Appendix A: Phase I Station Site Alternatives Analysis

Date: October 14, 2014

To: Eli Cooper, Transportation Manager, City of Ann Arbor
From: Project Team

Subject: Ann Arbor Station—Phase I Alternatives Analysis

The purpose of this memorandum is to describe the process for identifying and screening locations for a potential new multi-modal, intermodal, intercity and commuter passenger rail station in Ann Arbor (Ann Arbor Intermodal Passenger Rail Station). This Alternatives Analysis process is one element of the Ann Arbor Station Environmental Review. This effort, led by the City of Ann Arbor, began in January 2014 and is scheduled to conclude in December 2014. The Environmental Review is a concept planning study for:

a. Defining the long-term needs for an Ann Arbor Intermodal Passenger Rail Station;
b. Identifying potential sites and station options;
c. Evaluating benefits and impacts of various station options, including a No-Build Alternative (continued use of the existing station); and
d. Complying with Federal and State requirements for financing, building, and operating an Ann Arbor Intermodal Passenger Rail Station.

The Alternatives Analysis process is divided into two phases:

- **Phase I:** Identification of possible station sites and an initial screening of those sites; and
- **Phase II:** Development of conceptual station design alternatives for the sites identified in Phase I and review of those design alternatives to determine which are reasonable to advance into the Environmental Assessment phase.

Phase I is presented in this memorandum. Content contained here will be incorporated into an Environmental Assessment (EA) report, which will officially document the Environmental Review process.

Purpose and Need

The Ann Arbor Station Environmental Review is guided by a Purpose and Need document, which has been reviewed by the Michigan Department of Transportation (MDOT) and the Federal Railroad Administration (FRA). All station alternatives must comply with the Purpose and Need. The purpose of the proposed action is to:

> "provide an intermodal facility that will accommodate existing and future intercity passenger rail ridership; improve intermodal connectivity within the City of Ann Arbor and its neighboring communities, including proposed commuter rail in the City of Ann Arbor; and improve the integration of the station within the City of Ann Arbor."[1]

All station improvements would fully comply with accessibility requirements within the Americans with Disabilities Act (ADA).

As stated in the Purpose and Need document, the following elements contribute to the need for an enhanced, intermodal and multi-modal passenger rail station in Ann Arbor:

- Insufficient quality and comfort for passengers provided by the existing station
- Inadequate space for intermodal connectivity at the existing station
- Substantial existing and projected future passenger demand

[1] Ann Arbor Station Environmental Review Draft Purpose and Need, revised on October 14, 2014.

- Limited transportation choices between the existing station, Ann Arbor activity areas and surrounding communities.[2]

The Purpose and Need creates the framework for designing a new Ann Arbor Intermodal Passenger Rail Station. Thus, each station alternative must correspond with the Purpose and Need. Those alternatives that appear unable to meet the Purpose and Need are not recommended for further consideration. The complete Purpose and Need document will soon be available on the Ann Arbor Station website. A summary of the document is currently available on the website at:
http://www.a2gov.org/government/publicservices/systems_planning/Transportation/Pages/Ann-Arbor-Station.aspx

Potential Station Site Identification

Site selection criteria were developed in order to identify potential station sites. The primary criterion was provided by MDOT and the National Passenger Rail Corporation (Amtrak). Both entities requested that any enhancements to the existing station, or construction of a new station, should occur along a tangent (straight) section of track. This meets train operational objectives that ensure ADA compliance (manageable gaps between the trains and platforms), promote passenger convenience and safety, and protect railroad equipment and infrastructure. Both MDOT and Amtrak stipulated that the tangent track sections should be at least 1000 feet long to support railroad operational needs.

Based on the Purpose and Need, other station site identification criteria stipulated that the potential sites should:

- Lie along the existing Amtrak railroad corridor within City of Ann Arbor limits;
- Provide convenient access to downtown Ann Arbor and major activity areas. These other activity areas include notable trip generators in the City of Ann Arbor, including the University of Michigan (U-M) Central Campus, Medical Campus, and North Campus, and the Ann Arbor Department of Veterans Affairs (VA) Hospital. A proposed benchmark for convenience is proximity. Specifically, the Project Team (which includes URS, its subconsultants, and City staff) proposes using the national walking tolerance average of one-half mile to fixed guideway transit as optimal.[3] Station sites within one-half mile of activity areas that include reasonable pedestrian accommodations can be expected to promote walking access. All other access modes also benefit from this proximity.
- Include enough land to accommodate all required site features. The Project Team's preliminary estimate was that sites meeting the Purpose and Need would require at least three acres of suitable land for station facilities. [4] Given that ridership and station volume estimates have increased since this initial estimate, the amount of land required for a station has increased. Land requirements will be considered in detail as part of the Phase II analysis. During Conceptual Design, the

[2] *Ibid*.

[3] Transit Cooperative Research Program (2009). *Literature Review for Providing Access to Public Transportation Stations.* TCRP Web-Only Document 44, available at http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_webdoc_44.pdf.

[4] Three acres is the Project Team's preliminary minimum land estimate for accommodating station facilities, including a station building, multi-modal transfer center, platforms along both sides of a double-tracked rail corridor, a grade-separated track crossing for passengers—meaning a pedestrian bridge or tunnel meeting Americans with Disabilities Act (ADA) access requirements—and station parking.

project team will consider how the station can be built in stages and expanded as necessary;

- Allow convenient access to existing roadway networks. The station's high utilization projections[5] will require direct access to high volume roadway networks;
- Support connections to public transit services and non-motorized transportation facilities; and
- Minimize impacts to environmental resources. A list of environmental categories required for analysis as part of FRA-funded projects is provided on the FRA website.[6] Many of these criteria were considered generally during Phase I of the analysis and will be reviewed in detail for the small set of station sites advanced to Phase II.[7] The environmental category receiving the most stakeholder comments has been parks and recreational properties. The National Environmental Policy Act (NEPA) process requires special consideration of these properties, which are identified in the U.S. Department of Transportation Act of 1966 Section 4(f). Specifically,

> "Before an alternative involving the use of a Section 4(f) resource can be selected, avoidance alternatives and minimization measures must be considered."[8]

The Phase I criteria were reviewed by Ann Arbor stakeholders and citizens at public meetings in April 2014 and met with general approval. Stakeholders have since expressed interest in additional evaluation criteria, with numerous requests received for consideration of implementation costs and station-oriented development. Cost implications are considered generally in Phase I, in that land acquisition, relocations, required infrastructure and associated investments would increase project costs. However, implementation costs cannot be estimated until conceptual designs are developed. For these reasons, cost is not included as a specific criterion during Phase I. An alternative's economic constraints on local government is considered in the socioeconomic environmental category; thus general considerations to comparative costs are included in the Phase I analysis. Station-oriented development is also generally considered in the environmental categories, as it relates to compatible land uses and economic impacts.

In accordance with the site selection criteria, the Project Team has identified eight 1000-foot tangent track segments within the City of Ann Arbor. Figure 1 displays these track segments. Figure 2 shows the segments in context with half-mile radius circles around major activity areas. Figure 3 shows the segments in context with the public transit network.

[5] Ann Arbor Station internal memorandum on ridership and station utilization, August 8, 2014.
[6] The FRA environmental categories list can be found at https://www.fra.dot.gov/eLib/details/L02561. These were published in the Federal Register, Volume 64, Number 101, page 28550, on Wednesday, May 26, 1999. This 1999 categories list has yet to be superseded in final rulemaking.
[7] The environmental categories considered during the Phase I analysis are shown in the legends of the figures for this memorandum. These categories represent readily available data and the most prominent factors for screening alternatives. The analysis assumes that further evaluation would be performed in Phase II and for the Preferred Alternative.
[8] US Federal Highway Administration website: http://www.environment.fhwa.dot.gov/section4f/avoidance.aspx

Figure 1: 1000-Foot Straight Track Segments along Amtrak Corridor in Ann Arbor

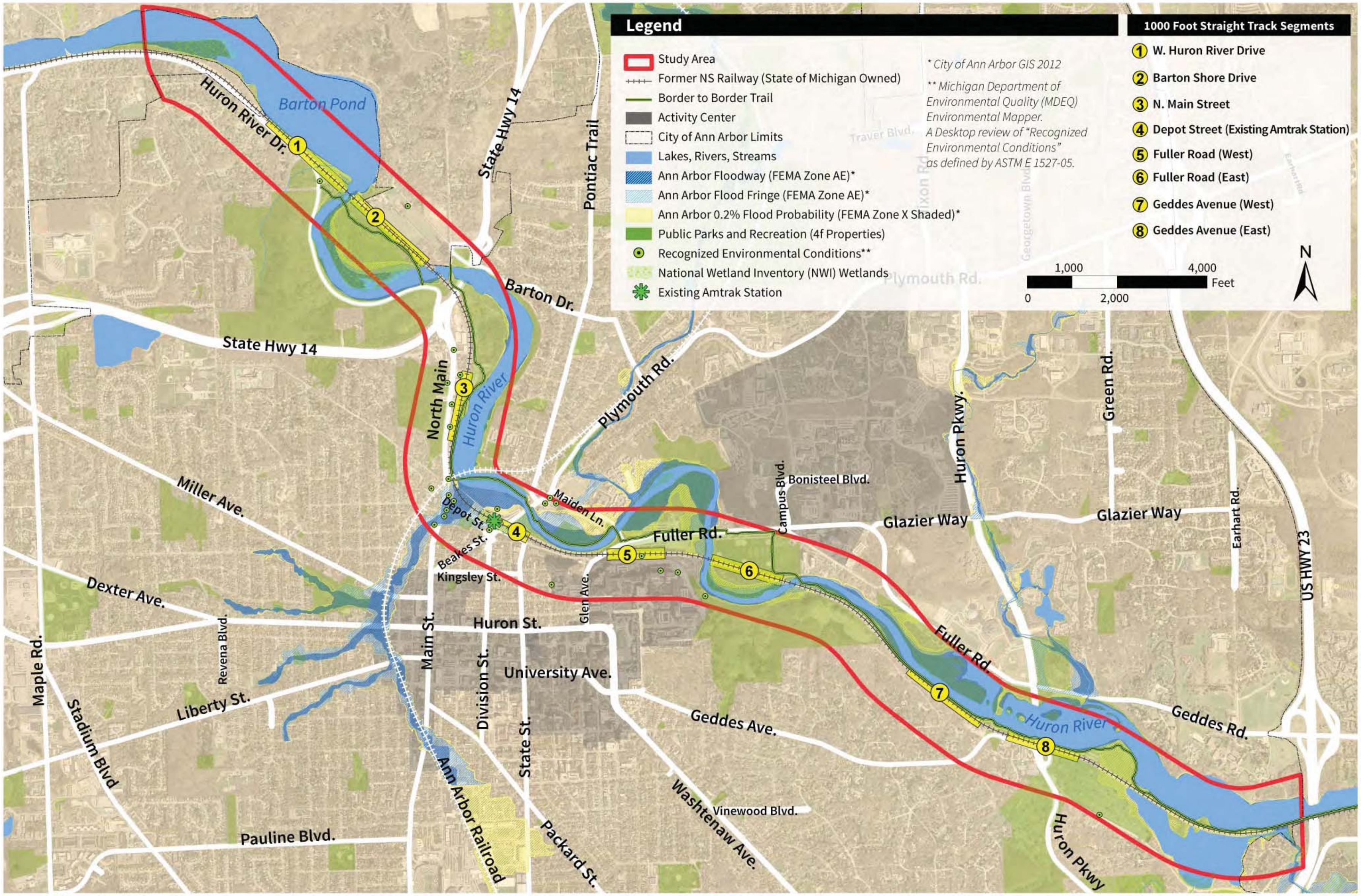


Figure 2: Proximity of Segments to Downtown Ann Arbor and Major Activity Areas

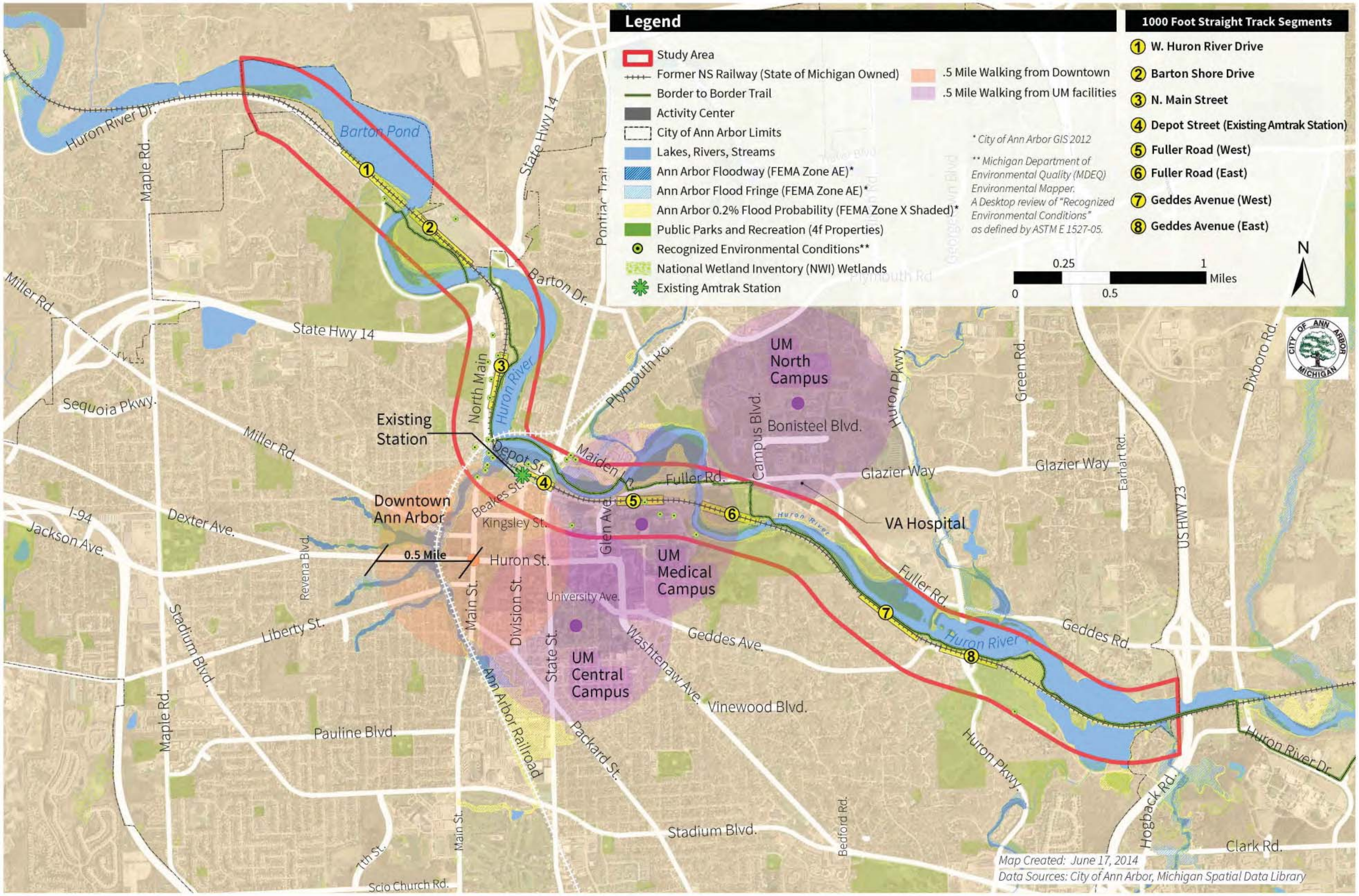
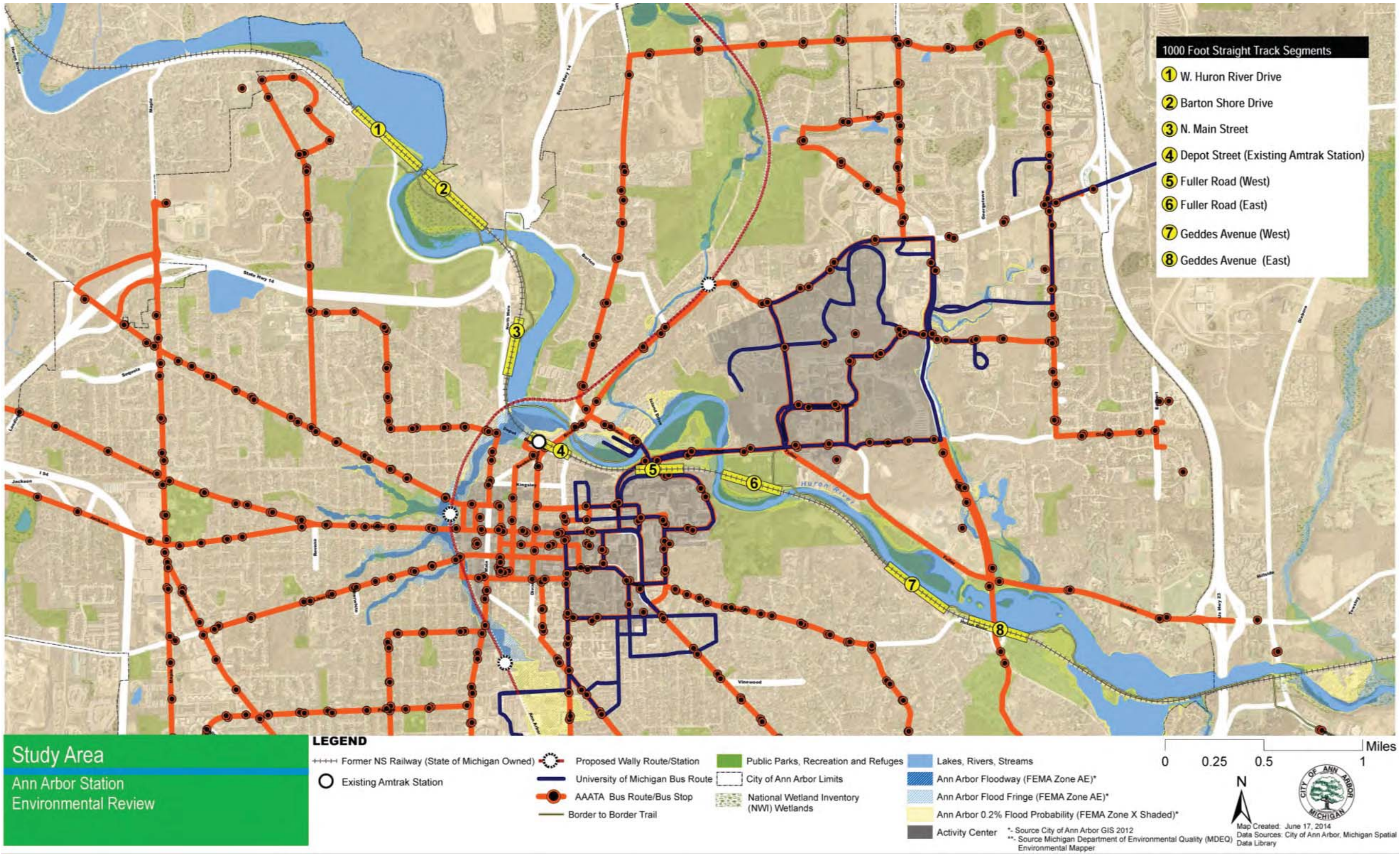


Figure 3: Segments in Context with Ann Arbor Transit Network



Segment identifiers are provided in Table 1.

Table 1: 1000-Foot Straight Track Segments along Amtrak Corridor in Ann Arbor

Segment #	Segment Name	Approximate Track Milepost*	Approximate Length (Feet)
1	West Huron River Drive	38.5	2300
2	Barton Shore Drive	38.4	2200
3	North Main Street	37.9	1500
4	Depot Street (Existing Amtrak Station)	37.3	1200
5	Fuller Road (West)	36.8	1300
6	Fuller Road (East)	36.2	1600
7	Geddes Avenue (West)	35.1	2000
8	Geddes Avenue (East)	34.8	1700

**From the 1999 Consolidated Rail Dearborn Division track charts, Michigan Line. These mileposts appear to land within the segments and do not represent surveyed midpoints.*

The existing railroad corridor follows the Huron River and has operated continuously along the river for over 100 years. Accordingly, potential stations present possible impacts to the river or riverfront areas. These and other potential environmental impacts are considered generally in Phase I of the analysis. Phase II and the Environmental Assessment will include more in-depth environmental evaluation.

Phase I Segment Descriptions and Scoring

The following sections describe the set of eight Phase I track segments identified for evaluation. The segments are described in context with the site selection criteria. Each segment evaluation criterion is assigned a preliminary score ranging from -2 (least compliant) to +2 (most compliant). This scoring represents an effort to generally gauge the feasibility and reasonableness of locating a station meeting the Purpose and Need at each segment. The goal of this process is to screen the segments to a small set worthy of detailed Phase II analysis. This memorandum does not rank the Phase II segments in any way; Phase II will commence a wholly new evaluation process for the remaining segments.

For a summary matrix showing how the Project Team scored each Phase I segment, please see Page 30.

Segment 1: West Huron River Drive (Figure 4)

This site in the city's far northwest corner and surrounded by parkland and natural resources meets few of the site identification criteria. Correspondingly, a brief description of the site's constraints is here provided.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
Segment 1 is located in the northwestern corner of the city. It is over 2.5 miles from the center of downtown and other major activity areas. This site does not meet the criterion for convenient access.

Criterion: Suitable Land for a Station
The track segment is surrounded by the Bird Hills Park / Nature Area and part of the segment is immediately adjacent to both the Huron River and West Huron River Drive. Nearby developed areas consist entirely of single-family homes, aside from the tracks themselves and the nearby Barton Dam on the river. There appears to be very little land for a station here, even if parkland were to be included for station use.

Criterion: Convenient Access to Existing Roadways
The segment is accessed via a winding two-lane road (West Huron Drive), which would require modifications to accommodate station access. The nearest high capacity roadways are further than one mile from the segment.

Criterion: Public Transit Connections
One existing Ann Arbor Area Transportation Authority (AAATA) bus route, Route 13, loops through a residential area within one block of Segment 1, at the end of its route. The route operates between the area and downtown Ann Arbor at peak 30-minute headways and hourly during the midday. Route 13 could potentially extend to a station at the segment to provide a very basic transit connection.

Criterion: Minimizing Environmental Impacts
The segment is within flood zones, which limits opportunities for a station in the area. A station would also present potential impacts to surrounding parkland, the Huron River, wetland areas, wildlife habitat, and a low-density residential area.

Summary
Segment 1 is not a reasonable station site, as it meets very few of the site identification criteria. It is not recommended for further consideration. Phase I scoring for this segment is shown in the matrix below. The Segment 1 area is displayed in Figure 4.

Segment 1: West Huron River Drive	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2
Suitable Land for Station Facilities	-2
Accessed by Existing Roadways	-1
Public Transit Connection Potential	-1
Minimize Environmental Impacts	-2
Phase I Score	**-8**

Figure 4: Segment 1—West Huron River Drive

Segment 2: Barton Shore Drive
(Figure 5)

Segment 2 meets few of the site identification criteria. The tracks follow the border between City parkland (the Barton Nature Area) and the Barton Hill Village incorporated area north of the city of Ann Arbor. The tracks bridge the Huron River at either end of the segment. Barton Shore Drive extends along the far side of the farmland from the tracks and is the nearest roadway. The City parkland is actually on a peninsula surrounded by the Huron River and thus is disconnected from the rest of the city except by two footbridges across the river. On the north side of the tracks is a meadow behind the Barton Hills Village Hall. A Barton Nature Area access trail crosses under the tracks at the northwestern end of the segment.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
This segment is north of the city (except for the bordering parkland). It is located about 2 miles from downtown and is further from other major activity areas. It is well outside the half-mile walk shed of major activity areas.

Criterion: Suitable Land for a Station
The only place to construct a station along Segment 2 is on the meadow north of the tracks. A station on these properties would be in Barton Hills Village, and thus does not meet the criterion of a station within the City of Ann Arbor. The meadow north of the tracks is large enough to host a station, but the land is outside Ann Arbor city limits and further than a mile from identified activity centers.

Criterion: Convenient Access to Existing Roadways
The Segment 2 area is not linked to a public road. A new street would need to be constructed to access a potential station site. Barton Shore Drive is a private, two-lane, tree-lined facility that connects to Barton Drive at a stop sign-controlled intersection. This intersection includes M 14 highway on and off ramps, which would be advantageous for this segment if local roadways connected the intersection to the segment. The meadow properties separate the tracks from the intersection and all local roadways.

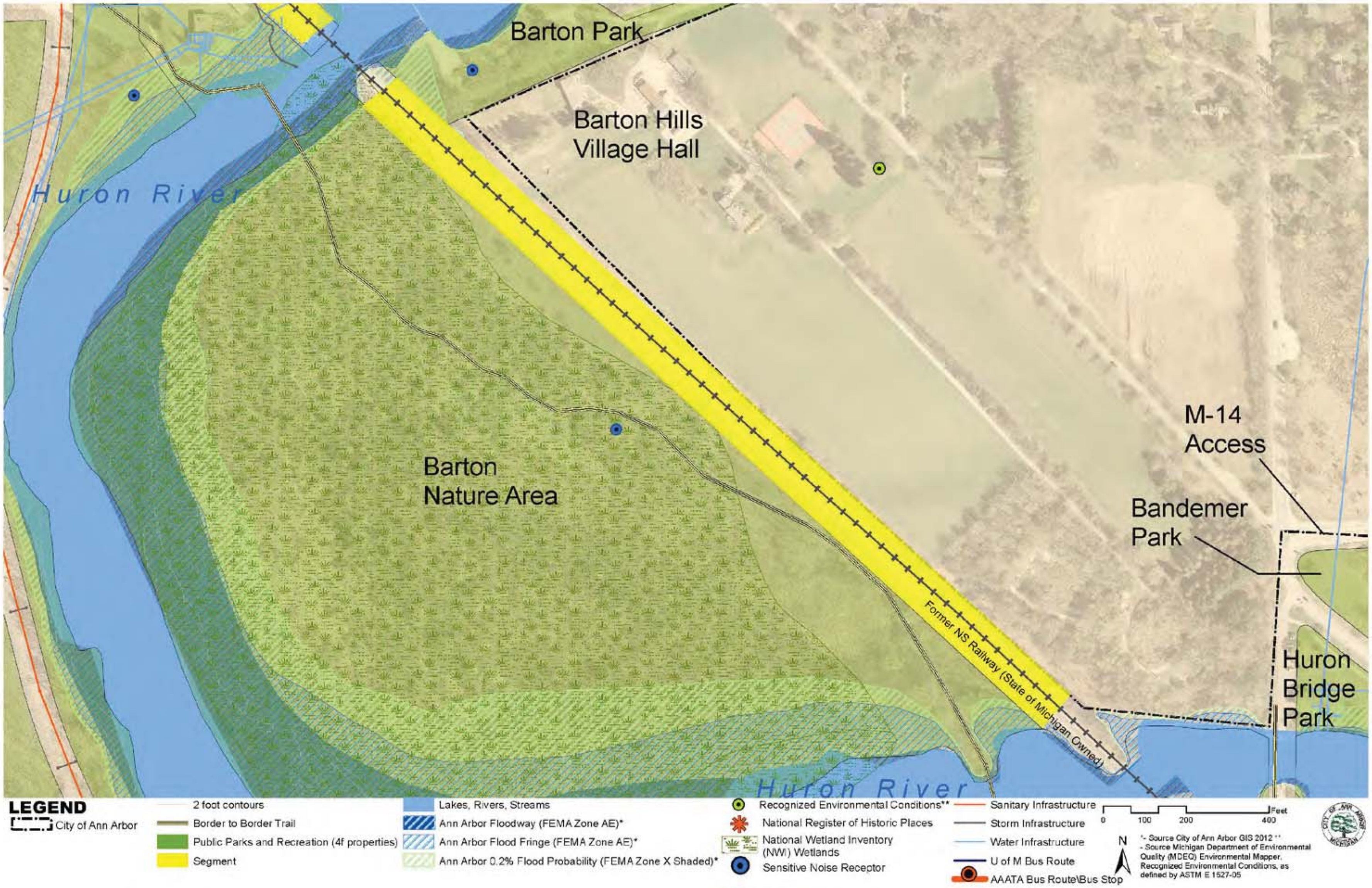
Criterion: Public Transit Connections
No public transit routes travel in nearby areas.

Criterion: Minimizing Environmental Impacts
Station construction and operations present potential impacts to surrounding wetland areas and parklands. Siting a station here would displace meadow land and dramatically change the area's character.

Summary
Segment 2 meets few of the site identification criteria and thus is not recommended for further consideration. Phase I scoring for this segment is shown in the matrix below. The Segment 2 area is displayed in Figure 5.

Segment 2: Barton Shore Drive	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2
Suitable Land for Station Facilities	-1
Accessed by Existing Roadways	-1
Public Transit Connection Potential	-2
Minimize Environmental Impacts	-2
Phase I Score	**-8**

Figure 5: Segment 2—Barton Shore Drive



Segment 3: North Main Street (Figure 6)

Segment 3 is located about one mile northwest of downtown Ann Arbor. Through this area, the tracks extend between a light industrial zone along North Main Street and Bandemer Park. At the southern end of the segment, the railroad right-of-way includes the Border-to-Border (B2B) Trail shared-use pathway, which sits on an easement provided by the railroad. In this area, the tracks and B2B Trail are immediately adjacent to the Huron River. The track area, Bandemer Park, and the B2B Trail are accessed via Lake Shore Drive, a private drive that connects perpendicularly with North Main Street and crosses the tracks at grade.

The railroad right-of-way is exceptionally wide along parts of Segment 3. The area historically included industrial access yard tracks, and an active excursion rail platform exists along this segment. Two siding tracks in the area are used for storing vintage railroad cars owned by Artrain/Mid America Railcar Leasing LLC (http://www.midamericarailcar.com/index.html). A trackside platform and shelter serves as a waiting area for visiting the railcars and excursion and educational trips using the vintage railcars.

The Artrain rail shelter sits adjacent to a parking lot for the NEW Center, a facility housing non-profit organizations at 1100 North Main Street. The parking lot contains just over 50 parking spaces adjacent to the tracks.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
The one mile distance between Segment 3 and downtown is greater than the national walking tolerance average of one-half mile to fixed guideway transit. Other activity areas are further from the segment. The primary connection to the area is North Main Street, which offers a sidewalk along the east side of the roadway and few other amenities for walking or bicycling between Downtown, Ann Arbor neighborhoods, and the segment area. The B2B Trail provides regional bicycle access to the area.

Criterion: Suitable Land for a Station
The wedge of properties between North Main Street and the tracks contains several light industrial and office businesses. One or more of these properties would need to be acquired in order to locate a multi-modal station in the area. An industrial use exists across North Main Street opposite Lake Shore Drive. A few other businesses are scattered along the west side of North Main Street. The majority of the west side of North Main Street contains a heavily wooded slope. This is part of the Bluffs Nature Area, which covers the hillside and borders North Main Street for much of its length through the area.

Criterion: Convenient Access to Existing Roadways
North Main Street is a major four-lane arterial through this area with connections to Downtown and M 14. For station access, North Main Street would likely require a signalized intersection and other improvements at Lake Shore Drive or a nearby site entry point. Lake Shore Drive is not currently a public road, which creates another challenge to access this location.

Criterion: Public Transit Connections
Only one AAATA bus route, Route 13, travels in the general Segment 3 area. It operates about three blocks from the southern limit of this segment. Other bus routes would need to make major diversions to serve the area. The proposed Washtenaw and Livingston Line (WALLY) commuter rail service may be implemented about 400 yards south of the segment. WALLY would travel between downtown Ann Arbor and Howell. At a point between Segments 3 and 4, the Ann Arbor Railroad tracks pass above the Amtrak tracks on a viaduct. Both railroads navigate sharp curves at the crossing point, which eliminates the option of locating the intercity rail station at the

crossing. The WALLY project has not proposed a station in the vicinity of the crossing point.

Criterion: Minimizing Environmental Impacts
Notable environmental impacts of a station along Segment 3 would be the cost to the City of acquiring multiple properties and relocation of several businesses. Potential impacts to nearby park areas, associated wetlands, and the Huron River would also need consideration. Also to be considered: the cost to redesign North Main Street and nearby intersections to provide multi-modal site access.

Summary
It appears possible to locate an intermodal passenger rail station at Segment 3. However, the segment does not meet the Purpose and Need. The prospect of acquiring several properties along the segment and relocating businesses raises the capital and socioeconomic costs of locating a station here. Access and roadway conditions create problems for vehicular and non-motorized access between the site and major activity areas. This site has limited potential for transit connections. The site's environmental constraints are complex, and thus the Project Team initially did not recommend advancing Segment 3 for further analysis.

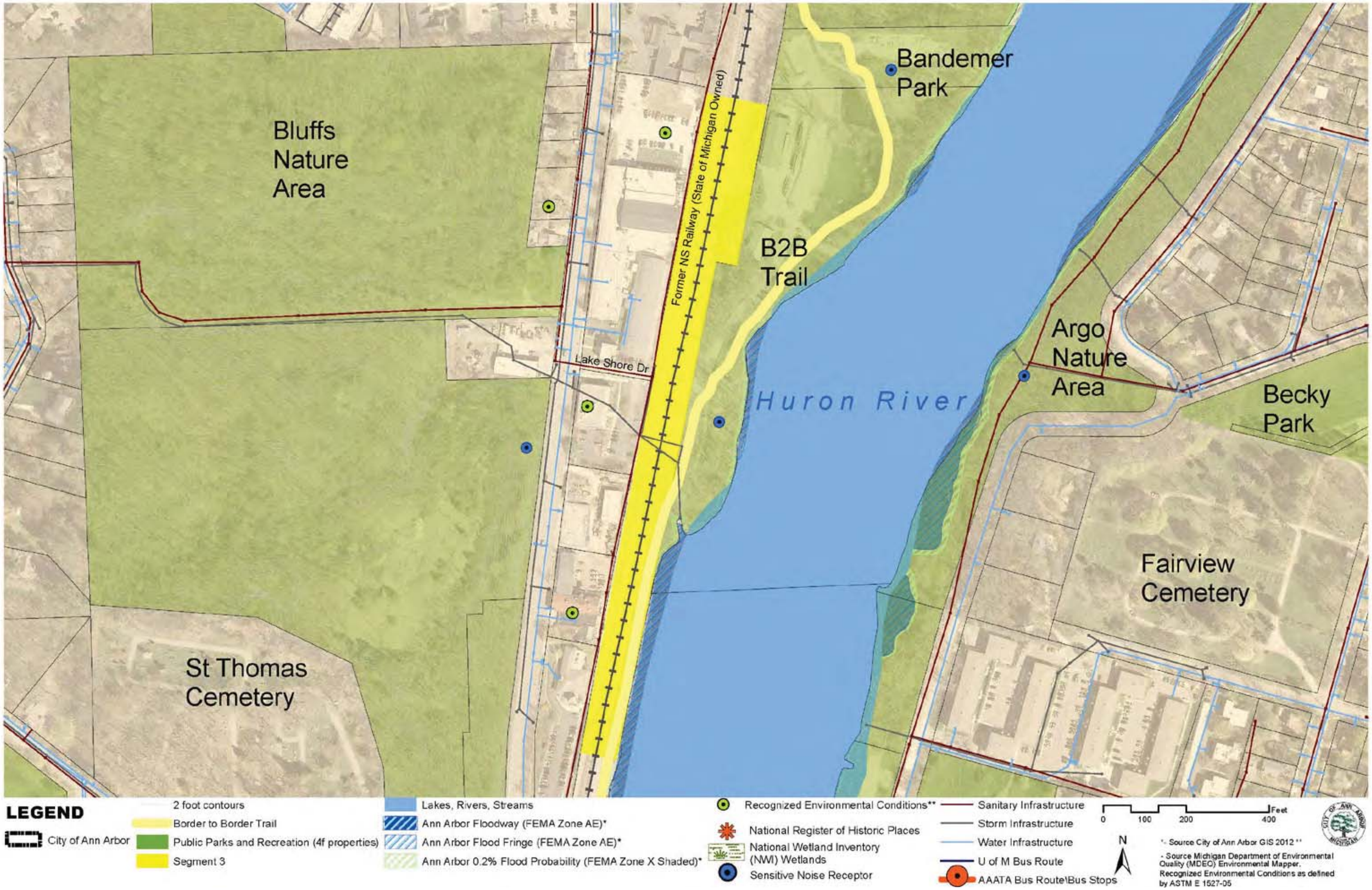
Postscript: *At June stakeholder and public meetings, a few participants expressed support for further consideration of this segment area. Several other meeting participants concurred with the requests, with no dissent. As a result, the Project Team advanced Segment 3 for further consideration in the Phase II analysis, along with Segment 4 (Depot Street/Existing Amtrak) and Segment 5 (Fuller Road—West).*

The Project Team performed further analysis on this site and developed conceptual designs after the conclusion of Phase I. The Team concluded that the station program would require considerably more land than originally anticipated and that very little buildable land would remain for station-oriented development. All businesses between North Main Street and the Huron River and within 700 feet of Lake Shore Drive would be relocated for this segment. This information was shared with diverse stakeholders during a site tour on September 15, 2014. Accordingly, tour participants and meeting attendees expressed little support for this site after the tour. The Project Team once again recommends eliminating Segment 3 from further consideration. Concept designs for this site and further analysis will be included in a Phase II Alternatives Analysis technical memorandum.

Phase I scoring for this segment is shown in the adjoining matrix. The Segment 3 area is displayed in Figure 6.

Segment 3: North Main Street	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	0
Suitable Land for Station Facilities	0
Accessed by Existing Roadways	1
Public Transit Connection Potential	0
Minimize Environmental Impacts	-1
Phase I Score	**0**

Figure 6: Segment 3—North Main Street



Segment 4: Depot Street (Existing Amtrak Station) (Figure 7)

The Segment 4 area includes the existing Ann Arbor Amtrak Station, the busiest passenger rail station in the state of Michigan. The station is located about one-half mile from the center of downtown Ann Arbor. Current station utilization is about 150,000 annual passengers. Segment 4 is also the location of the historic Ann Arbor train station building (now the Gandy Dancer restaurant), which sits next door to the Amtrak station. The Amtrak station building is situated south of the tracks on Depot Street, where the street passes beneath the Broadway Street Bridge. Public parking lots containing over 50 total metered spaces abut the station building.

The immediate Depot Street area contains a low-density mix of commercial properties. Beyond the commercial properties, a mix of single-family homes, apartment buildings, institutions and parks extends south of the station along an urban street grid. The area includes two Historic Districts: the Division Street Historic District (which includes the historic station building) and the Old Fourth Ward Historic District (which extends from Depot Street to downtown). The area's urban mix gains intensity as it reaches the fringes of downtown. North of the tracks, an L-shaped Amtrak parcel contains 70-80 long-term parking spaces for the station and a stormwater management area associated with the parking area. Grassy berms and the driveway throat in the area function as overflow parking. A large, previously developed parcel (owned by DTE Energy) extends northward from the Amtrak long-term parking lot to the Huron River. This land was used decades ago for energy manufacturing—a process that left the site polluted. DTE performed environmental remediation of the site in 2012-2013.[9] The Broadway Street Bridge divides these properties from Broadway Park. The area north of the river along Broadway Street contains a few sidewalk-oriented commercial buildings. The Kellogg Eye Center Hospital and other U-M facilities are situated along Wall Street just to the northeast of this location.

The total amount of parking currently available to Amtrak customers includes:

- 70-80 spaces north of the tracks and some additional open land used for parking (Long Term Parking). This parking is available at no charge and parking restrictions are lightly enforced. Riverfront recreational users and visitors to the nearby Kellogg Eye Center hospital reportedly use up to 50 percent of these spaces periodically;
- About 38 short-term metered spaces in the city lot west of the station, including 2 "blue" accessible spaces, and
- About 14 short-term metered spaces beneath the Broadway Bridge, just south of the station building.

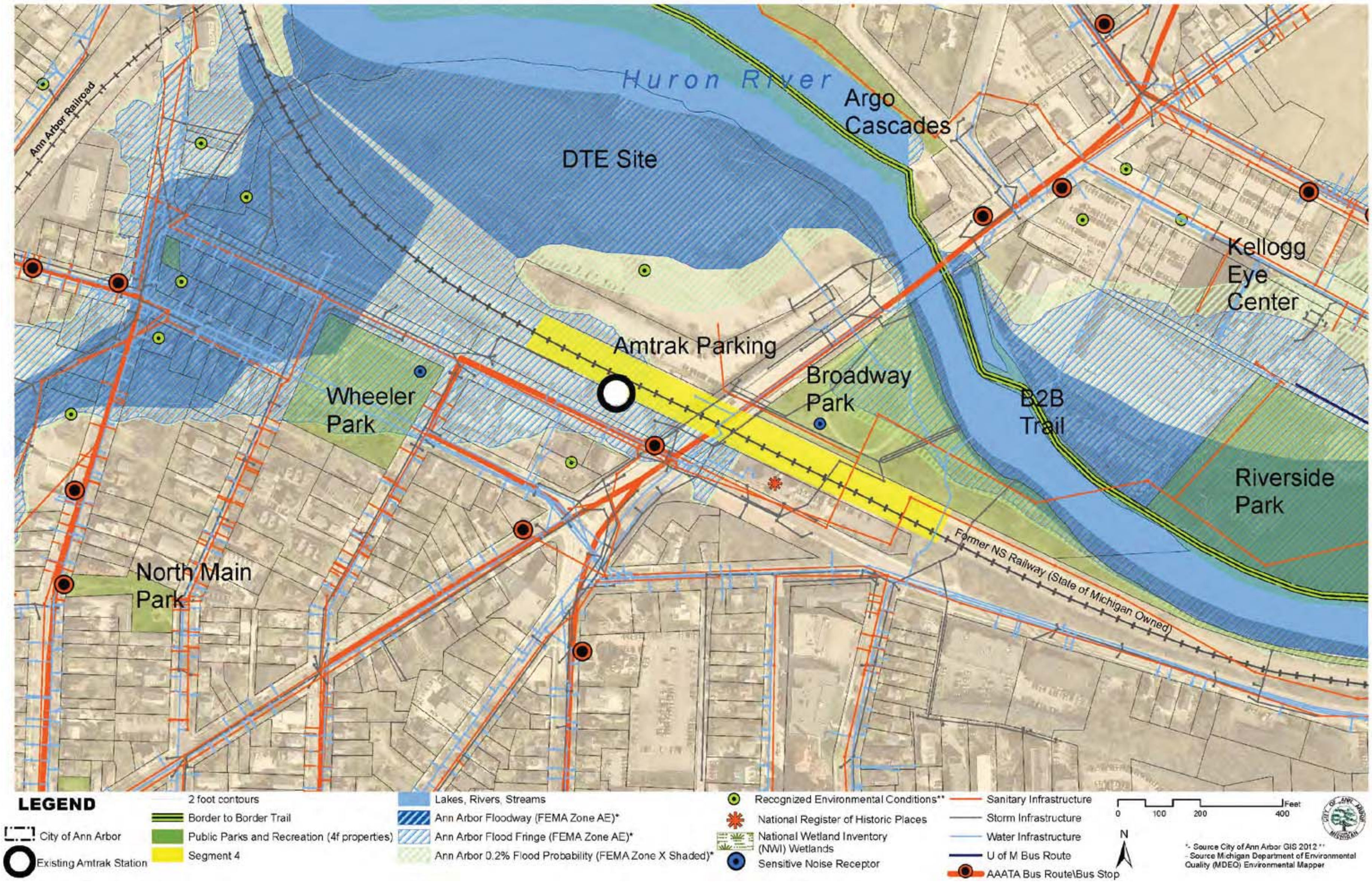
The existing Amtrak station building is undersized for its present use, and station activity is expected to grow more than seven fold by 2035. The station building lacks many amenities generally associated with busy intercity passenger rail stations. Also problematic: the long-term station parking area, located north of the tracks, is at capacity. Access to the parking area is a problem as well: the walk via the Broadway Street Bridge currently requires multiple flights of stairs. The narrowness of Depot Street, limited curbside space, and complex station traffic cause local congestion.[10]

The Segment 4 area is displayed in Figure 7.

[9] http://www.annarbor.com/news/dte-energy-calls-michcon-cleanup-success/

[10] More information on the existing Ann Arbor Amtrak station is available in an Existing Conditions memorandum prepared by the Project Team for the Environmental Review and dated March 5, 2014.

Figure 7: Segment 4—Depot Street (Existing Amtrak Station)



(Segment 4: Depot Street {Existing Amtrak Station}, continued)

Several community members have expressed interest in repurposing the historic station building /Gandy Dancer Restaurant as part of a new Ann Arbor Intermodal Passenger Rail Station. Factors complicating this reuse include:

1. The historic station building and its surrounding land are privately owned. This building and surrounding brick streets are in the Division Street Local Historic District, which could limit alteration and new construction;
2. The projected 2035 ridership at a new Ann Arbor Intermodal Passenger Rail Station is over 1 million annual riders. Amtrak guidelines for a station accommodating this passenger volume call for a building larger than the historic station building;
3. Land on the east side of the Broadway Street Bridge, which is where the historic station building is, is more constrained than land west of the bridge. Broadway Park boarders the tracks opposite the historic station building, which limits grade-separated pedestrian crossing options at this location. The impacts of a pedestrian bridge or tunnel between the historic building, a second passenger platform and parking across the tracks also need consideration;
4. The narrow, linear parking lot across Depot Street from the historic station building contains 20 parking spaces. Modifications to this lot for additional parking or multi-modal access are constrained by an adjoining forested slope that includes and borders residential structures. Also, this parking lot is in the Old Fourth Ward Local Historic District, which could limit construction on the site. A second parking lot east of the historic station building, including about 40 parking spaces, could possibly extend linearly. However, is probably too narrow to enable vertical station parking; and
5. Existing station parking and large parcels that can possibly host expanded parking are on the west side of the Broadway Street Bridge and north of the tracks. A building along the segment for a new Ann Arbor Intermodal Passenger Rail Station would connect directly with these parcels, and thus would most likely be located west of the Broadway Street Bridge.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
Of all the segments, Segment 4 is the closest to downtown Ann Arbor. It sits approximately one-half mile from the heart of downtown—a walkable distance. The U-M Medical Campus is located about two-thirds of a mile away, and the U-M Central Campus is less than a mile away. The city's street grid connects the station area to the entire city. Topography, an elevated roadway, and high speed vehicular approaches to the Broadway Street Bridge create some local non-motorized and barrier-free access problems. Mitigation measures may be able to address these problems, but would add to a new station's implementation costs.

Criterion: Suitable Land for a Station
The existing station properties on both sides of the tracks provide about 2.5 acres of relatively unencumbered land as a starting point. City-operated parking lots adjacent to the station are potentially suitable for station development. Other nearby land could possibly be acquired for the station; this includes DTE parcel(s), properties associated with the landmark historic station building (the Gandy Dancer restaurant), and commercial properties along Depot Street.

Criterion: Convenient Access to Existing Roadways
While the Segment 4 area is connected to the Ann Arbor street grid, previously-noted topographical and roadway conditions create challenges for local access. While land may be available for station parking on the north side of the tracks, access to and from Broadway

Street is currently funneled to a single, unsignalized access point. The station parking access drive would likely require a traffic signal and potentially require an additional access point. The grade differential between trackside parcels and the Broadway Street Bridge creates access challenges. It is possible that these issues can be addressed with mitigation measures, but at additional cost to the station project.

Criterion: Public Transit Connections
Existing transit service connects the Segment 4 area with downtown Ann Arbor, the U-M Central Campus, and the U-M North Campus. Three AAATA bus routes serve the immediate area. AAATA Route 17 stops on Depot Street in front of the existing station. Two other routes (AAATA Routes 1 and 2C) follow Broadway Street across the bridge, and thus travel above the station. The Project Team recommends exploring opportunities to connect these routes to the station in the next phase of the Environmental Review. Options include stops on the bridge with a crosswalk and vertical circulation, or a route diversion to the station. Improvements to enable Broadway Street routes to connect would add to the project cost.

U-M bus routes travel within one-quarter mile of the Segment 4 area and can possibly be extended to connect to the area. To summarize, connecting sufficient transit to a station at Segment 4 seems achievable.

Criterion: Minimizing Environmental Impacts
Impacts to Amtrak operations during development of a new station would require careful staging. Parts of the existing station property and much of the surrounding land lie within identified flood zones. Traffic impacts related to station and access improvements would need consideration and, conceivably, mitigation measures. Should property in addition to Amtrak parcels be required for a new station at the site, the financial and socioeconomic impacts of property acquisitions must be considered. The historic station building (now Gandy Dancer restaurant) is on the National Register of Historic Places. Thus, impacts to the historic station building must be avoided.

Summary
Segment 4 contains the city's passenger rail station today and may possibly host a new intermodal station meeting the Purpose and Need. An exploration of station options at this site is recommended for further consideration. Phase I scoring for this segment is shown in the matrix below.

Segment 4: Depot Street (Existing Amtrak)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	2
Suitable Land for Station Facilities	1
Accessed by Existing Roadways	1
Public Transit Connection Potential	1
Minimize Environmental Impacts	1
Phase I Score	**6**

Segment 5: Fuller Road (West) (Figure 8)

Segment 5 is located immediately north of and downhill from the U-M Medical Campus, below the Fuller Road and East Medical Center Drive bridges. The north side of the tracks is bordered by Fuller Park, which sits slightly higher in elevation than the tracks.

The Segment 5 area contains a dense employment concentration—far exceeding the other segment areas. It also contains multiple large parking lots and structures that support local employment, education and recreation. One of the parking areas within Fuller Park extends parallel to the tracks, about 75 feet north of the tracks. The lot contains about 250 spaces. Another large parking lot is located further north from the segment, on the far side of Fuller Road. This additional lot next to the Fuller Park Outdoor Pool and Waterslide contains about 235 spaces. Both of these parking lots appear to be used, in part, by commuters. South of the tracks and up the hill, the multi-level M15 North Entrance Parking Structure is nestled into the Medical Campus. Other parking structures and lots surround the Medical Campus, some of which are near the track segment.

The area also contains a nearby multi-family residential area, located across the Huron River from the segment along Maiden Lane. The Kellogg Eye Center Hospital is just beyond the housing areas. U-M recreational fields are east of the segment along Fuller Road, as are some U-M North Campus facilities and the VA Hospital.

The Segment 5 area is displayed in Figure 8.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators

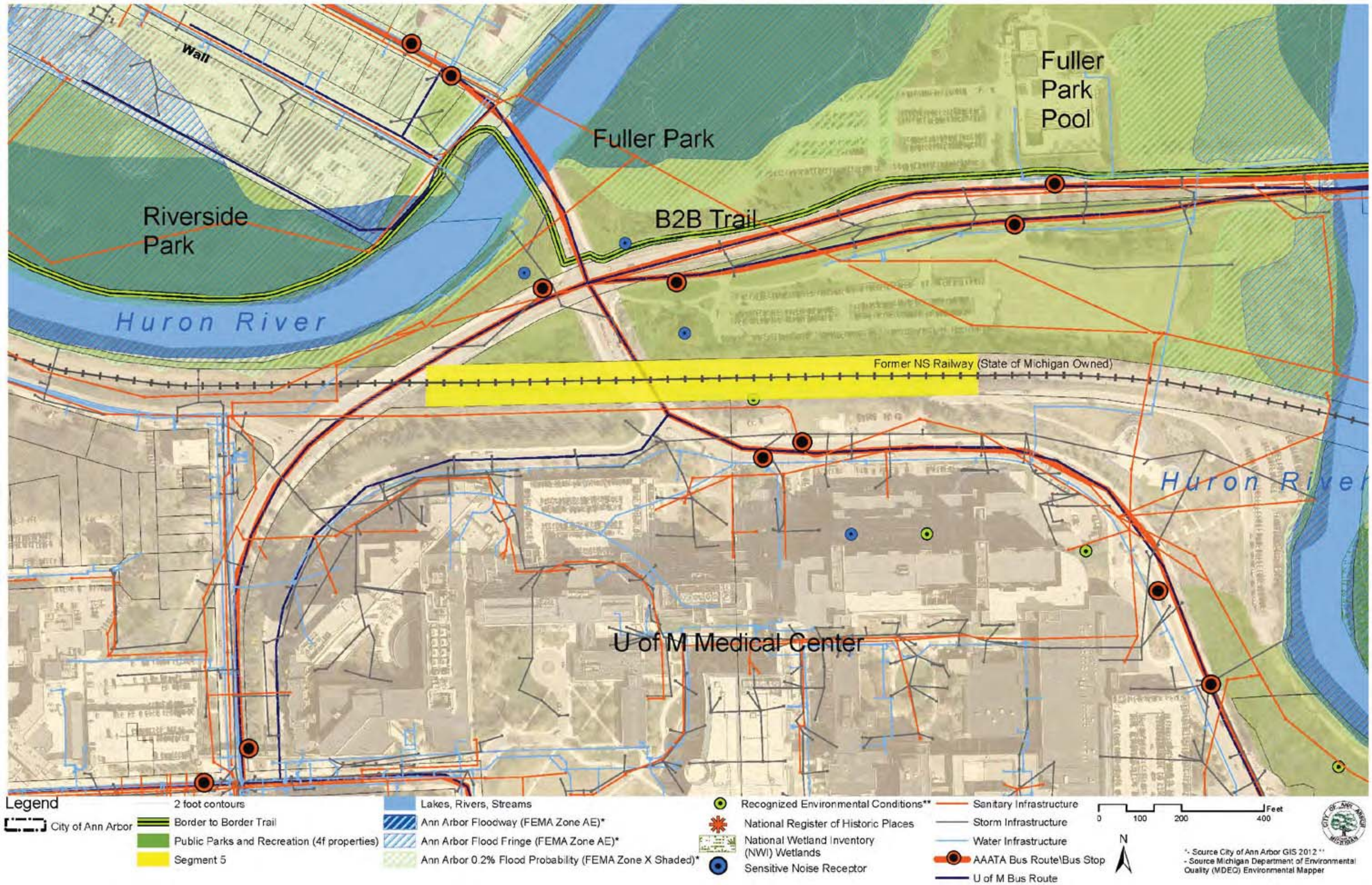
Segment 5 is located about one mile from the center of downtown Ann Arbor, beyond the typical distance passengers would be willing to walk. Frequent transit service between the segment area and downtown helps bridge that walking gap. A planned high-capacity transit service, the Connector, is proposed to link the area with downtown, U-M campuses, and other major activity areas. The segment is about 100 yards from the nearest U-M Medical Campus buildings.

The Medical Campus has one of the highest concentrations of jobs in Washtenaw County. The difference in elevation between the tracks and the Medical Campus would require vertical circulation, including elevators to serve persons with disabilities. The U-M Central Campus is located about two-thirds of a mile from the segment—a long walk. Both the Central and North Campuses connect to the area by frequent bus services.

Criterion: Suitable Land for a Station

The Segment 5 area has land uses to support a station. Platforms and vertical circulation may fit within railroad property, but a station building and other facilities would be located a) on City-owned designated park land now occupied by parking, b) in air rights above the MDOT tracks, c) on University property that is densely built-out with medical facilities, and/or d) along area roadways. While these issues appear complicated, further analysis would clarify the feasibility and reasonableness of a station along this segment.

Figure 8: Segment 5—Fuller Road (West)



(Segment 5: Fuller Road (West), continued)

Criterion: Convenient Access to Existing Roadways
The Segment 5 area is surrounded by high-capacity roadways. It is the most likely station site to absorb station traffic without significant roadway modifications. The impacts of adding station traffic to the already congested area roadways will require detailed traffic analysis in Phase II.

Fuller Road is a multi-lane parkway facility. The intersection with Maiden Lane and East Medical Center Drive is under consideration for an improvement by the City of Ann Arbor to address existing traffic issues. Sidewalks exist on all public streets with the sidewalk width of 8-10' allowing them to serve as shared-use paths. The regional B2B Trail is designated on the paths on the north side of Fuller Road through the area.

Criterion: Public Transit Connections
The Segment 5 area is second only to the City and University transit centers in its concentration of existing bus service. All points in the city and much of Washtenaw County can connect to the area via existing transit routes. AAATA bus routes serving the area include Routes 1U, 2A, 2B, and 3. Several other AAATA routes travel within one-third mile of the segment at the U-M Hospital Mott transit center and conceivably could extend to a station at Segment 5. These include Routes 4A, 14, 18A, 609, C, IC, and RL. All eleven U-M bus routes except the Oxford / Oxford Shuttle and Night Owl services travel in the immediate Segment 5 area.

In addition to existing transit routes, the planned Connector high-capacity transit corridor would serve the U-M Medical Campus, with a station just north of E. Medical Center Drive. Segment 5 is the only track segment where a Connector station is proposed in the immediate vicinity. All of the Connector alignments under consideration include a station in the Segment 5 area. Should the Connector advance to implementation, its corridor would extend from Segment 5 to a downtown area in the vicinity of a proposed WALLY commuter rail station near the intersection of W. Washington Street and S. 1st Street.

Criterion: Minimizing Environmental Impacts
A major environmental consideration for Segment 5 is its ability to accommodate station facilities north of the tracks, with resulting impacts to designated parkland. Much of the parkland adjacent to the track segment is currently used for commuter parking. Parkland impacts and associated mitigation measures will need careful consideration in the Phase II analysis.

Summary
Segment 5 presents significant opportunities as well as challenges. It also meets the Purpose and Need requirements if a station can be located along the segment. It is recommended for inclusion in the Phase II analysis. Because the station would use designated park lands, other alternatives and minimization measures will be considered during Phase II. Phase I scoring for this segment is shown in the matrix below.

Segment 5: Fuller Road (West)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	2
Suitable Land for Station Facilities	1
Accessed by Existing Roadways	2
Public Transit Connection Potential	2
Minimize Environmental Impacts	1
Phase I Score	**8**

Segment 6: Fuller Road (East) (Figure 9)

The track distance between Segment 6 and Segment 5 is only one-quarter mile. By comparison, though, Segment 6 is quite isolated from activity centers. Segment 6 is situated on a peninsula defined by a bend in the Huron River. The tracks cross the river at each end of the segment. The segment is completely surrounded by U-M land, including recreation fields (U-M Mitchell Field) on the north side of the tracks, and a nature area (part of Nichols Arboretum) south of the tracks.

Mitchell Field is a property meeting the definition of the U.S. Department of Transportation Act of 1966 Section 4(f) recreational lands. The University of Michigan website explains that:

> "Mitchell Field is used for scheduled activities and rentals. This facility is not available for drop-in play. Facilities include a large field area for soccer, softball, flag football, and ultimate frisbee."[11]

Two large parking lots straddle Fuller Road north of the recreation lands adjacent to the segment. These lots contain about 765 parking spaces (about 470 spaces south of Fuller Road and about 295 spaces north of Fuller Road). These lots are used by commuters. U-M and AAATA bus services connect the lots to locations throughout the city. Nearby activity areas include the Ann Arbor VA Hospital and North Campus facilities, both located about one-third mile from the segment. At their nearest, the parking lots are within 170 yards of the track segment. The average distance between the lots and the tracks is about 275 yards. No roadways connect the lots to the track area; one pathway generally makes that connection.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
This segment is about 1.5 miles from downtown Ann Arbor. A series of physical barriers separate the segment from all activity areas. For example: spanning the two-tenths-mile gap between the segment and the U-M Medical Campus would require a footbridge across the river, vertical circulation, and new pathways.

The Gallup Park Pathway (shared-use trail) passes near the segment, conveying the B2B Trail through the area. This path creates a connection to Fuller Road and transit services, but requires a 400-yard walk. No existing roadway connects to the segment. Substantial modifications to Mitchell Field would be required to establish direct connections between Fuller Road and the segment, thus providing connections to the rest of the city and activity centers.

Criterion: Suitable Land for a Station
Portions of Mitchell Field would need to be converted to other uses to enable a station along the segment. These uses would need to extend somewhat to the portion of Nichols Arboretum on the south side of the tracks, which is a pristine nature area.

Criterion: Convenient Access to Existing Roadways
While Fuller Road travels near the segment and is a high-capacity arterial, no roadway connects Segment 6 to Fuller Road.

Criterion: Public Transit Connections
Nearby Fuller Road and East Medical Center Drive are busy transit corridors conveying almost all U-M bus routes. AAATA Route 3 follows Fuller Road through the area, and several other AAATA routes serve the nearby U-M North Campus and Medical Campus. These bus corridors, Fuller Road and East Medical Center Drive, are each about 230 yards from the segment. However, no roadways connect these bus corridors to the segment.

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[11] University of Michigan website: http://recsports.umich.edu/article/mitchell-fields

Criterion: Minimizing Environmental Impacts

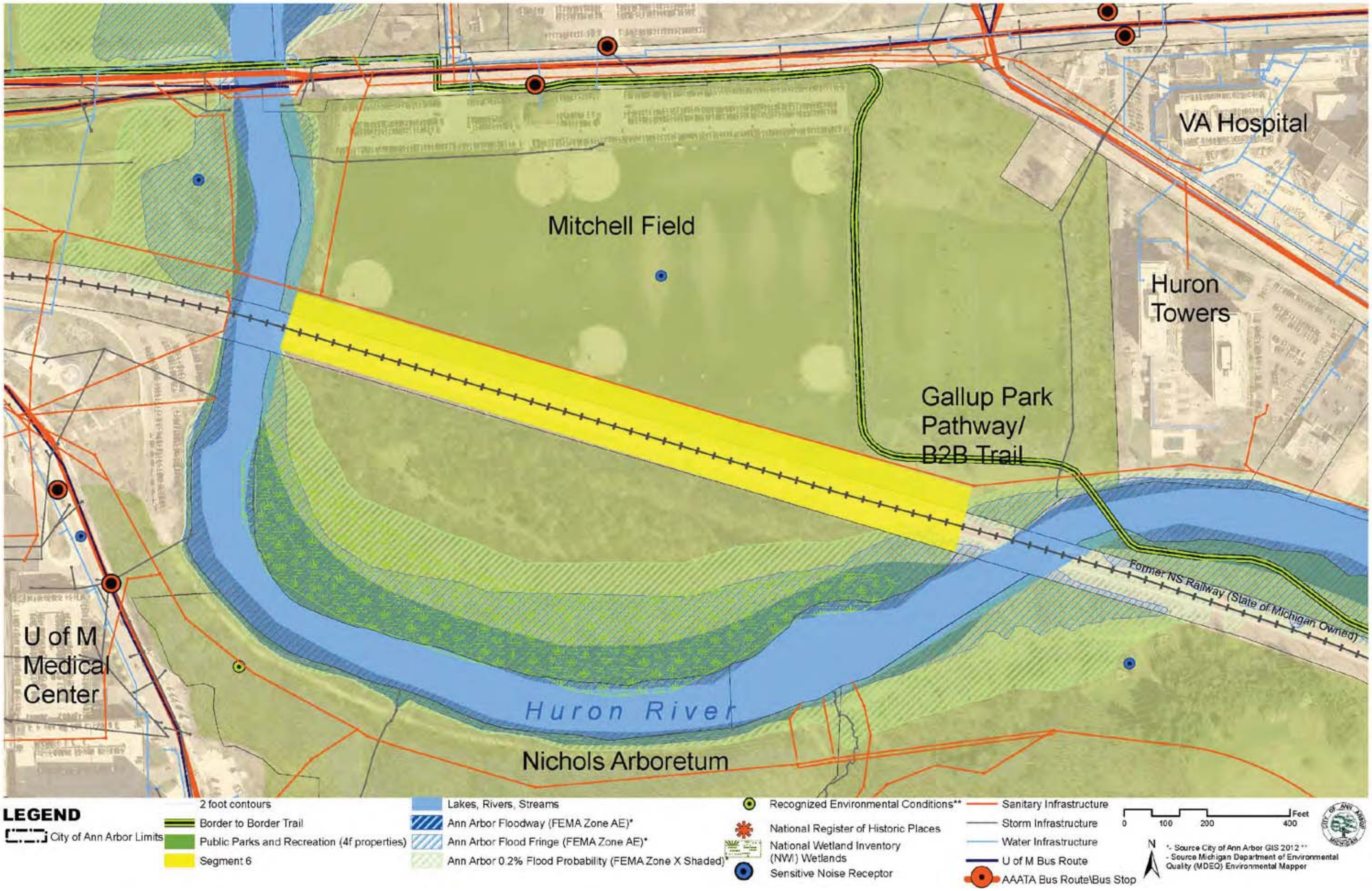
A station at Segment 6 would require converting a substantial portion of U-M Mitchell Field, which meets the Section 4(f) recreation land definition, to station uses. The Nichols Arboretum nature area south of the tracks, another Section 4(f) property, would also be used to some extent.

Summary

Segment 6 meets few of the site identification criteria. In particular, it offers insufficient access and suitable land meeting the Purpose and Need and requires substantial Section 4(f) property uses. It is not recommended for further analysis. Phase I scoring for this segment is shown in the matrix below. The Segment 6 area is displayed in Figure 9.

Segment 6: Fuller Road (East)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	0
Suitable Land for Station Facilities	0
Accessed by Existing Roadways	-1
Public Transit Connection Potential	-1
Minimize Environmental Impacts	-1
Phase I Score	**-3**

Figure 9: Segment 6—Fuller Road (East)



Segment 7: Geddes Avenue (West) (Figure 10)

Segment 7 lies along a sliver of riverfront Gallup Park land in residential east Ann Arbor. It offers the fewest characteristics meeting the Purpose and Need of all the segments.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
While Segment 7 offers direct access to the Gallup Park Pathway / B2B Trail, major activity areas are well beyond the half-mile walking distance from the segment. The segment is over 2.5 miles from downtown Ann Arbor.

Criterion: Suitable Land for a Station
Segment 7 offers virtually no suitable land for a station. The tracks are separated from the Huron River by a narrow strip of riparian forest. Opposite the tracks from the river is a strip of wooded backyards of single-family homes.

Criterion: Convenient Access to Existing Roadways
No existing roadway meets Segment 7. Geddes Avenue, a winding two-lane arterial travels near the segment's eastern end.

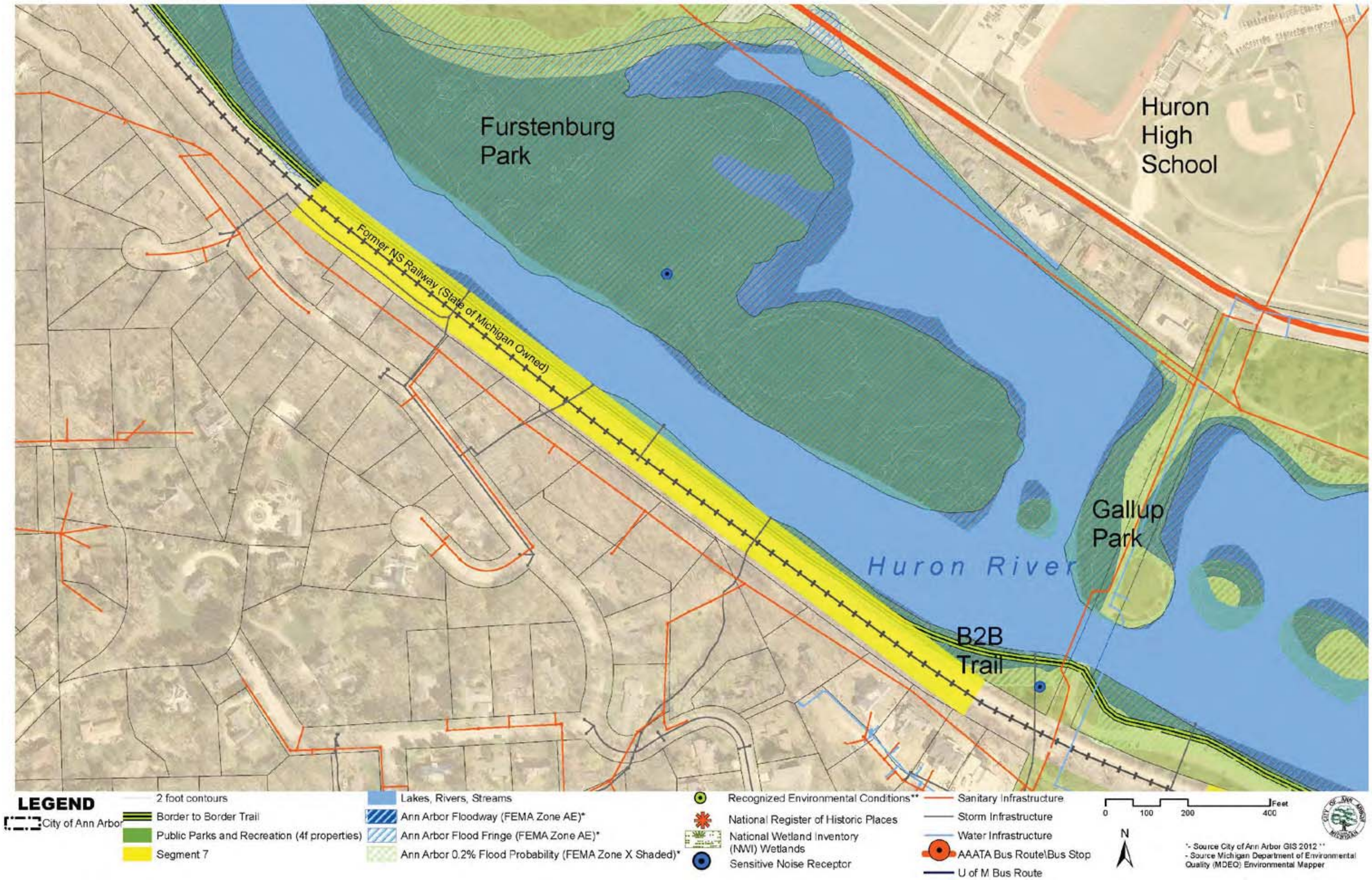
Criterion: Public Transit Connections
Two bus routes serve the general segment area. AAATA Route 22 follows Huron Parkway one-third mile east of Segment 7. Another route, AAATA Route 3, shifts its operation between Huron Parkway and Fuller Road. Both of these corridors are on the opposite side of the Huron River and Gallup Park from the segment, about one-third mile from the segment. These routes could conceivably make significant deviations to serve the segment area, but no roadway allows them to connect directly.

Criterion: Minimizing Environmental Impacts
A station at Segment 7 would face many environmental impacts: to parkland, wetlands, the river, a single-family residential area, narrow roadways and park drives.

Summary
Segment 7 meets none of the site identification criteria and is not recommended for further consideration. Phase I scoring for this segment is shown in the matrix below. The Segment 7 area is displayed in Figure 10.

Segment 7: Geddes Avenue (West)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2
Suitable Land for Station Facilities	-2
Accessed by Existing Roadways	-2
Public Transit Connection Potential	-2
Minimize Environmental Impacts	-2
Phase I Score	**-10**

Figure 10: Segment 7—Geddes Avenue (West)



**Segment 8: Geddes Avenue (East)
(Figure 11)**

Segment 8 extends along the southern banks of the Huron River, adjacent to Gallup Park and Geddes Avenue under the Huron Parkway Bridge. It is situated in the city's eastern extent, near the Huron Hills Golf Course and the Racquet Club of Ann Arbor. Adjacent properties consist solely of park and recreation land and facilities. The segment meets few site identification criteria.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
Segment 8 is over 2.5 miles from downtown Ann Arbor with no direct roadway connection. It is well beyond the half-mile walking distance from other activity centers.

Criterion: Suitable Land for a Station
To obtain the minimum 3 acres of land for a station at Segment 8 would require acquisition of private land (the Racquet Club) or converting part of the Huron Hills Golf Course, a city park, to station uses.

Criterion: Convenient Access to Existing Roadways
Huron Parkway is a major arterial crossing above the segment and provides a local access connection to the area at Geddes Avenue. Thus, a sufficient roadway connection to the segment may be feasible. This roadway connection would be far removed from Downtown and activity centers.

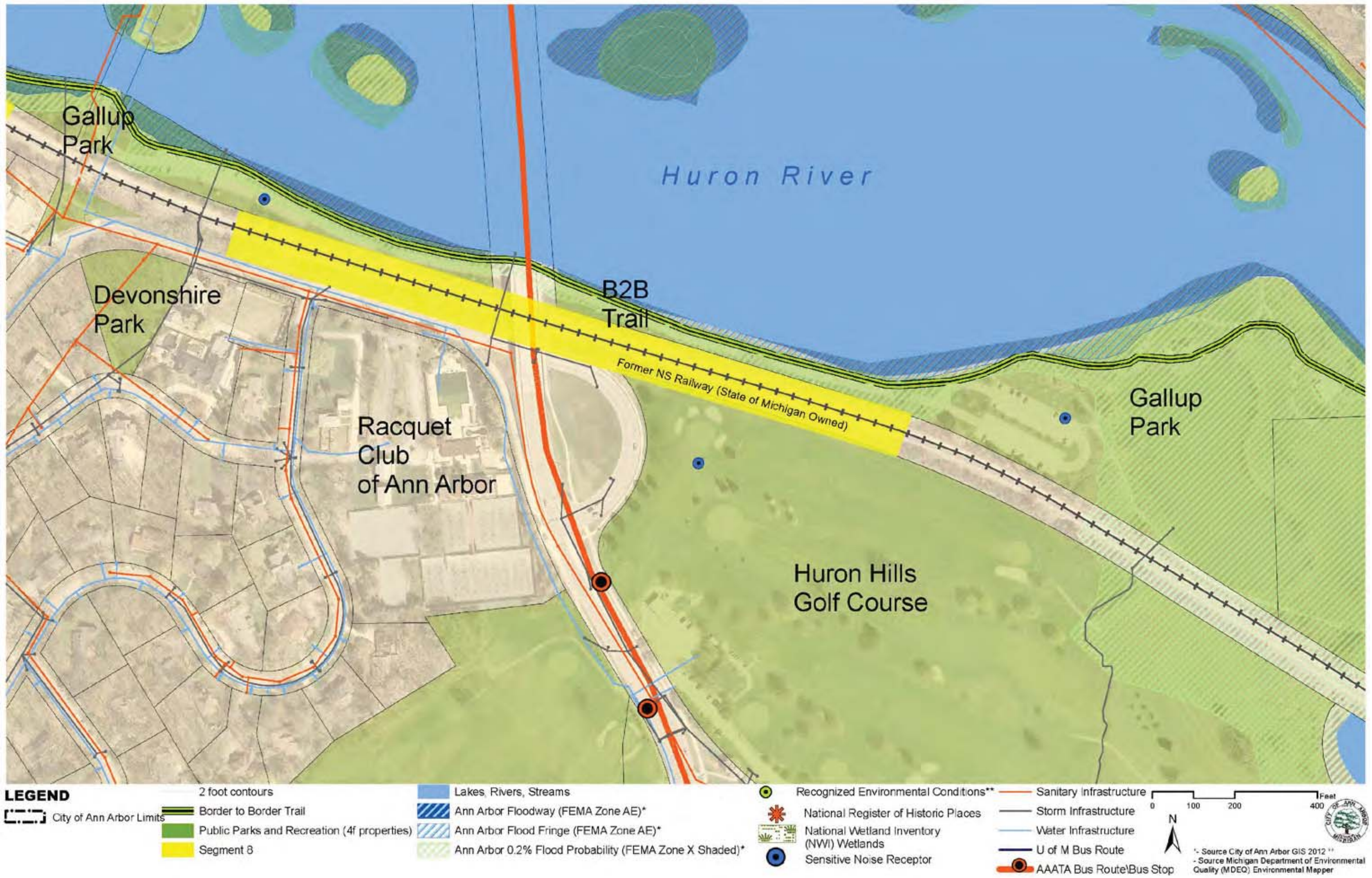
Criterion: Public Transit Connections
One AAATA bus route, Route 22, follows Huron Parkway through the area. This cross-town route operates at 30-minute headways throughout the day. It could possibly divert to connect to the segment, creating a very basic transit connection.

Criterion: Minimizing Environmental Impacts
A station at Segment 8 would cause significant socioeconomic impacts associated with the relocation of the Racquet Club, golf course, or both. These would raise the implementation cost of a station at the segment. Also, the segment is squeezed between two parks: Gallup Park and the golf course. Both would likely be impacted.

Summary
Segment 8 is in an outlying city area with poor access to downtown Ann Arbor and other activity areas. A station at this track segment would incur substantial socioeconomic impacts and would likely require Section 4(f) parkland uses. Segment 8 is not recommended for further consideration. Phase I scoring for this segment is shown in the matrix below. The Segment 8 area is displayed in Figure 11.

Segment 8: Geddes Avenue (East)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2
Suitable Land for Station Facilities	0
Accessed by Existing Roadways	0
Public Transit Connection Potential	-1
Minimize Environmental Impacts	-2
Phase I Score	**-5**

Figure 11: Segment 8—Geddes Avenue (East)



Station Site Identification Findings

Table 2 (page 30) provides an evaluation matrix for the eight track segments under consideration. The matrix shows each segment's performance according to the site identification criteria. This scoring system is used exclusively to screen the segments from eight to a smaller set for detailed analysis. No ranking order for the remaining segments will be carried into the Phase II analysis. The following bullets summarize the Phase I Alternatives Analysis findings:

- Segments 1, 2, 6, 7 and 8 do not perform well against the Ann Arbor Station Site Identification Criteria. In general, they offer limited access to downtown Ann Arbor and other activity areas, and lack suitable space for needed station facilities.
- Segment 3 (North Main Street) offers land that could be converted from light industrial and office use to station uses. Using these properties for the station would require substantial land acquisitions and business relocation. A station along this segment also has potential impacts to parks and open space resources. It is a relatively inconvenient location for transit and non-motorized access. While not initially recommended for advancement, a handful of participants at the June stakeholder and public meetings expressed support for further consideration of this area for a new station, and other meeting participants consented. As a result, the Project Team recommended including Segment 3 in the Phase II analysis. *(As noted in the postscript to the Segment 3 evaluation, the Project Team no longer recommends consideration of Segment 3. This position will be explained in the Phase II memorandum.)*
- Segment 4 (Depot Street/Existing Amtrak Station) is in proximity to downtown Ann Arbor and key activity centers. However, the segment may offer challenges in terms of floodways, traffic impacts, space available and access features.
- Segment 5 is also well-positioned in the center of the community. It is near a major employment and education area and abundant transit service. This area has potential environmental concerns related to parks and open space impacts.

Based on the initial screening analysis of the eight viable track segments along the corridor, three of these (Segments 3, 4 and 5) were recommended for further analysis during Phase II, in addition to the No-Build Alternative. A key consideration is expected to be the feasibility and reasonableness of using space at or adjacent to the existing Ann Arbor Amtrak station (Segment 4: Depot Street/Existing Amtrak) and accommodating station traffic and multi-modal access at this location. This is the only segment to be advanced that requires no park land uses. Since Segment 4 has not yet been demonstrated to be feasible and reasonable, the Project Team recommends advancing the two other locations as options for analysis. Of the considered locations other than Segment 4, Segment 5 (Fuller Road—West) most closely meets the Site Identification Criteria. A more detailed evaluation of potential environmental impacts and benefits associated with Segments 3, 4 and 5 will be the subject of Phase II.

The term "Segment" proved useful during Phase I to identify those track sections that could potentially accommodate a station. Moving forward, the potential locations for new stations will be referred to as station sites. These station site locations have thus been renamed as follows:

- Site 1 (North Main Street);
- Site 2 (Depot Street/Existing Amtrak); and
- Site 3 (Fuller Road—West).

Table 2: Evaluation Matrix—Ann Arbor Station Site Identification

(2 = Excels according to criteria; 1 = Meets criteria; 0 = Neutral; -1 = Does not meet the criteria; -2 = Very poor performance according to criteria)

Segment #	1	2	3	4	5	6	7	8
Name	W. Huron River Drive	Barton Shore Drive	N. Main Street	Depot Street (Exist. Amtrak Station)	Fuller Road (West)	Fuller Road (East)	Geddes Avenue (West)	Geddes Avenue (East)
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2	-2	0	2	2	0	-2	-2
Suitable Land for Station Facilities	-2	-1	0	1	1	0	-2	0
Accessed by Existing Roadways	-1	-1	1	1	2	-1	-2	0
Public Transit Connection Potential	-1	-2	0	1	2	-1	-2	-1
Minimize Environmental Impacts	-2	-2	-1	1	1	-1	-2	-2
Phase 1 Score	**-8**	**-8**	**0**	**6**	**8**	**-3**	**-10**	**-5**

Appendix B: Phase II Station Site Alternatives Analysis

Date: August 29, 2016

Subject: Ann Arbor Intermodal Passenger Rail Station—Alternatives Analysis Phase II Report

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1.0 Introduction and Overview of Alternatives Analysis

This report presents Phase II of the Alternatives Analysis for a proposed new multi-modal station: including facilities allowing for "intermodal" transitions from one mode of transportation to another (e.g., from bus to train); "intercity" train travel between cities (typically of a longer distance and greater speed than commuter or regional trains); and "commuter" train travel (typically daily, between cities within a region at a lower speed and with more frequent stops than intercity trains). The purpose of the Alternatives Analysis process is to screen potential station locations against defined criteria and identify reasonable station build alternatives to carry forward into the Environmental Assessment (EA).

This Alternatives Analysis is the result of technical and environmental analysis compliant with the National Environmental Policy Act (NEPA) and public input received since February 2014. The Ann Arbor Station planning effort is led by the City of Ann Arbor with the Michigan Department of Transportation (MDOT) and the Federal Railroad Administration (FRA) (collectively referred to as the Project Team).

Alternatives Analysis Overview

The Alternatives Analysis process was divided into two phases:

Phase I

The Phase I report (included as Appendix A) identified and screened 8 possible sites for the multi-modal station according to preliminary design and site selection criteria defined in the Purpose and Need for the project. This resulted in 3 potential station sites advancing to the Phase II analysis.

The Phase I report established a preliminary set of site selection criteria in order to identify potential station sites. MDOT, as the current owner of the railroad infrastructure within Ann Arbor, and the National Passenger Rail Corporation (Amtrak), as the intercity passenger rail operator on the line, determined the primary site selection criterion, which was that any new station or enhancements to the existing station should occur along a tangent (straight) section of track. Both MDOT and Amtrak stipulated that the tangent track sections should be at least 1,000 feet long to support railroad operational needs. The Phase I report identified 8 segments of track in Ann Arbor that met this primary criterion.

Based on the Purpose and Need for the project, the Phase I station site selection criteria also stipulated that the potential sites should:

- Lie along the existing Amtrak railroad corridor within City of Ann Arbor limits;
- Provide convenient access to downtown Ann Arbor and major activity areas;
- Include enough land to accommodate all required site features (i.e., station design requirements);
- Allow convenient access to existing roadway networks;
- Support connections to public transit services and non-motorized transportation facilities; and
- Minimize impacts to environmental resources.

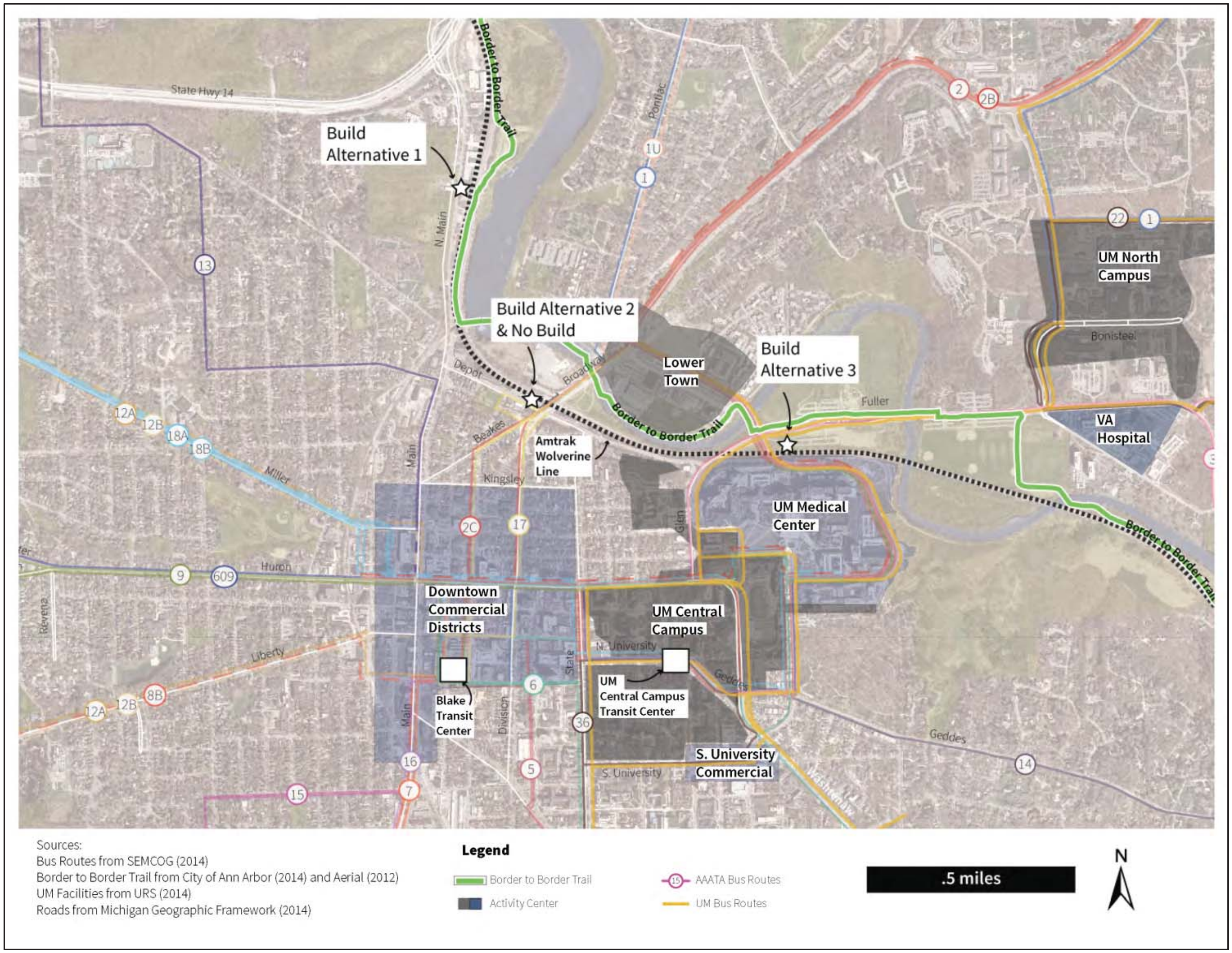
These preliminary site selection criteria were applied to screen 8 potential station sites (referred to as "segments" in the Phase I report), which resulted in the elimination of 5 station sites that did not reasonably meet the criteria. The remaining 3 station sites advanced to this Phase II of the Alternatives Analysis. (See Figure 1).

Phase II

Following the Phase I analysis, additional data was collected to further analyze the 3 station sites that were advanced from Phase I. In the following sections of this Phase II report, design alternatives for each of the remaining 3 sites were further developed, assessed, and screened, as follows:

- **Design Criteria (Section 2.0).** The design criteria for developing Phase II design alternatives were set forth to identify the programmatic needs for a station.
- **Purpose and Need Screening (Section 3.0).** Any station site or design alternative that did not reasonably meet the requirements of the project Purpose and Need was eliminated.
- **Phase II Design Alternatives (Section 4.0).** Conceptual-level design alternatives, including station footprints, were developed for each station site based on the Design Criteria set forth in Section 2.0.
- **Phase II Design Alternatives Screening Criteria (Section 5.0).** The process and criteria that were used to screen the design alternatives were set forth.
- **Phase II Design Alternatives Screening (Section 6.0).** The design alternatives were screened under the criteria established in Section 5.0. Design alternatives that did not reasonably meet the screening criteria were eliminated.
- **Summary and Conclusion (Section 7.0).** Design alternatives that will be carried forward into the Environmental Assessment are summarized.

Figure 1: Phase II Potential Station Site Locations in Ann Arbor



2.0 Design Criteria

This section describes the design criteria used for development of the Phase II station design alternatives. In 2014, the Project Team and stakeholders developed a set of preliminary design criteria for a new Ann Arbor intermodal passenger rail station. The design criteria for the Phase II design alternatives were generally carried over from the Phase I evaluation and were based on stakeholder input and analysis of data to identify the programmatic needs for the station. The Phase II Design Criteria are described below and summarized in Table 1.

The Phase II design alternatives include areas sized to accommodate the station building and associated elements; vertical circulation elements; platform(s); plazas; stormwater management areas; intermodal elements, including transit, parking, bicycle storage, taxis and private shuttles; and appropriate site access including drives and sidewalks.

Station Building Requirements

The design alternatives for the new station building reflect current needs and anticipated 2035 needs, which account for projected future ridership.[1]

It is anticipated that some elements of the station development can be phased and constructed as needed, including additional parking deck levels and a second track and/or platform. However, it is not cost effective to change the size of the station building and interior spaces (such as the waiting room) as ridership increases. Therefore, the station building was designed for anticipated future needs, including both required and optional interior spaces. Required interior spaces are derived from the Amtrak Station Program and Planning Guidelines. (See footnote 3). Potential uses of optional interior spaces include a café, retail, community gatherings, or cultural enrichment.

The Project Team performed an analysis, based on demand forecasts from the Chicago-Detroit/Pontiac Tier 1 Draft Environmental Impact Statement (EIS) to consider how existing boarding patterns inform station building space requirements as ridership increases. The analysis regarding station building requirements and a detailed description of required interior spaces is provided in Appendix B. The analysis concluded that a minimally-sized waiting room reflecting anticipated ridership and Amtrak design criteria should contain roughly 2,200 square feet of floor space to meet anticipated 2035 ridership demand. Other required interior spaces comprise an additional 6,300 square feet. An additional 600 square feet was also included to represent 1 small optional interior space. The total gross floor space deemed necessary for a new or refurbished station building for each design alterative is therefore approximately 9,100 square feet. This compares to roughly 3,200 square feet provided at the existing Ann Arbor Amtrak station building.

Station Parking

Amtrak's anticipated future demand for long-term intercity rail parking in Ann Arbor (year 2035) is roughly 870 spaces.[2] The Project Team also performed an access demand analysis, which

[1] 2035 ridership derived from the Chicago-Detroit/Pontiac Tier 1 Draft Environmental Impact Statement (EIS), Appendix E (available at http://greatlakesrail.org/~grtlakes); station building needs derived from Amtrak Station Program and Planning Guidelines (available at http://www.greatamericanstations.com/planning-development/station-planning-guidelines) (both accessed on July 26, 2016).

[2] Communication from Amtrak dated April 27, 2014.

reached a similar conclusion regarding intercity rail parking demand. (See Appendix C). The access demand analysis considered:

- Station activity estimates from the Chicago-Detroit/Pontiac Tier 1 Draft EIS;
- Central Ann Arbor urban setting and transportation patterns;
- Non-motorized travel and travel modes to work and education in Ann Arbor (US Census American Community Survey, 2014);
- University of Michigan enrollment compared to the general population;
- Estimated origins and destinations of Ann Arbor riders in the Chicago-Detroit/Pontiac Tier 1 Draft EIS; and
- Directional travel between Ann Arbor and other line stations.

In addition to intercity rail passenger parking, the Southeast Michigan Council of Governments (SEMCOG) has in previous years anticipated demand for approximately 200 additional parking spaces in Ann Arbor for the proposed Ann Arbor to Detroit Commuter Rail Project. The Regional Transit Authority for Southeast Michigan is currently partnering with MDOT and SEMCOG to explore Commuter/Regional Rail options in a shared corridor with intercity rail. Parking demand estimates for regional rail transit in a blended corridor are anticipated to be available in winter of 2016.

Short-term parking needs are projected to require approximately 50 typical parking spaces, either parallel to the curb in a queue lane or perpendicular. This includes 25 typical spaces for pick-up/drop-off, 10 for taxi, and 10 for private shuttle (at 1.5 typical parking spaces per shuttle).

The Phase II design alternatives all assume structured long-term parking, both to minimize the station footprint and because little land is available for surface parking. Each parking deck level would accommodate roughly 250 parking spaces, which could be phased vertically as needed.

Table 1: Design Criteria for Design Alternatives

Design Criteria Category	Elements	Notes
Consistency with Amtrak Guidelines	All Station Elements.	Consistency with most current version of the *Amtrak Station Program and Planning Guidelines* (May 2013)[3]
Accessibility	All station design elements compatible with Americans with Disabilities Act and accessibility best practices.	This includes all on-site circulation spaces, the grade-separated track crossing, vertical circulation, and accessible connections to nearby sidewalks.
Station Building	Total area for required interior spaces: 8,500 square feet; an additional 600 square feet are included for optional interior spaces. Total area: 9100 square feet.	Required interior spaces meet *Amtrak Station Program and Planning Guidelines* (May 2013) for 2035 ridership projections. Potential uses of optional interior spaces include a café, retail, community gatherings, or cultural enrichment.
Platforms	High-level platforms meeting Amtrak specifications, up to 800 feet in length, to be located on both sides of the tracks.	Grade-separated passenger circulation to be provided between the platforms. 800-foot platforms within 1,000-foot platform envelopes, positioned along 1,000-foot tangent track segments. Only one platform may be required for start-up operations. Platform features will likely include canopies, electronic variable signage, sound systems, portable lifts as required, benches, and trash receptacles. The platforms will include moveable edges where needed to accommodate high-wide freight traffic on the adjacent track.
Multi-Modal Access Areas (not including station parking)	Multi-modal access drives and circulation areas for transit buses, motorcoaches, station parking access, passenger drop-off/pick-up, taxis, shuttles, and non-motorized travel.	Transit access will be separated from general station traffic to the extent possible. Circulation will be separated from queue areas for general parking deck access.
	Minimum 9 transit and intercity bus berths.	Berths: Amtrak Thruway connecting buses (2), The Ride (Ann Arbor Area Transportation Authority) (3), UM Transportation (2), Greyhound (2) = 9 total berths.
	Minimum 30 bicycle parking spaces, with a combination of enclosed and rack spaces. Also reserve space for a potential bike share program.	Bicycle parking will be designed for consistency with City code provisions. Optional spaces and services may include showers associated with bicycle parking and supporting retail, equipment rentals, and repair.
	Non-motorized connectivity to city neighborhoods and the region.	On-site circulation for traffic to and from regional non-motorized facilities.

[3] Available at http://www.greatamericanstations.com/planning-development/station-planning-guidelines) (accessed on July 26, 2016).

Station Parking (suitable area to accommodate)	Space to accommodate approximately 1,120[4] parking spaces.	Parking to be provided in a structure to minimize footprint. Some short-term parking may be parallel in a queue lane or outside the structure to the extent practical. This parking space count represents 870 long-term parking spaces per Amtrak's intercity passenger forecast, up to 200 spaces of commuter rail parking, subject to refinement pending further data from the Regional Transit Authority of Southeast Michigan, and up to 50 spaces of short-term parking. The parking supply would be phased to match rollout of expanded service.
Stormwater Management and Utilities	On-site stormwater detention and utilities for all station elements.	Includes avoidance of existing major utilities. No stormwater detention will be located within the 100-year floodplain.
Design Supporting Station-Oriented Development	Circulation oriented to existing and potential development sites.	
Recreational Lands	Avoid or minimize use of recreational lands.	The City has expressed a policy preference to avoid or minimize the use of recreational lands.

[4] Subject to refinement in subsequent phases.

3.0 Purpose and Need Screening

The project purpose is:

> "to provide an intermodal facility that will accommodate existing and future intercity passenger rail ridership; improve intermodal connectivity within the City of Ann Arbor and its neighboring communities, including proposed commuter rail in the City of Ann Arbor; and improve the integration of the station within the City of Ann Arbor."[5]

The project need is based on the following factors:

- Insufficient quality and comfort for passengers provided by the existing station;
- Inadequate space for intermodal connectivity at the existing station;
- Substantial existing and projected future passenger demand; and
- Limited integration of the existing station within Ann Arbor and limited access to City neighborhoods and the region.[6]

An alternative must reasonably meet the project Purpose and Need to be considered a reasonable alternative; otherwise it is eliminated.

The Phase I report identified 3 station sites that the Project Team determined could meet the Purpose and Need. Development of design alternatives for Sites 2 and 3 (shown in Figures 3-6) showed that these could accommodate the station program and confirmed the Project Team's initial assessment that Sites 2 and 3 met the Purpose and Need. These alternatives are discussed in Section 4.0.

The Project Team initially recommended eliminating Site 1, the North Main Street site, because of its low score with regard to the preliminary site selection criteria, which were derived from the Purpose and Need. However, stakeholder feedback expressed a desire for further study of Site 1 to assess whether its potential to spur redevelopment of the North Main Street corridor would outweigh its site location disadvantages. In response, the Project Team recommended advancing Site 1 to Phase II for further development and analysis of specific design alternatives for the site. Upon further development of these design alternatives, it became clear that Site 1 could not meet the Purpose and Need and should be eliminated, as discussed in more detail below.

3.1 Elimination of Site 1 (North Main Street)

Site 1 is located north of central Ann Arbor between North Main Street and the Huron River, adjacent to the City of Ann Arbor's Bandemer Park. (See Figure 1). The Project Team made a determination that this site did not meet the Purpose and Need in the Phase I analysis because the prospect of acquiring several properties along the segment and relocating businesses would raise the capital and socioeconomic costs and leave little buildable land for station-oriented development; access and roadway conditions would create problems for vehicular and non-motorized access between the site and major activity areas; the site had limited potential for transit connections; and the site's environmental constraints were complex. (See Appendix A, pages 12-13). However, based on requests by stakeholders at the June 2014 Leadership Advisory Group, Community Work Group, and Public meetings, a subsequent analysis was conducted. Two preliminary design alternatives were developed (called Concept

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[5] Page 4, Ann Arbor Station Environmental Review Purpose and Need." Ann Arbor Station Project Team, including the City of Ann Arbor, MDOT, FRA, URS/AECOM and its subconsultants (2015). "Approved on January 15, 2015. http://www.a2gov.org/departments/systems-planning/Transportation/Documents/FINAL_AAS_Purpose_and_Need.pdf

[6] See previous footnote.

Plan A and B) and a Site 1 technical memorandum was prepared. (See Appendix D). The analysis in the technical memorandum verified the initial recommendation to eliminate Site 1 (North Main Street) from further consideration because it did not meet the Purpose and Need for the project.

In particular, the technical memorandum confirmed that Site 1 at North Main Street did not resolve the problem of "limited integration of the existing station within Ann Arbor and limited access to City neighborhoods and the region" identified in the Purpose and Need. Stakeholders cited the potential for a station at this location to spur redevelopment in the North Main Street Corridor, which would meet that portion of the Purpose defined as "improve the integration of the station within the City of Ann Arbor." However, further development of the station concepts revealed that in order to accommodate the station program at this site, most of the available private property that would have benefited from redevelopment would be consumed with the overall station program footprint. This site would, therefore, worsen integration of the station within the City because it is farther from downtown and other activity areas than the other remaining sites, including the existing station, and would impair a potential activity center by consuming developable property on North Main Street.

Site 1 also did not meet that portion of the Purpose to "improve intermodal connectivity within the City of Ann Arbor and its neighboring communities." The walking, biking and transit options of Site 1 were limited. These limitations are described in the following points:

Transit Access

The existing Ann Arbor transit network provides limited connectivity between Site 1, Ann Arbor activity areas, surrounding neighborhoods, and the wider region. Only one Ann Arbor Area Transportation Authority (AAATA) bus route, Route 13 (now 33), travels near Site 1. The closest stop on Route 33 is about three blocks' distance from the southern limit of the station site. Other existing bus routes would require diversions of a mile or more to serve the site. Adding or diverting bus routes in this location would be an additional expense for AAATA.

Intermodal commuter rail connections would also be less efficient at this alternative due to its distance from residential population centers, activity centers, and employment concentrations.

Pedestrian and Bicycle Access

The one-mile distance between Site 1 and downtown Ann Arbor is greater than the national walking tolerance average of ½-mile to fixed guideway transit.[7] Other major activity areas are farther from the site. The primary connection to the area is North Main Street, which is a four-lane road with a 45 miles per hour (mph) speed limit and no bicycle lanes. A sidewalk exists only along the east side of the roadway and there are few other amenities for walking or bicycling, making connections to the central business district/downtown difficult. The Border-to-Border/Iron Belle multi-use trail would provide a direct connection to the eastern, Huron River-side of the railroad tracks at this site. However, this trail follows the river and connections to downtown Ann Arbor from this trail are farther downstream at Broadway or Fuller Road.

Vehicular Access and Parking

Providing roadway access and parking at this site is feasible, but with high socioeconomic costs associated with property

[7] Transit Cooperative Research Program (2009). Literature Review for Providing Access to Public Transportation Stations. TCRP Web-Only Document 44, available at http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_webdoc_44.pdf.

acquisitions and the relocation of businesses. Access is constrained by limited roadway movements at the M-14 highway interchange and peak hour congestion along Main Street associated with M-14 access.

Because of all these factors, in addition to the factors identified in the Phase I report, Site 1 did not reasonably meet the Purpose and Need for the project, and was eliminated from consideration.

3.2 Elimination of Preliminary Design Alternative with Station South of the Railroad at Site 2 (Depot Street)

In developing the design alternatives for Site 2, the Project Team considered a ground level station building using the existing Ann Arbor Amtrak Station site on the south side of the railroad. For the reasons discussed below, this potential design alternative was also determined not to meet the Purpose and Need at an early stage of development. Therefore, it was eliminated from consideration.

Site and Building Size

The Design Criteria require a station building containing 9,100 square feet with a waiting area of at least 2,200 square feet. The existing Ann Arbor Amtrak Station is approximately 3,200 square feet, or one third of the total required building space.

Preliminary design efforts revealed that it was not possible to place both a new station building and the required intermodal transit facilities on the parcel south of the railroad. Intermodal transit facilities could not be located on the north side of the tracks along with the parking structure because Amtrak design guidelines call for separate circulation of transit vehicles and private automobiles.[8] The design guidelines seek to enable new or renovated stations to most efficiently move passengers within the station and between travel modes. Clear and separate pathways for transit and private automobile modes minimize passenger confusion and congestion during departure and arrival periods, when the station is at maximum usage.

Due to topography, there is only room for a single drive entrance and exit circulation pattern to and from Broadway on the north side of the tracks. Therefore, it is not possible to separate transit and private automobiles with a station building south of the railroad. When trains are departing or arriving, substantial numbers of both transit and private automobiles will access the station at the same time. Placing both in the same traffic pattern would increase congestion. For example, transit vehicles such as buses are generally larger and maneuver more slowly than most private automobiles. To avoid these issues, the other Site 2 design alternatives have separate circulation for transit vehicles on the south side of the railroad tracks.

The existing Amtrak parcel south of the railroad is approximately 31,000 square feet. The dimensions of the parcel are approximately 60 feet wide and 515 feet long. A 9,100 square-foot station building would be approximately 40 feet wide and 225 feet long. An additional 5,400 square feet would be needed for external pedestrian circulation, sidewalks, and a rear service drive allowing access for utility functions, which would leave an area of approximately 16,500 square feet for intermodal facilities.

This area would not be sufficient to accommodate the number of required bus bays and the large turning radius for buses entering and exiting. Therefore, this potential design alternative would not

[8] Available at http://www.greatamericanstations.com/planning-development/station-planning-guidelines) (accessed on July 26, 2016).

provide the intermodal connectivity required by the Purpose and Need and was eliminated from consideration.

4.0 Phase II Design Alternatives

For the two remaining sites under consideration (Sites 2 and 3), the Project Team developed 7 conceptual-level design alternatives that meet the Design Criteria, summarized as follows:

- Design Alternative 2A: Depot Street (ground level station building north of the tracks)
- Design Alternative 2B: Depot Street (elevated station above the tracks)
- Design Alternative 2C: Depot Street (ground level station incorporating the former Michigan Central Depot)
- Design Alternative 3A: Fuller Road (elevated station above the tracks with reduced footprint)
- Design Alternative 3B: Fuller Road (ground level station at the west end of the parking deck)
- Design Alternative 3C: Fuller Road (elevated station above the tracks with expanded footprint)
- Design Alternative 3D: Fuller Road (ground level station incorporated in the middle of the parking deck)

4.1 Design Alternative Descriptions

Site 2 (Depot Street)

Site 2 is located near the existing Amtrak station where Broadway crosses Depot Street and the railroad tracks. It is adjacent to a now mostly unused parcel of land belonging to DTE Energy that extends northward from the Amtrak long-term parking lot to the Huron River. The DTE Energy parcel was formerly used for a coal gasification plant, which left the site polluted. DTE Energy performed environmental remediation of portions of the site in 2012-2013 and has recently expressed an interest in redeveloping the parcel.[9] For Site 2, the Project Team developed three Design Alternatives: 2A, 2B, and 2C, which are depicted in Figures 2 through 4.

For Design Alternatives 2A and 2B, the existing Amtrak train platform would be extended as needed to accommodate longer train consists. A second platform would be constructed north of the tracks when a second track is added consistent with future corridor development plans. A pedestrian bridge or concourse would connect to platforms on both sides of the tracks. The weather-protected concourse would pass above the tracks and would be integrated with or adjacent to the sidewalk on the west side of the Broadway Bridge. Elevators and stairwells would connect the concourse to the platform level on both sides of the tracks.

For all Site 2 options, bus stop pullouts would be added along the Broadway Bridge above the tracks to accommodate bus routes that travel on this roadway. An additional elevator connecting to the bridge’s east sidewalk and/or a signalized pedestrian crossing of the Broadway Bridge roadway would be required to connect these bus stops to the station building and platforms.

As depicted in the conceptual drawings, taxis and passenger drop-off/pick-up would be provided within the parking structure or at curbside along Depot Street. Intercity bus, urban public transit and shuttle services would use the site of the existing Amtrak station building and the existing short-term parking lot west of the existing Amtrak station building.

[9] Stanton, R. (2013, January 3). “DTE Energy calling cleanup of riverfront MichCon site in Ann Arbor a huge success.” *The Ann Arbor News*, retrieved on July 9, 2015 from http://www.annarbor.com/news/dte-energy-calls-michcon-cleanup-success/

A parking structure, including stormwater collection systems, would be located north of the tracks and west of the Broadway Bridge.

The distinctive elements of the three Site 2 design alternatives are described in the following subsections.

Design Alternative 2A (Elevated Station)

(See Fig. 2)

The station building would be constructed above the tracks on the west side of the Broadway Bridge. Pedestrian access would be provided directly from sidewalk along the west side of the Broadway Bridge. The station building would remain within the railroad right-of-way. This option would provide passengers in the station building with equal distances to access both station platforms.

Design Alternative 2B (Ground Level Station)

(See Fig. 3)

The station building would be constructed west of the Broadway Bridge, at ground level, north of the tracks. The placement of the station building would be closely coordinated with the specific needs for on-site multi-modal facilities. The concourse above the tracks would attach directly to the station building. This option would place the station building adjacent to one railroad platform and across the tracks from the other platform.

Design Alternative 2C (Michigan Central Depot)

(See Fig. 4)

The historic Michigan Central Depot (currently occupied by the Gandy Dancer restaurant) would be acquired for re-use as the station building. Upon completion in 1886, the Depot was considered "the Michigan Central Railroad's finest station between Buffalo and Chicago." It was also considered the most important railroad station on the line between Detroit and Chicago.[10] The historic depot, shown in Figure 4, has been listed on the National Register of Historic Places since 1975, and included within the City of Ann Arbor's Division Street local historic district since 1976.[11]

Building modifications and expansion would be required to adapt the interior of the Michigan Central Depot for station program requirements and to provide full ADA accessibility. The interior of the building has been partitioned for restaurant purposes. It is not known if any interior structural modifications have been made. The exterior includes several temporary or reversible additions and is generally historically intact. A platform-level walkway would extend from the building under the Broadway Bridge to elevators, stairwells, and the pedestrian concourse on the west side of the Broadway Bridge. The historic depot as the station building would be adjacent to one railroad platform and across the tracks from the other platform.

[10] Shackman, Grace (May, 1991). "The Michigan Central depot." *Ann Arbor Observer*, accessed July 9, 2015: http://aaobserver.aadl.org/aaobserver/15258

[11] Information provided by the City of Ann Arbor's historic preservation coordinator from City databases.

Figure 2: Design Alternative 2A

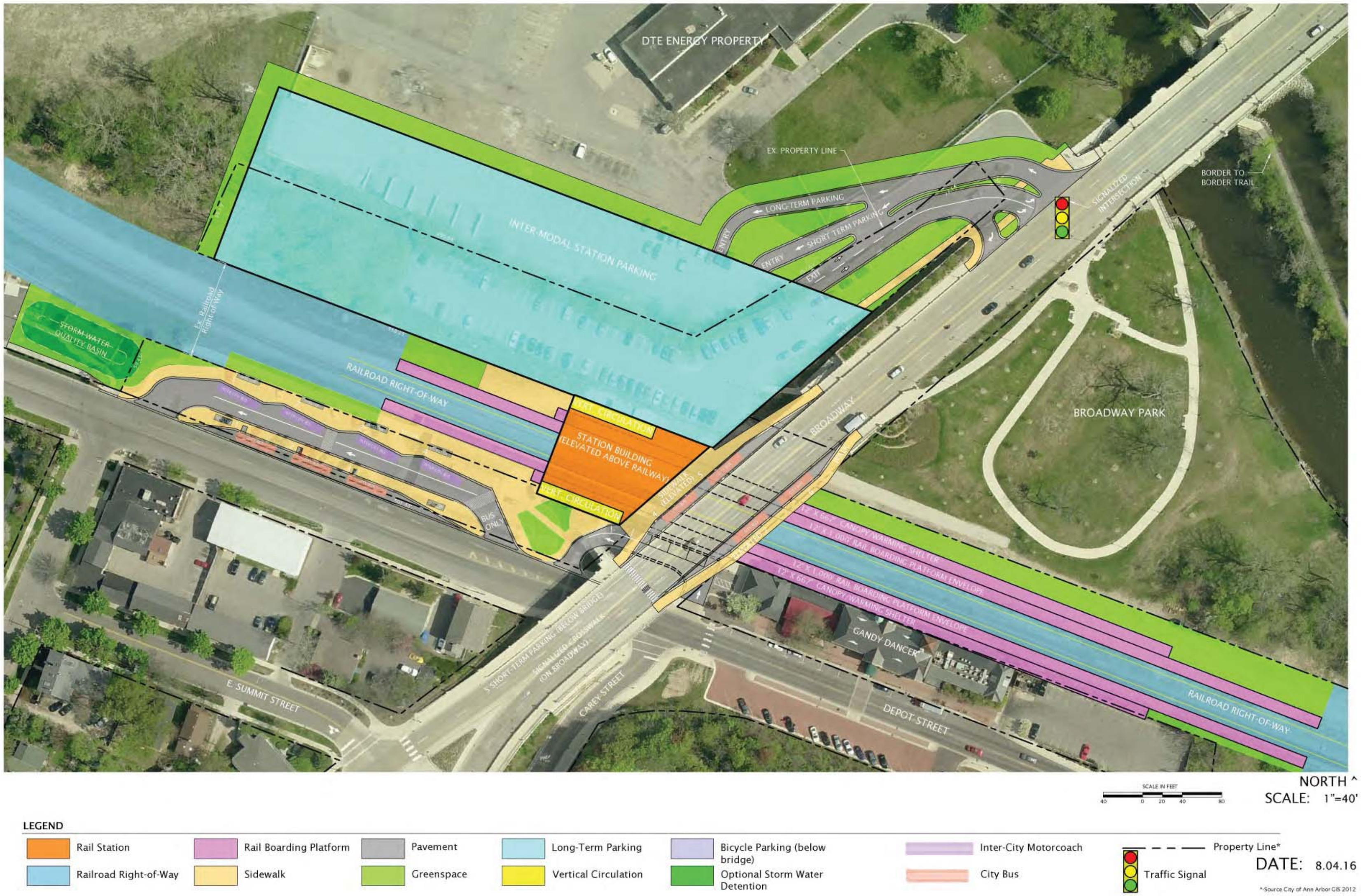


Figure 3: Design Alternative 2B

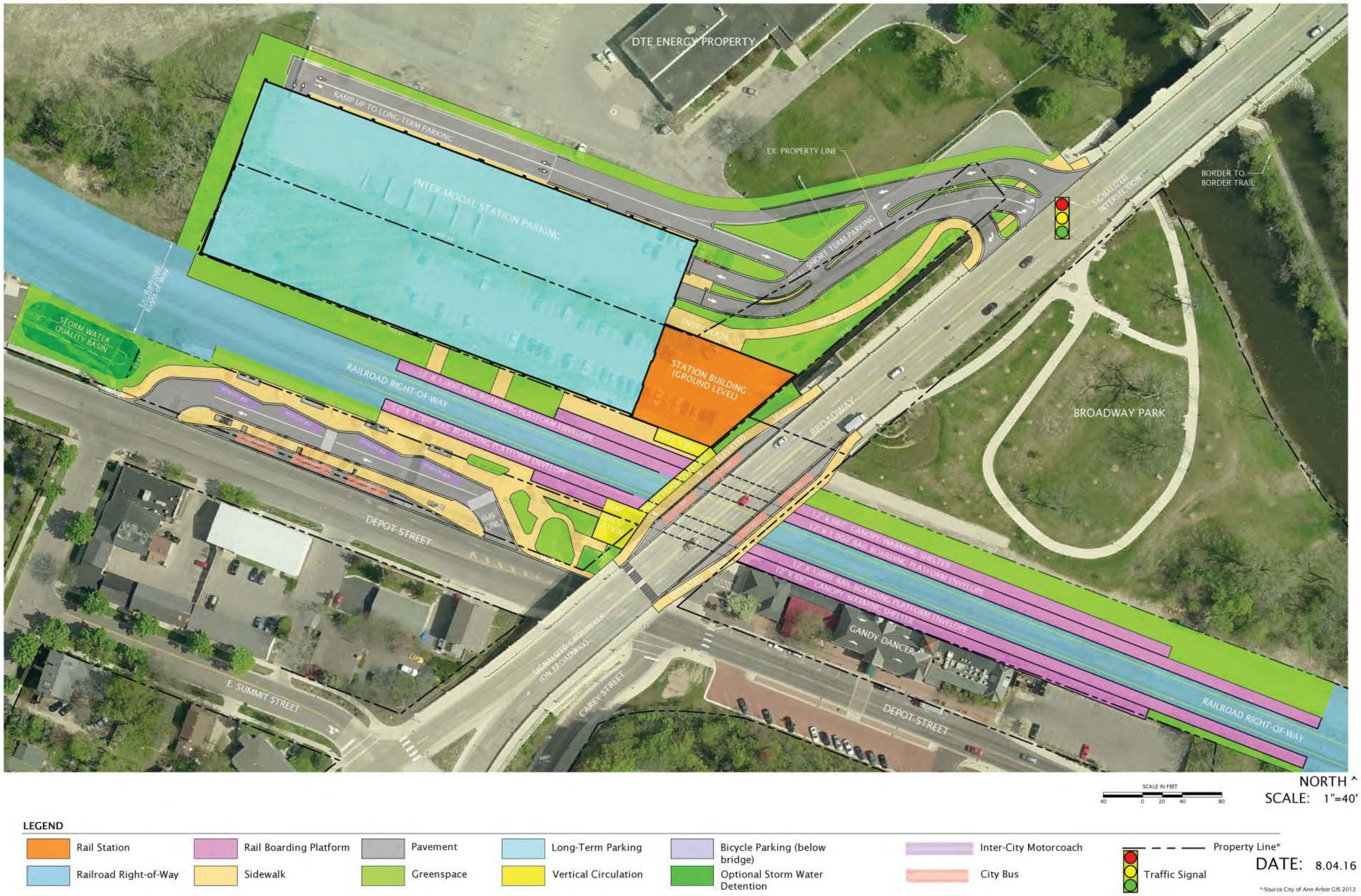


Figure 4: Design Alternative 2C

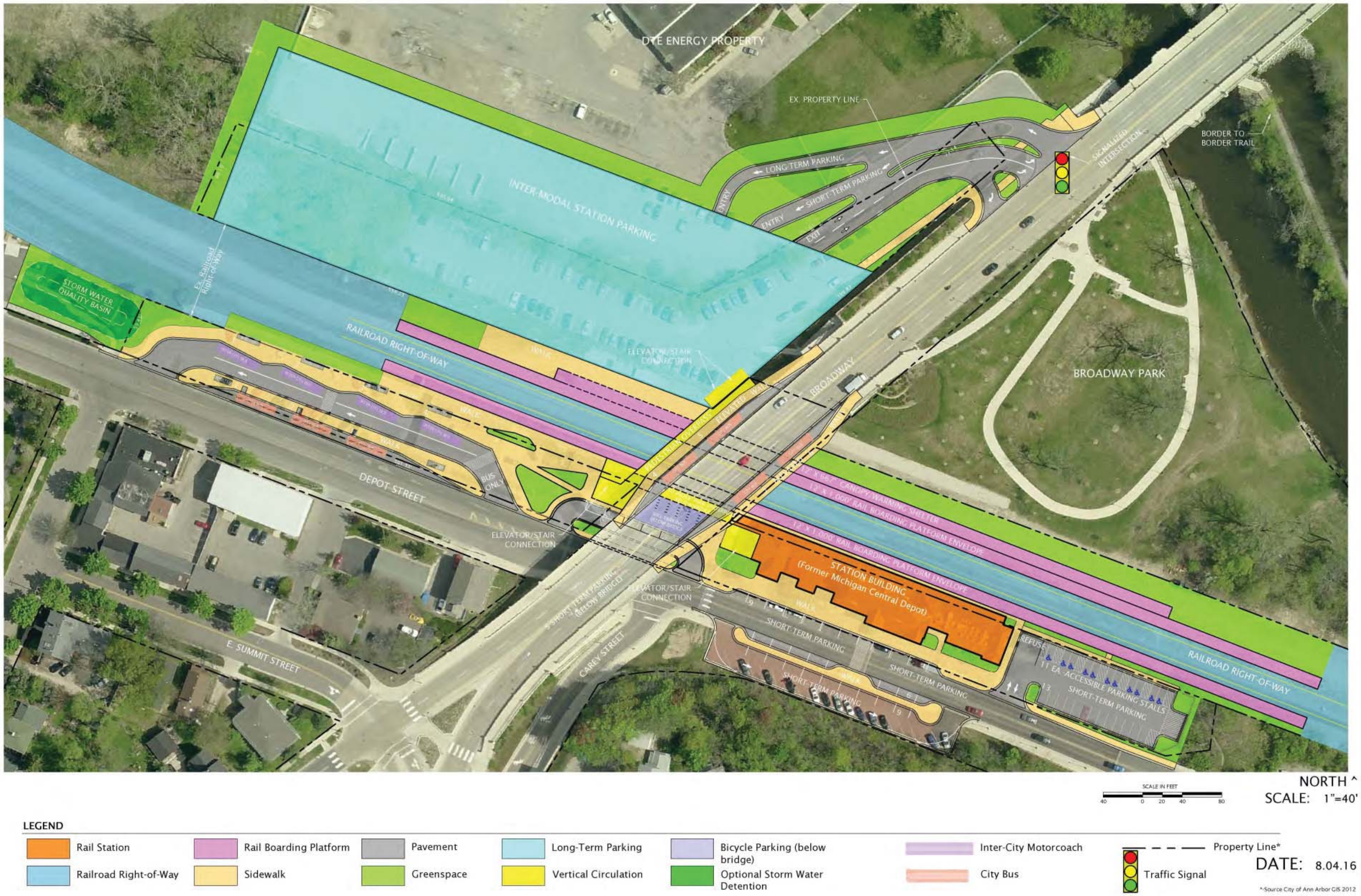
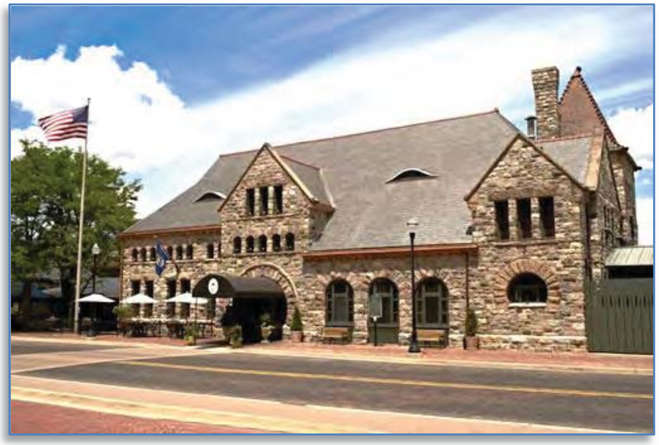


Figure 5: Michigan Central Depot/Gandy Dancer Restaurant



(Source: Gandy Dancer Restaurant website at http://www.muer.com/gandy-dancer/locations.asp)

Site 3 (Fuller Road – West)

For Site 3, the Project Team developed Design Alternatives 3A, 3B, 3C, and 3D, which are located partly in the City of Ann Arbor's Fuller Park and partly within the adjacent MDOT railroad right-of-way, with a potential pedestrian bridge extending south onto University of Michigan property to connect to East Medical Center Drive. The site is immediately north of and downhill from the University of Michigan Medical Campus, below the Fuller Road and East Medical Center Drive bridges. Design concepts for these alternatives are displayed in Figures 6 through 9.

The north side of the tracks is bordered by Fuller Park, which sits slightly higher in elevation than the tracks. A surface parking lot within Fuller Park extends parallel to the tracks, about 75 feet north of the tracks and containing about 250 spaces. This lot currently serves both the University of Michigan and Fuller Park through a joint use agreement that permits University employees to use the lot during working hours and reserves the lot for park users in the evening and on weekends. For all design alternatives at this site, a parking structure, including stormwater collection systems, would be placed where the existing parking lot is now located. As such, additional parking for park users may be appropriate mitigation at this site.

The Washtenaw County Border-to-Border Trail (a segment of the state-designated Iron Belle Trail) (B2B) extends along the north sidewalk of Fuller Road, across the street from this station site. The B2B trail crosses Fuller Road at the signalized intersection at Cedar Bend 0.25 miles to the east of the site driveways to the existing parking lot and is accessible from the site via a shared use path on the south side of Fuller Road. Bicycle and pedestrian access would also be available via a bridge link to the sidewalk on East Medical Center Drive.

Design Alternative 3A (Elevated Station with a Reduced Facilities Footprint)

(See Fig. 6)

The station building would be located above the tracks with other site facilities located within the area of the existing surface parking lot, with the exception of station access features. Multi-modal access would be provided on-site north of the tracks and along adjacent streets. Station parking would be provided in a structure.

Design Alternative 3B (Ground Level Station at the West End of a Wider Facilities Footprint)

(See Fig.7)

The station building would be located at ground level, outside the area of the existing parking lot in an active recreation area of Fuller Park, west of the other site facilities. The other site facilities would be within the area of the existing surface parking lot, with the exception of station access features. Multi-modal access would be provided on-site north of the tracks and along adjacent streets. Station parking would be provided in a structure.

Design Alternative 3C (Elevated Station with a Wider Facilities Footprint)

(See Fig. 8)

The station building would be located above the tracks with the other site facilities extending west outside the existing surface parking lot into an active recreation area of Fuller Park. Multi-modal access would be provided on-site north of the tracks and along adjacent streets. Station parking would be provided in a structure.

Design Alternative 3D (Station Integrated into a Wider Facilities Footprint)

(See Fig. 9)

The station building would be located at ground level in the middle of the other site facilities, which would extend west outside the existing surface parking lot into an active recreation area of Fuller Park. Multi-modal access would be provided on-site north of the tracks and along adjacent streets. Station parking would be provided in a structure.

Figure 6: Design Alternative 3A

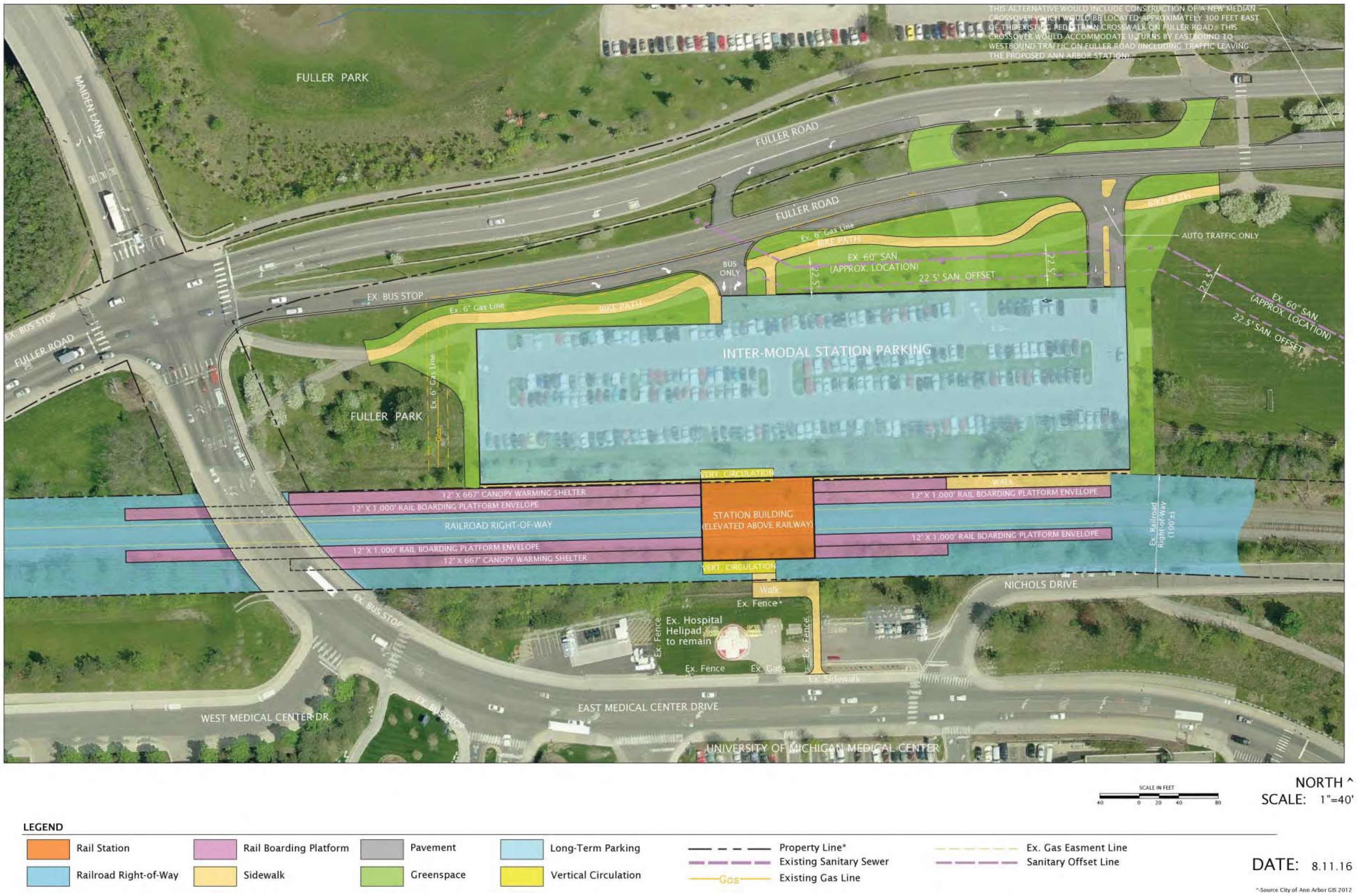


Figure 7: Design Alternative 3B

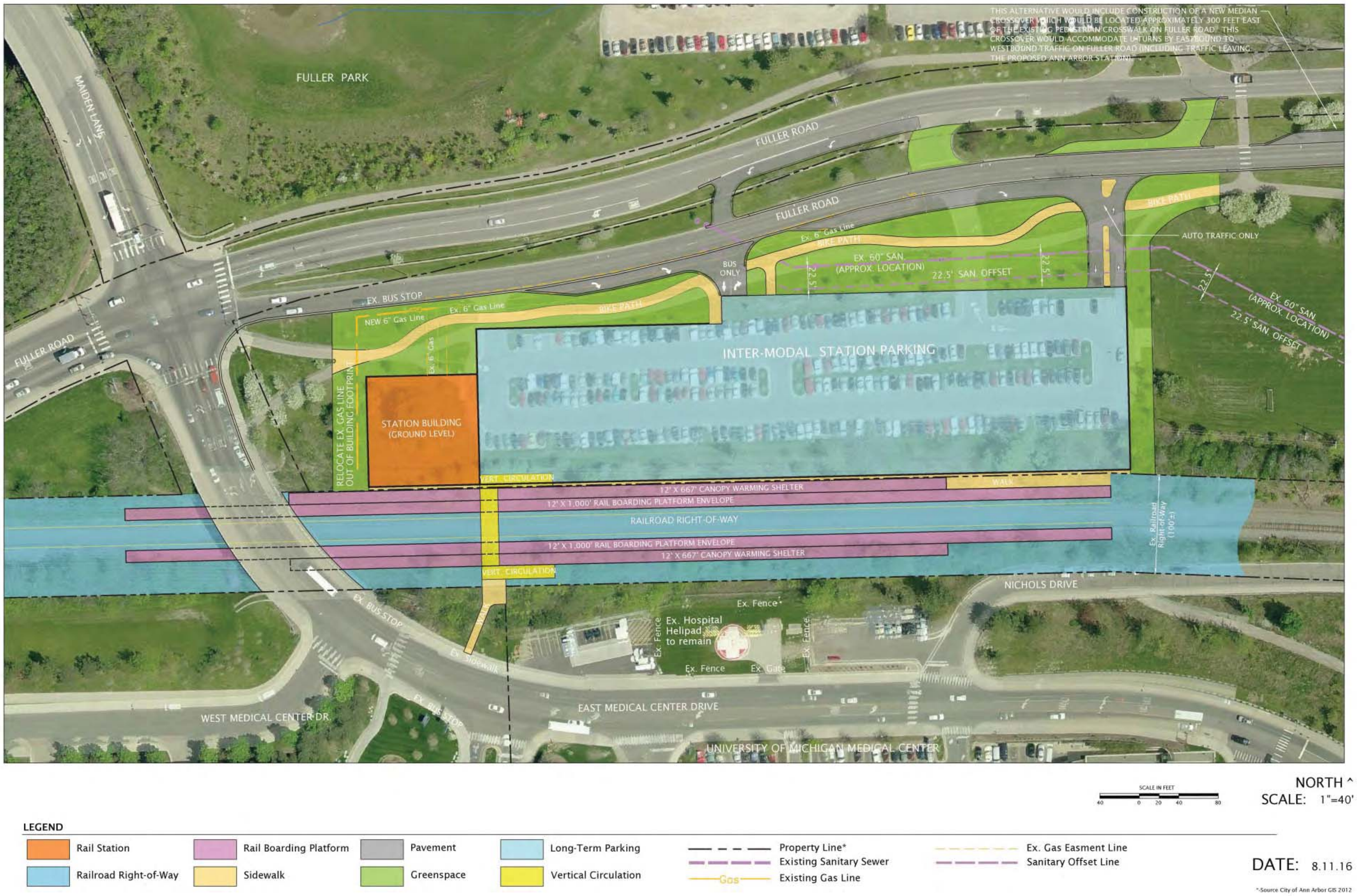


Figure 8: Design Alternative 3C

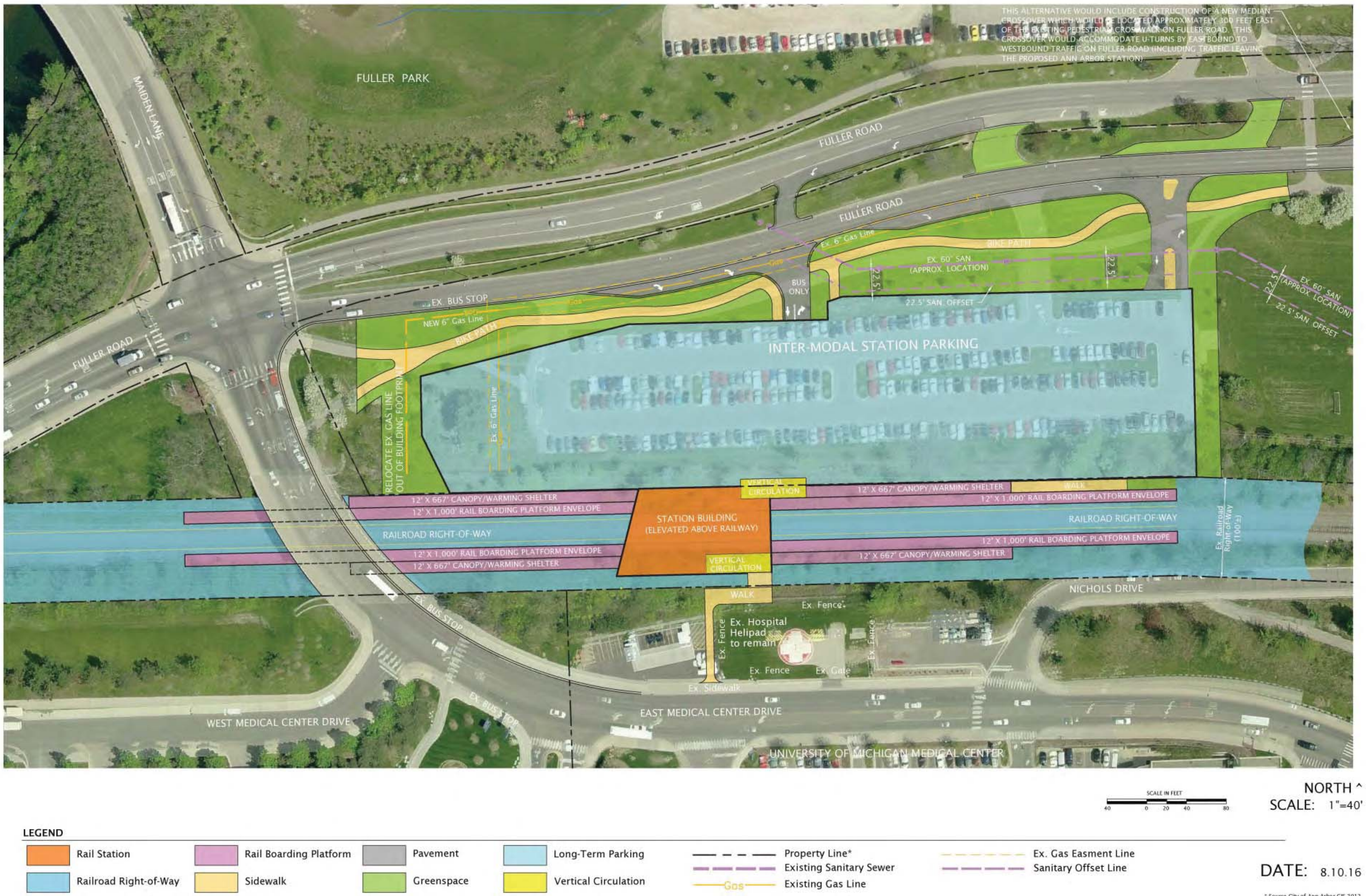
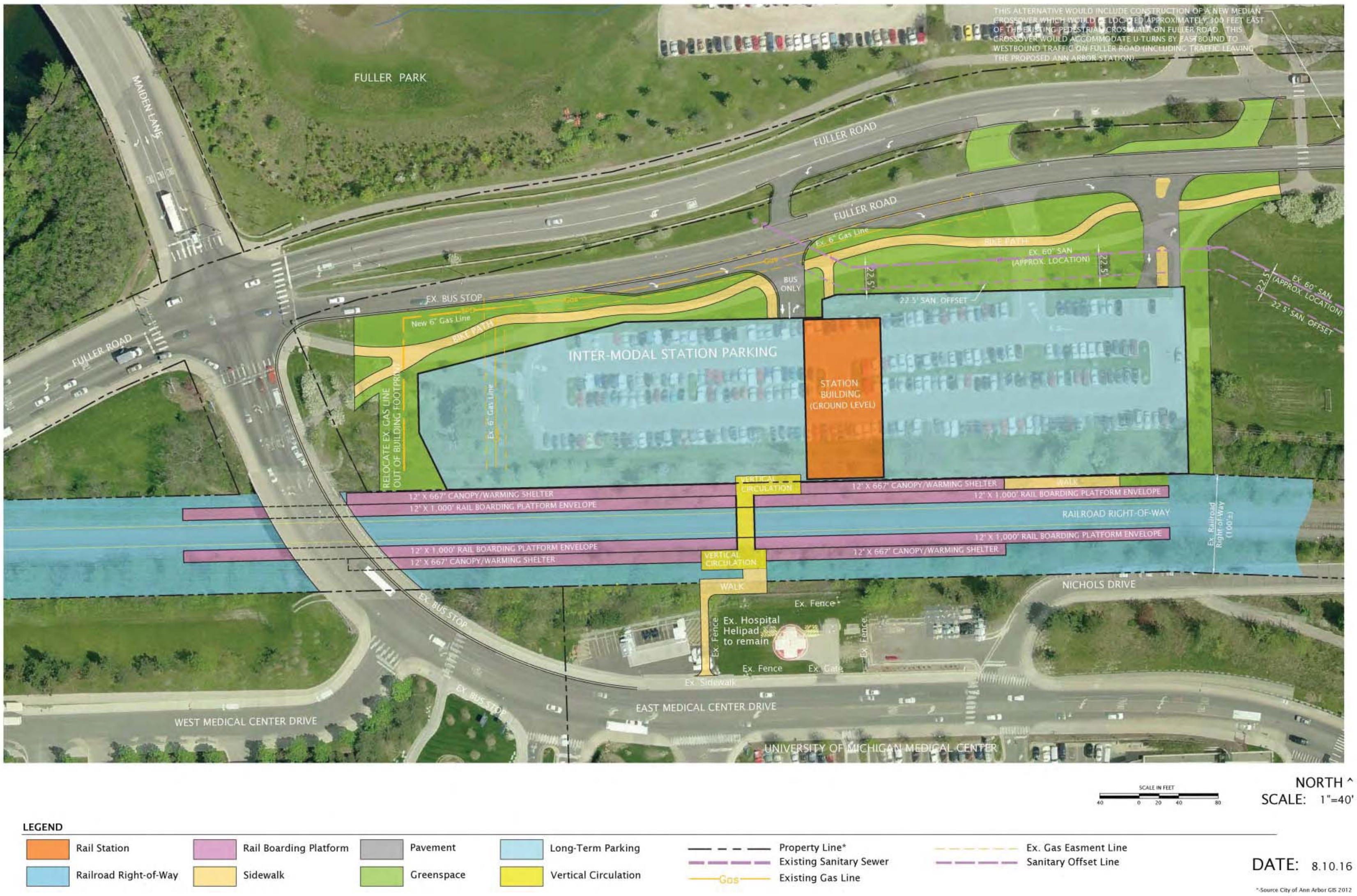


Figure 9: Design Alternative 3D



5.0 Phase II Design Alternatives Screening Criteria

The screening criteria used in this Phase II Alternatives Screening fall into three main categories:

- Location Within the Community
- Accessibility
- Site Assessment

The screening criteria described in this section were determined to be the appropriate considerations and potentially distinguishing factors in selecting a location for an intercity passenger rail station. These criteria were derived from the Purpose and Need, Amtrak's station location guidelines,[12] conversations with MDOT, and stakeholder input.

This section describes the criteria in each category and how the criteria were measured objectively for all design alternatives. Section 6.0 describes how each design alternative was evaluated with respect to each criterion to differentiate the design alternatives within each site and determine which design alternatives were reasonable.

5.1 Location Within the Community

Building on experience since the passage of the *High-Speed Ground Transportation Act of 1965*,[13] as well as successful examples abroad, the FRA has developed the following general guidelines for locating corridor rail passenger stations in cities.[14]

> 1. Each city should have a station located in or near the central business district (CBD). This is mandatory for larger Metropolitan Statistical Areas (MSAs) with metropolitan populations of 150,000 or more, since to do otherwise would undermine the inherent advantages of rail passenger systems. This central station should have direct access to local transit systems (bus, rail, taxi, etc.), as well as appropriate amounts of parking for private cars.
>
> 2. Every effort should be made to have each corridor station serve as a regional intermodal passenger terminal for all forms of regional and local transportation systems.

The following criteria have been developed for the evaluation of the design alternatives with regard to Location in the Community:

Enhancement of Urban Areas – This criterion measures the potential for each design alternative to enhance existing mixed-use development or spur development on underdeveloped or vacant, developable sites. The evaluation presumes that the station will have a beneficial effect on development of surrounding sites due primarily to increased pedestrian traffic generated by the station and demand for proximate services by users of the station. Therefore, data was collected within the national walking tolerance of ½ mile radius around each station site.[15]

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[12] Amtrak Station Program and Planning Guidelines, May 1, 2013. Available at http://www.greatamericanstations.com/planning-development/station-planning-guidelines

[13] Available at https://www.gpo.gov/fdsys/pkg/STATUTE-79/pdf/STATUTE-79-Pg893.pdf (accessed July 26, 2016).

[14] Railroad Corridor Transportation Plans: A Guidance Manual, July 8, 2005. Available at https://www.fra.dot.gov/eLib/Details/L04161.

[15] Transit Cooperative Research Program (2009). Literature Review for Providing Access to Public Transportation Stations. TCRP Web-Only Document 44, available at http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_webdoc_44.pdf.

To determine the effect on existing development, data was collected on the number of residents and jobs within the 1/2 mile radius. Alternatives that included more residents and jobs were ranked higher.

To determine the effect on vacant, developable sites, data was collected on the number and size of such sites within ½ mile. Design alternatives with more vacant sites within the ½ miles radius were ranked higher. Because the area around each design alternative is urban and already mostly developed, any development is expected to be relatively dense infill development and no urban sprawl effect is anticipated.

Potential for Multimodal Connectivity – This criterion addresses each design alternative's potential to serve as an effective intermodal passenger terminal for all forms of regional and local transportation systems. Data was collected on the number and capacity of different existing or planned modes that would serve or pass by each design alternative. Design alternatives with a greater number of modes or greater capacity were ranked higher.

5.2 Accessibility

Passenger stations are critically important in attracting riders to intercity trains. Accessibility to a wide range of users is a key in transit station design. Accessibility is defined by the ease of use or approach to a particular space or area. Accessibility is directly tied to the ridership of the station – if roadways approaching a station are too congested, or the station is located in a residential neighborhood, far from arterial streets, it will attract fewer riders than a station that is located near major roadways with efficient traffic flow and that is sufficiently signed to direct motorists to the station. With respect to internal pedestrian circulation, it is desirable to have short and simple paths between station elements. Other modes of transportation, including pedestrians, bicycles, and buses, should also have convenient access incorporated into the site and station design. Based upon these concepts, the following criteria have been developed to evaluate the design alternatives with regard to Accessibility:

Off-Site Traffic Infrastructure Improvements – This criterion is used to evaluate the level of off-site traffic infrastructure investments required for each design alternative within at least one signalized intersection in any direction from the access point(s) of each design alternative.

Data was collected on the number, scope, and feasibility of improvements to the external roadway system (including intersections) that would be necessary to ensure adequate traffic service levels accessing each design alternative. Design alternatives that required fewer, smaller, more feasible improvements were ranked higher.

Site Access Infrastructure Improvements – This criterion addresses site access at the point of connection from external transportation networks to the each design alternative for both motorized and non-motorized transportation modes. This criterion evaluates the feasibility and extent of required improvements to allow access to and from each design alternative for all transportation modes, both existing and potential. Design alternatives requiring fewer, smaller, more feasible improvements were ranked higher.

Internal Pedestrian Circulation – This criterion addresses movement of pedestrians within each design alternative. To evaluate pedestrian circulation, central nodes were assigned to the major station elements and the distances between them were measured to establish average pedestrian distances between nodes. The analysis evaluated two representative circulation patterns:

- From parking to station to platform
- From transit to station to platform

In general, clear and direct walking paths are desirable. Design alternatives with lesser distances were ranked higher, indicating easier pedestrian navigation.

5.3 Site Assessment

These criteria address the physical and ownership characteristics that distinguish the parcel(s) of land used for each design alternative, including potential environmental impacts. The following criteria have been developed to evaluate the design alternatives with regard to Site Assessment:

Environmental Factors – For this Phase II assessment, the following environmental criteria were used to evaluate design alternatives:

- **Floodplain**
  The amount of land in a floodplain (including floodway and flood fringe) at each design alternative was determined from Federal Emergency Management Agency (FEMA) maps. Design alternatives not in a floodplain were ranked higher.
- **Hazardous Materials**
  Each design alternative was examined for known hazardous materials based on a search of existing windshield surveys and regulatory databases using the Environmental Data Research database. Design alternatives with fewer known hazardous materials were ranked higher.
- **Cultural/Historic Resources**
  The number and nature of cultural or historic resources that would be used by of each design alternative was determined based on the National Register of Historic Places, City of Ann Arbor Local Historic Districts, and Native American Graves Protection and Repatriation Act databases. Design alternatives that would have the potential to avoid cultural or historic resources were ranked higher.
- **Recreational Lands**
  Past actions of the City with respect to potential train station development have consistently sought to minimize use of recreational lands. The City Council previously approved an MOU for the Fuller Road Station project that specifically provided that the land to be used for the station was the existing parking lot area.[16] The City's application through MDOT to the FRA for NEPA/ PE project funding for Fuller Road Station also stated that the project would be on the footprint of the parking area. "Ann Arbor Station, also known as Fuller Road Station, (FRS)is planned to be located on a city-owned surface parking lot in the City of Ann Arbor immediately south of Fuller Road and east of East Medical Center Drive." The amount of recreational lands that would be used by each design alternative was determined using City of Ann Arbor Parks and property databases. Design alternatives that would not use recreational land were ranked higher.

In order to evaluate these potential environmental impacts, the Project Team conducted a search of existing databases in these environmental categories. A more detailed study of potential environmental impacts will occur during the subsequent Environmental Assessment phase of the NEPA analysis.

Property Ownership – This criterion addresses the property ownership. Ownership was evaluated to determine the number of private property owners potentially affected for each design alternative.

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[16] See paragraph 4 on page 2 of the approved Memorandum of Understanding Between the City of Ann Arbor and the Regents of the University of Michigan for the Development of the Fuller Road Station. Available at http://a2gov.legistar.com/LegislationDetail.aspx?ID=536140&GUID=FA5BA616-56DF-4B49-9918-949BEF02BF96& (accessed on July 26, 2016).

6.0 Design Alternatives Screening

6.1 Methodology

Each of design alternatives described in Section 4.0 was screened based on the criteria described in Section 5.0. The design alternatives for each station site were then ranked sequentially based on their relative performance under each criterion. The highest performing alternative received a score of 1, with scores of 2, 3, etc. indicating progressively worse performance in comparison. Where design alternatives performed relatively equally, they received the same score and the next design alternative received the next ranking number (e.g. 1, 2, 2, 3).

The rankings for all criteria were then aggregated to determine which design alternative(s) showed overall higher performance relative to the others within that station site. If a design alternative failed to reasonably meet any criterion based on the data and analysis available, it was eliminated from further consideration. The results of this analysis are described throughout this Section and summarized in Section 6.5.

6.2 Location Within the Community

Table 2 shows the ranking of each design alternative with respect to the criteria for Location Within the Community. The rationale for each rating is discussed below.

Table 2: Location Within the Community Ranking

Criteria	Design Alternative		
	2A	2B	2C
Enhancement of Urban Areas	1	1	1
Potential for Multimodal Connectivity	1	1	1
Summary	**2**	**2**	**2**

Criteria	Design Alternative			
	3A	3B	3C	3D
Enhancement of Urban Areas	1	1	1	1
Potential for Multimodal Connectivity	1	1	1	1
Summary	**2**	**2**	**2**	**2**

Enhancement of Urban Areas

Design Alternatives 2A, 2B, and 2C are within ½ mile of:

1) A population of 5,275 residents and employment of 11,080 ;
2) 23.5 acres of vacant property;
3) The existing Lower Town commercial area along Broadway northeast of Swift Street.

Design Alternatives 3A, 3B, 3C, and 3D are within ½ mile of:

1) A population of 5,327 and employment of 17,231;
2) 7.9 acres of vacant property;
3) The existing Lower Town commercial area along Broadway northeast of Swift Street.

(See Figure 10 for illustration.)

The amount of vacant land is low for all alternatives. Design Alternatives 2A, 2B, and 2C are near to more vacant property than 3A, 3B, 3C and 3D particularly the Amtrak and DTE Energy property north of the tracks. However, the Site 2 design alternatives also occupy a substantial amount of the developable portion of this vacant land.

Design alternatives 3A, 3B, 3C, and 3D are surrounded on the north by parkland, which has very low potential for development. On the south, 3A, 3B, 3C, and 3D are bounded by the University of Michigan Medical Campus, which is largely already developed, but which may have modest potential for redevelopment or additional development between the railroad and East Medical Center Drive, which is currently the site of parking lots, a driveway, and heliport facilities.

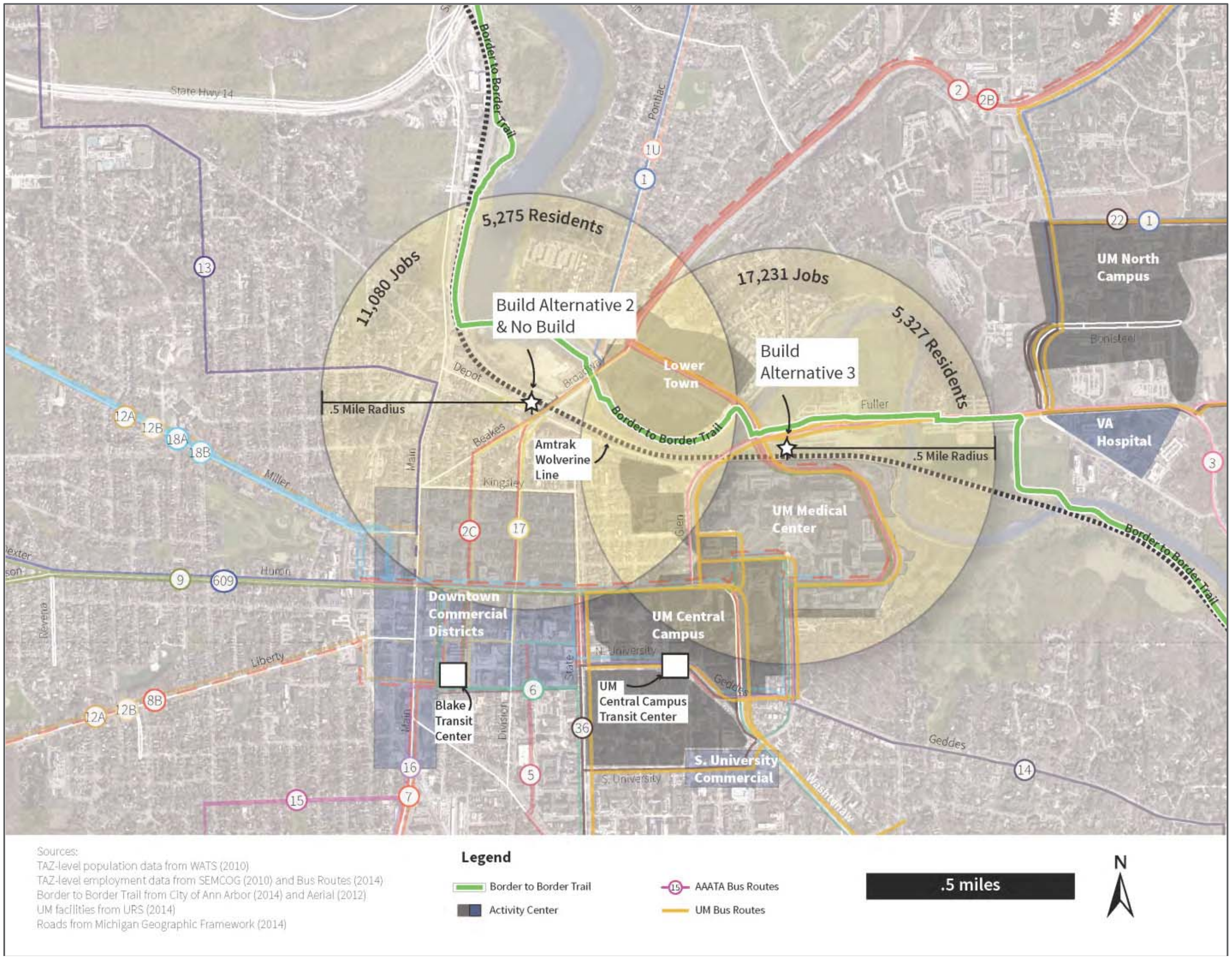
Because the urban environment surrounding each station site is largely developed, the effect of any design alternative would likely be more substantial on existing development than on potential development. Alternatives 2A and 2B are well-located relative to the existing Lower Town commercial area on Broadway northeast of Swift Street. Alternative 2B would likely have slightly less catalytic effect on Lower Town because pedestrians would enter and exit the station below the grade of Broadway and hence have a less direct connection to Lower Town. Alternative 2C is located along Depot Street and, therefore, would likely provide a slightly lesser effect on Lower Town than the other Site 2 alternatives. Alternatives 3A, 3B, 3C and 3D benefit from proximity to greater populations of existing development including the University of Michigan's Medical Campus, which contains the highest density of employment in the City.

Overall, the differences between the Site 2 design alternatives with respect to development are not great and therefore none appears unreasonable in comparison with the others. Similarly, the Site 3 design alternatives appear to have a more or less equal effect on development and therefore none appears unreasonable in comparison with the others. Table 3 below summarizes the affected population and employment by alternative:

Table 3: Summary of Urban Environment Within 1/2 Mile

Alternative	Population within 1/2 mile	Employment within 1/2 mile	Total
2A, 2B, 2C	5,275	11,080	16,355
3A, 3B, 3C,3D	5,327	17,231	22,558

Figure 10: Ann Arbor Activity Areas, Plus Jobs and Residents within 1/2 Mile of Final Alternatives



Potential for Multimodal Connectivity

Due to topographical constraints, Design Alternatives 2A, 2B, and 2C would require automobile and transit boarding locations to be on opposite sides of the tracks in order to achieve separate drive circulations for each. The transit boarding areas are located along Depot Street, which is subject to recurring congestion. Presently, only three AAATA Bus Routes 1 (now 22) and 2C (now 65) travel on the Broadway Bridges, and Route 17 (now 21) stops at the current Amtrak station. These routes carried approximately 3,000 weekday passengers in 2010. Because of the topography of Depot Street, adding additional transit connections is likely not feasible, limiting the potential for multimodal expansion. All the Site 2 design alternatives appear able to accommodate the required multimodal facilities and share similar constraints with respect to separation of modes, therefore none is unreasonable in comparison with the others.

Alternatives 3A, 3B, 3C and 3D have an integrated auto and transit operations center within the intermodal station/parking structure footprint, with separate drive circulations for each. AAATA bus routes that travel along Fuller Road or East Medical Center Drive include Routes 1U (now 63), 2A (now 23), 2B (now 23), and 3. In 2010, these routes transported an estimated 4,000 weekday riders. Almost all University of Michigan bus routes provide service in the area of Site 3, with ridership levels that are significantly higher than the AAATA routes. Approximately 34,000 passengers rode the University buses each weekday in 2010 during the school seasons.[17] In total, various transit routes carry approximately 38,000 weekday transit riders past Design Alternatives 3A, 3B, 3C , and 3D when the University is in session. Additionally, a planned future high capacity transit service ("The Connector") is planned to pass along the south edge of the site and can be integrated into the intercity and regional commuter services of this alternative. All the Site 3 design alternatives appear able to accommodate the required multimodal facilities, and the multi-modal facilities are generally in the same location for each design alternative, therefore none is unreasonable in comparison with the others.

6.3 Accessibility

Table 4 shows the ratings of each design alternative for Access and Parking. The rationale for each rating is discussed below.

Table 4 Accessibility and Parking Ratings

Criteria	Design Alternative		
	2A	2B	2C
Off-Site Traffic Infrastructure Improvements	1	1	1
Site Access Infrastructure Improvements	1	1	1
Internal Pedestrian Circulation	1	1	2
Summary	**3**	**3**	**4**

[17] SEMCOG regional ridership report for 2010. All U-M routes serve the Site 3 area except the Oxford Shuttle and Night Owl routes.

Criteria	Design Alternative			
	3A	3B	3C	3D
Off-Site Traffic Infrastructure Improvements	1	1	1	1
Site Access Infrastructure Improvements	1	1	1	1
Internal Pedestrian Circulation	1	2	1	1
Summary	**3**	**4**	**3**	**3**

Off-Site Traffic Infrastructure Improvements

Design Alternatives 2A, 2B, and 2C have similar infrastructure needs. Depot Street serves as a primary commuter corridor between highway M-14 via North Main Street and the University of Michigan Medical Center, and is subject to recurring peak hour congestion. Depot Street west of the Broadway Bridges is a three-lane roadway that is constrained from expansion by Wheeler Park on the south, and commercial development on the north and south. Depot Street underneath and east of the Broadway Bridges to State Street is a two-lane roadway that is constrained on the north by the former Michigan Central Depot and by the supports and grade approach to the Broadway Bridges. Widening Depot Street is not currently planned.

In addition to rush hour congestion, Depot Street also currently experiences congestion from station traffic in the mornings and afternoons. This is associated primarily with kiss-and-ride activity as passengers are picked up and dropped off with the arrival and departure of trains. These conditions have the potential to worsen under the current station design as railroad ridership increases.

For Design Alternative 2C, an additional controlled intersection (including signalization) may be required at Depot Street and State Street because the location of the station building in the Michigan Central Depot would encourage traffic access from State Street, which currently prohibits left turns onto Depot Street due to sightlines. Because the location of the station building would be farther west in Design Alternatives 2A and 2B, traffic would be more likely to access the station from Division to Carey Street, the intersection of which has clear sightlines and would not require signalization.

All Site 2 design alternatives would need similar off-site traffic infrastructure improvements, therefore none is unreasonable in comparison to the others.

For Design Alternatives 3A, 3B, 3C , and 3D improvements would likely be needed at the Fuller Road/East Medical Center Drive/Maiden Lane intersection to maintain an acceptable level of service at the station. This intersection presently experiences recurring peak hour congestion. The City of Ann Arbor has a planned improvement in its Capital Improvement Plan to address this intersection.[18] The City plans to construct this improvement regardless of where the station is located.

All Site 3 design alternatives would need the same off-site traffic infrastructure improvements, therefore none is unreasonable in comparison to the others.

Site Access Infrastructure Improvements

Design Alternatives 2A, 2B, and 2C would have primary automobile and parking access on Broadway and primary bus, transit, private shuttle, and taxi access on Depot Street. To accommodate ingress and egress on Broadway, a new signal would be necessary.[19] This new signal may cause traffic control delays at the intersection of Broadway, Plymouth Road, Maiden Lane, and Moore Street.

Ingress and egress lanes for each design alternative will be evaluated for compliance with City of Ann Arbor code and other applicable standards and requirements. To the extent that separate turning lanes at the automobile entrances on the north side of the tracks may be required, some reconstruction or modification of the Broadway Bridges may be necessary for all of the Site 2 design alternatives. For transit access on Depot Street,

[18] http://www.a2gov.org/departments/systems-planning/capital-improvements/Documents/FY2014-FY2019/Transportation_Street%20Construction(2).pdf
[19] Segment 4 Traffic analysis, dated September 8, 2014.

access would be impaired by the recurring congestion, with queues that would back up past driveways or transit bays on a regular basis. Signalization at transit access drives may be necessary to allow effective transit operations at congested times.

In order to access east-west bus routes on Broadway, bus stops would likely need to be constructed on the Broadway Bridge at the station. To mitigate congestion, bus pullouts on the Broadway Bridge may be necessary, in which case the bridge would need to be widened. The pedestrian crossing on the Broadway Bridge would require an additional traffic signal, likely synchronized with the new traffic signal that would be required at the parking structure ingress/egress point.

Design Alternatives 3A, 3B, 3C, and 3D would have one entrance for all street-based transit modes and a separate entrance for automobile traffic. All Site 3 design alternatives would also require reconfiguration of the existing crossovers along Fuller Road in front of the site. The existing westbound to eastbound crossover would need to shift to the west to allow direct access to the station for westbound traffic on Fuller Road. The existing eastbound to westbound crossover would need to be relocated to the east to allow traffic exiting from the station access westbound Fuller Road. If the Connector is constructed near this station site, additional infrastructure, such as an elevated pedestrian connection, may be required for access to and from the rail station.

All design alternatives at both Site 2 and 3 could be connected to the existing system of sidewalks and non-motorized shared-use (bike) paths. Where those sidewalks and paths cross station access driveways, traffic volumes would need to be monitored and additional measures, such as signage, may be appropriate to minimize conflicts. For the Site 2 design alternatives, the areas of potential conflict would be the Broadway Bridges sidewalk at the automobile access driveways and the Depot Street sidewalk at the transit access driveways. For the Site 3 design alternatives, the areas of potential conflict would be at the transit and automobile driveways along the shared-use path on the south side of Fuller Road.

The Site 2 design alternatives all share very similar access arrangements and would need similar site access infrastructure improvements. Therefore none of the Site 2 design alternatives is unreasonable in comparison to the others. The Site 3 design alternatives all have the same access arrangements and would need the same site access infrastructure improvements. Therefore none of the Site 3 design alternatives is unreasonable in comparison to the others.

Internal Pedestrian Circulation

Internal pedestrian circulation distances are summarized and overall averages given in Table 5.

Of the Site 2 design alternatives, Design Alternative 2A has the shortest cumulative internal pedestrian circulation distances. Design Alternative 2B is approximately 100 feet longer, followed by 2C, which is approximately 600 feet longer than 2B. Although Design Alternatives 2B and 2C have longer cumulative distances, neither appears unreasonable in comparison to the others.

Of the Site 3 design alternatives, Design Alternatives 3A and 3C have the same measurements and the shortest cumulative distances. Design Alternative 3D has almost the same cumulative distances (approximately 30 feet longer than 3A). Design Alternative 3B has considerably longer distances at over 600 feet longer than the other Site 3 design alternatives. Although Design Alternative 3B has longer cumulative distances, neither appears unreasonable in comparison to the others.

Table 5: Internal Pedestrian Circulation

Site 2A	*Feet*
WB Platform to Station	145
EB Platform to Station	145
Parking to Station	250
Transit to Station	
On-Site Bus Bays near Depot Street	*490*
NW Broadway Bridge	*35*
SE Broadway Bridge	*100*
Average Total	208.33

Site 2B	*Feet*
WB Platform to Station	115
EB Platform to Station	230
Parking to Station	260
Transit to Station	
On-Site Bus Bays near Depot Street	*575*
NW Broadway Bridge	*110*
SE Broadway Bridge	*175*
Average total	286.67

Site 2C	*Feet*
WB Platform to Station	430
EB Platform to Station	155
Parking to Station	670
Transit to Station	
On-Site Bus Bays near Depot Street	*705*
NW Broadway Bridge	*305*
SE Broadway Bridge	*240*
SE Broadway Bridge (no SE elevator)	*360*
Average total	402.5

Site 3A / 3C	*Feet*
WB Platform to Station	30
EB Platform to Station	30
Parking to Station	150
Transit to Station	
NB Med Ctr	300
SB Med Ctr	260
On-Site Bus Bay Area Within Parking Deck	190
Average total	250

Site 3B	*Feet*
WB Platform to Station	315
EB Platform to Station	410
Parking to Station	370
Transit to Station	
NB Med Ctr	250
SB Med Ctr	364
On-Site Bus Bay Area Within Parking Deck	480
Average total	364.67

Site 3D	*Feet*
WB Platform to Station	105
EB Platform to Station	170
Parking to Station	0
Transit to Station	
NB Med Ctr	460
SB Med Ctr	400
On-Site Bus Bay Area Within Parking Deck	115
Average total	325

All Station Alternatives	2A	2B	2C	3A/C	3B	3D
Average Dist. Platforms to Stations	145	172.5	292.5	30	362.5	137.5
Approx. Dist. Parking to Stations	250	260	670	150	370	80
Average Dist. Transit to Stations	208	287	403	250	365	325
Cumulative Feet	603	719	1,365	430	1,097	543

6.4 Site Assessment

Table 6 shows the ratings of each design alternative for Site Assessment. The rationale for each rating is discussed below.

Table 6: Site Assessment Ratings

Criteria	Design Alternative		
	2A	2B	2C
Floodplain	1	1	1
Hazardous Materials	1	1	1
Cultural/Historic Resources	1	1	2
Recreational Lands	1	1	1
Property Ownership	1	1	2
Summary	**5**	**5**	**7**

Criteria	Design Alternative			
	3A	3B	3C	3D
Floodplain	1	1	1	1
Hazardous Materials	1	1	1	1
Cultural/Historic Resources	1	1	1	1
Recreational Lands	1	2	2	2
Property Ownership	1	1	1	1
Summary	**5**	**6**	**6**	**6**

Environmental Factors

(See Figs. 11 and 12)

Floodplain

Design Alternatives 2A, 2B, and 2C would be located in the floodplain. Design Alternatives 3A, 3B, 3C, and 3D would not be located in a floodplain. [20]

Hazardous Materials

Design Alternatives 2A, 2B, and 2C all have potential impacts from hazardous materials due to structures located on known contaminated lands). Design Alternatives 3A, 3B, 3C, and 3D would not be located on a site with known hazardous materials located on-site.[21]

Cultural/Historic Resources

Design Alternative 2C incorporates a national register historic building (the former Michigan Central Depot) and requires use of property that is within a local historic district for short-term parking. Design Alternatives 2A and 2B are adjacent to the historic depot and historic district and may have impacts on the viewshed of the historic resource. Design Alternative 3A, 3B, 3C, and 3D have no known cultural or historic resources on site or within view.

Recreational Lands

Design Alternatives 2A, 2B and 2C do not use any recreational lands, although they are adjacent to or in view of several City parks or recreation areas within 500 feet, including Wheeler Park, Broadway Park, Argo Cascades, Riverside Park, and Fuller Park.

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[20] See Figure XX
[21] See Figure 11

Design Alternative 3A is located in the City of Ann Arbor's Fuller Park. Approximately 3 acres of the 60-acre park would be used, of which a majority is land currently used as a parking lot. The proposed footprints of the Design Alternative 3A buildings are in the parking lot area and railroad right-of-way, while site access elements link the station to Fuller Road.

Design Alternatives 3B, 3C, and 3D would use approximately 3.5 acres of the 60-acre park. In addition to use of the current parking lot area, the footprints would also use some recreational lands west of the footprint of the parking lot.

The Site 2 design alternatives have very similar issues with respect to these environmental factors. The primary difference is that Design Alternative 2C proposes to use a historic building, while the other alternatives may have an impact on the viewshed of the historic building. Given the identified space requirements, it may be possible to use the historic station without substantial modification, therefore none of the Site 2 design alternatives are unreasonable in comparison with the others.

The Site 3 design alternatives are very similar except that Design Alternative 3A is the only one that does not consume recreational lands west of the existing parking lot. As discussed above in Section 5.3, the City's policy has been to avoid use of recreational lands in Fuller Park and public comment has also reflected this desire. Therefore, Design Alternatives 3B, 3C, and 3D are not reasonable in comparison to Design Alternative 3A.

Property Ownership

The current expectation is that the City of Ann Arbor would own the station and the parking facilities and would operate the parking facilities. Amtrak (and potentially other entities) would occupy and operate the station. MDOT owns the railroad infrastructure and controls the railroad right-of-way.

Design Alternatives 2A, 2B, and 2C would be built primarily on property owned by Amtrak, which also owns the existing station building. These design alternatives would also require acquisition or use of some adjacent land owned by DTE Energy. In addition, Design Alternative 2C would require acquisition of the building housing the Gandy Dancer restaurant.

All the Site 2 design alternatives require acquisition or use of private property. Therefore none is unreasonable in comparison with the others.

Design Alternatives 3A, 3B, 3C, and 3D are within Fuller Park and the railroad right-of-way, which are owned by the City of Ann Arbor and MDOT respectively. All the Site 3 design alternatives are within property owned by public entities. Therefore none is unreasonable in comparison with the others.

Figure 11: Environmental Elements for Design Alternatives 2A, 2B, and 2C

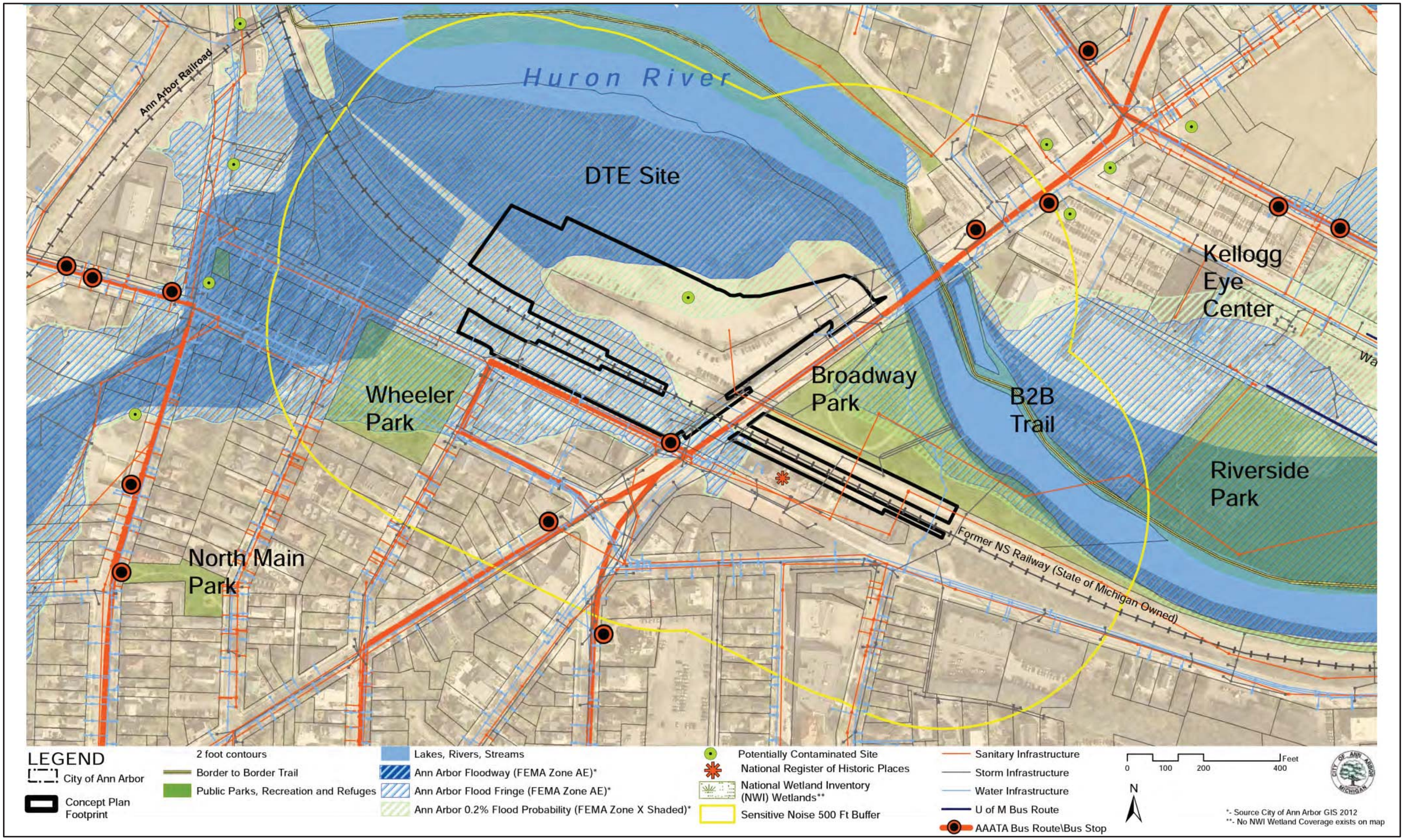
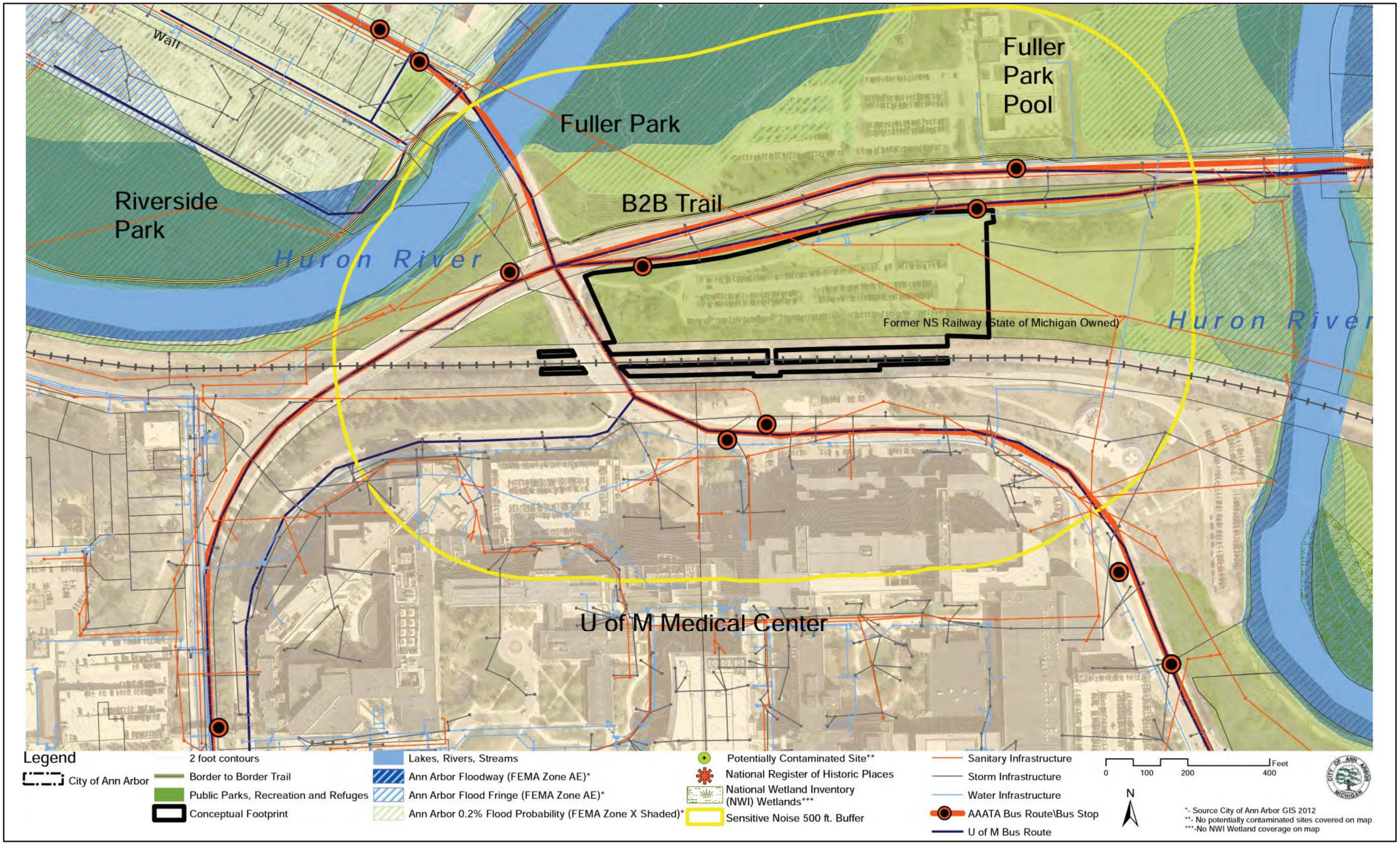


Figure 12: Environmental Elements for Design Alternative 3A, 3B, 3C, and 3D



6.5 Screening Summary

Table 7 summarizes and aggregates the rankings of each design alternative from Section 6.0.

Table 7: Screening Summary

Criteria	Design Alternative		
	Site 2A	2B	2C
Location within the Community	2	2	2
Accessibility and Parking	3	3	4
Site Assessment	5	5	7
Aggregate Rating	**10**	**10**	**13**

Criteria	Design Alternative			
	Site 3A	3B	3C	3D
Location within the Community	2	2	2	2
Accessibility and Parking	3	4	3	3
Site Assessment	5	6	6	6
Aggregate Rating	**10**	**12**	**11**	**11**

The comparative rankings suggest that each design alternative may have challenges with respect to particular issues. However, at this stage of data collection and analysis, four of the seven design alternatives appear to have the potential to meet the Purpose and Need, include all required design elements, and avoid the potential for substantial environmental impacts. Design Alternatives 3B, 3C, and 3D have impacts to public recreational lands in Fuller Park, contrary to City policy, which makes them unreasonable alternatives in comparison to Design Alternative 3A and eliminates them from consideration. Design Alternatives, 2A, 2B, 2C and 3A are identified as reasonable alternatives that will be advanced into the Environmental Assessment for further analysis consistent with the requirements of NEPA.

7.0 Summary and Conclusion

Summary

This Phase II Report was prepared as the second step in the Ann Arbor Intermodal Station Alternatives Analysis. The purpose of the Alternatives Analysis is to determine which of the potential station design alternatives were reasonable to carry forward into the Environmental Assessment phase. This report evaluated the three station sites that advanced from Phase I by:

1) Establishing Design Criteria for station design alternatives.
2) Designing conceptual-level footprints for station design alternatives at each station site.
3) Evaluating the station design alternatives to determine whether they met the project Purpose and Need.
4) Evaluating the station design alternatives to determine whether they were reasonable in comparison to the other design alternatives at the same station site.

Site 1 (North Main Street) and its two design alternatives (Concept Plan A and B) were eliminated as not meeting the project Purpose and Need. This site had scored poorly in the Phase I report, but further analysis was conducted at stakeholder request. Further evaluation showed that the site could not accommodate the station program in a manner that met the project Purpose and Need. The remaining two sites – Site 2 (Depot Street) and Site 3 (Fuller West) and their respective Design Alternatives 2A, 2B, and 2C and 3A, 3B, 3C, and 3D satisfied the factors outlined in the project Purpose and Need.

The seven design alternatives were screened under the Phase II Design Alternatives Screening Criteria defined in Section 5.0 to determine whether they were reasonable to advance into the Environmental Assessment. These criteria were selected because they were determined to be the appropriate considerations and potentially distinguishing factors in selecting a location for an intercity passenger rail station.

Conclusion and Next Steps

This report concluded that, given the current level of data and analysis, Design Alternatives 2A, 2B, 2C, and 3A are reasonable alternatives that should be advanced into the Environmental Assessment for further analysis consistent with the requirements of NEPA. Design Alternatives 3B, 3C, and 3D were eliminated from consideration because they were unreasonable in comparison to Design Alternative 3A due to their use of recreational lands in Fuller Park.

Upon release of this report, a public meeting will be held and comments will be collected, which will be included in the Environmental Assessment. The Environmental Assessment will contain an evaluation of potential environmental impacts for Design Alternatives 2A, 2B, 2C and 3A, consistent with the requirements of NEPA, and will identify the Preferred Alternative.

Following the release of the Environmental Assessment, a 30-day public comment period will begin. After comments are received and responses are provided, if it is evident that there are no significant impacts associated with the project pursuant to NEPA, FRA may prepare a Finding of No Significant Impact (FONSI) determination. A FONSI would be the final action in the FRA's NEPA process for the Ann Arbor Intermodal Passenger Rail Station.

Following completion of the Environmental Assessment, the project planning and design process will proceed with Preliminary Engineering (PE). The PE phase will include opportunities for public input. With the completion of PE, the plan for the Preferred Alternative will have been refined to a level of detail necessary to allow the project to advance to the Final Design and Construction phases.

No-Build Alternative

The National Environmental Policy Act and related regulations also require that a "No-Build Alternative" be evaluated in the Environmental Assessment. The No-Build Alternative for this project incorporates the existing Ann Arbor Amtrak Station (the busiest passenger rail station in the state of Michigan) and the associated long-term parking lot located north of the railroad tracks from the station itself. The station is located about one-half mile north of the center of downtown Ann Arbor. Current station utilization is about 150,000 annual passengers. The Amtrak station building is situated south of the tracks on Depot Street where the street passes beneath the Broadway Bridge. The site is near the historic Michigan Central Depot building. Public parking lots containing over 50 total short-term metered spaces abut the station building.

The immediate Depot Street area contains a low-density mix of commercial properties. Beyond the commercial properties, a mix of single-family homes, apartment buildings, institutions, and parks extend south of the station along an urban street grid. The area includes two Historic Districts: the Division Street Historic District (which includes the historic station building) and the Old Fourth Ward Historic District (which extends from Depot Street to downtown and does not include the historic Depot). The area's urban mix gains intensity as it reaches the fringes of downtown.

North of the tracks, an L-shaped Amtrak parcel contains 70-80 long-term parking spaces for the station and a storm water management area associated with the parking area. Grassy berms in the area and the parking lot's driveway throat function as overflow parking. The Broadway Bridge divides these properties from Broadway Park.

Date: October 14, 2014

To: Eli Cooper, Transportation Manager, City of Ann Arbor
From: Project Team

Subject: Ann Arbor Station—Phase I Alternatives Analysis

The purpose of this memorandum is to describe the process for identifying and screening locations for a potential new multi-modal, intermodal, intercity and commuter passenger rail station in Ann Arbor (Ann Arbor Intermodal Passenger Rail Station). This Alternatives Analysis process is one element of the Ann Arbor Station Environmental Review. This effort, led by the City of Ann Arbor, began in January 2014 and is scheduled to conclude in December 2014. The Environmental Review is a concept planning study for:

a. Defining the long-term needs for an Ann Arbor Intermodal Passenger Rail Station;
b. Identifying potential sites and station options;
c. Evaluating benefits and impacts of various station options, including a No-Build Alternative (continued use of the existing station); and
d. Complying with Federal and State requirements for financing, building, and operating an Ann Arbor Intermodal Passenger Rail Station.

The Alternatives Analysis process is divided into two phases:

- **Phase I:** Identification of possible station sites and an initial screening of those sites; and
- **Phase II:** Development of conceptual station design alternatives for the sites identified in Phase I and review of those design alternatives to determine which are reasonable to advance into the Environmental Assessment phase.

Phase I is presented in this memorandum. Content contained here will be incorporated into an Environmental Assessment (EA) report, which will officially document the Environmental Review process.

Purpose and Need

The Ann Arbor Station Environmental Review is guided by a Purpose and Need document, which has been reviewed by the Michigan Department of Transportation (MDOT) and the Federal Railroad Administration (FRA). All station alternatives must comply with the Purpose and Need. The purpose of the proposed action is to:

> "provide an intermodal facility that will accommodate existing and future intercity passenger rail ridership; improve intermodal connectivity within the City of Ann Arbor and its neighboring communities, including proposed commuter rail in the City of Ann Arbor; and improve the integration of the station within the City of Ann Arbor."[1]

All station improvements would fully comply with accessibility requirements within the Americans with Disabilities Act (ADA).

As stated in the Purpose and Need document, the following elements contribute to the need for an enhanced, intermodal and multi-modal passenger rail station in Ann Arbor:

- Insufficient quality and comfort for passengers provided by the existing station
- Inadequate space for intermodal connectivity at the existing station
- Substantial existing and projected future passenger demand

[1] Ann Arbor Station Environmental Review Draft Purpose and Need, revised on October 14, 2014.

- Limited transportation choices between the existing station, Ann Arbor activity areas and surrounding communities.[2]

The Purpose and Need creates the framework for designing a new Ann Arbor Intermodal Passenger Rail Station. Thus, each station alternative must correspond with the Purpose and Need. Those alternatives that appear unable to meet the Purpose and Need are not recommended for further consideration. The complete Purpose and Need document will soon be available on the Ann Arbor Station website. A summary of the document is currently available on the website at:
http://www.a2gov.org/government/publicservices/systems_planning/Transportation/Pages/Ann-Arbor-Station.aspx

Potential Station Site Identification

Site selection criteria were developed in order to identify potential station sites. The primary criterion was provided by MDOT and the National Passenger Rail Corporation (Amtrak). Both entities requested that any enhancements to the existing station, or construction of a new station, should occur along a tangent (straight) section of track. This meets train operational objectives that ensure ADA compliance (manageable gaps between the trains and platforms), promote passenger convenience and safety, and protect railroad equipment and infrastructure. Both MDOT and Amtrak stipulated that the tangent track sections should be at least 1000 feet long to support railroad operational needs.

Based on the Purpose and Need, other station site identification criteria stipulated that the potential sites should:

[2] *Ibid*.

- Lie along the existing Amtrak railroad corridor within City of Ann Arbor limits;
- Provide convenient access to downtown Ann Arbor and major activity areas. These other activity areas include notable trip generators in the City of Ann Arbor, including the University of Michigan (U-M) Central Campus, Medical Campus, and North Campus, and the Ann Arbor Department of Veterans Affairs (VA) Hospital. A proposed benchmark for convenience is proximity. Specifically, the Project Team (which includes URS, its subconsultants, and City staff) proposes using the national walking tolerance average of one-half mile to fixed guideway transit as optimal.[3] Station sites within one-half mile of activity areas that include reasonable pedestrian accommodations can be expected to promote walking access. All other access modes also benefit from this proximity.
- Include enough land to accommodate all required site features. The Project Team's preliminary estimate was that sites meeting the Purpose and Need would require at least three acres of suitable land for station facilities. [4] Given that ridership and station volume estimates have increased since this initial estimate, the amount of land required for a station has increased. Land requirements will be considered in detail as part of the Phase II analysis. During Conceptual Design, the

[3] Transit Cooperative Research Program (2009). *Literature Review for Providing Access to Public Transportation Stations.* TCRP Web-Only Document 44, available at http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_webdoc_44.pdf.

[4] Three acres is the Project Team's preliminary minimum land estimate for accommodating station facilities, including a station building, multi-modal transfer center, platforms along both sides of a double-tracked rail corridor, a grade-separated track crossing for passengers—meaning a pedestrian bridge or tunnel meeting Americans with Disabilities Act (ADA) access requirements—and station parking.

project team will consider how the station can be built in stages and expanded as necessary;

- Allow convenient access to existing roadway networks. The station's high utilization projections[5] will require direct access to high volume roadway networks;
- Support connections to public transit services and non-motorized transportation facilities; and
- Minimize impacts to environmental resources. A list of environmental categories required for analysis as part of FRA-funded projects is provided on the FRA website.[6] Many of these criteria were considered generally during Phase I of the analysis and will be reviewed in detail for the small set of station sites advanced to Phase II.[7] The environmental category receiving the most stakeholder comments has been parks and recreational properties. The National Environmental Policy Act (NEPA) process requires special consideration of these properties, which are identified in the U.S. Department of Transportation Act of 1966 Section 4(f). Specifically,

> "Before an alternative involving the use of a Section 4(f) resource can be selected, avoidance alternatives and minimization measures must be considered."[8]

The Phase I criteria were reviewed by Ann Arbor stakeholders and citizens at public meetings in April 2014 and met with general approval. Stakeholders have since expressed interest in additional evaluation criteria, with numerous requests received for consideration of implementation costs and station-oriented development. Cost implications are considered generally in Phase I, in that land acquisition, relocations, required infrastructure and associated investments would increase project costs. However, implementation costs cannot be estimated until conceptual designs are developed. For these reasons, cost is not included as a specific criterion during Phase I. An alternative's economic constraints on local government is considered in the socioeconomic environmental category; thus general considerations to comparative costs are included in the Phase I analysis. Station-oriented development is also generally considered in the environmental categories, as it relates to compatible land uses and economic impacts.

In accordance with the site selection criteria, the Project Team has identified eight 1000-foot tangent track segments within the City of Ann Arbor. Figure 1 displays these track segments. Figure 2 shows the segments in context with half-mile radius circles around major activity areas. Figure 3 shows the segments in context with the public transit network.

[5] Ann Arbor Station internal memorandum on ridership and station utilization, August 8, 2014.

[6] The FRA environmental categories list can be found at https://www.fra.dot.gov/eLib/details/L02561. These were published in the Federal Register, Volume 64, Number 101, page 28550, on Wednesday, May 26, 1999. This 1999 categories list has yet to be superseded in final rulemaking.

[7] The environmental categories considered during the Phase I analysis are shown in the legends of the figures for this memorandum. These categories represent readily available data and the most prominent factors for screening alternatives. The analysis assumes that further evaluation would be performed in Phase II and for the Preferred Alternative.

[8] US Federal Highway Administration website: http://www.environment.fhwa.dot.gov/section4f/avoidance.aspx

Figure 1: 1000-Foot Straight Track Segments along Amtrak Corridor in Ann Arbor

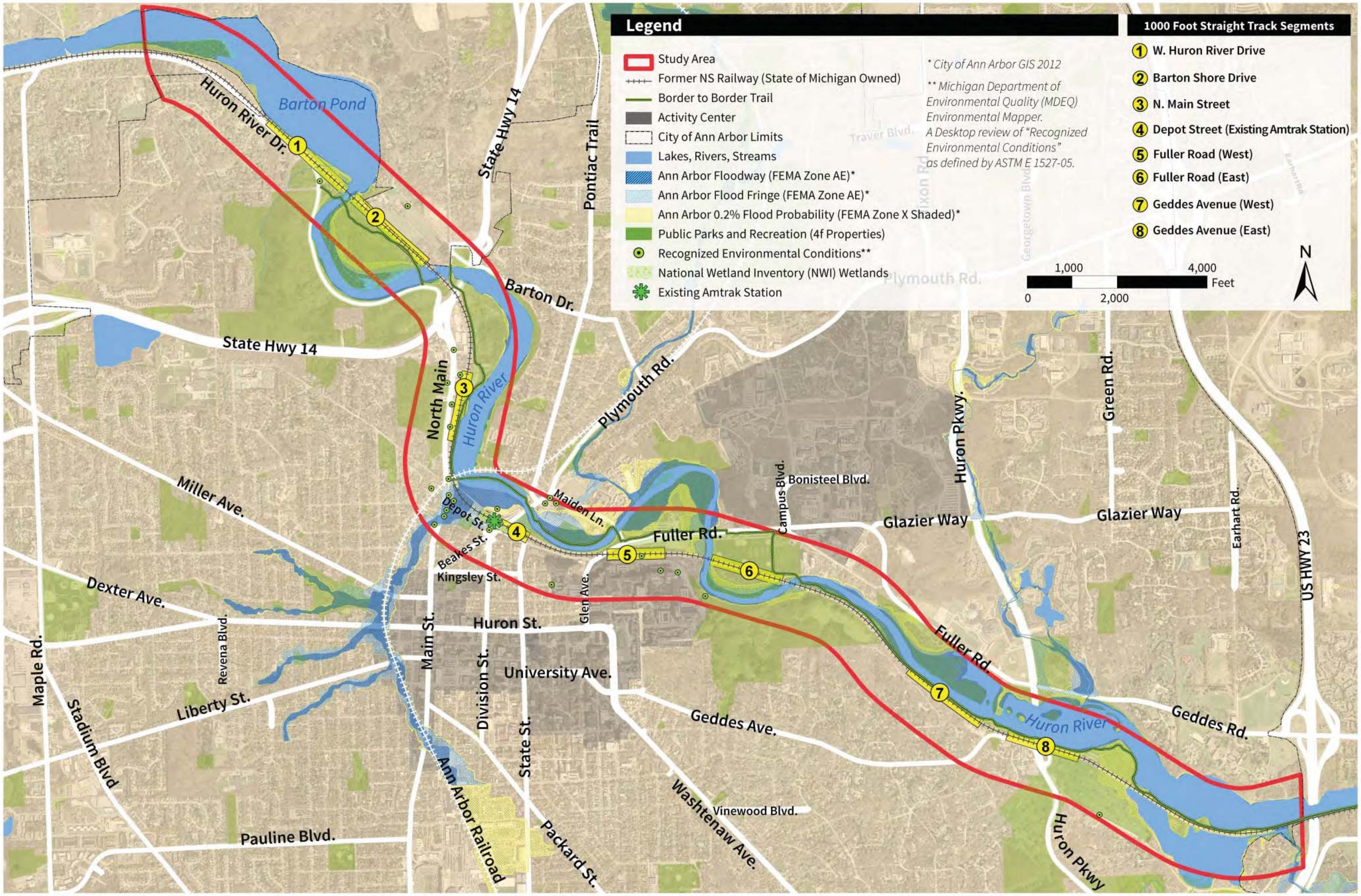


Figure 2: Proximity of Segments to Downtown Ann Arbor and Major Activity Areas

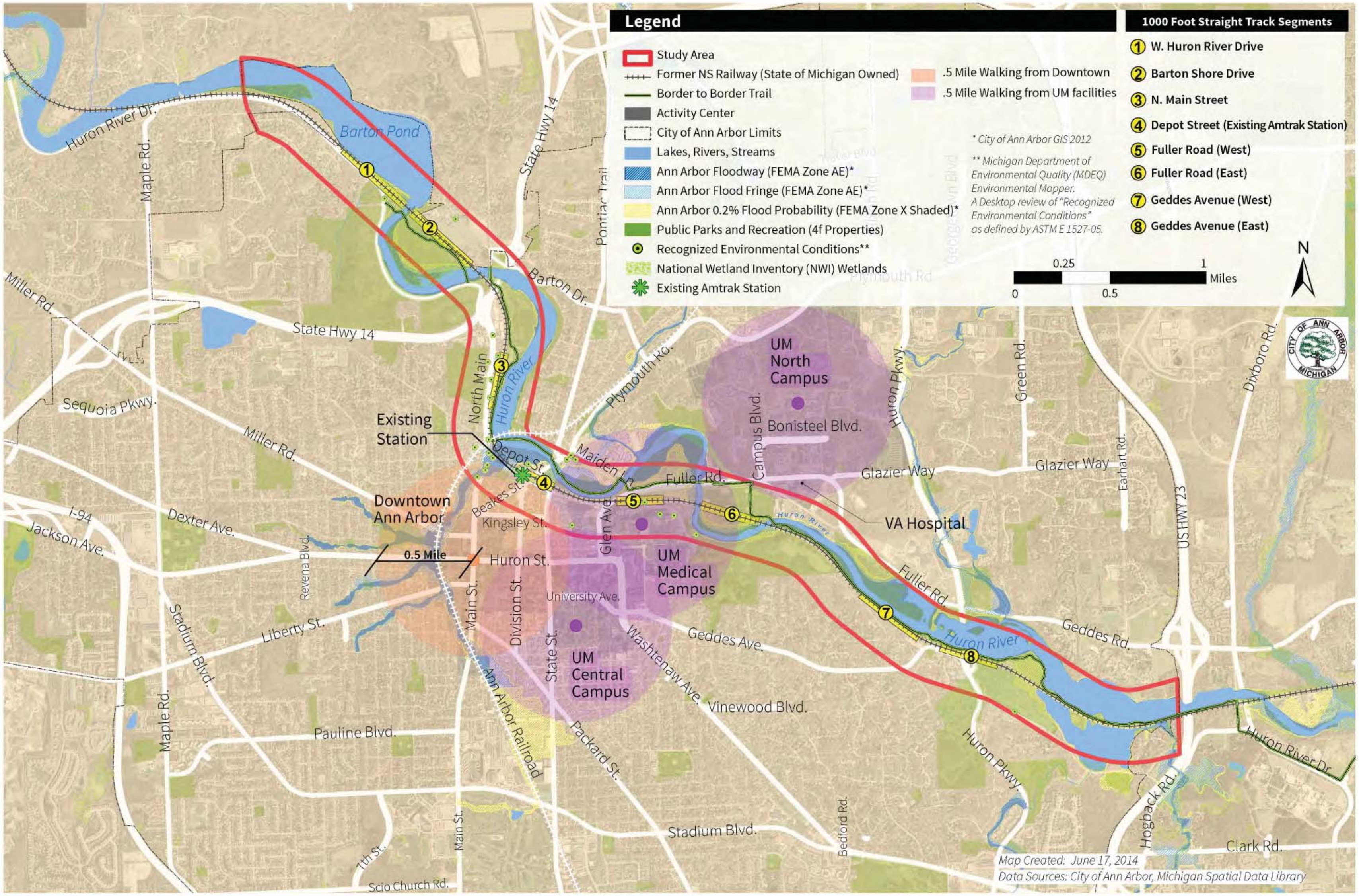
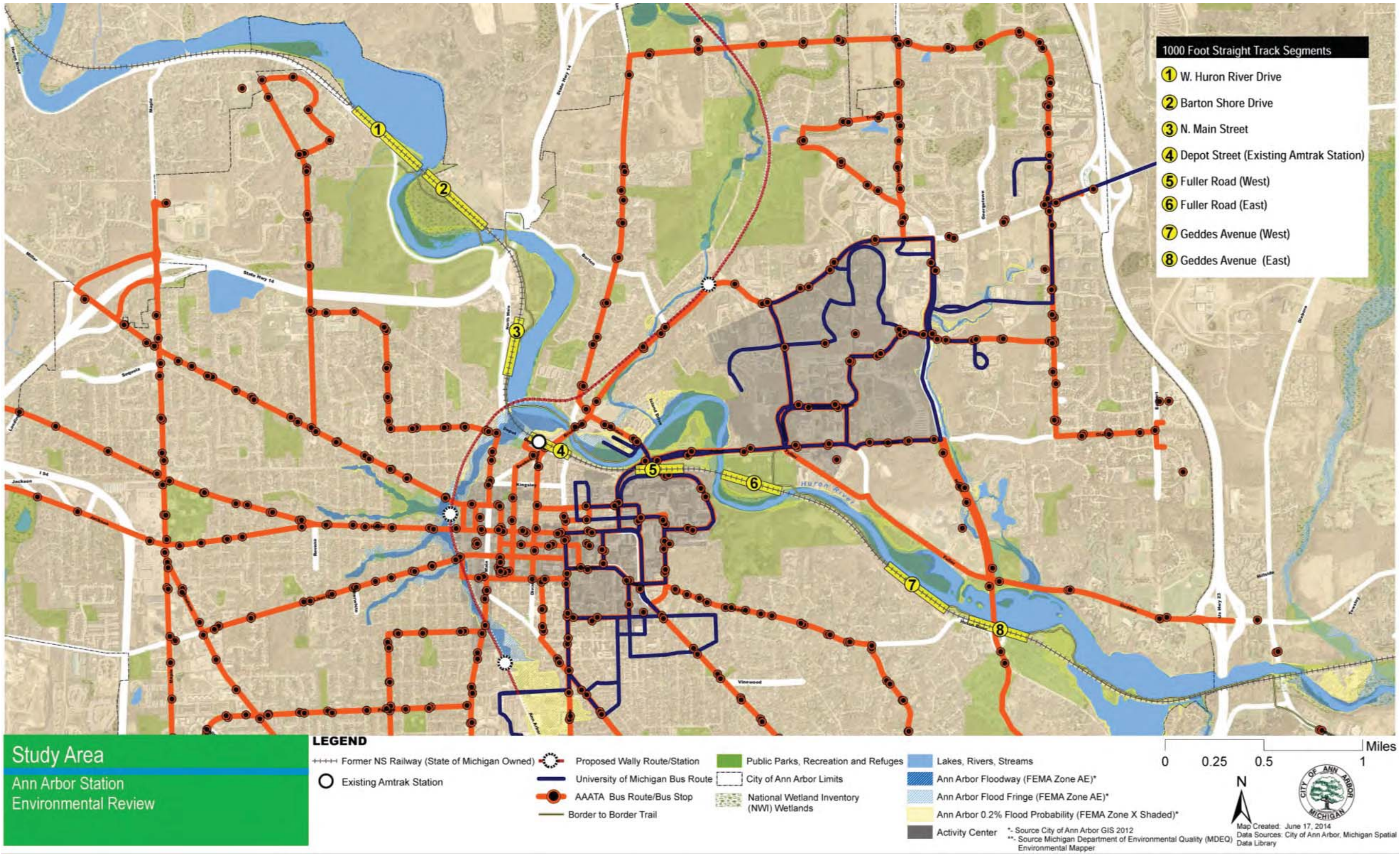


Figure 3: Segments in Context with Ann Arbor Transit Network



Segment identifiers are provided in Table 1.

Table 1: 1000-Foot Straight Track Segments along Amtrak Corridor in Ann Arbor

Segment #	Segment Name	Approximate Track Milepost*	Approximate Length (Feet)
1	West Huron River Drive	38.5	2300
2	Barton Shore Drive	38.4	2200
3	North Main Street	37.9	1500
4	Depot Street (Existing Amtrak Station)	37.3	1200
5	Fuller Road (West)	36.8	1300
6	Fuller Road (East)	36.2	1600
7	Geddes Avenue (West)	35.1	2000
8	Geddes Avenue (East)	34.8	1700

**From the 1999 Consolidated Rail Dearborn Division track charts, Michigan Line. These mileposts appear to land within the segments and do not represent surveyed midpoints.*

The existing railroad corridor follows the Huron River and has operated continuously along the river for over 100 years. Accordingly, potential stations present possible impacts to the river or riverfront areas. These and other potential environmental impacts are considered generally in Phase I of the analysis. Phase II and the Environmental Assessment will include more in-depth environmental evaluation.

Phase I Segment Descriptions and Scoring

The following sections describe the set of eight Phase I track segments identified for evaluation. The segments are described in context with the site selection criteria. Each segment evaluation criterion is assigned a preliminary score ranging from -2 (least compliant) to +2 (most compliant). This scoring represents an effort to generally gauge the feasibility and reasonableness of locating a station meeting the Purpose and Need at each segment. The goal of this process is to screen the segments to a small set worthy of detailed Phase II analysis. This memorandum does not rank the Phase II segments in any way; Phase II will commence a wholly new evaluation process for the remaining segments.

For a summary matrix showing how the Project Team scored each Phase I segment, please see Page 30.

Segment 1: West Huron River Drive (Figure 4)

This site in the city's far northwest corner and surrounded by parkland and natural resources meets few of the site identification criteria. Correspondingly, a brief description of the site's constraints is here provided.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
Segment 1 is located in the northwestern corner of the city. It is over 2.5 miles from the center of downtown and other major activity areas. This site does not meet the criterion for convenient access.

Criterion: Suitable Land for a Station
The track segment is surrounded by the Bird Hills Park / Nature Area and part of the segment is immediately adjacent to both the Huron River and West Huron River Drive. Nearby developed areas consist entirely of single-family homes, aside from the tracks themselves and the nearby Barton Dam on the river. There appears to be very little land for a station here, even if parkland were to be included for station use.

Criterion: Convenient Access to Existing Roadways
The segment is accessed via a winding two-lane road (West Huron Drive), which would require modifications to accommodate station access. The nearest high capacity roadways are further than one mile from the segment.

Criterion: Public Transit Connections
One existing Ann Arbor Area Transportation Authority (AAATA) bus route, Route 13, loops through a residential area within one block of Segment 1, at the end of its route. The route operates between the area and downtown Ann Arbor at peak 30-minute headways and hourly during the midday. Route 13 could potentially extend to a station at the segment to provide a very basic transit connection.

Criterion: Minimizing Environmental Impacts
The segment is within flood zones, which limits opportunities for a station in the area. A station would also present potential impacts to surrounding parkland, the Huron River, wetland areas, wildlife habitat, and a low-density residential area.

Summary
Segment 1 is not a reasonable station site, as it meets very few of the site identification criteria. It is not recommended for further consideration. Phase I scoring for this segment is shown in the matrix below. The Segment 1 area is displayed in Figure 4.

Segment 1: West Huron River Drive	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2
Suitable Land for Station Facilities	-2
Accessed by Existing Roadways	-1
Public Transit Connection Potential	-1
Minimize Environmental Impacts	-2
Phase I Score	-8

Figure 4: Segment 1—West Huron River Drive

Segment 2: Barton Shore Drive (Figure 5)

Segment 2 meets few of the site identification criteria. The tracks follow the border between City parkland (the Barton Nature Area) and the Barton Hill Village incorporated area north of the city of Ann Arbor. The tracks bridge the Huron River at either end of the segment. Barton Shore Drive extends along the far side of the farmland from the tracks and is the nearest roadway. The City parkland is actually on a peninsula surrounded by the Huron River and thus is disconnected from the rest of the city except by two footbridges across the river. On the north side of the tracks is a meadow behind the Barton Hills Village Hall. A Barton Nature Area access trail crosses under the tracks at the northwestern end of the segment.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
This segment is north of the city (except for the bordering parkland). It is located about 2 miles from downtown and is further from other major activity areas. It is well outside the half-mile walk shed of major activity areas.

Criterion: Suitable Land for a Station
The only place to construct a station along Segment 2 is on the meadow north of the tracks. A station on these properties would be in Barton Hills Village, and thus does not meet the criterion of a station within the City of Ann Arbor. The meadow north of the tracks is large enough to host a station, but the land is outside Ann Arbor city limits and further than a mile from identified activity centers.

Criterion: Convenient Access to Existing Roadways
The Segment 2 area is not linked to a public road. A new street would need to be constructed to access a potential station site. Barton Shore Drive is a private, two-lane, tree-lined facility that connects to Barton Drive at a stop sign-controlled intersection. This intersection includes M 14 highway on and off ramps, which would be advantageous for this segment if local roadways connected the intersection to the segment. The meadow properties separate the tracks from the intersection and all local roadways.

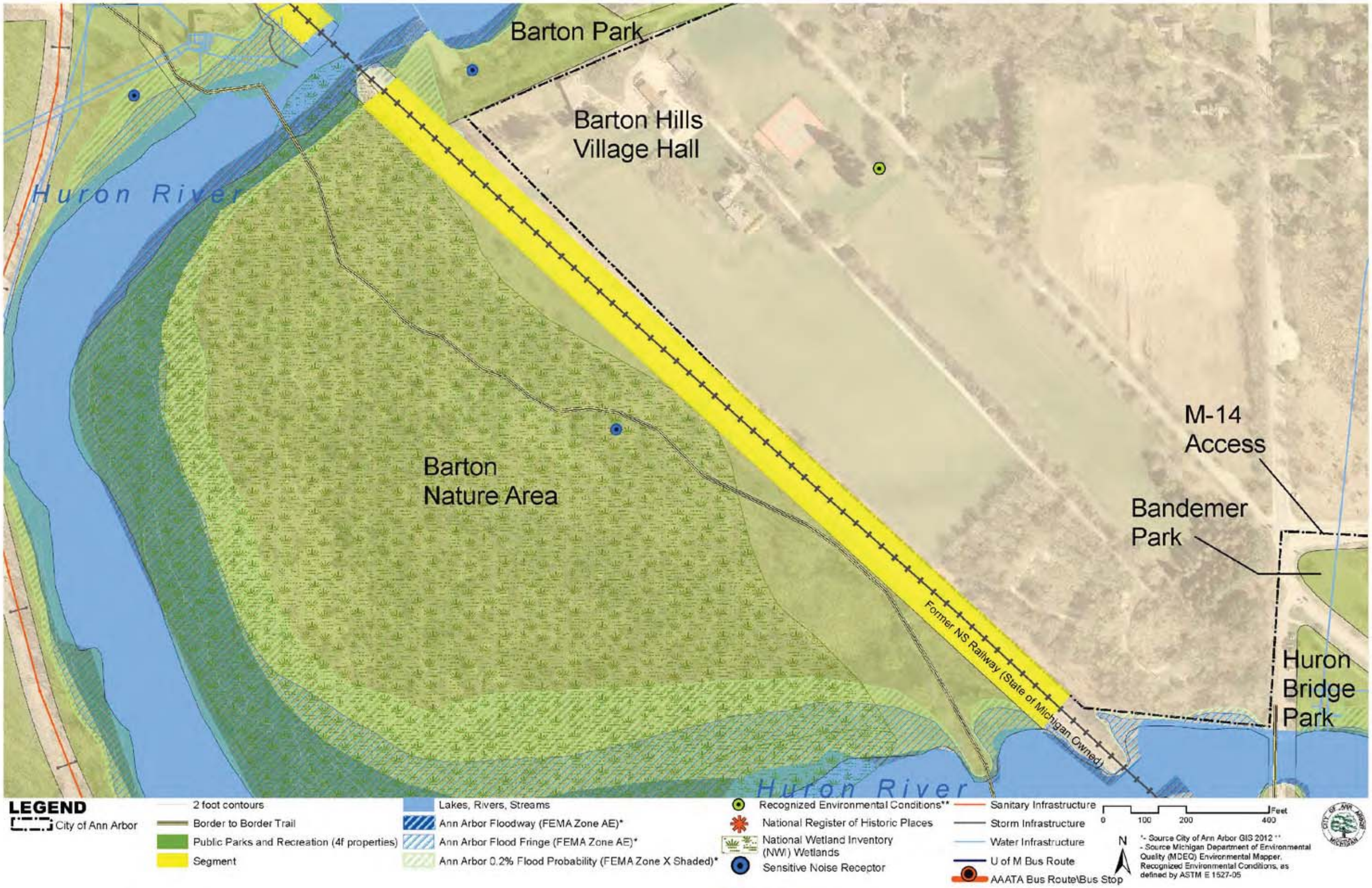
Criterion: Public Transit Connections
No public transit routes travel in nearby areas.

Criterion: Minimizing Environmental Impacts
Station construction and operations present potential impacts to surrounding wetland areas and parklands. Siting a station here would displace meadow land and dramatically change the area's character.

Summary
Segment 2 meets few of the site identification criteria and thus is not recommended for further consideration. Phase I scoring for this segment is shown in the matrix below. The Segment 2 area is displayed in Figure 5.

Segment 2: Barton Shore Drive	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2
Suitable Land for Station Facilities	-1
Accessed by Existing Roadways	-1
Public Transit Connection Potential	-2
Minimize Environmental Impacts	-2
Phase I Score	**-8**

Figure 5: Segment 2—Barton Shore Drive



Segment 3: North Main Street (Figure 6)

Segment 3 is located about one mile northwest of downtown Ann Arbor. Through this area, the tracks extend between a light industrial zone along North Main Street and Bandemer Park. At the southern end of the segment, the railroad right-of-way includes the Border-to-Border (B2B) Trail shared-use pathway, which sits on an easement provided by the railroad. In this area, the tracks and B2B Trail are immediately adjacent to the Huron River. The track area, Bandemer Park, and the B2B Trail are accessed via Lake Shore Drive, a private drive that connects perpendicularly with North Main Street and crosses the tracks at grade.

The railroad right-of-way is exceptionally wide along parts of Segment 3. The area historically included industrial access yard tracks, and an active excursion rail platform exists along this segment. Two siding tracks in the area are used for storing vintage railroad cars owned by Artrain/Mid America Railcar Leasing LLC (http://www.midamericarailcar.com/index.html). A trackside platform and shelter serves as a waiting area for visiting the railcars and excursion and educational trips using the vintage railcars.

The Artrain rail shelter sits adjacent to a parking lot for the NEW Center, a facility housing non-profit organizations at 1100 North Main Street. The parking lot contains just over 50 parking spaces adjacent to the tracks.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
The one mile distance between Segment 3 and downtown is greater than the national walking tolerance average of one-half mile to fixed guideway transit. Other activity areas are further from the segment. The primary connection to the area is North Main Street, which offers a sidewalk along the east side of the roadway and few other amenities for walking or bicycling between Downtown, Ann Arbor neighborhoods, and the segment area. The B2B Trail provides regional bicycle access to the area.

Criterion: Suitable Land for a Station
The wedge of properties between North Main Street and the tracks contains several light industrial and office businesses. One or more of these properties would need to be acquired in order to locate a multi-modal station in the area. An industrial use exists across North Main Street opposite Lake Shore Drive. A few other businesses are scattered along the west side of North Main Street. The majority of the west side of North Main Street contains a heavily wooded slope. This is part of the Bluffs Nature Area, which covers the hillside and borders North Main Street for much of its length through the area.

Criterion: Convenient Access to Existing Roadways
North Main Street is a major four-lane arterial through this area with connections to Downtown and M 14. For station access, North Main Street would likely require a signalized intersection and other improvements at Lake Shore Drive or a nearby site entry point. Lake Shore Drive is not currently a public road, which creates another challenge to access this location.

Criterion: Public Transit Connections
Only one AAATA bus route, Route 13, travels in the general Segment 3 area. It operates about three blocks from the southern limit of this segment. Other bus routes would need to make major diversions to serve the area. The proposed Washtenaw and Livingston Line (WALLY) commuter rail service may be implemented about 400 yards south of the segment. WALLY would travel between downtown Ann Arbor and Howell. At a point between Segments 3 and 4, the Ann Arbor Railroad tracks pass above the Amtrak tracks on a viaduct. Both railroads navigate sharp curves at the crossing point, which eliminates the option of locating the intercity rail station at the

crossing. The WALLY project has not proposed a station in the vicinity of the crossing point.

Criterion: Minimizing Environmental Impacts
Notable environmental impacts of a station along Segment 3 would be the cost to the City of acquiring multiple properties and relocation of several businesses. Potential impacts to nearby park areas, associated wetlands, and the Huron River would also need consideration. Also to be considered: the cost to redesign North Main Street and nearby intersections to provide multi-modal site access.

Summary
It appears possible to locate an intermodal passenger rail station at Segment 3. However, the segment does not meet the Purpose and Need. The prospect of acquiring several properties along the segment and relocating businesses raises the capital and socioeconomic costs of locating a station here. Access and roadway conditions create problems for vehicular and non-motorized access between the site and major activity areas. This site has limited potential for transit connections. The site's environmental constraints are complex, and thus the Project Team initially did not recommend advancing Segment 3 for further analysis.

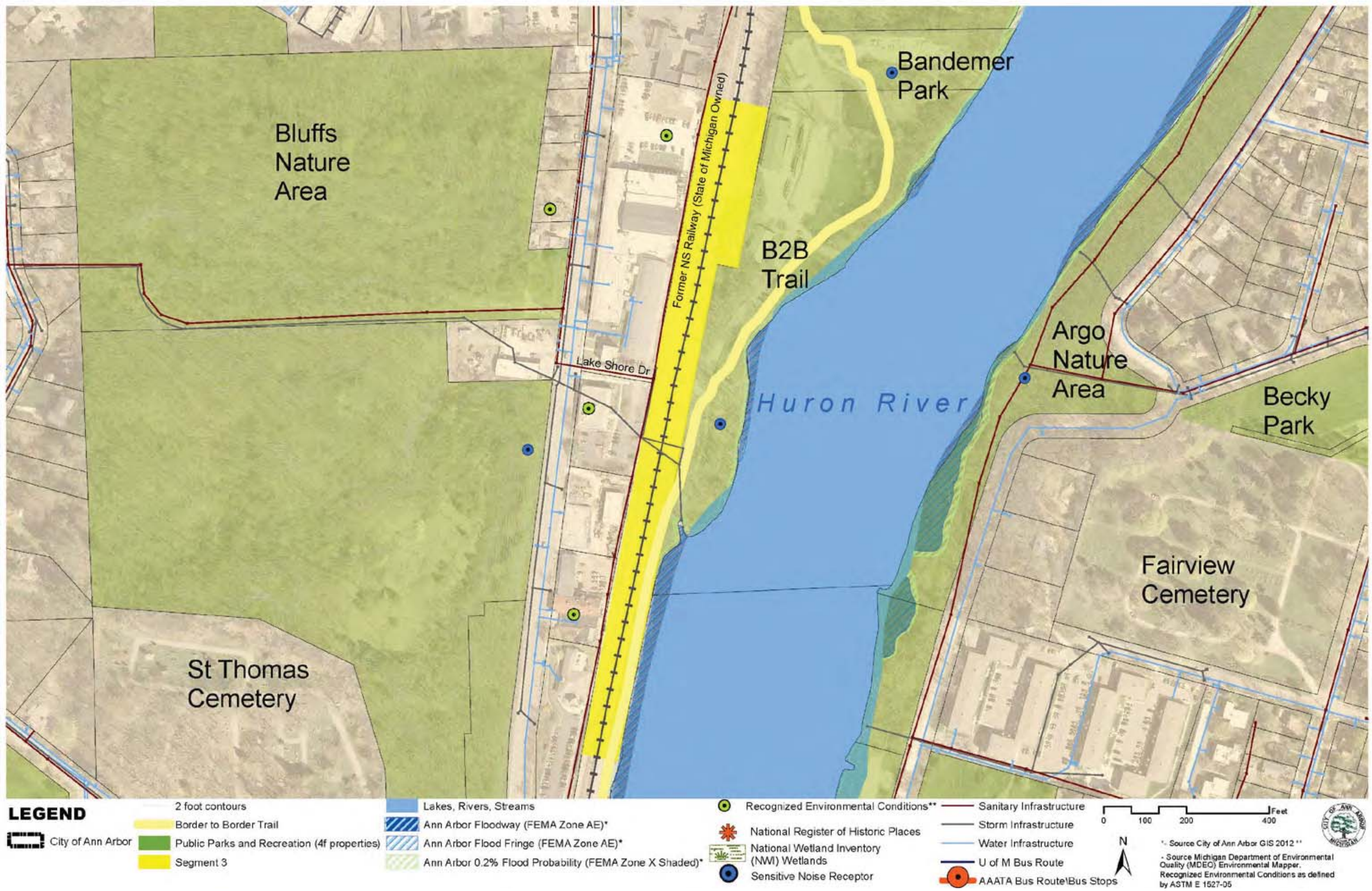
Postscript: *At June stakeholder and public meetings, a few participants expressed support for further consideration of this segment area. Several other meeting participants concurred with the requests, with no dissent. As a result, the Project Team advanced Segment 3 for further consideration in the Phase II analysis, along with Segment 4 (Depot Street/Existing Amtrak) and Segment 5 (Fuller Road—West).*

The Project Team performed further analysis on this site and developed conceptual designs after the conclusion of Phase I. The Team concluded that the station program would require considerably more land than originally anticipated and that very little buildable land would remain for station-oriented development. All businesses between North Main Street and the Huron River and within 700 feet of Lake Shore Drive would be relocated for this segment. This information was shared with diverse stakeholders during a site tour on September 15, 2014. Accordingly, tour participants and meeting attendees expressed little support for this site after the tour. The Project Team once again recommends eliminating Segment 3 from further consideration. Concept designs for this site and further analysis will be included in a Phase II Alternatives Analysis technical memorandum.

Phase I scoring for this segment is shown in the adjoining matrix. The Segment 3 area is displayed in Figure 6.

Segment 3: North Main Street	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	0
Suitable Land for Station Facilities	0
Accessed by Existing Roadways	1
Public Transit Connection Potential	0
Minimize Environmental Impacts	-1
Phase I Score	**0**

Figure 6: Segment 3—North Main Street



Segment 4: Depot Street (Existing Amtrak Station) (Figure 7)

The Segment 4 area includes the existing Ann Arbor Amtrak Station, the busiest passenger rail station in the state of Michigan. The station is located about one-half mile from the center of downtown Ann Arbor. Current station utilization is about 150,000 annual passengers. Segment 4 is also the location of the historic Ann Arbor train station building (now the Gandy Dancer restaurant), which sits next door to the Amtrak station. The Amtrak station building is situated south of the tracks on Depot Street, where the street passes beneath the Broadway Street Bridge. Public parking lots containing over 50 total metered spaces abut the station building.

The immediate Depot Street area contains a low-density mix of commercial properties. Beyond the commercial properties, a mix of single-family homes, apartment buildings, institutions and parks extends south of the station along an urban street grid. The area includes two Historic Districts: the Division Street Historic District (which includes the historic station building) and the Old Fourth Ward Historic District (which extends from Depot Street to downtown). The area's urban mix gains intensity as it reaches the fringes of downtown. North of the tracks, an L-shaped Amtrak parcel contains 70-80 long-term parking spaces for the station and a stormwater management area associated with the parking area. Grassy berms and the driveway throat in the area function as overflow parking. A large, previously developed parcel (owned by DTE Energy) extends northward from the Amtrak long-term parking lot to the Huron River. This land was used decades ago for energy manufacturing—a process that left the site polluted. DTE performed environmental remediation of the site in 2012-2013.[9] The Broadway Street Bridge divides these properties from Broadway Park. The area north of the river along Broadway Street contains a few sidewalk-oriented commercial buildings. The Kellogg Eye Center Hospital and other U-M facilities are situated along Wall Street just to the northeast of this location.

The total amount of parking currently available to Amtrak customers includes:

- 70-80 spaces north of the tracks and some additional open land used for parking (Long Term Parking). This parking is available at no charge and parking restrictions are lightly enforced. Riverfront recreational users and visitors to the nearby Kellogg Eye Center hospital reportedly use up to 50 percent of these spaces periodically;
- About 38 short-term metered spaces in the city lot west of the station, including 2 "blue" accessible spaces, and
- About 14 short-term metered spaces beneath the Broadway Bridge, just south of the station building.

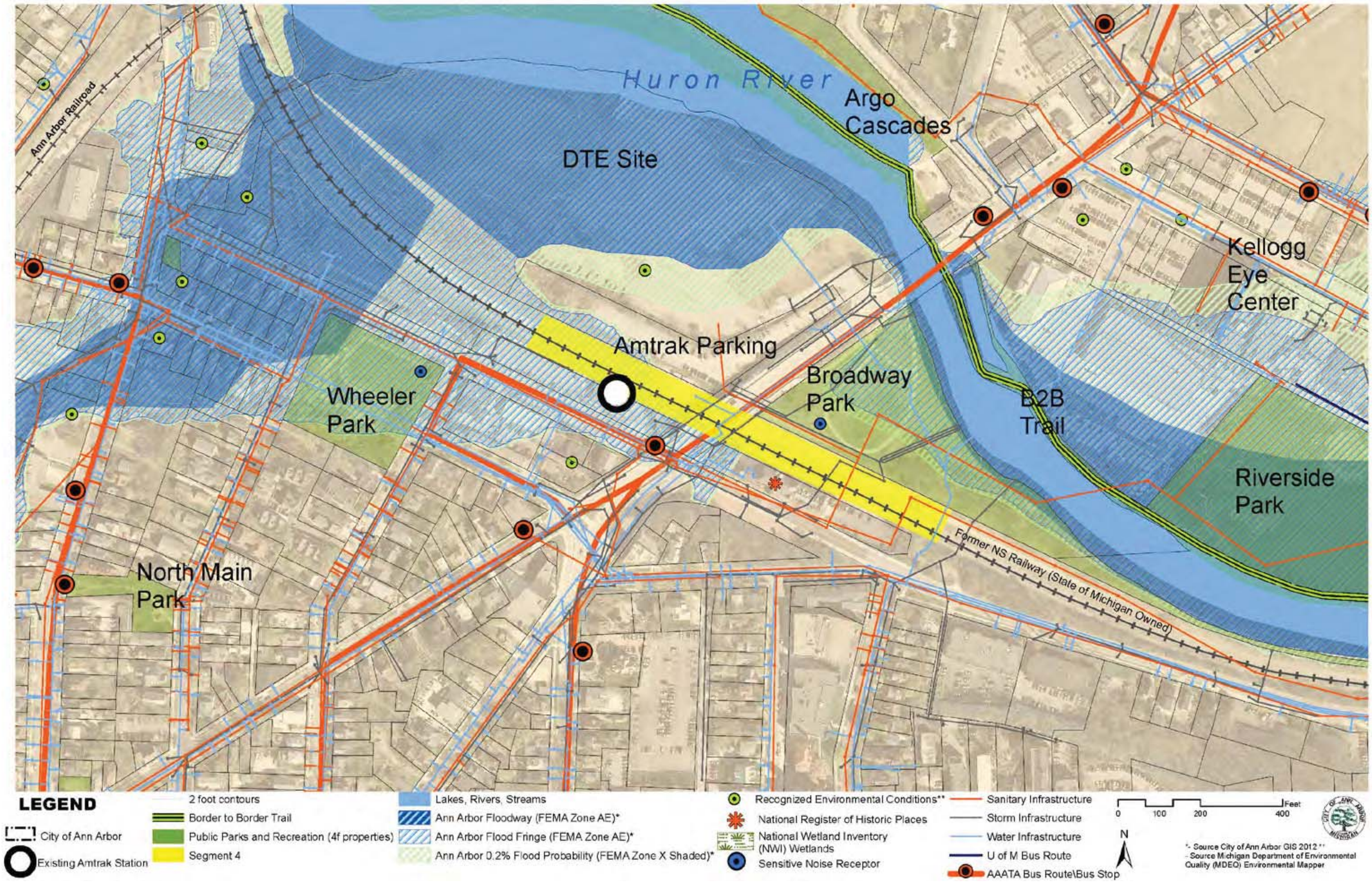
The existing Amtrak station building is undersized for its present use, and station activity is expected to grow more than seven fold by 2035. The station building lacks many amenities generally associated with busy intercity passenger rail stations. Also problematic: the long-term station parking area, located north of the tracks, is at capacity. Access to the parking area is a problem as well: the walk via the Broadway Street Bridge currently requires multiple flights of stairs. The narrowness of Depot Street, limited curbside space, and complex station traffic cause local congestion.[10]

The Segment 4 area is displayed in Figure 7.

[9] http://www.annarbor.com/news/dte-energy-calls-michcon-cleanup-success/

[10] More information on the existing Ann Arbor Amtrak station is available in an Existing Conditions memorandum prepared by the Project Team for the Environmental Review and dated March 5, 2014.

Figure 7: Segment 4—Depot Street (Existing Amtrak Station)



(Segment 4: Depot Street {Existing Amtrak Station}, continued)

Several community members have expressed interest in repurposing the historic station building /Gandy Dancer Restaurant as part of a new Ann Arbor Intermodal Passenger Rail Station. Factors complicating this reuse include:

1. The historic station building and its surrounding land are privately owned. This building and surrounding brick streets are in the Division Street Local Historic District, which could limit alteration and new construction;
2. The projected 2035 ridership at a new Ann Arbor Intermodal Passenger Rail Station is over 1 million annual riders. Amtrak guidelines for a station accommodating this passenger volume call for a building larger than the historic station building;
3. Land on the east side of the Broadway Street Bridge, which is where the historic station building is, is more constrained than land west of the bridge. Broadway Park boarders the tracks opposite the historic station building, which limits grade-separated pedestrian crossing options at this location. The impacts of a pedestrian bridge or tunnel between the historic building, a second passenger platform and parking across the tracks also need consideration;
4. The narrow, linear parking lot across Depot Street from the historic station building contains 20 parking spaces. Modifications to this lot for additional parking or multi-modal access are constrained by an adjoining forested slope that includes and borders residential structures. Also, this parking lot is in the Old Fourth Ward Local Historic District, which could limit construction on the site. A second parking lot east of the historic station building, including about 40 parking spaces, could possibly extend linearly. However, is probably too narrow to enable vertical station parking; and
5. Existing station parking and large parcels that can possibly host expanded parking are on the west side of the Broadway Street Bridge and north of the tracks. A building along the segment for a new Ann Arbor Intermodal Passenger Rail Station would connect directly with these parcels, and thus would most likely be located west of the Broadway Street Bridge.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators

Of all the segments, Segment 4 is the closest to downtown Ann Arbor. It sits approximately one-half mile from the heart of downtown—a walkable distance. The U-M Medical Campus is located about two-thirds of a mile away, and the U-M Central Campus is less than a mile away. The city's street grid connects the station area to the entire city. Topography, an elevated roadway, and high speed vehicular approaches to the Broadway Street Bridge create some local non-motorized and barrier-free access problems. Mitigation measures may be able to address these problems, but would add to a new station's implementation costs.

Criterion: Suitable Land for a Station

The existing station properties on both sides of the tracks provide about 2.5 acres of relatively unencumbered land as a starting point. City-operated parking lots adjacent to the station are potentially suitable for station development. Other nearby land could possibly be acquired for the station; this includes DTE parcel(s), properties associated with the landmark historic station building (the Gandy Dancer restaurant), and commercial properties along Depot Street.

Criterion: Convenient Access to Existing Roadways

While the Segment 4 area is connected to the Ann Arbor street grid, previously-noted topographical and roadway conditions create challenges for local access. While land may be available for station parking on the north side of the tracks, access to and from Broadway

Street is currently funneled to a single, unsignalized access point. The station parking access drive would likely require a traffic signal and potentially require an additional access point. The grade differential between trackside parcels and the Broadway Street Bridge creates access challenges. It is possible that these issues can be addressed with mitigation measures, but at additional cost to the station project.

Criterion: Public Transit Connections
Existing transit service connects the Segment 4 area with downtown Ann Arbor, the U-M Central Campus, and the U-M North Campus. Three AAATA bus routes serve the immediate area. AAATA Route 17 stops on Depot Street in front of the existing station. Two other routes (AAATA Routes 1 and 2C) follow Broadway Street across the bridge, and thus travel above the station. The Project Team recommends exploring opportunities to connect these routes to the station in the next phase of the Environmental Review. Options include stops on the bridge with a crosswalk and vertical circulation, or a route diversion to the station. Improvements to enable Broadway Street routes to connect would add to the project cost.

U-M bus routes travel within one-quarter mile of the Segment 4 area and can possibly be extended to connect to the area. To summarize, connecting sufficient transit to a station at Segment 4 seems achievable.

Criterion: Minimizing Environmental Impacts
Impacts to Amtrak operations during development of a new station would require careful staging. Parts of the existing station property and much of the surrounding land lie within identified flood zones. Traffic impacts related to station and access improvements would need consideration and, conceivably, mitigation measures. Should property in addition to Amtrak parcels be required for a new station at the site, the financial and socioeconomic impacts of property acquisitions must be considered. The historic station building (now Gandy Dancer restaurant) is on the National Register of Historic Places. Thus, impacts to the historic station building must be avoided.

Summary
Segment 4 contains the city's passenger rail station today and may possibly host a new intermodal station meeting the Purpose and Need. An exploration of station options at this site is recommended for further consideration. Phase I scoring for this segment is shown in the matrix below.

Segment 4: Depot Street (Existing Amtrak)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	2
Suitable Land for Station Facilities	1
Accessed by Existing Roadways	1
Public Transit Connection Potential	1
Minimize Environmental Impacts	1
Phase I Score	**6**

**Segment 5: Fuller Road (West)
(Figure 8)**

Segment 5 is located immediately north of and downhill from the U-M Medical Campus, below the Fuller Road and East Medical Center Drive bridges. The north side of the tracks is bordered by Fuller Park, which sits slightly higher in elevation than the tracks.

The Segment 5 area contains a dense employment concentration—far exceeding the other segment areas. It also contains multiple large parking lots and structures that support local employment, education and recreation. One of the parking areas within Fuller Park extends parallel to the tracks, about 75 feet north of the tracks. The lot contains about 250 spaces. Another large parking lot is located further north from the segment, on the far side of Fuller Road. This additional lot next to the Fuller Park Outdoor Pool and Waterslide contains about 235 spaces. Both of these parking lots appear to be used, in part, by commuters. South of the tracks and up the hill, the multi-level M15 North Entrance Parking Structure is nestled into the Medical Campus. Other parking structures and lots surround the Medical Campus, some of which are near the track segment.

The area also contains a nearby multi-family residential area, located across the Huron River from the segment along Maiden Lane. The Kellogg Eye Center Hospital is just beyond the housing areas. U-M recreational fields are east of the segment along Fuller Road, as are some U-M North Campus facilities and the VA Hospital.

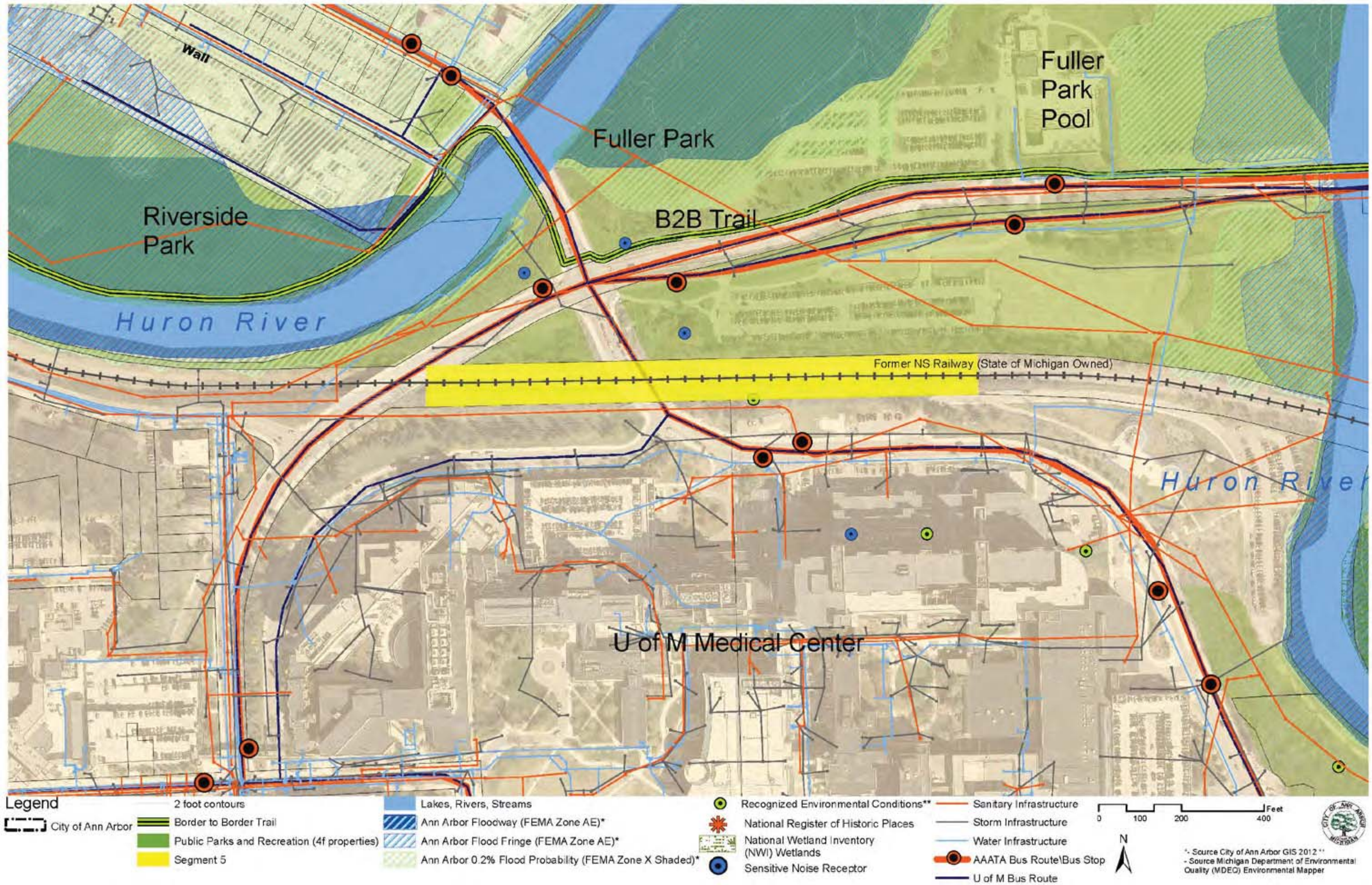
The Segment 5 area is displayed in Figure 8.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
Segment 5 is located about one mile from the center of downtown Ann Arbor, beyond the typical distance passengers would be willing to walk. Frequent transit service between the segment area and downtown helps bridge that walking gap. A planned high-capacity transit service, the Connector, is proposed to link the area with downtown, U-M campuses, and other major activity areas. The segment is about 100 yards from the nearest U-M Medical Campus buildings.

The Medical Campus has one of the highest concentrations of jobs in Washtenaw County. The difference in elevation between the tracks and the Medical Campus would require vertical circulation, including elevators to serve persons with disabilities. The U-M Central Campus is located about two-thirds of a mile from the segment—a long walk. Both the Central and North Campuses connect to the area by frequent bus services.

Criterion: Suitable Land for a Station
The Segment 5 area has land uses to support a station. Platforms and vertical circulation may fit within railroad property, but a station building and other facilities would be located a) on City-owned designated park land now occupied by parking, b) in air rights above the MDOT tracks, c) on University property that is densely built-out with medical facilities, and/or d) along area roadways. While these issues appear complicated, further analysis would clarify the feasibility and reasonableness of a station along this segment.

Figure 8: Segment 5—Fuller Road (West)



(Segment 5: Fuller Road (West), continued)

Criterion: Convenient Access to Existing Roadways
The Segment 5 area is surrounded by high-capacity roadways. It is the most likely station site to absorb station traffic without significant roadway modifications. The impacts of adding station traffic to the already congested area roadways will require detailed traffic analysis in Phase II.

Fuller Road is a multi-lane parkway facility. The intersection with Maiden Lane and East Medical Center Drive is under consideration for an improvement by the City of Ann Arbor to address existing traffic issues. Sidewalks exist on all public streets with the sidewalk width of 8-10' allowing them to serve as shared-use paths. The regional B2B Trail is designated on the paths on the north side of Fuller Road through the area.

Criterion: Public Transit Connections
The Segment 5 area is second only to the City and University transit centers in its concentration of existing bus service. All points in the city and much of Washtenaw County can connect to the area via existing transit routes. AAATA bus routes serving the area include Routes 1U, 2A, 2B, and 3. Several other AAATA routes travel within one-third mile of the segment at the U-M Hospital Mott transit center and conceivably could extend to a station at Segment 5. These include Routes 4A, 14, 18A, 609, C, IC, and RL. All eleven U-M bus routes except the Oxford / Oxford Shuttle and Night Owl services travel in the immediate Segment 5 area.

In addition to existing transit routes, the planned Connector high-capacity transit corridor would serve the U-M Medical Campus, with a station just north of E. Medical Center Drive. Segment 5 is the only track segment where a Connector station is proposed in the immediate vicinity. All of the Connector alignments under consideration include a station in the Segment 5 area. Should the Connector advance to implementation, its corridor would extend from Segment 5 to a downtown area in the vicinity of a proposed WALLY commuter rail station near the intersection of W. Washington Street and S. 1st Street.

Criterion: Minimizing Environmental Impacts
A major environmental consideration for Segment 5 is its ability to accommodate station facilities north of the tracks, with resulting impacts to designated parkland. Much of the parkland adjacent to the track segment is currently used for commuter parking. Parkland impacts and associated mitigation measures will need careful consideration in the Phase II analysis.

Summary
Segment 5 presents significant opportunities as well as challenges. It also meets the Purpose and Need requirements if a station can be located along the segment. It is recommended for inclusion in the Phase II analysis. Because the station would use designated park lands, other alternatives and minimization measures will be considered during Phase II. Phase I scoring for this segment is shown in the matrix below.

Segment 5: Fuller Road (West)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	2
Suitable Land for Station Facilities	1
Accessed by Existing Roadways	2
Public Transit Connection Potential	2
Minimize Environmental Impacts	1
Phase I Score	**8**

Segment 6: Fuller Road (East) (Figure 9)

The track distance between Segment 6 and Segment 5 is only one-quarter mile. By comparison, though, Segment 6 is quite isolated from activity centers. Segment 6 is situated on a peninsula defined by a bend in the Huron River. The tracks cross the river at each end of the segment. The segment is completely surrounded by U-M land, including recreation fields (U-M Mitchell Field) on the north side of the tracks, and a nature area (part of Nichols Arboretum) south of the tracks.

Mitchell Field is a property meeting the definition of the U.S. Department of Transportation Act of 1966 Section 4(f) recreational lands. The University of Michigan website explains that:

> "Mitchell Field is used for scheduled activities and rentals. This facility is not available for drop-in play. Facilities include a large field area for soccer, softball, flag football, and ultimate frisbee."[11]

Two large parking lots straddle Fuller Road north of the recreation lands adjacent to the segment. These lots contain about 765 parking spaces (about 470 spaces south of Fuller Road and about 295 spaces north of Fuller Road). These lots are used by commuters. U-M and AAATA bus services connect the lots to locations throughout the city. Nearby activity areas include the Ann Arbor VA Hospital and North Campus facilities, both located about one-third mile from the segment. At their nearest, the parking lots are within 170 yards of the track segment. The average distance between the lots and the tracks is about 275 yards. No roadways connect the lots to the track area; one pathway generally makes that connection.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
This segment is about 1.5 miles from downtown Ann Arbor. A series of physical barriers separate the segment from all activity areas. For example: spanning the two-tenths-mile gap between the segment and the U-M Medical Campus would require a footbridge across the river, vertical circulation, and new pathways.

The Gallup Park Pathway (shared-use trail) passes near the segment, conveying the B2B Trail through the area. This path creates a connection to Fuller Road and transit services, but requires a 400-yard walk. No existing roadway connects to the segment. Substantial modifications to Mitchell Field would be required to establish direct connections between Fuller Road and the segment, thus providing connections to the rest of the city and activity centers.

Criterion: Suitable Land for a Station
Portions of Mitchell Field would need to be converted to other uses to enable a station along the segment. These uses would need to extend somewhat to the portion of Nichols Arboretum on the south side of the tracks, which is a pristine nature area.

Criterion: Convenient Access to Existing Roadways
While Fuller Road travels near the segment and is a high-capacity arterial, no roadway connects Segment 6 to Fuller Road.

Criterion: Public Transit Connections
Nearby Fuller Road and East Medical Center Drive are busy transit corridors conveying almost all U-M bus routes. AAATA Route 3 follows Fuller Road through the area, and several other AAATA routes serve the nearby U-M North Campus and Medical Campus. These bus corridors, Fuller Road and East Medical Center Drive, are each about 230 yards from the segment. However, no roadways connect these bus corridors to the segment.

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[11] University of Michigan website: http://recsports.umich.edu/article/mitchell-fields

Criterion: Minimizing Environmental Impacts

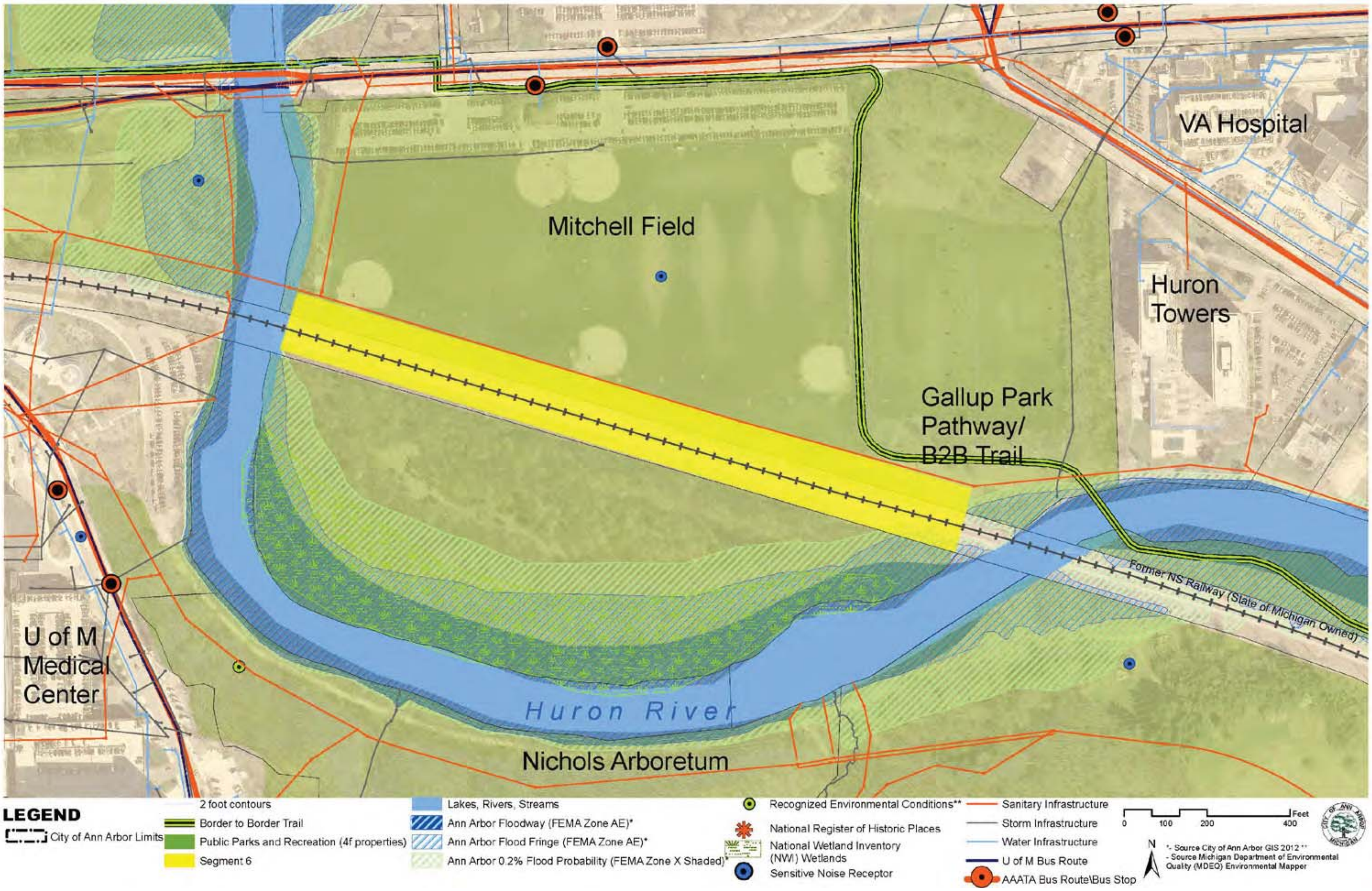
A station at Segment 6 would require converting a substantial portion of U-M Mitchell Field, which meets the Section 4(f) recreation land definition, to station uses. The Nichols Arboretum nature area south of the tracks, another Section 4(f) property, would also be used to some extent.

Summary

Segment 6 meets few of the site identification criteria. In particular, it offers insufficient access and suitable land meeting the Purpose and Need and requires substantial Section 4(f) property uses. It is not recommended for further analysis. Phase I scoring for this segment is shown in the matrix below. The Segment 6 area is displayed in Figure 9.

Segment 6: Fuller Road (East)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	0
Suitable Land for Station Facilities	0
Accessed by Existing Roadways	-1
Public Transit Connection Potential	-1
Minimize Environmental Impacts	-1
Phase I Score	**-3**

Figure 9: Segment 6—Fuller Road (East)



**Segment 7: Geddes Avenue (West)
(Figure 10)**

Segment 7 lies along a sliver of riverfront Gallup Park land in residential east Ann Arbor. It offers the fewest characteristics meeting the Purpose and Need of all the segments.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
While Segment 7 offers direct access to the Gallup Park Pathway / B2B Trail, major activity areas are well beyond the half-mile walking distance from the segment. The segment is over 2.5 miles from downtown Ann Arbor.

Criterion: Suitable Land for a Station
Segment 7 offers virtually no suitable land for a station. The tracks are separated from the Huron River by a narrow strip of riparian forest. Opposite the tracks from the river is a strip of wooded backyards of single-family homes.

Criterion: Convenient Access to Existing Roadways
No existing roadway meets Segment 7. Geddes Avenue, a winding two-lane arterial travels near the segment's eastern end.

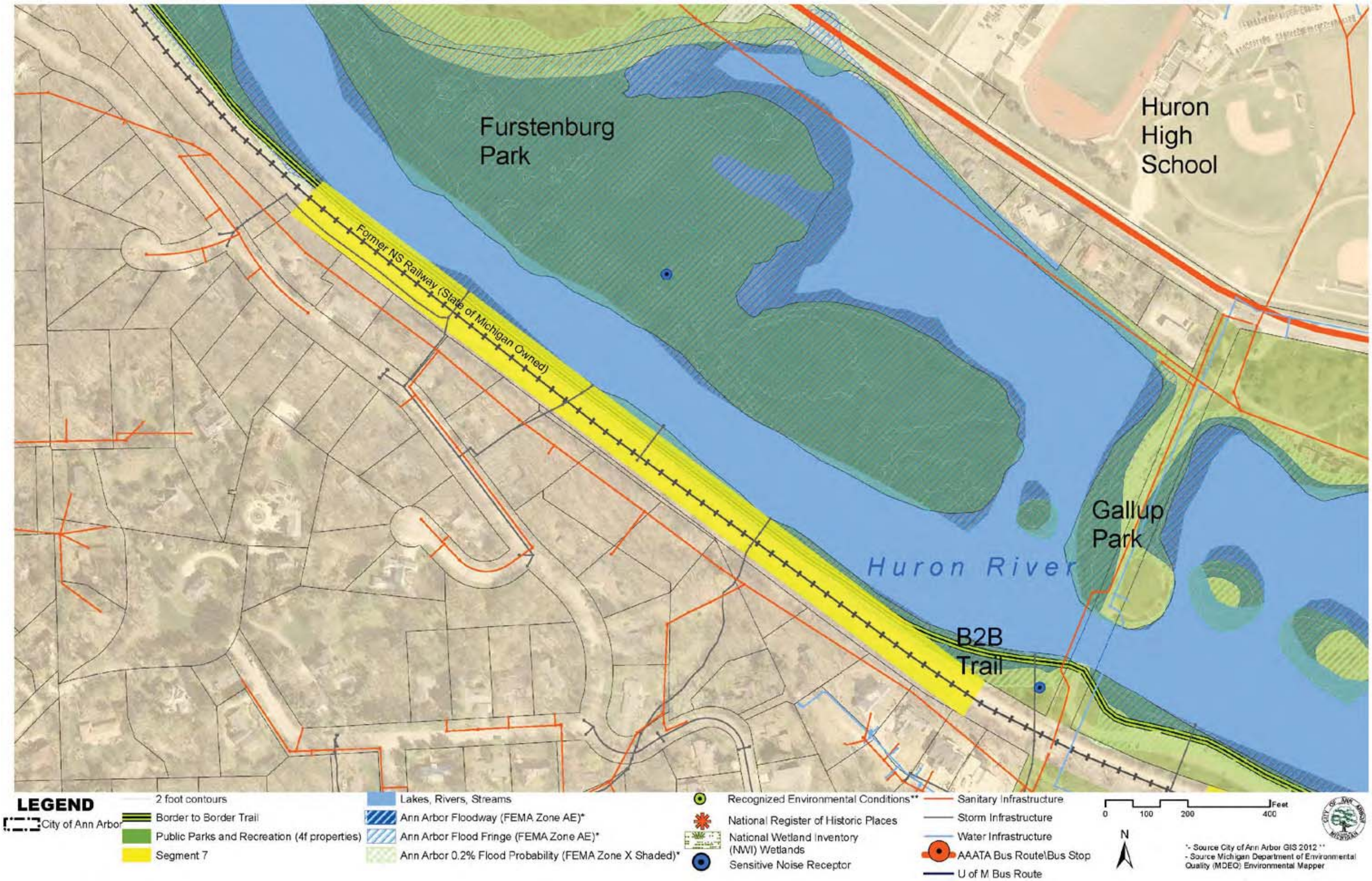
Criterion: Public Transit Connections
Two bus routes serve the general segment area. AAATA Route 22 follows Huron Parkway one-third mile east of Segment 7. Another route, AAATA Route 3, shifts its operation between Huron Parkway and Fuller Road. Both of these corridors are on the opposite side of the Huron River and Gallup Park from the segment, about one-third mile from the segment. These routes could conceivably make significant deviations to serve the segment area, but no roadway allows them to connect directly.

Criterion: Minimizing Environmental Impacts
A station at Segment 7 would face many environmental impacts: to parkland, wetlands, the river, a single-family residential area, narrow roadways and park drives.

Summary
Segment 7 meets none of the site identification criteria and is not recommended for further consideration. Phase I scoring for this segment is shown in the matrix below. The Segment 7 area is displayed in Figure 10.

Segment 7: Geddes Avenue (West)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2
Suitable Land for Station Facilities	-2
Accessed by Existing Roadways	-2
Public Transit Connection Potential	-2
Minimize Environmental Impacts	-2
Phase I Score	**-10**

Figure 10: Segment 7—Geddes Avenue (West)



Segment 8: Geddes Avenue (East) (Figure 11)

Segment 8 extends along the southern banks of the Huron River, adjacent to Gallup Park and Geddes Avenue under the Huron Parkway Bridge. It is situated in the city's eastern extent, near the Huron Hills Golf Course and the Racquet Club of Ann Arbor. Adjacent properties consist solely of park and recreation land and facilities. The segment meets few site identification criteria.

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators
Segment 8 is over 2.5 miles from downtown Ann Arbor with no direct roadway connection. It is well beyond the half-mile walking distance from other activity centers.

Criterion: Suitable Land for a Station
To obtain the minimum 3 acres of land for a station at Segment 8 would require acquisition of private land (the Racquet Club) or converting part of the Huron Hills Golf Course, a city park, to station uses.

Criterion: Convenient Access to Existing Roadways
Huron Parkway is a major arterial crossing above the segment and provides a local access connection to the area at Geddes Avenue. Thus, a sufficient roadway connection to the segment may be feasible. This roadway connection would be far removed from Downtown and activity centers.

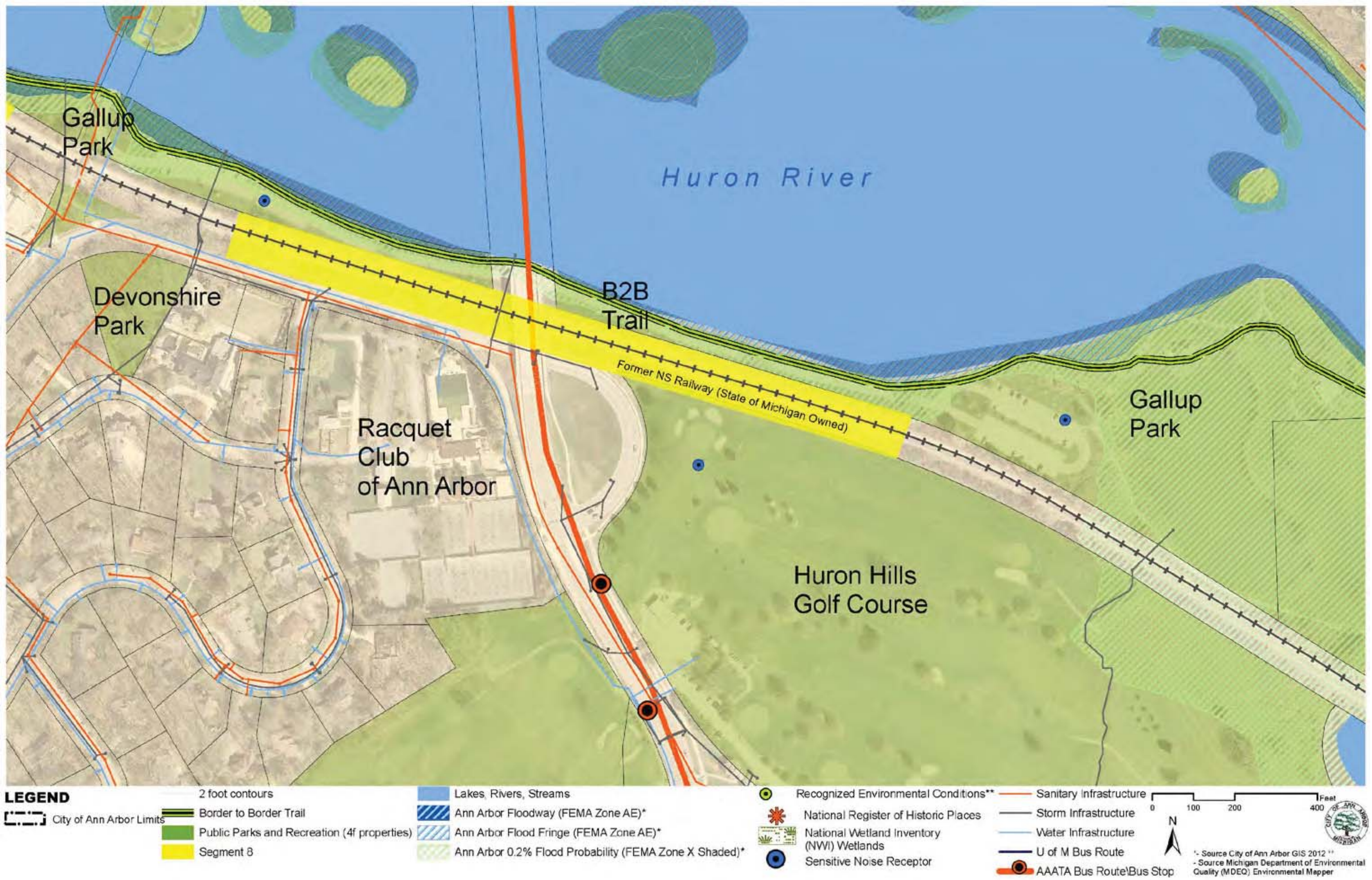
Criterion: Public Transit Connections
One AAATA bus route, Route 22, follows Huron Parkway through the area. This cross-town route operates at 30-minute headways throughout the day. It could possibly divert to connect to the segment, creating a very basic transit connection.

Criterion: Minimizing Environmental Impacts
A station at Segment 8 would cause significant socioeconomic impacts associated with the relocation of the Racquet Club, golf course, or both. These would raise the implementation cost of a station at the segment. Also, the segment is squeezed between two parks: Gallup Park and the golf course. Both would likely be impacted.

Summary
Segment 8 is in an outlying city area with poor access to downtown Ann Arbor and other activity areas. A station at this track segment would incur substantial socioeconomic impacts and would likely require Section 4(f) parkland uses. Segment 8 is not recommended for further consideration. Phase I scoring for this segment is shown in the matrix below. The Segment 8 area is displayed in Figure 11.

Segment 8: Geddes Avenue (East)	Scoring
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2
Suitable Land for Station Facilities	0
Accessed by Existing Roadways	0
Public Transit Connection Potential	-1
Minimize Environmental Impacts	-2
Phase I Score	**-5**

Figure 11: Segment 8—Geddes Avenue (East)



Station Site Identification Findings

Table 2 (page 30) provides an evaluation matrix for the eight track segments under consideration. The matrix shows each segment's performance according to the site identification criteria. This scoring system is used exclusively to screen the segments from eight to a smaller set for detailed analysis. No ranking order for the remaining segments will be carried into the Phase II analysis. The following bullets summarize the Phase I Alternatives Analysis findings:

- Segments 1, 2, 6, 7 and 8 do not perform well against the Ann Arbor Station Site Identification Criteria. In general, they offer limited access to downtown Ann Arbor and other activity areas, and lack suitable space for needed station facilities.
- Segment 3 (North Main Street) offers land that could be converted from light industrial and office use to station uses. Using these properties for the station would require substantial land acquisitions and business relocation. A station along this segment also has potential impacts to parks and open space resources. It is a relatively inconvenient location for transit and non-motorized access. While not initially recommended for advancement, a handful of participants at the June stakeholder and public meetings expressed support for further consideration of this area for a new station, and other meeting participants consented. As a result, the Project Team recommended including Segment 3 in the Phase II analysis. *(As noted in the postscript to the Segment 3 evaluation, the Project Team no longer recommends consideration of Segment 3. This position will be explained in the Phase II memorandum.)*
- Segment 4 (Depot Street/Existing Amtrak Station) is in proximity to downtown Ann Arbor and key activity centers. However, the segment may offer challenges in terms of floodways, traffic impacts, space available and access features.
- Segment 5 is also well-positioned in the center of the community. It is near a major employment and education area and abundant transit service. This area has potential environmental concerns related to parks and open space impacts.

Based on the initial screening analysis of the eight viable track segments along the corridor, three of these (Segments 3, 4 and 5) were recommended for further analysis during Phase II, in addition to the No-Build Alternative. A key consideration is expected to be the feasibility and reasonableness of using space at or adjacent to the existing Ann Arbor Amtrak station (Segment 4: Depot Street/Existing Amtrak) and accommodating station traffic and multi-modal access at this location. This is the only segment to be advanced that requires no park land uses. Since Segment 4 has not yet been demonstrated to be feasible and reasonable, the Project Team recommends advancing the two other locations as options for analysis. Of the considered locations other than Segment 4, Segment 5 (Fuller Road—West) most closely meets the Site Identification Criteria. A more detailed evaluation of potential environmental impacts and benefits associated with Segments 3, 4 and 5 will be the subject of Phase II.

The term "Segment" proved useful during Phase I to identify those track sections that could potentially accommodate a station. Moving forward, the potential locations for new stations will be referred to as station sites. These station site locations have thus been renamed as follows:

- Site 1 (North Main Street);
- Site 2 (Depot Street/Existing Amtrak); and
- Site 3 (Fuller Road—West).

Table 2: Evaluation Matrix—Ann Arbor Station Site Identification
(2 = Excels according to criteria; 1 = Meets criteria; 0 = Neutral; -1 = Does not meet the criteria; -2 = Very poor performance according to criteria)

Segment #	1	2	3	4	5	6	7	8
Name	W. Huron River Drive	Barton Shore Drive	N. Main Street	Depot Street (Exist. Amtrak Station)	Fuller Road (West)	Fuller Road (East)	Geddes Avenue (West)	Geddes Avenue (East)
Convenient Access to Downtown Ann Arbor and Major Activity Centers	-2	-2	0	2	2	0	-2	-2
Suitable Land for Station Facilities	-2	-1	0	1	1	0	-2	0
Accessed by Existing Roadways	-1	-1	1	1	2	-1	-2	0
Public Transit Connection Potential	-1	-2	0	1	2	-1	-2	-1
Minimize Environmental Impacts	-2	-2	-1	1	1	-1	-2	-2
Phase 1 Score	**-8**	**-8**	**0**	**6**	**8**	**-3**	**-10**	**-5**

LEGATARCHITECTS
SUSTAINABILITY | PERFORMANCE | DESIGN

May 24, 2016 VIA Email

RE Ann Arbor Station Environmental Review - 2035
Architect's Project Number: 214057
Ann Arbor Station Peak Boarding Ridership / Waiting Room Program Area

INTRODUCTION

The purpose of the following narrative and supporting documentation is to present a methodology for developing the appropriate level of peak boarding ridership that can be anticipated for the Ann Arbor intermodal station. The anticipated ridership will then form the basis for the required area of the waiting room for the multimodal train station. The basis for the anticipated ridership numbers outlined in this analysis is based on the latest and best information available. The number of occupants and required area will be based on the following factors:

- Design Parameters – This evaluation will be based on anticipated station passenger volumes as documented in MDOT's "Chicago – Detroit / Pontiac Passenger Rail Corridor Program Tier 1 EIS" Appendix E for a 10 round trip, full build out, 2035 scenario and current MDOT station boarding information. The current peak ridership trends per train will also be considered in this evaluation since no peak ridership per train has been developed for the full build-out condition. Pertinent information from these documents related to ridership are attached.

- Peak Boarding Ridership – The persons that generally utilize the station facility are those waiting to board a train. Persons deboarding a train generally leave for their destination and do not utilized the station and therefore do not impact the station size.

- Train Schedule – The highest level of persons waiting to board a train will occur when a westbound and an eastbound train depart the station at approximately the same time during peak ridership for one or both of the trains.

- Train Equipment – Except for rare occasions (Thanksgiving, Christmas, Spring Break, etc.) the rolling stock that will serve the Ann Arbor station in the future can accommodate a maximum of 460 riders.

- Loading Factor – To determine the peak board ridership at any station, the loading factor and the ratio of boarding to deboarding passengers needs to be considered along with the rolling stock capacity. The load factor is defined as a measure of capacity utilization of public transport provider "fills seats" and generates fare revenue.

- Program Waiting Room Area – The program waiting room area recommendation is based on Amtrak Station Program and Planning Guide (2013) section 5.7.

PEAK BOARDING RIDERSHIP

The change in Loading Factor at this station will determine the peak ridership for the station. The change that occurs at the Ann Arbor station for the full build-out condition (10 round trips, year 2045) is 19% (60% minus 41% - see attached). Based on current ridership records, the number of deboarding riders for west bound trains at the Ann Arbor station is approximately 12% of the number of peak boarding riders or an additional 2.3% (19% boarding x 12%) of Load Factor percentage to maintain the 19% total change in Load Factor. Based on these assumptions, approximately 21.3% of total rolling stock capacity would be taken at Ann Arbor. Due to slight seasonal variations in ridership an increase in this percentage to 28% is reasonable.

Based on current ridership trends, the highest boarding ridership occurs for the westbound trains heading for Chicago (see attached). The boarding ridership on the westbound trains is relatively equal between the three departing train times at 6:41 a.m., 12:17 p.m., and 7:21 p.m. except during the summer months when the westbound boarding ridership drops substantially at certain train boarding times. The eastbound train's boarding ridership is consistently around 11% of the westbound boarding ridership. The difference in the westbound and eastbound ridership numbers can be attributed to the location of the Ann Arbor station along the Chicago – Detroit / Pontiac line. The eastbound end of the line (Detroit / Pontiac) is relatively close to Ann Arbor and as a result would be far more accessible by car making the train a far less attractive option. This may change in the future as the Detroit area starts recovering economically and the increased number of trains makes daily commuting more practical.

In reviewing the proposed train schedules for the full build-out scenario (10 round trips) there are three times when an eastbound train and a westbound train would depart the station within 15 minutes or less of each other. The three times occur with the #700 (7:44 a.m.) eastbound train and the #709 (7:56 a.m.) westbound train, the # 706 (11:10 a.m.) eastbound train and the #711 (11:10 a.m.) westbound train, and the #714 (4:06 p.m.) eastbound train and the #713 (4:17 p.m.) westbound train. The peak boarding ridership calculation would be as follows:

Peak Westbound Boarding Ridership	129 Riders = 460 x 28% (Based on Train Capacity and Loading Factor)
Peak Eastbound Boarding Ridership	18 Riders (11% Westbound Ridership)
Total Peak Boarding Ridership	**147 Riders**

WAITING ROOM PROGRAM AREA

Amtrak recommends a waiting room area based on 20 s.f. for 50% of the total peak boarding ridership and 10 s.f. for the remainder of the peak boarding ridership. This calculates to:

Waiting room program area = (20 s.f. x ½ x 147) + (10 s.f. x ½ x 147) = **2,205 s.f.**

3.4 Full Build (10 DRTs and Improved Travel Time) Passenger Rail Forecast Results

Annual Passenger Rail Station Volumes

Station	2025 Annual Station Volume (thousand ONs and OFFs)	2035 Annual Station Volume (thousand ONs and OFFs)	2045 Annual Station Volume (thousand ONs and OFFs)	2055 Annual Station Volume (thousand ONs and OFFs)
Chicago Union Station, IL	1,672	1,946	2,271	2,644
Northwest Indiana, IN	35	41	47	55
Michigan City, IN	19	23	27	33
New Buffalo, MI	70	81	94	108
Niles, MI	79	91	107	124
Dowagiac, MI	17	19	23	27
Kalamazoo, MI	476	566	673	797
Battle Creek, MI	268	312	367	429
Albion, MI	10	12	14	16
Jackson, MI	155	179	208	240
Ann Arbor, MI	830	969	1,134	1,323
Dearborn, MI	418	483	560	647
Detroit, MI	384	440	507	582
Royal Oak, MI	199	231	268	311
Birmingham, MI	130	151	176	204
Pontiac, MI	90	108	129	154

Segment Loading Factors

Passenger Rail Segment Loading Factors

Station Link	2025 Segment Loading Factor	2035 Segment Loading Factor	2045 Segment Loading Factor	2055 Segment Loading Factor
Chicago Union Station, IL-Hammond-Whiting, IN	50%	58%	68%	79%
Northwest Indiana, IN-Michigan City, IN	57%	66%	70%	90%
Michigan City, IN-New Buffalo, MI	57%	66%	70%	90%
New Buffalo, MI-Niles, MI	54%	63%	67%	86%
Niles, MI-Dowagiac, MI	54%	63%	66%	86%
Dowagiac, MI-Kalamazoo, MI	54%	62%	66%	85%
Kalamazoo, MI-Battle Creek, MI	57%	66%	70%	90%
Battle Creek, MI-Albion, MI	54%	63%	74%	86%
Albion, MI-Jackson, MI	54%	63%	74%	86%
Jackson, MI-Ann Arbor, MI	51%	60%	70%	81%
Ann Arbor, MI-Dearborn, MI	36%	41%	48%	56%
Dearborn, MI-Detroit, MI	24%	27%	32%	37%
Detroit, MI-Royal Oak, MI	12%	15%	17%	20%
Royal Oak, MI-Birmingham, MI	7%	8%	9%	11%
Birmingham, MI-Pontiac, MI	3%	3%	4%	5%

MDOT Ridership per Train 2014

Facility

Facility ID: ARB

Facility Name: Ann Arbor Amtrak Station

Year	Trn #	Passenger Type	Boarded/ Deboarded	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	N	
2014	349	Incy.Rail	Boarded	0	0	0	0	5	69	86	83	38	0		
2014	349	Incy.Rail	Deboarded	0	0	0	0	0	0	0	0	0	0		
2014	350	Incy.Rail	Boarded	197	194	246	220	242	252	220	259	253	243	EASTBOUND	12:55 P.M.
2014	350	Incy.Rail	Deboarded	1,285	998	1,271	1,220	1,142	1,330	1,513	1,763	1,164	1,337		
2014	351	Incy.Rail	Boarded	1,658	1,593	1,688	2,039	2,229	2,239	2,642	2,586	1,774	1,840	WESTBOUND	6:41 A.M.
2014	351	Incy.Rail	Deboarded	159	94	146	132	166	141	130	130	107	139		
2014	352	Incy.Rail	Boarded	296	219	270	395	158	29	19	14	6	286	EASTBOUND	6:26 P.M.
2014	352	Incy.Rail	Deboarded	1,904	1,914	2,180	2,222	1,369	367	289	334	218	2,354		
2014	353	Incy.Rail	Boarded	1,751	1,874	2,058	2,044	1,289	462	425	514	417	2,112	WESTBOUND	12:17 P.M.
2014	353	Incy.Rail	Deboarded	202	238	249	366	151	49	56	75	49	267		
2014	354	Incy.Rail	Boarded	58	45	43	65	53	50	66	45	36	52	EASTBOUND	11:30 P.M.
2014	354	Incy.Rail	Deboarded	2,054	1,562	1,927	2,002	1,802	1,524	1,940	1,921	1,353	2,067		

Figure 4: Full Build 2035 Schedule

EASTBOUND

Station	Miles	Travel Times	Ar/Dp	Train Number											
				700	702	704	706	708	710	712	714	716	718	720	722
CHICAGO Ill.	0.0	0:00	Dp			6 00A	7 00A	8 00A	10 00A	1100A	12 00P	5 35P	6 00P	6 35P	7 35P
Suburban near Gary, Ind,	16.0	0:18	Dp					8 18A		11 18A		5 53P		6 53P	7 53P
Michigan City, Ind.	52.8	0:53	Dp							1153A		6 28P		7 28P	8 28P
New Buffalo, Mich.	62.9	1:02	Dp					10 02A	12 02P	1 02P		7 37P	8 02P	8 37P	9 37P
Niles, Mich.	89.8	1:22	Dp					10 22A	12 22P	1 22P		7 57P	8 22P	8 57P	9 57P
Dowagiac, Mich.	102.3	1:32	Dp					10 32A	12 32P	1 32P		8 07P		9 07P	10 07P
Kalamazoo, Mich.	138.3	2:01	Dp	6 01A	7 01A	8 40A	9 40A	1101A	1 01P	2 01P	2 40P	8 36P	9 01P	9 36P	10 36P
Battle Creek, Mich.	161.0	2:28	Dp	6 28A	7 28A		10 03A	1128A	1 28P	2 28P		9 03P	9 28P	10 03P	11 03P
Albion, Mich.	185.6	2:51	Dp	6 41A	7 41A					2 51P					
Jackson, Mich.	206.5	3:11	Dp	7 11A	8 11A			12 11A	2 11P	3 11P			10 11P	10 46P	
Ann Arbor, Mich.	243.5	3:44	Dp	7 44A	8 44A	10 06A	11 10A	12 44A	2 44P	3 44P	4 06P		10 44P	11 19P	
Dearborn, Mich.	273.5	4:09	Dp	8 09A	9 09A	10 31A	1135A	1 09A	3 09P	4 09P	4 31P		11 09P	11 44P	
DETROIT, MICH.	282.7	4:24	Ar	8 24A	9 24A	10 46A	1150A	1 24A	3 24P	4 24P	4 46P		11 24P	11 59P	
DETROIT, MICH.	282.7	4:27	Dp	8 27A			1153A	1 27A	3 27P	4 27P	4 49P		11 27P		
Royal Oak, Mich.	292.8	4:51	Dp	8 51A			12 17P	1 51A	3 51P	4 51P	5 13P		11 51P		
Birmingham, Mich.	297.1	4:58	Dp	8 58A			12 24P	1 58A	3 58P	4 58P	5 20P		11 58P		
PONTIAC, MICH.	305.4	5:16	Ar	9 16A			12 42P	2 16P	4 16P	5 16P	5 38P		12 16A		

Figure 4: Full Build 2035 Schedule

WESTBOUND

Station	Travel Times	Miles	Dp/Ar	Train Number											
				701	703	705	707	709	711	713	715	717	719	721	723
PONTIAC, MICH.	0:00	0.0	Dp		4 03A	4 33A			9 46A	2 53P	3 35P			6 52P	7 20P
Birmingham, Mich.	0:13	8.3	Dp		4 16A	4 46A			9 59A	3 06P	3 48P			7 05P	7 33P
Royal Oak, Mich.	0:20	12.6	Dp		4 23A	4 53A			10 06A	3 13P	3 55P			7 12P	7 40P
DETROIT, MICH.	0:40	22.7	Ar		4 43A	5 13A			10 26A	3 33P	4 15P			7 32	8 00P
DETROIT, MICH.	0:43	22.7	Dp		4 46A	5 16A		7 15A	10 29A	3 36P	4 18P	5 05P	5 35P	7 35P	8 03P
Dearborn, Mich.	0:54	31.9	Dp		4 57A	5 27A		7 26A	10 40A	3 47P	4 29P	5 16P	5 46P	7 46P	8 14P
Ann Arbor, Mich.	1:24	61.9	Dp		5 27A	5 57A		7 56A	11 10A	4 17P	4 59P	5 46P	6 16P	8 16P	8 44P
Jackson, Mich.	1:55	98.9	Dp		5 58A	6 28A		8 27A	11 41A	4 48P			6 47P	8 47P	9 15P
Albion, Mich.	2:13	119.8	Dp					8 45A	11 59A				7 05P		9 33P
Battle Creek, Mich.	2:40	144.4	Dp	5 43A	6 43A		7 43A	9 12A	12 26P	5 33P	6 06P		7 32P	9 32P	10 00P
Kalamazoo, Mich.	3:01	167.1	Dp	6 11A	7 11A	7 41A	8 11A	9 40A	12 54P	6 01P	6 29P	7 11P	8 00P	10 00P	10 29P
Dowagiac, Mich.	3:29	203.1	Dp	6 36A			8 36A		1 19P						10 53P
Niles, Mich.	3:42	215.6	Dp	6 49A	7 42A		8 49A		1 32P	6 39P					11 06P
New Buffalo, Mich.	4:01	242.5	Dp	7 10A	8 03A		9 10A		1 53P	7 00P					11 27P
Michigan City, Ind.	4:10	252.6	Dp	6 19A			8 19A		1 02P						10 36P
Suburban near Gary, IN	4:44	289.4	Dp	6 53A			8 53A		1 36P						11 10P
CHICAGO ,ILL.	5:06	305.4	Ar	7 15A	8 10A	8 21A	9 15A	10 20A	1 58P	7 05P	7 09P	7 51P			11 32P

5.7 Waiting Area Capacity

Waiting area type and capacities are dependent on the type of Amtrak service provided, and whether the station functions as an intermodal transportation center. At Category 1 stations and Category 2 stations with frequent train service, intermodal connections, and significant commuter rail operations, determining the overall waiting area capacity requires careful consideration of the schedules and peak loads of all services.

The Amtrak methodology to determine the space requirements for waiting areas should be used to develop the station program and is presented in the table here. This methodology is based on the type of Amtrak service provided at the station (State Corridor or Long Distance) and the station's daily ridership. Long Distance trains have different requirements than corridor trains, with the long distance traveler likely to arrive an hour or more before departure, requiring more seating than the high speed, regional or state corridor service passenger who typically arrives within fifteen to twenty minutes of train departure.

Waiting Area Capacity

Capacity Requirements are Determined by:

- Commuter vs. intercity differences—standing vs. seated passengers; and
- Seating for groups/space for luggage and carry-ons.

Formula	Comments
1. Determine daily ridership at the station Daily Ridership=Annual Ridership (ons + offs)/270	Daily ridership is calculated by dividing total annual ridership by 270 days. This formula produces a higher number than typical daily ridership in order to account for peak conditions that occur on busy travel days, and variations in weekday/weekend and seasonal travel.
2. Determine peak hour ridership **Six or more trains per day:** Peak hour ridership (2 way)=0.15 x daily ridership Peak hour ridership (1 way)=0.65 x peak hour ridership (2 way)	For locations with six or more trains per day, peak hour ridership is calculated as 15 percent of daily ridership.
Fewer than 6 trains per day: Peak hour ridership (2 way)=daily ridership/number of trains per day Peak hour ridership (1 way)=0.65 x peak hour ridership (2 way)	For locations with fewer than six trains per day, peak hour traffic is calculated as daily ridership divided by the number of trains per day.
3. Determine waiting area space requirements **Corridor Service Requirements** Seated passengers area= 0.50 x (peak hour 1 way ridership) x 20 sf/person Standing passengers area= 0.50 x (peak hour 1 way ridership) x 10 sf/person	Waiting area space requirements are determined based on the number of people waiting for a train at any given time (peak hour ridership 1 way), and on the waiting habits of the ridership population served. One way peak hour ridership numbers are used because those passengers de-boarding the train generally leave the station without utilizing the waiting area.
Long Distance Service Requirements Seated passenger area = 0.75 x (peak hour 1 way ridership) x 20 sf/person Standing passengers area = 0.25 x (peak hour 1 way ridership) x 10 sf/person	Because of the short waiting time, it is assumed that corridor services require seating for only one-half of the peak hour 1 way ridership. And conversely, long distance services require seating for 75 percent of peak hour 1 way ridership. Area requirements are 20 square feet per seated passenger and 10 square feet per standing passenger.

ANN ARBOR STATION ENVIRONMENTAL REVIEW

Ann Arbor, Michigan

STATION DESIGN CRITERIA AND PROGRAMMING - FULL BUILD OUT 2035

5/24/2016

ROOM	Ann Arbor Amtrak					Existing Station	
	Occupancy	Space	Total	Space	Total	Total	DESIGN CRITERIA SOURCES = Standards, Codes, Regulations, and Design Guidelines
		Type	Spaces	N.S.F	N.S.F	N.S.F.	
Required Areas							
Vestibule	NA	Public	4	200	800	100	Amtrak Station Program And Planning Guide - 2013
Pay Telephone	NA	Public	4	25	100	In Waiting Area	Amtrak Station Program And Planning Guide - 2013
Waiting	147	Public	1	2,205	2205	1280	Amtrak Station Program And Planning Guide - 2013
Peak One Way Ridership x .5 x 20 s.f. / person							
Peak One Way Ridership x .5 x 10 s.f. / person							
Men's Toilet Room	NA	Public	1	400	400	200	Amtrak Station Program And Planning Guide - 2013
Women's Toilet Room	NA	Public	1	400	400	200	Amtrak Station Program And Planning Guide - 2013
Family Toilet Room	NA	Public	2	65	130	NA	
Janitor's Closet	NA	Secure	1	100	100	40	Amtrak Station Program And Planning Guide - 2013
Electric Water Cooler	2	Public	2	25	50	10	Amtrak Station Program And Planning Guide - 2013
Vending Area	4	Public	4	20	80	60	Amtrak Station Program And Planning Guide - 2013
Information Kiosk	NA	Public	1	150	150	0	Amtrak Station Program And Planning Guide - 2013
Passenger Information Display System (PIDS)	NA	Public	1	40	40	0	Amtrak Station Program And Planning Guide - 2013
Quik - Trak / e - Ticketing with Queing	4	Public	4	50	200	In Waiting Area	Amtrak Station Program And Planning Guide - 2013
News and Brochure Racks	NA	Public	1	150	150	In Waiting Area	Amtrak Station Program And Planning Guide - 2013
Amtrak IT Equipment	NA	Secure	1	100	100	0	Amtrak Station Program And Planning Guide - 2013
Mechanical / Water Service Room	NA	Secure	1	250	250	0	Amtrak Station Program And Planning Guide - 2013
Electrical Service Room	NA	Secure	1	100	100	0	Amtrak Station Program And Planning Guide - 2013
Ticket Office / Baggage Check	4	Secure	4	70	280	120	Amtrak Station Program And Planning Guide - 2013
Baggage Storage	NA	Secure	1	NA	NA	350	Amtrak Station Program And Planning Guide - 2013
Lost Baggage Storage	NA	Secure	1	NA	NA	0	Amtrak Station Program And Planning Guide - 2013
Baggage Work Area	NA	Secure	1	NA	NA	0	Amtrak Station Program And Planning Guide - 2013
Secure Baggage Storage	NA	Secure	1	NA	NA	0	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Office	NA	Secure	1	150	150	160	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Toilet	NA	Secure	1	40	40	0	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Work Niche	NA	Secure	2	25	50	0	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Locker Room	NA	Secure	1	100	100	0	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Break Room	NA	Secure	1	200	200	0	Amtrak Station Program And Planning Guide - 2013
Amtrak Storage	NA	Secure	1	100	100	45	Amtrak Station Program And Planning Guide - 2013
CCTV / Security Equipment Room	NA	Secure	1	30	30	0	Amtrak Station Program And Planning Guide - 2013
Building Canopies							Amtrak Station Program And Planning Guide - 2013
Intercity Bus Ticket Office / Information Window		Secure	1	100	100	0	Greyhound Station Program Requirements - 2014
Intercity Bus Terminal Manager's Office		Secure	1	120	120	0	Greyhound Station Program Requirements - 2014
Intercity Bus Acounting / Reports Office		Secure	1	120	120	0	Greyhound Station Program Requirements - 2014
Intercity Bus Office Equipment / Storage		Secure	1	100	100	0	Greyhound Station Program Requirements - 2014
Intercity Bus Baggage Storage and Cart Staging		Secure	1	150	150	0	Greyhound Station Program Requirements - 2014
Intercity Bus Warming Shelters							
Total Occupancy / Net Square Footage					6795	2565	
Grossing Factor - 25%					1699	641	
Total Gross Square Feet					8494	3206	

URS

Date: January 28, 2015

To: Eli Cooper, Transportation Manager, City of Ann Arbor
From: Project Team

Subject: Ann Arbor Station—Assumptions for Intercity Parking

The purpose of this memorandum is to document assumptions regarding parking access to a new Ann Arbor intermodal passenger rail station. These assumptions are informed by origin and destination estimates prepared by MDOT consultants for the Chicago-Detroit/Pontiac passenger rail corridor (C-D/P) Tier 1 Draft Environmental Impact Statement (DEIS) [1], Amtrak parking estimates based on C-D/P ridership estimates, responses to a 2011 Michigan Department of Transportation (MDOT) passenger rail survey, and travel patterns in urbanized Washtenaw County.

The C/D-P DEIS estimates that in 969,000 annual boardings and alightings will be made at Ann Arbor Station in the year 2035 full build scenario. This estimate represents approximately 485,000 annual riders using the station. To meet this demand, Amtrak initially requested over 2,200 parking spaces in Ann Arbor to meet the demand. Amtrak subsequently revised its estimate to approximately 870 spaces for year the 2035 full build. This revised estimate reflects urban transportation assumptions for greater Ann Arbor. While Amtrak provided no methodology for their revised estimate, the Project Team assumes that it acknowledges the high percentage of trips in Ann Arbor and Ypsilanti made by walk, bike and public transit modes.

In response to FRA and stakeholder feedback, the Project Team has reviewed transportation patterns in Ann Arbor and Ypsilanti to adjust station parking assumptions. The Team also coordinated with the transportation modeling consultant for C-D/P, Transportation Economics and Management Systems, Inc. (TEMS), to understand how the model can assist in estimating the demand for parking at Ann Arbor Station. The results of this analysis are described in subsequent sections and generally validate Amtrak's 870 space estimate.

Intercity Rail and Commuter Rail

The C-D/P Tier 1 DEIS considers rail travel along the Amtrak *Wolverine* line corridor between Chicago and metropolitan Detroit. It does not include parking projections for the Southeastern Michigan Council of Governments (SEMCOG)'s proposed commuter rail between Ann Arbor and Detroit.

Transit and Non-Motorized Travel in Ann Arbor and Ypsilanti

According to the US Census American Community Survey (ACS), approximately 30% of Ann Arbor residents travel to work by transit, walking or biking.[2] Assuming that Ann Arbor Station charges some fee for parking, this same percentage seems applicable for station access by City residents who are not full-time students.

Travel Patterns To and From Ann Arbor University and College Campuses

Trips to school (university and college) in Ann Arbor are weighed more heavily toward non-automobile modes than work trips. The ACS does not survey for trips to school, so the Project Team

[1] The Draft EIS is available at http://greatlakesrail.org/~grtlakes/index.php/site/public-hearings. Appendix E contains ridership forecasts and the transportation analysis zones (TAZs) associated with the origin and destination estimates.

[2] http://download.ctpp.transportation.org/profiles_2014/transport_profiles.html

performed its own analysis of these trips. This analysis focuses exclusively on the University of Michigan Ann Arbor campuses.

Over 43,600 students were enrolled at the University of Michigan Ann Arbor (U-M) in the fall of 2014[3] Of these students, nearly 30% (about 13,000) lived on campus.[4] Most of these on-campus students likely walk or bike to school (an estimated 10,000). May other students also walk or bike to school from non-campus housing (perhaps another 5,000).

In addition to students, over 25,700 staff members worked at the Ann Arbor campuses in 2014. [5] The combined total of students and staff was about 69,400.

In 2010, nearly 35,000 students and staff rode U-M buses on a daily basis.[6] This volume reflects total trips, with generally half of those in the morning and half in the evening. These trips are made by an estimated 17,500 individuals using the buses daily and represent travel by about 25% of students and staff. In addition, a few thousand of the approximately 11,000 daily Ann Arbor Area Transportation Authority (AAATA) bus trips are to or from the campuses.[7] The Project Team estimates that roughly 5,000 daily AAATA trips are campus trips, representing about 2,500 travelling individuals. Combined, roughly 20,000 students and staff used transit each day to reach the campuses, or roughly 29% of daily campus visitors.

[3] University of Michigan (2014). "University of Michigan - Ann Arbor - Enrollment by Degree Level" (PDF). University of Michigan Office of Budget & Planning. October 20, 2014. Available at http://obp.umich.edu/wp-content/uploads/pubdata/factsfigures/enrollment_umaa_fall14.pdf.
[4] University of Michigan Housing, at http://www.housing.umich.edu/about.
[5] University of Michigan, at http://obp.umich.edu/wp-content/uploads/pubdata/factsfigures/facultyhrdef_umaa_fall14.pdf
[6] SEMCOG 2010.
[7] Project Team assumption based on SEMCOG 2010 reporting.

Between the 15,000 or so students walking or biking to campus and the 20,000 students and staff riding transit to campus, roughly 50% of campus visitors commute by non-automobile modes.

The 2011 MDOT survey of Amtrak passengers in Michigan notes that 14% of *Wolverine* line passengers reported as university/college students.[8] Many of these are assumed by the Project Team to be U-M students. If 50% of U-M students and staff travel to campus using non-automobile modes, a similar percentage of campus visitors are assumed to access the station using these same modes. This assumes that transit, non-motorized, and taxi/shuttle modes are readily available and convenient during the hours of railroad operation.

The C-D/P Tier 1DEIS assumes 2,830,000 annual *Wolverine* line riders in the full build scenario; this figure represents boardings only. If 14% of these riders are higher education students, then nearly 400,000 of these riders would be higher education students[9] 485,000 annual train passengers on the line are expected to use Ann Arbor Station, and more than half the higher education students on the line attend U-M Ann Arbor and nearby colleges and universities. Given that, roughly half the Ann Arbor Station passengers can be assumed to be students.

Non-Student Ann Arbor Residents

The Project Team assumes that Ann Arbor residents will access the station using similar travel modes to their work commute trips, with 30% of these trips made by non-automobile modes. The non-automobile mode share assumed for all Ann Arbor travel to and from the station is 40% - the median percentage of campus and city non-automobile travel. Many others will be dropped off and picked up at the station via personal automobiles rather than park a vehicle at the

[8] 2011 MDOT Intercity Passenger Rail Survey, page 17.
[9] C-D/P DEIS Appendix E, page E-110.

station. In all, close to 50% of Ann Arbor residents will likely access the station via non-auto modes.

Ypsilanti Residents

In Ypsilanti, about 20% of work trips were made by non-automobile modes in 2000.[10] Given strong transit connections, a similar percentage can be expected to access the multi-modal station without a car. Ypsilanti's resident student population will increase the non-auto access share. A separate analysis for student travel between Eastern Michigan University and Ann Arbor Station has not been performed, though students and staff are expected to have convenient access to public transit linking with the station. The Project Team assumes 30% of all trips between Ypsilanti and Ann Arbor Station are assumed to be made by non-automobile modes. When passenger drop-off and pickup is added, the non-parking percentage is estimated to increase approximately 40%.

Estimated Origins and Destinations of Ann Arbor Station Riders

Projected Ann Arbor Station ridership in the full build 2035 scenario is 969,000 boardings and deboardings. The C-D/P origin and destination model prepared by TEMS does not differentiate between Ann Arbor Station access trips to and from Ann Arbor and Ypsilanti as opposed to other communities. Nor does the TEMS model differentiate between riders originating from one station or zone compared to another. Rather, it shows total estimated passenger rail travel between zones. TEMS describes the model as a "triangulation" as opposed to a traditional origin and destination structure.

The student travel analysis in this memorandum suggests that half the station trips are made by higher education students, and these students are based primarily in Ann Arbor and Ypsilanti. If an additional quarter of the trips represent residents of and visitors to the urbanized core of Washtenaw County, then at least 75% of Ann Arbor Station users reside in or visit Ann Arbor and Ypsilanti.

Another factor to consider regarding parking requirements is the region of trip origin. For example, a round trip originating from southeast Michigan may include a car trip to and parking at Ann Arbor Station. A round trip from Chicago to Ann Arbor will not require a parking space at Ann Arbor. The C-D/P model tells us little about the direction of travel between linked station pairs.

The 2011 MDOT Intercity Passenger Rail Survey found that 88% of respondents on the *Wolverine* line traveled from Michigan to points outside Michigan (primarily Chicago). [11] However, in the same study "only 69 percent of *Wolverine* passengers reported a home residence in Michigan, with 22 percent of *Wolverine* passengers reporting a home residence in Illinois."[12] It is possible that some of the respondents were students attending Michigan colleges or universities but identifying home residences in Illinois.

The Project Team's impressions of directional travel indicate that the majority of Ann Arbor Station rail round trips start in Ann Arbor—nearly 90%. This round-trip travel flows predominantly from Ann Arbor to points west. 10% or less of Ann Arbor round trips appear to originate from stations other than Ann Arbor. This directional flow may change as service increases and additional trips are available during commuting hours to Ann Arbor destinations. Many of these trips are expected to be captured by the proposed commuter rail service, which would be scheduled and priced for commute trips.

[10] US Census ACS Journey to Work survey 2000, accessed from http://download.ctpp.transportation.org/profiles_2014/transport_profiles.html.

[11] 2011 MDOT Intercity Passenger Rail Survey, page 14.

[12] *Ibid*, page 30.

<u>Assumed Parking Requirements</u>
This section describes how the travel analysis is used to derive parking estimates. All stated figures represent the year 2035 full build scenario for the Chicago-Detroit/Pontiac passenger rail corridor and associated activity at Ann Arbor Station.

- Annual passengers at Ann Arbor Station: approximately 485,000 (which is half of the boarding of and alighting from trains at the station)
    - 90% of round trips originating at Ann Arbor Station = 436,500 round trips potentially requiring parking at the station
- 75% of station riders are assumed to be residents of Ann Arbor and Ypsilanti. Of the 436,500 travelers that originate round trips from Ann Arbor, these residents represent about 327,400 riders.
    - Approximately 85% of these riders are likely Ann Arbor residents (278,290). 50% are assumed to not park at the station (139,000).
    - Approximately 15% of these riders are likely Ypsilanti residents (49,000). 40% are assumed to not park (19,600).
        - 327,400 - 139,000 - 19,600 = **168,800** annual Ann Arbor and Ypsilanti resident passengers who would be inclined to park at the station.
- The remaining 25% of station passengers (81,850) are dropped off or park. If 20% are dropped-off/picked-up, then **16,400** extended area passengers are inclined to park.
- 168,800+16,400 = **185,200** annual passengers inclined to park at the station.

Of the 185,200 passengers inclined to park at the station, many would arrive with more than one passenger per car. If 1.5 occupants per vehicle parking is assumed, it reduces the parking demand by 1/3 (demand for 123,300 annual parked vehicles). This averages to 2,370 parked cars per week.

If trip purposes documented in the 2011 MDOT survey carry over, then about 70% of the travel will be recreational with heavy weekend peaking. This indicates demand for 1,660 recreational, longer-term parking spaces each week, which may equate to weekend parking demand.

An aggressive transportation demand management program would reduce the demand for on-site parking. Higher on-site parking charges and shuttles to utilize parking capacity elsewhere in Ann Arbor—especially on weekends—may reduce the demand for on-site weekend parking by 50%. This results in a **peak demand for approximately 830 parking spaces**, a number very similar to Amtrak’s revised request for 870 parking spaces. No spaces would be specifically provided for commuter rail customers, though capacity would likely be available for commuter trips on most weekdays.

This independent analysis comports generally with Amtrak's proposed number of intercity parking spaces required in 2035, which is based on Amtrak's proprietary methodology. Therefore, it is reasonable to use the Amtrak number in determining the design criteria for the station.

Additional Accommodation for Intercity Bus Passenger Parking at Ann Arbor Station:
Intercity bus service tends to attract travelers without access to a car. Travel patterns in peer regions shows a demand for express bus services to major airports, for which the parking demand is high. Should this travel mode grow substantially, an additional bus terminal with station parking near highway interchanges would likely be added. No more than 25 aggressively priced intercity bus parking spaces are likely required at Ann Arbor Station.

Date: May 16, 2016

To: Eli Cooper, Transportation Manager, City of Ann Arbor
From: Project Team

Subject: Ann Arbor Station—Consideration of Site 1 (North Main Street)

The purpose of this memorandum is to evaluate a proposed site for a potential new multi-modal, intermodal, intercity and commuter passenger rail station (Ann Arbor Intermodal Passenger Rail Station) near North Main Street and Lake Shore Drive. This location, situated approximately one mile north of downtown Ann Arbor, is identified as Site 1 (North Main Street). The memorandum includes an evaluation of the option to locate a new station at Site 1. This evaluation was based on outlined criteria, and resulted in a recommendation to remove this site from further consideration. The Site 1 location within Ann Arbor is shown in Figure 1.

The Ann Arbor Station Environmental Review began in February 2014 and is scheduled to conclude in December 2014. Its stated purpose is to:

> "provide an intermodal facility that will accommodate existing and future intercity passenger rail ridership; improve intermodal connectivity, including the possibility of commuter rail in the City of Ann Arbor; and to improve the integration of the station with the City of Ann Arbor and its neighboring communities."[1]

The Environmental Review is a conceptual planning study for:

a. Defining the long-term needs for an Ann Arbor Intermodal Passenger Rail Station;
b. Identifying potential sites and station options;
c. Evaluating benefits and impacts of various station options, including a No-Build Alternative (continued use of the existing station); and
d. Complying with Federal, State and local requirements, resulting in approval of a preferred alternative for an Ann Arbor Intermodal Passenger Rail Station.

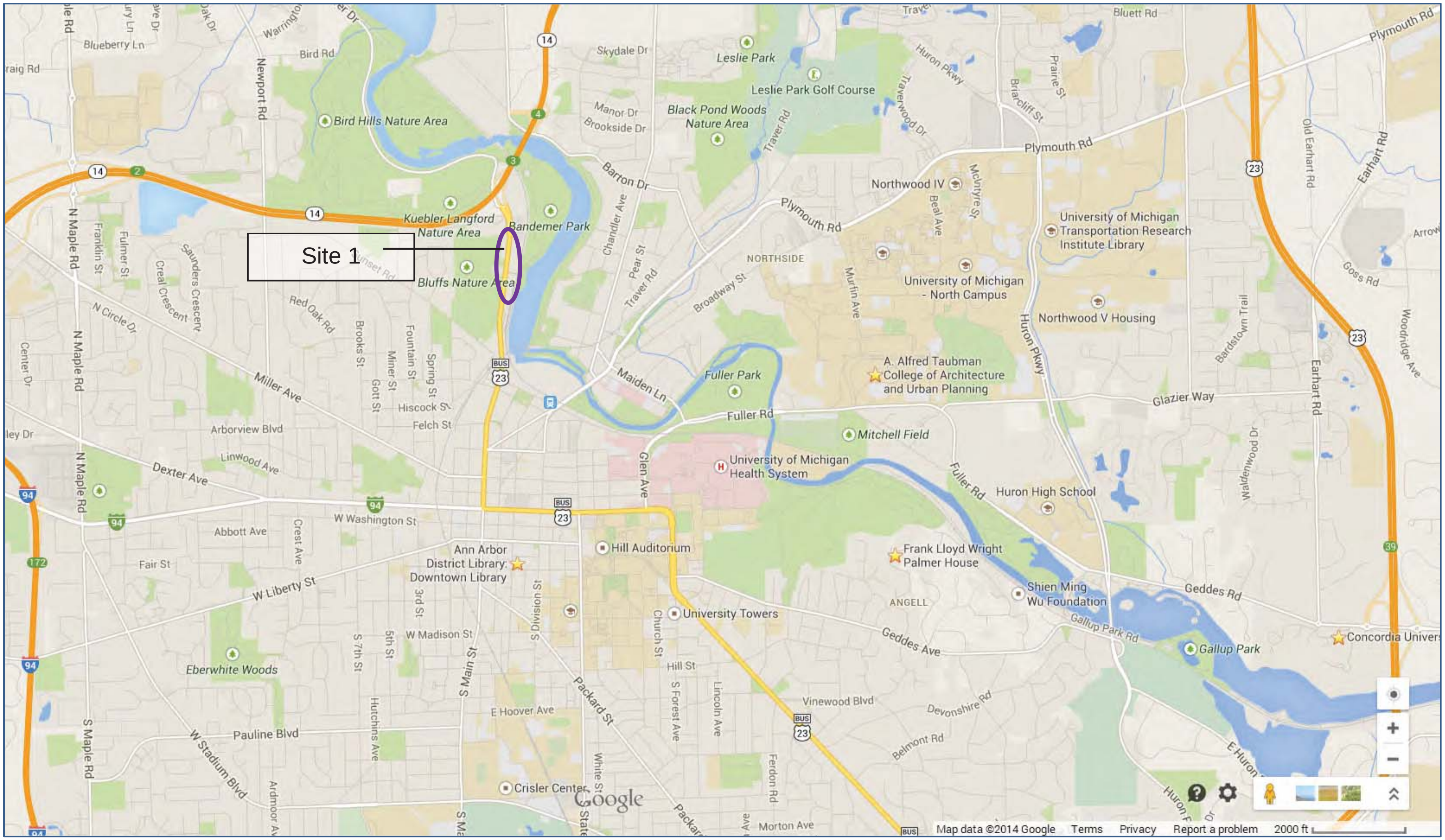
The Alternatives Analysis process is divided into two phases:

- **Phase I:** Identification of possible station sites and an initial screening of those sites; and
- **Phase II:** Development of site-specific station design alternatives for the sites identified in Phase I and review of those sites and design alternatives to determine which are reasonable to advance into the Environmental Assessment phase.

The completed Phase I screening is described in the following section. The Project Team has entered Phase II and completed initial conceptual designs for site-specific station design alternatives.

[1] Ann Arbor Station Environmental Review Purpose and Need Executive Summary, June 24, 2014. Available at http://www.a2gov.org/departments/systems-planning/Transportation/Documents/AAS_PurposeNeed_1-Page_Summ_06-24-2014_Final.pdf

Figure 1: Location of Site 1 (North Main Street) Within Ann Arbor



Source: Google Maps

Phase I Alternatives

Phase I of the Alternatives Analysis identified eight possible station sites based on the selection criteria provided by the Michigan Department of Transportation (MDOT) and the National Passenger Rail Corporation (Amtrak). Both entities requested that any enhancements to the existing station, or construction of a new station, should occur along a tangent (straight) section of the MDOT railroad. This meets train operational objectives that ensure ADA compliance (manageable gaps between the trains and platforms), promotes passenger convenience and safety, and protects railroad equipment and infrastructure. Both MDOT and Amtrak stipulated that the tangent track sections should be at least 1,000 feet long to support railroad operational needs.

Eight sites with 1,000-foot tangent track segments within the city of Ann Arbor were identified (the sites were referred to as "segments" in prior documentation). These track segments and their surrounding areas were then evaluated for their compatibility with the Ann Arbor Station program. The eight “segments” are shown in Table 1.

Design and environmental criteria were used to screen the sites. These criteria stipulated that the potential sites should:

- Lie along the existing MDOT railroad corridor along which Amtrak operates, and within City of Ann Arbor limits;
- Provide convenient access to downtown Ann Arbor and major activity areas;
- Include enough land to accommodate all required site features;
- Allow convenient access to existing roadway networks;
- Support connections to public transit services and non-motorized transportation facilities; and
- Minimize impacts to environmental resources.

Table 1:
1,000-Foot Straight Track Segments along the MDOT Corridor in Ann Arbor

Segment #	Name	Approximate Track Milepost*	Approximate Length (Feet)
1	West Huron River Drive	38.5	2,300
2	Barton Shore Drive	38.4	2,200
3	North Main Street	37.9	1,500
4	Depot Street (Existing Amtrak Station)	37.3	1,200
5	Fuller Road (West)	36.8	1,300
6	Fuller Road (East)	36.2	1,600
7	Geddes Avenue (West)	35.1	2,000
8	Geddes Avenue (East)	34.8	1,700

**From the 1999 Consolidated Rail Dearborn Division track charts, Michigan Line. These mileposts appear to land within the segments and do not represent surveyed midpoints.*

These criteria were reviewed by Ann Arbor stakeholders and citizens at public meetings in April 2014 and met with general approval. An evaluation of the eight segments was presented at a round of meetings in June 2014. Two of the segments were initially recommended for further evaluation in Phase II: Segment 4 (Depot Street/Existing Amtrak Station) and Segment 5 (Fuller Road—West).

Segment 3 (North Main Street) was determined to not meet the criteria and was not recommended for inclusion in Phase II.

During the June meetings, stakeholders expressed interest in additional evaluation criteria, with numerous requests received to consider implementation costs and station-oriented development. Several stakeholders questioned the evaluation of Segment 3 (North Main Street) and requested its inclusion in the Phase II analysis. Of particular interest was the idea of redeveloping the area with station-oriented development. While Segment 3 did not meet the initial criteria, the Project Team agreed to further evaluate Segment 3 in Phase II of the Alternatives Analysis. In the Phase II report, the "segments" are referred to as "sites" and are numbered as follows:

- Site 1: North Main Street. This site is located along the tracks east of North Main Street near Lake Shore Drive;
- Site 2: Depot Street/Existing Amtrak. This site would reuse the property currently occupied by the Ann Arbor Amtrak station, along Depot Street adjacent to the historic depot; and
- Site 3: Fuller Road (West). This site extends along the tracks south of Fuller Road near the East Medical Center Drive overpass.

As the Project Team proceeded with the Phase II analysis, further concerns arose regarding the viability of Site 1. These concerns are documented in the following sections of this technical memorandum.

Considerations Regarding Site 1 (North Main Street)

Location Description

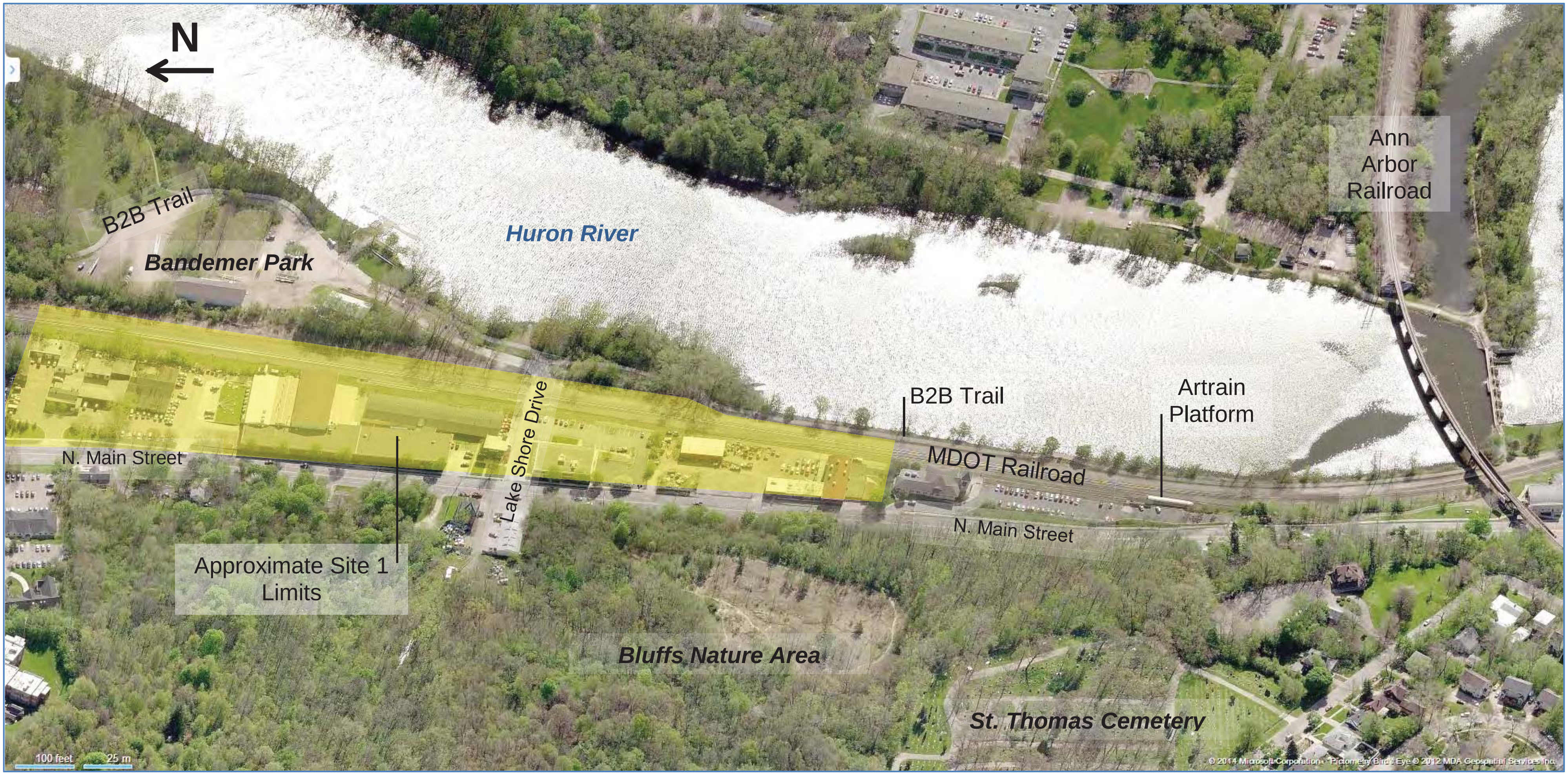
Site 1 is located approximately one mile northwest of downtown Ann Arbor, near the intersection of North Main Street and Lake Shore Drive (a private road). Here the tracks extend between two contrasting uses: a light industrial zone lining North Main Street, and Bandemer Park. The Site 1 area is shown in Figure 2. Two conceptual design alternatives for the site are provided in Attachment 1 (Concept Plan A and B).

The track area and Bandemer Park are accessed via Lake Shore Drive, a private roadway that connects perpendicularly with North Main Street and crosses the tracks at grade. Lake Shore Drive is also the only access point in the area for the Border-to-Border (B2B) Trail shared-use pathway, which extends through the park. At the southern end of the 1,000-foot track segment at this site, the B2B Trail transitions to an easement provided by the railroad. Here the tracks and B2B Trail are immediately adjacent to the Huron River.

The railroad right-of-way is exceptionally wide through much of the Site 1 area. Historically, this area included industrial access yard tracks. Artrain/Mid America Railcar Leasing LLC (http://www.midamericarailcar.com/index.html) uses two remaining siding tracks to store vintage railroad cars. A trackside platform and shelter serves provides access to the cars.

The Artrain rail shelter sits adjacent to a parking lot for the NEW Center, a facility housing nonprofit organizations at 1100 North Main Street. The parking lot contains just over 50 parking spaces adjacent to the tracks.

Figure 2: Site 1 Area Overview



Source: Bing Maps

Phase I Evaluation

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators

The one mile distance between Site 1 and downtown Ann Arbor is greater than the national walking tolerance average of one-half mile to fixed guideway transit. Other major activity areas are farther from the site. (As a point of comparison, Sites 2 and 3 are located within one-half mile of major activity areas.) The primary connection to the area is North Main Street, which has a sidewalk along the east side of the roadway, but few other amenities for walking or bicycling between Downtown, Ann Arbor neighborhoods, and the site. The Washtenaw County Border-to-Border Trail (B2B) provides regional bicycle access to the area, with the only connection to the train tracks in the area at Lake Shore Drive.

Upon further consideration, it was determined that constructing the station program at this site would require relocating Lake Shore Drive. Vehicular access to Bandemer Park would likely be shifted to a new roadway, to be constructed about 500 feet to the north of the existing Lake Shore Drive alignment. This would be required because no roadways can cross the train platforms, which would need to be nearly centered on the existing Lake Shore Drive. A pedestrian overpass to Bandemer Park and the B2B Trail would need be provided in the area of the present Lake Shore Drive. This bridge would provide elevators on either side of the tracks and would be required to access train platforms that would be located on both sides of the tracks.

Criterion: Suitable Land for a Station

The wedge of properties between North Main Street and the tracks contains several light industrial and office uses. The Project Team's initial expectation was that one or more of these properties would need to be acquired in order to locate a multi-modal station in the area.

In August 2014, the team developed two preliminary conceptual design alternatives for the site (See Concept Plan A and B in Attachment 1). Both designs assumed a station building above the tracks due to the narrow site and structured parking with transit multi-modal facilities on the ground floor of the parking deck. Concept Plan A placed kiss-and-ride, taxi, and short-term parking facilities outside of the parking deck. Concept Plan B placed these facilities under the parking deck to reduce the site footprint. Both concepts assumed higher parking demand than is currently assumed. Should the plans be revised to reflect current assumptions, the parking decks would be taller but would likely have a similar footprint.

The team concluded that the relatively narrow site required an elongated station form extending several hundred feet in each direction from the existing Lake Shore Drive. This is reflected in the concept plans. Thus, the station would require more property than was initially assumed: between 6.25 and 10 acres of property to fit the station program at the site. Accordingly, all properties between the tracks and North Main Street and within at least 600 feet of Lake Shore Drive would be required for the station program. This would necessitate relocating multiple manufacturing and office uses.

Criterion: Convenient Access to Existing Roadways

North Main Street is a major four-lane arterial through this area with connections to Downtown and M 14. Upon further consideration, North Main Street would likely require at least two signalized intersections plus a turn lane at vehicular entry points.

Criterion: Public Transit Connections

Only one AAATA bus route, Route 13, travels in the general Site 1 area. It operates about three blocks from the southern limit of the potential station. Other bus routes would need to make major diversions to serve the area. The proposed Washtenaw and Livingston Line (WALLY) commuter rail service may be implemented within one-quarter mile of the southern end of Site 1. The Ann Arbor Railroad, along which WALLY would operate, crosses above the MDOT railroad at this point. Both railroads navigate sharp curves at the crossing point. The WALLY project has not proposed a station in the vicinity of the crossing point. Track curvature makes a direct railroad-to-railroad vertical transfer at the crossing unfeasible.

Criterion: Minimizing Environmental Impacts
The need to acquire land from private office and industrial properties would be greater than initially anticipated, which would increase the site's costs. Potential uses of nearby park areas would also need consideration. One elevator tower for the pedestrian crossing would be immediately adjacent to parkland and may require parkland usage. A new roadway to replace the Lake Shore Drive crossing would use an undeveloped edge of Bandemer Park, with associated park land impacts. Also to be considered: the cost to redesign North Main Street and nearby intersections to provide multi-modal site access.

Phase II Evaluation

Additional Evaluation Criteria Requested by Stakeholders
Station-Oriented Development
The subjects of most frequent comment supporting further evaluation of this site were redevelopment and station-oriented development. Repeatedly mentioned was the recent North Main-Huron River Corridor Vision Project, which advocated a multi-modal streetscape and improved connections to the B2B Trail and riverfront.[2] These requests were the primary justification for retaining Site 1 in the Phase II analysis.

The potential for station-oriented development in the immediate Site 1 area is limited. As previously stated, the station program would require up to 10 acres, including all land between North Main Street and the tracks within at least 600 feet of Lake Shore Drive. The station program would leave no ground space for redevelopment. The entire area would be required for features such as a bus transfer facility, parking structure, and passenger drop-off area. Development east of the site is prevented by Bandemer Park and the river. Development west of the site is prevented by the Bluffs Nature Area. Remaining areas include:

West of Main:
- A small industrial area at 1251 North Main;
- A few single family homes along Main; and
- A newer office and assisted living redevelopment at Huronview Boulevard.

East of Main:
- The New Center nonprofit organization redevelopment south of the site (existing redevelopment); and
- Industrial properties at 1342 North Main and extending north to the M14 interchange.

In short, station-oriented development potential at and around Site 1 is highly constrained.

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[2] This project was active between spring 2012 and summer 2013. Sources: Renew North Main at http://www.renewnorthmain.org/; and Stanton, R.J., Ann Arbor News, May 8, 2012. "New task force will develop vision for connecting North Main Street and Huron River." http://www.annarbor.com/news/new-task-force-will-develop-vision-for-connecting-north-main-street-and-huron-river/.

Conclusions

It appears possible to locate an intermodal passenger rail station at the Site 1 (North Main Street) location. However, the prospect of acquiring several properties along the segment and relocating businesses raises the capital and socioeconomic costs of locating a station here. Access and roadway conditions create problems for vehicular and non-motorized access between the site and major activity areas and require parkland uses. This site has limited potential for transit connections compared to the other remaining sites. The site's environmental constraints are complex, and thus the Project Team initially did not recommend advancing this site for further analysis. Based on subsequent analysis requested by stakeholders, the initial recommendation to eliminate Site 1 (North Main Street) from further consideration has been reaffirmed.

Recent developments for a separate project are also relevant to the Site 1 evaluation. The Regional Transit Authority of Southeast Michigan (RTA) has partnered with MDOT to refine commuter / regional rail alternatives in the existing Amtrak Wolverine corridor between Ann Arbor and Detroit. The proposed Locally Preferred Alternative (scheduled for Board review and potential adoption in 2016) includes rail facilities at Site 1. These include a reversing siding and layover yard, which would incorporate a connection track between the MDOT and Ann Arbor railroads. The connection track can be located at this site only, and no other layover site at the Ann Arbor end of the corridor is currently under consideration. The Site 1 station layout would also directly conflict with these proposed facilities.

Appendix C: Traffic Impact Study

ANN ARBOR STATION TRANSPORTATION IMPACT STUDY
Ann Arbor, Michigan

Prepared For:

CITY OF ANN ARBOR

Prepared By:

DETROIT – SOUTHFIELD – GRAND RAPIDS – TRAVERSE CITY

February 1, 2017

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Preface

The City of Ann Arbor, Michigan in partnership with the Michigan Department of Transportation (MDOT) and the Federal Railroad Administration (FRA) have proposed to construct an intermodal station within the City of Ann Arbor. This project would support the existing Amtrak intercity service between Detroit, Michigan and Chicago, Illinois, the planned Midwest High Speed Rail service between Detroit/Pontiac and Chicago and the future proposed regional commuter rail service.

The existing Ann Arbor station is the busiest in Michigan and at times operates above its designed capacity for all arriving and departing passengers. The total number of passengers boarding or alighting at the Ann Arbor Amtrak station was approximately 129,000 in 2016, representing an increase of almost 70% over the past decade.

Parking facilities at the existing station are inadequate and do not function well. Thirty-eight (38) short-term parking spaces are managed by parking meters, and passengers are limited to four hours of daytime parking—no overnight parking. Long-term parking is located north of the station, on the opposite side of the railroad tracks from the station. Stairs from the long-term parking lot are provided for passengers to access Broadway Street (which passes over the rail line to the immediate east of the existing station via an overpass), providing grade-separated pedestrian access to the long-term parking lot.

The number of parking spaces at the long-term parking lot is inadequate at times throughout the year, particularly during peak periods of passenger rail traffic during holiday travel and seasonal local recreational activities. Although the lot is striped for use by 70 vehicles, at many times during these peak periods, 100 or more cars will park in the area by utilizing unmarked open space around the edges of the lot.

The existing site has no dedicated bus terminal, forcing Amtrak's thruway motor coach buses to load and unload from Depot Street. Pedestrian and bike access is also limited at the existing station.

Vehicular access to the existing site is provided along Depot Street for short-term parking, shuttle service, taxis, and local and regional bus traffic. Existing congestion along Depot Street and lack of a dedicated pickup/drop-off zone and bus bays create conflicts between site users and Depot Street traffic. Access to the site for long-term parking is provided at one driveway along Broadway Street. Broadway Street is a 4-lane roadway with moderate congestion in the vicinity of the existing long-term parking driveway.

As part of the evaluation and planning process for the proposed intermodal station site, it will be critical to provide adequate access and parking for all transportation modes including vehicular, pedestrian, bicycle, inter-city bus (Amtrak and Greyhound), local bus (University of Michigan and Ann Arbor Area Transportation Authority), Kiss n' Ride, shuttles, and taxis.

This traffic impact study will include an analysis of traffic impacts of two intermodal station site locations. The two site locations include a new intermodal station constructed at the Depot Street location and a new intermodal station constructed along Fuller Road. This study will assess the ability of each intermodal station site to support automobile and bus traffic at the site driveways and along adjacent roadways and intersections.

Executive Summary

The City of Ann Arbor has proposed the development of a new Amtrak intermodal facility. Two sites are being considered – the Depot site on the northwest corner of the Broadway Street/Deport Street intersection and an alternative site on Fuller Road east of East Medical Center Drive. The general location of the two candidate sites are shown in **Figure 1** (found at the end of report).

Proposed Depot Street Site Description

Three site alternatives are being considered for the Depot Street site. The Depot Street site plan alternatives are depicted in **Appendix A** (Alternate 2A, 2B, and 2C). For each of the alternatives, the proposed site development would include:

- The footprint includes areas north and south of the railroad right-of-way, which include the existing Amtrak station site, short and long-term parking lots, and adjacent property. For Alternative 2C, the historic Michigan Central Depot/Gandy Dancer Restaurant including adjacent parking areas are used as station facilities.
- For Alternatives 2A, 2B, and 2C the primary automobile site access will be via one site driveway on Broadway Street. For Alternate 2C, site access via Depot Street will be provided for short term parking, Kiss n' Ride and taxi vehicle trips.
- A parking deck with 870 long-term, 50 short-term, and 250 commuter parking spaces (1,170 total parking spaces), including parking spaces for motorcycles and Kiss n' Ride. Access to the parking deck will be from Broadway Street.
- Bus staging area for up to nine (9) buses. Bus staging areas are designated along Broadway Street via bus pullouts (2 spaces) and via site access driveways and bus pullouts along Depot Street (7 spaces).
- Up to Ten (10) daily inter-city train round-trips.
- Mid-block pedestrian crossing on Broadway Street.
- Vertical pedestrian mobility

Proposed Fuller Road Site Description

One site alternative is being considered for the Fuller Road site. The Fuller Road location site plan is depicted in Appendix A.

- The footprint of the development is generally within the footprint of the existing parking lot.
- All vehicular site access solely via Fuller Road with two right-in/right-out driveways and directional crossovers on Fuller Road.
- The west site driveway will be for buses, the east site driveway will be for passenger vehicles.
- A parking deck with 870 long-term, 50 short-term, and 250 commuter parking spaces (1,170 total parking spaces), including parking spaces for motorcycles and Kiss n' Ride. Access to the parking deck will be from Fuller Road.
- Inter-city (Amtrak and Greyhound) and transit bus staging area for up to nine (9) buses.
- Up to Ten (10) daily inter-city train round-trips.

This study is intended to outline the existing conditions, future (no build) conditions, and future build conditions at the two (2) alternative site locations. Recommendations to improve automobile and bus traffic at the site locations will be presented. For this study, the following objectives were defined:

- Collect existing traffic volumes at the 18 intersections within the study area.
- Evaluate the existing traffic and bus operations within the study area.
- Determine the future traffic anticipated to utilize the proposed station site for each alternative.
- Evaluate the existing roadway network and the proposed Depot Street and Fuller Road sites' ability to serve the anticipated traffic demand.
- Provide recommended traffic countermeasures to address existing and/or anticipated deficiencies at intersections or along roadways within the study area.

EXISTING (2016) CONDITIONS

To perform the analysis, AECOM utilized the turning movement counts collected at 11 intersections within the study area in June 2016 as well as recent available turning movement counts at an additional seven (7) intersections in order to evaluate the existing conditions. The traffic data collected in June 2016 may not represent typical traffic conditions within the study area due to several ongoing construction projects as well as the University of Michigan (UM) summer break. Section 2.2.1 - Existing (2016) Peak-Hour Volume Methodology describes the methodology used to adjust the 2016 traffic counts to more accurately represent the average daily conditions when all roadways are open and demand is representative of a normal day.

The capacity analysis indicated that the majority of the study area intersections operate at an overall Level-of-Service "D" or better under existing (2016) weekday morning and afternoon peak-hour conditions. While the majority of the study area intersections operate acceptably during the morning and afternoon peak-hours, several individual movements operate poorly. The majority of the poorly operating movements are low volume approaches where priority has been given to the primary street, however there are several high volume movements that operate poorly under existing conditions. One poorly operating movement at an intersection can create significant queuing and delay on the study area roadways, affecting nearby intersections and the corridor as a whole.

Two (2) individual movements at the existing Depot Street/Main Street intersection currently experience significant delay during both the morning and afternoon peak-hours even though the overall intersection LOS appears reasonable.

The southbound left-turn movement from Main Street to Depot Street during the morning peak-hour currently operates at LOS "E" with a volume-to-capacity (v/c) ratio of 1.08. As the volume for the movement exceeds the capacity, the calculated 550-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. This queue creates additional delay along southbound Main Street as vehicles waiting to turn left exceed the available 240-foot long turn lane and spill back into the adjacent thru lane, blocking southbound thru traffic.

The westbound right-turn movement from Depot Street to Main Street during the afternoon peak-hour currently operates at LOS "F" with a volume-to-capacity (v/c) ratio of 1.15. As the volume for the movement exceeds the capacity, the calculated 500-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. This queue frequently exceeds 500 feet and extends as far east as the existing station site creating delay for both automobile and bus traffic using the existing site.

The Ann Arbor Area Transportation Authority (AAATA) and the University of Michigan (UM) operate transit bus service within the City of Ann Arbor. One AAATA bus route (Route 21) serves the site directly, providing service between the site and the Blake Transit Center. This route utilizes Depot Street to access the site and is frequently delayed by the existing congestion along the corridor during the morning and afternoon peak-hours. AAATA Route 22 and Route 65 operate along Broadway Street adjacent to the existing site. The UM transit service does not serve the existing site and no routes operate adjacent to the site.

BASE YEAR NO BUILD (2035) CONDITIONS

Base year traffic conditions represent conditions during the projected future year (2035) of the proposed development, but without the traffic generated by the development. The Washtenaw Area Transportation Study (WATS) was contacted to procure a growth rate from existing (2016) to base year no build (2035). Based on information received from WATS, compounded background traffic growth rates of 0.21% to 0.41% were used in the study as part of the base year no build (2035) traffic volume determination.

Several traffic countermeasures were necessary to mitigate background (no build) traffic conditions:

- Signal timing optimization while maintaining existing cycle lengths.
- Construction of a roundabout at the Fuller Road/EMCD/Maiden Lane intersection as identified in the City Capital Improvement Program. As extensive analysis of the roundabout has been performed previously, an analysis of this intersection was not included in this study. The previous study accounted for future traffic growth and showed the intersection would operate acceptably under the base year (2035) conditions. **Appendix J** includes a summary of the previous analysis performed.
- Restriping the eastbound approach of the Pontiac Trail/Barton Drive intersection to include a shared left-turn/thru lane and a dedicated right-turn lane.

The base year no build (2035) capacity analysis indicated the majority of the study area intersections are anticipated to operate at Level-of-Service "D" or better during the weekday morning and afternoon peak-hour conditions. As with the existing conditions, several poorly operating movements create significant queuing on the study area roadways, especially along Depot Street during the morning and afternoon peak-hours. This queuing creates additional delay that may not be fully reflected in the overall intersection level-of-service analyses.

A previous study of the Main Street/Depot Street intersection was performed in 2013 and recommended the following improvements:

- Lengthening the existing southbound left-turn lane up to 2,300 feet to the north. This improvement would likely require the widening of the railroad overpass along Main Street to accommodate the existing pavement width.

- Converting the existing dedicated westbound left-turn lane to a shared left/right-turn lane.

- Installing a right-turn "green arrow" for the westbound right-turn. This recommendation has been implemented at the intersection.

While the improvements listed above may help reduce some of the delay at the intersection, a preliminary analysis shows additional improvements would likely be required to fully address the existing deficiencies. These additional improvements may include the following:

- Widening Main Street to accommodate dual southbound left-turn lanes at the Main Street/Depot Street intersection. While lengthening the existing turn lane may reduce the occurrence of the queue extending into the adjacent thru lane, it would not add capacity to a movement that is over capacity.

- Widening of Depot Street from Main Street to approximately 500 feet east of Main Street to a 5-lane section to accommodate dual westbound right-turn lanes, dedicated westbound left-turn lane, and two eastbound lanes. The dual right-turn lanes would allow for the continued use of an overlap phase (green arrow) with the westbound right-turn movement. Converting the existing westbound left-turn lane to a shared lane would not allow for the use of an overlap phase. The two eastbound lanes would accommodate the dual southbound left-turn lanes.

- Widening of Depot Street from approximately 150 feet west of the Broadway Street bridge to State Street from the existing 2-lane section to a 3-lane section. The widening may require the Broadway Street over Depot Street bridge to be lengthened. The 3-lane section would improve the existing site access driveways and the Depot Street/Carey Street intersection.

The improvements required at the Main Street/Depot Street intersection would have significant impacts to the surrounding area. Widening Main Street to lengthen the existing southbound left-turn lane or provide dual left-turn lanes would require the widening of the railroad overpass north of Depot Street to accommodate the increased pavement width. Lengthening the railroad bridge would require deeper bridge beams, lowering the existing vertical clearance. The railroad bridge would need to be raised or the Main Street road profile lowered to provide for the minimum vertical clearance under the bridge. Providing acceptable vertical clearance and widening the roadway would result in significant impacts, including right-of-way acquisition and impacts to existing buildings along the corridor.

Widening Depot Street from a 3-lane section to a 5-lane section at Main Street would also result in significant impacts to surrounding property, including right-of-way acquisition, impacts to the existing park land located on the southeast corner, and impacts to Wheeler Park located on the south side of Depot Street.

Widening Depot Street from a 2-lane section to a 3-lane section at Broadway Street would have significant impacts to the Michigan Central Depot Historic District and the historic brick road. In addition, widening Depot Street in this location may be impractical given the steep slope of the Carey Street approach, the existing staircase, retaining walls, and sidewalks.

The above Depot Street improvements were not considered to have been completed in the future year build scenarios as no plans to improve the Main Street/Depot Street intersection or the Depot Street corridor are being considered at this time.

FUTURE YEAR (2035) CONDITIONS

Future year (2035) conditions represent traffic conditions following the future opening of the proposed development.

Trip Generation, Trip Distribution, and Traffic Assignment

Vehicular trip generation for the weekday morning and afternoon peak-hours are based on Amtrak boarding and alighting projections provided by Amtrak for intercity and commuter travel.

The Depot site is projected to generate 297 new trips (195 entering trips, 102 exiting trips) in the future year (2035) weekday morning peak-hour, and 297 new trips (102 entering trips, 195 exiting trips) in the future year (2035) weekday afternoon peak-hour.

The Fuller Road site is projected to generate 274 new trips (175 entering trips, 99 exiting trips) in the future year (2035) weekday morning peak-hour, and 274 new trips (99 entering trips, 175 exiting trips) in the future year (2035) weekday afternoon peak-hour.

While a final determination of the increased bus service to the site has yet to be determined, it is anticipated that bus service to the site will increase with the increased inter-city train service and the commuter rail service. For the purposes of this study, both the Depot site and Fuller site are anticipated to generate approximately 30 bus trips (15 entering, 15 exiting) during the weekday morning and afternoon peak-hours. The bus trips include Amtrak, Greyhound, University of Michigan (UM), and Ann Arbor Area Transportation Authority (AAATA) buses.

Peak-hour traffic assignment for both of the candidate sites was estimated from existing traffic patterns on study area roadways.

Future Year (2035) Capacity Analysis

Two sites for the future year (2035) conditions capacity analyses were analyzed:

1. Future year (2035) at the proposed Depot Street site
2. Future year (2035) at the proposed Fuller Road site

Proposed Depot Street Site

For the Depot site location, the capacity analyses indicated that the majority of the study area intersections are anticipated to operate at Level-of-Service “D” or better during the weekday morning and afternoon peak-hour conditions. As with the existing and base year (2035) no build conditions, two (2) movements at the Depot Street/Main Street intersection will continue to experience significant delay during both the morning and afternoon peak-hours. These poorly operating movements will have a significant impact on automobile and bus traffic for the alternatives located along Depot Street.

The southbound left-turn movement from Main Street to Depot Street during the morning peak-hour is anticipated to operate at LOS “F” with a volume-to-capacity (v/c) ratio of 1.15. As the volume for the movement exceeds the capacity, the calculated 740-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. As with existing and base year (2035) no build conditions, this queue will likely create additional delay along southbound Main Street as vehicles waiting to turn left exceed the available 240-foot long turn lane and spill back into the adjacent thru lane, blocking southbound thru traffic.

The westbound right-turn movement during the afternoon peak-hour is anticipated to operate at LOS “F” with a volume-to-capacity (v/c) ratio of 1.09. As the volume for the movement exceeds the capacity, the calculated 550-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. As with the existing and base year (2035) conditions, this queue will likely exceed 550 feet and extend as far east as the existing station site creating delay for both automobile and bus traffic using the proposed Depot site.

For Alternate 2C, additional trips would access the site via Main Street, Fuller Road, and/or Carey Street as the short-term parking, Kiss n’ Ride, and taxi traffic will be located along Depot Street. The additional trips would increase the congestion along the Depot Street corridor. The average delay for the poorly operating (LOS “F”) northbound Carey Street approach to Depot Street during the morning peak-hour would worsen as a result of the additional traffic. Additional delay and queuing at the Main Street/Depot Street intersection would increase with Alternate 2C compared to Alternate 2A and 2B.

The site driveway located on Broadway Street is anticipated to operate at an overall LOS “A” during both the weekday morning and afternoon peak-hours assuming the improvements recommended within this study are implemented. The proposed mid-block pedestrian crossing located on Broadway Street at the west end of the existing Broadway Street bridge is anticipated to operate at LOS “B” during the morning and afternoon peak-hours.

The AAATA operates one (1) existing AAATA bus route (Route 21) that serves the site directly, providing service between the site and the Blake Transit Center. While a final determination of the increased bus service to the site has yet to be determined, it is anticipated that bus service to the site will increase with the increased inter-city train service and the commuter rail service. Additional routes and more frequent stops at the station are anticipated along Depot Street and at new bus stops constructed along Broadway Street.

While the UM bus service does not currently serve the existing station, the UM has expressed interest in providing a bus route that would connect the station site to the Central Campus Transit Center. This new bus route would most likely access the site via Fuller Road and Depot Street.

A portion of the increased bus traffic to the proposed Depot site will access the site along Depot Street via the two site driveways (one entrance, one exit) for all Alternate 2 options. Given the high volume of traffic along Depot Street and the impact the poorly operating movements at the Main Street/Depot Street intersection have on the corridor during the morning and afternoon peak-hours, bus traffic would experience significant delays entering and exiting the site at the Depot Street site driveways.

Proposed Fuller Road Site

For the Fuller site location, the capacity analyses indicated that the majority of the study area intersections are anticipated to operate at Level-of-Service “D” or better during the weekday morning and afternoon peak-hour conditions. As with the existing and base year (2035) no build conditions, two (2) movements at the Depot Street/Main Street intersection will continue to experience significant delay during both the morning and afternoon peak-hours. However, these poorly operating movements will not have an impact on automobile and bus traffic entering and exiting the Fuller site.

The City of Ann Arbor has previously studied the intersection of Fuller Road/East Medical Center Drive/Maiden Lane for alternatives to increase the capacity of the intersection. For the purposes of this study, it was assumed the proposed roundabout identified in the City Capital Improvement Plan (CIP) would be constructed. As extensive analysis of the roundabout has been performed previously, an analysis of this intersection was not included in this study. The previous study accounted for future traffic growth, including the potential Ann Arbor Station. The results of the study showed the intersection would operate acceptably under the future year (2035) conditions with the additional traffic generated by the proposed Ann Arbor Station.

The AAATA route (Route 21) serving the existing station site would be rerouted to provide direct access to/from the Blake Transit Center and the proposed Fuller site. While a final determination of the increased bus service to the site has yet to be determined, it is anticipated that bus service to the site will increase with the increased inter-city train service and the commuter rail service. The AAATA currently operates five (5) additional bus routes that travel adjacent to the proposed Fuller site location. These bus routes have the potential to also provide service to the Fuller site via the proposed site driveways along Fuller Road.

While the UM bus service does not currently serve the existing station, the UM has expressed interest in providing service to the proposed station. The UM currently operates approximately twelve (12) bus routes within the City of Ann Arbor. Eleven (11) of these routes operate along Fuller Road adjacent to the proposed Fuller site and have the potential to provide service to the proposed station via the proposed site driveways along Fuller Road.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analyses performed in this study, the proposed site is anticipated to have minor impacts to the study area intersections. The findings of the study are as follows:

Conclusions

Base Year No Build (2035) Conditions

- Assuming the existing Depot Street station increased service as anticipated and no improvements were made to the Main Street/Depot Street intersection or the Depot Street corridor, the base year no build (2035) alternative would provide insufficient site access for automobile and bus traffic utilizing the site. The increased vehicle trips along Depot Street would increase the existing congestion and create adverse impacts to customer access, including Kiss ‘n Ride, bus and taxi traffic.

- Significant improvements along Depot Street and at the Main Street/Depot Street intersection would be required to mitigate the existing and base year (2035) conditions. These improvements would likely be required to provide acceptable access for automobile and bus traffic to the existing site.

- The proposed roundabout identified in the City Capital Improvement Program at the Fuller Road/EMCD/Maiden Lane intersection would operate acceptably under base year (2035) conditions based on the results of the previous study and analysis performed. The roundabout is anticipated to operate at LOS “C” during the morning peak-hour and LOS “D” during the afternoon peak-hour.

Future Year (2035) Conditions - Depot Site

- The proposed Depot site is projected to generate 297 new trips (195 entering trips, 102 exiting trips) in the future year (2035) weekday morning peak-hour, and 297 new trips (102 entering trips, 195 exiting trips) in the future year (2035) weekday afternoon peak-hour. Sixty-nine percent (69%) of the total site trips in both the morning an afternoon peak-hours are intercity-related vehicle trips.

Broadway Street

- A left-turn lane analysis revealed that a left-turn lane is needed on northbound Broadway Street at the driveway in both the morning and afternoon peak-hours. The left-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing left-turning traffic to exit the adjacent thru lane.

- The right-turn lane analysis revealed that a right-turn lane is needed on southbound Broadway Street at the driveway in the morning peak-hour. The right-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing right-turning traffic to exit the adjacent thru lane.

- Under stop sign control, the Broadway Street access drive approach is anticipated to operate at LOS 'F' during the morning and afternoon peak-hours in future year (2035) with significant delay and long queues. The overall intersection is anticipated to operate at LOS "A" under signal control during the morning and afternoon peak-hours.

- The mid-block pedestrian crossing on Broadway Street is not anticipated to have a significant impact to vehicular delay.

- The proposed bus staging area along Broadway Street will require widening to the Broadway Street bridge.

Depot Street

- Automobile and bus traffic utilizing Depot Street to access the site would experience significant delay entering and exiting the site due to the high traffic volumes along Depot Street, particularly during the morning and afternoon peak-hours.

Future Year (2035) Conditions - Fuller Site

- The proposed Fuller site is projected to generate 274 new trips (175 entering trips, 99 exiting trips) in the future year (2035) weekday morning peak-hour, and 274 new trips (99 entering trips, 175 exiting trips) in the future year (2035) weekday afternoon peak-hour. Sixty-one percent (61%) of the total site trips in both the morning an afternoon peak-hours are intercity-related vehicle trips.

- A right-turn lane analysis revealed that a right-turn lane is needed on eastbound Fuller Road at the east site driveway in both the morning and afternoon peak-hours. The right-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing right-turning traffic to exit the adjacent thru lane.

- A right-turn lane analysis revealed that a right-turn lane is not needed on eastbound Fuller Road at the west site driveway based on the anticipated bus traffic volumes in both the morning and afternoon peak-hours. As bus traffic generally makes turning movements at slower speeds, a right-turn lane should be constructed to remove the bus traffic from the through lane. The right-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing right-turning bus traffic to exit the adjacent thru lane.

- The proposed stop-controlled driveway approaches to Fuller Road are anticipated to operate at LOS "B" or better during the morning and afternoon peak-hours assuming the recommendations outlined in this report are implemented.

- The proposed roundabout identified in the City Capital Improvement Program at the Fuller Road/EMCD/Maiden Lane intersection would operate acceptably under future year (2035) conditions with the proposed station located on Fuller Road based on the results of the previous study and analysis performed. The roundabout is anticipated to operate at LOS "C" during the morning peak-hour and LOS "D" during the afternoon peak-hour.

Recommendations

Future Year (2035) Conditions - Depot Site

- While a formal signal warrant study was not performed as part of this study, a traffic signal would be required to maintain acceptable LOS on the site access drive exiting approach to Broadway Street. The traffic signal should include pedestrian crosswalks on all approaches to the intersection.

- The signal timings at the study area intersections were optimized based on the anticipated traffic volumes. The most significant adjustment included increasing the existing cycle length for the three (3) signalized intersections along the Main Street (US-23BR) corridor from 90 seconds to 100 seconds during the morning peak-hour. The afternoon peak hour cycle length remained at 90 seconds.

- A northbound left-turn lane is needed at the proposed site driveway on Broadway Street, including a 250-foot left-turn bay length.

- A southbound right-turn lane is needed at the proposed site driveway on Broadway Street, including a 250-foot right-turn bay length.

- Appropriate mid-block crossing treatment should be constructed at the proposed crosswalk along Broadway Street, which would include pedestrian crossing signage and/or a Rectangular Rapid Flashing Beacon (RRFB). Sight distance for the proposed mid-block pedestrian crossing location should be verified.

Future Year (2035) Conditions - Fuller Site

- The signal timings at the study area intersections were optimized based on the anticipated traffic volumes. The most significant adjustment included increasing the existing cycle length for the three (3) signalized intersections along the Main Street (US 23BR) corridor from 90 seconds to 100 seconds during the morning peak-hour. The afternoon peak hour cycle length remained at 90 seconds.

- A right-turn lane is needed at the site east driveway, including a 250-foot right-turn bay length.

- A right-turn lane is needed at the site west driveway, including a 250-foot right-turn bay length.

- The existing Fuller Road crossovers should be relocated as shown on **Figure 9** (found at the end of report), including a 250-foot left-turn bay at each crossover. The geometric layout of the crossovers should be designed to Michigan Department of Transportation and City of Ann Arbor standards and accommodate bus turning movements. This may require the construction of additional pavement (loons) opposing the crossovers.

Section 1 Introduction

1.1 Background

The City of Ann Arbor has proposed the development of a new Amtrak intermodal facility. Two sites are being considered – the Depot site on the northwest corner of the Broadway Street/Deport Street intersection and an alternative site on Fuller Road east of East Medical Center Drive. The general location of the two candidate sites are shown in **Figure 1** (found at the end of report).

Current Existing Site Description
Currently, the existing site operates intercity passenger train service with three (3) daily round trips of which one daily round trip is provided in the morning peak-hour and one daily round trip in the afternoon peak-hour. Amtrak operates a long-term parking lot that and a 40-space short-term parking lot on-site.

Proposed Depot Site Description
Three site alternatives are being considered for the Depot site. The existing location site plans are depicted in **Appendix A** (Alternate 2A, 2B, and 2C). For each of the alternatives, the proposed Depot site development would include:

- The footprint includes areas north and south of the railroad right-of-way, which include the existing Amtrak station site, short and long-term parking lots, and adjacent property. For Alternative 2C, the historic Michigan Central Depot/Gandy Dancer Restaurant including adjacent parking areas are used as station facilities.
- For Alternatives 2A, 2B, and 2C the primary automobile site access will be via one site driveway on Broadway Street. For Alternate 2C, site access via Depot Street will be provided for short term parking, Kiss n' Ride and taxi vehicle trips.
- A four or five level parking deck with 1,100 to 1,400 parking spaces, including parking spaces for motorcycles and Kiss n' Ride. Access to the parking deck will be from Broadway Street.
- Bus staging area for up to nine (9) buses. Bus staging areas are designated along Broadway Street via bus pullouts (2 spaces) and via site access driveways and bus pullouts along Depot Street (7 spaces).
- Up to Ten (10) daily inter-city train round-trips.
- Mid-block pedestrian crossing on Broadway Street.
- Vertical pedestrian mobility

Current Fuller Road Site Description
The existing site is a UM-operated parking lot that has a capacity of 249 parking spaces. The users are exclusively University of Michigan Hospital Services (UMHS) employees during the daytime, while Fuller Park patrons have access to the parking lot after 4:00 PM and on weekends. The existing parking lot has two (2) driveways to Fuller Road, which cross an existing sidewalk/bike path located on the south side of Fuller Road. The existing Border-to-Border (B2B) trail is located on the north side of Fuller Road in this location.

Proposed Fuller Road Site Description
One site alternative is being considered for the Fuller Road site. The Fuller Road location site plan is depicted in Appendix A.

- The footprint of the development is generally within the footprint of the existing parking lot.
- All vehicular site access solely via Fuller Road with two right-in/right-out driveways and directional crossovers on Fuller Road.

- The west site driveway will be for buses, the east site driveway will be for passenger vehicles.
- A four or five level parking deck with 1,300 to 1,700 parking spaces, including parking spaces for motorcycles and Kiss n' Ride.
- Inter-city (Amtrak and Greyhound) and transit bus staging area for up to nine (9) buses.
- Up to Ten (10) daily inter-city train round-trips.

This study is intended to outline the existing conditions, future (no build) conditions, and future build conditions at the two (2) alternative site locations. Recommendations to improve automobile and bus traffic at the site locations will be presented. For this study, the following objectives were defined:

- Collect existing traffic volumes at the 18 intersections within the study area.
- Evaluate the existing traffic and bus operations within the study area.
- Evaluate non-motorized access to the proposed sites.
- Determine the future traffic anticipated to utilize the proposed station site for each alternative.
- Evaluate the existing roadway network and the proposed Depot Street and Fuller Road sites' ability to serve the anticipated traffic demand.
- Provide recommended traffic countermeasures to address existing and/or anticipated deficiencies at intersections or along roadways within the study area.

AECOM completed the traffic impact study in order to provide recommendations concerning proposed site access, including whether improvements might be necessary at the study area intersections to mitigate capacity and operational deficiencies at the intersections. The study will take into account any planned roadway improvements in the area.

1.2 Report Organization

Following the introductory section, the report is presented in the following sections:

- ***Section 2: Existing (2016) Conditions***
  Section 2 contains an analysis of existing (2016) peak-hour traffic conditions at study area intersections.

- ***Section 3: Base Year No Build (2035) Conditions***
  Section 3 contains an analysis of base year no build (2035) peak-hour traffic conditions – conditions for the projected future year (2035) of the proposed station but without the proposed improvements to the station.

- ***Section 4: Future Year (2035) Conditions***
  Section 4 contains an analysis of peak-hour traffic conditions for the two candidate sites at study area intersections under future year (2035) conditions, based on traffic projected to be generated by the proposed station. Traffic countermeasures, if needed, are included in Section 4.

Section 2 Existing (2016) Conditions

Section 2 provides a description of the existing transportation system and its operational characteristics within the study area. The study area includes 18 existing intersections, and is located in Ann Arbor, Michigan.

2.1 Study Area

Figure 1 depicts a vicinity map, including the study area and intersection locations. The following 22 intersections were analyzed as part of the study area:

Intersections (22)

Signalized (15)

1. Main Street/Beakes Street/Kingsley Street
2. Main Street/Summit Street
3. Main Street/Depot Street
4. Broadway Street/Swift Street
5. Broadway Street/Plymouth Rd/Maiden Lane
6. Plymouth Road/Broadway Street
7. Plymouth Road/Barton Drive
8. Glen Avenue/Huron Street
9. Glen Avenue/Ann Street
10. Glen Avenue/Catherine Street
11. Glen Avenue /Fuller Road/Depot Street
12. Fuller Road/Maiden Lane/EMCD
13. Fuller Road/Cedar Bend Drive
14. Fuller Road/Bonisteel Boulevard
15. Pontiac Trail/Barton Drive

Unsignalized (7)

16. Depot Street/Existing Site Access Drives
17. Depot Street/Carey Street
18. Division Street/Carey Street
19. Broadway Street/Beakes Street/Summit Street/Detroit Street
20. Broadway Street/Existing Site Access Drive
21. Fuller Road/Proposed East Site Access Drive
22. Fuller Road/Proposed West Site Access Drive

2.1.1 Existing Roadways

Following is a description of each roadway in the study area, in alphabetical order.

Barton Drive is an east-west 2-lane roadway within the study area with a speed limit of 25 mph. The Average Daily Traffic (ADT) of Barton Drive is approximately 6,300 west of Plymouth Road.

Beakes Street / Fifth Avenue / Division Street are a one-way pair diverging from Broadway Street south of Depot Street. Division Street is a one-way northbound two lane undivided street with on-street parking on the west side. Division Street is under the jurisdiction of the City of Ann Arbor. The posted speed limit is 30 mph and the ADT is 8,100 vehicles per day. Beakes Street is a two-lane undivided street with on-street parking on the left side. Beakes Street is under the jurisdiction of the City of Ann Arbor. The posted speed limit is 30 mph and the ADT is 6,900 vehicles per day.

East Medical Center Drive (EMCD) is a four-lane undivided street under the jurisdiction of the City of Ann Arbor between Fuller Road and the south edge of the bridge over the Norfolk Southern railroad tracks, and the University of Michigan has jurisdiction of the road south of that point. The posted speed limit is 25 mph, and the ADT is 12,500 vehicles per day.

Fuller Road is an east-west city road, which is a four-lane boulevard to the east of Maiden Lane/East Medical Center Drive, and a five-lane undivided road to the west. The lanes on Fuller Road are 11-feet wide. The ADT on Fuller Road east of Maiden Lane/EMCD is approximately 17,000 vehicles per day, with a posted speed limit of 35 mph.

Fuller Street / Depot Street is a two lane undivided street under the jurisdiction of the City of Ann Arbor. The posted speed limit is 25 mph and the ADT is 10,100 vehicles per day west of Fuller Road.

Glen Avenue is a four-lane undivided street under the jurisdiction of the City of Ann Arbor. The posted speed limit is 35 mph, and the ADT is 14,900 vehicles per day south of Fuller Street/Fuller Road.

Huron Street (I-94 BR) is a four- and five-lane street with a posted speed of 30 mph, and is under the jurisdiction of MDOT. The ADT of Huron Street is 18,700 vehicles per day east of Glen Avenue.

Maiden Lane is a three-lane undivided city street with a speed limit of 30 mph. Maiden Lane begins at Fuller Road to the south and ends at Broadway Street/Plymouth Road to the north. The ADT on Maiden Lane is 9,300 vehicles per day.

Main Street (US-23 BR) is four-lane undivided street with a posted speed of 30 mph south of Depot Street and 45 mph north of Depot Street. Main Street is under the jurisdiction of the Michigan Department of Transportation (MDOT). The ADT of Main Street is 15,500 vehicles per day north of Depot Street.

Plymouth Road / Broadway Street is an east-west four- or five-lane undivided city road with a speed limit of 35 mph to the east of Broadway Street, and 25 mph to the west. The ADT is 13,700 vehicles per day south of Swift Street.

Pontiac Trail is a north-south 2-lane roadway within the study area with a speed limit of 25 mph. The AADT of Pontiac Trail is approximately 8,700 vehicles per day south of Barton Drive.

The intersection configurations, traffic control, speed limits, and ADT's in the study area are shown in **Figure 2** (found at the end of report).

2.1.2 Existing Intersections

For the 22 intersections in the study area, 15 are signalized and seven (7) intersections are STOP-sign controlled. The signalized intersections operate at varying cycle lengths in the morning and afternoon peak-hours. The intersections in the study area, including type of traffic control and cycle length are listed in **Table 1**.

The signalized intersections along the Main Street (US 23BR) corridor are coordinated and operate with a 90 second cycle length during the morning and afternoon peak-hours. The signalized intersections along the Plymouth Road/Broadway Street corridor are controlled by the City of Ann Arbor SCOOT system which varies the cycle lengths throughout the day based on real time traffic demand. The signalized intersections along the Glen Avenue and Fuller Road corridors are coordinated and operate with a 90-second cycle length during the morning and afternoon peak-hours, except for the intersection of Fuller Road/East Medical Center Drive/Maiden Lane. This intersection is fully actuated and operates free throughout the day at a maximum cycle length of 135 seconds. Existing pedestrian volumes and timings at crosswalks were incorporated into the analyses, where appropriate.

The intersection of Pontiac Trail/Barton Drive is fully actuated and operates free throughout the day at a maximum cycle length of 79.2 seconds.

TABLE 1
Existing Intersections

Intersection	Type of Traffic Control	Cycle Length	
		Weekday Morning	Weekday Afternoon
Signalized Intersections			
Main St/Beakes St/Kingsley St	Signal (2-phase)	90 seconds	90 seconds
Main St/Summit St	Signal (2-phase)	90 seconds	90 seconds
Main St/Depot St	Signal (Split-phase)	90 seconds	90 seconds
Broadway St/Swift St	Signal (2-phase)	144 seconds[1]	144 seconds[1]
Broadway St/Plymouth Rd/Maiden Ln	Signal (3-phase)	144 seconds[1]	144 seconds[1]
Plymouth Rd/Broadway St	Signal (3-phase)	144 seconds[1]	144 seconds[1]
Plymouth Rd/Barton Dr	Signal (3-phase)	144 seconds[1]	144 seconds[1]
Glen Ave/Huron St	Signal (3-phase)	90 seconds	90 seconds
Glen Ave/Ann St	Signal (2-phase)	90 seconds	90 seconds
Glen Ave/Catherine St	Signal (Split-phase)	90 seconds	90 seconds
Glen Ave/Fuller Rd/Depot St	Signal (3-phase)	90 seconds	90 seconds
Fuller Rd/Maiden Ln/EMCD	Signal (4-phase)	135 seconds[2]	135 seconds[2]
Fuller Rd/Cedar Bend Dr	Signal (3-phase)	90 seconds	90 seconds
Fuller Rd/Bonisteel Blvd	Signal (4-phase)	90 seconds	90 seconds
Pontiac Trail/Barton Dr	Signal (2-phase)	79.2 seconds[2]	79.2 seconds[2]
Unsignalized Intersections			
Depot St/Carey St	2-way STOP	---	---
Division St/Carey St			
Broadway St/Beakes St/Summit St/Detroit St			
Depot Street/Existing Access Drives			
Broadway Street/Existing Access Drive			

Source: AECOM, October 2016

1. Signals controlled by SCOOT, cycle length varies
2. Fully actuated signal, cycle length varies

2.2 Existing (2016) Peak-Hour Traffic Volumes

As part of the Ann Arbor Station site evaluation, recent turning movement counts were utilized and new turning movement counts were collected to evaluate the potential traffic impacts related to the improvement (or relocation) of the existing Ann Arbor Station. To perform the analysis, AECOM utilized the turning movement counts collected at 11 intersections within the study area in June 2016 and utilized available previous turning movement counts at four of these intersections, as well as recent available turning movement counts at an additional seven (7) intersections. However, the traffic data collected in June 2016 may not represent typical traffic conditions within the study area due to several ongoing construction projects as well as the University of Michigan (UM) summer break.

The construction projects that may impact study area intersection traffic volumes are as follows:

- M-14 Closure – The closure of M-14 will likely impact traffic volumes on Main Street, Broadway Street, Pontiac Trail, and Barton Drive.
- Observatory Street Closure – The closure of Observatory Street results in different traffic patterns entering/exiting the UM Medical Campus with impacts along Fuller Road, East Medical Center Drive, Maiden Lane, Plymouth Road, and Broadway Street.

As a result, four (4) intersections in the study area with turning movement counts that were performed prior to the M-14 closure as well as while the UM was in session were utilized as control counts to aid in determining representative existing peak-hour volumes. All four intersections were also counted in June 2016 to provide a basis of comparison to the February 2012 counts. The four intersections and dates of turning movement counts are:

- Main Street/Depot Street – February 2012, June 2016
- Depot Street/State Street – February 2012, June 2016
- Broadway Street/Plymouth Road/Maiden Lane – February 2012, June 2016
- Pontiac Trail/Barton Drive – January 2016, June 2016

The above four intersections, and the other 15 intersections are listed in **Appendix B1**, including dates of most recent counts for each intersection.

2.2.1 Existing (2016) Peak-Hour Volume Methodology

The following methodology was used to determine the existing peak-hour volumes at the study area intersections:

1. Use the 2012 counts at the four above intersections as control counts to compare with intersection counts taken in June 2016.
2. Carry forward differential in control counts and June 2016 counts to subsequent study area intersections upstream and downstream from the control counts.
3. Adjust June 2016 intersection counts to match up with the four control count locations.
4. Balance peak-hour intersection volumes throughout the study area, representing 2012 peak-hour volumes.

Annual growth rates provided by the Washtenaw Area Transportation Study (WATS) were applied to the 2012 balanced peak-hour volumes to grow the volumes to ultimately arrive at existing 2016 levels. The annual growth rates provided by WATS are as follows:

- US 23 (Main Street) from M-14 to Kingsley Street – 0.41%
- Plymouth Road/Broadway Street from Kingsley Street to Barton Drive – 0.31%
- Glen Avenue/Fuller Road from Huron Street to Bonisteel Boulevard – 0.21%

Several traffic pattern differences were apparent in the study area when comparing the June 2016 counts to the February 2012 control counts:

- February 2012 to June 2016 on Northbound and Southbound Plymouth Road between Barton Drive and Broadway Street: A large increase in AM and PM northbound peak-hour volumes and AM and PM southbound peak-hour volumes. This is at least in part due to diversion of traffic to Plymouth Road with the M-14 closure.
- February 2012 to June 2016 on Northbound and Southbound Pontiac Trail between Barton Drive and Broadway Street: A modest increase in AM and PM northbound peak-hour volumes and AM and PM southbound peak-hour volumes. This is at least in part due to diversion of traffic to Pontiac Trail with the M-14 closure.
- February 2012 to June 2016, AM peak-hour volumes on Northbound Main Street north of Depot Street: A large increase in AM northbound peak-hour volumes. The AM peak-hour northbound volume increase may be in part due to diverted traffic destined to the north and east of the city, using Miller Avenue or I-94BL to Main Street and eastbound M-14.
- February 2012 to June 2016, PM peak-hour volumes on Southbound Main Street north of Depot Street: The PM peak-hour volume decrease may be in part due to diverted traffic destined to the city utilizing the US 23 exit at Plymouth Road east of the city.

2.2.2 Existing (2016) Peak-Hour Volumes

The existing (2016) morning and afternoon peak-hour traffic volumes are shown in **Figure 3** (found at the end of report). The existing 2012 through 2016 turning movement count reports are included in **Appendix B2**.

2.3 Existing (2016) Level-of-Service

In order to quantify intersection traffic operations, existing “Level-of-Service” (LOS) values were determined using industry-standard (*Synchro 9.0* and *Highway Capacity Software)* packages, which incorporate the methodology of the *Highway Capacity Manual*, published by the Transportation Research Board.

The term “Level-of-Service” denotes how well (or poorly) a traffic movement operates under given traffic demands, lane arrangements, and traffic controls. Each level is determined by the average amount of control delay per vehicle. Control delay is the total delay associated with stopping for a signal or stop sign, and includes four components; deceleration delay, stopped delay, queue move up time, and final acceleration delay.

The individual levels of service can be described by the following:

- *Level-of-Service A* – Very low vehicle delay
- *Level-of-Service B* – Low vehicle delays
- *Level-of-Service C* – Higher vehicle delays, significant number of stopped vehicles, not all vehicles in a queue are serviced by green signal phase
- *Level-of-Service D* – Congestion noticeable, longer vehicle delays, many vehicles stop at signals, many individual cycle failures
- *Level-of-Service E* – High vehicle delays, vehicle flow at lane capacity, frequent individual cycle failures
- *Level-of-Service F* – Vehicle flow exceeds lane capacity, significant congestion and vehicle delays, poor corridor progression, many individual cycle failures

As shown in **Table 2**, LOS "A" indicates small average control delays (less than ten seconds per vehicle) whereas LOS "F" indicates intersection failure, which results in extensive vehicular queues and long delays (over 50 seconds per vehicle at an unsignalized intersection, and over 80 seconds per vehicle at a signalized intersection). LOS "D" is typically considered acceptable peak-hour performance in an urban setting, and lower LOS values are tolerable for short time periods or during peak hours when heavier traffic volumes are expected.

TABLE 2
Level-of-Service Criteria at Intersections

Level-of-Service	Average Control Delay (seconds/vehicle)	
	Signalized Intersections	Unsignalized Intersections
A	<10	<10
B	10-20	10-15
C	20-35	15-25
D	35-55	25-35
E	55-80	35-50
F	80>	>50

Source: *Highway Capacity Manual,* TRB, 2010.

For the three (3) study area intersections that operate under two-way STOP-control, a LOS value was determined only for those movements that have to yield the right-of-way. The overall intersection LOS at the signalized intersections and the side-street approach LOS at the STOP-controlled intersections are shown in **Table 3**.

The existing Depot Street site access driveways and the Broadway Street site access drive for long-term parking were not analyzed under existing conditions as the volumes at the driveways are low.

TABLE 3
Existing (2016) Intersections Level-of-Service

Intersection or Intersection Approach		Morning Peak-hour		Afternoon Peak-hour	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Signalized Intersections – Overall					
Main St/Beakes St/Kingsley St		C	22.4	C	33.2
Main St/Summit St		C	20.3	B	10.5
Main St/Depot St		C	27.5	C	29.6
Broadway St/Swift St		C	28.2	B	17.1
Broadway St/Plymouth Rd/Maiden Ln		B	14.6	C	27.7
Plymouth Rd/Broadway St		A	4.0	A	8.1
Plymouth Rd/Barton Dr		C	24.6	B	14.2
Glen Ave/Huron St		C	22.8	C	25.2
Glen Ave/Ann St		B	10.2	B	12.4
Glen Ave/Catherine St		C	20.3	C	21.8
Glen Ave/Fuller Rd/Depot St		B	19.4	B	18.8
Fuller Rd/Maiden Ln/EMCD		D	43.8	D	42.2
Fuller Rd/Cedar Bend Dr		A	4.0	A	6.4
Fuller Rd/Bonisteel Blvd		C	28.4	C	27.8
Pontiac Trail/Barton Dr		D	46.9	B	19.8
Two-Way STOP-Controlled Intersection Approaches					
Depot St/Carey St	Northbound	E	46.0	C	15.4
Division St/Carey St	Westbound	B	11.8	B	11.3
Broadway St/Beakes St/Summit St/Detroit St	Westbound	D	26.5	C	18.5

Source: AECOM, October 2016

The existing (2016) conditions analysis, as summarized in Table 3, indicated that all but one study area intersection operate at Level-of-Service "D" or better under existing (2016) weekday morning and afternoon peak-hour conditions. Northbound Carey Street at the unsignalized Depot Street/Carey Street intersection operates at LOS "E" in the morning peak-hour. The existing (2016) intersection capacity reports are included in **Appendix C**.

Movement-by-movement LOS values are depicted in Figure 3 for the existing (2016) weekday peak-hours for all study area intersections. Examination of Figure 3 reveals that movements at 11 study area intersections have at least one movement operating at LOS "E" or "F" under existing (2016) morning and afternoon peak-hour conditions. While the majority of the poorly operating movements at the study area intersections are generally low volume movements where priority has been given to the high volume through movements, several of the poorly operating movements create significant queuing along the study area roadways as follows.

- The eastbound approach to the Barton Drive/Pontiac Trail intersection experiences significant queues during the morning peak-hour.

- The westbound right-turn movement at the Main Street/Depot Street intersection creates significant queuing along Depot Street during the afternoon peak-hour.
- The southbound left-turn movement at the Main Street/Depot Street intersection creates significant queuing along southbound Main Street during the morning peak-hour.

2.3.1 Depot Street

As shown in **Table 4,** two (2) movements at the existing Depot Street/Main Street intersection currently experience significant delay during both the morning and afternoon peak-hours.

The southbound left-turn movement from Main Street to Depot Street during the morning peak-hour currently operates at LOS “E” with a volume-to-capacity (v/c) ratio of 1.08. As the volume for the movement exceeds the capacity, the calculated 550-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. This queue creates additional delay along southbound Main Street as vehicles waiting to turn left exceed the available 240-foot long turn lane and spill back into the adjacent thru lane, blocking southbound thru traffic.

The westbound right-turn movement during the afternoon peak-hour currently operates at LOS “F” with a volume-to-capacity (v/c) ratio of 1.15. As the volume for the movement exceeds the capacity, the calculated 500-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. This queue frequently exceeds 500 feet and extends as far east as the existing station site creating delay for both automobile and bus traffic using the existing site.

TABLE 4
Main Street/Depot Street Existing (2016) Levels-of-Service

Movement	Morning Peak-hour				Afternoon Peak-hour			
	LOS	Delay (sec/veh)	v/c Ratio	95th Queue (feet)	LOS	Delay (sec/veh)	v/c Ratio	95th Queue (feet)
Main St/Depot St								
NBT/R	C	27.6	0.49	157	A	7.3	0.65	132
SBT	A	4.4	0.52	161	A	3.0	0.25	57
SBL (240’ Turn Lane)	**E**	**77.5**	**1.08**	**544**[1]	C	22.4	0.63	77
WBL	C	34.8	0.31	59	D	44.4	0.69	109
WBR	B	17.0	0.18	15	**F**	**113.2**	**1.15**	**504**[1]
Overall	C	27.5	**1.09**	-	C	29.6	0.93	-

Source: AECOM, October 2016
1. The traffic volume exceeds movement capacity, queue is theoretically infinite.

2.4 Transit Bus Service

The Ann Arbor Area Transportation Authority (AAATA) and the University of Michigan (UM) operate transit bus service within the City of Ann Arbor. One AAATA bus route (Route 21) serves the site directly, providing service between the site and the Blake Transit Center. This route utilizes Depot Street to access the site and is frequently delayed by the existing congestion along the corridor during the morning and afternoon peak-hours. AAATA Route 22 and Route 65 operate along Broadway Street adjacent to the existing site. The UM transit service does not serve the existing site and no routes operate adjacent to the site.

Section 3 Base Year No Build (2035) Conditions

Section 3 contains an analysis of traffic conditions under base year no build (2035) conditions - the projected future year (2035) of the proposed Ann Arbor Station development, but without the proposed improvements to the station.

Planned roadway improvements are typically included in the base year analysis. Based on discussions with MDOT and the City of Ann Arbor, as of this writing there is one (1) intersection improvement project earmarked for the study area in the near future. The City of Ann Arbor Capital Improvement Program includes the construction of a roundabout at the Fuller Road/East Medical Center Drive/Maiden Lane intersection in 2020.

3.1 Background Traffic Volumes

Peak-hour traffic volumes for base year no build (2035) conditions were developed by applying an annual growth factor to the existing (2016) peak-hour volumes, prior to adding peak-hour trips from the Ann Arbor Station development.

3.1.1 Background Growth Rate

Washtenaw Area Transportation Study (WATS) was contacted to procure a growth rate from existing (2016) to base year no build (2035). Based on information received from WATS, the following annual compounded background traffic growth rates were used in the study as part of the base year no build (2035) traffic volume determination.

- US 23 (Main Street) from M-14 to Kingsley Street – 0.41%
- Plymouth Road/Broadway Street from Kingsley Street to Barton Drive – 0.31%
- Glen Avenue/Fuller Road from Huron Street to Bonisteel Boulevard – 0.21%

3.2 Base Year No Build (2035) Peak-Hour Traffic Volumes

Applying the above growth rates to existing (2016) traffic volumes resulted in base year no build (2035) peak-hour volumes, depicted in **Figure 4** (found at the end of report).

3.3 Base Year No Build (2035) Traffic Countermeasures

Several traffic countermeasures were necessary to mitigate background (no build) traffic conditions that are expected by 2035. These traffic countermeasures included the following:

- The signal timings at the study area intersections were optimized while maintaining the existing cycle lengths. The most significant adjustment included shifting a portion of the green time at the Main Street/Depot Street intersection from the north-south phase to the southbound left/westbound right phase to accommodate the high southbound left-turn volume in the morning peak and the high westbound right-turn volume in the afternoon peak.

- The City of Ann Arbor has previously studied the intersection of Fuller Road/East Medical Center Drive/Maiden Lane for alternatives to increase the capacity of the intersection. For the purposes of this study, it was assumed the proposed roundabout identified in the City Capital Improvement Plan (CIP) would be constructed. As extensive analysis of the roundabout including future traffic growth has been performed previously, an analysis of this intersection was not included in this study. **Appendix J** includes a summary of the previous analysis performed.

- The eastbound approach to the Pontiac Trail/Barton Drive intersection is anticipated to operate poorly in 2035 due to the high volume of traffic coming from the M-14/Barton Drive interchange. As the existing pavement on eastbound Barton Drive is approximately 32 feet wide, allowing for a 10-foot center lane and 11-foot outside lanes without adding pavement, it was assumed the eastbound approach to the intersection would be restriped to include a shared left/thru lane and a dedicated right-turn lane by 2035.

The existing conditions analysis also showed significant delay and queuing at the Main Street/Depot Street intersection. Improvements to Depot Street were not considered to have been completed in the future year build scenarios as no plans to improve Depot Street are being considered at this time. Section 3.4.1 discusses possible improvements to this intersection in more detail.

3.4 Base Year No Build (2035) Level-of-Service

The overall intersection LOS at the signalized intersections and the side-street approach LOS at the two-way STOP-controlled intersections are shown in **Table 5**. Included in the base year no build (2035) traffic analysis were signal timing or phasing adjustments as needed to improve intersection LOS.

As with existing conditions, the existing Depot Street site access driveways and the Broadway Street site access drive for long-term parking were not analyzed under the base year (2035) conditions as the volumes at anticipated to remain low at these driveways.

Assuming the traffic countermeasures outlined in Section 3.3 are implemented, the base year no build (2035) conditions analysis, as summarized in Table 5, indicated that all but one study area intersection operate at Level-of-Service “D” or better under base year no build (2035) weekday morning and afternoon peak-hour conditions. Northbound Carey Street at the unsignalized Depot Street/Carey Street intersection operates at LOS “F” in the morning peak-hour. The base year no build (2035) intersection capacity reports are included in **Appendix D**.

Movement-by-movement LOS values are depicted in Figure 4 for the base year no build (2035) weekday peak-hours for all study area intersections. Examination of Figure 4 reveals that movements at 11 study area intersections have at least one movement operating at LOS “E” or “F” under base year no build (2035) morning and afternoon peak-hour conditions. While the majority of the poorly operating movements at study area intersections are generally low volume movements where priority has been given to the high volume through movements, several of the poorly operating movements create significant queuing along the study area roadways as follows:

- The westbound right-turn movement at the Main Street/Depot Street intersection creates significant queuing along Depot Street during the afternoon peak-hour.
- The southbound left-turn movement at the Main Street/Depot Street intersection creates significant queuing along southbound Main Street during the morning peak-hour.
- All approaches to the Main Street/Beakes Street/Kingsley Street intersection experience significant queues during the morning and afternoon peak-hour.

The proposed roundabout identified in the City Capital Improvement Program at the Fuller Road/EMCD/Maiden Lane intersection would operate acceptably under base year (2035) conditions based on the results of the previous study and analysis performed. The roundabout is anticipated to operate at LOS “C” during the morning peak-hour and LOS “D” during the afternoon peak-hour.

TABLE 5
Base Year No Build (2035) Intersections Level-of-Service

Intersection or Intersection Approach		Base Year No Build (2035) Morning Peak-hour LOS	Morning Peak-hour Delay (sec/veh)	Afternoon Peak-hour LOS	Afternoon Peak-hour Delay (sec/veh)
Signalized Intersections – Overall					
Main St/Beakes St/Kingsley St		C	29.7	D	41.7
Main St/Summit St		C	23.2	B	10.9
Main St/Depot St		C	24.4	C	20.6
Broadway St/Swift St		C	30.0	B	17.4
Broadway St/Plymouth Rd/Maiden Ln		B	16.0	C	30.3
Plymouth Rd/Broadway St		A	3.9	A	8.8
Plymouth Rd/Barton Dr		C	24.5	B	13.6
Glen Ave/Huron St		C	23.8	C	26.3
Glen Ave/Ann St		B	10.4	B	12.6
Glen Ave/Catherine St		C	20.9	C	21.8
Glen Ave/Fuller Rd/Depot St		B	17.3	B	19.8
Fuller Rd/Maiden Ln/EMCD[1]		-	-	-	-
Fuller Rd/Cedar Bend Dr		A	4.1	A	6.6
Fuller Rd/Bonisteel Blvd		C	28.5	C	28.7
Pontiac Trail/Barton Dr		C	24.3	C	22.0
Two-Way STOP-Controlled Intersection Approaches					
Depot St/Carey St	Northbound	F	63.8	C	16.6
Division St/Carey St	Westbound	B	12.2	B	11.6
Broadway St/Beakes St/Summit St/Detroit St	Westbound	D	30.0	C	20.0

Source: AECOM, October 2016
1. Analysis performed in previous intersection study report.

3.4.1 Depot Street

As with existing conditions, two (2) movements at the Depot Street/Main Street intersection will continue experience significant delay during both the morning and afternoon peak-hours as shown in **Table 6**.

The southbound left-turn movement from Main Street to Depot Street during the morning peak-hour is anticipated to operate at LOS “F” with a volume-to-capacity (v/c) ratio of 1.22. As the volume for the movement exceeds the capacity, the calculated 650-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. As with existing conditions, this queue will likely create additional delay along southbound Main Street as vehicles waiting to turn left exceed the available 240-foot long turn lane and spill back into the adjacent thru lane, blocking southbound thru traffic.

The westbound right-turn movement during the afternoon peak-hour is anticipated to operate at LOS “E” with a volume-to-capacity (v/c) ratio of 1.04. As the volume for the movement exceeds the capacity, the calculated 500-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. As with the existing conditions, this queue will likely exceed 500 feet and extend as far east as the existing station site creating delay for both automobile and bus traffic using the existing site.

TABLE 6
Main Street/Depot Street Base Year (2035) Levels-of-Service

Movement	Morning Peak-hour				Afternoon Peak-hour			
	LOS	Delay (sec/veh)	v/c Ratio	95th Queue (feet)	LOS	Delay (sec/veh)	v/c Ratio	95th Queue (feet)
Main St/Depot St								
NBT/R	C	27.4	0.54	188	B	12.2	0.77	234
SBT	A	4.7	0.57	184	A	3.3	0.27	67
SBL (240' Turn Lane)	**F**	**131.0**	**1.22**	**653**[1]	C	26.3	0.65	127
WBL	C	34.8	0.33	60	D	40.2	0.66	96
WBR	B	14.6	0.20	40	**E**	**71.7**	**1.04**	**513**[1]
Overall	D	39.0	**1.22**	-	C	23.9	**1.02**	-

Source: AECOM, October 2016
1. The traffic volume exceeds movement capacity, queue is theoretically infinite.

A previous study of the Main Street/Depot Street intersection was performed in 2013 and recommended the following improvements:

- Lengthening the existing southbound left-turn lane up to 2,300 feet to the north. This improvement would likely require the widening of the railroad overpass along Main Street to accommodate the existing pavement width.

- Converting the existing dedicated westbound left-turn lane to a shared left/right-turn lane.

- Installing a right-turn "green arrow" for the westbound right-turn. This recommendation has been implemented at the intersection.

While the improvements listed above may help reduce some of the delay at the intersection, a preliminary analysis shows additional improvements would likely be required to fully address the existing deficiencies. These additional improvements may include the following:

- Widening Main Street to accommodate dual southbound left-turn lanes at the Main Street/Depot Street intersection. While lengthening the existing turn lane may reduce the occurrence of the queue extending into the adjacent thru lane, it would not add capacity to a movement that is over capacity.

- Widening of Depot Street from Main Street to approximately 500 feet east of Main Street to a 5-lane section to accommodate dual westbound right-turn lanes, dedicated westbound left-turn lane, and two eastbound lanes. The dual right-turn lanes would allow for the continued use of an overlap phase (green arrow) with the westbound right-turn movement. Converting the existing westbound left-turn lane to a shared lane would not allow for the use of an overlap phase. The two eastbound lanes would accommodate the dual southbound left-turn lanes.

- Widening of Depot Street from approximately 150 feet west of the Broadway Street bridge to State Street from the existing 2-lane section to a 3-lane section. The widening may require the Broadway Street over Depot Street bridge to be lengthened. The 3-lane section would improve the existing site access driveways and the Depot Street/Carey Street intersection.

The improvements required at the Main Street/Depot Street intersection would have significant impacts to the surrounding area. Widening Main Street to lengthen the existing southbound left-turn lane or provide dual left-turn lanes would require the widening of the railroad overpass north of Depot Street to accommodate the increased pavement width. Lengthening the railroad bridge would require deeper bridge beams, lowering the existing vertical clearance. The railroad bridge would need to be raised or the Main Street road profile lowered to provide for the minimum vertical clearance under the bridge. Providing acceptable vertical clearance and widening the roadway would result in significant impacts, including right-of-way acquisition and impacts to existing buildings along the corridor.

Widening Depot Street from a 3-lane section to a 5-lane section at Main Street would also result in significant impacts to surrounding property, including right-of-way acquisition, impacts to the existing park land located on the southeast corner, and impacts to Wheeler Park located on the south side of Depot Street.

Widening Depot Street from a 2-lane section to a 3-lane section at Broadway Street would have significant impacts to the Michigan Central Depot Historic District and the historic brick road. In addition, widening Depot Street in this location may be impractical given the steep slope of the Carey Street approach, the existing staircase, retaining walls, and sidewalks.

Assuming the existing Depot Street station increased service as anticipated and no improvements were made to the Main Street/Depot Street intersection or the Depot Street corridor, the base year no build (2035) alternative would provide insufficient site access for automobile and bus traffic utilizing the site. The increased vehicle trips along Depot Street would increase the existing congestion and create adverse impacts to customer access, including Kiss 'n Ride, bus and taxi traffic.

Section 4 Future Year (2035) Conditions

Section 4 contains the analysis of future year (2035) conditions for the proposed Ann Arbor Station development. The traffic impact for the two candidate sites were analyzed.

The generation of trips and the assignment of traffic to the roadway network for the two scenarios are discussed herein. A capacity analysis of future year (2035) conditions and an evaluation of the traffic impacts of each scenario as compared to base year no build (2035) conditions are also provided.

Existing Site Description

Currently, the existing site operates intercity passenger train service with three (3) daily round trips of which one daily round trip is provided in the morning peak-hour and one daily round trip in the afternoon peak-hour. Amtrak operates a long-term parking lot that and a 40-space short-term parking lot on-site.

Proposed Depot Site Description

Three site alternatives are being considered for the Depot Street site. The Depot Street site plan alternatives are depicted in Appendix A (Alternate 2A, 2B, and 2C). For each of the alternatives, the proposed site development would include:

- The footprint includes areas north and south of the railroad right-of-way, which include the existing Amtrak station site, short and long-term parking lots, and adjacent property. For Alternative 2C, the historic Michigan Central Depot/Gandy Dancer Restaurant including adjacent parking areas are used as station facilities.
- For Alternatives 2A, 2B, and 2C the primary automobile site access will be via one site driveway on Broadway Street. For Alternate 2C, site access via Depot Street will be provided for short term parking, Kiss n' Ride and taxi vehicle trips.
- A parking deck with 870 long-term, 50 short-term, and 250 commuter parking spaces (1,170 total parking spaces), including parking spaces for motorcycles and Kiss n' Ride. Access to the parking deck will be from Broadway Street.
- Bus staging area for up to nine (9) buses. Bus staging areas are designated along Broadway Street via bus pullouts (2 spaces) and via site access driveways and bus pullouts along Depot Street (7 spaces).
- Up to Ten (10) daily inter-city train round-trips.
- Mid-block pedestrian crossing on Broadway Street.
- Vertical pedestrian mobility

Current Fuller Road Site Description

The existing site is a UM-operated parking lot that has a capacity of 249 parking spaces. The users are exclusively University of Michigan Hospital Services (UMHS) employees during the daytime, while Fuller Park patrons have access to the parking lot after 4:00 PM and on weekends. The existing parking lot has two (2) driveways to Fuller Road, which cross an existing sidewalk/bike path located on the south side of Fuller Road. The existing Border-to-Border (B2B) trail is located on the north side of Fuller Road at this location.

Proposed Fuller Road Site Description

One site alternative is being considered for the Fuller Road site. The Fuller Road location site plan is depicted in Appendix A.

- The footprint of the development is generally within the footprint of the existing parking lot.
- All vehicular site access solely via Fuller Road with two right-in/right-out driveways and directional crossovers on Fuller Road.

- The west site driveway will be for buses, the east site driveway will be for passenger vehicles.
- A parking deck with 870 long-term, 50 short-term, and 250 commuter parking spaces (1,170 total parking spaces), including parking spaces for motorcycles and Kiss n' Ride. Access to the parking deck will be from Fuller Road.
- Inter-city (Amtrak and Greyhound) and transit bus staging area for up to nine (9) buses.
- Up to Ten (10) daily inter-city train round-trips.

4.1 Depot Street Site

4.1.1 Site Access

Site access to the Depot site for vehicular access will be via a site driveway on Broadway Street for all three alternatives. For Alternative 2C, Kiss 'n Ride and taxi vehicles would access the site along Depot Street via a combination of on-street parking and off street short-term parking areas. Bus traffic would access the site via bus pullouts along Broadway Street and bus only site access driveways along Depot Street.

4.1.2 Trip Generation

Vehicular traffic generated by the proposed Depot site was used to measure the impact of the proposed development on the study area intersections. Trip generation was completed using Amtrak ridership projections for 2035.

4.1.2.1 Intercity and Commuter Rail Ridership Projections

Morning and afternoon peak-hour boardings and alightings were used as the basis for projecting existing site-related vehicle trips to and from the site. Ridership projections are outlined in a project memorandum included in **Appendix E**. Ridership assumptions for the morning and afternoon peak hours included the following:

Future Intercity Assumptions

- 10 daily round trips (DRTs)
- Annual ridership of 969,000 passengers
- Daily ridership of 2,668 passengers
- Even distribution across DRTs
- One DRT service during each peak hour
- 50% boarding and 50% alighting
- Morning and afternoon peak-hour boardings of 133 passengers each peak-hour
- Morning and afternoon peak-hour alightings of 133 passengers each peak-hour
- 10% multimodal reduction, 10% vehicle occupancy reduction, and 5% pedestrian reduction

Future Commuter Rail Assumptions

- 15 daily DRTs
- Annual ridership of 395,000 passengers
- Daily ridership of 1,514 passengers
- 50% boarding and 50% alighting
- 20% of daily trips during each peak-hour
- Morning peak – 40% boarding, 60% alighting
- Afternoon peak – 60% boarding, 40% alighting
- Morning peak-hour – 121 boardings, 182 alightings(1)
- Afternoon peak-hour – 182 boardings, 121 alightings(1)
- 10% multimodal reduction, 10% vehicle occupancy reduction, and 5% pedestrian reduction

(1) Since commuter alightings involve rail passengers arriving to the train station in lieu of commuting by car, commuter alightings are not included in vehicle trip generation for the purposes of this study.

Source: URS Project Memorandum to Eli Cooper, City of Ann Arbor, September 8, 2014.

Table 7 summarizes the morning and afternoon peak-hour trip generation estimate for the proposed Depot site, with separate trip projections for intercity-related vehicle trips to/from the site and commuter rail related vehicle trips to/from the site.

TABLE 7
Trip Generation - Future Year (2035)
Depot Street Site

Trip Type	Trip Adjustments	Peak-hour Trips					
		Weekday Morning			Weekday Afternoon		
		Enter	Exit	Total	Enter	Exit	Total
Intercity [1]		133	133	266	133	133	266
	Less: Multimodal Reduction (10%)	-13	-13	-27	-13	-13	-27
	Less: Pedestrian Reduction (5%)	-7	-7	-13	-7	-7	-13
New Station Development - Intercity		**113**	**113**	**226**	**113**	**113**	**226**
	Vehicle Occupancy Reduction (10%)	-11	-11	-23	-11	-11	-23
Total New Vehicle Trips - Intercity		**102**	**102**	**204**	**102**	**102**	**204**
Commuter Rail [1]		121	0	121	0	121	121
	Less: Multimodal Reduction (10%)	-12	0	-12	0	-12	-12
	Less: Pedestrian Reduction (5%)	-6	0	-6	0	-6	-6
New Station Development – Commuter Rail		**103**	**0**	**103**	**0**	**103**	**103**
	Vehicle Occupancy Reduction (10%)	-10	0	-10	0	-10	-10
Total New Vehicle Trips - Commuter Rail		**93**	**0**	**93**	**0**	**93**	**93**
Total New Vehicle Site Trips: Intercity + Commuter Rail		**195**	**102**	**297**	**102**	**195**	**297**

Source: Amtrak

1. Boardings ('Enter') and alightings ('Exit'). Trip generation for commuter alightings are set at zero trips since commuters arriving at the Ann Arbor station will have initially parked at a different Amtrak station.

As shown in Table 7, the proposed Depot site is projected to generate 297 new trips (195 entering trips, 102 exiting trips) in the future year (2035) weekday morning peak-hour, and 297 new trips (102 entering trips, 195 exiting trips) in the future year (2035) weekday afternoon peak-hour. Sixty-nine percent (69%) of the total site trips in both the morning an afternoon peak-hours are intercity-related vehicle trips.

The proposed site is also anticipated to generate approximately 30 bus trips (15 entering, 15 exiting) during the weekday morning and afternoon peak-hours. The bus trips include Amtrak, Greyhound, University of Michigan (UM), and Ann Arbor Area Transportation Authority (AAATA) buses.

4.1.3 Trip Distribution and Traffic Assignment

Peak-hour traffic assignment for the Depot site was estimated from existing traffic patterns on study area roadways. The following trip distribution percentages were applied to the trips in Table 5 to assign the proposed site trips to the adjacent roadway network.

Traffic Distribution

- 40% to/from the west
  - 20% to/from Main Street
  - 10% to/from Barton Drive
  - 10% to/from Pontiac Trail
- 30% to/from the east
  - 15% to/from Plymouth Road, 15% from Fuller Road
- 30% to/from the south
  - 15% to/from East Huron Street
  - 15% from Division Street and 15% to Beakes Street

Future year (2035) peak-hour traffic assignments are shown in **Figure 5** (found at the end of report) for the anticipated new trips associated with the proposed Depot site.

Alternate 2A and 2B will generate more traffic at the proposed site driveway to Broadway Street as all vehicular traffic would enter/exit the site at the proposed driveway. For Alternate 2C, a portion of the vehicular trips would utilize Depot Street (Kiss 'n Ride and taxi). As Alternate 2A and 2B would generate more trips at the proposed site driveway along Broadway Street, these alternatives were utilized for the trip distribution and traffic assignment analysis.

4.1.4 Future Year (2035) Peak-Hour Traffic Volumes

Applying the above site trips to base year no build (2035) traffic volumes resulted in future year (2035) peak-hour volumes that include the site development, depicted in **Figure 6** (found at the end of report).

4.1.5 Traffic Countermeasures

Several intersections require traffic operational improvements to improve poor LOS. Following is a description of each traffic countermeasure.

Signal Timing Optimization

The signal timings at the study area intersections were optimized based on the anticipated traffic volumes. The most significant adjustment included increasing the existing cycle length for the three (3) signalized intersections along the Main Street (US 23BR) corridor from 90 seconds to 100 seconds during the morning peak-hour. The afternoon peak hour cycle length remained at 90 seconds.

Left-turn Lane Analysis at Site Driveway Intersection

A left-turn lane analysis on northbound Broadway Street was performed at the site driveway for future year (2035). The MDOT Traffic and Safety Note 605A, "Traffic Volume Guidelines for Left-Turn Lanes at Unsignalized Driveways" was applied to determine the need for a left-turn turn-lane at the site driveway intersection. The left-turn lane analysis revealed that a left-turn lane is needed on northbound Broadway Street at the driveway in both the morning and afternoon peak-hours. The left-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing left-turning traffic to exit the adjacent thru lane. **Appendix F** includes a graph illustrating the need for a left-turn lane.

Right-turn Lane Analysis at Site Driveway Intersection

A right-turn lane analysis was performed on southbound Broadway Street at the site driveway for future year (2035). The MDOT Traffic and Safety Note 604A, "Traffic Volume Guidelines for Right-Turn Lanes and Tapers" was applied to determine the need for a right-turn taper or right-turn turn-lane at the site driveway. The right-turn lane analysis revealed that a right-turn lane is needed on southbound Broadway Street at the driveway in the morning peak-hour. The right-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing right-turning traffic to exit the adjacent thru lane. Appendix F includes a graph illustrating the need for a right-turn lane.

Traffic Signal at Site Driveway

The proposed site driveway to Broadway Street was evaluated assuming stop sign control for the access driveway approach to Broadway Street. Under stop sign control, the access drive approach is anticipated to operate at LOS 'F' during the morning and afternoon peak-hours with significant delay and long queues. While a formal signal warrant study was not performed as part of this study, a traffic signal, including pedestrian crosswalks, would be required to maintain acceptable LOS on the site access drive exiting approach to Broadway Street.

4.1.6 Future Year (2035) Level-of-Service

The overall intersection LOS at the signalized intersections and the side-street approach LOS at the two-way STOP-controlled intersections are shown in **Table 8**.

TABLE 8
Future Year (2035) Intersections Level-of-Service
Depot Street Site

Intersection or Intersection Approach		Future Year (2035)			
		Morning Peak-hour		Afternoon Peak-hour	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Signalized Intersections – Overall					
Main St/Beakes St/Kingsley St		C	33.5	D	41.9
Main St/Summit St		B	16.1	B	10.9
Main St/Depot St		C	21.1	C	22.8
Broadway St/Swift St		C	30.8	B	17.4
Broadway St/Plymouth Rd/Maiden Ln		B	17.4	C	30.9
Plymouth Rd/Broadway St		A	3.3	A	8.5
Plymouth Rd/Barton Dr		C	24.4	B	13.5
Glen Ave/Huron St		C	24.3	C	26.7
Glen Ave/Ann St		B	10.3	B	12.5
Glen Ave/Catherine St		C	21.2	C	21.4
Glen Ave/Fuller Rd/Depot St		B	19.6	B	20.0
Fuller Rd/Maiden Ln/EMCD[1]		-	-	-	-
Fuller Rd/Cedar Bend Dr		A	4.0	A	6.6
Fuller Rd/Bonisteel Blvd		C	29.0	C	29.1
Pontiac Trail/Barton Dr		C	25.7	C	23.3
Broadway Street/Existing Station Site Driveway		A	4.7	A	7.5
Two-Way STOP-Controlled Intersection Approaches					
Depot St/Carey St	Northbound	F	68.9	C	16.9
Division St/Carey St	Westbound	B	13.4	B	12.1
Broadway St/Beakes St/Summit St/Detroit St	Westbound	D	31.6	C	21.6

Source: AECOM, October 2016
1. Analysis performed in previous intersection study report.

The future year (2035) conditions analysis, as summarized in Table 8, indicated that all but one study area intersection operate at Level-of-Service "D" or better under future year (2035) weekday morning and afternoon peak-hour conditions. Northbound Carey Street at the unsignalized Depot Street/Carey Street intersection operates at LOS "F" in the morning peak-hour, the same as under base year no build (2035) conditions. The future year (2035) with the Depot site station intersection capacity reports are included in **Appendix G.**

Movement-by-movement LOS values are depicted in Figure 6 for the future year (2035) weekday peak-hours for all study area intersections. Examination of Figure 6 reveals that movements at 10 study area intersections have at least one movement operating at LOS "E" or "F" under future year (2035) morning and afternoon peak-hour conditions. While the majority of the poorly operating movements at study area intersections are generally low volume movements where priority has been given to the high volume through movements, several of the poorly operating movements create significant queuing along the study area roadways as follows:

- The westbound right-turn movement at the Main Street/Depot Street intersection creates significant queuing along Depot Street during the afternoon peak-hour.
- The southbound left-turn movement at the Main Street/Depot Street intersection creates significant queuing along southbound Main Street during the morning peak-hour.
- All approaches to the Main Street/Beakes Street/Kingsley Street intersection experience significant queues during the morning and afternoon peak-hour.

The City of Ann Arbor has previously studied the intersection of Fuller Road/East Medical Center Drive/Maiden Lane for alternatives to increase the capacity of the intersection. As extensive analysis of the roundabout has been performed previously, an analysis of this intersection was not included in this study. The previous study accounted for future traffic growth, including the potential Ann Arbor Station. The results of the study showed the intersection would operate acceptably under the future (2035) conditions with the additional traffic generated by the proposed Ann Arbor Station. The roundabout is anticipated to operate at LOS "C" during the morning peak-hour and LOS "D" during the afternoon peak-hour.

4.1.6.1 Depot Street

As with the existing and base year (2035) no build conditions, two (2) movements at the Depot Street/Main Street intersection will continue to experience significant delay during both the morning and afternoon peak-hours as shown in **Table 9**.

The southbound left-turn movement from Main Street to Depot Street during the morning peak-hour is anticipated to operate at LOS "F" with a volume-to-capacity (v/c) ratio of 1.15. As the volume for the movement exceeds the capacity, the calculated 740-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. As with existing and base year (2035) no build conditions, this queue will likely create additional delay along southbound Main Street as vehicles waiting to turn left exceed the available 240-foot long turn lane and spill back into the adjacent thru lane, blocking southbound thru traffic.

The westbound right-turn movement during the afternoon peak-hour is anticipated to operate at LOS "F" with a volume-to-capacity (v/c) ratio of 1.09. As the volume for the movement exceeds the capacity, the calculated 550-foot queue is theoretically infinite and represents the anticipated queue after two (2) cycle lengths. As with the existing conditions, this queue will likely exceed 550 feet and extend as far east as the existing station site creating delay for both automobile and bus traffic using the existing site.

For Alternate 2C, additional trips would access the site via Main Street, Fuller Road, and/or Carey Street as the short-term parking, Kiss n' Ride, and taxi traffic will be located along Depot Street. The additional trips would increase the congestion along the Depot Street corridor. The average delay for the poorly operating (LOS "F") northbound Carey Street approach to Depot Street during the morning peak-hour would worsen as a result of the additional traffic. Additional delay and queuing at the Main Street/Depot Street intersection would increase with Alternate 2C compared to Alternate 2A and 2B.

TABLE 9
Main Street/Depot Street Future Year (2035) Levels-of-Service – Depot Site

Movement	Morning Peak-hour				Afternoon Peak-hour			
	LOS	Delay (sec/veh)	v/c Ratio	95th Queue (feet)	LOS	Delay (sec/veh)	v/c Ratio	95th Queue (feet)
Main St/Depot St								
NBT/R	A	2.3	0.57	6	B	13.4	0.78	286
SBT	A	4.3	0.55	180	A	3.0	0.27	63
SBL (240' Turn Lane)	**F**	**104.7**	**1.15**	**738**[1]	C	25.7	0.65	146
WBL	D	45.9	0.33	65	D	49.1	0.74	106
WBR	B	18.0	0.20	58	**F**	**87.0**	**1.09**	**552**[1]
Overall	C	28.1	**1.16**	-	C	28.5	**1.05**	-

Source: AECOM, October 2016
1. The traffic volume exceeds movement capacity, queue is theoretically infinite.

4.1.7 Transit Bus Service

The AAATA operates one (1) existing AAATA bus route (Route 21) that serves the site directly, providing service between the site and the Blake Transit Center. While a final determination of the increased bus service to the site has yet to be determined, it is anticipated that bus service to the site will increase with the increased inter-city train service and the commuter rail service. Additional routes and more frequent stops at the station are anticipated along Depot Street and at new bus stops constructed along Broadway Street.

While the UM bus service does not currently serve the existing station, the UM has expressed interest in providing a bus route that would connect the station site to the Central Campus Transit Center. This new bus route would most likely access the site via Fuller Road and Depot Street.

A portion of the increased bus traffic to the proposed Depot site will access the site along Depot Street via the two site driveways (one entrance, one exit) for all Alternate 2 options. Given the high volume of traffic along Depot Street and the impact the poorly operating movements at the Main Street/Depot Street intersection have on the corridor during the morning and afternoon peak-hours, bus traffic would experience significant delays entering and exiting the site at the Depot Street site driveways.

4.1.8 Future Year (2035) Broadway Street Mid-Block Pedestrian Crossing

The proposed site plan for the Depot site option includes a proposed crosswalk on Broadway Street at the west end of the Broadway Street bridge (see site plan options in Appendix A). As the City of Ann Arbor ordinance requires vehicles to yield to pedestrians waiting to cross the street, pedestrians will likely create some delay to traffic along Broadway Street. The number of pedestrians anticipated to utilize the crossing were not quantified as part of the traffic study, however a sensitivity analysis was performed to determine the impact the crossing may have on Broadway Street traffic. It is anticipated that the mid-block pedestrian crossing will be unsignalized, but include pedestrian crossing features such as a Rectangular Rapid Flashing Beacon (RRFB). The existing sight distance at the proposed crossing location should also be verified during the design phase of the project due to the horizontal and vertical curvature of Broadway Street.

As the HCM does not have a procedure for analyzing the delay due to vehicles yielding the right-of-way to pedestrians, a microsimulation of an actuated traffic signal was used to approximate the vehicular delay that would be created by pedestrians. The "traffic signal" was timed such that it would immediately provide a walk indication for pedestrians in response to a pedestrian pressing the pedestrian push-button. The minimum green time for Broadway Street vehicle traffic was also set to three (3) seconds to allow repeated pedestrian button activation to be serviced immediately. The signal would rest in green for Broadway Street in the absence of any pedestrian calls.

To quantify the anticipated delay created by pedestrians crossing Broadway Street, it was assumed that 133 pedestrians would utilize the crosswalk during the morning and afternoon peak-hours. The value of 133 was chosen as it represents the threshold where the pedestrian signal warrant within the MMUTCD would be met. This value would be considered conservative as it is likely the actual volume of pedestrians using the crosswalk would be lower. The analysis for the crosswalk was performed by a microsimulation analysis utilizing the *SimTraffic* software. **Table 10** shows the result of the microsimulation analyses. The detailed reports of the mid-block crossing analyses are included in Appendix G.

TABLE 10
Broadway Street Mid-Block Crossing Average Delay
Depot Street Site

Methodology	Future Year (2035)			
	Morning Peak-hour		Afternoon Peak-hour	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
SimTraffic Microsimulation	B	14.5	B	12.3

Source: AECOM, October 2016

As shown in Table 10, the mid-block pedestrian crossing is not anticipated to have a significant impact to vehicles along Broadway Street. If the pedestrian volumes reach the level to warrant the installation of a pedestrian signal, the average delay for vehicles along Broadway Street would likely decrease as the signal would be coordinated with other signals along the corridor allowing dedicated green time to Broadway Street vehicular traffic while pedestrians queue on the sidewalk.

4.2 Fuller Road Site

4.2.1 Site Access

For sites with more than one site driveway, Amtrak guidelines stipulate that transit access to the station should be prioritized over private automobile access, including transit connections to the city bus system and other transit (e.g. UM transit) as close to the main entrance of the station as possible.

Site access will be solely via Fuller Road with two right-in/right-out driveways and directional crossovers on Fuller Road. Based on the Amtrak guidelines, the west driveway will be a right-in/right out entrance/exit driveway for buses only and the east site driveway will be will be a right-in/right out entrance/exit driveway for passenger vehicles. Site access for taxis, shuttle service, and Kiss n' Ride access will be also exclusively use the east driveway.

4.2.2 Trip Generation

Vehicular traffic generated by the proposed Depot site was used to measure the impact of the proposed development on the study area intersections. Trip generation was completed using Amtrak ridership projections for 2035.

4.2.2.1 Intercity and Commuter Rail Ridership Projections

Intercity and commuter rail ridership projections for the Fuller site are the same as for the Depot site (see Section 4.1.2.1). The only difference between trip generation for the two sites is that for the Fuller site, the pedestrian reduction is 20% for the Fuller site (versus 5% for the Depot site), resulting in slightly lower trip generation for the Fuller site. The Fuller site includes bus trips (Amtrak, Greyhound, UM, and AAATA), estimated at 15 entering and 15 exiting trips in the morning and afternoon peak hours.

Table 11 summarizes the morning and afternoon peak-hour trip generation estimate for the proposed Fuller Road site, with separate trip projections for intercity-related vehicle trips to/from the site and commuter rail related vehicle trips to/from the site.

TABLE 11
Trip Generation – Future Year (2035)
Fuller Road Site

Trip Type	Trip Adjustments	Peak-hour Trips					
		Weekday Morning			Weekday Afternoon		
		Enter	Exit	Total	Enter	Exit	Total
Intercity [1]		133	133	266	133	133	266
	Less: Multimodal Reduction (10%)	-13	-13	-27	-13	-13	-27
	Less: Pedestrian Reduction (20%)	-27	-27	-53	-27	-27	-53
New Station Development - Intercity		**93**	**93**	**186**	**93**	**93**	**186**
	Vehicle Occupancy Reduction (10%)	-9	-9	-19	-9	-9	-19
Total New Vehicle Trips - Intercity		**84**	**84**	**168**	**84**	**84**	**168**
Commuter Rail [1]		121	0	121	0	121	121
	Less: Multimodal Reduction (10%)	-12	0	-12	0	-12	-12
	Less: Pedestrian Reduction (20%)	-24	0	-24	0	-24	-24
New Station Development - Commuter Rail		**85**	**0**	**85**	**0**	**85**	**85**
	Vehicle Occupancy Reduction (10%)	-8	0	-8	0	-8	-8
Total New Vehicle Trips - Commuter Rail		**76**	**0**	**76**	**0**	**76**	**76**
Total New Vehicle Site Trips: Intercity + Commuter Rail		**160**	**84**	**244**	**84**	**160**	**244**
AATA, UM, and Intercity Buses		**15**	**15**	**30**	**15**	**15**	**30**
Total Site Trips		**175**	**99**	**274**	**99**	**175**	**274**

(1) AM Boardings and AM alightings
Source: Amtrak

As shown in Table 11, the proposed Fuller site is projected to generate 274 new trips (175 entering trips, 99 exiting trips) in the future year (2035) weekday morning peak-hour, and 274 new trips (99 entering trips, 175 exiting trips) in the future year (2035) weekday afternoon peak-hour. Sixty-one percent (61%) of the total site trips in both the morning an afternoon peak-hours are intercity-related vehicle trips.

The proposed site is also anticipated to generate approximately 30 bus trips (15 entering, 15 exiting) during the weekday morning and afternoon peak-hours. The bus trips include Amtrak, Greyhound, University of Michigan (UM), and Ann Arbor Area Transportation Authority (AAATA) buses.

4.2.3 Trip Distribution and Traffic Assignment

Peak-hour traffic assignment for the Depot site was estimated from existing traffic patterns on study area roadways. The following trip distribution percentages were applied to the trips in Table 8 to assign the proposed site trips to the adjacent roadway network.

<u>Traffic Distribution</u>

- 40% to/from the west
  - 20% to/from Main Street
  - 10% to/from Barton Drive
  - 10% to/from Pontiac Trail
- 30% to/from the east
  - 25% to/from Fuller Road
  - 5% to/from Plymouth Road
- 30% to/from the south
  - 15% to/from East Huron Street
  - 15% from Division Street and 15% to Beakes Street

Future year (2035) peak-hour traffic assignments are shown in **Figure 7** (found at the end of report) for the anticipated new trips associated with the proposed Fuller Road site.

4.2.4 Future Year (2035) Peak-Hour Traffic Volumes

Applying the above site trips to base year no build (2035) traffic volumes resulted in future year (2035) peak-hour volumes that include the site development, depicted in **Figure 8** (found at the end of report).

4.2.5 Traffic Countermeasures

Several intersections require traffic operational improvements to improve poor LOS. Following is a description of each traffic countermeasure.

<u>Signal Timing Optimization</u>

The signal timings at the study area intersections were optimized based on the anticipated traffic volumes. The most significant adjustment included increasing the existing cycle length for the three (3) signalized intersections along the Main Street (US 23BR) corridor from 90 seconds to 100 seconds during the morning peak-hour. The afternoon peak hour cycle length remained at 90 seconds.

<u>Right-turn Lane Analysis at New Site Driveway Intersection</u>

A right-turn lane analysis was performed on eastbound Fuller Road at the new site east driveway for future year (2035). The MDOT Traffic and Safety Note 604A, "Traffic Volume Guidelines for Right-Turn Lanes and Tapers" was applied to determine the need for a right-turn taper or right-turn turn-lane at the site driveway. The right-turn lane analysis revealed that a right-turn lane is needed on eastbound Fuller Road at the driveway in both the morning and afternoon peak-hours. **Appendix H** includes a graph illustrating the need for a right-turn lane.

Fuller Road Crossovers

Based on the proposed location of the driveways to the Fuller Road site, the existing crossovers located along Fuller Road would need to be relocated to accommodate the anticipated site traffic. **Figure 9** (found at the end of report) shows the recommended relocation of the Fuller Road crossovers.

4.2.6 Future Year (2035) Level-of-Service

The overall intersection LOS at the signalized intersections and the side-street approach LOS at the two-way STOP-controlled intersections for the Fuller Road site alternative are shown in **Table 12**.

TABLE 12
Future Year (2035) Intersections Level-of-Service (Fuller Site)

Intersection or Intersection Approach		Future Year (2035)			
		Morning Peak-hour		Afternoon Peak-hour	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Signalized Intersections – Overall					
Main St/Beakes St/Kingsley St		C	32.3	D	41.7
Main St/Summit St		C	16.1	B	10.9
Main St/Depot St		D	20.3	C	21.5
Broadway St/Swift St		C	30.2	B	17.3
Broadway St/Plymouth Rd/Maiden Ln		B	17.4	C	31.6
Plymouth Rd/Broadway St		A	3.3	A	8.6
Plymouth Rd/Barton Dr		C	24.5	B	14.1
Glen Ave/Huron St		C	24.3	C	27.5
Glen Ave/Ann St		B	10.2	B	12.3
Glen Ave/Catherine St		C	21.5	C	21.6
Glen Ave/Fuller Rd/Depot St		B	19.8	B	21.1
Fuller Rd/Maiden Ln/EMCD		-	-	-	-
Fuller Rd/Cedar Bend Dr		A	4.0	A	6.6
Fuller Rd/Bonisteel Blvd		C	29.1	C	29.3
Pontiac Trail/Barton Dr		C	25.5	C	22.8
Two-Way STOP-Controlled Intersection Approaches					
Depot St/Carey St	Northbound	F	75.1	C	17.6
Division St/Carey St	Westbound	B	12.2	B	11.6
Broadway St/Beakes St/Summit St/Detroit St	Westbound	D	30.0	C	20.0
Fuller Road/Proposed West Driveway	Northbound	A	9.0	A	10.0
	Southbound	B	10.5	B	12.2
Fuller Road/Fuller Pool Driveway	Southbound	B	12.4	B	13.2
Fuller Road/Proposed East Driveway	Northbound	B	10.0	B	12.1
Fuller Road/Proposed Crossover	Northbound	B	13.4	B	12.3

Source: AECOM, October 2016
1. Analysis performed in previous intersection study report.

The future year (2035) conditions analysis, as summarized in Table 12, indicated that all but one study area intersection operates at Level-of-Service “D” or better under future year (2035) weekday morning and afternoon peak-hour conditions. Northbound Carey Street at the unsignalized Depot Street/Carey Street intersection operates at LOS “F” in the morning peak-hour, the same as under base year no build (2035) conditions. The future year (2035) for the Fuller station site intersection capacity reports are included in **Appendix I**.

Movement-by-movement LOS values are depicted in Figure 8 for the future year (2035) weekday peak-hours for all study area intersections. Examination of Figure 8 reveals that movements at 10 study area intersections have at least one movement operating at LOS “E” or “F” under future year (2035) morning and afternoon peak-hour conditions. While the majority of the poorly operating movements are generally low volume movements where priority has been given to the high volume through movements, several of the poorly operating movements create significant queuing along the study area roadways as follows:

- The westbound right-turn movement at the Main Street/Depot Street intersection creates significant queuing along Depot Street during the afternoon peak-hour. The queue often extends past the existing Amtrak site to the Broadway Street bridge and Carey Street. It is anticipated that less traffic would utilize Depot Street to access the site with the station located on Fuller Road as compared to the Depot site.
- The southbound left-turn movement at the Main Street/Depot Street intersection creates significant queuing along southbound Main Street during the morning peak-hour. The queue often extends past the available left-turn lane creating additional delay for southbound Main Street thru traffic. It is anticipated that less traffic would utilize Depot Street to access the site with the station located on Fuller Road as compared to the Depot site.
- All approaches to the Main Street/Beakes Street/Kingsley Street intersection experience significant queues during the morning and afternoon peak-hour. It is anticipated that significantly less traffic would utilize Beakes Street to access the site with the station located on Fuller Road as compared to the Depot site.

The City of Ann Arbor has previously studied the intersection of Fuller Road/East Medical Center Drive/Maiden Lane for alternatives to increase the capacity of the intersection. As extensive analysis of the roundabout has been performed previously, an analysis of this intersection was not included in this study. The previous study accounted for future traffic growth, including the potential Ann Arbor Station. The results of the study showed the intersection would operate acceptably under the future (2035) conditions with the additional traffic generated by the proposed Ann Arbor Station. The roundabout is anticipated to operate at LOS “C” during the morning peak-hour and LOS “D” during the afternoon peak-hour.

4.2.7 Transit Bus Service

The AAATA route (Route 21) serving the existing station site would be reconfigured to provide direct access to/from the Blake Transit Center and the proposed Fuller site. While a final determination of the increased bus service to the site has yet to be determined, it is anticipated that bus service to the site will increase with the increased inter-city train service and the commuter rail service. The AAATA currently operates five (5) additional bus routes that travel adjacent to the proposed Fuller site location. These bus routes have the potential to also provide service to the Fuller site via the proposed site driveways along Fuller Road.

While the UM bus service does not currently serve the existing station, the UM has expressed interest in providing service to the proposed station. The UM currently operates approximately twelve (12) bus routes within the City of Ann Arbor. Eleven (11) of these routes operate along Fuller Road adjacent to the proposed Fuller site and have the potential to provide service to the proposed station via the proposed site driveways along Fuller Road.

4.3 Conclusions and Recommendations

Based on the analyses performed in this study, the proposed Ann Arbor Station is anticipated to have minor impacts to the study area intersections. The findings of the study are as follows:

4.3.1 Conclusions

Base Year No Build (2035) Conditions

- Assuming the existing Depot Street station increased service as anticipated and no improvements were made to the Main Street/Depot Street intersection or the Depot Street corridor, the base year no build (2035) alternative would provide insufficient site access for automobile and bus traffic utilizing the site. The increased vehicle trips along Depot Street would increase the existing congestion and create adverse impacts to customer access, including Kiss ‘n Ride, bus and taxi traffic.

- Significant improvements along Depot Street and at the Main Street/Depot Street intersection would be required to mitigate the existing and base year (2035) conditions. These improvements would likely be required to provide acceptable access for automobile and bus traffic to the existing site.

- The proposed roundabout identified in the City Capital Improvement Program at the Fuller Road/EMCD/Maiden Lane intersection would operate acceptably under base year (2035) conditions based on the results of the previous study and analysis performed. The roundabout is anticipated to operate at LOS “C” during the morning peak-hour and LOS “D” during the afternoon peak-hour.

Future Year (2035) Conditions - Depot Site

- The proposed Depot site is projected to generate 297 new trips (195 entering trips, 102 exiting trips) in the future year (2035) weekday morning peak-hour, and 297 new trips (102 entering trips, 195 exiting trips) in the future year (2035) weekday afternoon peak-hour. Sixty-nine percent (69%) of the total site trips in both the morning an afternoon peak-hours are intercity-related vehicle trips.

Broadway Street

- A left-turn lane analysis revealed that a left-turn lane is needed on northbound Broadway Street at the driveway in both the morning and afternoon peak-hours. The left-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing left-turning traffic to exit the adjacent thru lane.

- The right-turn lane analysis revealed that a right-turn lane is needed on southbound Broadway Street at the driveway in the morning peak-hour. The right-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing right-turning traffic to exit the adjacent thru lane.

- Under stop sign control, the Broadway Street access drive approach is anticipated to operate at LOS ‘F’ during the morning and afternoon peak-hours in future year (2035) with significant delay and long queues. The overall intersection is anticipated to operate at LOS “A” under signal control during the morning and afternoon peak-hours.

- The mid-block pedestrian crossing on Broadway Street is not anticipated to have a significant impact to vehicular delay.

- The proposed bus staging area along Broadway Street will require widening to the Broadway Street bridge.

Depot Street

- Automobile and bus traffic utilizing Depot Street to access the site would experience significant delay entering and exiting the site due to the high traffic volumes along Depot Street, particularly during the morning and afternoon peak-hours.

Future Year (2035) Conditions - Fuller Site

- The proposed Fuller site is projected to generate 274 new trips (175 entering trips, 99 exiting trips) in the future year (2035) weekday morning peak-hour, and 274 new trips (99 entering trips, 175 exiting trips) in the future year (2035) weekday afternoon peak-hour. Sixty-one percent (61%) of the total site trips in both the morning an afternoon peak-hours are intercity-related vehicle trips.

- A right-turn lane analysis revealed that a right-turn lane is needed on eastbound Fuller Road at the east site driveway in both the morning and afternoon peak-hours. The right-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing right-turning traffic to exit the adjacent thru lane.

- A right-turn lane analysis revealed that a right-turn lane is not needed on eastbound Fuller Road at the west site driveway based on the anticipated bus traffic volumes in both the morning and afternoon peak-hours. As bus traffic generally makes turning movements at slower speeds, a right-turn lane should be constructed to remove the bus traffic from the through lane. The right-turn lane will decrease the likelihood of rear-end type crashes at the proposed site driveway by allowing right-turning bus traffic to exit the adjacent thru lane.

- The proposed stop-controlled driveway approaches to Fuller Road are anticipated to operate at LOS "B" or better during the morning and afternoon peak-hours assuming the recommendations outlined in this report are implemented.

- The proposed roundabout identified in the City Capital Improvement Program at the Fuller Road/EMCD/Maiden Lane intersection would operate acceptably under future year (2035) conditions with the proposed station located on Fuller Road based on the results of the previous study and analysis performed. The roundabout is anticipated to operate at LOS "C" during the morning peak-hour and LOS "D" during the afternoon peak-hour.

4.3.2 Recommendations

Future Year (2035) Conditions - Depot Site

- While a formal signal warrant study was not performed as part of this study, a traffic signal would be required to maintain acceptable LOS on the site access drive exiting approach to Broadway Street. The traffic signal should include pedestrian crosswalks on all approaches to the intersection.

- The signal timings at the study area intersections were optimized based on the anticipated traffic volumes. The most significant adjustment included increasing the existing cycle length for the three (3) signalized intersections along the Main Street (US-23BR) corridor from 90 seconds to 100 seconds during the morning peak-hour. The afternoon peak hour cycle length remained at 90 seconds.

- A northbound left-turn lane is needed at the proposed site driveway on Broadway Street, including a 250-foot left-turn bay length.

- A southbound right-turn lane is needed at the proposed site driveway on Broadway Street, including a 250-foot right-turn bay length.

- Appropriate mid-block crossing treatment should be constructed at the proposed crosswalk along Broadway Street, which would include pedestrian crossing signage and/or a Rectangular Rapid Flashing Beacon (RRFB). Sight distance for the proposed mid-block pedestrian crossing location should be verified.

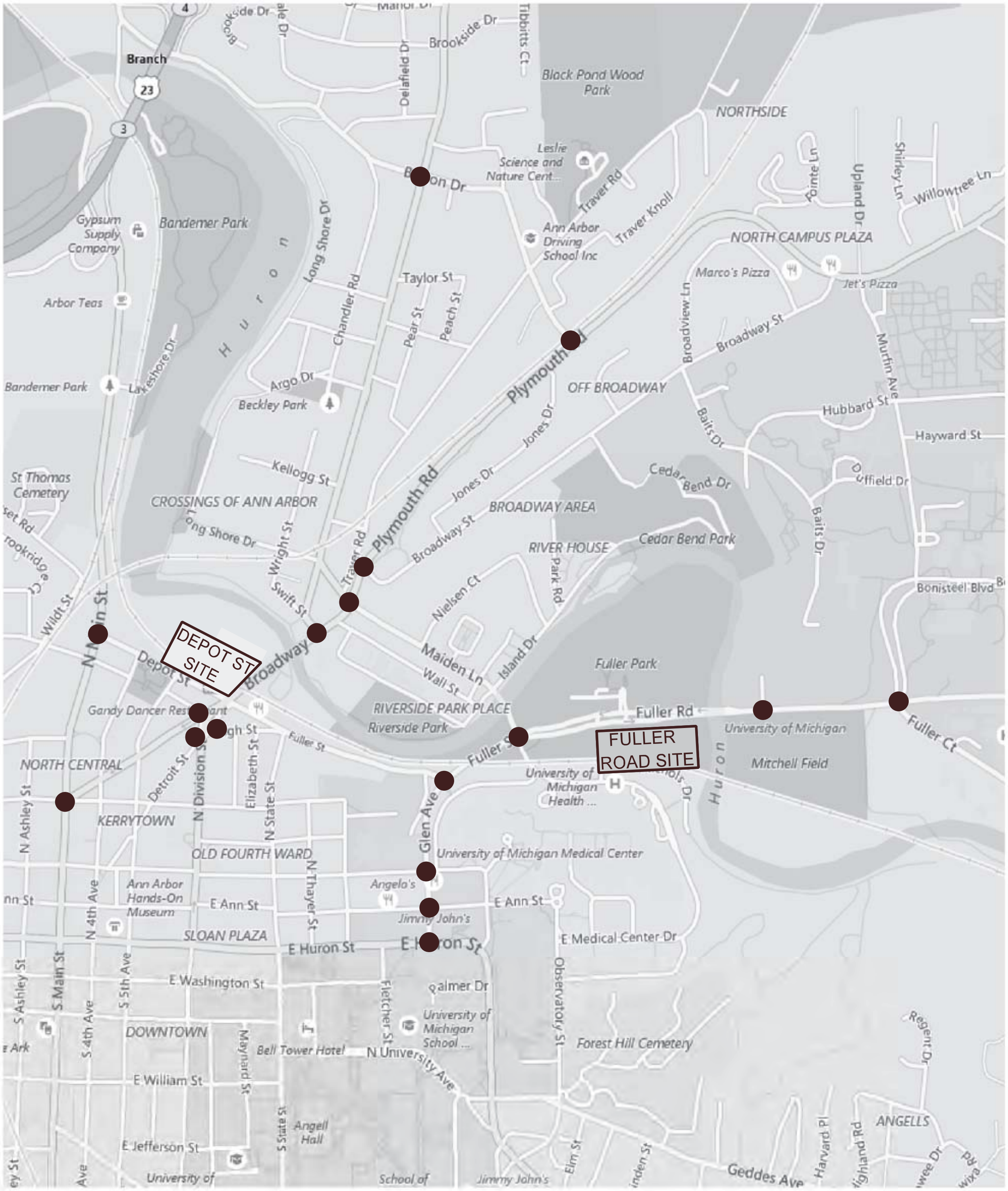
Future Year (2035) Conditions - Fuller Site

- The signal timings at the study area intersections were optimized based on the anticipated traffic volumes. The most significant adjustment included increasing the existing cycle length for the three (3) signalized intersections along the Main Street (US 23BR) corridor from 90 seconds to 100 seconds during the morning peak-hour. The afternoon peak hour cycle length remained at 90 seconds.

- A right-turn lane is needed at the site east driveway, including a 250-foot right-turn bay length.

- A right-turn lane is needed at the site west driveway, including a 250-foot right-turn bay length.

- The existing Fuller Road crossovers should be relocated as shown on Figure 9, including a 250-foot left-turn bay at each crossover. The geometric layout of the crossovers should be designed to Michigan Department of Transportation and City of Ann Arbor standards and accommodate bus turning movements. This may require the construction of additional pavement (loons) opposing the crossovers.



SOURCE: YAHOO MAPS

LEGEND
● - EXISTING STUDY AREA INTERSECTIONS

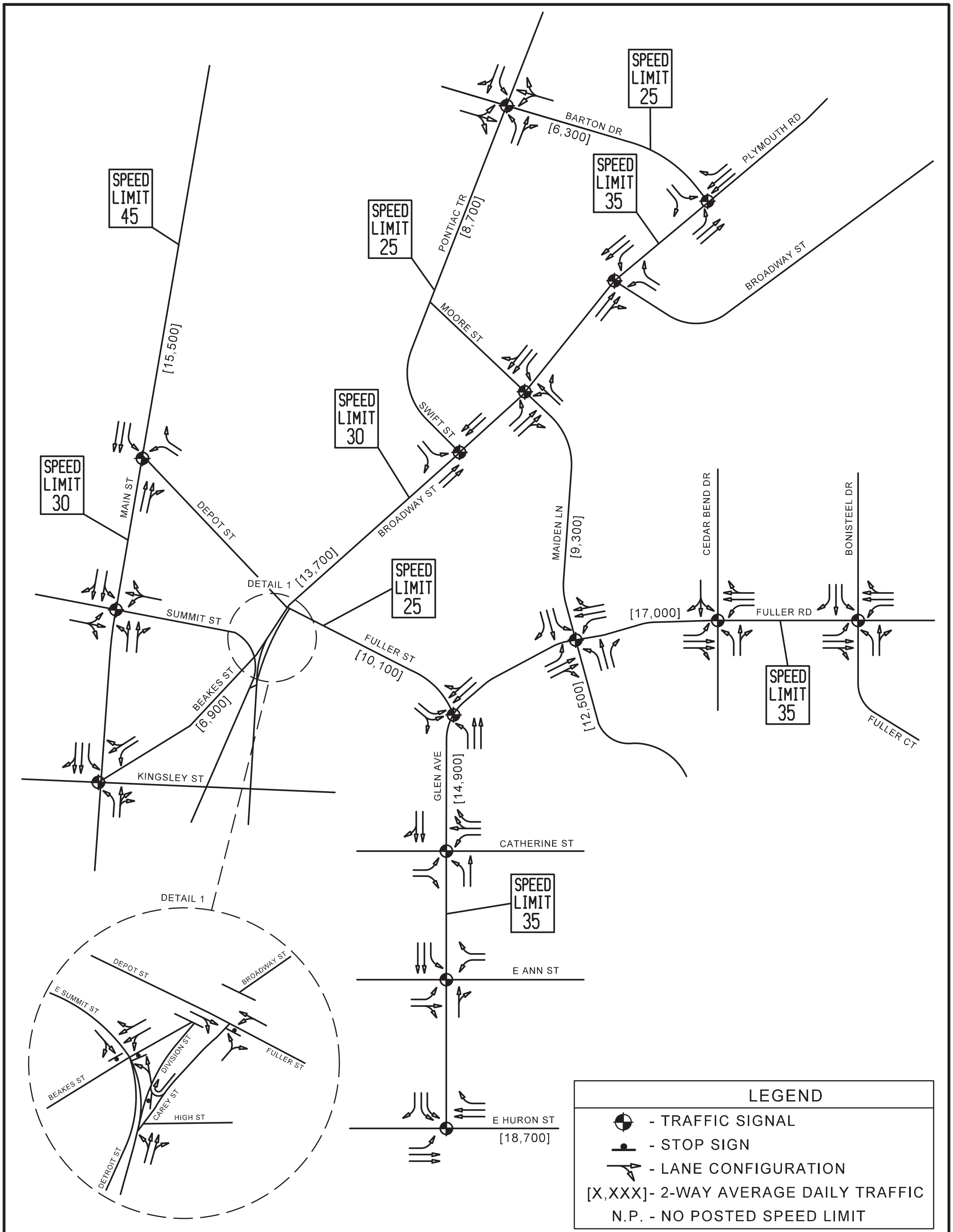
ANN ARBOR STATION TRANSPORTATION IMPACT STUDY

Ann Arbor AECOM

STUDY AREA AND SITE LOCATIONS

FIGURE 1

M:\Project\44234\Task 4 Environmental Review-4.4Environmental Documentation\Traffic\CAD-1_STUDY AREA AND SITE LOCATIONS



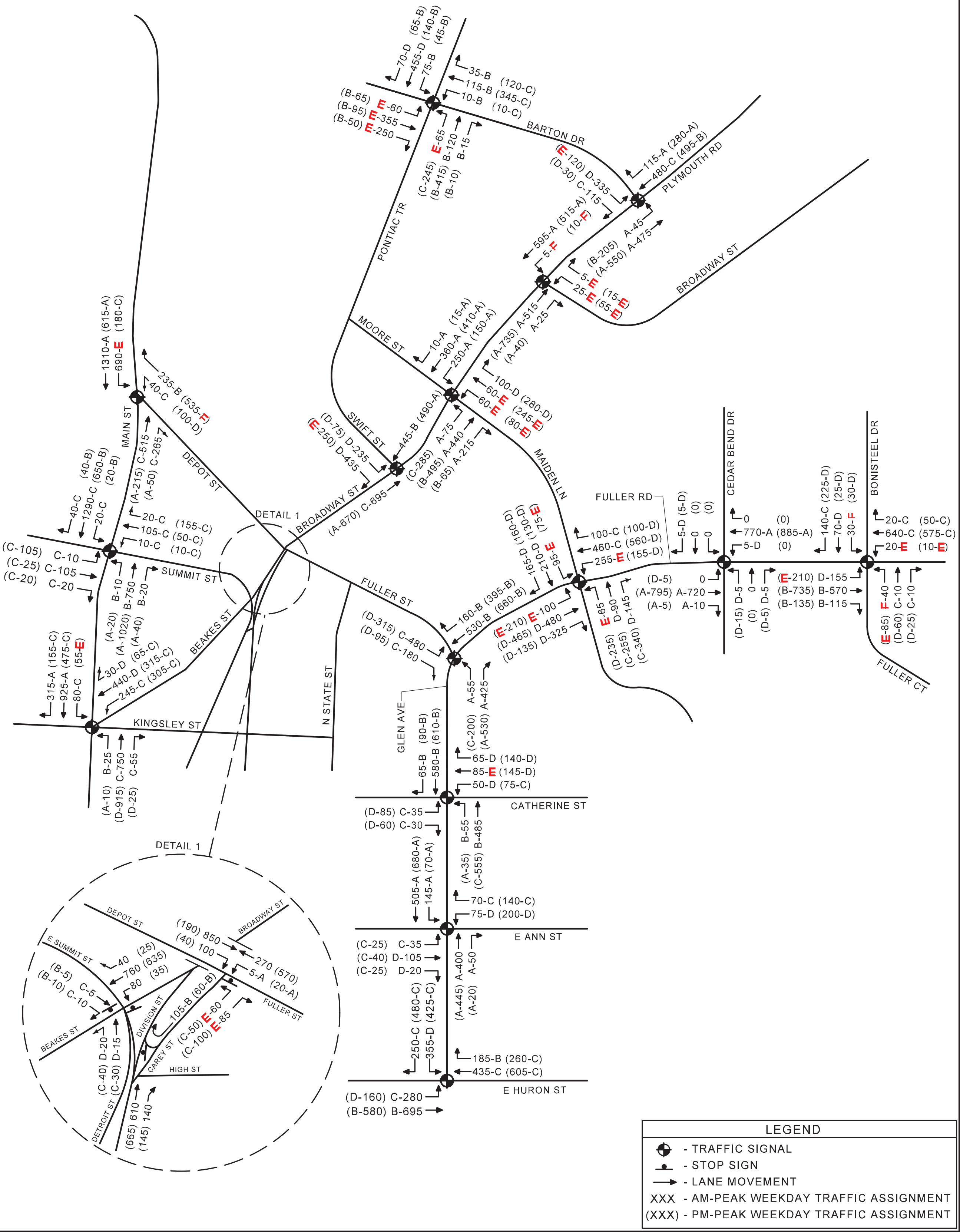
ANN ARBOR STATION TRANSPORTATION IMPACT STUDY

Ann Arbor AECOM

EXISTING TRAFFIC OPERATIONS

FIGURE 2

M:\Project\44234\Task 4 Environmental Review-4.4Environmental Documentation\Traffic\CAD-2_EXISTING TRAFFIC OPERATIONS



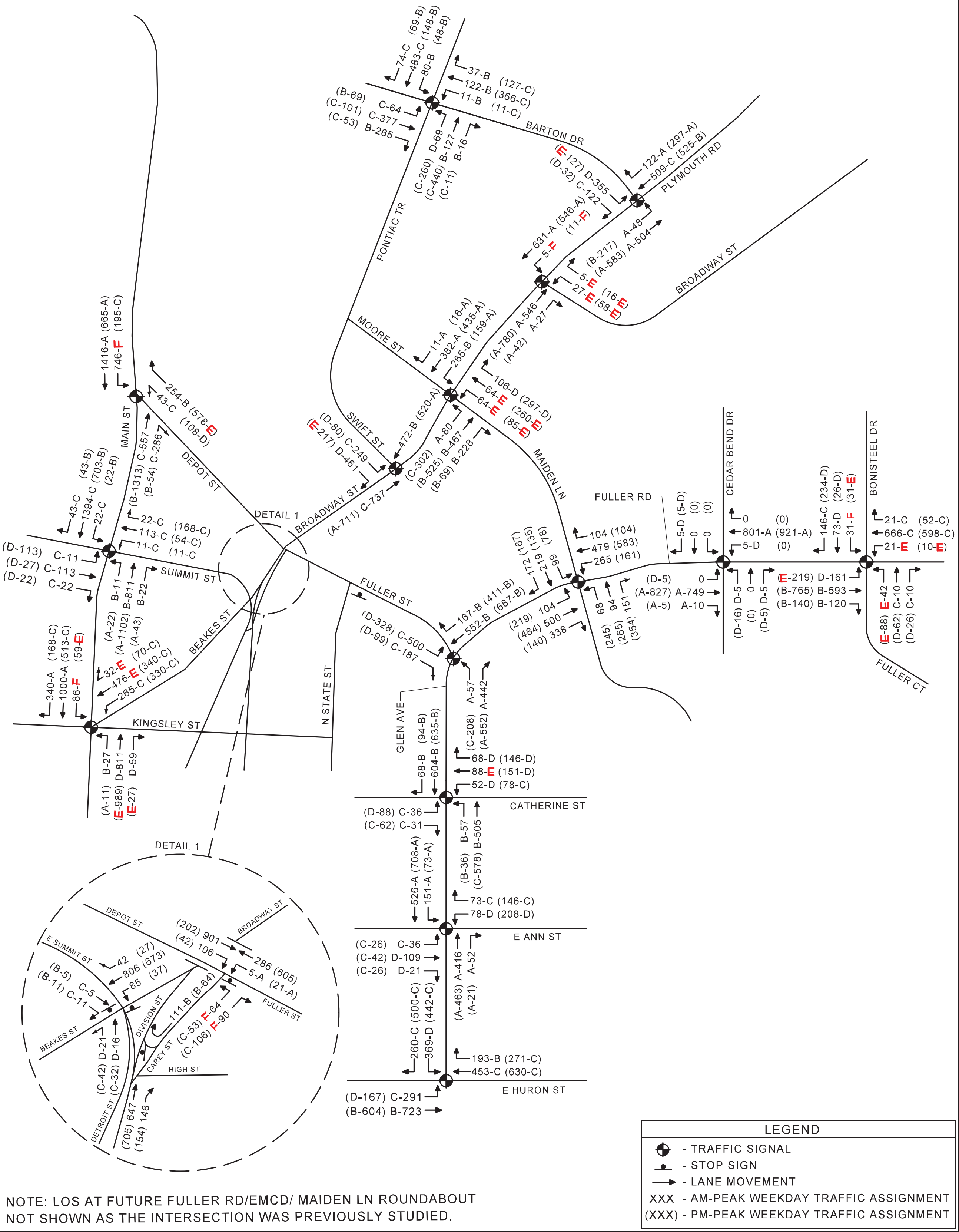
ANN ARBOR STATION TRANSPORTATION IMPACT STUDY

Ann Arbor AECOM

EXISTING (2016) PEAK-HOUR VOLUMES AND LEVEL OF SERVICE

FIGURE 3

M:\Project\44234\Task 4 Environmental Review-4.4Environmental Documentation\Traffic\CADD-3_EXISTING (2016) PEAK-HOUR VOLUMES AND LEVEL OF SERVICE



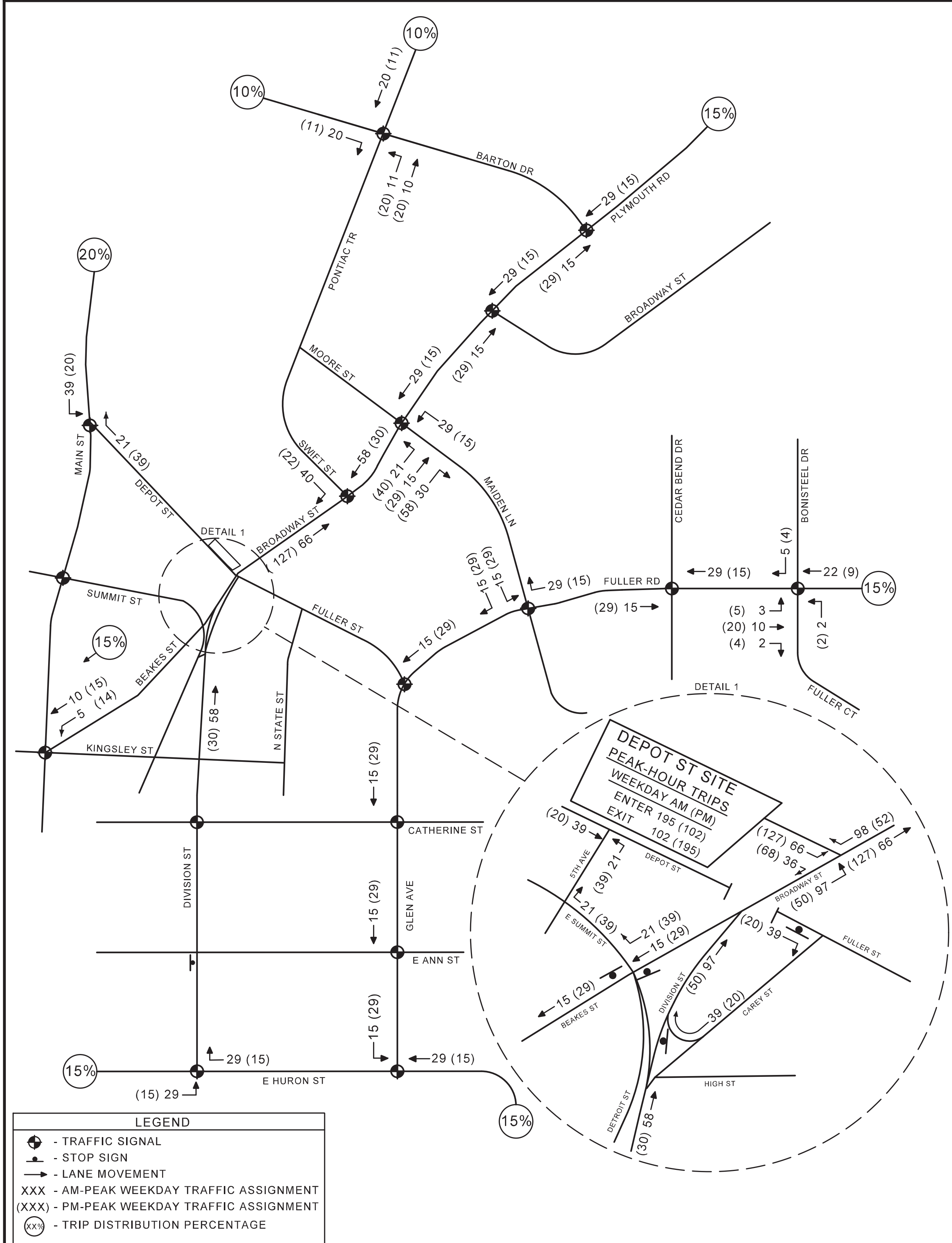
NOTE: LOS AT FUTURE FULLER RD/EMCD/ MAIDEN LN ROUNDABOUT NOT SHOWN AS THE INTERSECTION WAS PREVIOUSLY STUDIED.

ANN ARBOR STATION TRANSPORTATION IMPACT STUDY

Ann Arbor AECOM

BASE YEAR (2035) PEAK-HOUR VOLUMES AND LEVEL OF SERVICE

FIGURE 4



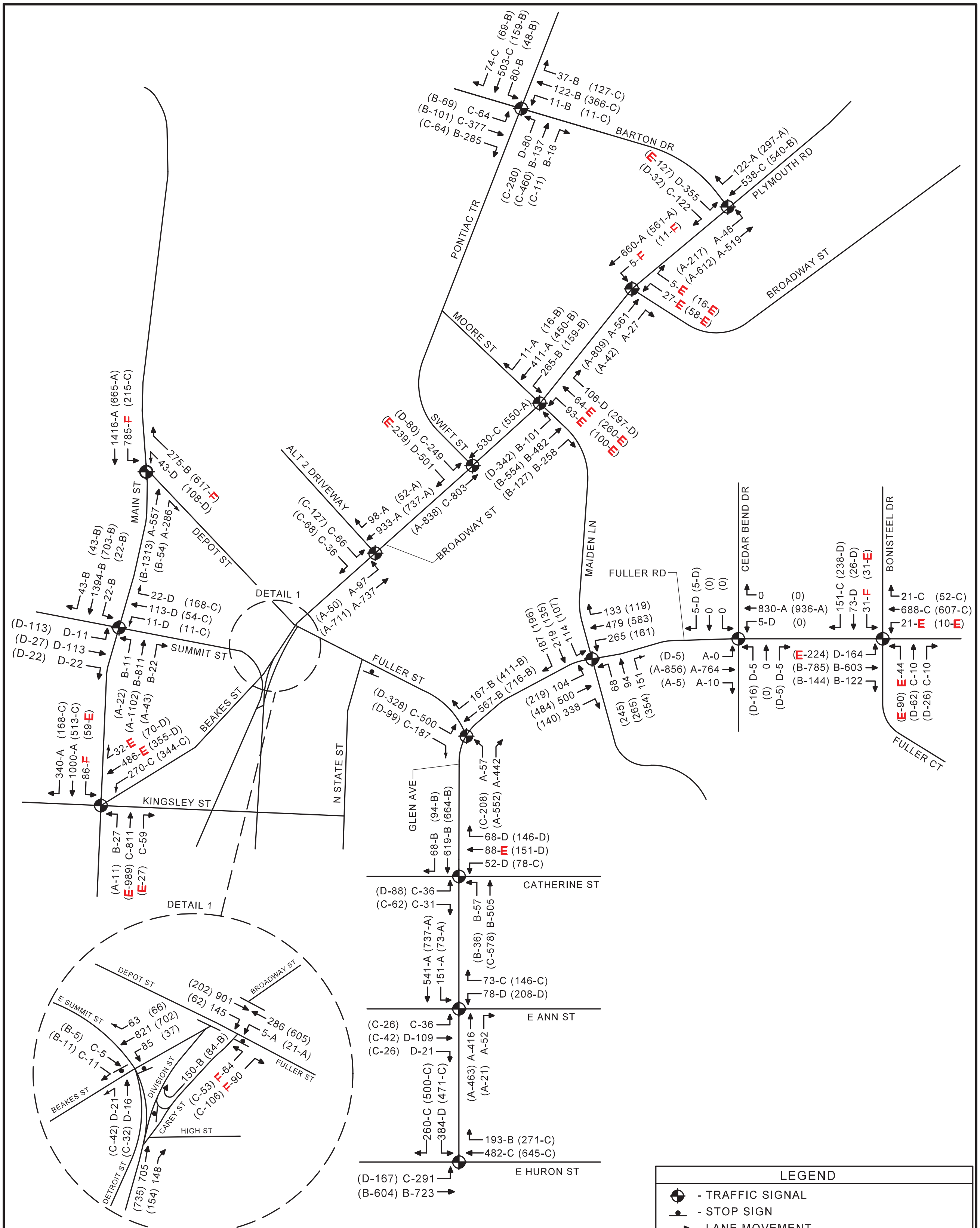
ANN ARBOR STATION TRANSPORTATION IMPACT STUDY

Ann Arbor AECOM

FUTURE YEAR (2035) PEAK-HOUR SITE TRIP DISTRIBUTION AND TRAFFIC ASSIGNMENT-DEPOT ST SITE

FIGURE 5

M:\Projects\60397780-12944234\Task 4 Environmental Review-4 Environmental Documentation\Traffic\CADD-5_FUTURE YEAR (2035) PEAK-HOUR SITE TRIP DISTRIBUTION AND TRAFFIC ASSIGNMENT-DEPOT ST SITE



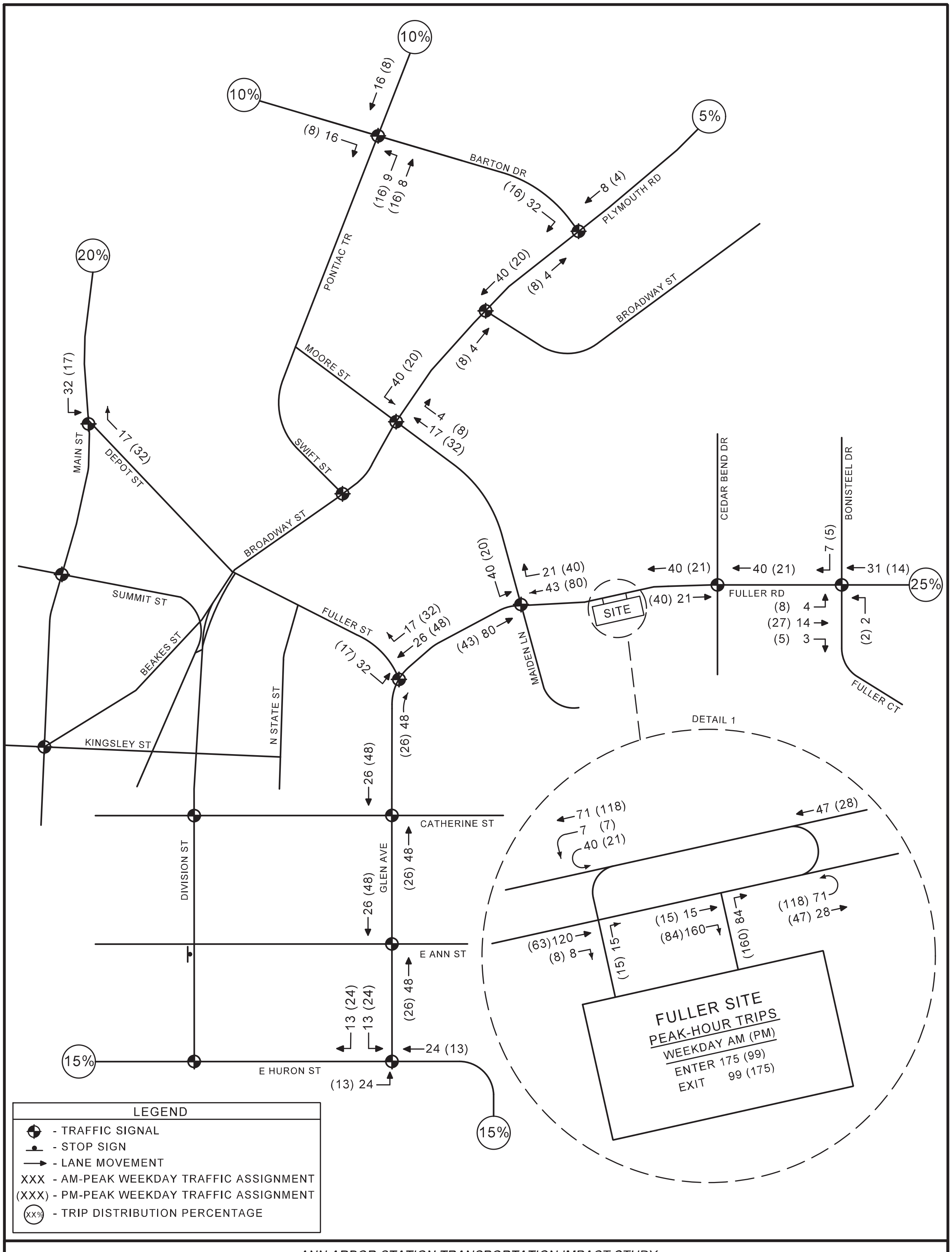
NOTE: LOS AT FUTURE FULLER RD/EMCD/ MAIDEN LN ROUNDABOUT NOT SHOWN AS THE INTERSECTION WAS PREVIOUSLY STUDIED.

ANN ARBOR STATION TRANSPORTATION IMPACT STUDY

FUTURE YEAR (2035) PEAK-HOUR VOLUMES AND LEVEL OF SERVICE-DEPOT ST SITE

FIGURE 6

M:\Projects\60397780-12944234\Task 4 Environmental Review-4 Environmental Documentation\Traffic\CADD-6_FUTURE YEAR 2035 PEAK HR VOLUMES AND LOS DEPOT ST SITE



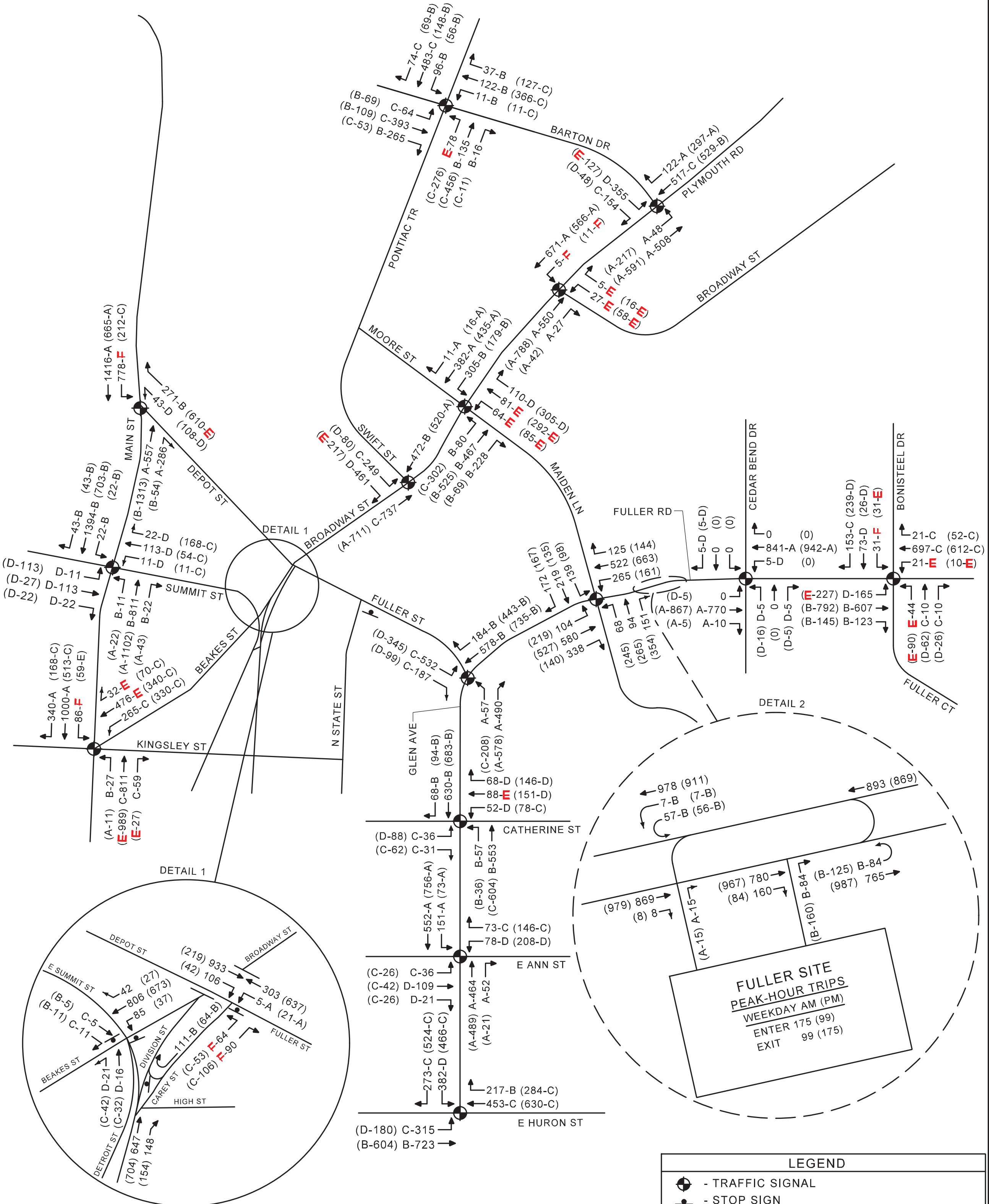
ANN ARBOR STATION TRANSPORTATION IMPACT STUDY

Ann Arbor AECOM

FUTURE YEAR 2035 PEAK HOUR SITE TRIP DISTRIBUTION AND TRAFFIC ASSIGNMENT- FULLER ROAD SITE

FIGURE 7

M:\Project\44234\Task 4 Environmental Review-4.4Environmental Documentation\Traffic\CADD-7_FUTURE YEAR 2035 PEAK HR SITE TRIP DIST AND TRAFFIC ASSIGN FULLER RD SITE



NOTE: LOS AT FUTURE FULLER RD/EMCD/ MAIDEN LN ROUNDABOUT NOT SHOWN AS THE INTERSECTION WAS PREVIOUSLY STUDIED.

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

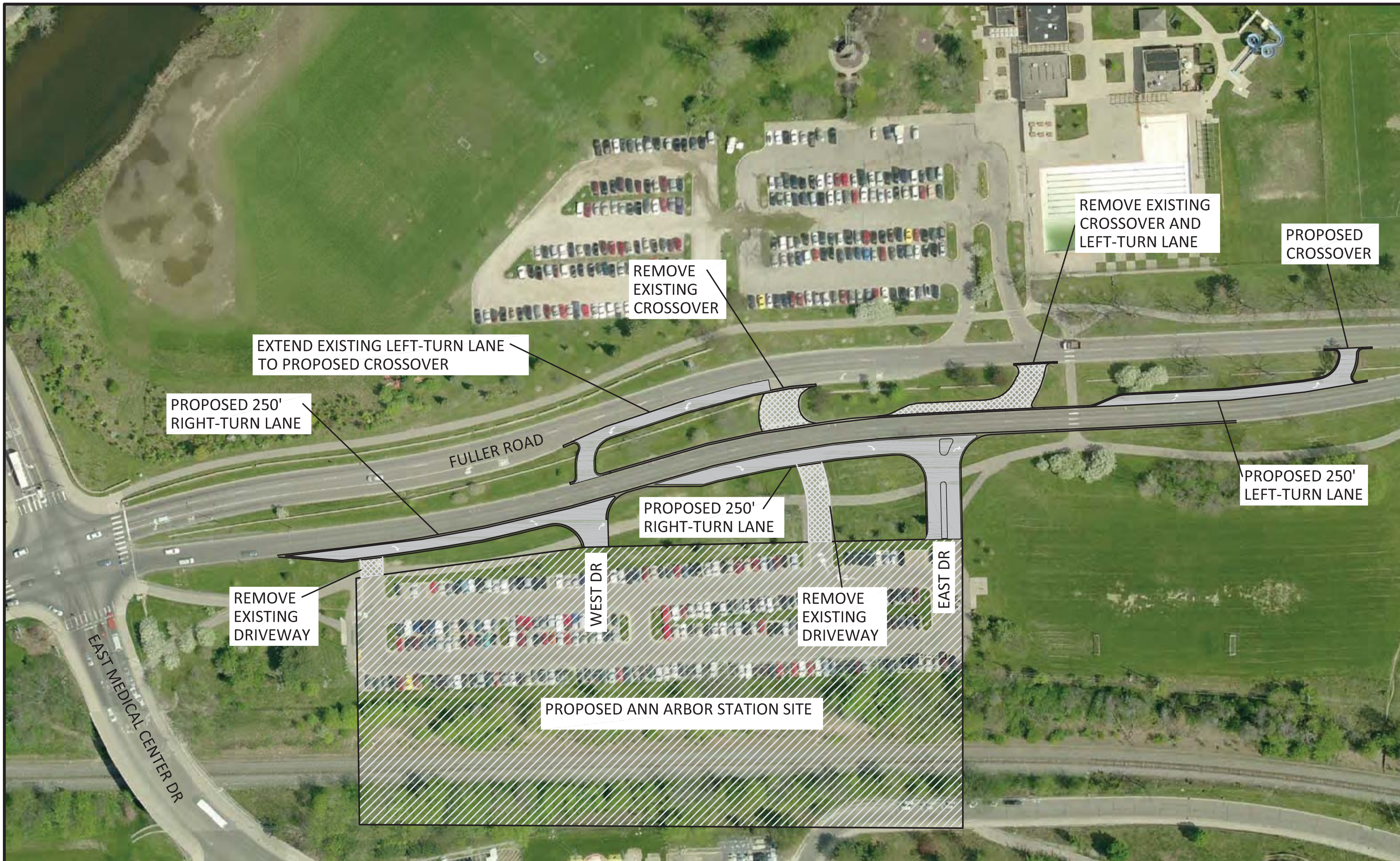
XXX - AM-PEAK WEEKDAY TRAFFIC ASSIGNMENT
(XXX) - PM-PEAK WEEKDAY TRAFFIC ASSIGNMENT

ANN ARBOR STATION TRANSPORTATION IMPACT STUDY

FUTURE YEAR (2035) PEAK-HOUR VOLUMES AND LEVEL OF SERVICE-FULLER ROAD SITE

FIGURE 8

M:\Projects\60397780-12944234\Task 4 Environmental Review 44 Environmental Documentation\Traffic\CADD-8_FUTURE YEAR 2035 PEAK HR VOLUMES AND LOS-FULLER SITE



ANN ARBOR STATION TRANSPORTATION IMPACT STUDY

SCALE: NTS

Ann Arbor AECOM

PROPOSED FULLER ROAD IMPROVEMENTS

FIGURE 9

M:\Projects\12944234\Task 4 Environmental Review\4.4 Environmental Documentation\Traffic\CADD\Figure 9

DRAFT 08/12/16

APPENDIX A

SITE PLAN ALTERNATIVES

ALTERNATE 2A

SCALE IN FEET

SCALE: 1"=50'

LEGEND

- Rail Station
- Railroad Right-of-Way
- Rail Boarding Platform
- Sidewalk
- Pavement
- Greenspace
- Long-Term Parking
- Vertical Circulation
- Bicycle Parking (below bridge)
- Floodplain Compensatory Cut Area
- Inter-City Motorcoach
- City Bus
- Property Line*
- Traffic Signal

DATE: 10.06.16

*Source City of Ann Arbor GIS 2012

ALTERNATE 2B

SCALE IN FEET 50 0 25 50 100

NORTH ^

SCALE: 1"=50'

LEGEND

- Rail Station
- Railroad Right-of-Way
- Rail Boarding Platform
- Sidewalk
- Pavement
- Greenspace
- Long-Term Parking
- Vertical Circulation
- Bicycle Parking (below bridge)
- Floodplain Compensatory Cut Area
- Inter-City Motorcoach
- City Bus
- Property Line*
- Traffic Signal

DATE: 10.06.16

*Source City of Ann Arbor GIS 2012

ALTERNATE 2C

NORTH ^
SCALE: 1"=50'

SCALE IN FEET 50 0 25 50 100

LEGEND

Rail Station	Railroad Right-of-Way
Rail Boarding Platform	Sidewalk
Pavement	Greenspace
Long-Term Parking	Vertical Circulation
Bicycle Parking (below bridge)	Floodplain Compensatory Cut Area
Inter-City Motorcoach	City Bus
Property Line*	Traffic Signal

DATE: 10.06.16

*Source: City of Ann Arbor GIS 2012

ALTERNATE 3A

SCALE IN FEET 40 0 20 40 80

NORTH ^

SCALE: 1"=40'

LEGEND

Rail Station
Railroad Right-of-Way
Rail Boarding Platform
Sidewalk
Pavement
Greenspace
Long-Term Parking
Vertical Circulation
Property Line*
Existing Sanitary Sewer
Gas Existing Gas Line
Ex. Gas Easment Line
Sanitary Offset Line

DATE: 8.11.16

*Source City of Ann Arbor GIS 2012

APPENDIX B

TURNING MOVEMENT COUNTS

APPENDIX B1

TURNING MOVEMENT COUNT LIST AND COUNT DATES

Appendix B1 - Turning Movement Counts and Dates Counted - Study Area Intersections

Intersection	Date of Counts
Main St/Beakes St/Kingsley St	Jun 2016
Main St/Summit St	None (1)
Main St/Depot St	Feb 2012, Jun 2016
Depot St/Carey St	Jun 2016
Depot St/State St	Feb 2012, Jun 2016
Division St/Carey St	Jun 2016
Broadway St/Beakes St/Summit St/Detroit St	Jun 2016
Broadway St/Swift St	Jun 2016
Broadway St/Plymouth Rd/Maiden Ln	Feb 2012, Jun 2016
Plymouth Rd/Broadway St	Jun 2016
Plymouth Rd/Barton Dr	Jun 2016
Glen Ave/Huron St	Jan/Feb 2016
Glen Ave/Ann St	Jan/Feb 2016
Glen Ave/Catherine St	Jan/Feb 2016
Glen Ave/Fuller Rd/Depot St	Mar 2015
Fuller Rd/Maiden Ln/EMCD	Mar 2015
Fuller Rd/Cedar Bend Dr	Apr 2014
Fuller Rd/Bonisteel Blvd	Mar 2015
Pontiac Trail/Barton Dr	Jan, Jun 2016 (2)

(1) Approach counts on Main Street determined from adjacent intersections, turning movements estimated

(2) Counts performed in January 2016 were done prior to M-14 Detour and other construction projects

*Shaded intersections counts were completed while the University of Michigan was in session and before the M-14 Detour. Shaded counts were used as control counts under which June 2016 counts were adjusted.

APPENDIX B2

2012 THROUGH 2016 COUNT REPORTS

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Main_St_@_Beakes_St___Kingsley_St_06-08-2016
Site Code :
Start Date : 6/8/2016
Page No : 1

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	Main St Southbound					Beaks St Westbound					Main St Northbound					W Kingsley Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	14	157	39	1	211	22	19	4	1	46	1	196	9	0	206	0	0	0	1	1	464
07:15 AM	13	165	43	0	221	29	62	2	0	93	1	199	16	3	219	0	0	0	1	1	534
07:30 AM	15	174	30	3	222	40	85	8	2	135	3	212	15	3	233	0	0	0	4	4	594
07:45 AM	19	193	43	3	258	32	92	10	3	137	2	180	14	1	197	0	0	0	1	1	593
Total	61	689	155	7	912	123	258	24	6	411	7	787	54	7	855	0	0	0	7	7	2185
08:00 AM	16	160	51	2	229	38	86	4	2	130	0	195	12	7	214	0	0	0	4	4	577
08:15 AM	20	154	48	1	223	46	69	7	2	124	0	175	10	9	194	0	0	0	10	10	551
08:30 AM	19	162	50	15	246	44	89	8	17	158	0	167	12	13	192	0	0	0	5	5	601
08:45 AM	18	129	57	30	234	54	84	7	31	176	0	158	20	4	182	0	0	0	8	8	600
Total	73	605	206	48	932	182	328	26	52	588	0	695	54	33	782	0	0	0	27	27	2329
04:00 PM	12	128	47	3	190	55	98	14	4	171	1	197	8	1	207	0	0	0	2	2	570
04:15 PM	18	138	37	6	199	69	97	12	6	184	3	202	4	5	214	0	0	0	6	6	603
04:30 PM	10	136	34	2	182	81	70	22	4	177	5	191	5	2	203	0	0	0	3	3	565
04:45 PM	20	129	49	3	201	92	44	18	2	156	2	200	6	0	208	0	0	0	3	3	568
Total	60	531	167	14	772	297	309	66	16	688	11	790	23	8	832	0	0	0	14	14	2306
05:00 PM	27	114	29	10	180	80	35	11	10	136	13	188	6	2	209	0	0	0	5	5	530
05:15 PM	23	112	26	4	165	87	26	15	11	139	7	204	2	2	215	0	0	0	4	4	523
05:30 PM	24	144	32	5	205	82	28	12	3	125	12	166	3	2	183	0	0	0	3	3	516
05:45 PM	27	125	28	6	186	82	43	10	4	139	7	161	14	1	183	0	0	0	5	5	513
Total	101	495	115	25	736	331	132	48	28	539	39	719	25	7	790	0	0	0	17	17	2082
06:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	295	2321	643	94	3353	933	1027	164	102	2226	57	2991	156	55	3259	0	0	0	65	65	8903
Apprch %	8.8	69.2	19.2	2.8		41.9	46.1	7.4	4.6		1.7	91.8	4.8	1.7		0	0	0	100		
Total %	3.3	26.1	7.2	1.1	37.7	10.5	11.5	1.8	1.1	25	0.6	33.6	1.8	0.6	36.6	0	0	0	0.7	0.7	
Lights	292	2267	636	0	3195	914	1017	161	0	2092	56	2916	154	0	3126	0	0	0	0	0	8413
% Lights	99	97.7	98.9	0	95.3	98	99	98.2	0	94	98.2	97.5	98.7	0	95.9	0	0	0	0	0	94.5
Buses	0	10	0	0	10	4	5	0	0	9	0	13	0	0	13	0	0	0	0	0	32
% Buses	0	0.4	0	0	0.3	0.4	0.5	0	0	0.4	0	0.4	0	0	0.4	0	0	0	0	0	0.4
Single-Unit Trucks																					
% Single-Unit Trucks	1	1.3	1.1	0	1.2	1.3	0.5	1.2	0	0.9	0	1.3	1.3	0	1.2	0	0	0	0	0	1.1
Articulated Trucks	0	14	0	0	14	3	0	1	0	4	1	24	0	0	25	0	0	0	0	0	43
% Articulated Trucks	0	0.6	0	0	0.4	0.3	0	0.6	0	0.2	1.8	0.8	0	0	0.8	0	0	0	0	0	0.5
Pedestrians	0	0	0	94	94	0	0	0	102	102	0	0	0	55	55	0	0	0	65	65	316
% Pedestrians	0	0	0	100	2.8	0	0	0	100	4.6	0	0	0	100	1.7	0	0	0	100	100	3.5

AECOM
3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Main_St_@_Beakes_St___Kingsley_St_06-08-2016
Site Code :
Start Date : 6/8/2016

	Main St Southbound					Beaks St Westbound					Main St Northbound					W Kingsley Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	16	160	51	2	229	38	86	4	2	130	0	**195**	12	7	**214**	0	0	0	4	4	577
08:15 AM	**20**	154	48	1	223	46	69	7	2	124	0	175	10	9	194	0	0	0	**10**	**10**	551
08:30 AM	19	**162**	50	15	**246**	44	**89**	**8**	17	158	0	167	12	**13**	192	0	0	0	5	5	**601**
08:45 AM	18	129	**57**	**30**	234	**54**	84	7	**31**	**176**	0	158	**20**	4	182	0	0	0	8	8	600
Total Volume	73	605	206	48	932	182	328	26	52	588	0	695	54	33	782	0	0	0	27	27	2329
% App. Total	7.8	64.9	22.1	5.2		31	55.8	4.4	8.8		0	88.9	6.9	4.2		0	0	0	100		
PHF	.913	.934	.904	.400	.947	.843	.921	.813	.419	.835	.000	.891	.675	.635	.914	.000	.000	.000	.675	.675	.969
Lights	72	586	202	0	860	172	326	25	0	523	0	670	54	0	724	0	0	0	0	0	2107
% Lights	98.6	96.9	98.1	0	92.3	94.5	99.4	96.2	0	88.9	0	96.4	100	0	92.6	0	0	0	0	0	90.5
Buses	0	3	0	0	3	1	1	0	0	2	0	3	0	0	3	0	0	0	0	0	8
% Buses	0	0.5	0	0	0.3	0.5	0.3	0	0	0.3	0	0.4	0	0	0.4	0	0	0	0	0	0.3
Single-Unit Trucks	1	11	4	0	16	8	1	1	0	10	0	9	0	0	9	0	0	0	0	0	35
% Single-Unit Trucks	1.4	1.8	1.9	0	1.7	4.4	0.3	3.8	0	1.7	0	1.3	0	0	1.2	0	0	0	0	0	1.5
Articulated Trucks	0	5	0	0	5	1	0	0	0	1	0	13	0	0	13	0	0	0	0	0	19
% Articulated Trucks	0	0.8	0	0	0.5	0.5	0	0	0	0.2	0	1.9	0	0	1.7	0	0	0	0	0	0.8
Pedestrians	0	0	0	48	48	0	0	0	52	52	0	0	0	33	33	0	0	0	27	27	160
% Pedestrians	0	0	0	100	5.2	0	0	0	100	8.8	0	0	0	100	4.2	0	0	0	100	100	6.9
Peak Hour Analysis From 04:00 PM to 06:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	12	128	47	3	190	55	**98**	14	4	171	1	197	**8**	1	207	0	0	0	2	2	570
04:15 PM	18	**138**	37	**6**	199	69	97	12	**6**	**184**	3	**202**	4	**5**	**214**	0	0	0	**6**	**6**	**603**
04:30 PM	10	136	34	2	182	81	70	**22**	4	177	**5**	191	5	2	203	0	0	0	3	3	565
04:45 PM	**20**	129	**49**	3	**201**	**92**	44	18	2	156	2	200	6	0	208	0	0	0	3	3	568
Total Volume	60	531	167	14	772	297	309	66	16	688	11	790	23	8	832	0	0	0	14	14	2306
% App. Total	7.8	68.8	21.6	1.8		43.2	44.9	9.6	2.3		1.3	95	2.8	1		0	0	0	100		
PHF	.750	.962	.852	.583	.960	.807	.788	.750	.667	.935	.550	.978	.719	.400	.972	.000	.000	.000	.583	.583	.956
Lights	60	511	166	0	737	293	306	66	0	665	10	770	22	0	802	0	0	0	0	0	2204
% Lights	100	96.2	99.4	0	95.5	98.7	99.0	100	0	96.7	90.9	97.5	95.7	0	96.4	0	0	0	0	0	95.6
Buses	0	3	0	0	3	3	0	0	0	3	0	5	0	0	5	0	0	0	0	0	11
% Buses	0	0.6	0	0	0.4	1.0	0	0	0	0.4	0	0.6	0	0	0.6	0	0	0	0	0	0.5
Single-Unit Trucks	0	11	1	0	12	1	3	0	0	4	0	13	1	0	14	0	0	0	0	0	30
% Single-Unit Trucks	0	2.1	0.6	0	1.6	0.3	1.0	0	0	0.6	0	1.6	4.3	0	1.7	0	0	0	0	0	1.3
Articulated Trucks	0	6	0	0	6	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	9
% Articulated Trucks	0	1.1	0	0	0.8	0	0	0	0	0	9.1	0.3	0	0	0.4	0	0	0	0	0	0.4
Pedestrians	0	0	0	14	14	0	0	0	16	16	0	0	0	8	8	0	0	0	14	14	52
% Pedestrians	0	0	0	100	1.8	0	0	0	100	2.3	0	0	0	100	1.0	0	0	0	100	100	2.3

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3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Main_St_@_Depot_St_06-08-2016
Site Code :
Start Date : 6/8/2016
Page No : 1

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	N Main St Southbound			Depot St Westbound			N Main St Northbound			
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Int. Total
07:00 AM	145	215	0	5	65	1	228	42	0	701
07:15 AM	123	221	0	7	90	0	246	53	0	740
07:30 AM	130	213	0	7	85	4	269	43	0	751
07:45 AM	130	246	0	8	94	1	243	51	0	773
Total	528	895	0	27	334	6	986	189	0	2965
08:00 AM	125	244	0	9	66	0	248	38	0	730
08:15 AM	97	244	0	5	44	0	233	33	0	656
08:30 AM	128	233	0	11	41	5	200	44	0	662
08:45 AM	108	232	1	10	43	6	176	40	0	616
Total	458	953	1	35	194	11	857	155	0	2664
04:00 PM	65	190	0	17	111	4	243	22	1	653
04:15 PM	53	188	0	25	100	2	259	10	0	637
04:30 PM	56	205	0	10	87	10	220	12	0	600
04:45 PM	60	234	0	15	103	2	292	10	0	716
Total	234	817	0	67	401	18	1014	54	1	2606
05:00 PM	65	243	0	15	96	13	249	11	0	692
05:15 PM	65	237	0	38	93	10	250	16	0	709
05:30 PM	69	214	0	33	92	8	195	8	0	619
05:45 PM	63	232	0	33	83	14	213	15	0	653
Total	262	926	0	119	364	45	907	50	0	2673
06:00 PM	0	1	0	2	2	0	0	0	0	5
Grand Total	1482	3592	1	250	1295	80	3764	448	1	10913
Apprch %	29.2	70.8	0	15.4	79.7	4.9	89.3	10.6	0	
Total %	13.6	32.9	0	2.3	11.9	0.7	34.5	4.1	0	
Lights	1467	3533	0	248	1283	0	3696	447	0	10674
% Lights	99	98.4	0	99.2	99.1	0	98.2	99.8	0	97.8
Buses	3	3	0	0	1	0	4	0	0	11
% Buses	0.2	0.1	0	0	0.1	0	0.1	0	0	0.1
Single-Unit Trucks	11	41	0	2	11	0	46	1	0	112
% Single-Unit Trucks	0.7	1.1	0	0.8	0.8	0	1.2	0.2	0	1
Articulated Trucks	1	15	0	0	0	0	18	0	0	34
% Articulated Trucks	0.1	0.4	0	0	0	0	0.5	0	0	0.3
Pedestrians	0	0	1	0	0	80	0	0	1	82
% Pedestrians	0	0	100	0	0	100	0	0	100	0.8

AECOM
3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Main_St_@_Depot_St_06-08-2016
Site Code :
Start Date : 6/8/2016

	N Main St Southbound				Depot St Westbound				N Main St Northbound				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	123	221	0	344	7	90	0	97	246	**53**	0	299	740
07:30 AM	**130**	213	0	343	7	85	**4**	96	**269**	43	0	**312**	751
07:45 AM	130	**246**	0	**376**	8	**94**	1	**103**	243	51	0	294	**773**
08:00 AM	125	244	0	369	**9**	66	0	75	248	38	0	286	730
Total Volume	508	924	0	1432	31	335	5	371	1006	185	0	1191	2994
% App. Total	35.5	64.5	0		8.4	90.3	1.3		84.5	15.5	0		
PHF	.977	.939	.000	.952	.861	.891	.313	.900	.935	.873	.000	.954	.968
Lights	506	916	0	1422	31	334	0	365	993	184	0	1177	2964
% Lights	99.6	99.1	0	99.3	100	99.7	0	98.4	98.7	99.5	0	98.8	99.0
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	2	6	0	8	0	1	0	1	8	1	0	9	18
% Single-Unit Trucks	0.4	0.6	0	0.6	0	0.3	0	0.3	0.8	0.5	0	0.8	0.6
Articulated Trucks	0	2	0	2	0	0	0	0	5	0	0	5	7
% Articulated Trucks	0	0.2	0	0.1	0	0	0	0	0.5	0	0	0.4	0.2
Pedestrians	0	0	0	0	0	0	5	5	0	0	0	0	5
% Pedestrians	0	0	0	0	0	0	100	1.3	0	0	0	0	0.2
Peak Hour Analysis From 04:00 PM to 06:00 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	60	234	0	294	15	**103**	2	120	**292**	10	0	**302**	**716**
05:00 PM	65	**243**	0	**308**	15	96	**13**	124	249	11	0	260	692
05:15 PM	65	237	0	302	**38**	93	10	**141**	250	**16**	0	266	709
05:30 PM	**69**	214	0	283	33	92	8	133	195	8	0	203	619
Total Volume	259	928	0	1187	101	384	33	518	986	45	0	1031	2736
% App. Total	21.8	78.2	0		19.5	74.1	6.4		95.6	4.4	0		
PHF	.938	.955	.000	.963	.664	.932	.635	.918	.844	.703	.000	.853	.955
Lights	256	916	0	1172	99	375	0	474	977	45	0	1022	2668
% Lights	98.8	98.7	0	98.7	98.0	97.7	0	91.5	99.1	100	0	99.1	97.5
Buses	0	1	0	1	0	1	0	1	1	0	0	1	3
% Buses	0	0.1	0	0.1	0	0.3	0	0.2	0.1	0	0	0.1	0.1
Single-Unit Trucks	3	9	0	12	2	8	0	10	7	0	0	7	29
% Single-Unit Trucks	1.2	1.0	0	1.0	2.0	2.1	0	1.9	0.7	0	0	0.7	1.1
Articulated Trucks	0	2	0	2	0	0	0	0	1	0	0	1	3
% Articulated Trucks	0	0.2	0	0.2	0	0	0	0	0.1	0	0	0.1	0.1
Pedestrians	0	0	0	0	0	0	33	33	0	0	0	0	33
% Pedestrians	0	0	0	0	0	0	100	6.4	0	0	0	0	1.2

AECOM
3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Summit-Detroit@Beakes-Broadway_06-16-2016
Site Code :
Start Date : 6/16/2016
Page No : 1

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	E Summit St Southbound					Broadway St Westbound					Detroit St Northbound					Beakes St Eastbound				
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	2	3	3	8	12	135	6	0	153	4	3	0	1	8	0	0	0	169	169
07:15 AM	0	0	3	0	3	10	185	11	3	209	1	1	0	5	7	0	0	0	219	219
07:30 AM	0	0	1	1	2	19	239	10	4	272	8	4	0	1	13	0	0	0	287	287
07:45 AM	0	1	4	1	6	29	246	12	1	288	3	3	0	1	7	0	0	0	301	301
Total	0	3	11	5	19	70	805	39	8	922	16	11	0	8	35	0	0	0	976	976
08:00 AM	0	0	2	1	3	12	248	14	1	275	3	3	0	1	7	0	0	0	285	285
08:15 AM	0	0	1	1	2	16	280	12	2	310	2	2	0	2	6	0	0	0	318	318
08:30 AM	0	0	1	0	1	25	364	8	11	408	9	5	0	3	17	0	0	0	426	426
08:45 AM	0	2	3	4	9	24	291	5	14	334	7	4	0	6	17	0	0	0	360	360
Total	0	2	7	6	15	77	1183	39	28	1327	21	14	0	12	47	0	0	0	1389	1389
04:00 PM	0	1	2	1	4	6	290	10	5	311	12	15	0	4	31	0	0	0	346	346
04:15 PM	0	0	0	4	4	14	324	15	5	358	17	9	0	4	30	0	0	0	392	392
04:30 PM	0	3	2	5	10	13	331	6	4	354	18	11	0	4	33	0	0	0	397	397
04:45 PM	0	0	3	0	3	16	339	9	0	364	8	13	0	0	21	0	0	0	388	388
Total	0	4	7	10	21	49	1284	40	14	1387	55	48	0	12	115	0	0	0	1523	1523
05:00 PM	0	1	3	3	7	16	347	12	3	378	13	6	0	3	22	0	0	0	407	407
05:15 PM	0	0	2	2	4	20	332	16	9	377	11	6	0	3	20	0	0	0	401	401
05:30 PM	0	0	1	4	5	25	370	26	7	428	8	6	0	6	20	0	0	0	453	453
05:45 PM	0	1	3	2	6	11	322	14	2	349	13	9	0	4	26	0	0	0	381	381
Total	0	2	9	11	22	72	1371	68	21	1532	45	27	0	16	88	0	0	0	1642	1642
Grand Total	0	11	34	32	77	268	4643	186	71	5168	137	100	0	48	285	0	0	0	5530	5530
Apprch %	0	14.3	44.2	41.6		5.2	89.8	3.6	1.4		48.1	35.1	0	16.8						
Total %	0	0.2	0.6	0.6	1.4	4.8	84	3.4	1.3	93.5	2.5	1.8	0	0.9	5.2		0	0	100	
Lights	0	11	26	0	37	268	4571	185	0	5024	136	99	0	0	235		0	0	0	5296
% Lights	0	100	76.5	0	48.1	100	98.4	99.5	0	97.2	99.3	99	0	0	82.5	0	0	0	0	95.8
Buses	0	0	7	0	7	0	39	0	0	39	1	0	0	0	1		0	0	0	47
% Buses	0	0	20.6	0	9.1	0	0.8	0	0	0.8	0.7	0	0	0	0.4	0	0	0	0	0.8
Single-Unit Trucks	0	0	1	0	1	0	29	1	0	30	0	1	0	0	1		0	0	0	32
% Single-Unit Trucks	0	0	2.9	0	1.3	0	0.6	0.5	0	0.6	0	1	0	0	0.4	0	0	0	0	0.6
Articulated Trucks	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0		0	0	0	4
% Articulated Trucks	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	32	32	0	0	0	71	71	0	0	0	48	48		0	0	0	151
% Pedestrians	0	0	0	100	41.6	0	0	0	100	1.4	0	0	0	100	16.8	0	0	0	0	2.7

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Summit-Detroit@Beakes-Broadway_06-16-2016
Site Code :
Start Date : 6/16/2016

	E Summit St Southbound					Broadway St Westbound					Detroit St Northbound					Eastbound	
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	0	2	1	3	12	248	**14**	1	275	3	3	0	1	7	0	285
08:15 AM	0	0	1	1	2	16	280	12	2	310	2	2	0	2	6	0	318
08:30 AM	0	0	1	0	1	**25**	**364**	8	11	**408**	**9**	**5**	0	3	**17**	0	**426**
08:45 AM	0	**2**	**3**	**4**	**9**	24	291	5	**14**	334	7	4	0	**6**	17	0	360
Total Volume	0	2	7	6	15	77	1183	39	28	1327	21	14	0	12	47	0	1389
% App. Total	0	13.3	46.7	40		5.8	89.1	2.9	2.1		44.7	29.8	0	25.5			
PHF	.000	.250	.583	.375	.417	.770	.813	.696	.500	.813	.583	.700	.000	.500	.691	.000	.815
Lights	0	2	6	0	8	77	1171	39	0	1287	21	13	0	0	34	0	1329
% Lights	0	100	85.7	0	53.3	100	99.0	100	0	97.0	100	92.9	0	0	72.3	0	95.7
Buses	0	0	1	0	1	0	7	0	0	7	0	0	0	0	0	0	8
% Buses	0	0	14.3	0	6.7	0	0.6	0	0	0.5	0	0	0	0	0	0	0.6
Single-Unit Trucks	0	0	0	0	0	0	5	0	0	5	0	1	0	0	1	0	6
% Single-Unit Trucks	0	0	0	0	0	0	0.4	0	0	0.4	0	7.1	0	0	2.1	0	0.4
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	6	6	0	0	0	28	28	0	0	0	12	12	0	46
% Pedestrians	0	0	0	100	40.0	0	0	0	100	2.1	0	0	0	100	25.5	0	3.3
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	**3**	0	3	16	339	9	0	364	8	**13**	0	0	21	0	388
05:00 PM	0	**1**	3	3	**7**	16	347	12	3	378	**13**	6	0	3	**22**	0	407
05:15 PM	0	0	2	2	4	20	332	16	**9**	377	11	6	0	3	20	0	401
05:30 PM	0	0	1	**4**	5	**25**	**370**	**26**	7	**428**	8	6	0	**6**	20	0	**453**
Total Volume	0	1	9	9	19	77	1388	63	19	1547	40	31	0	12	83	0	1649
% App. Total	0	5.3	47.4	47.4		5	89.7	4.1	1.2		48.2	37.3	0	14.5			
PHF	.000	.250	.750	.563	.679	.770	.938	.606	.528	.904	.769	.596	.000	.500	.943	.000	.910
Lights	0	1	7	0	8	77	1370	63	0	1510	40	31	0	0	71	0	1589
% Lights	0	100	77.8	0	42.1	100	98.7	100	0	97.6	100	100	0	0	85.5	0	96.4
Buses	0	0	2	0	2	0	13	0	0	13	0	0	0	0	0	0	15
% Buses	0	0	22.2	0	10.5	0	0.9	0	0	0.8	0	0	0	0	0	0	0.9
Single-Unit Trucks	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	4
% Single-Unit Trucks	0	0	0	0	0	0	0.3	0	0	0.3	0	0	0	0	0	0	0.2
Articulated Trucks	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	9	9	0	0	0	19	19	0	0	0	12	12	0	40
% Pedestrians	0	0	0	100	47.4	0	0	0	100	1.2	0	0	0	100	14.5	0	2.4

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : High@Carey_06-16-2016
Site Code :
Start Date : 6/16/2016

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	Carey St Southbound		High St Westbound		CAREY Northbound				
Start Time	Peds	App. Total	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	1	1	0	0	23	4	0	27	28
07:15 AM	1	1	1	1	32	0	0	32	34
07:30 AM	2	2	5	5	25	0	0	25	32
07:45 AM	3	3	3	3	46	3	0	49	55
Total	7	7	9	9	126	7	0	133	149
08:00 AM	1	1	4	4	22	0	0	22	27
08:15 AM	0	0	4	4	40	2	0	42	46
08:30 AM	0	0	3	3	32	3	0	35	38
08:45 AM	0	0	8	8	38	3	0	41	49
Total	1	1	19	19	132	8	0	140	160
04:00 PM	2	2	6	6	22	3	0	25	33
04:15 PM	4	4	7	7	30	2	0	32	43
04:30 PM	1	1	3	3	33	2	0	35	39
04:45 PM	4	4	4	4	38	4	0	42	50
Total	11	11	20	20	123	11	0	134	165
05:00 PM	5	5	9	9	54	6	0	60	74
05:15 PM	6	6	7	7	52	2	1	55	68
05:30 PM	2	2	7	7	53	2	0	55	64
05:45 PM	1	1	5	5	46	3	0	49	55
Total	14	14	28	28	205	13	1	219	261
Grand Total	33	33	76	76	586	39	1	626	735
Apprch %	100		100		93.6	6.2	0.2		
Total %	4.5	4.5	10.3	10.3	79.7	5.3	0.1	85.2	
Lights	0	0	0	0	575	38	0	613	613
% Lights	0	0	0	0	98.1	97.4	0	97.9	83.4
Buses	0	0	0	0	10	0	0	10	10
% Buses	0	0	0	0	1.7	0	0	1.6	1.4
Single-Unit Trucks	0	0	0	0	1	1	0	2	2
% Single-Unit Trucks	0	0	0	0	0.2	2.6	0	0.3	0.3
Articulated Trucks	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0
Pedestrians	33	33	76	76	0	0	1	1	110
% Pedestrians	100	100	100	100	0	0	100	0.2	15

AECOM
3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : High@Carey_06-16-2016
Site Code :
Start Date : 6/16/2016

	Carey St Southbound		High St Westbound		CAREY Northbound				
Start Time	Peds	App. Total	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1									
Peak Hour for Entire Intersection Begins at 07:45 AM									
07:45 AM	**3**	**3**	3	3	**46**	**3**	0	**49**	**55**
08:00 AM	1	1	**4**	**4**	22	0	0	22	27
08:15 AM	0	0	4	4	40	2	0	42	46
08:30 AM	0	0	3	3	32	3	0	35	38
Total Volume	4	4	14	14	140	8	0	148	166
% App. Total	100		100		94.6	5.4	0		
PHF	.333	.333	.875	.875	.761	.667	.000	.755	.755
Lights	0	0	0	0	137	8	0	145	145
% Lights	0	0	0	0	97.9	100	0	98.0	87.3
Buses	0	0	0	0	2	0	0	2	2
% Buses	0	0	0	0	1.4	0	0	1.4	1.2
Single-Unit Trucks	0	0	0	0	1	0	0	1	1
% Single-Unit Trucks	0	0	0	0	0.7	0	0	0.7	0.6
Articulated Trucks	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0
Pedestrians	4	4	14	14	0	0	0	0	18
% Pedestrians	100	100	100	100	0	0	0	0	10.8
Peak Hour Analysis From 04:00 PM to 06:00 PM - Peak 1 of 1									
Peak Hour for Entire Intersection Begins at 05:00 PM									
05:00 PM	5	5	**9**	**9**	**54**	**6**	0	**60**	**74**
05:15 PM	**6**	**6**	7	7	52	2	**1**	55	68
05:30 PM	2	2	7	7	53	2	0	55	64
05:45 PM	1	1	5	5	46	3	0	49	55
Total Volume	14	14	28	28	205	13	1	219	261
% App. Total	100		100		93.6	5.9	0.5		
PHF	.583	.583	.778	.778	.949	.542	.250	.913	.882
Lights	0	0	0	0	202	13	0	215	215
% Lights	0	0	0	0	98.5	100	0	98.2	82.4
Buses	0	0	0	0	3	0	0	3	3
% Buses	0	0	0	0	1.5	0	0	1.4	1.1
Single-Unit Trucks	0	0	0	0	0	0	0	0	0
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0
Articulated Trucks	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0
Pedestrians	14	14	28	28	0	0	1	1	43
% Pedestrians	100	100	100	100	0	0	100	0.5	16.5

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Carey@Division_06-16-2016
Site Code :
Start Date : 6/16/2016

Groups Printed- Lights - Single_Unit Trucks - Articulated Trucks - Buses

	South westbound	Carey Westbound					Division Northeastbound					Carey Eastbound					
Start Time	App. Total	Bear Left	Thru	Hard Right	Peds	App. Total	Hard Left	Thru	Bear Right	Peds	App. Total	Bear Left	Thru	Hard Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	16	1	17	0	156	0	0	156	0	30	0	0	30	203
07:15 AM	0	0	0	27	1	28	0	202	0	1	203	0	29	0	0	29	260
07:30 AM	0	0	0	18	4	22	0	282	0	1	283	0	23	0	0	23	328
07:45 AM	0	0	0	28	4	32	0	241	0	1	242	0	45	0	0	45	319
Total	0	0	0	89	10	99	0	881	0	3	884	0	127	0	0	127	1110
08:00 AM	0	0	0	30	5	35	0	210	0	2	212	0	28	0	0	28	275
08:15 AM	0	0	0	30	3	33	0	248	0	2	250	0	37	0	0	37	320
08:30 AM	0	0	0	28	12	40	0	219	0	4	223	0	39	0	0	39	302
08:45 AM	0	0	0	20	23	43	0	233	0	11	244	0	36	0	0	36	323
Total	0	0	0	108	43	151	0	910	0	19	929	0	140	0	0	140	1220
03:45 PM	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
04:00 PM	0	0	0	29	8	37	0	280	0	2	282	0	22	0	0	22	341
04:15 PM	0	0	0	19	9	28	0	319	0	4	323	0	31	0	0	31	382
04:30 PM	0	0	0	22	5	27	0	335	0	2	337	0	32	0	0	32	396
04:45 PM	0	0	0	16	4	20	0	313	0	0	313	0	38	0	0	38	371
Total	0	0	0	86	26	112	0	1247	0	8	1255	0	123	0	0	123	1490
05:00 PM	0	0	0	25	7	32	0	319	0	1	320	0	56	0	0	56	408
05:15 PM	0	0	0	22	10	32	0	317	0	3	320	0	59	0	0	59	411
05:30 PM	0	0	0	31	7	38	0	279	0	3	282	0	53	0	0	53	373
05:45 PM	0	0	0	20	4	24	0	248	0	1	249	0	41	0	0	41	314
Total	0	0	0	98	28	126	0	1163	0	8	1171	0	209	0	0	209	1506
Grand Total	0	0	0	381	107	488	0	4202	0	38	4240	0	599	0	0	599	5327
Apprch %		0	0	78.1	21.9		0	99.1	0	0.9		0	100	0	0		
Total %	0	0	0	7.2	2	9.2	0	78.9	0	0.7	79.6	0	11.2	0	0	11.2	
Lights	0	0	0	379	107	486	0	3618	0	38	3656	0	572	0	0	572	4714
% Lights	0	0	0	99.5	100	99.6	0	86.1	0	100	86.2	0	95.5	0	0	95.5	88.5
Single_Unit Trucks	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	2
% Single_Unit Trucks	0	0	0	0.5	0	0.4	0	0	0	0	0	0	0	0	0	0	0
Articulated Trucks	0	0	0	0	0	0	0	572	0	0	572	0	0	0	0	0	572
% Articulated Trucks	0	0	0	0	0	0	0	13.6	0	0	13.5	0	0	0	0	0	10.7
Buses	0	0	0	0	0	0	0	12	0	0	12	0	27	0	0	27	39
% Buses	0	0	0	0	0	0	0	0.3	0	0	0.3	0	4.5	0	0	4.5	0.7

AECOM
3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 07:30 AM

	South westbound	Carey Westbound					Division Northeastbound					Carey Eastbound					
Start Time	App. Total	Bear Left	Thru	Hard Right	Peds	App. Total	Hard Left	Thru	Bear Right	Peds	App. Total	Bear Left	Thru	Hard Right	Peds	App. Total	Int. Total
07:30 AM	0	0	0	18	4	22	0	**282**	0	1	**283**	0	23	0	0	23	**328**
07:45 AM	0	0	0	28	4	32	0	241	0	1	242	0	**45**	0	0	**45**	319
08:00 AM	0	0	0	**30**	**5**	**35**	0	210	0	**2**	212	0	28	0	0	28	275
08:15 AM	0	0	0	30	3	33	0	248	0	2	250	0	37	0	0	37	320
Total Volume	0	0	0	106	16	122	0	981	0	6	987	0	133	0	0	133	1242
% App. Total		0	0	86.9	13.1		0	99.4	0	0.6		0	100	0	0		
PHF	.000	.000	.000	.883	.800	.871	.000	.870	.000	.750	.872	.000	.739	.000	.000	.739	.947
Lights	0	0	0	106	16	122	0	856	0	6	862	0	124	0	0	124	1108
% Lights	0	0	0	100	100	100	0	87.3	0	100	87.3	0	93.2	0	0	93.2	89.2
Single_Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Single_Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated Trucks	0	0	0	0	0	0	0	124	0	0	124	0	0	0	0	0	124
% Articulated Trucks	0	0	0	0	0	0	0	12.6	0	0	12.6	0	0	0	0	0	10.0
Buses	0	0	0	0	0	0	0	1	0	0	1	0	9	0	0	9	10
% Buses	0	0	0	0	0	0	0	0.1	0	0	0.1	0	6.8	0	0	6.8	0.8

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 04:30 PM

	South westbound	Carey Westbound					Division Northeastbound					Carey Eastbound					
Start Time	App. Total	Bear Left	Thru	Hard Right	Peds	App. Total	Hard Left	Thru	Bear Right	Peds	App. Total	Bear Left	Thru	Hard Right	Peds	App. Total	Int. Total
04:30 PM	0	0	0	22	5	27	0	**335**	0	2	**337**	0	32	0	0	32	396
04:45 PM	0	0	0	16	4	20	0	313	0	0	313	0	38	0	0	38	371
05:00 PM	0	0	0	**25**	7	**32**	0	319	0	1	320	0	56	0	0	56	408
05:15 PM	0	0	0	22	**10**	32	0	317	0	**3**	320	0	**59**	0	0	**59**	**411**
Total Volume	0	0	0	85	26	111	0	1284	0	6	1290	0	185	0	0	185	1586
% App. Total		0	0	76.6	23.4		0	99.5	0	0.5		0	100	0	0		
PHF	.000	.000	.000	.850	.650	.867	.000	.958	.000	.500	.957	.000	.784	.000	.000	.784	.965
Lights	0	0	0	84	26	110	0	1096	0	6	1102	0	180	0	0	180	1392
% Lights	0	0	0	98.8	100	99.1	0	85.4	0	100	85.4	0	97.3	0	0	97.3	87.8
Single_Unit Trucks	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
% Single_Unit Trucks	0	0	0	1.2	0	0.9	0	0	0	0	0	0	0	0	0	0	0.1
Articulated Trucks	0	0	0	0	0	0	0	180	0	0	180	0	0	0	0	0	180
% Articulated Trucks	0	0	0	0	0	0	0	14.0	0	0	14.0	0	0	0	0	0	11.3
Buses	0	0	0	0	0	0	0	8	0	0	8	0	5	0	0	5	13
% Buses	0	0	0	0	0	0	0	0.6	0	0	0.6	0	2.7	0	0	2.7	0.8

AECOM
3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Carey@Depot_06-16-2016
Site Code :
Start Date : 6/16/2016
Page No : 1

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	Park Dvwy Southbound				Depot St Westbound					Carey St Northbound					Depot St Eastbound					
Start Time	Left	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	2	37	0	0	39	15	0	7	1	23	0	168	19	0	187	249
07:15 AM	0	0	1	1	0	67	0	0	67	24	0	7	1	32	0	153	27	0	180	280
07:30 AM	0	0	0	0	0	103	0	0	103	15	1	10	0	26	0	187	19	0	206	335
07:45 AM	0	1	0	1	1	83	0	0	84	14	0	33	1	48	0	191	24	0	215	348
Total	0	1	1	2	3	290	0	0	293	68	1	57	3	129	0	699	89	0	788	1212
08:00 AM	0	0	0	0	1	67	0	0	68	8	0	13	0	21	0	160	27	0	187	276
08:15 AM	0	0	0	0	1	60	0	2	63	21	0	21	1	43	0	137	29	0	166	272
08:30 AM	0	0	0	0	3	65	0	0	68	16	0	19	4	39	0	121	29	1	151	258
08:45 AM	0	0	1	1	1	78	0	1	80	18	0	20	2	40	0	140	15	0	155	276
Total	0	0	1	1	6	270	0	3	279	63	0	73	7	143	0	558	100	1	659	1082
04:00 PM	2	0	0	2	8	145	0	1	154	10	0	11	1	22	1	67	18	0	86	264
04:15 PM	0	0	1	1	5	140	0	0	145	17	0	15	4	36	1	81	13	0	95	277
04:30 PM	0	1	0	1	1	150	0	0	151	19	0	12	2	33	0	69	19	0	88	273
04:45 PM	0	0	2	2	3	136	0	0	139	21	0	18	1	40	1	95	13	0	109	290
Total	2	1	3	6	17	571	0	1	589	67	0	56	8	131	3	312	63	0	378	1104
05:00 PM	0	0	1	1	4	126	0	3	133	24	1	29	5	59	1	86	22	0	109	302
05:15 PM	0	0	3	3	4	133	0	0	137	30	1	26	4	61	0	112	18	1	131	332
05:30 PM	0	0	0	0	3	123	1	4	131	22	0	27	0	49	0	105	26	0	131	311
05:45 PM	0	0	8	8	4	127	9	1	141	25	1	19	2	47	0	100	17	0	117	313
Total	0	0	12	12	15	509	10	8	542	101	3	101	11	216	1	403	83	1	488	1258
Grand Total	2	2	17	21	41	1640	10	12	1703	299	4	287	29	619	4	1972	335	2	2313	4656
Apprch %	9.5	9.5	81		2.4	96.3	0.6	0.7		48.3	0.6	46.4	4.7		0.2	85.3	14.5	0.1		
Total %	0	0	0.4	0.5	0.9	35.2	0.2	0.3	36.6	6.4	0.1	6.2	0.6	13.3	0.1	42.4	7.2	0	49.7	
Lights	2	2	0	4	41	1624	10	0	1675	289	4	286	0	579	4	1954	331	0	2289	4547
% Lights	100	100	0	19	100	99	100	0	98.4	96.7	100	99.7	0	93.5	100	99.1	98.8	0	99	97.7
Buses	0	0	0	0	0	3	0	0	3	10	0	0	0	10	0	4	0	0	4	17
% Buses	0	0	0	0	0	0.2	0	0	0.2	3.3	0	0	0	1.6	0	0.2	0	0	0.2	0.4
Single-Unit Trucks	0	0	0	0	0	11	0	0	11	0	0	1	0	1	0	13	4	0	17	29
% Single-Unit Trucks	0	0	0	0	0	0.7	0	0	0.6	0	0	0.3	0	0.2	0	0.7	1.2	0	0.7	0.6
Articulated Trucks	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	3
% Articulated Trucks	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0.1
Pedestrians	0	0	17	17	0	0	0	12	12	0	0	0	29	29	0	0	0	2	2	60
% Pedestrians	0	0	100	81	0	0	0	100	0.7	0	0	0	100	4.7	0	0	0	100	0.1	1.3

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Carey@Depot_06-16-2016
Site Code :
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	Park Dvwy Southbound				Depot St Westbound					Carey St Northbound					Depot St Eastbound					
Start Time	Left	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																				
Peak Hour for Entire Intersection Begins at 07:15 AM																				
07:15 AM	0	0	**1**	**1**	0	67	0	0	67	**24**	0	7	**1**	32	0	153	**27**	0	180	280
07:30 AM	0	0	0	0	0	**103**	0	0	**103**	15	**1**	10	0	26	0	187	19	0	206	335
07:45 AM	0	**1**	0	1	**1**	83	0	0	84	14	0	**33**	1	**48**	0	**191**	24	0	**215**	**348**
08:00 AM	0	0	0	0	1	67	0	0	68	8	0	13	0	21	0	160	27	0	187	276
Total Volume	0	1	1	2	2	320	0	0	322	61	1	63	2	127	0	691	97	0	788	1239
% App. Total	0	50	50		0.6	99.4	0	0		48	0.8	49.6	1.6		0	87.7	12.3	0		
PHF	.000	.250	.250	.500	.500	.777	.000	.000	.782	.635	.250	.477	.500	.661	.000	.904	.898	.000	.916	.890
Lights	0	1	0	1	2	318	0	0	320	59	1	62	0	122	0	686	97	0	783	1226
% Lights	0	100	0	50.0	100	99.4	0	0	99.4	96.7	100	98.4	0	96.1	0	99.3	100	0	99.4	99.0
Buses	0	0	0	0	0	1	0	0	1	2	0	0	0	2	0	1	0	0	1	4
% Buses	0	0	0	0	0	0.3	0	0	0.3	3.3	0	0	0	1.6	0	0.1	0	0	0.1	0.3
Single-Unit Trucks	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	3	0	0	3	5
% Single-Unit Trucks	0	0	0	0	0	0.3	0	0	0.3	0	0	1.6	0	0.8	0	0.4	0	0	0.4	0.4
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0.1
Pedestrians	0	0	1	1	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	3
% Pedestrians	0	0	100	50.0	0	0	0	0	0	0	0	0	100	1.6	0	0	0	0	0	0.2
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																				
Peak Hour for Entire Intersection Begins at 05:00 PM																				
05:00 PM	0	0	1	1	**4**	126	0	3	133	24	**1**	**29**	**5**	59	**1**	86	22	0	109	302
05:15 PM	0	0	3	3	4	**133**	0	0	137	**30**	1	26	4	**61**	0	**112**	18	**1**	**131**	**332**
05:30 PM	0	0	0	0	3	123	1	**4**	131	22	0	27	0	49	0	105	**26**	0	131	311
05:45 PM	0	0	**8**	**8**	4	127	**9**	1	**141**	25	1	19	2	47	0	100	17	0	117	313
Total Volume	0	0	12	12	15	509	10	8	542	101	3	101	11	216	1	403	83	1	488	1258
% App. Total	0	0	100		2.8	93.9	1.8	1.5		46.8	1.4	46.8	5.1		0.2	82.6	17	0.2		
PHF	.000	.000	.375	.375	.938	.957	.278	.500	.961	.842	.750	.871	.550	.885	.250	.900	.798	.250	.931	.947
Lights	0	0	0	0	15	506	10	0	531	98	3	101	0	202	1	399	82	0	482	1215
% Lights	0	0	0	0	100	99.4	100	0	98.0	97.0	100	100	0	93.5	100	99.0	98.8	0	98.8	96.6
Buses	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	0	0	0	3
% Buses	0	0	0	0	0	0	0	0	0	3.0	0	0	0	1.4	0	0	0	0	0	0.2
Single-Unit Trucks	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	4	1	0	5	7
% Single-Unit Trucks	0	0	0	0	0	0.4	0	0	0.4	0	0	0	0	0	0	1.0	1.2	0	1.0	0.6
Articulated Trucks	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	12	12	0	0	0	8	8	0	0	0	11	11	0	0	0	1	1	32
% Pedestrians	0	0	100	100	0	0	0	100	1.5	0	0	0	100	5.1	0	0	0	100	0.2	2.5

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File Name : Depot-Fuller@State_merged_1_328636_06-14-2016
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Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	Fuller St Northwestbound				State St Northbound				Depot St Southeastbound				
Start Time	Hard Left	Thru	Peds	App. Total	Bear Left	Hard Right	Peds	App. Total	Thru	Bear Right	Peds	App. Total	Int. Total
07:00 AM	5	50	2	57	0	4	0	4	169	21	0	190	251
07:15 AM	1	72	1	74	1	9	1	11	175	16	0	191	276
07:30 AM	2	95	0	97	0	8	1	9	166	22	0	188	294
07:45 AM	9	94	1	104	2	4	2	8	179	26	0	205	317
Total	17	311	4	332	3	25	4	32	689	85	0	774	1138
08:00 AM	15	57	0	72	0	8	4	12	128	28	0	156	240
08:15 AM	6	56	0	62	1	7	1	9	122	18	0	140	211
08:30 AM	3	54	0	57	0	5	1	6	135	21	0	156	219
08:45 AM	9	56	4	69	0	9	2	11	115	22	0	137	217
Total	33	223	4	260	1	29	8	38	500	89	0	589	887
04:00 PM	5	147	4	156	2	21	1	24	59	11	0	70	250
04:15 PM	5	124	3	132	0	15	0	15	80	17	0	97	244
04:30 PM	6	129	0	135	0	22	0	22	81	16	0	97	254
04:45 PM	6	132	0	138	1	35	0	36	87	13	0	100	274
Total	22	532	7	561	3	93	1	97	307	57	0	364	1022
05:00 PM	10	135	4	149	3	26	3	32	110	17	0	127	308
05:15 PM	4	126	3	133	3	24	6	33	106	18	0	124	290
05:30 PM	8	127	4	139	3	40	2	45	102	19	0	121	305
05:45 PM	6	99	0	105	3	17	7	27	87	17	0	104	236
Total	28	487	11	526	12	107	18	137	405	71	0	476	1139
Grand Total	100	1553	26	1679	19	254	31	304	1901	302	0	2203	4186
Apprch %	6	92.5	1.5		6.2	83.6	10.2		86.3	13.7	0		
Total %	2.4	37.1	0.6	40.1	0.5	6.1	0.7	7.3	45.4	7.2	0	52.6	
Lights	100	1542	0	1642	19	252	0	271	1884	298	0	2182	4095
% Lights	100	99.3	0	97.8	100	99.2	0	89.1	99.1	98.7	0	99	97.8
Buses	0	4	0	4	0	0	0	0	1	2	0	3	7
% Buses	0	0.3	0	0.2	0	0	0	0	0.1	0.7	0	0.1	0.2
Single-Unit Trucks	0	7	0	7	0	2	0	2	15	1	0	16	25
% Single-Unit Trucks	0	0.5	0	0.4	0	0.8	0	0.7	0.8	0.3	0	0.7	0.6
Articulated Trucks	0	0	0	0	0	0	0	0	1	1	0	2	2
% Articulated Trucks	0	0	0	0	0	0	0	0	0.1	0.3	0	0.1	0
Pedestrians	0	0	26	26	0	0	31	31	0	0	0	0	57
% Pedestrians	0	0	100	1.5	0	0	100	10.2	0	0	0	0	1.4

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File Name : Depot-Fuller@State_merged_1_328636_06-14-2016
Site Code :
Start Date : 6/14/2016

	Fuller St Northwestbound				State St Northbound				Depot St Southeastbound				
Start Time	Hard Left	Thru	Peds	App. Total	Bear Left	Hard Right	Peds	App. Total	Thru	Bear Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	5	50	**2**	57	0	4	0	4	169	21	0	190	251
07:15 AM	1	72	1	74	1	**9**	1	**11**	175	16	0	191	276
07:30 AM	2	**95**	0	97	0	8	1	9	166	22	0	188	294
07:45 AM	**9**	94	1	**104**	**2**	4	**2**	8	**179**	**26**	0	**205**	**317**
Total Volume	17	311	4	332	3	25	4	32	689	85	0	774	1138
% App. Total	5.1	93.7	1.2		9.4	78.1	12.5		89	11	0		
PHF	.472	.818	.500	.798	.375	.694	.500	.727	.962	.817	.000	.944	.897
Lights	17	308	0	325	3	24	0	27	686	85	0	771	1123
% Lights	100	99.0	0	97.9	100	96.0	0	84.4	99.6	100	0	99.6	98.7
Buses	0	1	0	1	0	0	0	0	0	0	0	0	1
% Buses	0	0.3	0	0.3	0	0	0	0	0	0	0	0	0.1
Single-Unit Trucks	0	2	0	2	0	1	0	1	2	0	0	2	5
% Single-Unit Trucks	0	0.6	0	0.6	0	4.0	0	3.1	0.3	0	0	0.3	0.4
Articulated Trucks	0	0	0	0	0	0	0	0	1	0	0	1	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0.1
Pedestrians	0	0	4	4	0	0	4	4	0	0	0	0	8
% Pedestrians	0	0	100	1.2	0	0	100	12.5	0	0	0	0	0.7
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	6	132	0	138	1	35	0	36	87	13	0	100	274
05:00 PM	**10**	**135**	**4**	**149**	**3**	26	3	32	**110**	17	0	**127**	**308**
05:15 PM	4	126	3	133	3	24	**6**	33	106	18	0	124	290
05:30 PM	8	127	4	139	3	**40**	2	**45**	102	**19**	0	121	305
Total Volume	28	520	11	559	10	125	11	146	405	67	0	472	1177
% App. Total	5	93	2		6.8	85.6	7.5		85.8	14.2	0		
PHF	.700	.963	.688	.938	.833	.781	.458	.811	.920	.882	.000	.929	.955
Lights	28	518	0	546	10	124	0	134	401	67	0	468	1148
% Lights	100	99.6	0	97.7	100	99.2	0	91.8	99.0	100	0	99.2	97.5
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	2	0	2	0	1	0	1	4	0	0	4	7
% Single-Unit Trucks	0	0.4	0	0.4	0	0.8	0	0.7	1.0	0	0	0.8	0.6
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	11	11	0	0	11	11	0	0	0	0	22
% Pedestrians	0	0	100	2.0	0	0	100	7.5	0	0	0	0	1.9

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File Name : Broadway@Swift_06-14-2016
Site Code :
Start Date : 6/14/2016
Page No : 1

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks

	Swift St Southbound					Broadway St Westbound			Northbound	Broadway St Eastbound			
Start Time	Left	Thru	Right	Peds	App. Total	Thru	Peds	App. Total	App. Total	Thru	Peds	App. Total	Int. Total
07:00 AM	57	0	65	1	123	79	1	80	0	142	0	142	345
07:15 AM	86	0	128	2	216	90	1	91	0	209	0	209	516
07:30 AM	85	0	152	2	239	170	2	172	0	330	0	330	741
07:45 AM	108	0	189	0	297	187	0	187	0	307	0	307	791
Total	336	0	534	5	875	526	4	530	0	988	0	988	2393
08:00 AM	80	0	169	0	249	155	0	155	0	284	0	284	688
08:15 AM	106	0	168	3	277	185	2	187	0	266	0	266	730
08:30 AM	73	0	154	3	230	188	2	190	0	254	0	254	674
08:45 AM	69	0	139	1	209	188	0	188	0	290	0	290	687
Total	328	0	630	7	965	716	4	720	0	1094	0	1094	2779
04:00 PM	32	3	68	1	104	250	0	250	0	221	0	221	575
04:15 PM	23	10	52	2	87	298	0	298	0	285	0	285	670
04:30 PM	15	2	50	2	69	319	0	319	0	260	0	260	648
04:45 PM	27	5	65	0	97	265	0	265	0	293	0	293	655
Total	97	20	235	5	357	1132	0	1132	0	1059	0	1059	2548
05:00 PM	29	2	65	0	96	284	0	284	0	336	0	336	716
05:15 PM	23	1	67	3	94	274	0	274	0	317	0	317	685
05:30 PM	22	1	83	3	109	296	0	296	0	300	0	300	705
05:45 PM	30	1	92	1	124	293	0	293	0	262	0	262	679
Total	104	5	307	7	423	1147	0	1147	0	1215	0	1215	2785
06:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	1
Grand Total	865	26	1706	24	2621	3521	8	3529	0	4356	0	4356	10506
Apprch %	33	1	65.1	0.9		99.8	0.2			100	0		
Total %	8.2	0.2	16.2	0.2	24.9	33.5	0.1	33.6	0	41.5	0	41.5	
Lights	856	0	1694	24	2574	3480	8	3488	0	4284	0	4284	10346
% Lights	99	0	99.3	100	98.2	98.8	100	98.8	0	98.3	0	98.3	98.5
Buses	5	11	10	0	26	14	0	14	0	31	0	31	71
% Buses	0.6	42.3	0.6	0	1	0.4	0	0.4	0	0.7	0	0.7	0.7
Single-Unit Trucks	4	14	2	0	20	27	0	27	0	39	0	39	86
% Single-Unit Trucks	0.5	53.8	0.1	0	0.8	0.8	0	0.8	0	0.9	0	0.9	0.8
Articulated Trucks	0	1	0	0	1	0	0	0	0	2	0	2	3
% Articulated Trucks	0	3.8	0	0	0	0	0	0	0	0	0	0	0

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File Name : Broadway@Swift_06-14-2016
Site Code :
Start Date : 6/14/2016

	Swift St Southbound					Broadway St Westbound			Northbound	Broadway St Eastbound			
Start Time	Left	Thru	Right	Peds	App. Total	Thru	Peds	App. Total	App. Total	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	85	0	152	2	239	170	**2**	172	0	**330**	0	**330**	741
07:45 AM	**108**	0	**189**	0	**297**	**187**	0	**187**	0	307	0	307	**791**
08:00 AM	80	0	169	0	249	155	0	155	0	284	0	284	688
08:15 AM	106	0	168	**3**	277	185	2	187	0	266	0	266	730
Total Volume	379	0	678	5	1062	697	4	701	0	1187	0	1187	2950
% App. Total	35.7	0	63.8	0.5		99.4	0.6			100	0		
PHF	.877	.000	.897	.417	.894	.932	.500	.937	.000	.899	.000	.899	.932
Lights	373	0	672	5	1050	683	4	687	0	1150	0	1150	2887
% Lights	98.4	0	99.1	100	98.9	98.0	100	98.0	0	96.9	0	96.9	97.9
Buses	3	0	5	0	8	6	0	6	0	16	0	16	30
% Buses	0.8	0	0.7	0	0.8	0.9	0	0.9	0	1.3	0	1.3	1.0
Single-Unit Trucks	3	0	1	0	4	8	0	8	0	20	0	20	32
% Single-Unit Trucks	0.8	0	0.1	0	0.4	1.1	0	1.1	0	1.7	0	1.7	1.1
Articulated Trucks													
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0.0
Peak Hour Analysis From 04:00 PM to 06:00 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	29	**2**	65	0	96	284	0	284	0	**336**	0	**336**	**716**
05:15 PM	23	1	67	**3**	94	274	0	274	0	317	0	317	685
05:30 PM	22	1	83	3	109	**296**	0	**296**	0	300	0	300	705
05:45 PM	**30**	1	**92**	1	**124**	293	0	293	0	262	0	262	679
Total Volume	104	5	307	7	423	1147	0	1147	0	1215	0	1215	2785
% App. Total	24.6	1.2	72.6	1.7		100	0			100	0		
PHF	.867	.625	.834	.583	.853	.969	.000	.969	.000	.904	.000	.904	.972
Lights	104	0	307	7	418	1147	0	1147	0	1215	0	1215	2780
% Lights	100	0	100	100	98.8	100	0	100	0	100	0	100	99.8
Buses	0	2	0	0	2	0	0	0	0	0	0	0	2
% Buses	0	40.0	0	0	0.5	0	0	0	0	0	0	0	0.1
Single-Unit Trucks	0	3	0	0	3	0	0	0	0	0	0	0	3
% Single-Unit Trucks	0	60.0	0	0	0.7	0	0	0	0	0	0	0	0.1
Articulated Trucks													
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0

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3950 Sparks Drive SE
Grand Rapids, MI, 49546
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File Name : Plymouth-Broadway@Maiden-Moore_06-14-2016
Site Code :
Start Date : 6/14/2016

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	Plumouth Rd Southbound					Maiden St Westbound					Broadway St Northbound					Moore St Eastbound		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Peds	App. Total	Int. Total
07:00 AM	64	74	1	1	140	4	8	14	0	26	11	89	32	0	132	1	1	299
07:15 AM	92	80	0	3	175	6	5	35	0	46	31	143	36	1	211	0	0	432
07:30 AM	64	138	1	7	210	12	24	36	2	74	44	213	56	5	318	1	1	603
07:45 AM	95	163	4	3	265	9	25	45	1	80	62	213	52	3	330	1	1	676
Total	315	455	6	14	790	31	62	130	3	226	148	658	176	9	991	3	3	2010
08:00 AM	79	140	5	5	229	12	19	35	4	70	51	193	51	3	298	1	1	598
08:15 AM	93	172	2	4	271	13	9	25	6	53	39	197	53	7	296	2	2	622
08:30 AM	62	161	1	6	230	13	15	35	1	64	34	189	39	0	262	4	4	560
08:45 AM	72	177	4	4	257	15	14	30	5	64	42	207	45	3	297	0	0	618
Total	306	650	12	19	987	53	57	125	16	251	166	786	188	13	1153	7	7	2398
04:00 PM	34	195	5	4	238	21	69	66	1	157	104	167	25	0	296	1	1	692
04:15 PM	37	261	11	3	312	28	111	82	2	223	70	224	14	2	310	0	0	845
04:30 PM	33	229	9	6	277	29	103	83	4	219	95	219	20	3	337	1	1	834
04:45 PM	61	248	6	3	318	41	84	73	4	202	83	201	10	2	296	1	1	817
Total	165	933	31	16	1145	119	367	304	11	801	352	811	69	7	1239	3	3	3188
05:00 PM	51	293	5	10	359	39	81	77	11	208	68	218	16	1	303	3	3	873
05:15 PM	56	298	7	6	367	24	93	91	9	217	67	201	18	5	291	2	2	877
05:30 PM	54	256	10	4	324	43	97	66	5	211	79	212	14	5	310	0	0	845
05:45 PM	44	242	8	4	298	24	64	69	4	161	83	197	16	2	298	0	0	757
Total	205	1089	30	24	1348	130	335	303	29	797	297	828	64	13	1202	5	5	3352
Grand Total	991	3127	79	73	4270	333	821	862	59	2075	963	3083	497	42	4585	18	18	10948
Apprch %	23.2	73.2	1.9	1.7		16	39.6	41.5	2.8		21	67.2	10.8	0.9		100		
Total %	9.1	28.6	0.7	0.7	39	3	7.5	7.9	0.5	19	8.8	28.2	4.5	0.4	41.9	0.2	0.2	
Lights	963	3072	78	0	4113	328	806	827	0	1961	940	3018	486	0	4444	0	0	10518
% Lights	97.2	98.2	98.7	0	96.3	98.5	98.2	95.9	0	94.5	97.6	97.9	97.8	0	96.9	0	0	96.1
Buses	20	23	1	0	44	2	12	25	0	39	13	14	5	0	32	0	0	115
% Buses	2	0.7	1.3	0	1	0.6	1.5	2.9	0	1.9	1.3	0.5	1	0	0.7	0	0	1.1
Single-Unit Trucks	7	31	0	0	38	2	3	8	0	13	8	47	5	0	60	0	0	111
% Single-Unit Trucks	0.7	1	0	0	0.9	0.6	0.4	0.9	0	0.6	0.8	1.5	1	0	1.3	0	0	1
Articulated Trucks	1	1	0	0	2	1	0	2	0	3	2	4	1	0	7	0	0	12
% Articulated Trucks	0.1	0	0	0	0	0.3	0	0.2	0	0.1	0.2	0.1	0.2	0	0.2	0	0	0.1
Pedestrians	0	0	0	73	73	0	0	0	59	59	0	0	0	42	42	18	18	192
% Pedestrians	0	0	0	100	1.7	0	0	0	100	2.8	0	0	0	100	0.9	100	100	1.8

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Plymouth-Broadway@Maiden-Moore_06-14-2016
Site Code :
Start Date : 6/14/2016

Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 07:30 AM

	Plumouth Rd Southbound					Maiden St Westbound					Broadway St Northbound					Moore St Eastbound		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Peds	App. Total	Int. Total
07:30 AM	64	138	1	**7**	210	12	24	36	2	74	44	**213**	**56**	5	318	1	1	603
07:45 AM	**95**	163	4	3	265	9	**25**	**45**	1	**80**	**62**	213	52	3	**330**	1	1	**676**
08:00 AM	79	140	**5**	5	229	12	19	35	4	70	51	193	51	3	298	1	1	598
08:15 AM	93	**172**	2	4	**271**	**13**	9	25	**6**	53	39	197	53	**7**	296	**2**	**2**	622
Total Volume	331	613	12	19	975	46	77	141	13	277	196	816	212	18	1242	5	5	2499
% App. Total	33.9	62.9	1.2	1.9		16.6	27.8	50.9	4.7		15.8	65.7	17.1	1.4		100		
PHF	.871	.891	.600	.679	.899	.885	.770	.783	.542	.866	.790	.958	.946	.643	.941	.625	.625	.924
Lights	321	600	12	0	933	45	74	128	0	247	189	790	208	0	1187	0	0	2367
% Lights	97.0	97.9	100	0	95.7	97.8	96.1	90.8	0	89.2	96.4	96.8	98.1	0	95.6	0	0	94.7
Buses	7	5	0	0	12	1	2	8	0	11	5	6	2	0	13	0	0	36
% Buses	2.1	0.8	0	0	1.2	2.2	2.6	5.7	0	4.0	2.6	0.7	0.9	0	1.0	0	0	1.4
Single-Unit Trucks	2	8	0	0	10	0	1	4	0	5	2	20	1	0	23	0	0	38
% Single-Unit Trucks	0.6	1.3	0	0	1.0	0	1.3	2.8	0	1.8	1.0	2.5	0.5	0	1.9	0	0	1.5
Articulated Trucks	1	0	0	0	1	0	0	1	0	1	0	0	1	0	1	0	0	3
% Articulated Trucks	0.3	0	0	0	0.1	0	0	0.7	0	0.4	0	0	0.5	0	0.1	0	0	0.1
Pedestrians	0	0	0	19	19	0	0	0	13	13	0	0	0	18	18	5	5	55
% Pedestrians	0	0	0	100	1.9	0	0	0	100	4.7	0	0	0	100	1.4	100	100	2.2

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 04:45 PM

	Plumouth Rd Southbound					Maiden St Westbound					Broadway St Northbound					Moore St Eastbound		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Peds	App. Total	Int. Total
04:45 PM	**61**	248	6	3	318	41	84	73	4	202	**83**	201	10	2	296	1	1	817
05:00 PM	51	293	5	**10**	359	39	81	77	**11**	208	68	**218**	16	1	303	**3**	**3**	873
05:15 PM	56	**298**	7	6	**367**	24	93	**91**	9	**217**	67	201	**18**	**5**	291	2	2	**877**
05:30 PM	54	256	**10**	4	324	**43**	**97**	66	5	211	79	212	14	5	**310**	0	0	845
Total Volume	222	1095	28	23	1368	147	355	307	29	838	297	832	58	13	1200	6	6	3412
% App. Total	16.2	80	2	1.7		17.5	42.4	36.6	3.5		24.8	69.3	4.8	1.1		100		
PHF	.910	.919	.700	.575	.932	.855	.915	.843	.659	.965	.895	.954	.806	.650	.968	.500	.500	.973
Lights	217	1088	27	0	1332	147	351	301	0	799	293	826	57	0	1176	0	0	3307
% Lights	97.7	99.4	96.4	0	97.4	100	98.9	98.0	0	95.3	98.7	99.3	98.3	0	98.0	0	0	96.9
Buses	4	5	1	0	10	0	4	5	0	9	2	3	0	0	5	0	0	24
% Buses	1.8	0.5	3.6	0	0.7	0	1.1	1.6	0	1.1	0.7	0.4	0	0	0.4	0	0	0.7
Single-Unit Trucks	1	2	0	0	3	0	0	1	0	1	2	1	1	0	4	0	0	8
% Single-Unit Trucks	0.5	0.2	0	0	0.2	0	0	0.3	0	0.1	0.7	0.1	1.7	0	0.3	0	0	0.2
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	2
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0.1
Pedestrians	0	0	0	23	23	0	0	0	29	29	0	0	0	13	13	6	6	71
% Pedestrians	0	0	0	100	1.7	0	0	0	100	3.5	0	0	0	100	1.1	100	100	2.1

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Plymouth@Broadway_06-14-2016
Site Code :
Start Date : 6/14/2016
Page No : 1

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	Plymouth Rd Southbound				Broadway St Westbound				Plymouth Rd Northbound				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	125	1	126	10	0	0	10	100	5	0	105	241
07:15 AM	0	161	0	161	6	0	0	6	174	6	0	180	347
07:30 AM	0	199	0	199	10	0	0	10	245	6	0	251	460
07:45 AM	1	246	0	247	11	1	1	13	248	8	0	256	516
Total	1	731	1	733	37	1	1	39	767	25	0	792	1564
08:00 AM	0	214	0	214	9	0	3	12	208	19	0	227	453
08:15 AM	1	259	0	260	9	0	1	10	214	9	0	223	493
08:30 AM	0	213	0	213	11	1	2	14	209	12	0	221	448
08:45 AM	1	245	0	246	8	0	4	12	227	17	0	244	502
Total	2	931	0	933	37	1	10	48	858	57	0	915	1896
04:00 PM	3	245	0	248	15	7	1	23	195	13	0	208	479
04:15 PM	6	195	0	201	16	3	6	25	248	12	0	260	486
04:30 PM	1	273	1	275	18	4	1	23	288	24	0	312	610
04:45 PM	4	257	0	261	27	7	2	36	247	24	0	271	568
Total	14	970	1	985	76	21	10	107	978	73	0	1051	2143
05:00 PM	3	296	0	299	42	4	0	46	296	17	0	313	658
05:15 PM	1	294	1	296	27	0	3	30	268	16	0	284	610
05:30 PM	3	255	0	258	17	9	4	30	304	14	0	318	606
05:45 PM	1	270	1	272	39	1	2	42	252	10	0	262	576
Total	8	1115	2	1125	125	14	9	148	1120	57	0	1177	2450
Grand Total	25	3747	4	3776	275	37	30	342	3723	212	0	3935	8053
Apprch %	0.7	99.2	0.1		80.4	10.8	8.8		94.6	5.4	0		
Total %	0.3	46.5	0	46.9	3.4	0.5	0.4	4.2	46.2	2.6	0	48.9	
Lights	25	3696	3	3724	273	37	19	329	3660	205	0	3865	7918
% Lights	100	98.6	75	98.6	99.3	100	63.3	96.2	98.3	96.7	0	98.2	98.3
Buses	0	27	0	27	0	0	0	0	18	3	0	21	48
% Buses	0	0.7	0	0.7	0	0	0	0	0.5	1.4	0	0.5	0.6
Single-Unit Trucks	0	22	0	22	1	0	0	1	44	4	0	48	71
% Single-Unit Trucks	0	0.6	0	0.6	0.4	0	0	0.3	1.2	1.9	0	1.2	0.9
Articulated Trucks	0	2	0	2	1	0	0	1	1	0	0	1	4
% Articulated Trucks	0	0.1	0	0.1	0.4	0	0	0.3	0	0	0	0	0
Pedestrians	0	0	1	1	0	0	11	11	0	0	0	0	12
% Pedestrians	0	0	25	0	0	0	36.7	3.2	0	0	0	0	0.1

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Plymouth@Broadway_06-14-2016
Site Code :
Start Date : 6/14/2016

	Plymouth Rd Southbound				Broadway St Westbound				Plymouth Rd Northbound				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	199	0	199	10	0	0	10	245	6	0	251	460
07:45 AM	**1**	246	0	247	**11**	**1**	1	**13**	**248**	8	0	**256**	**516**
08:00 AM	0	214	0	214	9	0	**3**	12	208	**19**	0	227	453
08:15 AM	1	**259**	0	**260**	9	0	1	10	214	9	0	223	493
Total Volume	2	918	0	920	39	1	5	45	915	42	0	957	1922
% App. Total	0.2	99.8	0		86.7	2.2	11.1		95.6	4.4	0		
PHF	.500	.886	.000	.885	.886	.250	.417	.865	.922	.553	.000	.935	.931
Lights	2	896	0	898	38	1	0	39	877	39	0	916	1853
% Lights	100	97.6	0	97.6	97.4	100	0	86.7	95.8	92.9	0	95.7	96.4
Buses	0	14	0	14	0	0	0	0	13	1	0	14	28
% Buses	0	1.5	0	1.5	0	0	0	0	1.4	2.4	0	1.5	1.5
Single-Unit Trucks	0	7	0	7	0	0	0	0	25	2	0	27	34
% Single-Unit Trucks	0	0.8	0	0.8	0	0	0	0	2.7	4.8	0	2.8	1.8
Articulated Trucks	0	1	0	1	1	0	0	1	0	0	0	0	2
% Articulated Trucks	0	0.1	0	0.1	2.6	0	0	2.2	0	0	0	0	0.1
Pedestrians	0	0	0	0	0	0	5	5	0	0	0	0	5
% Pedestrians	0	0	0	0	0	0	100	11.1	0	0	0	0	0.3
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	**3**	**296**	0	**299**	**42**	4	0	**46**	296	**17**	0	313	**658**
05:15 PM	1	294	**1**	296	27	0	3	30	268	16	0	284	610
05:30 PM	3	255	0	258	17	**9**	**4**	30	**304**	14	0	**318**	606
05:45 PM	1	270	1	272	39	1	2	42	252	10	0	262	576
Total Volume	8	1115	2	1125	125	14	9	148	1120	57	0	1177	2450
% App. Total	0.7	99.1	0.2		84.5	9.5	6.1		95.2	4.8	0		
PHF	.667	.942	.500	.941	.744	.389	.563	.804	.921	.838	.000	.925	.931
Lights	8	1115	2	1125	125	14	9	148	1120	57	0	1177	2450
% Lights	100	100	100	100	100	100	100	100	100	100	0	100	100
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Plymouth_Rd_@_Barton_Dr_06-08-2016
Site Code :
Start Date : 6/8/2016
Page No : 1

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	Plymouth Rd Southbound				Plymouth Rd Northbound				Barton Dr Eastbound				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
07:00 AM	155	7	1	163	9	89	0	98	35	5	2	42	303
07:15 AM	170	27	1	198	8	144	4	156	56	7	2	65	419
07:30 AM	225	18	2	245	12	164	2	178	50	16	2	68	491
07:45 AM	162	44	2	208	13	158	9	180	44	21	1	66	454
Total	712	96	6	814	42	555	15	612	185	49	7	241	1667
08:00 AM	167	51	1	219	10	78	3	91	74	35	0	109	419
08:15 AM	180	24	0	204	6	102	4	112	63	31	0	94	410
08:30 AM	203	17	3	223	7	127	0	134	38	17	2	57	414
08:45 AM	254	28	2	284	6	164	1	171	37	24	4	65	520
Total	804	120	6	930	29	471	8	508	212	107	6	325	1763
04:00 PM	209	72	0	281	43	192	0	235	17	10	0	27	543
04:15 PM	254	70	4	328	67	179	0	246	26	10	0	36	610
04:30 PM	230	76	1	307	77	190	1	268	45	22	1	68	643
04:45 PM	312	71	5	388	68	210	4	282	35	12	1	48	718
Total	1005	289	10	1304	255	771	5	1031	123	54	2	179	2514
05:00 PM	327	84	1	412	73	203	2	278	30	10	0	40	730
05:15 PM	296	94	7	397	76	199	2	277	25	10	0	35	709
05:30 PM	278	77	5	360	72	159	3	234	35	7	0	42	636
05:45 PM	229	75	4	308	66	169	4	239	27	14	0	41	588
Total	1130	330	17	1477	287	730	11	1028	117	41	0	158	2663
Grand Total	3651	835	39	4525	613	2527	39	3179	637	251	15	903	8607
Apprch %	80.7	18.5	0.9		19.3	79.5	1.2		70.5	27.8	1.7		
Total %	42.4	9.7	0.5	52.6	7.1	29.4	0.5	36.9	7.4	2.9	0.2	10.5	
Lights	3576	822	0	4398	609	2470	0	3079	628	244	0	872	8349
% Lights	97.9	98.4	0	97.2	99.3	97.7	0	96.9	98.6	97.2	0	96.6	97
Buses	42	6	0	48	3	31	0	34	5	4	0	9	91
% Buses	1.2	0.7	0	1.1	0.5	1.2	0	1.1	0.8	1.6	0	1	1.1
Single-Unit Trucks	28	7	0	35	1	20	0	21	4	3	0	7	63
% Single-Unit Trucks	0.8	0.8	0	0.8	0.2	0.8	0	0.7	0.6	1.2	0	0.8	0.7
Articulated Trucks	5	0	0	5	0	6	0	6	0	0	0	0	11
% Articulated Trucks	0.1	0	0	0.1	0	0.2	0	0.2	0	0	0	0	0.1
Pedestrians	0	0	39	39	0	0	39	39	0	0	15	15	93
% Pedestrians	0	0	100	0.9	0	0	100	1.2	0	0	100	1.7	1.1

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Plymouth_Rd_@_Barton_Dr_06-08-2016
Site Code :
Start Date : 6/8/2016

	Plymouth Rd Southbound				Plymouth Rd Northbound				Barton Dr Eastbound				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	170	27	1	198	8	144	4	156	56	7	**2**	65	419
07:30 AM	**225**	18	**2**	**245**	12	**164**	2	178	50	16	2	68	**491**
07:45 AM	162	44	2	208	**13**	158	**9**	**180**	44	21	1	66	454
08:00 AM	167	**51**	1	219	10	78	3	91	**74**	**35**	0	**109**	419
Total Volume	724	140	6	870	43	544	18	605	224	79	5	308	1783
% App. Total	83.2	16.1	0.7		7.1	89.9	3		72.7	25.6	1.6		
PHF	.804	.686	.750	.888	.827	.829	.500	.840	.757	.564	.625	.706	.908
Lights	706	134	0	840	41	532	0	573	222	76	0	298	1711
% Lights	97.5	95.7	0	96.6	95.3	97.8	0	94.7	99.1	96.2	0	96.8	96.0
Buses	10	4	0	14	2	8	0	10	2	2	0	4	28
% Buses	1.4	2.9	0	1.6	4.7	1.5	0	1.7	0.9	2.5	0	1.3	1.6
Single-Unit Trucks	5	2	0	7	0	4	0	4	0	1	0	1	12
% Single-Unit Trucks	0.7	1.4	0	0.8	0	0.7	0	0.7	0	1.3	0	0.3	0.7
Articulated Trucks	3	0	0	3	0	0	0	0	0	0	0	0	3
% Articulated Trucks	0.4	0	0	0.3	0	0	0	0	0	0	0	0	0.2
Pedestrians	0	0	6	6	0	0	18	18	0	0	5	5	29
% Pedestrians	0	0	100	0.7	0	0	100	3.0	0	0	100	1.6	1.6
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	230	76	1	307	**77**	190	1	268	**45**	**22**	**1**	**68**	643
04:45 PM	312	71	5	388	68	**210**	**4**	**282**	35	12	1	48	718
05:00 PM	**327**	84	1	**412**	73	203	2	278	30	10	0	40	**730**
05:15 PM	296	**94**	**7**	397	76	199	2	277	25	10	0	35	709
Total Volume	1165	325	14	1504	294	802	9	1105	135	54	2	191	2800
% App. Total	77.5	21.6	0.9		26.6	72.6	0.8		70.7	28.3	1		
PHF	.891	.864	.500	.913	.955	.955	.563	.980	.750	.614	.500	.702	.959
Lights	1150	325	0	1475	294	793	0	1087	135	53	0	188	2750
% Lights	98.7	100	0	98.1	100	98.9	0	98.4	100	98.1	0	98.4	98.2
Buses	11	0	0	11	0	6	0	6	0	0	0	0	17
% Buses	0.9	0	0	0.7	0	0.7	0	0.5	0	0	0	0	0.6
Single-Unit Trucks	4	0	0	4	0	2	0	2	0	1	0	1	7
% Single-Unit Trucks	0.3	0	0	0.3	0	0.2	0	0.2	0	1.9	0	0.5	0.3
Articulated Trucks	0	0	0	0	0	1	0	1	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0.0
Pedestrians	0	0	14	14	0	0	9	9	0	0	2	2	25
% Pedestrians	0	0	100	0.9	0	0	100	0.8	0	0	100	1.0	0.9

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Pontiac_Trail_@_Barton_Dr_06-08-2016
Site Code :
Start Date : 6/8/2016
Page No : 1

Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	Pontiac Tr Southbound					Barton Dr Westbound					Pontiac Tr Northbound					Barton Dr Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	8	80	4	0	92	0	6	3	0	9	10	12	1	0	23	0	27	45	0	72	196
07:15 AM	7	120	11	0	138	1	23	2	1	27	7	7	2	2	18	1	39	90	1	131	314
07:30 AM	8	139	5	0	152	0	12	5	0	17	15	30	1	2	48	4	40	65	1	110	327
07:45 AM	17	142	5	3	167	1	15	7	4	27	16	39	7	5	67	7	32	73	6	118	379
Total	40	481	25	3	549	2	56	17	5	80	48	88	11	9	156	12	138	273	8	431	1216
08:00 AM	24	146	5	1	176	2	24	8	6	40	12	45	7	9	73	1	48	70	0	119	408
08:15 AM	16	139	3	0	158	1	14	7	0	22	11	38	4	4	57	4	46	74	2	126	363
08:30 AM	14	129	4	0	147	1	11	4	1	17	16	29	1	2	48	4	25	49	1	79	291
08:45 AM	14	118	3	0	135	4	10	11	0	25	13	37	3	1	54	1	27	53	0	81	295
Total	68	532	15	1	616	8	59	30	7	104	52	149	15	16	232	10	146	246	3	405	1357
04:00 PM	4	42	8	0	54	4	67	26	0	97	73	80	2	2	157	3	9	18	0	30	338
04:15 PM	9	36	3	0	48	1	69	26	0	96	83	92	4	0	179	3	17	17	1	38	361
04:30 PM	14	46	4	1	65	3	74	45	1	123	64	97	5	5	171	6	17	20	1	44	403
04:45 PM	15	52	6	0	73	2	72	47	3	124	64	108	1	3	176	6	16	19	4	45	418
Total	42	176	21	1	240	10	282	144	4	440	284	377	12	10	683	18	59	74	6	157	1520
05:00 PM	7	52	3	0	62	3	73	46	1	123	56	100	4	1	161	2	12	26	1	41	387
05:15 PM	9	48	4	0	61	4	81	43	3	131	64	80	1	4	149	1	11	19	2	33	374
05:30 PM	4	36	6	0	46	4	81	41	1	127	62	84	1	2	149	3	24	22	0	49	371
05:45 PM	6	58	4	0	68	3	62	32	1	98	74	71	1	0	146	2	22	17	0	41	353
Total	26	194	17	0	237	14	297	162	6	479	256	335	7	7	605	8	69	84	3	164	1485
Grand Total	176	1383	78	5	1642	34	694	353	22	1103	640	949	45	42	1676	48	412	677	20	1157	5578
Apprch %	10.7	84.2	4.8	0.3		3.1	62.9	32	2		38.2	56.6	2.7	2.5		4.1	35.6	58.5	1.7		
Total %	3.2	24.8	1.4	0.1	29.4	0.6	12.4	6.3	0.4	19.8	11.5	17	0.8	0.8	30	0.9	7.4	12.1	0.4	20.7	
Lights	173	1357	77	0	1607	34	687	349	0	1070	634	921	41	0	1596	47	406	672	0	1125	5398
% Lights	98.3	98.1	98.7	0	97.9	100	99	98.9	0	97	99.1	97	91.1	0	95.2	97.9	98.5	99.3	0	97.2	96.8
Buses	2	21	0	0	23	0	1	0	0	1	2	22	1	0	25	0	1	2	0	3	52
% Buses	1.1	1.5	0	0	1.4	0	0.1	0	0	0.1	0.3	2.3	2.2	0	1.5	0	0.2	0.3	0	0.3	0.9
Single-Unit Trucks																					
% Single-Unit Trucks	0.6	0.4	1.3	0	0.4	0	0.7	0.8	0	0.7	0.6	0.6	2.2	0	0.7	2.1	1	0.4	0	0.7	0.6
Articulated Trucks	0	0	0	0	0	0	1	1	0	2	0	0	2	0	2	0	1	0	0	1	5
% Articulated Trucks	0	0	0	0	0	0	0.1	0.3	0	0.2	0	0	4.4	0	0.1	0	0.2	0	0	0.1	0.1
Pedestrians	0	0	0	5	5	0	0	0	22	22	0	0	0	42	42	0	0	0	20	20	89
% Pedestrians	0	0	0	100	0.3	0	0	0	100	2	0	0	0	100	2.5	0	0	0	100	1.7	1.6

AECOM
3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Pontiac_Trail_@_Barton_Dr_06-08-2016
Site Code :
Start Date : 6/8/2016

	Pontiac Tr Southbound					Barton Dr Westbound					Pontiac Tr Northbound					Barton Dr Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	8	139	**5**	0	152	0	12	5	0	17	15	30	1	2	48	4	40	65	1	110	327
07:45 AM	17	142	5	**3**	167	1	15	7	4	27	**16**	39	**7**	5	67	**7**	32	73	**6**	118	379
08:00 AM	**24**	**146**	5	1	**176**	**2**	**24**	**8**	**6**	**40**	12	**45**	7	**9**	**73**	1	**48**	70	0	119	**408**
08:15 AM	16	139	3	0	158	1	14	7	0	22	11	38	4	4	57	4	46	**74**	2	**126**	363
Total Volume	65	566	18	4	653	4	65	27	10	106	54	152	19	20	245	16	166	282	9	473	1477
% App. Total	10	86.7	2.8	0.6		3.8	61.3	25.5	9.4		22	62	7.8	8.2		3.4	35.1	59.6	1.9		
PHF	.677	.969	.900	.333	.928	.500	.677	.844	.417	.663	.844	.844	.679	.556	.839	.571	.865	.953	.375	.938	.905
Lights	63	556	18	0	637	4	64	27	0	95	54	141	15	0	210	15	163	279	0	457	1399
% Lights	96.9	98.2	100	0	97.5	100	98.5	100	0	89.6	100	92.8	78.9	0	85.7	93.8	98.2	98.9	0	96.6	94.7
Buses	2	7	0	0	9	0	1	0	0	1	0	9	1	0	10	0	1	1	0	2	22
% Buses	3.1	1.2	0	0	1.4	0	1.5	0	0	0.9	0	5.9	5.3	0	4.1	0	0.6	0.4	0	0.4	1.5
Single-Unit Trucks	0	3	0	0	3	0	0	0	0	0	0	2	1	0	3	1	2	2	0	5	11
% Single-Unit Trucks	0	0.5	0	0	0.5	0	0	0	0	0	0	1.3	5.3	0	1.2	6.3	1.2	0.7	0	1.1	0.7
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	2
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	10.5	0	0.8	0	0	0	0	0	0.1
Pedestrians	0	0	0	4	4	0	0	0	10	10	0	0	0	20	20	0	0	0	9	9	43
% Pedestrians	0	0	0	100	0.6	0	0	0	100	9.4	0	0	0	100	8.2	0	0	0	100	1.9	2.9
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	14	46	4	**1**	65	3	74	45	1	123	**64**	97	**5**	**5**	171	**6**	**17**	20	1	44	403
04:45 PM	**15**	**52**	**6**	0	**73**	2	72	**47**	**3**	124	64	**108**	1	3	**176**	6	16	19	**4**	**45**	**418**
05:00 PM	7	52	3	0	62	3	73	46	1	123	56	100	4	1	161	2	12	**26**	1	41	387
05:15 PM	9	48	4	0	61	**4**	**81**	43	3	**131**	64	80	1	4	149	1	11	19	2	33	374
Total Volume	45	198	17	1	261	12	300	181	8	501	248	385	11	13	657	15	56	84	8	163	1582
% App. Total	17.2	75.9	6.5	0.4		2.4	59.9	36.1	1.6		37.7	58.6	1.7	2		9.2	34.4	51.5	4.9		
PHF	.750	.952	.708	.250	.894	.750	.926	.963	.667	.956	.969	.891	.550	.650	.933	.625	.824	.808	.500	.906	.946
Lights	44	193	17	0	254	12	300	181	0	493	247	379	11	0	637	15	56	83	0	154	1538
% Lights	97.8	97.5	100	0	97.3	100	100	100	0	98.4	99.6	98.4	100	0	97.0	100	100	98.8	0	94.5	97.2
Buses	0	5	0	0	5	0	0	0	0	0	0	5	0	0	5	0	0	1	0	1	11
% Buses	0	2.5	0	0	1.9	0	0	0	0	0	0	1.3	0	0	0.8	0	0	1.2	0	0.6	0.7
Single-Unit Trucks	1	0	0	0	1	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	3
% Single-Unit Trucks	2.2	0	0	0	0.4	0	0	0	0	0	0.4	0.3	0	0	0.3	0	0	0	0	0	0.2
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	1	1	0	0	0	8	8	0	0	0	13	13	0	0	0	8	8	30
% Pedestrians	0	0	0	100	0.4	0	0	0	100	1.6	0	0	0	100	2.0	0	0	0	100	4.9	1.9

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3950 Sparks Drive SE
Grand Rapids, MI, 49546
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File Name : Fuller@Bonisteel
Site Code :
Start Date : 3/11/2015
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Groups Printed- Lights - Buses - Unit Trucks - Articulated Trucks - Pedestrians

	Banisteel Blvd Southbound					Fuller Rd Westbound					Fuller Ct Northbound					Fuller Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	22	21	0	43	4	117	2	0	123	4	4	0	0	8	14	85	32	0	131	305
07:15 AM	9	21	28	0	58	6	139	4	0	149	10	3	0	0	13	18	106	29	0	153	373
07:30 AM	7	26	32	0	65	8	171	3	0	182	9	2	0	0	11	33	156	32	0	221	479
07:45 AM	6	21	36	0	63	4	162	5	1	172	9	2	0	0	11	36	144	42	0	222	468
Total	22	90	117	0	229	22	589	14	1	626	32	11	0	0	43	101	491	135	0	727	1625
08:00 AM	11	13	29	3	56	7	162	5	1	175	13	4	0	0	17	33	137	28	2	200	448
08:15 AM	6	8	41	1	56	1	145	8	0	154	10	3	0	0	13	53	132	14	1	200	423
08:30 AM	6	6	43	0	55	4	181	5	0	190	6	3	0	0	9	40	113	20	1	174	428
08:45 AM	8	7	43	1	59	5	162	7	0	174	6	2	0	0	8	37	127	22	0	186	427
Total	31	34	156	5	226	17	650	25	1	693	35	12	0	0	47	163	509	84	4	760	1726
04:00 PM	6	1	34	2	43	5	123	15	0	143	31	26	0	2	59	54	146	35	0	235	480
04:15 PM	4	6	46	2	58	2	127	14	2	145	14	14	0	0	28	58	150	28	0	236	467
04:30 PM	3	4	45	10	62	5	138	12	0	155	32	25	0	0	57	44	183	22	1	250	524
04:45 PM	13	6	53	4	76	3	135	9	4	151	16	8	0	0	24	55	164	31	0	250	501
Total	26	17	178	18	239	15	523	50	6	594	93	73	0	2	168	211	643	116	1	971	1972
05:00 PM	6	3	80	4	93	0	144	14	0	158	24	16	0	0	40	51	172	44	1	268	559
05:15 PM	8	10	44	4	66	2	159	12	0	173	10	11	0	0	21	58	210	37	2	307	567
05:30 PM	4	7	61	3	75	0	154	11	0	165	8	13	0	0	21	52	163	29	0	244	505
05:45 PM	10	8	63	5	86	2	140	9	0	151	14	5	0	0	19	52	138	21	0	211	467
Total	28	28	248	16	320	4	597	46	0	647	56	45	0	0	101	213	683	131	3	1030	2098
Grand Total	107	169	699	39	1014	58	2359	135	8	2560	216	141	0	2	359	688	2326	466	8	3488	7421
Apprch %	10.6	16.7	68.9	3.8		2.3	92.1	5.3	0.3		60.2	39.3	0	0.6		19.7	66.7	13.4	0.2		
Total %	1.4	2.3	9.4	0.5	13.7	0.8	31.8	1.8	0.1	34.5	2.9	1.9	0	0	4.8	9.3	31.3	6.3	0.1	47	
Lights	92	166	590	0	848	46	2286	126	0	2458	211	139	0	0	350	568	2264	459	0	3291	6947
% Lights	86	98.2	84.4	0	83.6	79.3	96.9	93.3	0	96	97.7	98.6	0	0	97.5	82.6	97.3	98.5	0	94.4	93.6
Buses	12	1	102	0	115	10	51	9	0	70	0	0	0	0	0	111	40	1	0	152	337
% Buses	11.2	0.6	14.6	0	11.3	17.2	2.2	6.7	0	2.7	0	0	0	0	0	16.1	1.7	0.2	0	4.4	4.5
Single-Unit Trucks																					
% Single-Unit Trucks	0.9	1.2	1	0	1	1.7	0.9	0	0	0.9	1.9	0	0	0	1.1	1.2	0.9	1.3	0	1	1
Articulated Trucks	2	0	0	0	2	1	1	0	0	2	1	2	0	0	3	1	0	0	0	1	8
% Articulated Trucks	1.9	0	0	0	0.2	1.7	0	0	0	0.1	0.5	1.4	0	0	0.8	0.1	0	0	0	0	0.1
Pedestrians	0	0	0	39	39	0	0	0	8	8	0	0	0	2	2	0	0	0	8	8	57
% Pedestrians	0	0	0	100	3.8	0	0	0	100	0.3	0	0	0	100	0.6	0	0	0	100	0.2	0.8

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3950 Sparks Drive SE
Grand Rapids, MI, 49546
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File Name : Fuller@Bonisteel
Site Code :
Start Date : 3/11/2015
Page No : 2

	Banisteel Blvd Southbound					Fuller Rd Westbound					Fuller Ct Northbound					Fuller Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	7	**26**	32	0	**65**	**8**	**171**	3	0	**182**	9	2	0	0	11	33	**156**	32	0	221	**479**
07:45 AM	6	21	36	0	63	4	162	5	**1**	172	9	2	0	0	11	36	144	**42**	0	**222**	468
08:00 AM	**11**	13	29	**3**	56	7	162	5	1	175	**13**	**4**	0	0	**17**	33	137	28	**2**	200	448
08:15 AM	6	8	**41**	1	56	1	145	**8**	0	154	10	3	0	0	13	**53**	132	14	1	200	423
Total Volume	30	68	138	4	240	20	640	21	2	683	41	11	0	0	52	155	569	116	3	843	1818
% App. Total	12.5	28.3	57.5	1.7		2.9	93.7	3.1	0.3		78.8	21.2	0	0		18.4	67.5	13.8	0.4		
PHF	.682	.654	.841	.333	.923	.625	.936	.656	.500	.938	.788	.688	.000	.000	.765	.731	.912	.690	.375	.949	.949
Lights	24	67	106	0	197	15	627	18	0	660	40	11	0	0	51	115	550	113	0	778	1686
% Lights	80.0	98.5	76.8	0	82.1	75.0	98.0	85.7	0	96.6	97.6	100	0	0	98.1	74.2	96.7	97.4	0	92.3	92.7
Buses	3	0	31	0	34	4	11	3	0	18	0	0	0	0	0	35	7	1	0	43	95
% Buses	10.0	0	22.5	0	14.2	20.0	1.7	14.3	0	2.6	0	0	0	0	0	22.6	1.2	0.9	0	5.1	5.2
Single-Unit Trucks	1	1	1	0	3	0	2	0	0	2	1	0	0	0	1	4	12	2	0	18	24
% Single-Unit Trucks	3.3	1.5	0.7	0	1.3	0	0.3	0	0	0.3	2.4	0	0	0	1.9	2.6	2.1	1.7	0	2.1	1.3
Articulated Trucks	2	0	0	0	2	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	4
% Articulated Trucks	6.7	0	0	0	0.8	5.0	0	0	0	0.1	0	0	0	0	0	0.6	0	0	0	0.1	0.2
Pedestrians	0	0	0	4	4	0	0	0	2	2	0	0	0	0	0	0	0	0	3	3	9
% Pedestrians	0	0	0	100	1.7	0	0	0	100	0.3	0	0	0	0	0	0	0	0	100	0.4	0.5
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	3	4	45	**10**	62	**5**	138	12	0	155	**32**	**25**	0	0	**57**	44	183	22	1	250	524
04:45 PM	**13**	6	53	4	76	3	135	9	**4**	151	16	8	0	0	24	55	164	31	0	250	501
05:00 PM	6	3	**80**	4	**93**	0	144	**14**	0	158	24	16	0	0	40	51	172	**44**	1	268	559
05:15 PM	8	**10**	44	4	66	2	**159**	12	0	**173**	10	11	0	0	21	**58**	**210**	37	**2**	**307**	**567**
Total Volume	30	23	222	22	297	10	576	47	4	637	82	60	0	0	142	208	729	134	4	1075	2151
% App. Total	10.1	7.7	74.7	7.4		1.6	90.4	7.4	0.6		57.7	42.3	0	0		19.3	67.8	12.5	0.4		
PHF	.577	.575	.694	.550	.798	.500	.906	.839	.250	.921	.641	.600	.000	.000	.623	.897	.868	.761	.500	.875	.948
Lights	28	22	197	0	247	8	562	45	0	615	80	60	0	0	140	186	715	131	0	1032	2034
% Lights	93.3	95.7	88.7	0	83.2	80.0	97.6	95.7	0	96.5	97.6	100	0	0	98.6	89.4	98.1	97.8	0	96.0	94.6
Buses	2	0	23	0	25	2	12	2	0	16	0	0	0	0	0	21	11	0	0	32	73
% Buses	6.7	0	10.4	0	8.4	20.0	2.1	4.3	0	2.5	0	0	0	0	0	10.1	1.5	0	0	3.0	3.4
Single-Unit Trucks	0	1	2	0	3	0	2	0	0	2	2	0	0	0	2	1	3	3	0	7	14
% Single-Unit Trucks	0	4.3	0.9	0	1.0	0	0.3	0	0	0.3	2.4	0	0	0	1.4	0.5	0.4	2.2	0	0.7	0.7
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	22	22	0	0	0	4	4	0	0	0	0	0	0	0	0	4	4	30
% Pedestrians	0	0	0	100	7.4	0	0	0	100	0.6	0	0	0	0	0	0	0	0	100	0.4	1.4

URS Corporation
3950 Sparks Drive SE
Grand Rapids, MI 49546
(616) 574-8500

File Name : Fuller Rd @ Lot M75 Driveway & Cedar Bend Dr
Site Code : 00000000
Start Date : 4/22/2014
Page No : 1

Groups Printed- Cars - Transit Buses - Peds out of crosswalk

	Cedar Bend Dr Southbound					Fuller Rd Westbound					M75 Driveway Northbound					Fuller Rd Eastbound					
Start Time		Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	0	0	1	1	2	65	0	0	67	3	0	0	2	5	0	53	14	0	67	140
06:15 AM	0	0	0	1	1	7	103	0	0	110	6	0	0	2	8	0	55	28	0	83	202
06:30 AM	0	0	0	5	5	0	123	0	0	123	5	0	1	3	9	0	88	12	2	102	239
06:45 AM	0	0	0	12	12	0	105	0	4	109	4	0	0	6	10	0	156	4	2	162	293
Total	0	0	0	19	19	9	396	0	4	409	18	0	1	13	32	0	352	58	4	414	874
07:00 AM	0	0	0	8	8	0	108	0	1	109	1	0	1	6	8	0	139	0	1	140	265
07:15 AM	0	0	1	3	4	1	137	0	1	139	0	0	1	1	2	0	155	2	0	157	302
07:30 AM	0	0	0	9	9	1	177	0	0	178	1	0	1	3	5	0	198	3	2	203	395
07:45 AM	0	0	1	8	9	0	220	0	0	220	1	0	2	4	7	0	171	1	0	172	408
Total	0	0	2	28	30	2	642	0	2	646	3	0	5	14	22	0	663	6	3	672	1370
08:00 AM	0	0	0	6	6	0	199	0	0	199	2	0	2	12	16	0	167	3	0	170	391
08:15 AM	0	0	1	6	7	0	170	0	1	171	0	0	0	5	5	0	177	1	0	178	361
08:30 AM	0	0	2	11	13	0	182	0	1	183	0	0	2	2	4	0	183	4	1	188	388
08:45 AM	0	0	0	5	5	0	200	0	0	200	0	0	0	7	7	1	168	0	1	170	382
Total	0	0	3	28	31	0	751	0	2	753	2	0	4	26	32	1	695	8	2	706	1522
09:00 AM	1	0	1	6	8	0	167	0	1	168	0	0	0	4	4	0	167	2	0	169	349
09:15 AM	0	0	0	8	8	0	164	0	0	164	0	0	1	4	5	0	136	5	1	142	319
09:30 AM	0	0	2	5	7	0	154	0	0	154	1	0	1	3	5	0	143	1	1	145	311
09:45 AM	1	0	1	6	8	0	144	0	1	145	1	0	0	3	4	0	92	2	1	95	252
Total	2	0	4	25	31	0	629	0	2	631	2	0	2	14	18	0	538	10	3	551	1231
10:00 AM	0	2	1	0	3	0	118	1	0	119	1	0	1	0	2	0	126	1	0	127	251
10:15 AM	0	0	0	1	1	0	133	0	0	133	1	0	0	0	1	1	157	1	0	159	294
10:30 AM	0	0	0	1	1	0	172	0	0	172	0	0	0	2	2	1	148	1	0	150	325
10:45 AM	0	0	1	1	2	0	153	1	0	154	1	0	0	0	1	1	143	3	0	147	304
Total	0	2	2	3	7	0	576	2	0	578	3	0	1	2	6	3	574	6	0	583	1174
11:00 AM	0	0	0	2	2	0	157	2	1	160	0	0	0	1	1	0	139	1	0	140	303
11:15 AM	0	0	0	0	0	0	149	0	0	149	0	0	0	0	0	1	122	3	0	126	275
11:30 AM	0	0	1	1	2	0	160	0	0	160	1	0	0	0	1	1	133	0	1	135	298
11:45 AM	0	0	0	0	0	0	147	0	2	149	0	0	0	0	0	0	147	0	0	147	296
Total	0	0	1	3	4	0	613	2	3	618	1	0	0	1	2	2	541	4	1	548	1172
12:00 PM	0	0	1	1	2	0	161	0	0	161	1	0	0	0	1	1	157	0	0	158	322
12:15 PM	1	0	0	0	1	0	160	0	0	160	0	0	0	1	1	0	155	3	0	158	320
12:30 PM	0	0	1	1	2	0	147	1	0	148	1	0	0	2	3	0	147	3	0	150	303
12:45 PM	0	0	0	4	4	0	151	0	0	151	0	0	0	0	0	0	166	0	0	166	321
Total	1	0	2	6	9	0	619	1	0	620	2	0	0	3	5	1	625	6	0	632	1266
01:00 PM	0	0	1	2	3	0	143	0	0	143	0	0	0	0	0	0	153	2	2	157	303
01:15 PM	0	0	0	0	0	0	136	0	0	136	0	0	0	0	0	0	163	1	0	164	300
01:30 PM	0	0	1	2	3	0	187	0	1	188	0	0	0	2	2	1	159	6	3	169	362
01:45 PM	0	0	0	2	2	0	156	0	0	156	0	0	0	0	0	0	159	2	0	161	319
Total	0	0	2	6	8	0	622	0	1	623	0	0	0	2	2	1	634	11	5	651	1284
02:00 PM	0	0	0	3	3	1	154	0	1	156	3	0	2	3	8	0	147	4	0	151	318
02:15 PM	0	0	0	12	12	0	157	1	2	160	0	0	1	3	4	0	157	4	0	161	337
02:30 PM	1	0	1	15	17	2	171	0	5	178	10	0	11	7	28	0	203	12	2	217	440
02:45 PM	0	0	1	5	6	0	195	0	8	203	6	0	5	7	18	0	177	6	0	183	410
Total	1	0	2	35	38	3	677	1	16	697	19	0	19	20	58	0	684	26	2	712	1505
03:00 PM	0	0	0	10	10	0	148	1	12	161	7	0	3	5	15	0	198	9	2	209	395

URS Corporation

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File Name : Fuller Rd @ Lot M75 Driveway & Cedar Bend Dr
Site Code : 00000000
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Groups Printed- Cars - Transit Buses - Peds out of crosswalk

	Cedar Bend Dr Southbound					Fuller Rd Westbound					M75 Driveway Northbound					Fuller Rd Eastbound					
Start Time		Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:15 PM	0	0	1	5	6	0	170	1	5	176	15	0	2	5	22	1	172	4	0	177	381
03:30 PM	0	0	0	9	9	0	204	0	2	206	21	0	9	5	35	0	179	2	0	181	431
03:45 PM	1	0	0	5	6	0	210	1	1	212	8	0	2	5	15	0	159	4	2	165	398
Total	1	0	1	29	31	0	732	3	20	755	51	0	16	20	87	1	708	19	4	732	1605
04:00 PM	0	0	0	7	7	0	187	0	2	189	2	0	2	11	15	0	187	0	1	188	399
04:15 PM	0	0	1	10	11	0	219	0	1	220	3	0	0	9	12	1	192	1	1	195	438
04:30 PM	0	0	1	13	14	0	222	0	3	225	5	0	2	5	12	1	187	0	0	188	439
04:45 PM	0	0	0	11	11	0	217	0	0	217	2	0	1	3	6	0	196	0	1	197	431
Total	0	0	2	41	43	0	845	0	6	851	12	0	5	28	45	2	762	1	3	768	1707
05:00 PM	0	0	0	17	17	0	222	0	0	222	2	0	3	12	17	0	215	0	1	216	472
05:15 PM	1	0	1	11	13	0	191	1	3	195	5	0	1	12	18	0	202	1	0	203	429
05:30 PM	0	0	0	8	8	1	211	0	2	214	5	0	0	7	12	0	202	1	0	203	437
05:45 PM	1	0	2	10	13	0	183	1	5	189	1	0	0	9	10	3	197	0	0	200	412
Total	2	0	3	46	51	1	807	2	10	820	13	0	4	40	57	3	816	2	1	822	1750
Grand Total	7	2	24	269	302	15	7909	11	66	8001	126	0	57	183	366	14	7592	157	28	7791	16460
Apprch %	2.3	0.7	7.9	89.1		0.2	98.9	0.1	0.8		34.4	0	15.6	50		0.2	97.4	2	0.4		
Total %	0	0	0.1	1.6	1.8	0.1	48	0.1	0.4	48.6	0.8	0	0.3	1.1	2.2	0.1	46.1	1	0.2	47.3	
Cars	7	2	24	269	302	15	7451	11	46	7523	112	0	57	183	352	14	7107	157	27	7305	15482
% Cars	100	100	100	100	100	100	94.2	100	69.7	94	88.9	0	100	100	96.2	100	93.6	100	96.4	93.8	94.1
Transit Buses	0	0	0	0	0	0	458	0	0	458	14	0	0	0	14	0	485	0	0	485	957
% Transit Buses	0	0	0	0	0	0	5.8	0	0	5.7	11.1	0	0	0	3.8	0	6.4	0	0	6.2	5.8
Peds out of crosswalk	0	0	0	0	0	0	0	0	20	20	0	0	0	0	0	0	0	0	1	1	21
% Peds out of crosswalk	0	0	0	0	0	0	0	0	30.3	0.2	0	0	0	0	0	0	0	0	3.6	0	0.1

URS Corporation

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Start Date : 4/22/2014
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	Cedar Bend Dr Southbound					Fuller Rd Westbound					M75 Driveway Northbound					Fuller Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	**9**	**9**	**1**	177	0	0	178	1	0	1	3	5	0	**198**	**3**	**2**	**203**	395
07:45 AM	0	0	**1**	8	9	0	**220**	0	0	**220**	1	0	**2**	4	7	0	171	1	0	172	**408**
08:00 AM	0	0	0	6	6	0	199	0	0	199	**2**	0	2	**12**	**16**	0	167	3	0	170	391
08:15 AM	0	0	1	6	7	0	170	0	**1**	171	0	0	0	5	5	0	177	1	0	178	361
Total Volume	0	0	2	29	31	1	766	0	1	768	4	0	5	24	33	0	713	8	2	723	1555
% App. Total	0	0	6.5	93.5		0.1	99.7	0	0.1		12.1	0	15.2	72.7		0	98.6	1.1	0.3		
PHF	.000	.000	.500	.806	.861	.250	.870	.000	.250	.873	.500	.000	.625	.500	.516	.000	.900	.667	.250	.890	.953
Cars	0	0	2	29	31	1	722	0	1	724	4	0	5	24	33	0	670	8	2	680	1468
% Cars	0	0	100	100	100	100	94.3	0	100	94.3	100	0	100	100	100	0	94.0	100	100	94.1	94.4
Transit Buses	0	0	0	0	0	0	44	0	0	44	0	0	0	0	0	0	43	0	0	43	87
% Transit Buses	0	0	0	0	0	0	5.7	0	0	5.7	0	0	0	0	0	0	6.0	0	0	5.9	5.6
Peds out of crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds out of crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:45 PM																					
12:45 PM	0	0	0	**4**	**4**	0	151	0	0	151	0	0	0	0	0	0	**166**	0	0	166	321
01:00 PM	0	0	**1**	2	3	0	143	0	0	143	0	0	0	0	0	0	153	2	2	157	303
01:15 PM	0	0	0	0	0	0	136	0	0	136	0	0	0	0	0	0	163	1	0	164	300
01:30 PM	0	0	1	2	3	0	**187**	0	**1**	**188**	0	0	0	**2**	**2**	**1**	159	**6**	**3**	**169**	**362**
Total Volume	0	0	2	8	10	0	617	0	1	618	0	0	0	2	2	1	641	9	5	656	1286
% App. Total	0	0	20	80		0	99.8	0	0.2		0	0	0	100		0.2	97.7	1.4	0.8		
PHF	.000	.000	.500	.500	.625	.000	.825	.000	.250	.822	.000	.000	.000	.250	.250	.250	.965	.375	.417	.970	.888
Cars	0	0	2	8	10	0	579	0	1	580	0	0	0	2	2	1	597	9	5	612	1204
% Cars	0	0	100	100	100	0	93.8	0	100	93.9	0	0	0	100	100	100	93.1	100	100	93.3	93.6
Transit Buses	0	0	0	0	0	0	38	0	0	38	0	0	0	0	0	0	44	0	0	44	82
% Transit Buses	0	0	0	0	0	0	6.2	0	0	6.1	0	0	0	0	0	0	6.9	0	0	6.7	6.4
Peds out of crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds out of crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour Analysis From 02:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	**1**	10	11	0	219	0	1	220	3	0	0	9	12	**1**	192	**1**	**1**	195	438
04:30 PM	0	0	1	13	14	0	**222**	0	**3**	**225**	**5**	0	2	5	12	1	187	0	0	188	439
04:45 PM	0	0	0	11	11	0	217	0	0	217	2	0	1	3	6	0	196	0	1	197	431
05:00 PM	0	0	0	**17**	**17**	0	222	0	0	222	2	0	**3**	**12**	**17**	0	**215**	0	1	**216**	**472**
Total Volume	0	0	2	51	53	0	880	0	4	884	12	0	6	29	47	2	790	1	3	796	1780
% App. Total	0	0	3.8	96.2		0	99.5	0	0.5		25.5	0	12.8	61.7		0.3	99.2	0.1	0.4		
PHF	.000	.000	.500	.750	.779	.000	.991	.000	.333	.982	.600	.000	.500	.604	.691	.500	.919	.250	.750	.921	.943
Cars	0	0	2	51	53	0	841	0	3	844	12	0	6	29	47	2	751	1	3	757	1701
% Cars	0	0	100	100	100	0	95.6	0	75.0	95.5	100	0	100	100	100	100	95.1	100	100	95.1	95.6
Transit Buses	0	0	0	0	0	0	39	0	0	39	0	0	0	0	0	0	39	0	0	39	78
% Transit Buses	0	0	0	0	0	0	4.4	0	0	4.4	0	0	0	0	0	0	4.9	0	0	4.9	4.4
Peds out of crosswalk	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1
% Peds out of crosswalk	0	0	0	0	0	0	0	0	25.0	0.1	0	0	0	0	0	0	0	0	0	0	0.1

AECOM

3950 Sparks Drive SE
Grand Rapids, MI, 49546
(616) 574-8500

File Name : Fuller@Maiden
Site Code :
Start Date : 3/11/2015
Page No : 1

Groups Printed- Lights - Buses - Peds

	Maiden Ln Southbound					Fuller Rd Westbound					E Medical Cnt Dr Northbound					Fuller Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	18	70	72	5	165	79	82	32	5	198	24	23	50	8	105	33	111	63	22	229	697
07:15 AM	33	66	70	7	176	52	90	22	9	173	62	48	78	3	191	23	121	75	19	238	778
07:30 AM	11	52	35	6	104	71	96	37	4	208	38	30	31	3	102	26	95	48	38	207	621
07:45 AM	3	19	11	4	37	12	26	6	3	47	6	2	16	0	24	1	26	9	5	41	149
Total	65	207	188	22	482	214	294	97	21	626	130	103	175	14	422	83	353	195	84	715	2245
08:00 AM	24	58	57	10	149	77	116	21	9	223	15	29	47	5	96	22	134	80	26	262	730
08:15 AM	27	50	23	13	113	53	93	34	10	190	17	19	46	0	82	22	132	80	28	262	647
08:30 AM	19	50	49	3	121	53	92	28	7	180	19	22	18	1	60	19	107	68	32	226	587
08:45 AM	26	50	33	5	114	73	156	18	10	257	13	17	34	0	64	34	106	96	56	292	727
Total	96	208	162	31	497	256	457	101	36	850	64	87	145	6	302	97	479	324	142	1042	2691
04:00 PM	17	17	36	0	70	31	133	31	9	204	58	52	64	4	178	41	95	19	35	190	642
04:15 PM	12	13	38	2	65	37	138	25	10	210	52	48	65	5	170	42	99	21	39	201	646
04:30 PM	20	15	30	0	65	38	143	38	12	231	62	62	78	6	208	45	113	28	36	222	726
04:45 PM	16	20	30	0	66	42	156	39	13	250	57	59	80	7	203	47	114	28	41	230	749
Total	65	65	134	2	266	148	570	133	44	895	229	221	287	22	759	175	421	96	151	843	2763
05:00 PM	22	25	35	0	82	30	118	34	16	198	58	63	84	7	212	47	113	34	47	241	733
05:15 PM	25	35	38	0	98	33	135	32	19	219	68	66	82	11	227	47	111	30	55	243	787
05:30 PM	15	31	43	0	89	46	151	14	16	227	49	63	84	9	205	58	122	35	48	263	784
05:45 PM	13	37	45	0	95	47	154	20	16	237	60	60	87	12	219	55	120	35	48	258	809
Total	75	128	161	0	364	156	558	100	67	881	235	252	337	39	863	207	466	134	198	1005	3113
Grand Total	301	608	645	55	1609	774	1879	431	168	3252	658	663	944	81	2346	562	1719	749	575	3605	10812
Apprch %	18.7	37.8	40.1	3.4		23.8	57.8	13.3	5.2		28	28.3	40.2	3.5		15.6	47.7	20.8	16		
Total %	2.8	5.6	6	0.5	14.9	7.2	17.4	4	1.6	30.1	6.1	6.1	8.7	0.7	21.7	5.2	15.9	6.9	5.3	33.3	
Lights	293	578	645	0	1516	742	1810	422	0	2974	656	633	898	0	2187	559	1647	744	0	2950	9627
% Lights	97.3	95.1	100	0	94.2	95.9	96.3	97.9	0	91.5	99.7	95.5	95.1	0	93.2	99.5	95.8	99.3	0	81.8	89
Buses	8	30	0	4	42	32	69	9	1	111	2	30	46	1	79	3	72	5	122	202	434
% Buses	2.7	4.9	0	7.3	2.6	4.1	3.7	2.1	0.6	3.4	0.3	4.5	4.9	1.2	3.4	0.5	4.2	0.7	21.2	5.6	4
Peds	0	0	0	51	51	0	0	0	167	167	0	0	0	80	80	0	0	0	453	453	751
% Peds	0	0	0	92.7	3.2	0	0	0	99.4	5.1	0	0	0	98.8	3.4	0	0	0	78.8	12.6	6.9

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	Maiden Ln Southbound					Fuller Rd Westbound					E Medical Cnt Dr Northbound					Fuller Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	24	**58**	**57**	10	**149**	**77**	116	21	9	223	15	**29**	**47**	**5**	**96**	22	**134**	80	26	262	**730**
08:15 AM	**27**	50	23	**13**	113	53	93	**34**	**10**	190	17	19	46	0	82	22	132	80	28	262	647
08:30 AM	19	50	49	3	121	53	92	28	7	180	**19**	22	18	1	60	19	107	68	32	226	587
08:45 AM	26	50	33	5	114	73	**156**	18	10	**257**	13	17	34	0	64	**34**	106	**96**	**56**	**292**	727
Total Volume	96	208	162	31	497	256	457	101	36	850	64	87	145	6	302	97	479	324	142	1042	2691
% App. Total	19.3	41.9	32.6	6.2		30.1	53.8	11.9	4.2		21.2	28.8	48	2		9.3	46	31.1	13.6		
PHF	.889	.897	.711	.596	.834	.831	.732	.743	.900	.827	.842	.750	.771	.300	.786	.713	.894	.844	.634	.892	.922
Lights	95	199	162	0	456	250	436	93	0	779	63	79	134	0	276	96	458	324	0	878	2389
% Lights	99.0	95.7	100	0	91.8	97.7	95.4	92.1	0	91.6	98.4	90.8	92.4	0	91.4	99.0	95.6	100	0	84.3	88.8
Buses	1	9	0	0	10	6	21	8	0	35	1	8	11	1	21	1	21	0	25	47	113
% Buses	1.0	4.3	0	0	2.0	2.3	4.6	7.9	0	4.1	1.6	9.2	7.6	16.7	7.0	1.0	4.4	0	17.6	4.5	4.2
Peds	0	0	0	31	31	0	0	0	36	36	0	0	0	5	5	0	0	0	117	117	189
% Peds	0	0	0	100	6.2	0	0	0	100	4.2	0	0	0	83.3	1.7	0	0	0	82.4	11.2	7.0
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	22	25	35	0	82	30	118	**34**	16	198	58	63	84	7	212	47	113	34	47	241	733
05:15 PM	**25**	35	38	0	**98**	33	135	32	**19**	219	**68**	**66**	82	11	**227**	47	111	30	**55**	243	787
05:30 PM	15	31	43	0	89	46	151	14	16	227	49	63	84	9	205	**58**	**122**	**35**	48	**263**	784
05:45 PM	13	**37**	**45**	0	95	**47**	**154**	20	16	**237**	60	60	**87**	**12**	219	55	120	35	48	258	**809**
Total Volume	75	128	161	0	364	156	558	100	67	881	235	252	337	39	863	207	466	134	198	1005	3113
% App. Total	20.6	35.2	44.2	0		17.7	63.3	11.4	7.6		27.2	29.2	39	4.5		20.6	46.4	13.3	19.7		
PHF	.750	.865	.894	.000	.929	.830	.906	.735	.882	.929	.864	.955	.968	.813	.950	.892	.955	.957	.900	.955	.962
Lights	74	117	161	0	352	147	538	100	0	785	235	246	326	0	807	207	444	134	0	785	2729
% Lights	98.7	91.4	100	0	96.7	94.2	96.4	100	0	89.1	100	97.6	96.7	0	93.5	100	95.3	100	0	78.1	87.7
Buses	1	11	0	0	12	9	20	0	0	29	0	6	11	0	17	0	22	0	26	48	106
% Buses	1.3	8.6	0	0	3.3	5.8	3.6	0	0	3.3	0	2.4	3.3	0	2.0	0	4.7	0	13.1	4.8	3.4
Peds	0	0	0	0	0	0	0	0	67	67	0	0	0	39	39	0	0	0	172	172	278
% Peds	0	0	0	0	0	0	0	0	100	7.6	0	0	0	100	4.5	0	0	0	86.9	17.1	8.9

URS Corporation

3950 Sparks Drive SE
Grand Rapids, MI 49546
(616) 574-8500

File Name : Fuller St-Glen Ave @ Fuller St (Depot)
Site Code : 00000000
Start Date : 3/19/2015
Page No : 1

Groups Printed- Cars - Trucks

	Fuller St Southbound					Westbound					Glen Ave Northbound					Fuller St (Depot) Eastbound					
Start Time		Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
08:00 AM	0	100	20	0	120	0	0	0	0	0	11	67	0	0	78	58	1	21	2	82	280
08:15 AM	0	136	42	0	178	0	0	0	0	0	15	75	0	1	91	132	0	33	13	178	447
08:30 AM	0	164	47	0	211	0	0	0	0	0	13	89	0	9	111	111	0	57	15	183	505
08:45 AM	0	156	39	0	195	0	0	0	0	0	12	94	0	4	110	129	0	54	7	190	495
Total	0	556	148	0	704	0	0	0	0	0	51	325	0	14	390	430	1	165	37	633	1727
09:00 AM	0	144	32	0	176	0	0	0	0	0	15	100	0	2	117	109	0	33	10	152	445
09:15 AM	0	106	33	0	139	0	0	0	0	0	10	79	0	6	95	99	0	32	9	140	374
09:30 AM	0	108	41	0	149	0	0	0	0	0	15	80	0	3	98	109	0	30	5	144	391
09:45 AM	0	111	33	0	144	0	0	0	0	0	13	83	0	3	99	114	0	25	13	152	395
Total	0	469	139	0	608	0	0	0	0	0	53	342	0	14	409	431	0	120	37	588	1605
04:00 PM	0	159	119	0	278	0	0	0	0	0	55	120	0	6	181	48	0	19	11	78	537
04:15 PM	0	155	112	0	267	0	0	0	0	0	50	118	0	3	171	59	0	10	9	78	516
04:30 PM	0	141	101	0	242	0	0	0	0	0	69	104	0	1	174	52	0	16	12	80	496
04:45 PM	0	198	118	0	316	0	0	0	0	0	35	112	0	3	150	61	0	17	9	87	553
Total	0	653	450	0	1103	0	0	0	0	0	209	454	0	13	676	220	0	62	41	323	2102
05:00 PM	0	161	92	0	253	0	0	0	0	0	45	109	0	4	158	81	0	18	10	109	520
05:15 PM	0	148	116	0	264	0	0	0	0	0	64	159	0	4	227	73	0	18	9	100	591
05:30 PM	0	173	98	0	271	0	0	0	0	0	53	132	0	2	187	74	0	32	9	115	573
05:45 PM	0	177	88	0	265	0	0	0	0	0	38	130	0	4	172	84	0	27	18	129	566
Total	0	659	394	0	1053	0	0	0	0	0	200	530	0	14	744	312	0	95	46	453	2250
Grand Total	0	2337	1131	0	3468	0	0	0	0	0	513	1651	0	55	2219	1393	1	442	161	1997	7684
Apprch %	0	67.4	32.6	0		0	0	0	0		23.1	74.4	0	2.5		69.8	0.1	22.1	8.1		
Total %	0	30.4	14.7	0	45.1	0	0	0	0	0	6.7	21.5	0	0.7	28.9	18.1	0	5.8	2.1	26	
Cars	0	2228	1128	0	3356	0	0	0	0	0	510	1549	0	55	2114	1391	1	440	161	1993	7463
% Cars	0	95.3	99.7	0	96.8	0	0	0	0	0	99.4	93.8	0	100	95.3	99.9	100	99.5	100	99.8	97.1
Trucks	0	109	3	0	112	0	0	0	0	0	3	102	0	0	105	2	0	2	0	4	221
% Trucks	0	4.7	0.3	0	3.2	0	0	0	0	0	0.6	6.2	0	0	4.7	0.1	0	0.5	0	0.2	2.9

URS Corporation

3950 Sparks Drive SE
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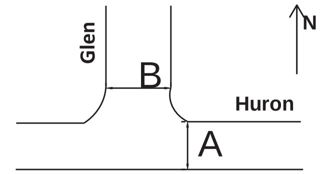
File Name : Fuller St-Glen Ave @ Fuller St (Depot)
Site Code : 00000000
Start Date : 3/19/2015
Page No : 2

	Fuller St Southbound					Westbound					Glen Ave Northbound					Fuller St (Depot) Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 08:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:15 AM																					
08:15 AM	0	136	42	0	178	0	0	0	0	0	**15**	75	0	1	91	**132**	0	33	13	178	447
08:30 AM	0	**164**	**47**	0	**211**	0	0	0	0	0	13	89	0	**9**	111	111	0	**57**	**15**	183	**505**
08:45 AM	0	156	39	0	195	0	0	0	0	0	12	94	0	4	110	129	0	54	7	**190**	495
09:00 AM	0	144	32	0	176	0	0	0	0	0	15	**100**	0	2	**117**	109	0	33	10	152	445
Total Volume	0	600	160	0	760	0	0	0	0	0	55	358	0	16	429	481	0	177	45	703	1892
% App. Total	0	78.9	21.1	0		0	0	0	0		12.8	83.4	0	3.7		68.4	0	25.2	6.4		
PHF	.000	.915	.851	.000	.900	.000	.000	.000	.000	.000	.917	.895	.000	.444	.917	.911	.000	.776	.750	.925	.937
Cars	0	567	158	0	725	0	0	0	0	0	53	327	0	16	396	481	0	177	45	703	1824
% Cars	0	94.5	98.8	0	95.4	0	0	0	0	0	96.4	91.3	0	100	92.3	100	0	100	100	100	96.4
Trucks	0	33	2	0	35	0	0	0	0	0	2	31	0	0	33	0	0	0	0	0	68
% Trucks	0	5.5	1.3	0	4.6	0	0	0	0	0	3.6	8.7	0	0	7.7	0	0	0	0	0	3.6
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	161	92	0	253	0	0	0	0	0	45	109	0	**4**	158	81	0	18	10	109	520
05:15 PM	0	148	**116**	0	264	0	0	0	0	0	**64**	**159**	0	4	**227**	73	0	18	9	100	**591**
05:30 PM	0	173	98	0	**271**	0	0	0	0	0	53	132	0	2	187	74	0	**32**	9	115	573
05:45 PM	0	**177**	88	0	265	0	0	0	0	0	38	130	0	4	172	**84**	0	27	**18**	**129**	566
Total Volume	0	659	394	0	1053	0	0	0	0	0	200	530	0	14	744	312	0	95	46	453	2250
% App. Total	0	62.6	37.4	0		0	0	0	0		26.9	71.2	0	1.9		68.9	0	21	10.2		
PHF	.000	.931	.849	.000	.971	.000	.000	.000	.000	.000	.781	.833	.000	.875	.819	.929	.000	.742	.639	.878	.952
Cars	0	636	393	0	1029	0	0	0	0	0	200	505	0	14	719	312	0	95	46	453	2201
% Cars	0	96.5	99.7	0	97.7	0	0	0	0	0	100	95.3	0	100	96.6	100	0	100	100	100	97.8
Trucks	0	23	1	0	24	0	0	0	0	0	0	25	0	0	25	0	0	0	0	0	49
% Trucks	0	3.5	0.3	0	2.3	0	0	0	0	0	0	4.7	0	0	3.4	0	0	0	0	0	2.2

APPENDIX II – TURNING VOLUME COUNTS FOR THE AM & PM PEAK HOURS ON WEEKDAYS AND PM PEAK HOUR ON WEEKENDS

Traffic Volume Counts at the Intersection of Glen and Huron St
February 9, 2016



AM Peak Hour

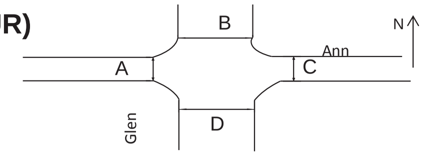
Time	Glen (PC = passenger car, T = truck)				Pedestrian Count	Huron (PC = passenger car, T = truck								Pedestrian Count	Total
	Southbound					Eastbound				Westbound					
	Left		Right		North-South(A)	Left		Through		Through		Right		East-West(B)	
	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T		
7:00AM - 7:15AM	41	1	20	3	5	59	3	95	2	46	6	25	1	3	302
7:15AM - 7:30AM	42	3	34	5	5	64	4	105	4	81	3	28	2	2	375
7:30AM - 7:45AM	56	1	41	5	4	84	1	125	5	121	4	43	1	2	487
7:45AM - 8:00AM	65	1	61	6	14	69	5	160	5	104	6	49	0	3	531
8:00AM - 8:15AM	64	2	38	10	26	70	5	146	12	94	8	57	3	3	509
8:15AM - 8:30AM	87	0	69	5	28	62	5	182	5	104	6	44	1	5	570
8:30AM - 8:45AM	92	1	45	7	27	61	9	170	7	116	4	40	2	5	554
8:45AM - 9:00AM	106	1	64	10	59	65	1	165	5	97	5	34	1	4	554

Time	Glen (PC = passenger car, T = truck)				Pedestrian Count	Huron (PC = passenger car, T = truck)								Pedestrian Count	Total
	Southbound					Eastbound				Westbound					
	Left		Right		North-South(A)	Left		Through		Through		Right		East West(B)	
	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T		
7:00AM - 8:00AM	204	6	156	19	28	276	13	485	16	352	19	145	4	10	1695
7:15AM - 8:15AM	227	7	174	26	49	287	15	536	26	400	21	177	6	10	1902
7:30AM - 8:30AM	272	4	209	26	72	285	16	613	27	423	24	193	5	13	2097
7:45AM - 8:45AM	308	4	213	28	95	262	24	658	29	418	24	190	6	16	2164
8:00AM - 9:00AM	349	4	216	32	140	258	20	663	29	411	23	175	7	17	2187

TOTAL PEAK HOUR VOLUME	**2187**
Peak Hour Factor	**0.96**

Traffic Volume Counts at the Intersection of Glen and Ann St (AM PEAK HOUR)

February 3, 2016



AM Peak Hour

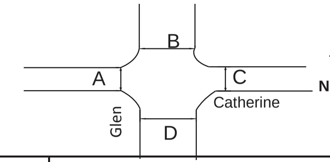
Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Ann (PC = passenger car, T = truck										Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound				Southbound					Eastbound						Westbound									
	Through		Right		Left		Through			Left		Through		Right		Left	Through	Right				A	B	C	D
	PC	T	PC	T	PC	T	PC	T	North-South	PC	T	PC	T	PC	T	PC	T	PC	T	East-West					
7:00AM - 7:15AM	51	2	21	1	55	1	63	1	18	2	0	41	4	3	0	15	2	9	0	7	271	4	2	14	5
7:15AM - 7:30AM	84	6	14	2	54	1	64	5	23	6	0	40	5	5	0	19	0	11	0	9	316	5	5	18	4
7:30AM - 7:45AM	93	0	6	1	29	1	85	2	20	10	1	32	2	1	0	38	0	30	1	5	332	4	2	16	3
7:45AM - 8:00AM	120	1	15	1	40	2	114	3	24	9	0	38	2	1	0	20	1	24	0	23	391	6	9	18	14
8:00AM - 8:15AM	88	5	12	2	30	2	119	6	13	5	0	27	2	0	0	28	0	18	0	11	344	5	7	8	4
8:15AM - 8:30AM	90	2	9	2	33	2	108	7	23	10	0	14	1	8	0	12	1	10	1	17	310	13	10	10	7
8:30AM - 8:45AM	91	3	7	1	33	2	142	6	27	10	0	20	2	9	0	12	0	15	1	21	354	10	9	17	12
8:45AM - 9:00AM	92	4	10	1	27	2	138	6	33	8	1	21	3	6	0	19	0	3	0	19	341	13	8	20	11

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Ann (PC = passenger car, T = truck)										Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Southbound					Eastbound						Westbound									
	Through		Right		Left		Through		North-South	Left		Through		Right		Left	Through	Right		East-West		A	B	C	D
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T						
7:00AM - 8:00AM	348	9	56	5	178	5	326	11	85	27	1	151	13	10	0	92	3	74	1	44	1310	19	18	66	26
7:15AM - 8:15AM	385	12	47	6	153	6	382	16	80	30	1	137	11	7	0	105	1	83	1	48	1383	20	23	60	25
7:30AM - 8:30AM	391	8	42	6	132	7	426	18	80	34	1	111	7	10	0	98	2	82	2	56	1377	28	28	52	28
7:45AM - 8:45AM	389	11	43	6	136	8	483	22	87	34	0	99	7	18	0	72	2	67	2	72	1399	34	35	53	37
8:00AM - 9:00AM	361	14	38	6	123	8	507	25	96	33	1	82	8	23	0	71	1	46	2	68	1349	41	34	55	34

TOTAL PEAK HOUR VOLUME **1399**
Peak Hour Factor **0.89**

Traffic Volume Counts at the Intersection of Glen and Catherine St (AM PEAK HOUR)

February 3, 2016



AM Peak Hour

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck												Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound				Southbound					Eastbound				Westbound													
	Left		Through		Through		Right		North-South	Left		Right		Left		Through		Right				East-West					
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T					A	B	C	D
7:00AM - 7:15AM	11	0	54	2	105	2	20	1	5	2	0	4	0	7	0	18	2	7	0			24	235	5	19	0	5
7:15AM - 7:30AM	12	1	89	2	115	2	20	0	10	4	1	3	0	3	0	14	4	6	4			44	280	5	40	5	4
7:30AM - 7:45AM	26	0	110	5	110	1	24	3	13	3	0	0	0	13	0	34	2	10	2			62	343	10	54	3	8
7:45AM - 8:00AM	28	1	90	1	137	1	21	0	24	0	0	1	1	16	1	44	11	9	5			84	367	18	82	6	2
8:00AM - 8:15AM	20	0	102	4	123	6	24	1	22	7	0	7	0	19	0	27	8	9	6			60	363	12	54	10	6
8:15AM - 8:30AM	10	0	114	3	122	7	12	0	17	11	1	13	0	6	1	15	1	6	5			38	327	11	34	6	4
8:30AM - 8:45AM	11	0	119	4	163	7	14	2	29	3	0	4	0	7	1	10	4	10	5			46	364	17	41	12	5
8:45AM - 9:00AM	13	0	135	5	144	7	11	2	23	9	2	6	0	16	0	14	3	14	7			119	388	15	78	8	41

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck)												Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Southbound					Eastbound				Westbound													
	Left		Through		Through		Right		North-South	Left		Right		Left		Through		Right				East-West		A	B	C	D
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T								
7:00AM - 8:00AM	77	2	343	10	467	6	85	4	52	9	1	8	1	39	1	110	19	32	11			214	1225	38	195	14	19
7:15AM - 8:15AM	86	2	391	12	485	10	89	4	69	14	1	11	1	51	1	119	25	34	17			250	1353	45	230	24	20
7:30AM - 8:30AM	84	1	416	13	492	15	81	4	76	21	1	21	1	54	2	120	22	34	18			244	1400	51	224	25	20
7:45AM - 8:45AM	69	1	425	12	545	21	71	3	92	21	1	25	1	48	3	96	24	34	21			228	1421	58	211	34	17
8:00AM - 9:00AM	54	0	470	16	552	27	61	5	91	30	3	30	0	48	2	66	16	39	23			263	1442	55	207	36	56

TOTAL PEAK HOUR VOLUME **1442**

Peak Hour Factor **0.93**

Traffic Volume Counts at the Intersection of Glen and Huron St
January 27, 2016

PM Peak Hour

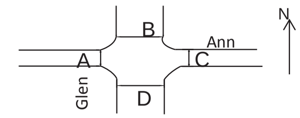
Time	Glen (PC = passenger car, T = truck)				Huron (PC = passenger car, T = truck								Total
	Southbound				Eastbound				Westbound				
	Left		Right		Left		Through		Through		Right		
	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T	
4:00PM - 4:15PM	97	2	99	3	48	2	127	5	140	3	48	0	574
4:15PM - 4:30PM	81	0	92	5	40	3	124	4	121	4	43	1	478
4:30PM - 4:45PM	109	1	82	4	44	0	125	3	112	7	51	1	539
4:45PM - 5:00PM	99	1	119	5	42	1	108	5	144	3	45	1	573
5:00PM - 5:15PM	113	0	104	5	54	0	174	6	184	3	76	1	720
5:15PM - 5:30PM	102	0	132	5	34	0	131	5	153	7	47	2	584
5:30PM - 5:45PM	95	0	115	5	29	1	128	2	129	4	66	1	575
5:45PM - 6:00PM	113	0	112	3	43	0	129	3	124	2	67	0	596

Time	Glen (PC = passenger car, T = truck)				Huron (PC = passenger car, T = truck)								Total
	Southbound				Eastbound				Westbound				
	Left		Right		Left		Through		Through		Right		
	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T	
7:00AM - 8:00AM	386	4	392	17	174	6	484	17	517	17	187	3	2204
7:15AM - 8:15AM	402	2	397	19	180	4	531	18	561	17	215	4	2350
7:30AM - 8:30AM	423	2	437	19	174	1	538	19	593	20	219	5	2450
7:45AM - 8:45AM	409	1	470	20	159	2	541	18	610	17	234	5	2486
8:00AM - 9:00AM	423	0	463	18	160	1	562	16	590	16	256	4	2509

TOTAL PEAK HOUR VOLUME **2509**
Peak Hour Factor **0.87**

Traffic Volume Counts at the Intersection of Glen and Ann St (PM PEAK HOUR)

January 27, 2016



PM Peak Hour

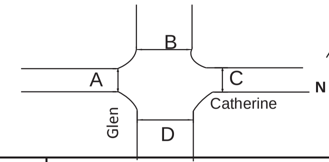
Time	Glen NB Through PC	Glen NB Through T	Glen NB Right PC	Glen NB Right T	Glen SB Left PC	Glen SB Left T	Glen SB Through PC	Glen SB Through T	Pedestrian Count North-South	Ann EB Left PC	Ann EB Left T	Ann EB Through PC	Ann EB Through T	Ann EB Right PC	Ann EB Right T	Ann WB Left PC	Ann WB Through T	Ann WB Right PC	Ann WB Right T	Pedestrian Count East-West	Total Vehicle Count	Pedestrian Count A	Pedestrian Count B	Pedestrian Count C	Pedestrian Count D
4:00PM-4:15 PM	98	4	6	2	17	2	143	2	15	6	1	6	0	8	0	37	0	31	0	25	363	10	11	5	14
4:15PM-4:30 PM	80	0	13	1	18	2	133	5	16	4	0	16	2	8	0	31	1	43	0	15	357	7	9	9	6
4:30PM-4:45 PM	100	0	4	0	25	1	140	3	16	3	0	10	1	5	0	24	0	49	0	21	365	8	11	8	10
4:45PM-5:00 PM	88	1	2	2	17	2	171	6	16	8	0	15	1	2	0	45	0	30	0	22	390	8	16	8	6
5:00PM-5:15 PM	118	0	4	1	11	1	162	4	30	7	0	10	2	4	0	61	0	35	0	29	420	5	19	25	10
5:15PM-5:30 PM	106	0	3	2	18	1	164	7	18	8	0	7	1	11	0	54	0	38	0	14	420	3	6	15	8
5:30PM-5:45 PM	96	0	3	1	13	0	159	6	15	3	0	5	1	3	0	44	0	38	0	21	372	7	8	8	13
5:45PM-6:00 PM	124	0	3	2	23	1	172	4	12	4	0	11	1	7	0	42	0	26	0	19	420	4	9	8	10

144

Time	Glen NB Through PC	Glen NB Through T	Glen NB Right PC	Glen NB Right T	Glen SB Left PC	Glen SB Left T	Glen SB Through PC	Glen SB Through T	Pedestrian Count North-South	Ann EB Left PC	Ann EB Left T	Ann EB Through PC	Ann EB Through T	Ann EB Right PC	Ann EB Right T	Ann WB Left PC	Ann WB Through T	Ann WB Right PC	Ann WB Right T	Pedestrian Count East-West	Total Vehicle Count	Total Pedestrian Volume A	Total Pedestrian Volume B	Total Pedestrian Volume C	Total Pedestrian Volume D
4:00PM - 5:00PM	366	5	25	5	77	7	587	16	63	21	1	47	4	23	0	137	1	153	0	83	1475	33	47	30	36
4:15PM - 5:15PM	386	1	23	4	71	6	606	18	78	22	0	51	6	19	0	161	1	157	0	87	1532	28	55	50	32
4:30PM - 5:30PM	412	1	13	5	71	5	637	20	80	26	0	42	5	22	0	184	0	152	0	86	1595	24	52	56	34
4:45PM - 5:45PM	408	1	12	6	59	4	656	23	79	26	0	37	5	20	0	204	0	141	0	86	1602	23	49	56	37
5:00PM - 6:00PM	444	0	13	6	65	3	657	21	75	22	0	33	5	25	0	201	0	137	0	83	1632	19	42	56	41

TOTAL PEAK HOUR VOLUME 1632
Peak Hour Factor 0.97

Traffic Volume Counts at the Intersection of Glen and Catherine St (PM PEAK HOUR)



January 27, 2016

PM Peak Hour

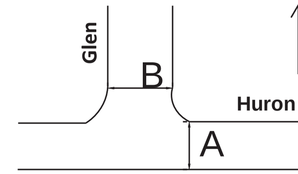
Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck												Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound				Southbound					Eastbound				Westbound													
	Left		Through		Through		Right		North-South	Left		Right		Left		Through		Right				East-West					
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T			A	B	C	D
4:00PM-4:15 PM	7	0	122	3	126	3	19	0	18	19	1	21	2	18	1	43	1	43	2	46	431	7	37	11	9
4:15PM-4:30 PM	9	0	121	4	127	1	16	2	9	9	0	15	0	15	0	38	0	32	3	46	392	3	40	6	6
4:30PM-4:45 PM	13	0	130	2	131	0	22	0	22	29	0	17	0	21	2	42	1	20	2	57	432	13	53	9	4
4:45PM-5:00 PM	5	0	133	0	156	0	27	1	19	19	0	15	1	19	0	34	2	35	4	44	451	12	35	7	9
5:00PM-5:15 PM	6	0	141	5	152	4	15	0	24	18	2	16	1	14	2	34	0	32	4	80	446	4	70	20	10
5:15PM-5:30 PM	11	0	143	2	161	3	24	1	12	18	0	11	0	17	0	29	2	40	2	43	464	5	38	7	5
5:30PM-5:45 PM	7	0	130	2	155	5	23	0	17	7	2	11	0	21	0	26	1	28	0	33	418	5	27	12	6
5:45PM-6:00 PM	2	0	145	3	176	3	20	0	10	9	1	8	0	24	2	27	1	15	3	32	439	7	29	3	3

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck)												Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Southbound					Eastbound				Westbound										A	B	C	D
	Left		Through		Through		Right		North-South	Left		Right		Left		Through		Right				East-West					
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T						
4:00PM - 5:00PM	34	0	506	9	540	4	84	3	68	76	1	68	3	73	3	157	4	130	11	193	1706	35	165	33	28
4:15PM - 5:15PM	33	0	525	11	566	5	80	3	74	75	2	63	2	69	4	148	3	119	13	227	1721	32	198	42	29
4:30PM - 5:30PM	35	0	547	9	600	7	88	2	77	84	2	59	2	71	4	139	5	127	12	224	1793	34	196	43	28
4:45PM - 5:45PM	29	0	547	9	624	12	89	2	72	62	4	53	2	71	2	123	5	135	10	200	1779	26	170	46	30
5:00PM - 6:00PM	26	0	559	12	644	15	82	1	63	52	5	46	1	76	4	116	4	115	9	188	1767	21	164	42	24

TOTAL PEAK HOUR VOLUME **1793**

Peak Hour Factor **0.97**

Traffic Volume Counts at the Intersection of Glen and Huron St
January 30, 2016



PM Peak Hour

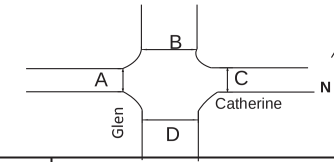
Time	Glen (PC = passenger car, T = truck)				Pedestrian Count	Huron (PC = passenger car, T = truck								Pedestrian Count	Total
	Southbound					Eastbound				Westbound					
	Left		Right		North-South(A)	Left		Through		Through		Right		East-West(B)	
	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T		
4:00PM - 4:15PM	51	0	58	1	3	25	0	83	1	72	1	18	0	5	310
4:15PM - 4:30PM	52	0	73	2	8	41	0	86	2	75	1	24	0	1	356
4:30PM - 4:45PM	52	0	77	1	6	34	0	109	1	85	0	30	0	11	389
4:45PM - 5:00PM	59	0	85	1	4	37	0	103	2	74	0	23	1	9	385
5:00PM - 5:15PM	51	0	73	1	11	45	0	102	0	64	1	31	0	7	368
5:15PM - 5:30PM	61	0	70	1	6	35	0	94	3	61	1	25	0	2	351
5:30PM - 5:45PM	53	0	70	1	6	31	0	110	1	63	1	25	0	0	355
5:45PM - 6:00PM	56	0	67	1	4	26	0	86	2	72	1	30	0	2	341

Time	Glen (PC = passenger car, T = truck)				Pedestrian Count	Huron (PC = passenger car, T = truck)								Pedestrian Count	Total
	Southbound					Eastbound				Westbound					
	Left		Right		North-South(A)	Left		Through		Through		Right		East West(B)	
	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T		
4:00PM - 5:00PM	214	0	293	5	21	137	0	381	6	306	2	95	1	26	1440
4:15PM - 5:15PM	214	0	308	5	29	157	0	400	5	298	2	108	1	28	1498
4:30PM - 5:30PM	223	0	305	4	27	151	0	408	6	284	2	109	1	29	1493
4:45PM - 5:45PM	224	0	298	4	27	148	0	409	6	262	3	104	1	18	1459
5:00PM - 6:00PM	221	0	280	4	27	137	0	392	6	260	4	111	0	11	1415

TOTAL PEAK HOUR VOLUME **1498**
Peak Hour Factor **0.96**

Traffic Volume Counts at the Intersection of Glen and Catherine St (PM PEAK HOUR)

January 30, 2016



PM Peak Hour

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck										Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound				Southbound					Eastbound				Westbound											
	Left		Through		Through		Right		North-South	Left		Right		Left		Through		Right		East-West					
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T			A	B	C	D
4:00PM-4:15 PM	5	0	67	0	106	0	19	0	16	3	0	1	0	10	0	5	0	9	0	24	225	13	15	3	9
4:15PM-4:30 PM	7	0	58	0	103	3	9	0	11	2	0	0	0	9	0	7	0	4	2	9	204	3	4	8	5
4:30PM-4:45 PM	6	0	78	0	98	2	14	0	10	0	0	0	0	17	0	6	0	13	1	8	235	7	6	3	2
4:45PM-5:00 PM	1	0	91	0	135	1	18	0	14	3	0	3	0	16	0	10	0	15	3	13	296	7	8	7	5
5:00PM-5:15 PM	6	0	100	0	104	1	23	1	5	2	0	3	0	11	0	5	0	10	1	12	267	4	7	1	5
5:15PM-5:30 PM	6	0	78	0	101	2	10	0	17	0	0	0	0	9	0	2	0	6	2	17	216	15	12	2	5
5:30PM-5:45 PM	0	0	73	0	106	2	16	0	10	2	0	3	0	10	0	7	0	7	2	5	228	7	1	3	4
5:45PM-6:00 PM	2	0	79	0	106	1	17	0	10	2	0	1	0	4	0	6	0	3	0	4	221	9	2	1	2

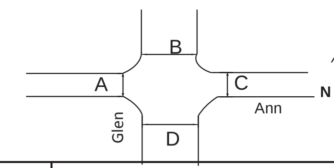
Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck)										Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Southbound					Eastbound				Westbound											
	Left		Through		Through		Right		North-South	Left		Right		Left		Through		Right		East-West		A	B	C	D
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T						
4:00PM - 5:00PM	19	0	294	0	442	6	60	0	51	8	0	4	0	52	0	28	0	41	6	54	960	30	33	21	21
4:15PM - 5:15PM	20	0	327	0	440	7	64	1	40	7	0	6	0	53	0	28	0	42	7	42	1002	21	25	19	17
4:30PM - 5:30PM	19	0	347	0	438	6	65	1	46	5	0	6	0	53	0	23	0	44	7	50	1014	33	33	13	17
4:45PM - 5:45PM	13	0	342	0	446	6	67	1	46	7	0	9	0	46	0	24	0	38	8	47	1007	33	28	13	19
5:00PM - 6:00PM	14	0	330	0	417	6	66	1	42	6	0	7	0	34	0	20	0	26	5	38	932	35	22	7	16

TOTAL PEAK HOUR VOLUME **1014**

Peak Hour Factor **0.86**

Traffic Volume Counts at the Intersection of Glen and Ann (PM PEAK HOUR)

January 30, 2016



PM Peak Hour

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck										Pedestrian Count	Total Vehicle Count	Pedestrian Count			
	Northbound				Southbound					Eastbound				Westbound											
	Through		Right		Left		Through		North-South	Left		Right		Left		Through		Right		East-West					
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T			A	B	C	D
4:00PM - 4:15PM	38	0	5	0	17	1	93	1	20	4	0	8	0	4	0	14	0	16	0	17	201	13	13	7	4
4:15PM - 4:30PM	55	2	8	2	16	1	88	2	12	6	0	10	1	3	0	16	0	20	0	3	230	3	2	9	1
4:30PM - 4:45PM	62	3	4	1	14	1	113	1	20	5	0	3	0	3	0	20	0	10	0	8	240	5	3	15	5
4:45PM - 5:00PM	62	2	4	1	15	0	123	1	23	5	0	6	1	3	0	15	0	12	0	12	250	11	9	12	3
5:00PM - 5:15PM	77	3	4	2	19	1	106	1	18	6	0	2	0	5	0	17	0	15	0	10	258	5	8	13	2
5:15PM - 5:30PM	59	2	7	2	12	1	93	1	17	9	1	4	0	5	0	14	0	16	0	6	226	13	1	4	5
5:30PM - 5:45PM	50	2	3	3	17	1	98	1	10	1	0	6	0	4	0	18	0	14	0	4	218	7	4	3	0
5:45PM - 6:00PM	67	3	3	1	15	0	101	3	15	4	0	1	0	5	0	15	0	11	0	14	229	10	4	5	10

Time	Glen (PC = passenger car, T = truck)								Pedestrian Count	Catherine (PC = passenger car, T = truck)										Pedestrian Count	Total Vehicle Count	Total Pedestrian Volume			
	Northbound				Southbound					Eastbound				Westbound											
	Left		Through		Through		Right		North-South	Left		Right		Left		Through		Right		East-West		A	B	C	D
	PC	T	PC	T	PC	T	PC	T		PC	T	PC	T	PC	T	PC	T	PC	T						
5:00PM - 6:00PM	217	7	21	4	62	3	417	5	75	20	0	27	2	13	0	65	0	58	0	40	921	32	27	43	13
5:15PM - 6:15PM	256	10	20	6	64	3	430	5	73	22	0	21	2	14	0	68	0	57	0	33	978	24	22	49	11
5:30PM - 6:30PM	260	10	19	6	60	3	435	4	78	25	1	15	1	16	0	66	0	53	0	36	974	34	21	44	15
5:45PM - 6:45PM	248	9	18	8	63	3	420	4	68	21	1	18	1	17	0	64	0	57	0	32	952	36	22	32	10
6:00PM - 7:00PM	253	10	17	8	63	3	398	6	60	20	1	13	0	19	0	64	0	56	0	34	931	35	17	25	17

TOTAL PEAK HOUR VOLUME **978**

Peak Hour Factor **0.95**

AECOM

3950 Sparks Drive SE
Grand Rapids, MI 49546

With School Traffic

File Name : Barton-Pontiac_01-14-2016
Site Code :
Start Date : 1/14/2016
Page No : 1

Groups Printed- Lights - Other Vehicles - Pedestrians

	PONTIAC Southbound					BARTON Westbound					PONTIAC Northbound					BARTON Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	9	58	6	0	73	0	25	3	0	28	3	4	2	0	9	5	61	50	0	116	226
07:15 AM	7	66	22	0	95	2	27	4	0	33	13	14	3	0	30	11	72	62	0	145	303
07:30 AM	12	106	25	0	143	1	21	3	0	25	16	21	3	1	41	17	87	71	0	175	384
07:45 AM	23	119	16	7	165	3	28	8	6	45	13	34	6	5	58	16	85	64	2	167	435
Total	51	349	69	7	476	6	101	18	6	131	45	73	14	6	138	49	305	247	2	603	1348
08:00 AM	27	137	17	7	188	4	25	16	12	57	13	44	5	4	66	10	76	56	1	143	454
08:15 AM	14	94	12	3	123	2	38	6	5	51	20	20	1	3	44	16	106	59	1	182	400
08:30 AM	9	104	18	0	131	1	30	6	0	37	10	24	2	2	38	14	80	57	2	153	359
08:45 AM	19	91	17	0	127	1	26	10	0	37	18	16	5	0	39	10	61	43	2	116	319
Total	69	426	64	10	569	8	119	38	17	182	61	104	13	9	187	50	323	215	6	594	1532
02:00 PM	5	16	10	0	31	0	25	4	0	29	24	24	0	0	48	7	22	15	0	44	152
02:15 PM	4	23	8	0	35	0	33	2	1	36	29	37	4	0	70	12	21	11	0	44	185
02:30 PM	7	30	9	0	46	0	37	4	1	42	35	28	2	1	66	5	33	28	1	67	221
02:45 PM	14	25	6	1	46	2	29	8	1	40	35	27	3	2	67	32	29	12	0	73	226
Total	30	94	33	1	158	2	124	18	3	147	123	116	9	3	251	56	105	66	1	228	784
03:00 PM	9	36	15	0	60	3	37	13	2	55	43	50	2	1	96	13	28	23	1	65	276
03:15 PM	14	40	27	1	82	4	60	15	5	84	57	58	5	20	140	15	11	13	11	50	356
03:30 PM	13	32	12	1	58	0	63	19	5	87	60	42	1	5	108	12	17	11	7	47	300
03:45 PM	7	24	12	2	45	1	76	14	3	94	68	68	0	0	136	11	30	12	2	55	330
Total	43	132	66	4	245	8	236	61	15	320	228	218	8	26	480	51	86	59	21	217	1262
04:00 PM	8	31	7	0	46	0	77	12	1	90	56	41	0	0	97	16	25	6	0	47	280
04:15 PM	7	24	9	0	40	1	74	15	0	90	69	74	3	1	147	8	23	5	0	36	313
04:30 PM	6	32	18	0	56	1	82	23	1	107	55	87	3	1	146	16	13	9	1	39	348
04:45 PM	8	35	16	0	59	1	91	20	2	114	64	108	2	1	175	19	27	14	2	62	410
Total	29	122	50	0	201	3	324	70	4	401	244	310	8	3	565	59	88	34	3	184	1351
05:00 PM	13	40	15	1	69	3	100	40	1	144	56	116	2	1	175	16	22	11	1	50	438
05:15 PM	16	32	14	0	62	2	71	38	0	111	67	103	1	0	171	13	30	15	5	63	407
05:30 PM	7	37	6	0	50	5	70	19	1	95	54	91	2	0	147	18	24	11	2	55	347
05:45 PM	18	38	10	0	66	2	49	23	0	74	46	76	2	0	124	10	25	15	0	50	314
Total	54	147	45	1	247	12	290	120	2	424	223	386	7	1	617	57	101	52	8	218	1506
Grand Total	276	1270	327	23	1896	39	1194	325	47	1605	924	1207	59	48	2238	322	1008	673	41	2044	7783
Apprch %	14.6	67	17.2	1.2		2.4	74.4	20.2	2.9		41.3	53.9	2.6	2.1		15.8	49.3	32.9	2		
Total %	3.5	16.3	4.2	0.3	24.4	0.5	15.3	4.2	0.6	20.6	11.9	15.5	0.8	0.6	28.8	4.1	13	8.6	0.5	26.3	
Lights	272	1233	319	0	1824	39	1184	318	0	1541	920	1172	58	0	2150	309	997	664	0	1970	7485
% Lights	98.6	97.1	97.6	0	96.2	100	99.2	97.8	0	96	99.6	97.1	98.3	0	96.1	96	98.9	98.7	0	96.4	96.2
Other Vehicles																					
% Other Vehicles	1.4	2.9	2.4	0	2.6	0	0.8	2.2	0	1.1	0.4	2.9	1.7	0	1.8	4	1.1	1.3	0	1.6	1.8
Pedestrians	0	0	0	23	23	0	0	0	47	47	0	0	0	48	48	0	0	0	41	41	159
% Pedestrians	0	0	0	100	1.2	0	0	0	100	2.9	0	0	0	100	2.1	0	0	0	100	2	2

AECOM
3950 Sparks Drive SE
Grand Rapids, MI 49546

With School Traffic

File Name : Barton-Pontiac_01-14-2016
Site Code :
Start Date : 1/14/2016
Page No : 2

	PONTIAC Southbound					BARTON Westbound					PONTIAC Northbound					BARTON Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	12	106	**25**													**17**		**71**			
07:45 AM	**23**	**119**	**16**	**7**	**165**	**3**	**28**	**8**	**6**	**45**	**13**	**34**	**6**	**5**	**58**	**16**	**85**	**64**	**2**	**167**	**435**
08:00 AM	**27**	**137**	17	7	**188**	**4**	**25**	**16**	**12**	**57**	13	**44**	5	4	**66**	10	76	56	1	143	**454**
08:15 AM	14	94	12	3	123	2	**38**	6	5	51	**20**						**106**	59	1	**182**	400
Total Volume	76	456	70	17	619	10	112	33	23	178	62	119	15	13	209	59	354	250	4	667	1673
% App. Total	12.3	73.7	11.3	2.7		5.6	62.9	18.5	12.9		29.7	56.9	7.2	6.2		8.8	53.1	37.5	0.6		
PHF	.704	.832	.700	.607	.823	.625	.737	.516	.479	.781	.775	.676	.625	.650	.792	.868	.835	.880	.500	.916	.921
Lights	74	448	68	0	590	10	112	32	0	154	62	112	14	0	188	57	351	246	0	654	1586
% Lights	97.4	98.2	97.1	0	95.3	100	100	97.0	0	86.5	100	94.1	93.3	0	90.0	96.6	99.2	98.4	0	98.1	94.8
Other Vehicles																					
% Other Vehicles	2.6	1.8	2.9	0	1.9	0	0	3.0	0	0.6	0	5.9	6.7	0	3.8	3.4	0.8	1.6	0	1.3	1.8
Pedestrians	0	0	0	17	17	0	0	0	23	23	0	0	0	13	13	0	0	0	4	4	57
% Pedestrians	0	0	0	100	2.7	0	0	0	100	12.9	0	0	0	100	6.2	0	0	0	100	0.6	3.4
Peak Hour Analysis From 02:00 PM to 03:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	9	36	15	0	60	3	37	13	2	55	43	50	2	1	96	13	28	**23**		**65**	276
03:15 PM	**14**	**40**	**27**		**82**	**4**			**5**				**5**	**20**	**140**	**15**			**11**		**356**
03:30 PM	13	32	12	1	58	0	63	**19**													
03:45 PM	**7**	**24**	**12**	**2**	**45**	**1**	**76**	14	3	**94**	**68**	**68**	0	0	136	11	**30**	12	2	55	330
Total Volume	43	132	66	4	245	8	236	61	15	320	228	218	8	26	480	51	86	59	21	217	1262
% App. Total	17.6	53.9	26.9	1.6		2.5	73.8	19.1	4.7		47.5	45.4	1.7	5.4		23.5	39.6	27.2	9.7		
PHF	.768	.825	.611	.500	.747	.500	.776	.803	.750	.851	.838	.801	.400	.325	.857	.850	.717	.641	.477	.835	.886
Lights	43	124	64	0	231	8	236	58	0	302	228	210	8	0	446	49	85	59	0	193	1172
% Lights	100	93.9	97.0	0	94.3	100	100	95.1	0	94.4	100	96.3				96.1	98.8				
Other Vehicles	0	8	2	0	10	0	0	3	0	3	0	8	0	0	8	2	1	0	0	3	24
% Other Vehicles	0	6.1	3.0	0	4.1	0	0	4.9	0	0.9	0	3.7	0	0	1.7	3.9	1.2	0	0	1.4	1.9
Pedestrians	0	0	0	4	4	0	0	0	15	15	0	0	0	26	26	0	0	0	21	21	66
% Pedestrians	0	0	0	100	1.6	0	0	0	100	4.7	0	0	0	100	5.4	0	0	0	100	9.7	5.2

URS Corporation

3950 Sparks Dr SE
Grand Rapids, MI 49546
(616) 574-8500

File Name : Maiden Ln @ Plymouth Rd-Broadway St
Site Code : 00000000
Start Date : 3/7/2012
Page No : 1

Groups Printed- Peds - Trucks

	Plymouth Rd/Broadway St Southbound					Maiden Ln Westbound					Plymouth Rd/Broadway St Northbound					Moore St Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	37	26	2	0	65	0	4	17	3	24	10	42	37	1	90	0	0	0	2	2	181
07:15 AM	60	41	2	0	103	3	4	18	0	25	6	67	61	0	134	0	0	0	0	0	262
07:30 AM	47	57	2	0	106	5	20	24	1	50	11	89	56	1	157	0	0	0	0	0	313
07:45 AM	63	96	3	0	162	9	23	31	4	67	12	161	65	1	239	0	0	0	1	1	469
Total	207	220	9	0	436	17	51	90	8	166	39	359	219	3	620	0	0	0	3	3	1225
08:00 AM	67	104	2	0	173	6	16	19	2	43	25	92	51	2	170	0	0	0	0	0	386
08:15 AM	50	75	4	0	129	11	10	22	3	46	16	87	56	1	160	0	0	0	0	0	335
08:30 AM	64	79	0	0	143	12	11	29	3	55	23	95	38	1	157	0	0	0	0	0	355
08:45 AM	93	104	1	3	201	13	11	19	1	44	17	101	36	0	154	0	0	0	0	0	399
Total	274	362	7	3	646	42	48	89	9	188	81	375	181	4	641	0	0	0	0	0	1475
*** BREAK ***																					
04:00 PM	34	112	10	1	157	13	45	64	2	124	29	107	6	0	142	0	0	1	1	2	425
04:15 PM	38	95	13	6	152	18	67	61	1	147	58	99	17	0	174	0	0	0	0	0	473
04:30 PM	31	108	5	0	144	17	47	68	0	132	56	127	25	1	209	0	0	0	0	0	485
04:45 PM	43	103	2	0	148	22	75	80	0	177	73	109	16	0	198	0	0	0	0	0	523
Total	146	418	30	7	601	70	234	273	3	580	216	442	64	1	723	0	0	1	1	2	1906
05:00 PM	39	77	2	3	121	16	55	55	0	126	58	122	10	0	190	0	0	0	0	0	437
05:15 PM	32	114	4	2	152	24	60	72	0	156	91	130	14	0	235	0	0	0	0	0	543
05:30 PM	44	79	3	2	128	22	54	46	0	122	59	135	15	0	209	0	0	0	0	0	459
05:45 PM	50	124	5	0	179	14	43	59	0	116	49	152	26	0	227	0	0	0	0	0	522
Total	165	394	14	7	580	76	212	232	0	520	257	539	65	0	861	0	0	0	0	0	1961
Grand Total	792	1394	60	17	2263	205	545	684	20	1454	593	1715	529	8	2845	0	0	1	4	5	6567
Apprch %	35	61.6	2.7	0.8		14.1	37.5	47	1.4		20.8	60.3	18.6	0.3		0	0	20	80		
Total %	12.1	21.2	0.9	0.3	34.5	3.1	8.3	10.4	0.3	22.1	9	26.1	8.1	0.1	43.3	0	0	0	0.1	0.1	
Cars-Peds	763	1359										1674									
% Cars-Peds	96.3	97.5	93.3	100	97	97.6	98.9	96.2	100	97.5	97.1	97.6	97.9	100	97.6	0	0	100	100	100	97.4
Trucks	29	35	4	0	68	5	6	26	0	37	17	41	11	0	69	0	0	0	0	0	174
% Trucks	3.7	2.5	6.7	0	3	2.4	1.1	3.8	0	2.5	2.9	2.4	2.1	0	2.4	0	0	0	0	0	2.6

	Plymouth Rd/Broadway St Southbound					Maiden Ln Westbound					Plymouth Rd/Broadway St Northbound					Moore St Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total		Thru	Right	Peds	App. Total		Thru	Right	Peds	App. Total		Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	63	96	3	0	162	9	**23**	**31**	**4**	**67**	12	**161**	**65**	1	**239**	0	0	0	**1**	**1**	**469**
08:00 AM	**67**	**104**	2	0	**173**	6	16	19	2	43	**25**	92	51	**2**	170	0	0	0	0	0	386
08:15 AM	50	75	**4**	0	129	11	10	22	3	46	16	87	56	1	160	0	0	0	0	0	335
08:30 AM	64	79	0	0	143	**12**	11	29	3	55	23	95	38	1	157	0	0	0	0	0	355
Total Volume	244	354	9	0	607	38	60	101	12	211	76	435	210	5	726	0	0	0	1	1	1545
% App. Total	40.2	58.3	1.5	0		18	28.4	47.9	5.7		10.5	59.9	28.9	0.7		0	0	0	100		
PHF	.910	.851	.563	.000	.877	.792	.652	.815	.750	.787	.760	.675	.808	.625	.759	.000	.000	.000	.250	.250	.824
Cars-Peds																					
% Cars-Peds	96.3	97.7	88.9	0	97.0	97.4	98.3	93.1	100	95.7	94.7	96.1	98.1	100	96.6	0	0	0	100	100	96.6
Trucks	9	8	1	0	18	1	1	7	0	9	4	17	4	0	25	0	0	0	0	0	52
% Trucks	3.7	2.3	11.1	0	3.0	2.6	1.7	6.9	0	4.3	5.3	3.9	1.9	0	3.4	0	0	0	0	0	3.4

URS Corporation

3950 Sparks Dr SE
Grand Rapids, MI 49546
(616) 574-8500

File Name : Maiden Ln @ Plymouth Rd-Broadway St
Site Code : 00000000
Start Date : 3/7/2012

	Plymouth Rd/Broadway St Southbound					Maiden Ln Westbound					Plymouth Rd/Broadway St Northbound					Moore St Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	31	108	**5**	0	144	17	47	68	0	132	56	127	**25**	**1**	209	0	0	0	0	0	485
04:45 PM	**43**	103	2	0	148	22	**75**	**80**	0	**177**	73	109	16	0	198	0	0	0	0	0	523
05:00 PM	39	77	2	**3**	121	16	55	55	0	126	58	122	10	0	190	0	0	0	0	0	437
05:15 PM	32	**114**	4	2	**152**	**24**	60	72	0	156	**91**	**130**	14	0	**235**	0	0	0	0	0	**543**
Total Volume	145	402	13	5	565	79	237	275	0	591	278	488	65	1	832	0	0	0	0	0	1988
% App. Total	25.7	71.2	2.3	0.9		13.4	40.1	46.5	0		33.4	58.7	7.8	0.1		0	0	0	0		
PHF	.843	.882	.650	.417	.929	.823	.790	.859	.000	.835	.764	.938	.650	.250	.885	.000	.000	.000	.000	.000	.915
Cars-Peds																					
% Cars-Peds	96.6	98.0	100	100	97.7	97.5	99.6	97.5	0	98.3	98.6	99.6	98.5	100	99.2	0	0	0	0	0	98.5
Trucks	5	8	0	0	13	2	1	7	0	10	4	2	1	0	7	0	0	0	0	0	30
% Trucks	3.4	2.0	0	0	2.3	2.5	0.4	2.5	0	1.7	1.4	0.4	1.5	0	0.8	0	0	0	0	0	1.5

URS Corporation

3950 Sparks Dr SE
Grand Rapids, MI 49546
(616) 574-8500

File Name : Main at Depot
Site Code : 00000000
Start Date : 2/15/2012

Groups Printed- Peds - Trucks

	Main St Southbound					Depot St Westbound					Main St Northbound					Depot St Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	177	163	0	0	340	3	0	31	0	34	0	86	25	0	111	0	0	0	0	0	485
07:15 AM	197	223	1	0	421	5	0	48	0	53	0	89	46	0	135	0	0	0	0	0	609
07:30 AM	181	276	0	0	457	4	0	59	1	64	0	127	74	0	201	0	0	0	0	0	722
07:45 AM	132	342	0	1	475	14	0	65	2	81	0	134	66	0	200	0	0	0	0	0	756
Total	687	1004	1	1	1693	26	0	203	3	232	0	436	211	0	647	0	0	0	0	0	2572
08:00 AM	169	380	0	0	549	9	0	57	3	69	0	133	69	0	202	0	0	0	0	0	820
08:15 AM	196	292	0	0	488	10	0	46	1	57	0	109	48	1	158	0	0	0	0	0	703
*** BREAK ***																					
Total	365	672	0	0	1037	19	0	103	4	126	0	242	117	1	360	0	0	0	0	0	1523
*** BREAK ***																					
04:30 PM	40	125	0	0	165	13	0	140	3	156	0	280	12	0	292	0	0	0	0	0	613
04:45 PM	42	125	0	0	167	19	0	130	5	154	0	287	8	0	295	0	0	0	0	0	616
Total	82	250	0	0	332	32	0	270	8	310	0	567	20	0	587	0	0	0	0	0	1229
05:00 PM	40	140	0	0	180	22	0	128	3	153	0	306	12	0	318	0	0	0	0	0	651
05:15 PM	47	169	0	0	216	28	0	138	7	173	0	328	9	0	337	0	0	0	0	0	726
05:30 PM	46	171	0	0	217	27	0	127	5	159	3	278	19	0	300	0	0	0	0	0	676
05:45 PM	57	154	0	0	211	11	0	122	10	143	0	222	17	0	239	0	0	0	0	0	593
Total	190	634	0	0	824	88	0	515	25	628	3	1134	57	0	1194	0	0	0	0	0	2646
Grand Total	1324	2560	1	1	3886	165	0	1091	40	1296	3	2379	405	1	2788	0	0	0	0	0	7970
Apprch %	34.1	65.9	0	0		12.7	0	84.2	3.1		0.1	85.3	14.5	0		0	0	0	0		
Total %	16.6	32.1	0	0	48.8	2.1	0	13.7	0.5	16.3	0	29.8	5.1	0	35	0	0	0	0	0	
Cars-Peds	1316	2544						1081				2360									
% Cars-Peds	99.4	99.4	100	100	99.4	99.4	0	99.1	100	99.2	100	99.2	99	100	99.2	0	0	0	0	0	99.3
Trucks	8	16	0	0	24	1	0	10	0	11	0	19	4	0	23	0	0	0	0	0	58
% Trucks	0.6	0.6	0	0	0.6	0.6	0	0.9	0	0.8	0	0.8	1	0	0.8	0	0	0	0	0	0.7

	Main St Southbound					Depot St Westbound					Main St Northbound					Depot St Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total		Thru	Right	Peds	App. Total		Thru	Right	Peds	App. Total		Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	181	276	0	0	457	4	0	59	1	64	0	127	**74**	0	201	0	0	0	0	0	722
07:45 AM	132	342	0	**1**	475	**14**	0	**65**	2	**81**	0	**134**	66	0	200	0	0	0	0	0	756
08:00 AM	169	**380**	0	0	**549**	9	0	57	**3**	69	0	133	69	0	**202**	0	0	0	0	0	**820**
08:15 AM	**196**	292	0	0	488	10	0	46	1	57	0	109	48	**1**	158	0	0	0	0	0	703
Total Volume	678	1290	0	1	1969	37	0	227	7	271	0	503	257	1	761	0	0	0	0	0	3001
% App. Total	34.4	65.5	0	0.1		13.7	0	83.8	2.6		0	66.1	33.8	0.1		0	0	0	0		
PHF	.865	.849	.000	.250	.897	.661	.000	.873	.583	.836	.000	.938	.868	.250	.942	.000	.000	.000	.000	.000	.915
Cars-Peds		1280																			
% Cars-Peds	99.4	99.2	0	100	99.3	100	0	98.2	100	98.5	0	98.2	98.8	100	98.4	0	0	0	0	0	99.0
Trucks	4	10	0	0	14	0	0	4	0	4	0	9	3	0	12	0	0	0	0	0	30
% Trucks	0.6	0.8	0	0	0.7	0	0	1.8	0	1.5	0	1.8	1.2	0	1.6	0	0	0	0	0	1.0

URS Corporation

3950 Sparks Dr SE
Grand Rapids, MI 49546
(616) 574-8500

File Name : Main at Depot
Site Code : 00000000
Start Date : 2/15/2012
Page No : 2

	Main St Southbound					Depot St Westbound					Main St Northbound					Depot St Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	42	125	0	0	167	19	0	130	5	154	0	287	8	0	295	0	0	0	0	0	616
05:00 PM	40	140	0	0	180	22	0	128	3	153	0	306	12	0	318	0	0	0	0	0	651
05:15 PM	**47**	169	0	0	216	**28**	0	**138**	**7**	**173**	0	**328**	9	0	**337**	0	0	0	0	0	**726**
05:30 PM	46	**171**	0	0	**217**	27	0	127	5	159	**3**	278	**19**	0	300	0	0	0	0	0	676
Total Volume	175	605	0	0	780	96	0	523	20	639	3	1199	48	0	1250	0	0	0	0	0	2669
% App. Total	22.4	77.6	0	0		15	0	81.8	3.1		0.2	95.9	3.8	0		0	0	0	0		
PHF	.931	.885	.000	.000	.899	.857	.000	.947	.714	.923	.250	.914	.632	.000	.927	.000	.000	.000	.000	.000	.919
Cars-Peds												1195									
% Cars-Peds	98.3	99.2	0	0	99.0	99.0	0	99.4	100	99.4	100	99.7	100	0	99.7	0	0	0	0	0	99.4
Trucks	3	5	0	0	8	1	0	3	0	4	0	4	0	0	4	0	0	0	0	0	16
% Trucks	1.7	0.8	0	0	1.0	1.0	0	0.6	0	0.6	0	0.3	0	0	0.3	0	0	0	0	0	0.6

URS Corporation

3950 Sparks Dr SE
Grand Rapids, MI 49546
(616) 574-8500

File Name : State at Fuller
Site Code : 00000000
Start Date : 2/15/2012
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Groups Printed- Peds - Trucks

	High St					Fuller St					State St					Fuller St					
	Southbound					Westbound					Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	8	0	8	0	31	0	0	31	0	0	1	2	3	0	162	23	0	185	227
07:15 AM	0	0	8	0	8	3	50	0	1	54	0	0	2	1	3	0	220	21	0	241	306
07:30 AM	0	0	52	0	52	15	69	0	0	84	0	0	14	2	16	0	203	29	0	232	384
07:45 AM	0	0	78	0	78	8	66	1	0	75	1	0	17	0	18	0	194	26	0	220	391
Total	0	0	146	0	146	26	216	1	1	244	1	0	34	5	40	0	779	99	0	878	1308
08:00 AM	0	0	26	0	26	7	67	0	0	74	1	0	9	1	11	0	224	26	0	250	361
08:15 AM	0	0	15	0	15	5	61	0	0	66	0	0	14	3	17	0	202	32	0	234	332
*** BREAK ***																					
Total	0	0	41	0	41	12	128	0	0	140	1	0	23	4	28	0	426	58	0	484	693
*** BREAK ***																					
04:30 PM	0	0	11	0	11	3	180	0	0	183	4	0	15	3	22	0	57	5	0	62	278
04:45 PM	1	0	16	0	17	9	168	0	0	177	0	0	14	3	17	0	65	3	1	69	280
Total	1	0	27	0	28	12	348	0	0	360	4	0	29	6	39	0	122	8	1	131	558
05:00 PM	0	0	22	0	22	4	163	0	3	170	2	0	27	1	30	0	60	9	0	69	291
05:15 PM	0	0	12	0	12	8	190	0	0	198	2	0	29	5	36	0	76	5	0	81	327
05:30 PM	0	0	8	0	8	2	138	0	2	142	8	0	21	4	33	0	66	4	0	70	253
05:45 PM	0	0	12	0	12	7	161	0	1	169	3	0	14	3	20	0	72	8	0	80	281
Total	0	0	54	0	54	21	652	0	6	679	15	0	91	13	119	0	274	26	0	300	1152
Grand Total	1	0	268	0	269	71	1344	1	7	1423	21	0	177	28	226	0	1601	191	1	1793	3711
Apprch %	0.4	0	99.6	0		5	94.4	0.1	0.5		9.3	0	78.3	12.4		0	89.3	10.7	0.1		
Total %	0	0	7.2	0	7.2	1.9	36.2	0	0.2	38.3	0.6	0	4.8	0.8	6.1	0	43.1	5.1	0	48.3	
Cars-Peds	0	0	268	0	268	71	1332										1587				
% Cars-Peds	0	0	100	0	99.6	100	99.1	100	100	99.2	100	0	99.4	100	99.6	0	99.1	99.5	100	99.2	99.2
Trucks	1	0	0	0	1	0	12	0	0	12	0	0	1	0	1	0	14	1	0	15	29
% Trucks	100	0	0	0	0.4	0	0.9	0	0	0.8	0	0	0.6	0	0.4	0	0.9	0.5	0	0.8	0.8

	High St					Fuller St					State St					Fuller St					
	Southbound					Westbound					Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total		Thru	Right	Peds	App. Total		Thru	Right	Peds	App. Total		Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	52	0	52	**15**	**69**	0	0	**84**	0	0	14	2	16	0	203	29	0	232	384
07:45 AM	0	0	**78**	0	**78**	8	66	**1**	0	75	**1**	0	**17**	0	**18**	0	194	26	0	220	**391**
08:00 AM	0	0	26	0	26	7	67	0	0	74	1	0	9	1	11	0	**224**	26	0	**250**	361
08:15 AM	0	0	15	0	15	5	61	0	0	66	0	0	14	**3**	17	0	202	**32**	0	234	332
Total Volume	0	0	171	0	171	35	263	1	0	299	2	0	54	6	62	0	823	113	0	936	1468
% App. Total	0	0	100	0		11.7	88	0.3	0		3.2	0	87.1	9.7		0	87.9	12.1	0		
PHF	.000	.000	.548	.000	.548	.583	.953	.250	.000	.890	.500	.000	.794	.500	.861	.000	.919	.883	.000	.936	.939
Cars-Peds																					
% Cars-Peds	0	0	100	0	100	100	98.5	100	0	98.7	100	0	98.1	100	98.4	0	99.3	99.1	0	99.3	99.2
Trucks	0	0	0	0	0	0	4	0	0	4	0	0	1	0	1	0	6	1	0	7	12
% Trucks	0	0	0	0	0	0	1.5	0	0	1.3	0	0	1.9	0	1.6	0	0.7	0.9	0	0.7	0.8

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	High St Southbound					Fuller St Westbound					State St Northbound					Fuller St Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	11	0	11	3	180	0	0	183	**4**	0	15	3	22	0	57	5	0	62	278
04:45 PM	**1**	0	16	0	17	**9**	168	0	0	177	0	0	14	3	17	0	65	3	**1**	69	280
05:00 PM	0	0	**22**	0	**22**	4	163	0	**3**	170	2	0	27	1	30	0	60	**9**	0	69	291
05:15 PM	0	0	12	0	12	8	**190**	0	0	**198**	2	0	**29**	**5**	**36**	0	**76**	5	0	**81**	**327**
Total Volume	1	0	61	0	62	24	701	0	3	728	8	0	85	12	105	0	258	22	1	281	1176
% App. Total	1.6	0	98.4	0		3.3	96.3	0	0.4		7.6	0	81	11.4		0	91.8	7.8	0.4		
PHF	.250	.000	.693	.000	.705	.667	.922	.000	.250	.919	.500	.000	.733	.600	.729	.000	.849	.611	.250	.867	.899
Cars-Peds																					
% Cars-Peds	0	0	100	0	98.4	100	99.6	0	100	99.6	100	0	100	100	100	0	97.7	100	100	97.9	99.1
Trucks	1	0	0	0	1	0	3	0	0	3	0	0	0	0	0	0	6	0	0	6	10
% Trucks	100	0	0	0	1.6	0	0.4	0	0	0.4	0	0	0	0	0	0	2.3	0	0	2.1	0.9

APPENDIX C

EXISTING (2016) CAPACITY ANALYSIS REPORTS

Lane Group	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	292	560	27	884	84	1306
v/c Ratio	0.55	0.93	0.20	0.87	0.75	0.70
Control Delay	29.8	53.5	14.8	28.0	32.7	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.8	53.5	14.8	28.0	32.7	4.7
Queue Length 50th (ft)	135	303	7	393	12	28
Queue Length 95th (ft)	198	#449	25	#668	m17	m31
Internal Link Dist (ft)		1428		423		156
Turn Bay Length (ft)			150		90	
Base Capacity (vph)	527	603	133	1016	112	1878
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.93	0.20	0.87	0.75	0.70

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	WBL	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	245	440	30	25	750	55	80	925	315
Future Volume (vph)	245	440	30	25	750	55	80	925	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1846		1797	1811		1770	3326	
Flt Permitted	0.95	1.00		0.13	1.00		0.11	1.00	
Satd. Flow (perm)	1621	1846		242	1811		204	3326	
Peak-hour factor, PHF	0.84	0.84	0.84	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	292	524	36	27	824	60	84	974	332
RTOR Reduction (vph)	0	3	0	0	15	0	0	38	0
Lane Group Flow (vph)	292	557	0	27	869	0	84	1268	0
Confl. Peds. (#/hr)	33		48	27			52		27
Heavy Vehicles (%)	6%	1%	2%	0%	4%	2%	2%	3%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			1			1	
Permitted Phases	2	2		1			1		
Actuated Green, G (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Effective Green, g (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Actuated g/C Ratio	0.33	0.33		0.55	0.55		0.55	0.55	
Clearance Time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Vehicle Extension (s)	5.0	5.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	527	600		133	1002		112	1840	
v/s Ratio Prot		c0.30			c0.48			0.38	
v/s Ratio Perm	0.18			0.11			0.41		
v/c Ratio	0.55	0.93		0.20	0.87		0.75	0.69	
Uniform Delay, d1	25.0	29.3		10.1	17.3		15.3	14.5	
Progression Factor	1.00	1.00		1.00	1.00		0.40	0.26	
Incremental Delay, d2	4.2	22.9		3.4	10.1		19.8	1.0	
Delay (s)	29.1	52.2		13.5	27.3		25.9	4.9	
Level of Service	C	D		B	C		C	A	
Approach Delay (s)		44.3			26.9			6.1	
Approach LOS		D			C			A	

Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	147	147	848	1467
v/c Ratio	0.23	0.23	0.52	0.88
Control Delay	20.0	20.0	13.2	25.1
Queue Delay	0.2	0.2	1.3	0.0
Total Delay	20.1	20.1	14.4	25.1
Queue Length 50th (ft)	53	53	223	375
Queue Length 95th (ft)	98	98	m224	#486
Internal Link Dist (ft)	303	327	1027	111
Turn Bay Length (ft)				
Base Capacity (vph)	641	641	1646	1674
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	120	120	543	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.28	0.28	0.77	0.88

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	105	20	10	105	20	10	750	20	20	1290	40
Future Volume (vph)	10	105	20	10	105	20	10	750	20	20	1290	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.2			6.2	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.98			0.98			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1818			1818			3523			3521	
Flt Permitted		0.98			0.98			0.92			0.93	
Satd. Flow (perm)		1785			1785			3231			3284	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	114	22	11	114	22	11	815	22	22	1402	43
RTOR Reduction (vph)	0	7	0	0	7	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	140	0	0	140	0	0	846	0	0	1465	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		32.0			32.0			45.8			45.8	
Effective Green, g (s)		32.0			32.0			45.8			45.8	
Actuated g/C Ratio		0.36			0.36			0.51			0.51	
Clearance Time (s)		6.0			6.0			6.2			6.2	
Vehicle Extension (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		634			634			1644			1671	
v/s Ratio Prot												
v/s Ratio Perm		c0.08			0.08			0.26			c0.45	
v/c Ratio		0.22			0.22			0.51			0.88	
Uniform Delay, d1		20.3			20.3			14.7			19.6	
Progression Factor		1.00			1.00			0.85			0.94	
Incremental Delay, d2		0.8			0.8			0.5			6.0	
Delay (s)		21.1			21.1			13.0			24.4	
Level of Service		C			C			B			C	
Approach Delay (s)		21.1			21.1			13.0			24.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	48	280	830	726	1462
v/c Ratio	0.31	0.35	0.51	1.08	0.52
Control Delay	38.6	3.5	24.5	82.7	4.5
Queue Delay	0.0	0.0	21.3	0.0	0.9
Total Delay	38.6	3.5	45.8	82.7	5.4
Queue Length 50th (ft)	27	35	130	~325	126
Queue Length 95th (ft)	59	15	157	#544	161
Internal Link Dist (ft)			111		640
Turn Bay Length (ft)	300			240	
Base Capacity (vph)	160	801	1622	670	2788
Starvation Cap Reductn	0	0	806	0	0
Spillback Cap Reductn	0	0	0	0	956
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.30	0.35	1.02	1.08	0.80

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	40	0	235	0	515	265	690	1310	5
Future Volume (vph)	0	0	0	40	0	235	0	515	265	690	1310	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0		6.0		6.0		6.0	6.0	
Lane Util. Factor				1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes				1.00		1.00		0.99		1.00	1.00	
Flpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Frt				1.00		0.85		0.95		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				1805		1583		3333		1786	3572	
Flt Permitted				0.95		1.00		1.00		0.26	1.00	
Satd. Flow (perm)				1805		1583		3333		498	3572	
Peak-hour factor, PHF	0.92	0.92	0.92	0.84	0.84	0.84	0.94	0.94	0.94	0.95	0.90	0.90
Adj. Flow (vph)	0	0	0	48	0	280	0	548	282	726	1456	6
RTOR Reduction (vph)	0	0	0	0	0	169	0	57	0	0	0	0
Lane Group Flow (vph)	0	0	0	48	0	111	0	773	0	726	1462	0
Confl. Peds. (#/hr)	1		5	1		1			7	7		
Heavy Vehicles (%)	2%	2%	2%	0%	0%	2%	0%	2%	1%	1%	1%	0%
Turn Type				Prot		pt+ov		NA		D.P+P	NA	
Protected Phases		8		4		4 5		6		5	2	
Permitted Phases	8									6		
Actuated Green, G (s)				7.7		35.7		42.3		64.3	70.3	
Effective Green, g (s)				7.7		35.7		42.3		64.3	70.3	
Actuated g/C Ratio				0.09		0.40		0.47		0.71	0.78	
Clearance Time (s)				6.0				6.0		6.0	6.0	
Vehicle Extension (s)				4.0				5.0		2.0	5.0	
Lane Grp Cap (vph)				154		627		1566		670	2790	
v/s Ratio Prot				c0.03		0.07		0.23		c0.26	0.41	
v/s Ratio Perm										c0.51		
v/c Ratio				0.31		0.18		0.49		1.08	0.52	
Uniform Delay, d1				38.7		17.6		16.5		17.9	3.6	
Progression Factor				0.86		0.95		1.62		1.00	1.00	
Incremental Delay, d2				1.6		0.2		1.0		59.6	0.7	
Delay (s)				34.8		17.0		27.6		77.5	4.4	
Level of Service				C		B		C		E	A	
Approach Delay (s)		0.0			19.6			27.6			28.6	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.7
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	850	100	5	270	60	85
Future Volume (Veh/h)	850	100	5	270	60	85
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	924	109	5	293	65	92
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1035		1284	980
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1035		1284	980
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		64	70
cM capacity (veh/h)			670		180	302

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1033	298	157
Volume Left	0	5	65
Volume Right	109	0	92
cSH	1700	670	236
Volume to Capacity	0.61	0.01	0.66
Queue Length 95th (ft)	0	1	105
Control Delay (s)	0.0	0.3	46.0
Lane LOS		A	E
Approach Delay (s)	0.0	0.3	46.0
Approach LOS			E

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	85	0	0	105	35	590	0	0	0	0
Future Volume (Veh/h)	0	0	85	0	0	105	35	590	0	0	0	0
Sign Control		Yield			Yield			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.74	0.92	0.92	0.87	0.87	0.87	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	115	0	0	121	40	678	0	0	0	0
Pedestrians											6	
Lane Width (ft)											0.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	546	758	0	873	758	345	0			678		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	546	758	0	873	758	345	0			678		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	89	100	100	81	98			100		
cM capacity (veh/h)	336	327	1084	214	327	651	1622			910		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	115	121	266	452
Volume Left	0	0	40	0
Volume Right	115	121	0	0
cSH	1084	651	1622	1700
Volume to Capacity	0.11	0.19	0.02	0.27
Queue Length 95th (ft)	9	17	2	0
Control Delay (s)	8.7	11.8	1.3	0.0
Lane LOS	A	B	A	
Approach Delay (s)	8.7	11.8	0.5	
Approach LOS	A	B		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	32.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	5	10	20	15	0	0	0	0	80	760	40
Future Volume (Veh/h)	0	5	10	20	15	0	0	0	0	80	760	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.70	0.70	0.70	0.92	0.92	0.92	0.81	0.81	0.81
Hourly flow rate (vph)	0	8	17	29	21	0	0	0	0	99	938	49
Pedestrians		6			12							
Lane Width (ft)		12.0			12.0							
Walking Speed (ft/s)		4.0			4.0							
Percent Blockage		1			1							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1177	1178	500	700	1203	12	993			12		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1177	1178	500	700	1203	12	993			12		
tC, single (s)	7.5	6.5	7.2	7.5	6.6	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.1	3.3	2.2			2.2		
p0 queue free %	100	95	96	90	87	100	100			94		
cM capacity (veh/h)	126	178	484	287	163	1061	701			1604		

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	25	50	568	518
Volume Left	0	29	99	0
Volume Right	17	0	0	49
cSH	312	217	1604	1700
Volume to Capacity	0.08	0.23	0.06	0.30
Queue Length 95th (ft)	6	22	5	0
Control Delay (s)	17.5	26.5	1.8	0.0
Lane LOS	C	D	A	
Approach Delay (s)	17.5	26.5	0.9	
Approach LOS	C	D		

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	772	473	247	458
v/c Ratio	0.41	0.25	0.39	0.82
Control Delay	23.6	12.2	35.5	54.0
Queue Delay	0.0	0.2	0.0	0.0
Total Delay	23.7	12.5	35.5	54.0
Queue Length 50th (ft)	205	145	173	387
Queue Length 95th (ft)	397	102	219	468
Internal Link Dist (ft)	355	346	123	
Turn Bay Length (ft)				
Base Capacity (vph)	1884	1903	779	696
Starvation Cap Reductn	0	755	0	0
Spillback Cap Reductn	86	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.41	0.32	0.66

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	695	445	0	235	435
Future Volume (vph)	0	695	445	0	235	435
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6	5.6
Lane Util. Factor		0.95	0.95		1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3505	3539		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3505	3539		1770	1583
Peak-hour factor, PHF	0.90	0.90	0.94	0.94	0.95	0.95
Adj. Flow (vph)	0	772	473	0	247	458
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	772	473	0	247	458
Confl. Peds. (#/hr)					4	
Heavy Vehicles (%)	2%	3%	2%	2%	2%	2%
Turn Type		NA	NA		Prot	Prot
Protected Phases		1	1		3	3
Permitted Phases						3
Actuated Green, G (s)		75.0	75.0		51.0	51.0
Effective Green, g (s)		75.0	75.0		51.0	51.0
Actuated g/C Ratio		0.52	0.52		0.35	0.35
Clearance Time (s)		5.6	5.6		5.6	5.6
Vehicle Extension (s)		3.0	3.0		5.0	5.0
Lane Grp Cap (vph)		1825	1843		626	560
v/s Ratio Prot		c0.22	0.13		0.14	c0.29
v/s Ratio Perm						
v/c Ratio		0.42	0.26		0.39	0.82
Uniform Delay, d1		21.2	19.1		34.9	42.3
Progression Factor		1.00	0.57		1.00	1.00
Incremental Delay, d2		0.7	0.3		0.9	10.2
Delay (s)		21.9	11.2		35.8	52.4
Level of Service		C	B		D	D
Approach Delay (s)		21.9	11.2		46.6	
Approach LOS		C	B		D	

Intersection Summary			
HCM 2000 Control Delay	28.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	14.2
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	99	862	284	420	152	127
v/c Ratio	0.17	0.42	0.57	0.16	0.65	0.30
Control Delay	10.2	10.3	11.1	1.3	72.4	41.2
Queue Delay	0.0	0.2	0.1	0.2	0.0	0.0
Total Delay	10.2	10.5	11.2	1.5	72.4	41.2
Queue Length 50th (ft)	24	101	12	7	137	97
Queue Length 95th (ft)	46	226	73	24	181	113
Internal Link Dist (ft)		346		296	1476	
Turn Bay Length (ft)	220		200			
Base Capacity (vph)	581	2051	644	2678	281	594
Starvation Cap Reductn	0	420	26	1519	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.53	0.46	0.36	0.54	0.21

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	440	215	250	360	10	60	60	100	0	0	0
Future Volume (vph)	75	440	215	250	360	10	60	60	100	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1			5.7	5.7			
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			
Frpb, ped/bikes	1.00	0.97		1.00	1.00			1.00	1.00			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.95		1.00	1.00			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.98	1.00			
Satd. Flow (prot)	1765	3278		1770	3523			1817	1583			
Flt Permitted	0.51	1.00		0.26	1.00			0.98	1.00			
Satd. Flow (perm)	941	3278		485	3523			1817	1583			
Peak-hour factor, PHF	0.76	0.76	0.76	0.88	0.88	0.88	0.79	0.79	0.79	0.92	0.92	0.92
Adj. Flow (vph)	99	579	283	284	409	11	76	76	127	0	0	0
RTOR Reduction (vph)	0	26	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	99	836	0	284	419	0	0	152	127	0	0	0
Confl. Peds. (#/hr)	1		12	12		1	5					
Turn Type	Perm	NA		pm+pt	NA		Split	NA	pt+ov			
Protected Phases		6		5	2		7	7	7 5			
Permitted Phases	6			2								
Actuated Green, G (s)	86.7	86.7		107.1	107.1			18.5	38.5			
Effective Green, g (s)	86.7	86.7		107.1	107.1			18.5	38.5			
Actuated g/C Ratio	0.60	0.60		0.74	0.74			0.13	0.27			
Clearance Time (s)	6.1	6.1		6.1	6.1			5.7				
Vehicle Extension (s)	5.0	5.0		3.0	5.0			5.0				
Lane Grp Cap (vph)	566	1973		488	2620			233	423			
v/s Ratio Prot		0.26		c0.06	0.12			c0.08	0.08			
v/s Ratio Perm	0.11			c0.37								
v/c Ratio	0.17	0.42		0.58	0.16			0.65	0.30			
Uniform Delay, d1	12.7	15.3		8.0	5.4			59.7	42.0			
Progression Factor	0.56	0.60		0.98	0.20			1.00	1.00			
Incremental Delay, d2	0.6	0.6		1.8	0.1			8.5	0.8			
Delay (s)	7.8	9.9		9.7	1.2			68.2	42.9			
Level of Service	A	A		A	A			E	D			
Approach Delay (s)		9.7			4.6			56.7			0.0	
Approach LOS		A			A			E			A	

Intersection Summary			
HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	575	6	669	29	6
v/c Ratio	0.19	0.08	0.21	0.30	0.04
Control Delay	1.3	86.2	2.0	72.4	29.0
Queue Delay	0.2	0.0	0.0	0.0	0.0
Total Delay	1.5	86.2	2.0	72.4	29.0
Queue Length 50th (ft)	5	5	37	27	0
Queue Length 95th (ft)	54	m21	6	59	14
Internal Link Dist (ft)	296		2760	173	
Turn Bay Length (ft)		200		100	
Base Capacity (vph)	3087	206	3245	345	271
Starvation Cap Reductn	1545	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.37	0.03	0.21	0.08	0.02

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	515	25	5	595	25	5
Future Volume (vph)	515	25	5	595	25	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		5.2	5.2	5.6	5.2
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3508		1770	3539	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3508		1770	3539	1770	1583
Peak-hour factor, PHF	0.94	0.94	0.89	0.89	0.87	0.87
Adj. Flow (vph)	548	27	6	669	29	6
RTOR Reduction (vph)	1	0	0	0	0	6
Lane Group Flow (vph)	574	0	6	669	29	0
Confl. Peds. (#/hr)		5	5			
Turn Type	NA		Prot	NA	Prot	pt+ov
Protected Phases	2		1	6	3	1 8
Permitted Phases						
Actuated Green, G (s)	118.9		2.7	127.7	5.5	13.8
Effective Green, g (s)	118.9		2.7	127.7	5.5	8.2
Actuated g/C Ratio	0.83		0.02	0.89	0.04	0.06
Clearance Time (s)	6.1		5.2	5.2	5.6	
Vehicle Extension (s)	4.0		3.0	4.0	3.0	
Lane Grp Cap (vph)	2896		33	3138	67	90
v/s Ratio Prot	0.16		0.00	c0.19	c0.02	0.00
v/s Ratio Perm						
v/c Ratio	0.20		0.18	0.21	0.43	0.00
Uniform Delay, d1	2.6		69.6	1.1	67.7	64.0
Progression Factor	0.47		1.28	1.56	1.00	1.00
Incremental Delay, d2	0.1		2.6	0.2	4.4	0.0
Delay (s)	1.4		91.4	1.9	72.2	64.1
Level of Service	A		F	A	E	E
Approach Delay (s)	1.4			2.7	70.8	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	54	565	539	129	419	144
v/c Ratio	0.11	0.27	0.31	0.10	0.78	0.20
Control Delay	11.2	11.0	25.3	0.7	55.8	4.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.2	11.0	25.3	0.7	55.8	4.0
Queue Length 50th (ft)	11	110	142	0	359	0
Queue Length 95th (ft)	29	102	284	12	371	25
Internal Link Dist (ft)		2760	1391		524	
Turn Bay Length (ft)	100			150	75	
Base Capacity (vph)	493	2070	1765	1326	693	805
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.27	0.31	0.10	0.60	0.18

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	45	475	480	115	335	115
Future Volume (vph)	45	475	480	115	335	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.6	5.6	5.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1768	3539	3539	1561	1770	1583
Flt Permitted	0.40	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	748	3539	3539	1561	1770	1583
Peak-hour factor, PHF	0.84	0.84	0.89	0.89	0.80	0.80
Adj. Flow (vph)	54	565	539	129	419	144
RTOR Reduction (vph)	0	0	0	27	0	88
Lane Group Flow (vph)	54	565	539	102	419	56
Confl. Peds. (#/hr)	5			5	6	18
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	1	6	2	4	4	1 7
Permitted Phases	6			2		
Actuated Green, G (s)	82.7	82.7	70.3	113.9	43.6	56.0
Effective Green, g (s)	82.7	82.7	70.3	113.9	43.6	56.0
Actuated g/C Ratio	0.57	0.57	0.49	0.79	0.30	0.39
Clearance Time (s)	5.5	5.5	5.5	5.6	5.6	
Vehicle Extension (s)	4.0	4.5	4.5	6.0	6.0	
Lane Grp Cap (vph)	478	2032	1727	1234	535	615
v/s Ratio Prot	0.01	c0.16	c0.15	0.03	c0.24	0.04
v/s Ratio Perm	0.06			0.04		
v/c Ratio	0.11	0.28	0.31	0.08	0.78	0.09
Uniform Delay, d1	18.0	15.5	22.3	3.4	45.9	27.9
Progression Factor	0.54	0.60	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.3	0.2	0.1	9.1	0.1
Delay (s)	9.9	9.6	22.4	3.4	55.0	28.0
Level of Service	A	A	C	A	D	C
Approach Delay (s)		9.7	18.8		48.0	
Approach LOS		A	B		D	

Intersection Summary			
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	295	732	458	195	428	301
v/c Ratio	0.63	0.41	0.35	0.29	0.63	0.60
Control Delay	28.7	16.2	23.0	5.0	37.5	27.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	1.5
Total Delay	28.7	16.2	23.0	5.0	37.5	28.7
Queue Length 50th (ft)	114	155	111	0	122	154
Queue Length 95th (ft)	#206	207	157	48	150	207
Internal Link Dist (ft)		355	330		239	
Turn Bay Length (ft)	150			100	140	
Base Capacity (vph)	467	1797	1325	681	682	649
Starvation Cap Reductn	0	0	0	0	0	193
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.41	0.35	0.29	0.63	0.66

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	280	695	435	185	355	250
Future Volume (vph)	280	695	435	185	355	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.94	1.00	1.00
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1672	3471	3438	1455	3467	1429
Flt Permitted	0.45	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	793	3471	3438	1455	3467	1429
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.83	0.83
Adj. Flow (vph)	295	732	458	195	428	301
RTOR Reduction (vph)	0	0	0	122	0	0
Lane Group Flow (vph)	295	732	458	73	428	301
Confl. Peds. (#/hr)	17			17	140	
Heavy Vehicles (%)	7%	4%	5%	4%	1%	13%
Turn Type	pm+pt	NA	NA	Perm	Prot	Prot
Protected Phases	1	6	2		3	8
Permitted Phases	6			2		
Actuated Green, G (s)	45.4	45.4	33.5	33.5	17.7	32.7
Effective Green, g (s)	45.4	45.4	33.5	33.5	17.7	32.7
Actuated g/C Ratio	0.50	0.50	0.37	0.37	0.20	0.36
Clearance Time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Lane Grp Cap (vph)	460	1750	1279	541	681	519
v/s Ratio Prot	c0.04	0.21	0.13		0.12	c0.21
v/s Ratio Perm	c0.28			0.05		
v/c Ratio	0.64	0.42	0.36	0.13	0.63	0.58
Uniform Delay, d1	19.2	14.0	20.5	18.7	33.1	23.1
Progression Factor	1.00	1.00	1.00	1.00	0.99	0.97
Incremental Delay, d2	6.7	0.7	0.8	0.5	4.3	1.6
Delay (s)	25.9	14.7	21.2	19.2	37.0	23.9
Level of Service	C	B	C	B	D	C
Approach Delay (s)		18.0	20.6		31.6	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	22.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	44	158	96	90	549	163	567
v/c Ratio	0.15	0.50	0.49	0.28	0.45	0.33	0.24
Control Delay	30.4	35.6	40.8	9.0	4.2	3.8	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.3	0.0	0.1
Total Delay	30.4	35.6	40.8	9.0	4.5	3.8	2.3
Queue Length 50th (ft)	20	72	47	0	74	13	23
Queue Length 95th (ft)	42	110	80	26	42	19	26
Internal Link Dist (ft)		284			239		250
Turn Bay Length (ft)			85			100	
Base Capacity (vph)	534	566	357	515	1224	490	2391
Starvation Cap Reductn	0	0	0	0	244	0	770
Spillback Cap Reductn	0	0	0	1	30	0	53
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.28	0.27	0.18	0.56	0.33	0.35

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	105	20	75	0	70	0	400	50	145	505	0
Future Volume (vph)	35	105	20	75	0	70	0	400	50	145	505	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Lane Util. Factor	1.00	1.00		1.00		1.00		1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00		0.90		0.99		1.00	1.00	
Flpb, ped/bikes	0.92	1.00		0.96		1.00		1.00		0.95	1.00	
Frt	1.00	0.98		1.00		0.85		0.98		1.00	1.00	
Flt Protected	0.95	1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1659	1734		1733		1412		1773		1624	3471	
Flt Permitted	0.95	1.00		0.61		1.00		1.00		0.41	1.00	
Satd. Flow (perm)	1659	1734		1113		1412		1773		706	3471	
Peak-hour factor, PHF	0.79	0.79	0.79	0.78	0.78	0.78	0.82	0.82	0.82	0.89	0.89	0.89
Adj. Flow (vph)	44	133	25	96	0	90	0	488	61	163	567	0
RTOR Reduction (vph)	0	9	0	0	0	74	0	3	0	0	0	0
Lane Group Flow (vph)	44	149	0	96	0	16	0	546	0	163	567	0
Confl. Peds. (#/hr)	35		37	37		35			53	53		
Heavy Vehicles (%)	0%	7%	0%	0%	3%	3%	0%	3%	12%	6%	4%	0%
Turn Type	Perm	NA		D.Pm		Perm		NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4			4		4				2		
Actuated Green, G (s)	15.9	15.9		15.9		15.9		62.0		62.0	62.0	
Effective Green, g (s)	15.9	15.9		15.9		15.9		62.0		62.0	62.0	
Actuated g/C Ratio	0.18	0.18		0.18		0.18		0.69		0.69	0.69	
Clearance Time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Vehicle Extension (s)	4.0	4.0		4.0		4.0		4.0		4.0	4.0	
Lane Grp Cap (vph)	293	306		196		249		1221		486	2391	
v/s Ratio Prot		0.09						c0.31			0.16	
v/s Ratio Perm	0.03			c0.09		0.01				0.23		
v/c Ratio	0.15	0.49		0.49		0.06		0.45		0.34	0.24	
Uniform Delay, d1	31.3	33.4		33.4		30.9		6.3		5.7	5.2	
Progression Factor	1.00	1.00		1.00		1.00		0.43		0.29	0.34	
Incremental Delay, d2	0.3	1.7		2.6		0.1		1.1		1.7	0.2	
Delay (s)	31.7	35.0		36.0		31.0		3.8		3.4	2.0	
Level of Service	C	D		D		C		A		A	A	
Approach Delay (s)		34.3			33.6			3.8			2.3	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.1
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	56	48	71	130	84	63	551	742
v/c Ratio	0.19	0.12	0.31	0.68	0.57	0.23	0.61	0.46
Control Delay	33.6	0.6	39.5	57.1	52.9	12.9	16.8	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0
Total Delay	33.6	0.6	39.5	57.1	52.9	12.9	17.7	10.7
Queue Length 50th (ft)	27	0	37	75	47	15	142	75
Queue Length 95th (ft)	42	0	59	104	74	30	182	119
Internal Link Dist (ft)				296			250	793
Turn Bay Length (ft)		25				100		
Base Capacity (vph)	292	397	229	190	148	278	899	1623
Starvation Cap Reductn	0	0	0	0	0	0	142	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.12	0.31	0.68	0.57	0.23	0.73	0.46

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	0	30	50	85	65	55	485	0	0	580	65
Future Volume (vph)	35	0	30	50	85	65	55	485	0	0	580	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Lane Util. Factor	1.00		1.00	1.00	0.95	0.95	1.00	1.00			0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.98	1.00	1.00	1.00			0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	0.95	1.00			1.00	
Frt	1.00		0.85	1.00	0.99	0.85	1.00	1.00			0.98	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1656		1615	1736	1439	1120	1718	1845			3310	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.31	1.00			1.00	
Satd. Flow (perm)	1656		1615	1736	1439	1120	567	1845			3310	
Peak-hour factor, PHF	0.63	0.63	0.63	0.70	0.70	0.70	0.88	0.88	0.88	0.87	0.87	0.87
Adj. Flow (vph)	56	0	48	71	121	93	62	551	0	0	667	75
RTOR Reduction (vph)	0	0	40	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	56	0	8	71	130	84	63	551	0	0	733	0
Confl. Peds. (#/hr)	207		56	56		207	55					55
Heavy Vehicles (%)	9%	0%	0%	4%	20%	37%	0%	3%	0%	0%	5%	8%
Turn Type	Prot		Prot	Split	NA	Prot	Perm	NA			NA	
Protected Phases	8		8	4	4	4		2			2	
Permitted Phases							2					
Actuated Green, G (s)	15.9		15.9	11.9	11.9	11.9	43.9	43.9			43.9	
Effective Green, g (s)	15.9		15.9	11.9	11.9	11.9	43.9	43.9			43.9	
Actuated g/C Ratio	0.18		0.18	0.13	0.13	0.13	0.49	0.49			0.49	
Clearance Time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Vehicle Extension (s)	2.0		2.0	4.0	4.0	4.0	2.0	2.0			2.0	
Lane Grp Cap (vph)	292		285	229	190	148	276	899			1614	
v/s Ratio Prot	c0.03		0.01	0.04	c0.09	0.08		c0.30			0.22	
v/s Ratio Perm							0.11					
v/c Ratio	0.19		0.03	0.31	0.68	0.57	0.23	0.61			0.45	
Uniform Delay, d1	31.6		30.7	35.3	37.3	36.6	13.3	16.8			15.2	
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.79	0.80			0.65	
Incremental Delay, d2	1.5		0.2	3.5	18.2	14.8	1.8	2.9			0.8	
Delay (s)	33.0		30.9	38.8	55.5	51.5	12.3	16.3			10.7	
Level of Service	C		C	D	E	D	B	B			B	
Approach Delay (s)		32.0			50.1			15.9			10.7	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.3
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	710	60	462	767
v/c Ratio	0.74	0.15	0.23	0.47
Control Delay	30.7	6.0	5.5	16.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	30.7	6.0	5.5	16.4
Queue Length 50th (ft)	174	9	36	140
Queue Length 95th (ft)	m165	m11	42	217
Internal Link Dist (ft)	1498		793	705
Turn Bay Length (ft)	200	125		
Base Capacity (vph)	1175	436	1979	1642
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.60	0.14	0.23	0.47

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	480	180	55	425	530	160
Future Volume (vph)	480	180	55	425	530	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7		6.1	6.1	6.1	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.98		1.00	1.00	0.97	
Flpb, ped/bikes	1.00		0.99	1.00	1.00	
Frt	0.96		1.00	1.00	0.97	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	3358		1723	3312	3240	
Flt Permitted	0.96		0.31	1.00	1.00	
Satd. Flow (perm)	3358		559	3312	3240	
Peak-hour factor, PHF	0.93	0.93	0.92	0.92	0.90	0.90
Adj. Flow (vph)	516	194	60	462	589	178
RTOR Reduction (vph)	50	0	0	0	26	0
Lane Group Flow (vph)	660	0	60	462	741	0
Confl. Peds. (#/hr)		16	45			45
Heavy Vehicles (%)	0%	0%	4%	9%	6%	1%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	2		1	4	3	
Permitted Phases			4			
Actuated Green, G (s)	24.4		53.8	53.8	43.7	
Effective Green, g (s)	24.4		53.8	53.8	43.7	
Actuated g/C Ratio	0.27		0.60	0.60	0.49	
Clearance Time (s)	5.7		6.1	6.1	6.1	
Vehicle Extension (s)	4.0		2.0	0.2	2.0	
Lane Grp Cap (vph)	910		385	1979	1573	
v/s Ratio Prot	c0.20		0.01	c0.14	c0.23	
v/s Ratio Perm			0.09			
v/c Ratio	0.73		0.16	0.23	0.47	
Uniform Delay, d1	29.8		11.6	8.5	15.4	
Progression Factor	1.04		0.51	0.57	1.00	
Incremental Delay, d2	1.9		0.1	0.2	1.0	
Delay (s)	33.0		6.0	5.0	16.5	
Level of Service	C		A	A	B	
Approach Delay (s)	33.0			5.1	16.5	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	111	894	307	674	82	114	184	114	253	199
v/c Ratio	0.67	0.86	0.84	0.50	0.52	0.36	0.46	0.68	0.65	0.50
Control Delay	72.4	44.3	66.7	29.1	64.5	44.3	9.5	72.5	50.8	9.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.4	44.3	66.7	29.1	64.5	44.3	9.5	72.5	50.8	9.9
Queue Length 50th (ft)	82	298	225	192	60	74	0	85	178	0
Queue Length 95th (ft)	153	#496	#392	291	104	117	37	143	252	46
Internal Link Dist (ft)		705		221		369			433	
Turn Bay Length (ft)	500				250			350		
Base Capacity (vph)	373	1043	365	1353	287	507	537	290	536	474
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.86	0.84	0.50	0.29	0.22	0.34	0.39	0.47	0.42

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	480	325	255	460	100	65	90	145	95	210	165
Future Volume (vph)	100	480	325	255	460	100	65	90	145	95	210	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		6.4	6.4	6.4	6.4	6.4	6.4
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.98		1.00	1.00	0.94	1.00	1.00	0.74
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.94		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1787	3246		1752	3270		1770	1727	1400	1787	1827	1199
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1787	3246		1752	3270		1770	1727	1400	1787	1827	1199
Peak-hour factor, PHF	0.90	0.90	0.90	0.83	0.83	0.83	0.79	0.79	0.79	0.83	0.83	0.83
Adj. Flow (vph)	111	533	361	307	554	120	82	114	184	114	253	199
RTOR Reduction (vph)	0	83	0	0	11	0	0	0	148	0	0	157
Lane Group Flow (vph)	111	811	0	307	663	0	82	114	36	114	253	42
Confl. Peds. (#/hr)	31		6	6		31	142		36	36		142
Heavy Vehicles (%)	1%	5%	0%	3%	5%	8%	2%	10%	8%	1%	4%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases									4			8
Actuated Green, G (s)	10.7	34.2		24.2	47.7		8.8	22.7	22.7	10.9	24.8	24.8
Effective Green, g (s)	10.7	34.2		24.2	47.7		8.8	22.7	22.7	10.9	24.8	24.8
Actuated g/C Ratio	0.09	0.29		0.21	0.41		0.08	0.19	0.19	0.09	0.21	0.21
Clearance Time (s)	6.1	6.1		6.1	6.1		6.4	6.4	6.4	6.4	6.4	6.4
Vehicle Extension (s)	1.0	4.0		2.5	4.0		2.5	3.0	3.0	1.0	5.0	5.0
Lane Grp Cap (vph)	163	948		362	1333		133	335	271	166	387	254
v/s Ratio Prot	0.06	c0.25		c0.18	0.20		0.05	0.07		c0.06	c0.14	
v/s Ratio Perm									0.03			0.04
v/c Ratio	0.68	0.86		0.85	0.50		0.62	0.34	0.13	0.69	0.65	0.17
Uniform Delay, d1	51.5	39.1		44.6	25.7		52.5	40.7	39.0	51.4	42.2	37.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.0	7.9		16.4	0.4		7.1	0.6	0.2	9.0	5.3	0.6
Delay (s)	60.5	47.0		61.0	26.1		59.5	41.3	39.2	60.4	47.4	38.3
Level of Service	E	D		E	C		E	D	D	E	D	D
Approach Delay (s)		48.5			37.1			44.2			46.8	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	43.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	117.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	820	6	885	8	8	6
v/c Ratio	0.28	0.05	0.29	0.04	0.02	0.01
Control Delay	4.6	34.2	2.8	32.8	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.6	34.2	2.8	32.8	0.0	0.0
Queue Length 50th (ft)	0	3	4	4	0	0
Queue Length 95th (ft)	182	m8	91	10	0	0
Internal Link Dist (ft)	293		1215		158	248
Turn Bay Length (ft)		200		50		
Base Capacity (vph)	2922	202	3023	410	663	661
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.03	0.29	0.02	0.01	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	720	10	5	770	0	5	0	5	0	0	5
Future Volume (vph)	0	720	10	5	770	0	5	0	5	0	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7		5.7	5.7		5.6	5.6			5.6	
Lane Util. Factor		0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes		1.00		1.00	1.00		1.00	0.99			0.99	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00			1.00	
Frt		1.00		1.00	1.00		1.00	0.85			0.86	
Flt Protected		1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3397		1770	3406		1764	1562			1587	
Flt Permitted		1.00		0.95	1.00		0.75	1.00			1.00	
Satd. Flow (perm)		3397		1770	3406		1400	1562			1587	
Peak-hour factor, PHF	0.89	0.89	0.89	0.87	0.87	0.87	0.60	0.60	0.60	0.86	0.86	0.86
Adj. Flow (vph)	0	809	11	6	885	0	8	0	8	0	0	6
RTOR Reduction (vph)	0	1	0	0	0	0	0	8	0	0	6	0
Lane Group Flow (vph)	0	819	0	6	885	0	8	0	0	0	0	0
Confl. Peds. (#/hr)	29		24	24		29	2		1	1		2
Heavy Vehicles (%)	2%	6%	2%	2%	6%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	NA		Prot	NA		Perm	NA			NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		66.1		1.3	73.1		5.6	5.6			5.6	
Effective Green, g (s)		66.1		1.3	73.1		5.6	5.6			5.6	
Actuated g/C Ratio		0.73		0.01	0.81		0.06	0.06			0.06	
Clearance Time (s)		5.7		5.7	5.7		5.6	5.6			5.6	
Vehicle Extension (s)		3.0		3.0	4.5		1.0	1.0			1.0	
Lane Grp Cap (vph)		2494		25	2766		87	97			98	
v/s Ratio Prot		0.24		0.00	c0.26			0.00			0.00	
v/s Ratio Perm							c0.01					
v/c Ratio		0.33		0.24	0.32		0.09	0.01			0.00	
Uniform Delay, d1		4.2		43.9	2.1		39.8	39.6			39.6	
Progression Factor		1.00		0.85	1.01		1.00	1.00			1.00	
Incremental Delay, d2		0.4		4.5	0.3		0.2	0.0			0.0	
Delay (s)		4.5		41.8	2.4		40.0	39.6			39.6	
Level of Service		A		D	A		D	D			D	
Approach Delay (s)		4.5			2.7			39.8			39.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	163	721	21	702	52	26	33	76	152
v/c Ratio	0.71	0.34	0.22	0.46	0.49	0.11	0.37	0.31	0.39
Control Delay	56.2	14.6	45.9	21.1	57.2	22.1	52.5	37.4	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.2	14.6	45.9	21.1	57.2	22.1	52.5	37.4	2.9
Queue Length 50th (ft)	88	84	12	152	29	7	18	41	0
Queue Length 95th (ft)	#184	219	35	242	57	22	49	74	0
Internal Link Dist (ft)		1215		729		257		381	
Turn Bay Length (ft)	225		150		100		180		
Base Capacity (vph)	237	2094	94	1529	106	405	90	422	488
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.34	0.22	0.46	0.49	0.06	0.37	0.18	0.31

Intersection Summary

\#   95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	570	115	20	640	20	40	10	10	30	70	140
Future Volume (vph)	155	570	115	20	640	20	40	10	10	30	70	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1433	3417		1444	3509		1770	1744		1504	1863	1291
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1433	3417		1444	3509		1770	1744		1504	1863	1291
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	163	600	121	21	681	21	52	13	13	33	76	152
RTOR Reduction (vph)	0	14	0	0	2	0	0	11	0	0	0	132
Lane Group Flow (vph)	163	707	0	21	700	0	52	15	0	33	76	20
Confl. Peds. (#/hr)	4					4	3		2	2		3
Heavy Vehicles (%)	26%	3%	3%	25%	2%	14%	2%	0%	0%	20%	2%	23%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												8
Actuated Green, G (s)	14.4	49.0		2.4	37.0		3.2	13.0		2.2	12.0	12.0
Effective Green, g (s)	14.4	49.0		2.4	37.0		3.2	13.0		2.2	12.0	12.0
Actuated g/C Ratio	0.16	0.54		0.03	0.41		0.04	0.14		0.02	0.13	0.13
Clearance Time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Vehicle Extension (s)	6.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	229	1860		38	1442		62	251		36	248	172
v/s Ratio Prot	c0.11	0.21		0.01	c0.20		c0.03	0.01		0.02	c0.04	
v/s Ratio Perm												0.02
v/c Ratio	0.71	0.38		0.55	0.49		0.84	0.06		0.92	0.31	0.12
Uniform Delay, d1	35.8	11.8		43.3	19.5		43.1	33.2		43.8	35.2	34.3
Progression Factor	1.07	1.27		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	13.8	0.6		19.7	1.2		62.0	0.1		116.8	1.0	0.4
Delay (s)	52.1	15.5		63.0	20.7		105.2	33.4		160.6	36.2	34.8
Level of Service	D	B		E	C		F	C		F	D	C
Approach Delay (s)		22.3			21.9			81.2			51.1	
Approach LOS		C			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.4
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	723	205	82	171	91	640
v/c Ratio	1.01	0.28	0.77	0.24	0.20	0.87
Control Delay	60.0	14.4	68.0	15.0	16.1	35.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.0	14.4	68.0	15.0	16.1	35.0
Queue Length 50th (ft)	~302	50	29	44	24	237
Queue Length 95th (ft)	#615	94	#98	84	57	#424
Internal Link Dist (ft)	628	690		412		625
Turn Bay Length (ft)			80		150	
Base Capacity (vph)	714	733	111	737	467	770
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.01	0.28	0.74	0.23	0.19	0.83

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	355	250	10	115	35	65	120	15	75	455	70
Future Volume (vph)	60	355	250	10	115	35	65	120	15	75	455	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6			5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.97			0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		0.93	1.00	
Frt		0.95			0.97		1.00	0.98		1.00	0.98	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1716			1793		1805	1740		1632	1815	
Flt Permitted		0.95			0.95		0.14	1.00		0.65	1.00	
Satd. Flow (perm)		1638			1716		265	1740		1115	1815	
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.79	0.79	0.79	0.82	0.82	0.82
Adj. Flow (vph)	65	386	272	13	147	45	82	152	19	91	555	85
RTOR Reduction (vph)	0	26	0	0	13	0	0	6	0	0	7	0
Lane Group Flow (vph)	0	697	0	0	192	0	82	165	0	91	633	0
Confl. Peds. (#/hr)	17		13	13		17	4		23	23		4
Heavy Vehicles (%)	3%	1%	2%	0%	0%	3%	0%	6%	7%	3%	2%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		30.1			30.1		28.7	28.7		28.7	28.7	
Effective Green, g (s)		30.1			30.1		28.7	28.7		28.7	28.7	
Actuated g/C Ratio		0.40			0.40		0.38	0.38		0.38	0.38	
Clearance Time (s)		5.6			5.6		5.6	5.6		5.6	5.6	
Vehicle Extension (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		659			690		101	667		427	696	
v/s Ratio Prot								0.10			c0.35	
v/s Ratio Perm		c0.43			0.11		0.31			0.08		
v/c Ratio		1.06			0.28		0.81	0.25		0.21	0.91	
Uniform Delay, d1		22.3			15.0		20.6	15.7		15.5	21.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		51.2			0.3		38.7	0.3		0.3	16.1	
Delay (s)		73.5			15.3		59.4	16.0		15.8	37.9	
Level of Service		E			B		E	B		B	D	
Approach Delay (s)		73.5			15.3			30.0			35.1	
Approach LOS		E			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	46.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	74.8	Sum of lost time (s)	15.2
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	715	5	0	0	0	0	0	15	15	10	0
Future Volume (Veh/h)	0	715	5	0	0	0	0	0	15	15	10	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	777	5	0	0	0	0	0	16	16	11	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		817										
pX, platoon unblocked												
vC, conflicting volume	0			782			785	780	391	404	782	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			782			785	780	391	404	782	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	97	97	97	100
cM capacity (veh/h)	1622			832			276	325	608	517	324	1084

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	518	264	16	27
Volume Left	0	0	0	16
Volume Right	0	5	16	0
cSH	1700	1700	608	416
Volume to Capacity	0.30	0.16	0.03	0.06
Queue Length 95th (ft)	0	0	2	5
Control Delay (s)	0.0	0.0	11.1	14.2
Lane LOS			B	B
Approach Delay (s)	0.0		11.1	14.2
Approach LOS			B	B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	825	5	10	10	0	0	0	5
Future Volume (Veh/h)	0	0	0	0	825	5	10	10	0	0	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	897	5	11	11	0	0	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1301							
pX, platoon unblocked												
vC, conflicting volume	902			0			454	902	0	905	900	451
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	902			0			454	902	0	905	900	451
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			98	96	100	100	100	99
cM capacity (veh/h)	749			1622			485	276	1084	225	277	556

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	598	304	22	5
Volume Left	0	0	11	0
Volume Right	0	5	0	5
cSH	1700	1700	352	556
Volume to Capacity	0.35	0.18	0.06	0.01
Queue Length 95th (ft)	0	0	5	1
Control Delay (s)	0.0	0.0	15.9	11.5
Lane LOS			C	B
Approach Delay (s)	0.0		15.9	11.5
Approach LOS			C	B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	324	404	11	989	58	663
v/c Ratio	0.56	0.67	0.03	0.96	0.69	0.35
Control Delay	29.7	32.0	9.5	39.9	72.9	22.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.7	32.0	9.5	39.9	72.9	22.4
Queue Length 50th (ft)	151	191	3	488	35	174
Queue Length 95th (ft)	236	294	10	#794	m#100	235
Internal Link Dist (ft)		1428		423		156
Turn Bay Length (ft)			150		90	
Base Capacity (vph)	574	600	379	1031	84	1878
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.67	0.03	0.96	0.69	0.35

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	WBL	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	305	315	65	10	915	25	55	475	155
Future Volume (vph)	305	315	65	10	915	25	55	475	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1766	1819		1790	1838		1805	3333	
Flt Permitted	0.95	1.00		0.36	1.00		0.08	1.00	
Satd. Flow (perm)	1766	1819		686	1838		153	3333	
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	324	335	69	11	963	26	58	500	163
RTOR Reduction (vph)	0	8	0	0	15	0	0	35	0
Lane Group Flow (vph)	324	396	0	11	974	0	58	628	0
Confl. Peds. (#/hr)	8		14	14			16		14
Heavy Vehicles (%)	1%	1%	0%	0%	3%	1%	0%	4%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			1			1	
Permitted Phases	2	2		1			1		
Actuated Green, G (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Effective Green, g (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Actuated g/C Ratio	0.33	0.33		0.55	0.55		0.55	0.55	
Clearance Time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Vehicle Extension (s)	5.0	5.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	574	592		379	1017		84	1844	
v/s Ratio Prot		c0.22			c0.53			0.19	
v/s Ratio Perm	0.18			0.02			0.38		
v/c Ratio	0.56	0.67		0.03	0.96		0.69	0.34	
Uniform Delay, d1	25.1	26.2		9.1	19.1		14.5	11.1	
Progression Factor	1.00	1.00		1.00	1.00		1.96	2.23	
Incremental Delay, d2	4.0	5.9		0.1	19.7		35.2	0.5	
Delay (s)	29.1	32.1		9.3	38.8		63.7	25.2	
Level of Service	C	C		A	D		E	C	
Approach Delay (s)		30.7			38.5			28.3	
Approach LOS		C			D			C	

Intersection Summary			
HCM 2000 Control Delay	33.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	163	233	1174	772
v/c Ratio	0.55	0.45	0.61	0.42
Control Delay	34.5	19.4	3.6	10.5
Queue Delay	2.0	0.5	0.0	0.8
Total Delay	36.5	20.0	3.6	11.2
Queue Length 50th (ft)	74	65	45	72
Queue Length 95th (ft)	141	134	m51	91
Internal Link Dist (ft)	303	327	1027	111
Turn Bay Length (ft)				
Base Capacity (vph)	295	523	1926	1851
Starvation Cap Reductn	0	0	0	703
Spillback Cap Reductn	50	81	2	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.67	0.53	0.61	0.67

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	25	20	10	50	155	20	1020	40	20	650	40
Future Volume (vph)	105	25	20	10	50	155	20	1020	40	20	650	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.2			6.2	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.98			0.90			0.99			0.99	
Flt Protected		0.97			1.00			1.00			1.00	
Satd. Flow (prot)		1767			1677			3516			3505	
Flt Permitted		0.57			0.98			0.93			0.90	
Satd. Flow (perm)		1040			1654			3276			3147	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	27	22	11	54	168	22	1109	43	22	707	43
RTOR Reduction (vph)	0	7	0	0	64	0	0	3	0	0	5	0
Lane Group Flow (vph)	0	157	0	0	169	0	0	1171	0	0	767	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		25.0			25.0			52.8			52.8	
Effective Green, g (s)		25.0			25.0			52.8			52.8	
Actuated g/C Ratio		0.28			0.28			0.59			0.59	
Clearance Time (s)		6.0			6.0			6.2			6.2	
Vehicle Extension (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		288			459			1921			1846	
v/s Ratio Prot												
v/s Ratio Perm		c0.15			0.10			c0.36			0.24	
v/c Ratio		0.54			0.37			0.61			0.42	
Uniform Delay, d1		27.6			26.2			12.0			10.2	
Progression Factor		1.00			1.00			0.23			0.96	
Incremental Delay, d2		7.2			2.3			0.8			0.7	
Delay (s)		34.8			28.4			3.6			10.5	
Level of Service		C			C			A			B	
Approach Delay (s)		34.8			28.4			3.6			10.5	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	80.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	109	582	1365	200	683
v/c Ratio	0.69	1.11	0.65	0.63	0.25
Control Delay	54.1	88.8	7.4	22.7	3.0
Queue Delay	0.0	0.0	0.2	0.0	0.0
Total Delay	54.1	88.8	7.6	22.7	3.0
Queue Length 50th (ft)	62	~304	102	22	43
Queue Length 95th (ft)	m#109	#504	132	77	57
Internal Link Dist (ft)			111		640
Turn Bay Length (ft)	300			240	
Base Capacity (vph)	158	526	2105	319	2779
Starvation Cap Reductn	0	0	161	0	0
Spillback Cap Reductn	0	0	0	0	43
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.69	1.11	0.70	0.63	0.25

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	100	0	535	5	1215	50	180	615	0
Future Volume (vph)	0	0	0	100	0	535	5	1215	50	180	615	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0		6.0		6.0		6.0	6.0	
Lane Util. Factor				1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Flpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Frt				1.00		0.85		0.99		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				1787		1599		3546		1769	3574	
Flt Permitted				0.95		1.00		0.95		0.14	1.00	
Satd. Flow (perm)				1787		1599		3380		261	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	109	0	582	5	1306	54	200	683	0
RTOR Reduction (vph)	0	0	0	0	0	135	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	109	0	447	0	1363	0	200	683	0
Confl. Peds. (#/hr)									20	20		
Heavy Vehicles (%)	2%	2%	2%	1%	0%	1%	0%	1%	0%	2%	1%	0%
Turn Type				Prot		pt+ov	Perm	NA		D.P+P	NA	
Protected Phases		8		4		4 5		6		5	2	
Permitted Phases	8						6			6		
Actuated Green, G (s)				8.0		22.0		56.0		64.0	70.0	
Effective Green, g (s)				8.0		22.0		56.0		64.0	70.0	
Actuated g/C Ratio				0.09		0.24		0.62		0.71	0.78	
Clearance Time (s)				6.0				6.0		6.0	6.0	
Vehicle Extension (s)				4.0				5.0		2.0	5.0	
Lane Grp Cap (vph)				158		390		2103		319	2779	
v/s Ratio Prot				0.06		c0.28				0.06	0.19	
v/s Ratio Perm								c0.40		0.39		
v/c Ratio				0.69		1.15		0.65		0.63	0.25	
Uniform Delay, d1				39.8		34.0		10.8		19.7	2.7	
Progression Factor				0.85		0.75		0.56		1.00	1.00	
Incremental Delay, d2				10.7		87.8		1.3		2.8	0.2	
Delay (s)				44.4		113.2		7.3		22.4	3.0	
Level of Service				D		F		A		C	A	
Approach Delay (s)		0.0			102.3			7.3			7.4	
Approach LOS		A			F			A			A	

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.7
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	190	40	20	570	50	100
Future Volume (Veh/h)	190	40	20	570	50	100
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	207	43	22	620	54	109
Pedestrians	1			8	11	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			261		904	248
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			261		904	248
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		82	86
cM capacity (veh/h)			1291		299	779

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	250	642	163
Volume Left	0	22	54
Volume Right	43	0	109
cSH	1700	1291	508
Volume to Capacity	0.15	0.02	0.32
Queue Length 95th (ft)	0	1	34
Control Delay (s)	0.0	0.5	15.4
Lane LOS		A	C
Approach Delay (s)	0.0	0.5	15.4
Approach LOS			C

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	40	0	0	60	70	610	0	0	0	0
Future Volume (Veh/h)	0	0	40	0	0	60	70	610	0	0	0	0
Sign Control		Yield			Yield			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.74	0.92	0.92	0.87	0.87	0.87	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	54	0	0	69	80	701	0	0	0	0
Pedestrians											6	
Lane Width (ft)											0.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	586	861	0	915	861	356	0			701		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	586	861	0	915	861	356	0			701		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	95	100	100	89	95			100		
cM capacity (veh/h)	338	277	1084	208	277	640	1622			892		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	54	69	314	467
Volume Left	0	0	80	0
Volume Right	54	69	0	0
cSH	1084	640	1622	1700
Volume to Capacity	0.05	0.11	0.05	0.27
Queue Length 95th (ft)	4	9	4	0
Control Delay (s)	8.5	11.3	2.2	0.0
Lane LOS	A	B	A	
Approach Delay (s)	8.5	11.3	0.9	
Approach LOS	A	B		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	31.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	5	10	40	30	0	0	0	0	35	635	25
Future Volume (Veh/h)	0	5	10	40	30	0	0	0	0	35	635	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.68	0.68	0.68	0.69	0.69	0.69	0.92	0.92	0.92	0.90	0.90	0.90
Hourly flow rate (vph)	0	7	15	58	43	0	0	0	0	39	706	28
Pedestrians		9			12							
Lane Width (ft)		12.0			12.0							
Walking Speed (ft/s)		4.0			4.0							
Percent Blockage		1			1							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	828	819	376	462	833	12	743			12		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	828	819	376	462	833	12	743			12		
tC, single (s)	7.5	6.5	7.3	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	98	97	87	85	100	100			98		
cM capacity (veh/h)	228	300	569	448	294	1061	867			1604		

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	22	101	392	381
Volume Left	0	58	39	0
Volume Right	15	0	0	28
cSH	442	366	1604	1700
Volume to Capacity	0.05	0.28	0.02	0.22
Queue Length 95th (ft)	4	28	2	0
Control Delay (s)	13.6	18.5	0.9	0.0
Lane LOS	B	C	A	
Approach Delay (s)	13.6	18.5	0.5	
Approach LOS	B	C		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	744	516	88	241
v/c Ratio	0.29	0.20	0.24	0.75
Control Delay	8.3	3.7	47.5	67.2
Queue Delay	0.0	0.2	0.0	0.0
Total Delay	8.3	3.9	47.5	67.2
Queue Length 50th (ft)	119	48	70	214
Queue Length 95th (ft)	187	m19	104	269
Internal Link Dist (ft)	355	346	123	
Turn Bay Length (ft)				
Base Capacity (vph)	2539	2539	631	565
Starvation Cap Reductn	0	1143	0	0
Spillback Cap Reductn	118	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.31	0.37	0.14	0.43

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰	↱
Traffic Volume (vph)	0	670	490	0	75	205
Future Volume (vph)	0	670	490	0	75	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6	5.6
Lane Util. Factor		0.95	0.95		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3539	3539		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3539	3539		1770	1583
Peak-hour factor, PHF	0.90	0.90	0.95	0.95	0.85	0.85
Adj. Flow (vph)	0	744	516	0	88	241
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	744	516	0	88	241
Turn Type		NA	NA		Prot	Prot
Protected Phases		1	1		3	3
Permitted Phases						3
Actuated Green, G (s)		103.3	103.3		29.5	29.5
Effective Green, g (s)		103.3	103.3		29.5	29.5
Actuated g/C Ratio		0.72	0.72		0.20	0.20
Clearance Time (s)		5.6	5.6		5.6	5.6
Vehicle Extension (s)		3.0	3.0		5.0	5.0
Lane Grp Cap (vph)		2538	2538		362	324
v/s Ratio Prot		c0.21	0.15		0.05	c0.15
v/s Ratio Perm						
v/c Ratio		0.29	0.20		0.24	0.74
Uniform Delay, d1		7.3	6.7		47.9	53.7
Progression Factor		1.00	0.47		1.00	1.00
Incremental Delay, d2		0.3	0.2		0.7	10.6
Delay (s)		7.6	3.4		48.6	64.3
Level of Service		A	A		D	E
Approach Delay (s)		7.6	3.4		60.1	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	14.2
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	320	629	161	457	387	333
v/c Ratio	0.62	0.32	0.35	0.20	0.88	0.64
Control Delay	27.5	15.0	6.4	3.7	74.1	47.4
Queue Delay	0.4	0.3	0.0	0.3	0.0	0.0
Total Delay	27.9	15.3	6.4	4.0	74.1	47.4
Queue Length 50th (ft)	205	86	20	28	348	262
Queue Length 95th (ft)	#424	272	32	38	#439	339
Internal Link Dist (ft)		346		296	1476	
Turn Bay Length (ft)	220		200			
Base Capacity (vph)	514	1966	463	2293	458	505
Starvation Cap Reductn	27	693	0	1187	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.49	0.35	0.41	0.84	0.66

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	495	65	150	410	15	80	245	280	0	0	0
Future Volume (vph)	285	495	65	150	410	15	80	245	280	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1			5.7	5.7			
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.98		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (prot)	1787	3508		1752	3523			1849	1568			
Flt Permitted	0.49	1.00		0.34	1.00			0.99	1.00			
Satd. Flow (perm)	919	3508		628	3523			1849	1568			
Peak-hour factor, PHF	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.92	0.92	0.92
Adj. Flow (vph)	320	556	73	161	441	16	95	292	333	0	0	0
RTOR Reduction (vph)	0	5	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	320	624	0	161	456	0	0	387	333	0	0	0
Confl. Peds. (#/hr)							1		5			
Heavy Vehicles (%)	1%	1%	2%	3%	2%	0%	3%	1%	3%	2%	2%	2%
Turn Type	Perm	NA		pm+pt	NA		Split	NA	pt+ov			
Protected Phases		6		5	2		7	7	7 5			
Permitted Phases	6			2								
Actuated Green, G (s)	78.1	78.1		91.3	91.3			34.3	47.1			
Effective Green, g (s)	78.1	78.1		91.3	91.3			34.3	47.1			
Actuated g/C Ratio	0.54	0.54		0.63	0.63			0.24	0.33			
Clearance Time (s)	6.1	6.1		6.1	6.1			5.7				
Vehicle Extension (s)	5.0	5.0		3.0	5.0			5.0				
Lane Grp Cap (vph)	498	1902		453	2233			440	512			
v/s Ratio Prot		0.18		0.02	0.13			c0.21	c0.21			
v/s Ratio Perm	c0.35			0.21								
v/c Ratio	0.64	0.33		0.36	0.20			0.88	0.65			
Uniform Delay, d1	23.1	18.3		11.6	11.1			52.9	41.4			
Progression Factor	0.87	0.80		0.37	0.31			1.00	1.00			
Incremental Delay, d2	6.1	0.5		0.5	0.2			19.1	4.0			
Delay (s)	26.3	15.2		4.8	3.6			71.9	45.4			
Level of Service	C	B		A	A			E	D			
Approach Delay (s)		18.9			3.9			59.7			0.0	
Approach LOS		B			A			E			A	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	842	11	560	69	19
v/c Ratio	0.29	0.14	0.18	0.51	0.08
Control Delay	4.6	83.0	2.9	76.4	18.5
Queue Delay	0.2	0.0	0.0	0.0	0.0
Total Delay	4.8	83.0	2.9	76.4	18.5
Queue Length 50th (ft)	144	10	121	63	0
Queue Length 95th (ft)	57	34	3	100	19
Internal Link Dist (ft)	296		2760	173	
Turn Bay Length (ft)		200		100	
Base Capacity (vph)	2861	157	3089	352	303
Starvation Cap Reductn	1014	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.46	0.07	0.18	0.20	0.06

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	735	40	10	515	55	15
Future Volume (vph)	735	40	10	515	55	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		5.2	5.2	5.6	5.2
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3502		1770	3539	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3502		1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.80	0.80
Adj. Flow (vph)	799	43	11	560	69	19
RTOR Reduction (vph)	1	0	0	0	0	17
Lane Group Flow (vph)	841	0	11	560	69	2
Confl. Peds. (#/hr)		9	9			2
Turn Type	NA		Prot	NA	Prot	pt+ov
Protected Phases	2		1	6	3	1 8
Permitted Phases						
Actuated Green, G (s)	113.2		4.3	123.6	9.6	19.5
Effective Green, g (s)	113.2		4.3	123.6	9.6	13.9
Actuated g/C Ratio	0.79		0.03	0.86	0.07	0.10
Clearance Time (s)	6.1		5.2	5.2	5.6	
Vehicle Extension (s)	4.0		3.0	4.0	3.0	
Lane Grp Cap (vph)	2752		52	3037	118	152
v/s Ratio Prot	c0.24		0.01	c0.16	c0.04	0.00
v/s Ratio Perm						
v/c Ratio	0.31		0.21	0.18	0.58	0.01
Uniform Delay, d1	4.3		68.2	1.7	65.3	58.8
Progression Factor	0.93		1.21	1.43	1.00	1.00
Incremental Delay, d2	0.3		2.0	0.1	7.2	0.0
Delay (s)	4.3		84.6	2.6	72.5	58.9
Level of Service	A		F	A	E	E
Approach Delay (s)	4.3			4.2	69.5	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	8.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	216	579	538	304	171	43
v/c Ratio	0.34	0.22	0.24	0.23	0.60	0.10
Control Delay	14.3	7.9	13.8	0.8	64.4	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.3	7.9	13.8	0.8	64.4	10.3
Queue Length 50th (ft)	59	92	92	0	152	0
Queue Length 95th (ft)	152	280	222	18	163	16
Internal Link Dist (ft)		2760	1391		524	
Turn Bay Length (ft)	100			150	75	
Base Capacity (vph)	844	2576	2264	1348	398	526
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.22	0.24	0.23	0.43	0.08

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	205	550	495	280	120	30
Future Volume (vph)	205	550	495	280	120	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.6	5.6	5.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1769	3539	3539	1557	1770	1583
Flt Permitted	0.43	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	802	3539	3539	1557	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.92	0.92	0.70	0.70
Adj. Flow (vph)	216	579	538	304	171	43
RTOR Reduction (vph)	0	0	0	64	0	32
Lane Group Flow (vph)	216	579	538	240	171	11
Confl. Peds. (#/hr)	2			2	14	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	1	6	2	4	4	1 7
Permitted Phases	6			2		
Actuated Green, G (s)	103.2	103.2	90.5	113.6	23.1	35.8
Effective Green, g (s)	103.2	103.2	90.5	113.6	23.1	35.8
Actuated g/C Ratio	0.72	0.72	0.63	0.79	0.16	0.25
Clearance Time (s)	5.5	5.5	5.5	5.6	5.6	
Vehicle Extension (s)	4.0	4.5	4.5	6.0	6.0	
Lane Grp Cap (vph)	623	2536	2224	1228	283	393
v/s Ratio Prot	c0.02	0.16	0.15	0.03	c0.10	0.01
v/s Ratio Perm	c0.23			0.12		
v/c Ratio	0.35	0.23	0.24	0.20	0.60	0.03
Uniform Delay, d1	9.6	6.9	11.7	3.8	56.2	40.9
Progression Factor	1.16	0.93	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.2	0.1	0.2	6.4	0.0
Delay (s)	11.6	6.6	11.8	4.0	62.6	41.0
Level of Service	B	A	B	A	E	D
Approach Delay (s)		8.0	9.0		58.2	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	203	734	738	317	447	505
v/c Ratio	0.64	0.44	0.61	0.48	0.53	0.83
Control Delay	35.5	18.0	28.8	10.8	28.7	30.7
Queue Delay	4.1	0.0	0.0	0.3	0.0	6.4
Total Delay	39.6	18.0	28.8	11.1	28.7	37.1
Queue Length 50th (ft)	73	155	196	38	124	239
Queue Length 95th (ft)	106	177	235	91	187	400
Internal Link Dist (ft)		355	330		239	
Turn Bay Length (ft)	150			100	140	
Base Capacity (vph)	317	1665	1202	660	838	705
Starvation Cap Reductn	0	0	0	0	0	151
Spillback Cap Reductn	58	0	0	67	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.44	0.61	0.53	0.53	0.91

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	160	580	605	260	425	480
Future Volume (vph)	160	580	605	260	425	480
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.94	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1783	3505	3505	1492	3502	1553
Flt Permitted	0.26	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	483	3505	3505	1492	3502	1553
Peak-hour factor, PHF	0.79	0.79	0.82	0.82	0.95	0.95
Adj. Flow (vph)	203	734	738	317	447	505
RTOR Reduction (vph)	0	0	0	152	0	0
Lane Group Flow (vph)	203	734	738	165	447	505
Confl. Peds. (#/hr)	15			15	150	
Heavy Vehicles (%)	1%	3%	3%	2%	0%	4%
Turn Type	pm+pt	NA	NA	Perm	Prot	Prot
Protected Phases	1	6	2		3	8
Permitted Phases	6			2		
Actuated Green, G (s)	41.6	41.6	29.7	29.7	21.5	36.5
Effective Green, g (s)	41.6	41.6	29.7	29.7	21.5	36.5
Actuated g/C Ratio	0.46	0.46	0.33	0.33	0.24	0.41
Clearance Time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Lane Grp Cap (vph)	312	1620	1156	492	836	629
v/s Ratio Prot	c0.04	0.21	0.21		0.13	c0.33
v/s Ratio Perm	c0.26			0.11		
v/c Ratio	0.65	0.45	0.64	0.34	0.53	0.80
Uniform Delay, d1	27.6	16.5	25.6	22.7	29.9	23.6
Progression Factor	1.00	1.00	1.00	1.00	0.84	0.79
Incremental Delay, d2	10.1	0.9	2.7	1.8	2.3	7.0
Delay (s)	37.7	17.4	28.3	24.5	27.5	25.5
Level of Service	D	B	C	C	C	C
Approach Delay (s)		21.8	27.2		26.4	
Approach LOS		C	C		C	

Intersection Summary			
HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	32	83	227	159	516	75	731
v/c Ratio	0.08	0.19	0.71	0.33	0.45	0.17	0.34
Control Delay	22.7	16.3	41.8	5.7	8.8	4.4	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.7	0.0	0.1
Total Delay	22.7	16.3	41.8	5.7	9.5	4.4	4.2
Queue Length 50th (ft)	14	23	118	0	51	8	39
Queue Length 95th (ft)	27	42	166	37	393	14	45
Internal Link Dist (ft)		284			239		250
Turn Bay Length (ft)			85			100	
Base Capacity (vph)	633	647	493	652	1135	434	2146
Starvation Cap Reductn	0	0	0	0	308	0	509
Spillback Cap Reductn	0	2	0	14	168	0	210
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.13	0.46	0.25	0.62	0.17	0.45

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	40	25	200	0	140	0	445	20	70	680	0
Future Volume (vph)	25	40	25	200	0	140	0	445	20	70	680	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Lane Util. Factor	1.00	1.00		1.00		1.00		1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.97		1.00		0.89		0.99		1.00	1.00	
Flpb, ped/bikes	0.90	1.00		0.95		1.00		1.00		0.95	1.00	
Frt	1.00	0.94		1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1630	1614		1714		1429		1852		1651	3505	
Flt Permitted	0.95	1.00		0.70		1.00		1.00		0.41	1.00	
Satd. Flow (perm)	1630	1614		1268		1429		1852		704	3505	
Peak-hour factor, PHF	0.79	0.79	0.79	0.88	0.88	0.88	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	32	51	32	227	0	159	0	494	22	75	731	0
RTOR Reduction (vph)	0	24	0	0	0	119	0	1	0	0	0	0
Lane Group Flow (vph)	32	59	0	227	0	40	0	515	0	75	731	0
Confl. Peds. (#/hr)	42		41	41		42			56	56		
Heavy Vehicles (%)	0%	13%	0%	0%	0%	0%	0%	0%	32%	4%	3%	0%
Turn Type	Perm	NA		D.Pm		Perm		NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4			4		4				2		
Actuated Green, G (s)	22.8	22.8		22.8		22.8		55.1		55.1	55.1	
Effective Green, g (s)	22.8	22.8		22.8		22.8		55.1		55.1	55.1	
Actuated g/C Ratio	0.25	0.25		0.25		0.25		0.61		0.61	0.61	
Clearance Time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Vehicle Extension (s)	4.0	4.0		4.0		4.0		4.0		4.0	4.0	
Lane Grp Cap (vph)	412	408		321		362		1133		431	2145	
v/s Ratio Prot		0.04						c0.28			0.21	
v/s Ratio Perm	0.02			c0.18		0.03				0.11		
v/c Ratio	0.08	0.14		0.71		0.11		0.45		0.17	0.34	
Uniform Delay, d1	25.6	26.0		30.6		25.8		9.4		7.6	8.6	
Progression Factor	1.00	1.00		1.00		1.00		0.69		0.35	0.38	
Incremental Delay, d2	0.1	0.2		7.4		0.2		1.1		0.8	0.4	
Delay (s)	25.7	26.3		38.0		26.0		7.6		3.5	3.6	
Level of Service	C	C		D		C		A		A	A	
Approach Delay (s)		26.1			33.1			7.6			3.6	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.1
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	106	75	79	168	132	37	584	753
v/c Ratio	0.34	0.19	0.26	0.57	0.53	0.15	0.71	0.49
Control Delay	36.0	1.9	34.7	42.4	42.5	10.4	20.7	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0
Total Delay	36.0	1.9	34.7	42.4	42.5	10.4	23.7	11.5
Queue Length 50th (ft)	53	0	39	92	72	0	300	166
Queue Length 95th (ft)	89	0	80	162	134	m13	119	68
Internal Link Dist (ft)				296			250	793
Turn Bay Length (ft)		25				100		
Base Capacity (vph)	312	388	303	295	248	239	825	1538
Starvation Cap Reductn	0	0	0	0	0	0	147	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.19	0.26	0.57	0.53	0.15	0.86	0.49

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	0	60	75	145	140	35	555	0	0	610	90
Future Volume (vph)	85	0	60	75	145	140	35	555	0	0	610	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Lane Util. Factor	1.00		1.00	1.00	0.95	0.95	1.00	1.00			0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.97	1.00	1.00	1.00			0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	0.97	1.00			1.00	
Frt	1.00		0.85	1.00	0.99	0.85	1.00	1.00			0.98	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1770		1568	1719	1672	1408	1756	1863			3443	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.29	1.00			1.00	
Satd. Flow (perm)	1770		1568	1719	1672	1408	540	1863			3443	
Peak-hour factor, PHF	0.80	0.80	0.80	0.95	0.95	0.95	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	106	0	75	79	153	147	37	584	0	0	656	97
RTOR Reduction (vph)	0	0	62	0	0	0	0	0	0	0	12	0
Lane Group Flow (vph)	106	0	13	79	168	132	37	584	0	0	741	0
Confl. Peds. (#/hr)	196		28	28		196	34					34
Heavy Vehicles (%)	2%	0%	3%	5%	3%	9%	0%	2%	0%	0%	1%	2%
Turn Type	Prot		Prot	Split	NA	Prot	Perm	NA			NA	
Protected Phases	8		8	4	4	4		2			2	
Permitted Phases							2					
Actuated Green, G (s)	15.9		15.9	15.9	15.9	15.9	39.9	39.9			39.9	
Effective Green, g (s)	15.9		15.9	15.9	15.9	15.9	39.9	39.9			39.9	
Actuated g/C Ratio	0.18		0.18	0.18	0.18	0.18	0.44	0.44			0.44	
Clearance Time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	4.0	4.0	4.0			4.0	
Lane Grp Cap (vph)	312		277	303	295	248	239	825			1526	
v/s Ratio Prot	c0.06		0.01	0.05	c0.10	0.09		c0.31			0.22	
v/s Ratio Perm							0.07					
v/c Ratio	0.34		0.05	0.26	0.57	0.53	0.15	0.71			0.49	
Uniform Delay, d1	32.5		30.8	32.0	33.9	33.7	15.0	20.3			17.8	
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.58	0.76			0.61	
Incremental Delay, d2	2.9		0.3	2.1	7.8	8.0	1.3	4.8			0.9	
Delay (s)	35.4		31.1	34.1	41.7	41.6	9.9	20.2			11.7	
Level of Service	D		C	C	D	D	A	C			B	
Approach Delay (s)		33.6			40.1			19.6			11.7	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.3
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	466	244	646	1111
v/c Ratio	0.66	0.70	0.28	0.63
Control Delay	35.5	26.8	8.7	15.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	35.5	26.8	8.7	15.2
Queue Length 50th (ft)	111	48	66	188
Queue Length 95th (ft)	146	#81	89	293
Internal Link Dist (ft)	1498		793	705
Turn Bay Length (ft)	200	125		
Base Capacity (vph)	1171	348	2313	1753
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.40	0.70	0.28	0.63

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	315	95	200	530	660	395
Future Volume (vph)	315	95	200	530	660	395
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7		6.1	6.1	6.1	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.96	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.97		1.00	1.00	0.94	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	3385		1801	3438	3175	
Flt Permitted	0.96		0.19	1.00	1.00	
Satd. Flow (perm)	3385		357	3438	3175	
Peak-hour factor, PHF	0.88	0.88	0.82	0.82	0.95	0.95
Adj. Flow (vph)	358	108	244	646	695	416
RTOR Reduction (vph)	39	0	0	0	76	0
Lane Group Flow (vph)	427	0	244	646	1035	0
Confl. Peds. (#/hr)		14	46			46
Heavy Vehicles (%)	0%	0%	0%	5%	4%	1%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	2		1	4	3	
Permitted Phases			4			
Actuated Green, G (s)	17.6		60.6	60.6	47.6	
Effective Green, g (s)	17.6		60.6	60.6	47.6	
Actuated g/C Ratio	0.20		0.67	0.67	0.53	
Clearance Time (s)	5.7		6.1	6.1	6.1	
Vehicle Extension (s)	4.0		2.0	0.2	2.0	
Lane Grp Cap (vph)	661		351	2314	1679	
v/s Ratio Prot	c0.13		c0.05	0.19	0.33	
v/s Ratio Perm			c0.41			
v/c Ratio	0.65		0.70	0.28	0.62	
Uniform Delay, d1	33.3		20.4	5.9	14.8	
Progression Factor	1.05		0.92	1.30	1.00	
Incremental Delay, d2	2.4		3.9	0.2	1.7	
Delay (s)	37.3		22.6	8.0	16.5	
Level of Service	D		C	A	B	
Approach Delay (s)	37.3			12.0	16.5	
Approach LOS	D			B	B	

Intersection Summary			
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	221	631	167	710	247	268	358	81	140	172
v/c Ratio	0.79	0.71	0.67	0.79	0.78	0.50	0.55	0.57	0.49	0.53
Control Delay	65.7	39.5	59.1	44.1	63.2	40.2	7.5	66.8	48.7	12.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.7	39.5	59.1	44.1	63.2	40.2	7.5	66.8	48.7	12.9
Queue Length 50th (ft)	154	202	115	241	173	165	0	57	91	0
Queue Length 95th (ft)	261	312	202	360	#370	290	85	118	166	64
Internal Link Dist (ft)		705		221		369			433	
Turn Bay Length (ft)	500				250			350		
Base Capacity (vph)	408	1044	385	1078	318	602	686	311	554	463
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.60	0.43	0.66	0.78	0.45	0.52	0.26	0.25	0.37

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	210	465	135	155	560	100	235	255	340	75	130	160
Future Volume (vph)	210	465	135	155	560	100	235	255	340	75	130	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		6.4	6.4	6.4	6.4	6.4	6.4
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.97		1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.69
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3183		1703	3343		1805	1863	1408	1770	1743	1113
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3183		1703	3343		1805	1863	1408	1770	1743	1113
Peak-hour factor, PHF	0.95	0.95	0.95	0.93	0.93	0.93	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	221	489	142	167	602	108	247	268	358	81	140	172
RTOR Reduction (vph)	0	20	0	0	10	0	0	0	256	0	0	142
Lane Group Flow (vph)	221	611	0	167	700	0	247	268	102	81	140	30
Confl. Peds. (#/hr)	47		39	39		47	198		67	67		198
Heavy Vehicles (%)	0%	5%	13%	6%	4%	0%	0%	2%	3%	2%	9%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases									4			8
Actuated Green, G (s)	16.7	29.8		15.8	28.9		19.0	30.9	30.9	7.4	19.3	19.3
Effective Green, g (s)	16.7	29.8		15.8	28.9		19.0	30.9	30.9	7.4	19.3	19.3
Actuated g/C Ratio	0.15	0.27		0.15	0.27		0.17	0.28	0.28	0.07	0.18	0.18
Clearance Time (s)	6.1	6.1		6.1	6.1		6.4	6.4	6.4	6.4	6.4	6.4
Vehicle Extension (s)	1.0	4.0		2.5	4.0		2.5	3.0	3.0	1.0	5.0	5.0
Lane Grp Cap (vph)	276	871		247	887		314	528	399	120	308	197
v/s Ratio Prot	c0.12	0.19		0.10	c0.21		c0.14	c0.14		0.05	0.08	
v/s Ratio Perm									0.07			0.03
v/c Ratio	0.80	0.70		0.68	0.79		0.79	0.51	0.25	0.68	0.45	0.15
Uniform Delay, d1	44.5	35.6		44.1	37.2		43.0	32.6	30.1	49.6	40.1	37.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.4	2.8		6.5	5.0		11.8	0.8	0.3	11.2	2.2	0.8
Delay (s)	58.9	38.3		50.6	42.2		54.8	33.4	30.4	60.7	42.3	38.7
Level of Service	E	D		D	D		D	C	C	E	D	D
Approach Delay (s)		43.7			43.8			38.3			44.5	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	42.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	108.9	Sum of lost time (s)	25.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	5	869	932	22	7	6
v/c Ratio	0.05	0.30	0.33	0.13	0.01	0.01
Control Delay	45.0	3.1	8.2	40.1	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	3.1	8.2	40.1	0.0	0.0
Queue Length 50th (ft)	3	65	63	13	0	0
Queue Length 95th (ft)	15	127	306	26	0	0
Internal Link Dist (ft)		293	1215		158	248
Turn Bay Length (ft)	180			50		
Base Capacity (vph)	438	2941	2859	490	904	914
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.30	0.33	0.04	0.01	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	795	5	0	885	0	15	0	5	0	0	5
Future Volume (vph)	5	795	5	0	885	0	15	0	5	0	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7			5.7		5.6	5.6			5.6	
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98			0.98	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			1.00		1.00	0.85			0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	3434			3438		1796	1585			1616	
Flt Permitted	0.95	1.00			1.00		0.75	1.00			1.00	
Satd. Flow (perm)	1805	3434			3438		1425	1585			1616	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.69	0.69	0.69	0.78	0.78	0.78
Adj. Flow (vph)	5	864	5	0	932	0	22	0	7	0	0	6
RTOR Reduction (vph)	0	0	0	0	0	0	0	6	0	0	6	0
Lane Group Flow (vph)	5	869	0	0	932	0	22	1	0	0	0	0
Confl. Peds. (#/hr)	51		29	29		51	3		4	4		3
Heavy Vehicles (%)	0%	5%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA			NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	1.3	81.1			74.1		7.6	7.6			7.6	
Effective Green, g (s)	1.3	81.1			74.1		7.6	7.6			7.6	
Actuated g/C Ratio	0.01	0.81			0.74		0.08	0.08			0.08	
Clearance Time (s)	5.7	5.7			5.7		5.6	5.6			5.6	
Vehicle Extension (s)	3.0	3.0			4.5		1.0	1.0			1.0	
Lane Grp Cap (vph)	23	2784			2547		108	120			122	
v/s Ratio Prot	0.00	c0.25			c0.27			0.00			0.00	
v/s Ratio Perm							c0.02					
v/c Ratio	0.22	0.31			0.37		0.20	0.00			0.00	
Uniform Delay, d1	48.8	2.4			4.6		43.4	42.7			42.7	
Progression Factor	1.00	1.00			1.73		1.00	1.00			1.00	
Incremental Delay, d2	4.7	0.3			0.4		0.3	0.0			0.0	
Delay (s)	53.6	2.7			8.3		43.7	42.7			42.7	
Level of Service	D	A			A		D	D			D	
Approach Delay (s)		3.0			8.3			43.5			42.7	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	239	988	11	679	92	92	38	31	281
v/c Ratio	0.83	0.47	0.10	0.49	0.71	0.32	0.31	0.14	0.67
Control Delay	64.8	11.7	44.7	24.8	74.4	32.8	51.2	38.9	13.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.8	11.7	44.7	24.8	74.4	32.8	51.2	38.9	13.1
Queue Length 50th (ft)	127	99	7	161	58	44	23	18	0
Queue Length 95th (ft)	#253	321	24	247	#137	84	50	37	42
Internal Link Dist (ft)		1215		729		257		381	
Turn Bay Length (ft)	225		150		100		180		
Base Capacity (vph)	291	2086	269	1373	130	456	124	445	560
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.47	0.04	0.49	0.71	0.20	0.31	0.07	0.50

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	210	735	135	10	575	50	85	60	25	30	25	225
Future Volume (vph)	210	735	135	10	575	50	85	60	25	30	25	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1626	3457		1504	3481		1770	1807		1687	1827	1428
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1626	3457		1504	3481		1770	1807		1687	1827	1428
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.80	0.80	0.80
Adj. Flow (vph)	239	835	153	11	625	54	92	65	27	38	31	281
RTOR Reduction (vph)	0	9	0	0	5	0	0	17	0	0	0	247
Lane Group Flow (vph)	239	979	0	11	674	0	92	75	0	38	31	34
Confl. Peds. (#/hr)	22					22	4		4	4		4
Heavy Vehicles (%)	11%	2%	2%	20%	2%	4%	2%	0%	0%	7%	4%	11%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												8
Actuated Green, G (s)	17.7	55.2		1.8	39.3		7.4	15.2		4.4	12.2	12.2
Effective Green, g (s)	17.7	55.2		1.8	39.3		7.4	15.2		4.4	12.2	12.2
Actuated g/C Ratio	0.18	0.55		0.02	0.39		0.07	0.15		0.04	0.12	0.12
Clearance Time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Vehicle Extension (s)	6.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	287	1908		27	1368		130	274		74	222	174
v/s Ratio Prot	c0.15	c0.28		0.01	0.19		c0.05	c0.04		0.02	0.02	
v/s Ratio Perm												0.02
v/c Ratio	0.83	0.51		0.41	0.49		0.71	0.27		0.51	0.14	0.20
Uniform Delay, d1	39.7	14.0		48.6	22.8		45.2	37.5		46.8	39.2	39.5
Progression Factor	1.01	0.85		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	20.7	1.0		13.1	1.3		17.2	0.7		7.8	0.4	0.8
Delay (s)	60.8	12.9		61.7	24.1		62.4	38.3		54.5	39.6	40.3
Level of Service	E	B		E	C		E	D		D	D	D
Approach Delay (s)		22.2			24.7			50.3			41.7	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.4
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	247	573	258	448	51	230
v/c Ratio	0.49	0.77	0.62	0.64	0.22	0.35
Control Delay	17.6	24.7	24.5	21.6	17.7	14.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	24.7	24.5	21.6	17.7	14.4
Queue Length 50th (ft)	54	157	76	133	13	50
Queue Length 95th (ft)	142	#328	181	274	43	120
Internal Link Dist (ft)	628	690		412		625
Turn Bay Length (ft)			80		150	
Base Capacity (vph)	655	972	601	1003	333	929
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.59	0.43	0.45	0.15	0.25

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	95	50	10	345	120	245	415	10	45	140	65
Future Volume (vph)	65	95	50	10	345	120	245	415	10	45	140	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6			5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.99		1.00	1.00		1.00	0.98	
Flpb, ped/bikes		1.00			1.00		0.98	1.00		1.00	1.00	
Frt		0.97			0.97		1.00	1.00		1.00	0.95	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1749			1809		1768	1873		1798	1712	
Flt Permitted		0.68			0.99		0.61	1.00		0.33	1.00	
Satd. Flow (perm)		1204			1796		1129	1873		620	1712	
Peak-hour factor, PHF	0.85	0.85	0.85	0.83	0.83	0.83	0.95	0.95	0.95	0.89	0.89	0.89
Adj. Flow (vph)	76	112	59	12	416	145	258	437	11	51	157	73
RTOR Reduction (vph)	0	14	0	0	15	0	0	1	0	0	22	0
Lane Group Flow (vph)	0	233	0	0	558	0	258	447	0	51	208	0
Confl. Peds. (#/hr)	1		3	3		1	9		4	4		9
Heavy Vehicles (%)	3%	2%	4%	0%	1%	0%	0%	1%	0%	0%	6%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		24.6			24.6		22.3	22.3		22.3	22.3	
Effective Green, g (s)		24.6			24.6		22.3	22.3		22.3	22.3	
Actuated g/C Ratio		0.39			0.39		0.36	0.36		0.36	0.36	
Clearance Time (s)		5.6			5.6		5.6	5.6		5.6	5.6	
Vehicle Extension (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		472			704		401	666		220	608	
v/s Ratio Prot								c0.24			0.12	
v/s Ratio Perm		0.19			c0.31		0.23			0.08		
v/c Ratio		0.49			0.79		0.64	0.67		0.23	0.34	
Uniform Delay, d1		14.4			16.8		16.9	17.1		14.2	14.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1			6.4		3.9	2.9		0.7	0.5	
Delay (s)		15.5			23.2		20.8	20.0		14.9	15.3	
Level of Service		B			C		C	B		B	B	
Approach Delay (s)		15.5			23.2			20.3			15.2	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	62.7	Sum of lost time (s)	15.2
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	875	5	0	0	0	0	0	35	35	10	0
Future Volume (Veh/h)	0	875	5	0	0	0	0	0	35	35	10	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	951	5	0	0	0	0	0	38	38	11	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		817										
pX, platoon unblocked				0.90			0.90	0.90	0.90	0.90	0.90	
vC, conflicting volume	0			956			959	954	478	514	956	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			718			722	715	185	224	718	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	95	94	97	100
cM capacity (veh/h)	1622			787			274	318	740	605	316	1084

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	634	322	38	49
Volume Left	0	0	0	38
Volume Right	0	5	38	0
cSH	1700	1700	740	502
Volume to Capacity	0.37	0.19	0.05	0.10
Queue Length 95th (ft)	0	0	4	8
Control Delay (s)	0.0	0.0	10.1	12.9
Lane LOS			B	B
Approach Delay (s)	0.0		10.1	12.9
Approach LOS			B	B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	785	5	35	5	0	0	0	40
Future Volume (Veh/h)	0	0	0	0	785	5	35	5	0	0	0	40
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	853	5	38	5	0	0	0	43
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1301							
pX, platoon unblocked	1.00						1.00	1.00		1.00	1.00	1.00
vC, conflicting volume	858			0			470	858	0	858	856	429
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	849			0			459	849	0	849	846	418
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			92	98	100	100	100	93
cM capacity (veh/h)	781			1622			448	295	1084	250	296	581

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	569	289	43	43
Volume Left	0	0	38	0
Volume Right	0	5	0	43
cSH	1700	1700	422	581
Volume to Capacity	0.33	0.17	0.10	0.07
Queue Length 95th (ft)	0	0	8	6
Control Delay (s)	0.0	0.0	14.5	11.7
Lane LOS			B	B
Approach Delay (s)	0.0		14.5	11.7
Approach LOS			B	B

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D

BASE YEAR (2035) CAPACITY ANALYSIS REPORTS

Ann Arbor Station Traffic Analysis

Lane Group	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	315	605	30	956	91	1411
v/c Ratio	0.60	1.00	0.28	0.94	1.11	0.75
Control Delay	31.1	69.4	19.3	36.8	112.7	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.1	69.4	19.3	36.8	112.7	5.0
Queue Length 50th (ft)	149	~341	8	462	~25	30
Queue Length 95th (ft)	215	#505	31	#761	m#29	m28
Internal Link Dist (ft)		1428		423		156
Turn Bay Length (ft)			150		90	
Base Capacity (vph)	527	603	106	1016	82	1873
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	1.00	0.28	0.94	1.11	0.75

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Ann Arbor Station Traffic Analysis

Movement	WBL	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	265	476	32	27	811	59	86	1000	340
Future Volume (vph)	265	476	32	27	811	59	86	1000	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1847		1799	1811		1770	3327	
Flt Permitted	0.95	1.00		0.10	1.00		0.08	1.00	
Satd. Flow (perm)	1621	1847		193	1811		150	3327	
Peak-hour factor, PHF	0.84	0.84	0.84	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	315	567	38	30	891	65	91	1053	358
RTOR Reduction (vph)	0	3	0	0	15	0	0	32	0
Lane Group Flow (vph)	315	602	0	30	941	0	91	1379	0
Confl. Peds. (#/hr)	33		48	27			52		27
Heavy Vehicles (%)	6%	1%	2%	0%	4%	2%	2%	3%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			1			1	
Permitted Phases	2	2		1			1		
Actuated Green, G (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Effective Green, g (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Actuated g/C Ratio	0.33	0.33		0.55	0.55		0.55	0.55	
Clearance Time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Vehicle Extension (s)	5.0	5.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	527	601		106	1002		83	1840	
v/s Ratio Prot		c0.33			0.52			0.41	
v/s Ratio Perm	0.19			0.16			c0.61		
v/c Ratio	0.60	1.00		0.28	0.94		1.10	0.75	
Uniform Delay, d1	25.4	30.4		10.6	18.7		20.1	15.3	
Progression Factor	1.00	1.00		1.00	1.00		0.42	0.27	
Incremental Delay, d2	4.9	37.2		6.6	17.1		87.0	1.0	
Delay (s)	30.4	67.6		17.2	35.8		95.5	5.2	
Level of Service	C	E		B	D		F	A	
Approach Delay (s)		54.8			35.2			10.6	
Approach LOS		D			D			B	

Intersection Summary			
HCM 2000 Control Delay	29.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	93.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	159	159	918	1586
v/c Ratio	0.25	0.25	0.60	0.95
Control Delay	20.3	20.3	14.2	31.6
Queue Delay	0.3	0.3	1.6	0.0
Total Delay	20.6	20.6	15.8	31.6
Queue Length 50th (ft)	58	58	243	434
Queue Length 95th (ft)	105	105	m242	#88
Internal Link Dist (ft)	303	327	1027	111
Turn Bay Length (ft)				
Base Capacity (vph)	641	641	1541	1667
Starvation Cap Reductn	0	0	0	1
Spillback Cap Reductn	173	173	421	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.34	0.34	0.82	0.95

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Ann Arbor Station Traffic Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	113	22	11	113	22	11	811	22	22	1394	43
Future Volume (vph)	11	113	22	11	113	22	11	811	22	22	1394	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.2			6.2	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.98			0.98			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1818			1818			3523			3521	
Flt Permitted		0.98			0.98			0.86			0.93	
Satd. Flow (perm)		1782			1782			3025			3271	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	123	24	12	123	24	12	882	24	24	1515	47
RTOR Reduction (vph)	0	7	0	0	7	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	152	0	0	152	0	0	916	0	0	1584	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		32.0			32.0			45.8			45.8	
Effective Green, g (s)		32.0			32.0			45.8			45.8	
Actuated g/C Ratio		0.36			0.36			0.51			0.51	
Clearance Time (s)		6.0			6.0			6.2			6.2	
Vehicle Extension (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		633			633			1539			1664	
v/s Ratio Prot												
v/s Ratio Perm		c0.09			0.09			0.30			c0.48	
v/c Ratio		0.24			0.24			0.60			0.95	
Uniform Delay, d1		20.4			20.4			15.6			21.0	
Progression Factor		1.00			1.00			0.86			0.90	
Incremental Delay, d2		0.9			0.9			0.6			11.6	
Delay (s)		21.3			21.3			14.0			30.5	
Level of Service		C			C			B			C	
Approach Delay (s)		21.3			21.3			14.0			30.5	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	51	302	897	785	1579
v/c Ratio	0.33	0.38	0.55	1.22	0.57
Control Delay	38.9	3.6	24.6	136.5	4.9
Queue Delay	0.0	0.0	35.7	0.0	1.2
Total Delay	38.9	3.6	60.4	136.5	6.0
Queue Length 50th (ft)	29	39	134	~429	145
Queue Length 95th (ft)	m60	6	188	#653	184
Internal Link Dist (ft)			111		640
Turn Bay Length (ft)	300			240	
Base Capacity (vph)	160	807	1621	643	2787
Starvation Cap Reductn	0	0	776	0	0
Spillback Cap Reductn	0	0	0	0	896
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.32	0.37	1.06	1.22	0.84

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	43	0	254	0	557	286	746	1416	5
Future Volume (vph)	0	0	0	43	0	254	0	557	286	746	1416	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0		6.0		6.0		6.0	6.0	
Lane Util. Factor				1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes				1.00		1.00		0.99		1.00	1.00	
Flpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Frt				1.00		0.85		0.95		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				1805		1583		3334		1786	3572	
Flt Permitted				0.95		1.00		1.00		0.24	1.00	
Satd. Flow (perm)				1805		1583		3334		442	3572	
Peak-hour factor, PHF	0.92	0.92	0.92	0.84	0.84	0.84	0.94	0.94	0.94	0.95	0.90	0.90
Adj. Flow (vph)	0	0	0	51	0	302	0	593	304	785	1573	6
RTOR Reduction (vph)	0	0	0	0	0	176	0	57	0	0	0	0
Lane Group Flow (vph)	0	0	0	51	0	126	0	840	0	785	1579	0
Confl. Peds. (#/hr)	1		5	1		1			7	7		
Heavy Vehicles (%)	2%	2%	2%	0%	0%	2%	0%	2%	1%	1%	1%	0%
Turn Type				Prot		pt+ov		NA		D.P+P	NA	
Protected Phases		8		4		4 5		6		5	2	
Permitted Phases	8									6		
Actuated Green, G (s)				7.7		35.7		42.3		64.3	70.3	
Effective Green, g (s)				7.7		35.7		42.3		64.3	70.3	
Actuated g/C Ratio				0.09		0.40		0.47		0.71	0.78	
Clearance Time (s)				6.0				6.0		6.0	6.0	
Vehicle Extension (s)				4.0				5.0		2.0	5.0	
Lane Grp Cap (vph)				154		627		1566		644	2790	
v/s Ratio Prot				c0.03		0.08		0.25		c0.30	0.44	
v/s Ratio Perm										c0.57		
v/c Ratio				0.33		0.20		0.54		1.22	0.57	
Uniform Delay, d1				38.7		17.8		16.9		18.8	3.9	
Progression Factor				0.85		0.81		1.56		1.00	1.00	
Incremental Delay, d2				1.7		0.2		1.1		112.2	0.8	
Delay (s)				34.8		14.6		27.4		131.0	4.7	
Level of Service				C		B		C		F	A	
Approach Delay (s)		0.0			17.5			27.4			46.6	
Approach LOS		A			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	39.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.7
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	901	106	5	286	64	90
Future Volume (Veh/h)	901	106	5	286	64	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	979	115	5	311	70	98
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1096		1360	1038
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1096		1360	1038
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		57	65
cM capacity (veh/h)			636		162	280

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1094	316	168
Volume Left	0	5	70
Volume Right	115	0	98
cSH	1700	636	215
Volume to Capacity	0.64	0.01	0.78
Queue Length 95th (ft)	0	1	138
Control Delay (s)	0.0	0.3	63.8
Lane LOS		A	F
Approach Delay (s)	0.0	0.3	63.8
Approach LOS			F

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	90	0	0	111	37	626	0	0	0	0
Future Volume (Veh/h)	0	0	90	0	0	111	37	626	0	0	0	0
Sign Control		Yield			Yield			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.74	0.92	0.92	0.87	0.87	0.87	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	122	0	0	128	43	720	0	0	0	0
Pedestrians											6	
Lane Width (ft)											0.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	580	806	0	928	806	366	0			720		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	580	806	0	928	806	366	0			720		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	89	100	100	80	97			100		
cM capacity (veh/h)	311	306	1084	194	306	631	1622			877		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	122	128	283	480
Volume Left	0	0	43	0
Volume Right	122	128	0	0
cSH	1084	631	1622	1700
Volume to Capacity	0.11	0.20	0.03	0.28
Queue Length 95th (ft)	9	19	2	0
Control Delay (s)	8.7	12.2	1.3	0.0
Lane LOS	A	B	A	
Approach Delay (s)	8.7	12.2	0.5	
Approach LOS	A	B		

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	33.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	5	11	21	16	0	0	0	0	85	806	42
Future Volume (Veh/h)	0	5	11	21	16	0	0	0	0	85	806	42
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.70	0.70	0.70	0.92	0.92	0.92	0.81	0.81	0.81
Hourly flow rate (vph)	0	8	18	30	23	0	0	0	0	105	995	52
Pedestrians		6			12							
Lane Width (ft)		12.0			12.0							
Walking Speed (ft/s)		4.0			4.0							
Percent Blockage		1			1							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1248	1249	530	742	1275	12	1053			12		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1248	1249	530	742	1275	12	1053			12		
tC, single (s)	7.5	6.5	7.2	7.5	6.6	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.1	3.3	2.2			2.2		
p0 queue free %	100	95	96	89	84	100	100			93		
cM capacity (veh/h)	108	161	462	265	146	1061	665			1604		

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	26	53	602	550
Volume Left	0	30	105	0
Volume Right	18	0	0	52
cSH	293	196	1604	1700
Volume to Capacity	0.09	0.27	0.07	0.32
Queue Length 95th (ft)	7	26	5	0
Control Delay (s)	18.5	30.0	1.9	0.0
Lane LOS	C	D	A	
Approach Delay (s)	18.5	30.0	1.0	
Approach LOS	C	D		

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	41.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	819	502	262	485
v/c Ratio	0.45	0.27	0.40	0.83
Control Delay	25.4	17.5	34.3	53.5
Queue Delay	0.0	0.3	0.0	0.0
Total Delay	25.4	17.8	34.3	53.5
Queue Length 50th (ft)	232	165	179	407
Queue Length 95th (ft)	431	156	231	499
Internal Link Dist (ft)	355	346	123	
Turn Bay Length (ft)				
Base Capacity (vph)	1831	1849	779	696
Starvation Cap Reductn	0	698	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.45	0.44	0.34	0.70

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	737	472	0	249	461
Future Volume (vph)	0	737	472	0	249	461
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6	5.6
Lane Util. Factor		0.95	0.95		1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3505	3539		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3505	3539		1770	1583
Peak-hour factor, PHF	0.90	0.90	0.94	0.94	0.95	0.95
Adj. Flow (vph)	0	819	502	0	262	485
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	819	502	0	262	485
Confl. Peds. (#/hr)					4	
Heavy Vehicles (%)	2%	3%	2%	2%	2%	2%
Turn Type		NA	NA		Prot	Prot
Protected Phases		1	1		3	3
Permitted Phases						3
Actuated Green, G (s)		72.8	72.8		53.2	53.2
Effective Green, g (s)		72.8	72.8		53.2	53.2
Actuated g/C Ratio		0.51	0.51		0.37	0.37
Clearance Time (s)		5.6	5.6		5.6	5.6
Vehicle Extension (s)		3.0	3.0		5.0	5.0
Lane Grp Cap (vph)		1771	1789		653	584
v/s Ratio Prot		c0.23	0.14		0.15	c0.31
v/s Ratio Perm						
v/c Ratio		0.46	0.28		0.40	0.83
Uniform Delay, d1		23.0	20.5		33.6	41.3
Progression Factor		1.00	0.77		1.00	1.00
Incremental Delay, d2		0.9	0.4		0.8	10.8
Delay (s)		23.8	16.3		34.5	52.1
Level of Service		C	B		C	D
Approach Delay (s)		23.8	16.3		45.9	
Approach LOS		C	B		D	

Intersection Summary			
HCM 2000 Control Delay	30.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	14.2
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	105	914	301	447	162	134
v/c Ratio	0.19	0.46	0.62	0.17	0.68	0.29
Control Delay	12.5	12.2	13.6	1.3	73.9	38.7
Queue Delay	0.0	0.1	0.1	0.2	0.0	0.0
Total Delay	12.5	12.3	13.7	1.5	73.9	38.7
Queue Length 50th (ft)	29	125	12	8	146	98
Queue Length 95th (ft)	35	96	89	26	192	114
Internal Link Dist (ft)		346		296	1476	
Turn Bay Length (ft)	220		200			
Base Capacity (vph)	546	1983	620	2669	276	607
Starvation Cap Reductn	0	277	30	1479	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.54	0.51	0.38	0.59	0.22

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	467	228	265	382	11	64	64	106	0	0	0
Future Volume (vph)	80	467	228	265	382	11	64	64	106	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1			5.7	5.7			
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			
Frpb, ped/bikes	1.00	0.97		1.00	1.00			1.00	1.00			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.95		1.00	1.00			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.98	1.00			
Satd. Flow (prot)	1765	3278		1770	3521			1817	1583			
Flt Permitted	0.49	1.00		0.24	1.00			0.98	1.00			
Satd. Flow (perm)	917	3278		439	3521			1817	1583			
Peak-hour factor, PHF	0.76	0.76	0.76	0.88	0.88	0.88	0.79	0.79	0.79	0.92	0.92	0.92
Adj. Flow (vph)	105	614	300	301	434	12	81	81	134	0	0	0
RTOR Reduction (vph)	0	27	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	105	887	0	301	446	0	0	162	134	0	0	0
Confl. Peds. (#/hr)	1		12	12		1	5					
Turn Type	Perm	NA		pm+pt	NA		Split	NA	pt+ov			
Protected Phases		6		5	2		7	7	7 5			
Permitted Phases	6			2								
Actuated Green, G (s)	83.6	83.6		106.7	106.7			18.9	41.6			
Effective Green, g (s)	83.6	83.6		106.7	106.7			18.9	41.6			
Actuated g/C Ratio	0.58	0.58		0.74	0.74			0.13	0.29			
Clearance Time (s)	6.1	6.1		6.1	6.1			5.7				
Vehicle Extension (s)	5.0	5.0		3.0	5.0			5.0				
Lane Grp Cap (vph)	532	1903		482	2608			238	457			
v/s Ratio Prot		0.27		c0.07	0.13			c0.09	0.08			
v/s Ratio Perm	0.11			c0.39								
v/c Ratio	0.20	0.47		0.62	0.17			0.68	0.29			
Uniform Delay, d1	14.3	17.4		9.3	5.5			59.7	39.8			
Progression Factor	0.62	0.63		1.20	0.19			1.00	1.00			
Incremental Delay, d2	0.8	0.8		2.5	0.1			9.9	0.7			
Delay (s)	9.7	11.6		13.7	1.2			69.6	40.5			
Level of Service	A	B		B	A			E	D			
Approach Delay (s)		11.4			6.2			56.4			0.0	
Approach LOS		B			A			E			A	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	610	6	709	31	6
v/c Ratio	0.20	0.08	0.22	0.31	0.04
Control Delay	1.2	87.6	2.0	72.8	28.8
Queue Delay	0.2	0.0	0.0	0.0	0.0
Total Delay	1.4	87.6	2.0	72.8	28.8
Queue Length 50th (ft)	7	5	41	29	0
Queue Length 95th (ft)	57	m19	7	62	14
Internal Link Dist (ft)	296		2760	173	
Turn Bay Length (ft)		200		100	
Base Capacity (vph)	3085	194	3243	344	252
Starvation Cap Reductn	1509	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.39	0.03	0.22	0.09	0.02

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	546	27	5	631	27	5
Future Volume (vph)	546	27	5	631	27	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		5.2	5.2	5.6	5.2
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3507		1770	3539	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3507		1770	3539	1770	1583
Peak-hour factor, PHF	0.94	0.94	0.89	0.89	0.87	0.87
Adj. Flow (vph)	581	29	6	709	31	6
RTOR Reduction (vph)	1	0	0	0	0	6
Lane Group Flow (vph)	609	0	6	709	31	0
Confl. Peds. (#/hr)		5	5			
Turn Type	NA		Prot	NA	Prot	pt+ov
Protected Phases	2		1	6	3	1 8
Permitted Phases						
Actuated Green, G (s)	118.8		2.7	127.6	5.6	13.9
Effective Green, g (s)	118.8		2.7	127.6	5.6	8.3
Actuated g/C Ratio	0.82		0.02	0.89	0.04	0.06
Clearance Time (s)	6.1		5.2	5.2	5.6	
Vehicle Extension (s)	4.0		3.0	4.0	3.0	
Lane Grp Cap (vph)	2893		33	3135	68	91
v/s Ratio Prot	0.17		0.00	c0.20	c0.02	0.00
v/s Ratio Perm						
v/c Ratio	0.21		0.18	0.23	0.46	0.00
Uniform Delay, d1	2.7		69.6	1.2	67.7	64.0
Progression Factor	0.40		1.30	1.55	1.00	1.00
Incremental Delay, d2	0.2		2.6	0.2	4.8	0.0
Delay (s)	1.2		93.0	2.0	72.5	64.0
Level of Service	A		F	A	E	E
Approach Delay (s)	1.2			2.7	71.1	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	3.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	57	600	572	137	444	153
v/c Ratio	0.13	0.30	0.33	0.11	0.79	0.21
Control Delay	9.8	10.1	26.9	0.7	54.7	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.8	10.1	26.9	0.7	54.7	3.7
Queue Length 50th (ft)	12	75	157	0	379	0
Queue Length 95th (ft)	26	94	308	13	389	25
Internal Link Dist (ft)		2760	1391		524	
Turn Bay Length (ft)	100			150	75	
Base Capacity (vph)	459	2018	1713	1324	693	810
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.30	0.33	0.10	0.64	0.19

Intersection Summary

Ann Arbor Station Traffic Analysis

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	48	504	509	122	355	122
Future Volume (vph)	48	504	509	122	355	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.6	5.6	5.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1768	3539	3539	1561	1770	1583
Flt Permitted	0.38	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	706	3539	3539	1561	1770	1583
Peak-hour factor, PHF	0.84	0.84	0.89	0.89	0.80	0.80
Adj. Flow (vph)	57	600	572	137	444	152
RTOR Reduction (vph)	0	0	0	29	0	91
Lane Group Flow (vph)	57	600	572	108	444	62
Confl. Peds. (#/hr)	5			5	6	18
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	1	6	2	4	4	1 7
Permitted Phases	6			2		
Actuated Green, G (s)	80.5	80.5	68.1	113.9	45.8	58.2
Effective Green, g (s)	80.5	80.5	68.1	113.9	45.8	58.2
Actuated g/C Ratio	0.56	0.56	0.47	0.79	0.32	0.40
Clearance Time (s)	5.5	5.5	5.5	5.6	5.6	
Vehicle Extension (s)	4.0	4.5	4.5	6.0	6.0	
Lane Grp Cap (vph)	445	1978	1673	1234	562	639
v/s Ratio Prot	0.01	c0.17	c0.16	0.03	c0.25	0.04
v/s Ratio Perm	0.07			0.04		
v/c Ratio	0.13	0.30	0.34	0.09	0.79	0.10
Uniform Delay, d1	20.0	16.9	23.9	3.4	44.7	26.6
Progression Factor	0.44	0.51	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.4	0.2	0.1	9.0	0.1
Delay (s)	9.1	9.0	24.1	3.5	53.7	26.7
Level of Service	A	A	C	A	D	C
Approach Delay (s)		9.0	20.1		46.8	
Approach LOS		A	C		D	

Intersection Summary			
HCM 2000 Control Delay	24.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	51.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Ann Arbor Station Traffic Analysis

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	306	761	477	203	445	313
v/c Ratio	0.67	0.43	0.36	0.30	0.65	0.62
Control Delay	31.0	16.5	23.3	5.0	39.1	28.8
Queue Delay	0.1	0.0	0.0	0.0	0.0	1.8
Total Delay	31.1	16.5	23.3	5.0	39.1	30.6
Queue Length 50th (ft)	119	163	116	0	128	160
Queue Length 95th (ft)	#229	216	164	49	157	225
Internal Link Dist (ft)		355	330		239	
Turn Bay Length (ft)	150			100	140	
Base Capacity (vph)	455	1790	1318	682	689	649
Starvation Cap Reductn	0	0	0	0	0	193
Spillback Cap Reductn	4	0	0	8	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.43	0.36	0.30	0.65	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	291	723	453	193	369	260
Future Volume (vph)	291	723	453	193	369	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.94	1.00	1.00
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1673	3471	3438	1455	3467	1429
Flt Permitted	0.44	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	768	3471	3438	1455	3467	1429
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.83	0.83
Adj. Flow (vph)	306	761	477	203	445	313
RTOR Reduction (vph)	0	0	0	128	0	0
Lane Group Flow (vph)	306	761	477	75	445	313
Confl. Peds. (#/hr)	17			17	140	
Heavy Vehicles (%)	7%	4%	5%	4%	1%	13%
Turn Type	pm+pt	NA	NA	Perm	Prot	Prot
Protected Phases	1	6	2		3	8
Permitted Phases	6			2		
Actuated Green, G (s)	45.2	45.2	33.3	33.3	17.9	32.9
Effective Green, g (s)	45.2	45.2	33.3	33.3	17.9	32.9
Actuated g/C Ratio	0.50	0.50	0.37	0.37	0.20	0.37
Clearance Time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Lane Grp Cap (vph)	448	1743	1272	538	689	522
v/s Ratio Prot	c0.05	0.22	0.14		0.13	c0.22
v/s Ratio Perm	c0.30			0.05		
v/c Ratio	0.68	0.44	0.38	0.14	0.65	0.60
Uniform Delay, d1	20.3	14.3	20.7	18.8	33.1	23.2
Progression Factor	1.00	1.00	1.00	1.00	1.02	1.02
Incremental Delay, d2	8.2	0.8	0.8	0.5	4.6	1.8
Delay (s)	28.5	15.1	21.6	19.4	38.5	25.4
Level of Service	C	B	C	B	D	C
Approach Delay (s)		18.9	20.9		33.1	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	46	165	100	94	570	170	591
v/c Ratio	0.16	0.52	0.52	0.29	0.47	0.36	0.25
Control Delay	30.2	35.7	41.9	8.9	4.7	4.5	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.4	0.0	0.1
Total Delay	30.2	35.7	41.9	8.9	5.1	4.5	2.3
Queue Length 50th (ft)	21	75	49	0	85	13	23
Queue Length 95th (ft)	43	114	82	27	45	20	28
Internal Link Dist (ft)		284			239		250
Turn Bay Length (ft)			85			100	
Base Capacity (vph)	534	566	348	518	1220	473	2383
Starvation Cap Reductn	0	0	0	0	258	0	759
Spillback Cap Reductn	0	0	0	0	16	0	91
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.29	0.29	0.18	0.59	0.36	0.36

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	109	21	78	0	73	0	416	52	151	526	0
Future Volume (vph)	36	109	21	78	0	73	0	416	52	151	526	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Lane Util. Factor	1.00	1.00		1.00		1.00		1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00		0.90		0.99		1.00	1.00	
Flpb, ped/bikes	0.92	1.00		0.96		1.00		1.00		0.96	1.00	
Frt	1.00	0.98		1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1659	1733		1734		1412		1773		1628	3471	
Flt Permitted	0.95	1.00		0.59		1.00		1.00		0.40	1.00	
Satd. Flow (perm)	1659	1733		1084		1412		1773		684	3471	
Peak-hour factor, PHF	0.79	0.79	0.79	0.78	0.78	0.78	0.82	0.82	0.82	0.89	0.89	0.89
Adj. Flow (vph)	46	138	27	100	0	94	0	507	63	170	591	0
RTOR Reduction (vph)	0	10	0	0	0	77	0	3	0	0	0	0
Lane Group Flow (vph)	46	155	0	100	0	17	0	567	0	170	591	0
Confl. Peds. (#/hr)	35		37	37		35			53	53		
Heavy Vehicles (%)	0%	7%	0%	0%	3%	3%	0%	3%	12%	6%	4%	0%
Turn Type	Perm	NA		D.Pm		Perm		NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4			4		4				2		
Actuated Green, G (s)	16.1	16.1		16.1		16.1		61.8		61.8	61.8	
Effective Green, g (s)	16.1	16.1		16.1		16.1		61.8		61.8	61.8	
Actuated g/C Ratio	0.18	0.18		0.18		0.18		0.69		0.69	0.69	
Clearance Time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Vehicle Extension (s)	4.0	4.0		4.0		4.0		4.0		4.0	4.0	
Lane Grp Cap (vph)	296	310		193		252		1217		469	2383	
v/s Ratio Prot		0.09						c0.32			0.17	
v/s Ratio Perm	0.03			c0.09		0.01				0.25		
v/c Ratio	0.16	0.50		0.52		0.07		0.47		0.36	0.25	
Uniform Delay, d1	31.2	33.3		33.4		30.7		6.5		5.9	5.3	
Progression Factor	1.00	1.00		1.00		1.00		0.48		0.34	0.32	
Incremental Delay, d2	0.3	1.7		3.1		0.2		1.2		2.0	0.2	
Delay (s)	31.5	35.1		36.5		30.9		4.3		4.0	2.0	
Level of Service	C	D		D		C		A		A	A	
Approach Delay (s)		34.3			33.8			4.3			2.4	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.1
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	57	49	74	136	87	65	574	772
v/c Ratio	0.20	0.12	0.32	0.72	0.59	0.25	0.64	0.48
Control Delay	33.7	0.6	39.8	60.2	54.4	13.3	16.9	11.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0
Total Delay	33.7	0.6	39.8	60.2	54.4	13.3	17.8	11.3
Queue Length 50th (ft)	28	0	39	78	49	16	154	79
Queue Length 95th (ft)	43	0	61	108	76	31	177	137
Internal Link Dist (ft)				296			250	793
Turn Bay Length (ft)		25				100		
Base Capacity (vph)	292	397	229	189	148	265	899	1623
Starvation Cap Reductn	0	0	0	0	0	0	118	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.12	0.32	0.72	0.59	0.25	0.73	0.48

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	0	31	52	88	68	57	505	0	0	604	68
Future Volume (vph)	36	0	31	52	88	68	57	505	0	0	604	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Lane Util. Factor	1.00		1.00	1.00	0.95	0.95	1.00	1.00			0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.98	1.00	1.00	1.00			0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	0.96	1.00			1.00	
Frt	1.00		0.85	1.00	0.99	0.85	1.00	1.00			0.98	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1656		1615	1736	1436	1120	1724	1845			3310	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.30	1.00			1.00	
Satd. Flow (perm)	1656		1615	1736	1436	1120	543	1845			3310	
Peak-hour factor, PHF	0.63	0.63	0.63	0.70	0.70	0.70	0.88	0.88	0.88	0.87	0.87	0.87
Adj. Flow (vph)	57	0	49	74	126	97	65	574	0	0	694	78
RTOR Reduction (vph)	0	0	40	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	57	0	9	74	136	87	65	574	0	0	763	0
Confl. Peds. (#/hr)	207		56	56		207	55					55
Heavy Vehicles (%)	9%	0%	0%	4%	20%	37%	0%	3%	0%	0%	5%	8%
Turn Type	Prot		Prot	Split	NA	Prot	Perm	NA			NA	
Protected Phases	8		8	4	4	4		2			2	
Permitted Phases							2					
Actuated Green, G (s)	15.9		15.9	11.9	11.9	11.9	43.9	43.9			43.9	
Effective Green, g (s)	15.9		15.9	11.9	11.9	11.9	43.9	43.9			43.9	
Actuated g/C Ratio	0.18		0.18	0.13	0.13	0.13	0.49	0.49			0.49	
Clearance Time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Vehicle Extension (s)	2.0		2.0	4.0	4.0	4.0	2.0	2.0			2.0	
Lane Grp Cap (vph)	292		285	229	189	148	264	899			1614	
v/s Ratio Prot	c0.03		0.01	0.04	c0.09	0.08		c0.31			0.23	
v/s Ratio Perm							0.12					
v/c Ratio	0.20		0.03	0.32	0.72	0.59	0.25	0.64			0.47	
Uniform Delay, d1	31.6		30.7	35.4	37.4	36.7	13.4	17.1			15.3	
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.78	0.77			0.68	
Incremental Delay, d2	1.5		0.2	3.7	21.0	16.0	2.1	3.2			0.9	
Delay (s)	33.1		30.9	39.1	58.4	52.7	12.6	16.5			11.4	
Level of Service	C		C	D	E	D	B	B			B	
Approach Delay (s)		32.1			51.9			16.1			11.4	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.3
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	739	62	480	799
v/c Ratio	0.75	0.16	0.25	0.49
Control Delay	29.5	5.9	5.4	17.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	29.5	5.9	5.4	17.0
Queue Length 50th (ft)	188	9	36	151
Queue Length 95th (ft)	m157	m11	43	229
Internal Link Dist (ft)	1498		793	705
Turn Bay Length (ft)	200	125		
Base Capacity (vph)	1175	417	1957	1621
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.63	0.15	0.25	0.49

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Ann Arbor Station Traffic Analysis

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	500	187	57	442	552	167
Future Volume (vph)	500	187	57	442	552	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7		6.1	6.1	6.1	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.98		1.00	1.00	0.97	
Flpb, ped/bikes	1.00		0.99	1.00	1.00	
Frt	0.96		1.00	1.00	0.97	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	3359		1725	3312	3239	
Flt Permitted	0.96		0.29	1.00	1.00	
Satd. Flow (perm)	3359		529	3312	3239	
Peak-hour factor, PHF	0.93	0.93	0.92	0.92	0.90	0.90
Adj. Flow (vph)	538	201	62	480	613	186
RTOR Reduction (vph)	48	0	0	0	27	0
Lane Group Flow (vph)	691	0	62	480	772	0
Confl. Peds. (#/hr)		16	45			45
Heavy Vehicles (%)	0%	0%	4%	9%	6%	1%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	2		1	4	3	
Permitted Phases			4			
Actuated Green, G (s)	25.0		53.2	53.2	43.1	
Effective Green, g (s)	25.0		53.2	53.2	43.1	
Actuated g/C Ratio	0.28		0.59	0.59	0.48	
Clearance Time (s)	5.7		6.1	6.1	6.1	
Vehicle Extension (s)	4.0		2.0	0.2	2.0	
Lane Grp Cap (vph)	933		365	1957	1551	
v/s Ratio Prot	c0.21		0.01	c0.14	c0.24	
v/s Ratio Perm			0.09			
v/c Ratio	0.74		0.17	0.25	0.50	
Uniform Delay, d1	29.5		12.5	8.8	16.0	
Progression Factor	1.02		0.48	0.54	1.00	
Incremental Delay, d2	1.6		0.1	0.2	1.1	
Delay (s)	31.7		6.0	5.0	17.2	
Level of Service	C		A	A	B	
Approach Delay (s)	31.7			5.1	17.2	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	19.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	853	6	921	8	8	6
v/c Ratio	0.29	0.05	0.30	0.04	0.02	0.01
Control Delay	4.6	34.4	2.8	32.8	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.6	34.4	2.8	32.8	0.0	0.0
Queue Length 50th (ft)	0	3	4	4	0	0
Queue Length 95th (ft)	192	m8	93	10	0	0
Internal Link Dist (ft)	293		1215		158	248
Turn Bay Length (ft)		200		50		
Base Capacity (vph)	2922	202	3023	410	659	658
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.03	0.30	0.02	0.01	0.01

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

Ann Arbor Station Traffic Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	749	10	5	801	0	5	0	5	0	0	5
Future Volume (vph)	0	749	10	5	801	0	5	0	5	0	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7		5.7	5.7		5.6	5.6			5.6	
Lane Util. Factor		0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes		1.00		1.00	1.00		1.00	0.99			0.99	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00			1.00	
Frt		1.00		1.00	1.00		1.00	0.85			0.86	
Flt Protected		1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3397		1770	3406		1764	1562			1587	
Flt Permitted		1.00		0.95	1.00		0.75	1.00			1.00	
Satd. Flow (perm)		3397		1770	3406		1400	1562			1587	
Peak-hour factor, PHF	0.89	0.89	0.89	0.87	0.87	0.87	0.60	0.60	0.60	0.86	0.86	0.86
Adj. Flow (vph)	0	842	11	6	921	0	8	0	8	0	0	6
RTOR Reduction (vph)	0	1	0	0	0	0	0	8	0	0	6	0
Lane Group Flow (vph)	0	852	0	6	921	0	8	0	0	0	0	0
Confl. Peds. (#/hr)	29		24	24		29	2		1	1		2
Heavy Vehicles (%)	2%	6%	2%	2%	6%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	NA		Prot	NA		Perm	NA			NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		66.1		1.3	73.1		5.6	5.6			5.6	
Effective Green, g (s)		66.1		1.3	73.1		5.6	5.6			5.6	
Actuated g/C Ratio		0.73		0.01	0.81		0.06	0.06			0.06	
Clearance Time (s)		5.7		5.7	5.7		5.6	5.6			5.6	
Vehicle Extension (s)		3.0		3.0	4.5		1.0	1.0			1.0	
Lane Grp Cap (vph)		2494		25	2766		87	97			98	
v/s Ratio Prot		0.25		0.00	c0.27			0.00			0.00	
v/s Ratio Perm							c0.01					
v/c Ratio		0.34		0.24	0.33		0.09	0.01			0.00	
Uniform Delay, d1		4.2		43.9	2.2		39.8	39.6			39.6	
Progression Factor		1.00		0.86	1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.4		4.4	0.3		0.2	0.0			0.0	
Delay (s)		4.6		42.0	2.5		40.0	39.6			39.6	
Level of Service		A		D	A		D	D			D	
Approach Delay (s)		4.6			2.7			39.8			39.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	4.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Ann Arbor Station Traffic Analysis

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	169	750	22	731	55	26	34	79	159
v/c Ratio	0.73	0.37	0.23	0.51	0.52	0.11	0.38	0.32	0.41
Control Delay	57.7	15.9	46.3	22.9	59.2	22.1	53.0	37.5	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.7	15.9	46.3	22.9	59.2	22.1	53.0	37.5	3.4
Queue Length 50th (ft)	92	89	12	160	31	7	19	42	0
Queue Length 95th (ft)	#193	239	36	253	59	22	50	76	4
Internal Link Dist (ft)		1215		729		257		381	
Turn Bay Length (ft)	225		150		100		180		
Base Capacity (vph)	237	2009	94	1436	106	405	90	422	488
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.37	0.23	0.51	0.52	0.06	0.38	0.19	0.33

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	161	593	120	21	666	21	42	10	10	31	73	146
Future Volume (vph)	161	593	120	21	666	21	42	10	10	31	73	146
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1433	3417		1444	3509		1770	1744		1504	1863	1291
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1433	3417		1444	3509		1770	1744		1504	1863	1291
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	169	624	126	22	709	22	55	13	13	34	79	159
RTOR Reduction (vph)	0	15	0	0	2	0	0	11	0	0	0	138
Lane Group Flow (vph)	169	735	0	22	729	0	55	15	0	34	79	21
Confl. Peds. (#/hr)	4					4	3		2	2		3
Heavy Vehicles (%)	26%	3%	3%	25%	2%	14%	2%	0%	0%	20%	2%	23%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												8
Actuated Green, G (s)	14.5	47.8		2.4	35.7		4.3	14.2		2.2	12.1	12.1
Effective Green, g (s)	14.5	47.8		2.4	35.7		4.3	14.2		2.2	12.1	12.1
Actuated g/C Ratio	0.16	0.53		0.03	0.40		0.05	0.16		0.02	0.13	0.13
Clearance Time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Vehicle Extension (s)	6.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	230	1814		38	1391		84	275		36	250	173
v/s Ratio Prot	c0.12	0.22		0.02	c0.21		c0.03	0.01		0.02	c0.04	
v/s Ratio Perm												0.02
v/c Ratio	0.73	0.41		0.58	0.52		0.65	0.05		0.94	0.32	0.12
Uniform Delay, d1	35.9	12.6		43.3	20.7		42.1	32.2		43.8	35.2	34.3
Progression Factor	1.07	1.28		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	15.2	0.7		23.1	1.4		18.5	0.1		127.6	1.0	0.4
Delay (s)	53.4	16.9		66.4	22.1		60.6	32.3		171.4	36.2	34.7
Level of Service	D	B		E	C		E	C		F	D	C
Approach Delay (s)		23.6			23.4			51.5			52.2	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	28.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.4
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	480	288	217	87	181	98	679
v/c Ratio	0.76	0.41	0.34	0.71	0.23	0.20	0.84
Control Delay	27.9	5.5	15.6	54.6	14.0	15.4	30.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.9	5.5	15.6	54.6	14.0	15.4	30.5
Queue Length 50th (ft)	163	10	54	28	42	24	237
Queue Length 95th (ft)	314	61	99	#102	89	61	#466
Internal Link Dist (ft)	628		690		412		625
Turn Bay Length (ft)		250		80		150	
Base Capacity (vph)	783	805	796	127	796	501	832
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.36	0.27	0.69	0.23	0.20	0.82

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	377	265	11	122	37	69	127	16	80	483	74
Future Volume (vph)	64	377	265	11	122	37	69	127	16	80	483	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.93		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		0.94	1.00	
Frt		1.00	0.85		0.97		1.00	0.98		1.00	0.98	
Flt Protected		0.99	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1852	1480		1795		1805	1742		1642	1815	
Flt Permitted		0.92	1.00		0.96		0.15	1.00		0.64	1.00	
Satd. Flow (perm)		1720	1480		1728		280	1742		1111	1815	
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.79	0.79	0.79	0.82	0.82	0.82
Adj. Flow (vph)	70	410	288	14	156	47	87	161	20	98	589	90
RTOR Reduction (vph)	0	0	161	0	13	0	0	5	0	0	6	0
Lane Group Flow (vph)	0	480	127	0	204	0	87	176	0	98	673	0
Confl. Peds. (#/hr)	17		13	13		17	4		23	23		4
Heavy Vehicles (%)	3%	1%	2%	0%	0%	3%	0%	6%	7%	3%	2%	3%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2		2	2			1			1		
Actuated Green, G (s)		24.6	24.6		24.6		29.6	29.6		29.6	29.6	
Effective Green, g (s)		24.6	24.6		24.6		29.6	29.6		29.6	29.6	
Actuated g/C Ratio		0.35	0.35		0.35		0.42	0.42		0.42	0.42	
Clearance Time (s)		5.6	5.6		5.6		5.6	5.6		5.6	5.6	
Vehicle Extension (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		604	520		607		118	736		469	767	
v/s Ratio Prot								0.10			c0.37	
v/s Ratio Perm		c0.28	0.09		0.12		0.31			0.09		
v/c Ratio		0.79	0.24		0.34		0.74	0.24		0.21	0.88	
Uniform Delay, d1		20.4	16.1		16.7		16.9	13.0		12.8	18.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		7.5	0.3		0.4		22.4	0.2		0.3	11.4	
Delay (s)		28.0	16.4		17.1		39.3	13.2		13.1	29.9	
Level of Service		C	B		B		D	B		B	C	
Approach Delay (s)		23.6			17.1			21.7			27.8	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	744	5	0	0	0	0	0	16	16	10	0
Future Volume (Veh/h)	0	744	5	0	0	0	0	0	16	16	10	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	809	5	0	0	0	0	0	17	17	11	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		817										
pX, platoon unblocked				0.87			0.87	0.87	0.87	0.87	0.87	
vC, conflicting volume	0			814			817	812	407	422	814	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			502			505	499	36	53	502	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	98	98	97	100
cM capacity (veh/h)	1622			927			386	413	899	806	411	1084

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	539	275	17	28
Volume Left	0	0	0	17
Volume Right	0	5	17	0
cSH	1700	1700	899	585
Volume to Capacity	0.32	0.16	0.02	0.05
Queue Length 95th (ft)	0	0	1	4
Control Delay (s)	0.0	0.0	9.1	11.5
Lane LOS			A	B
Approach Delay (s)	0.0		9.1	11.5
Approach LOS			A	B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	859	5	10	10	0	0	0	5
Future Volume (Veh/h)	0	0	0	0	859	5	10	10	0	0	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	934	5	11	11	0	0	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1301							
pX, platoon unblocked												
vC, conflicting volume	939			0			472	939	0	942	936	470
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	939			0			472	939	0	942	936	470
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			98	96	100	100	100	99
cM capacity (veh/h)	726			1622			471	263	1084	211	263	540

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	623	316	22	5
Volume Left	0	0	11	0
Volume Right	0	5	0	5
cSH	1700	1700	337	540
Volume to Capacity	0.37	0.19	0.07	0.01
Queue Length 95th (ft)	0	0	5	1
Control Delay (s)	0.0	0.0	16.4	11.7
Lane LOS			C	B
Approach Delay (s)	0.0		16.4	11.7
Approach LOS			C	B

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	40.6%	ICU Level of Service		A
Analysis Period (min)	15			

Ann Arbor Station Traffic Analysis

Lane Group	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	351	436	12	1069	62	717
v/c Ratio	0.61	0.73	0.03	1.04	0.74	0.38
Control Delay	31.0	34.3	9.6	59.4	78.5	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.0	34.3	9.6	59.4	78.5	22.6
Queue Length 50th (ft)	166	211	3	~653	37	192
Queue Length 95th (ft)	258	322	11	#896	m#108	257
Internal Link Dist (ft)		1428		423		156
Turn Bay Length (ft)			150		90	
Base Capacity (vph)	574	600	351	1031	84	1878
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.73	0.03	1.04	0.74	0.38

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	WBL	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	330	340	70	11	989	27	59	513	168
Future Volume (vph)	330	340	70	11	989	27	59	513	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1766	1820		1792	1838		1805	3332	
Flt Permitted	0.95	1.00		0.34	1.00		0.08	1.00	
Satd. Flow (perm)	1766	1820		637	1838		153	3332	
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	351	362	74	12	1041	28	62	540	177
RTOR Reduction (vph)	0	8	0	0	15	0	0	35	0
Lane Group Flow (vph)	351	428	0	12	1054	0	62	682	0
Confl. Peds. (#/hr)	8		14	14			16		14
Heavy Vehicles (%)	1%	1%	0%	0%	3%	1%	0%	4%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			1			1	
Permitted Phases	2	2		1			1		
Actuated Green, G (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Effective Green, g (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Actuated g/C Ratio	0.33	0.33		0.55	0.55		0.55	0.55	
Clearance Time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Vehicle Extension (s)	5.0	5.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	574	592		352	1017		84	1843	
v/s Ratio Prot		c0.24			c0.57			0.20	
v/s Ratio Perm	0.20			0.02			0.41		
v/c Ratio	0.61	0.72		0.03	1.04		0.74	0.37	
Uniform Delay, d1	25.6	26.8		9.2	20.1		15.2	11.3	
Progression Factor	1.00	1.00		1.00	1.00		1.93	2.19	
Incremental Delay, d2	4.8	7.5		0.2	38.1		40.5	0.5	
Delay (s)	30.4	34.2		9.3	58.2		69.8	25.2	
Level of Service	C	C		A	E		E	C	
Approach Delay (s)		32.5			57.7			28.8	
Approach LOS		C			E			C	

Intersection Summary			
HCM 2000 Control Delay	41.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	176	254	1269	835
v/c Ratio	0.63	0.50	0.66	0.46
Control Delay	38.5	23.1	3.7	10.4
Queue Delay	91.4	71.5	0.0	0.7
Total Delay	129.8	94.6	3.7	11.1
Queue Length 50th (ft)	83	85	51	76
Queue Length 95th (ft)	#159	159	m51	93
Internal Link Dist (ft)	303	327	1027	111
Turn Bay Length (ft)				
Base Capacity (vph)	280	511	1916	1831
Starvation Cap Reductn	0	0	0	603
Spillback Cap Reductn	223	377	9	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	3.09	1.90	0.67	0.68

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	27	22	11	54	168	22	1102	43	22	703	43
Future Volume (vph)	113	27	22	11	54	168	22	1102	43	22	703	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.2			6.2	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.98			0.90			0.99			0.99	
Flt Protected		0.97			1.00			1.00			1.00	
Satd. Flow (prot)		1767			1678			3516			3504	
Flt Permitted		0.54			0.98			0.93			0.89	
Satd. Flow (perm)		987			1653			3262			3112	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	123	29	24	12	59	183	24	1198	47	24	764	47
RTOR Reduction (vph)	0	7	0	0	52	0	0	3	0	0	5	0
Lane Group Flow (vph)	0	170	0	0	202	0	0	1266	0	0	830	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		25.0			25.0			52.8			52.8	
Effective Green, g (s)		25.0			25.0			52.8			52.8	
Actuated g/C Ratio		0.28			0.28			0.59			0.59	
Clearance Time (s)		6.0			6.0			6.2			6.2	
Vehicle Extension (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		274			459			1913			1825	
v/s Ratio Prot												
v/s Ratio Perm		c0.17			0.12			c0.39			0.27	
v/c Ratio		0.62			0.44			0.66			0.45	
Uniform Delay, d1		28.3			26.7			12.6			10.5	
Progression Factor		1.00			1.00			0.23			0.91	
Incremental Delay, d2		10.1			3.0			0.8			0.8	
Delay (s)		38.4			29.8			3.6			10.4	
Level of Service		D			C			A			B	
Approach Delay (s)		38.4			29.8			3.6			10.4	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	117	628	1475	217	739
v/c Ratio	0.66	1.03	0.77	0.64	0.27
Control Delay	48.4	60.9	12.4	30.4	3.4
Queue Delay	0.0	0.0	0.6	0.0	0.0
Total Delay	48.4	60.9	13.0	30.4	3.4
Queue Length 50th (ft)	66	~312	158	52	51
Queue Length 95th (ft)	m96	#513	234	127	67
Internal Link Dist (ft)			111		640
Turn Bay Length (ft)	300			240	
Base Capacity (vph)	178	608	1917	337	2740
Starvation Cap Reductn	0	0	151	0	0
Spillback Cap Reductn	0	0	0	0	60
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.66	1.03	0.84	0.64	0.28

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	108	0	578	5	1313	54	195	665	0
Future Volume (vph)	0	0	0	108	0	578	5	1313	54	195	665	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0		6.0		6.0		6.0	6.0	
Lane Util. Factor				1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Flpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Frt				1.00		0.85		0.99		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				1787		1599		3546		1769	3574	
Flt Permitted				0.95		1.00		0.95		0.10	1.00	
Satd. Flow (perm)				1787		1599		3380		178	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	117	0	628	5	1412	58	217	739	0
RTOR Reduction (vph)	0	0	0	0	0	129	0	3	0	0	0	0
Lane Group Flow (vph)	0	0	0	117	0	499	0	1472	0	217	739	0
Confl. Peds. (#/hr)									20	20		
Heavy Vehicles (%)	2%	2%	2%	1%	0%	1%	0%	1%	0%	2%	1%	0%
Turn Type				Prot		pt+ov	Perm	NA		D.P+P	NA	
Protected Phases		8		4		4 5		6		5	2	
Permitted Phases	8						6			6		
Actuated Green, G (s)				9.0		27.0		51.0		63.0	69.0	
Effective Green, g (s)				9.0		27.0		51.0		63.0	69.0	
Actuated g/C Ratio				0.10		0.30		0.57		0.70	0.77	
Clearance Time (s)				6.0				6.0		6.0	6.0	
Vehicle Extension (s)				4.0				5.0		2.0	5.0	
Lane Grp Cap (vph)				178		479		1915		336	2740	
v/s Ratio Prot				0.07		c0.31				0.09	0.21	
v/s Ratio Perm								c0.44		0.36		
v/c Ratio				0.66		1.04		0.77		0.65	0.27	
Uniform Delay, d1				39.0		31.5		15.0		23.1	3.1	
Progression Factor				0.84		0.75		0.66		1.00	1.00	
Incremental Delay, d2				7.6		48.2		2.3		3.2	0.2	
Delay (s)				40.2		71.7		12.2		26.3	3.3	
Level of Service				D		E		B		C	A	
Approach Delay (s)		0.0			66.8			12.2			8.5	
Approach LOS		A			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	23.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.7
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	202	42	21	605	53	106
Future Volume (Veh/h)	202	42	21	605	53	106
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	220	46	23	658	58	115
Pedestrians	1			8	11	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			277		959	262
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			277		959	262
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		79	85
cM capacity (veh/h)			1274		277	764

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	266	681	173
Volume Left	0	23	58
Volume Right	46	0	115
cSH	1700	1274	481
Volume to Capacity	0.16	0.02	0.36
Queue Length 95th (ft)	0	1	40
Control Delay (s)	0.0	0.5	16.6
Lane LOS		A	C
Approach Delay (s)	0.0	0.5	16.6
Approach LOS			C

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	42	0	0	64	74	647	0	0	0	0
Future Volume (Veh/h)	0	0	42	0	0	64	74	647	0	0	0	0
Sign Control		Yield			Yield			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.74	0.92	0.92	0.87	0.87	0.87	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	57	0	0	74	85	744	0	0	0	0
Pedestrians											6	
Lane Width (ft)											0.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	622	914	0	971	914	378	0			744		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	622	914	0	971	914	378	0			744		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	95	100	100	88	95			100		
cM capacity (veh/h)	314	257	1084	188	257	620	1622			859		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	57	74	333	496
Volume Left	0	0	85	0
Volume Right	57	74	0	0
cSH	1084	620	1622	1700
Volume to Capacity	0.05	0.12	0.05	0.29
Queue Length 95th (ft)	4	10	4	0
Control Delay (s)	8.5	11.6	2.2	0.0
Lane LOS	A	B	A	
Approach Delay (s)	8.5	11.6	0.9	
Approach LOS	A	B		

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	5	11	42	32	0	0	0	0	37	673	27
Future Volume (Veh/h)	0	5	11	42	32	0	0	0	0	37	673	27
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.68	0.68	0.68	0.69	0.69	0.69	0.92	0.92	0.92	0.90	0.90	0.90
Hourly flow rate (vph)	0	7	16	61	46	0	0	0	0	41	748	30
Pedestrians		9			12							
Lane Width (ft)		12.0			12.0							
Walking Speed (ft/s)		4.0			4.0							
Percent Blockage		1			1							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	877	866	398	488	881	12	787			12		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	877	866	398	488	881	12	787			12		
tC, single (s)	7.5	6.5	7.3	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	98	97	86	83	100	100			97		
cM capacity (veh/h)	206	281	549	427	275	1061	835			1604		

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	23	107	415	404
Volume Left	0	61	41	0
Volume Right	16	0	0	30
cSH	426	345	1604	1700
Volume to Capacity	0.05	0.31	0.03	0.24
Queue Length 95th (ft)	4	32	2	0
Control Delay (s)	13.9	20.0	0.9	0.0
Lane LOS	B	C	A	
Approach Delay (s)	13.9	20.0	0.5	
Approach LOS	B	C		

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	790	547	94	255
v/c Ratio	0.31	0.22	0.25	0.76
Control Delay	8.9	4.2	46.8	66.9
Queue Delay	0.0	0.2	0.0	0.0
Total Delay	8.9	4.3	46.8	66.9
Queue Length 50th (ft)	133	51	74	227
Queue Length 95th (ft)	207	m28	109	280
Internal Link Dist (ft)	355	346	123	
Turn Bay Length (ft)				
Base Capacity (vph)	2509	2509	619	554
Starvation Cap Reductn	0	1063	0	0
Spillback Cap Reductn	125	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.33	0.38	0.15	0.46

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	711	520	0	80	217
Future Volume (vph)	0	711	520	0	80	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6	5.6
Lane Util. Factor		0.95	0.95		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3539	3539		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3539	3539		1770	1583
Peak-hour factor, PHF	0.90	0.90	0.95	0.95	0.85	0.85
Adj. Flow (vph)	0	790	547	0	94	255
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	790	547	0	94	255
Turn Type		NA	NA		Prot	Prot
Protected Phases		1	1		3	3
Permitted Phases						3
Actuated Green, G (s)		102.1	102.1		30.7	30.7
Effective Green, g (s)		102.1	102.1		30.7	30.7
Actuated g/C Ratio		0.71	0.71		0.21	0.21
Clearance Time (s)		5.6	5.6		5.6	5.6
Vehicle Extension (s)		3.0	3.0		5.0	5.0
Lane Grp Cap (vph)		2509	2509		377	337
v/s Ratio Prot		c0.22	0.15		0.05	c0.16
v/s Ratio Perm						
v/c Ratio		0.31	0.22		0.25	0.76
Uniform Delay, d1		7.8	7.2		47.1	53.1
Progression Factor		1.00	0.50		1.00	1.00
Incremental Delay, d2		0.3	0.2		0.7	11.0
Delay (s)		8.2	3.8		47.8	64.2
Level of Service		A	A		D	E
Approach Delay (s)		8.2	3.8		59.8	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	14.2
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	339	668	171	485	411	354
v/c Ratio	0.68	0.34	0.39	0.21	0.92	0.68
Control Delay	29.7	14.7	9.7	6.7	80.6	49.1
Queue Delay	0.3	0.3	0.8	0.3	0.0	0.0
Total Delay	30.0	15.0	10.5	7.0	80.6	49.1
Queue Length 50th (ft)	225	87	59	152	377	284
Queue Length 95th (ft)	#445	289	42	41	#504	366
Internal Link Dist (ft)		346		296	1476	
Turn Bay Length (ft)	220		200			
Base Capacity (vph)	498	1956	440	2285	453	516
Starvation Cap Reductn	15	659	98	1163	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.52	0.50	0.43	0.91	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Ann Arbor Station Traffic Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	302	525	69	159	435	16	85	260	297	0	0	0
Future Volume (vph)	302	525	69	159	435	16	85	260	297	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1			5.7	5.7			
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.98		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (prot)	1787	3508		1752	3523			1849	1568			
Flt Permitted	0.48	1.00		0.32	1.00			0.99	1.00			
Satd. Flow (perm)	895	3508		593	3523			1849	1568			
Peak-hour factor, PHF	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.92	0.92	0.92
Adj. Flow (vph)	339	590	78	171	468	17	101	310	354	0	0	0
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	339	662	0	171	484	0	0	411	354	0	0	0
Confl. Peds. (#/hr)							1		5			
Heavy Vehicles (%)	1%	1%	2%	3%	2%	0%	3%	1%	3%	2%	2%	2%
Turn Type	Perm	NA		pm+pt	NA		Split	NA	pt+ov			
Protected Phases		6		5	2		7	7	7 5			
Permitted Phases	6			2								
Actuated Green, G (s)	77.7	77.7		90.9	90.9			34.7	47.5			
Effective Green, g (s)	77.7	77.7		90.9	90.9			34.7	47.5			
Actuated g/C Ratio	0.54	0.54		0.63	0.63			0.24	0.33			
Clearance Time (s)	6.1	6.1		6.1	6.1			5.7				
Vehicle Extension (s)	5.0	5.0		3.0	5.0			5.0				
Lane Grp Cap (vph)	482	1892		431	2223			445	517			
v/s Ratio Prot		0.19		0.02	0.14			c0.22	c0.23			
v/s Ratio Perm	c0.38			0.23								
v/c Ratio	0.70	0.35		0.40	0.22			0.92	0.68			
Uniform Delay, d1	24.6	18.8		12.0	11.3			53.4	41.8			
Progression Factor	0.85	0.77		0.60	0.57			1.00	1.00			
Incremental Delay, d2	8.2	0.5		0.6	0.2			25.7	4.8			
Delay (s)	29.1	15.0		7.8	6.7			79.1	46.6			
Level of Service	C	B		A	A			E	D			
Approach Delay (s)		19.8			7.0			64.0			0.0	
Approach LOS		B			A			E			A	

Intersection Summary			
HCM 2000 Control Delay	30.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	894	12	593	73	20
v/c Ratio	0.31	0.15	0.19	0.53	0.08
Control Delay	4.3	85.2	5.4	76.7	18.3
Queue Delay	0.2	0.0	0.0	0.0	0.0
Total Delay	4.4	85.2	5.4	76.7	18.3
Queue Length 50th (ft)	161	11	151	67	0
Queue Length 95th (ft)	72	36	3	104	20
Internal Link Dist (ft)	296		2760	173	
Turn Bay Length (ft)		200		100	
Base Capacity (vph)	2852	157	3082	352	315
Starvation Cap Reductn	925	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.46	0.08	0.19	0.21	0.06

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	780	42	11	546	58	16
Future Volume (vph)	780	42	11	546	58	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		5.2	5.2	5.6	5.2
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3502		1770	3539	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3502		1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.80	0.80
Adj. Flow (vph)	848	46	12	593	72	20
RTOR Reduction (vph)	2	0	0	0	0	18
Lane Group Flow (vph)	892	0	12	593	73	2
Confl. Peds. (#/hr)		9	9			2
Turn Type	NA		Prot	NA	Prot	pt+ov
Protected Phases	2		1	6	3	1 8
Permitted Phases						
Actuated Green, G (s)	112.9		4.3	123.3	9.9	19.8
Effective Green, g (s)	112.9		4.3	123.3	9.9	14.2
Actuated g/C Ratio	0.78		0.03	0.86	0.07	0.10
Clearance Time (s)	6.1		5.2	5.2	5.6	
Vehicle Extension (s)	4.0		3.0	4.0	3.0	
Lane Grp Cap (vph)	2745		52	3030	121	156
v/s Ratio Prot	c0.25		0.01	c0.17	c0.04	0.00
v/s Ratio Perm						
v/c Ratio	0.33		0.23	0.20	0.60	0.01
Uniform Delay, d1	4.5		68.2	1.8	65.1	58.6
Progression Factor	0.82		1.24	2.59	1.00	1.00
Incremental Delay, d2	0.3		2.2	0.1	8.2	0.0
Delay (s)	4.0		87.0	4.8	73.4	58.6
Level of Service	A		F	A	E	E
Approach Delay (s)	4.0			6.4	70.2	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	228	614	571	323	181	46
v/c Ratio	0.38	0.24	0.26	0.25	0.61	0.11
Control Delay	11.9	5.8	14.9	0.9	63.6	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.9	5.8	14.9	0.9	63.6	9.4
Queue Length 50th (ft)	17	2	103	0	159	0
Queue Length 95th (ft)	141	238	248	18	169	16
Internal Link Dist (ft)		2760	1391		524	
Turn Bay Length (ft)	100			150	75	
Base Capacity (vph)	812	2549	2226	1343	398	533
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.24	0.26	0.24	0.45	0.09

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	217	583	525	297	127	32
Future Volume (vph)	217	583	525	297	127	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.6	5.6	5.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1769	3539	3539	1557	1770	1583
Flt Permitted	0.41	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	767	3539	3539	1557	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.92	0.92	0.70	0.70
Adj. Flow (vph)	228	614	571	323	181	46
RTOR Reduction (vph)	0	0	0	69	0	34
Lane Group Flow (vph)	228	614	571	254	181	12
Confl. Peds. (#/hr)	2			2	14	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	1	6	2	4	4	1 7
Permitted Phases	6			2		
Actuated Green, G (s)	102.1	102.1	88.9	113.1	24.2	37.4
Effective Green, g (s)	102.1	102.1	88.9	113.1	24.2	37.4
Actuated g/C Ratio	0.71	0.71	0.62	0.79	0.17	0.26
Clearance Time (s)	5.5	5.5	5.5	5.6	5.6	
Vehicle Extension (s)	4.0	4.5	4.5	6.0	6.0	
Lane Grp Cap (vph)	597	2509	2184	1222	297	411
v/s Ratio Prot	c0.02	0.17	0.16	0.03	c0.10	0.01
v/s Ratio Perm	c0.25			0.13		
v/c Ratio	0.38	0.24	0.26	0.21	0.61	0.03
Uniform Delay, d1	10.9	7.4	12.6	4.0	55.5	39.8
Progression Factor	0.83	0.63	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2	0.1	0.2	6.2	0.0
Delay (s)	9.6	4.9	12.7	4.2	61.7	39.8
Level of Service	A	A	B	A	E	D
Approach Delay (s)		6.1	9.6		57.3	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	211	765	768	330	465	526
v/c Ratio	0.70	0.46	0.65	0.51	0.54	0.85
Control Delay	40.5	18.5	29.8	11.7	28.6	32.5
Queue Delay	8.7	0.0	0.0	0.3	0.0	12.4
Total Delay	49.3	18.5	29.8	12.1	28.6	44.9
Queue Length 50th (ft)	76	164	207	44	126	252
Queue Length 95th (ft)	#117	186	246	100	194	422
Internal Link Dist (ft)		355	330		239	
Turn Bay Length (ft)	150			100	140	
Base Capacity (vph)	301	1646	1183	653	856	705
Starvation Cap Reductn	0	0	0	0	0	161
Spillback Cap Reductn	60	0	0	68	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.46	0.65	0.56	0.54	0.97

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	167	604	630	271	442	500
Future Volume (vph)	167	604	630	271	442	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.94	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1784	3505	3505	1492	3502	1553
Flt Permitted	0.24	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	446	3505	3505	1492	3502	1553
Peak-hour factor, PHF	0.79	0.79	0.82	0.82	0.95	0.95
Adj. Flow (vph)	211	765	768	330	465	526
RTOR Reduction (vph)	0	0	0	153	0	0
Lane Group Flow (vph)	211	765	768	177	465	526
Confl. Peds. (#/hr)	15			15	150	
Heavy Vehicles (%)	1%	3%	3%	2%	0%	4%
Turn Type	pm+pt	NA	NA	Perm	Prot	Prot
Protected Phases	1	6	2		3	8
Permitted Phases	6			2		
Actuated Green, G (s)	41.1	41.1	29.2	29.2	22.0	37.0
Effective Green, g (s)	41.1	41.1	29.2	29.2	22.0	37.0
Actuated g/C Ratio	0.46	0.46	0.32	0.32	0.24	0.41
Clearance Time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Lane Grp Cap (vph)	295	1600	1137	484	856	638
v/s Ratio Prot	c0.05	0.22	0.22		0.13	c0.34
v/s Ratio Perm	c0.28			0.12		
v/c Ratio	0.72	0.48	0.68	0.36	0.54	0.82
Uniform Delay, d1	28.5	17.0	26.3	23.3	29.6	23.6
Progression Factor	1.00	1.00	1.00	1.00	0.84	0.79
Incremental Delay, d2	13.8	1.0	3.2	2.1	2.3	8.1
Delay (s)	42.3	18.0	29.5	25.4	27.2	26.7
Level of Service	D	B	C	C	C	C
Approach Delay (s)		23.3	28.3		26.9	
Approach LOS		C	C		C	

Intersection Summary			
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	33	86	236	166	537	78	761
v/c Ratio	0.08	0.19	0.72	0.34	0.48	0.19	0.36
Control Delay	22.2	15.9	41.6	5.5	9.4	4.5	4.2
Queue Delay	0.0	0.0	0.0	0.0	1.0	0.0	0.1
Total Delay	22.2	15.9	41.6	5.5	10.4	4.5	4.3
Queue Length 50th (ft)	14	23	123	0	52	8	41
Queue Length 95th (ft)	27	42	171	38	410	15	47
Internal Link Dist (ft)		284			239		250
Turn Bay Length (ft)			85			100	
Base Capacity (vph)	633	647	491	657	1121	411	2120
Starvation Cap Reductn	0	0	0	0	331	0	450
Spillback Cap Reductn	0	2	0	16	181	0	244
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.13	0.48	0.26	0.68	0.19	0.46

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	42	26	208	0	146	0	463	21	73	708	0
Future Volume (vph)	26	42	26	208	0	146	0	463	21	73	708	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Lane Util. Factor	1.00	1.00		1.00		1.00		1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.97		1.00		0.89		0.99		1.00	1.00	
Flpb, ped/bikes	0.90	1.00		0.95		1.00		1.00		0.95	1.00	
Frt	1.00	0.94		1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1630	1615		1714		1429		1852		1656	3505	
Flt Permitted	0.95	1.00		0.70		1.00		1.00		0.39	1.00	
Satd. Flow (perm)	1630	1615		1265		1429		1852		676	3505	
Peak-hour factor, PHF	0.79	0.79	0.79	0.88	0.88	0.88	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	33	53	33	236	0	166	0	514	23	78	761	0
RTOR Reduction (vph)	0	24	0	0	0	123	0	1	0	0	0	0
Lane Group Flow (vph)	33	62	0	236	0	43	0	536	0	78	761	0
Confl. Peds. (#/hr)	42		41	41		42			56	56		
Heavy Vehicles (%)	0%	13%	0%	0%	0%	0%	0%	0%	32%	4%	3%	0%
Turn Type	Perm	NA		D.Pm		Perm		NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4			4		4				2		
Actuated Green, G (s)	23.4	23.4		23.4		23.4		54.5		54.5	54.5	
Effective Green, g (s)	23.4	23.4		23.4		23.4		54.5		54.5	54.5	
Actuated g/C Ratio	0.26	0.26		0.26		0.26		0.61		0.61	0.61	
Clearance Time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Vehicle Extension (s)	4.0	4.0		4.0		4.0		4.0		4.0	4.0	
Lane Grp Cap (vph)	423	419		328		371		1121		409	2122	
v/s Ratio Prot		0.04						c0.29			0.22	
v/s Ratio Perm	0.02			c0.19		0.03				0.12		
v/c Ratio	0.08	0.15		0.72		0.12		0.48		0.19	0.36	
Uniform Delay, d1	25.2	25.6		30.3		25.4		9.9		7.9	8.9	
Progression Factor	1.00	1.00		1.00		1.00		0.70		0.34	0.37	
Incremental Delay, d2	0.1	0.2		7.9		0.2		1.2		0.9	0.4	
Delay (s)	25.3	25.8		38.2		25.6		8.1		3.6	3.7	
Level of Service	C	C		D		C		A		A	A	
Approach Delay (s)		25.7			33.0			8.1			3.7	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.1
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	110	78	82	174	139	38	608	784
v/c Ratio	0.35	0.20	0.27	0.59	0.56	0.17	0.74	0.51
Control Delay	36.3	2.3	34.8	43.2	43.6	10.6	21.3	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0
Total Delay	36.3	2.3	34.8	43.2	43.6	10.6	23.8	10.6
Queue Length 50th (ft)	56	0	41	96	76	12	303	133
Queue Length 95th (ft)	92	0	82	167	141	m13	134	71
Internal Link Dist (ft)				296			250	793
Turn Bay Length (ft)		25				100		
Base Capacity (vph)	312	388	303	295	248	227	825	1538
Starvation Cap Reductn	0	0	0	0	0	0	118	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.20	0.27	0.59	0.56	0.17	0.86	0.51

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	0	62	78	151	146	36	578	0	0	635	94
Future Volume (vph)	88	0	62	78	151	146	36	578	0	0	635	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Lane Util. Factor	1.00		1.00	1.00	0.95	0.95	1.00	1.00			0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.97	1.00	1.00	1.00			0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	0.97	1.00			1.00	
Frt	1.00		0.85	1.00	0.99	0.85	1.00	1.00			0.98	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1770		1568	1719	1675	1408	1759	1863			3443	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.28	1.00			1.00	
Satd. Flow (perm)	1770		1568	1719	1675	1408	512	1863			3443	
Peak-hour factor, PHF	0.80	0.80	0.80	0.95	0.95	0.95	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	110	0	78	82	159	154	38	608	0	0	683	101
RTOR Reduction (vph)	0	0	64	0	0	0	0	0	0	0	12	0
Lane Group Flow (vph)	110	0	14	82	174	139	38	608	0	0	772	0
Confl. Peds. (#/hr)	196		28	28		196	34					34
Heavy Vehicles (%)	2%	0%	3%	5%	3%	9%	0%	2%	0%	0%	1%	2%
Turn Type	Prot		Prot	Split	NA	Prot	Perm	NA			NA	
Protected Phases	8		8	4	4	4		2			2	
Permitted Phases							2					
Actuated Green, G (s)	15.9		15.9	15.9	15.9	15.9	39.9	39.9			39.9	
Effective Green, g (s)	15.9		15.9	15.9	15.9	15.9	39.9	39.9			39.9	
Actuated g/C Ratio	0.18		0.18	0.18	0.18	0.18	0.44	0.44			0.44	
Clearance Time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	4.0	4.0	4.0			4.0	
Lane Grp Cap (vph)	312		277	303	295	248	226	825			1526	
v/s Ratio Prot	c0.06		0.01	0.05	c0.10	0.10		c0.33			0.22	
v/s Ratio Perm							0.07					
v/c Ratio	0.35		0.05	0.27	0.59	0.56	0.17	0.74			0.51	
Uniform Delay, d1	32.5		30.8	32.0	34.1	33.9	15.1	20.7			18.0	
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.57	0.74			0.55	
Incremental Delay, d2	3.1		0.3	2.2	8.4	8.9	1.5	5.4			0.9	
Delay (s)	35.6		31.1	34.2	42.4	42.7	10.1	20.7			10.8	
Level of Service	D		C	C	D	D	B	C			B	
Approach Delay (s)		33.8			40.8			20.1			10.8	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.3
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	486	254	673	1156
v/c Ratio	0.67	0.77	0.29	0.67
Control Delay	36.2	32.2	8.4	16.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	36.2	32.2	8.4	16.4
Queue Length 50th (ft)	118	52	65	204
Queue Length 95th (ft)	156	#115	97	317
Internal Link Dist (ft)	1498		793	705
Turn Bay Length (ft)	200	125		
Base Capacity (vph)	1171	329	2287	1731
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.42	0.77	0.29	0.67

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	328	99	208	552	687	411
Future Volume (vph)	328	99	208	552	687	411
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7		6.1	6.1	6.1	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.96	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.97		1.00	1.00	0.94	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	3385		1802	3438	3175	
Flt Permitted	0.96		0.17	1.00	1.00	
Satd. Flow (perm)	3385		326	3438	3175	
Peak-hour factor, PHF	0.88	0.88	0.82	0.82	0.95	0.95
Adj. Flow (vph)	373	112	254	673	723	433
RTOR Reduction (vph)	39	0	0	0	78	0
Lane Group Flow (vph)	447	0	254	673	1078	0
Confl. Peds. (#/hr)		14	46			46
Heavy Vehicles (%)	0%	0%	0%	5%	4%	1%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	2		1	4	3	
Permitted Phases			4			
Actuated Green, G (s)	18.3		59.9	59.9	46.9	
Effective Green, g (s)	18.3		59.9	59.9	46.9	
Actuated g/C Ratio	0.20		0.67	0.67	0.52	
Clearance Time (s)	5.7		6.1	6.1	6.1	
Vehicle Extension (s)	4.0		2.0	0.2	2.0	
Lane Grp Cap (vph)	688		330	2288	1654	
v/s Ratio Prot	c0.13		c0.06	0.20	0.34	
v/s Ratio Perm			c0.45			
v/c Ratio	0.65		0.77	0.29	0.65	
Uniform Delay, d1	32.9		21.7	6.3	15.6	
Progression Factor	1.08		0.86	1.20	1.00	
Incremental Delay, d2	2.3		7.5	0.3	2.0	
Delay (s)	38.0		26.1	7.8	17.6	
Level of Service	D		C	A	B	
Approach Delay (s)	38.0			12.8	17.6	
Approach LOS	D			B	B	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	5	904	969	23	7	6
v/c Ratio	0.05	0.31	0.34	0.14	0.01	0.01
Control Delay	45.0	3.2	8.4	40.2	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	3.2	8.4	40.2	0.0	0.0
Queue Length 50th (ft)	3	68	66	14	0	0
Queue Length 95th (ft)	15	134	320	26	0	0
Internal Link Dist (ft)		293	1215		158	248
Turn Bay Length (ft)	180			50		
Base Capacity (vph)	438	2941	2859	490	904	914
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.31	0.34	0.05	0.01	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	827	5	0	921	0	16	0	5	0	0	5
Future Volume (vph)	5	827	5	0	921	0	16	0	5	0	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7			5.7		5.6	5.6			5.6	
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98			0.98	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			1.00		1.00	0.85			0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	3434			3438		1796	1585			1616	
Flt Permitted	0.95	1.00			1.00		0.75	1.00			1.00	
Satd. Flow (perm)	1805	3434			3438		1425	1585			1616	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.69	0.69	0.69	0.78	0.78	0.78
Adj. Flow (vph)	5	899	5	0	969	0	23	0	7	0	0	6
RTOR Reduction (vph)	0	0	0	0	0	0	0	6	0	0	6	0
Lane Group Flow (vph)	5	904	0	0	969	0	23	1	0	0	0	0
Confl. Peds. (#/hr)	51		29	29		51	3		4	4		3
Heavy Vehicles (%)	0%	5%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA			NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	1.3	81.1			74.1		7.6	7.6			7.6	
Effective Green, g (s)	1.3	81.1			74.1		7.6	7.6			7.6	
Actuated g/C Ratio	0.01	0.81			0.74		0.08	0.08			0.08	
Clearance Time (s)	5.7	5.7			5.7		5.6	5.6			5.6	
Vehicle Extension (s)	3.0	3.0			4.5		1.0	1.0			1.0	
Lane Grp Cap (vph)	23	2784			2547		108	120			122	
v/s Ratio Prot	0.00	c0.26			c0.28			0.00			0.00	
v/s Ratio Perm							c0.02					
v/c Ratio	0.22	0.32			0.38		0.21	0.00			0.00	
Uniform Delay, d1	48.8	2.4			4.7		43.4	42.7			42.7	
Progression Factor	1.00	1.00			1.75		1.00	1.00			1.00	
Incremental Delay, d2	4.7	0.3			0.4		0.4	0.0			0.0	
Delay (s)	53.6	2.7			8.6		43.8	42.7			42.7	
Level of Service	D	A			A		D	D			D	
Approach Delay (s)		3.0			8.6			43.5			42.7	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	249	1028	11	707	96	95	39	33	293
v/c Ratio	0.86	0.49	0.10	0.52	0.74	0.33	0.32	0.15	0.68
Control Delay	68.1	11.9	44.7	25.3	77.8	33.0	51.5	39.0	13.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.1	11.9	44.7	25.3	77.8	33.0	51.5	39.0	13.1
Queue Length 50th (ft)	133	104	7	170	61	45	24	20	0
Queue Length 95th (ft)	#268	338	24	258	#145	87	51	39	42
Internal Link Dist (ft)		1215		729		257		381	
Turn Bay Length (ft)	225		150		100		180		
Base Capacity (vph)	291	2082	269	1364	130	456	124	445	569
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.49	0.04	0.52	0.74	0.21	0.31	0.07	0.51

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	219	765	140	10	598	52	88	62	26	31	26	234
Future Volume (vph)	219	765	140	10	598	52	88	62	26	31	26	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1626	3457		1504	3480		1770	1806		1687	1827	1428
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1626	3457		1504	3480		1770	1806		1687	1827	1428
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.80	0.80	0.80
Adj. Flow (vph)	249	869	159	11	650	57	96	67	28	39	32	292
RTOR Reduction (vph)	0	9	0	0	5	0	0	17	0	0	0	257
Lane Group Flow (vph)	249	1019	0	11	702	0	96	78	0	39	33	36
Confl. Peds. (#/hr)	22					22	4		4	4		4
Heavy Vehicles (%)	11%	2%	2%	20%	2%	4%	2%	0%	0%	7%	4%	11%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												8
Actuated Green, G (s)	17.8	55.1		1.8	39.1		7.4	15.3		4.4	12.3	12.3
Effective Green, g (s)	17.8	55.1		1.8	39.1		7.4	15.3		4.4	12.3	12.3
Actuated g/C Ratio	0.18	0.55		0.02	0.39		0.07	0.15		0.04	0.12	0.12
Clearance Time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Vehicle Extension (s)	6.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	289	1904		27	1360		130	276		74	224	175
v/s Ratio Prot	c0.15	c0.29		0.01	0.20		c0.05	c0.04		0.02	0.02	
v/s Ratio Perm												0.03
v/c Ratio	0.86	0.54		0.41	0.52		0.74	0.28		0.53	0.15	0.21
Uniform Delay, d1	39.9	14.3		48.6	23.2		45.4	37.5		46.8	39.2	39.5
Progression Factor	1.01	0.85		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	24.5	1.1		13.1	1.4		20.7	0.8		8.5	0.4	0.8
Delay (s)	65.0	13.2		61.7	24.6		66.0	38.3		55.3	39.6	40.3
Level of Service	E	B		E	C		E	D		E	D	D
Approach Delay (s)		23.3			25.2			52.2			41.8	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	28.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.4
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	200	62	607	274	475	54	244
v/c Ratio	0.43	0.37	0.79	0.68	0.68	0.26	0.37
Control Delay	18.8	6.1	26.6	27.8	23.0	19.2	15.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	6.1	26.6	27.8	23.0	19.2	15.0
Queue Length 50th (ft)	52	0	185	90	155	15	59
Queue Length 95th (ft)	126	0	#391	#202	294	46	128
Internal Link Dist (ft)	628		690		412		625
Turn Bay Length (ft)		250		80		150	
Base Capacity (vph)	557	168	922	546	948	281	880
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.37	0.66	0.50	0.50	0.19	0.28

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	101	53	11	366	127	260	440	11	48	148	69
Future Volume (vph)	69	101	53	11	366	127	260	440	11	48	148	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	4.0		5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	1.00		0.99		1.00	1.00		1.00	0.98	
Flpb, ped/bikes		1.00	1.00		1.00		0.98	1.00		1.00	1.00	
Frt		1.00	0.85		0.97		1.00	1.00		1.00	0.95	
Flt Protected		0.98	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1819	1553		1809		1769	1873		1799	1711	
Flt Permitted		0.59	1.00		0.99		0.58	1.00		0.29	1.00	
Satd. Flow (perm)		1102	1553		1798		1083	1873		553	1711	
Peak-hour factor, PHF	0.85	0.85	0.85	0.83	0.83	0.83	0.95	0.95	0.95	0.89	0.89	0.89
Adj. Flow (vph)	81	119	62	13	441	153	274	463	12	54	166	78
RTOR Reduction (vph)	0	0	62	0	15	0	0	1	0	0	22	0
Lane Group Flow (vph)	0	200	0	0	592	0	274	474	0	54	222	0
Confl. Peds. (#/hr)	1		3	3		1	9		4	4		9
Heavy Vehicles (%)	3%	2%	4%	0%	1%	0%	0%	1%	0%	0%	6%	0%
Turn Type	Perm	NA	NA	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		26.2	0.0		26.2		23.3	23.3		23.3	23.3	
Effective Green, g (s)		26.2	0.0		26.2		23.3	23.3		23.3	23.3	
Actuated g/C Ratio		0.40	0.00		0.40		0.36	0.36		0.36	0.36	
Clearance Time (s)		5.6			5.6		5.6	5.6		5.6	5.6	
Vehicle Extension (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		442	0		721		386	668		197	610	
v/s Ratio Prot								0.25			0.13	
v/s Ratio Perm		0.18			c0.33		c0.25			0.10		
v/c Ratio		0.45	0.00		0.82		0.71	0.71		0.27	0.36	
Uniform Delay, d1		14.3	32.6		17.5		18.1	18.1		15.0	15.5	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0	0.0		7.8		6.3	3.7		1.0	0.5	
Delay (s)		15.3	32.6		25.3		24.4	21.8		16.0	16.0	
Level of Service		B	C		C		C	C		B	B	
Approach Delay (s)		19.4			25.3			22.7			16.0	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	65.3	Sum of lost time (s)	15.2
Intersection Capacity Utilization	87.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	911	5	0	0	0	0	0	36	36	10	0
Future Volume (Veh/h)	0	911	5	0	0	0	0	0	36	36	10	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	990	5	0	0	0	0	0	39	39	11	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		817										
pX, platoon unblocked				0.89			0.89	0.89	0.89	0.89	0.89	
vC, conflicting volume	0			995			998	992	498	534	995	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			739			743	736	178	219	739	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	95	94	96	100
cM capacity (veh/h)	1622			765			262	306	740	603	305	1084

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	660	335	39	50
Volume Left	0	0	0	39
Volume Right	0	5	39	0
cSH	1700	1700	740	496
Volume to Capacity	0.39	0.20	0.05	0.10
Queue Length 95th (ft)	0	0	4	8
Control Delay (s)	0.0	0.0	10.1	13.1
Lane LOS			B	B
Approach Delay (s)	0.0		10.1	13.1
Approach LOS			B	B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	817	5	36	5	0	0	0	42
Future Volume (Veh/h)	0	0	0	0	817	5	36	5	0	0	0	42
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	888	5	39	5	0	0	0	46
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1301							
pX, platoon unblocked	0.99						0.99	0.99		0.99	0.99	0.99
vC, conflicting volume	893			0			490	893	0	893	890	446
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	862			0			453	862	0	862	859	409
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			91	98	100	100	100	92
cM capacity (veh/h)	765			1622			445	287	1084	242	288	583

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	592	301	44	46
Volume Left	0	0	39	0
Volume Right	0	5	0	46
cSH	1700	1700	419	583
Volume to Capacity	0.35	0.18	0.11	0.08
Queue Length 95th (ft)	0	0	9	6
Control Delay (s)	0.0	0.0	14.6	11.7
Lane LOS			B	B
Approach Delay (s)	0.0		14.6	11.7
Approach LOS			B	B

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	39.4%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX E

FUTURE YEAR (2035) AMTRAK INTERCITY AND COMMUTER RAIL RIDERSHIP PROJECTIONS

URS

Project Memorandum

To:	**Eli Cooper, David Dykman** (City of Ann Arobr)	Client:	City of Ann Arbor
		Project Name:	Ann Arbor Station EA
		Location:	Ann Arbor, MI
From:	**Robert Gorski, Luke Liu** (URS)	URS Project No.:	12944234
		Issue Date:	September 8, 2014

Subject: **Ann Arbor Station Environmental Assessment – Segment 4 – Transportation Draft**

As part of the Ann Arbor Station Environmental Assessment, URS is submitting draft analysis result for the transportation portion of Segment 4, existing train station site. Trip generation assumptions and initial traffic analysis results are included in this memo. Traffic models for Segment 4 were prepared based on traffic volume data collected during recent transportation studies at locations near the Segment 4 project area.

Trip Generation

Trip generation for Ann Arbor Station Segment 4 is shown in Table 1, as follows.

Table 1. Ann Arbor Station Trip Generation for Segment 4 - 2035

	Amtrak	**Commuter Rail**
Train Daily Round Trips (DRT)	10	15
Yearly Ridership	~~974,000~~ 969,000	395,000
Daily Ridership	2,668	1,514
AM Peak Period (7A-9A) Boardings	267	242
AM Peak Period (7A-9A) Alightings	267	363
AM Peak Hour Boardings	133	121
AM Peak Hour Alightings	133	182
PM Peak Period (4P-6P) Boardings	267	363
PM Peak Period (4P-6P) Alightings	267	242
PM Peak Hour Boardings	133	182
PM Peak Hour Alightings	133	121

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The following items were assumed for trip generation related to Amtrak service.

- Even distribution of passengers across Daily Round Trips (DRT)
- One DRT service during each peak hour
- 50% boarding & 50% alighting of trips at Ann Arbor Station

The following items were assumed for trip generation related to Commuter Rail service.

- 40% of daily trips during each peak period
- 20% of daily trips during each peak hour
- AM Peak, 40% boarding and 60% alighting at Ann Arbor Station
- PM Peak, 60% boarding and 40% alighting at Ann Arbor Station

The analysis further assumed the following trip reduction factors due to vehicle sharing and transit service.

- 10% multimodal reduction
- 5% pedestrian reduction
- 10% vehicle occupancy reduction

The final vehicle trips generated for Ann Arbor Station Segment 4 include:

- 195 vehicles per hour ingress and 102 vehicles per hour egress during the AM peak hour
- 102 vehicles per hour ingress and 195 vehicles per hour egress during the PM peak hour

<u>Traffic Operations at Site Access</u>

Existing and future year expected traffic volumes at Segment 4 driveway are summarized in Table 2.

Table 2. Traffic Volumes at Segment 4 Drive
(vehicles per hour, AM Peak Hour/PM Peak Hour)

Intersection	**Movement**	**Existing** (2014)	**Horizon Year No Build** (2040)	**Horizon Year with Site Traffic**
Broadway at Segment 4 Drive	EB Broadway Left	35/35	35/35	124/64
	EB Broadway Thru	715/930	785/1020	785/1020
	WB Broadway Thru	415/545	450/595	450/595
	WB Broadway Right	20/20	20/20	71/38
	AAS Drive Left	35/35	35/35	65/123
	AAS Drive Right	20/20	20/20	37/72

Operational analysis results, as shown in Table 3, indicate that signalized traffic control is likely needed at the station driveway to mitigate potential excessive control delay if the driveway is kept stop controlled. Complete signal warrant analysis was not conducted as 24-hour machine counts were not available.

Table 3. Traffic Operational Conditions at Segment 4 Drive (seconds, AM Peak Hour/PM Peak Hour)					
Intersection	**Movement**	**Existing** (2014)	**Horizon Year No Build** (2040)	**Horizon Year Build** (w/o mitigation)	**Horizon Year Build** (with mitigation)
Broadway at Segment 4 Drive	EB Broadway	1.4(A) / 1.3(A)	1.3(A) / 1.3(A)	3.9(A) / 2.2(A)	2.4(A) / 2.1(A)
	WB Broadway	-- / --	-- / --	-- / --	1.6(A) / 3.5(A)
	AAS Drive	17.8(C) / 24.4(C)	19.5(C) / 28.1(D)	39.9(E) / 151.9(F)	38.4(D) / 41.4(D)

Should you have questions regarding this memo, please feel free to contact me at (313) 961-3418.

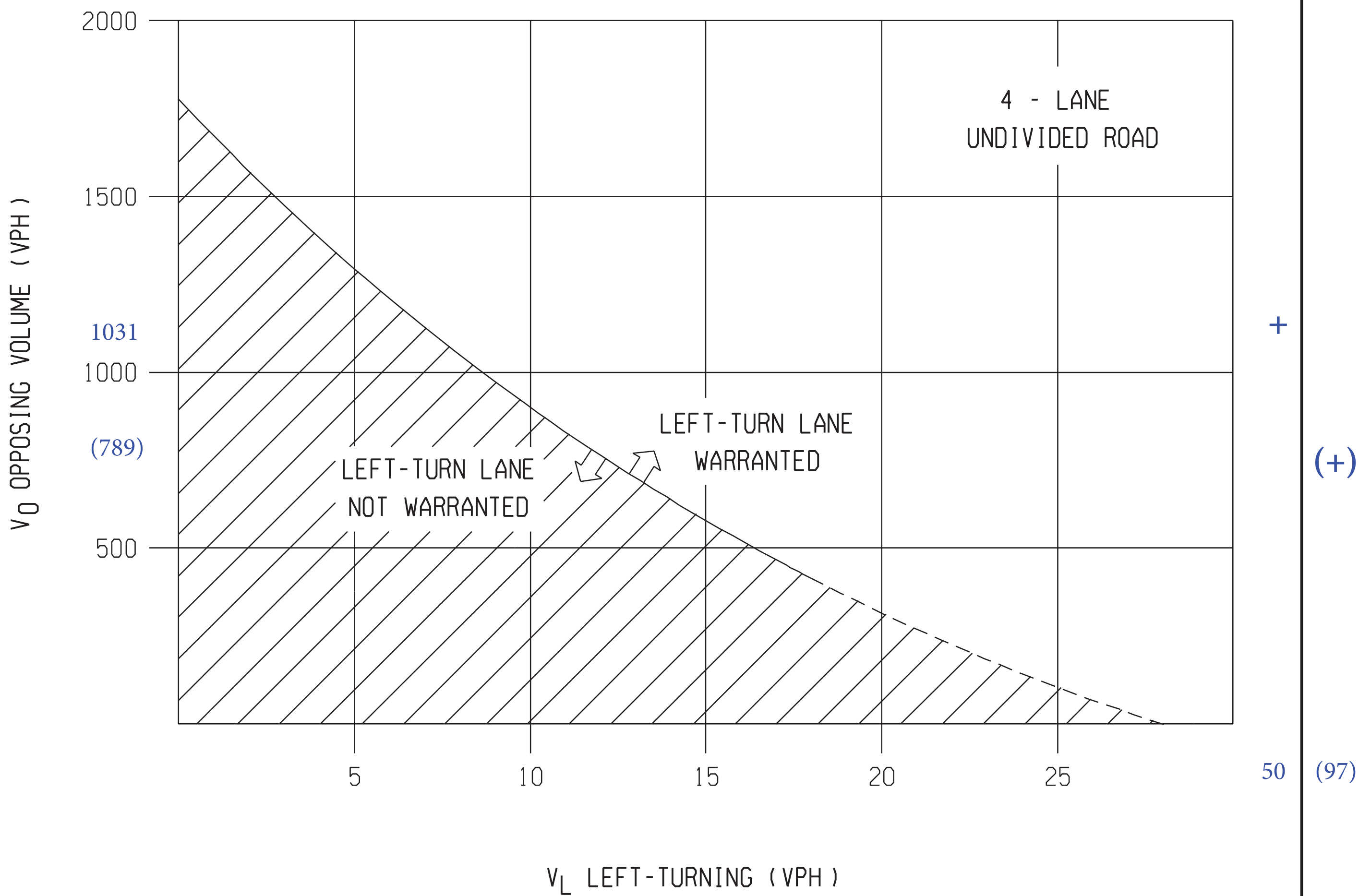
Sincerely,

Signed: Robert Gorski, PE
URS Corporation Great Lakes

APPENDIX F

FUTURE YEAR (2035) LEFT-TURN LANE AND RIGHT-TURN LANE ANALYSES – DEPOT STREET SITE

FOUR-LANE HIGHWAYS



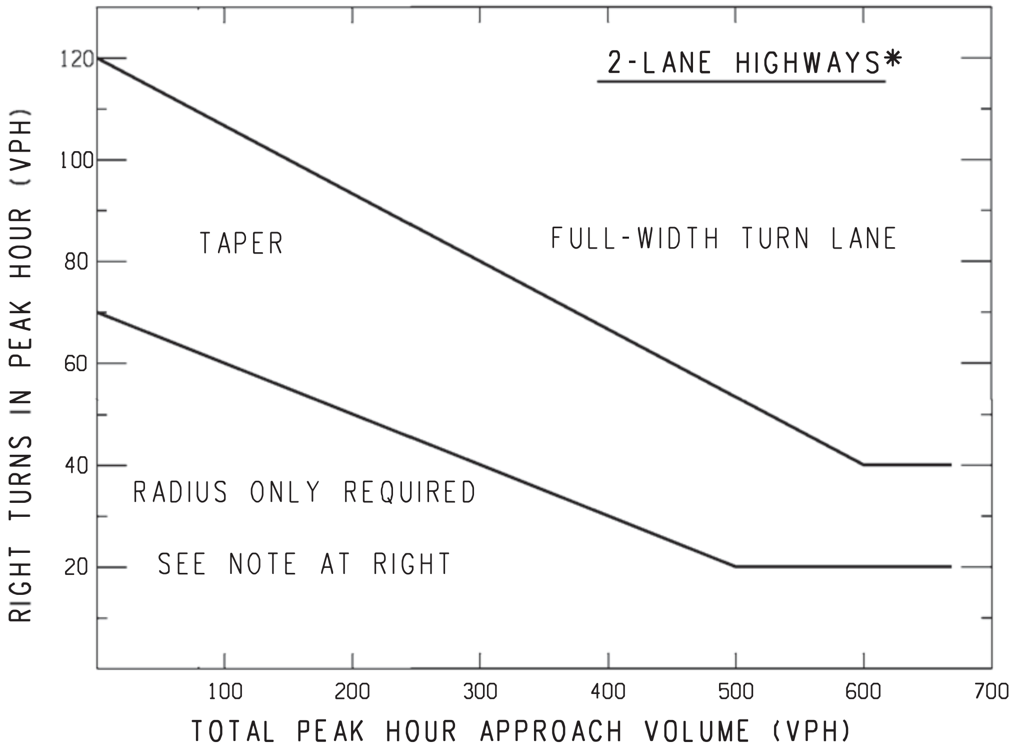
EXISTING SITE DRIVEWAY
FUTURE YEAR (2035)

NOTE: When V_O < 400 vph (dashed line), a Left-Turn Lane is Not Normally Warranted Unless The Advancing Volume (V_A) in The Same Direction as the Left-Turning Traffic Exceeds 400 vph (V_A > 400 vph).

+ AM Peak-hour

(+) PM Peak-hour

MDOT Michigan Department of Transportation TRAFFIC AND SAFETY NOTE	TRAFFIC VOLUME GUIDELINES FOR LEFT-TURN LANES AT UNSIGNALIZED INTERSECTIONS		
DRAWN BY: MTS CHECKED BY: JAT	08/05/2004 PLAN DATE:	605A	SHEET 6 OF 6
FILE: K:/DGN/ts notes/Note605A tsn.dgn		REV. 08/05/2004	

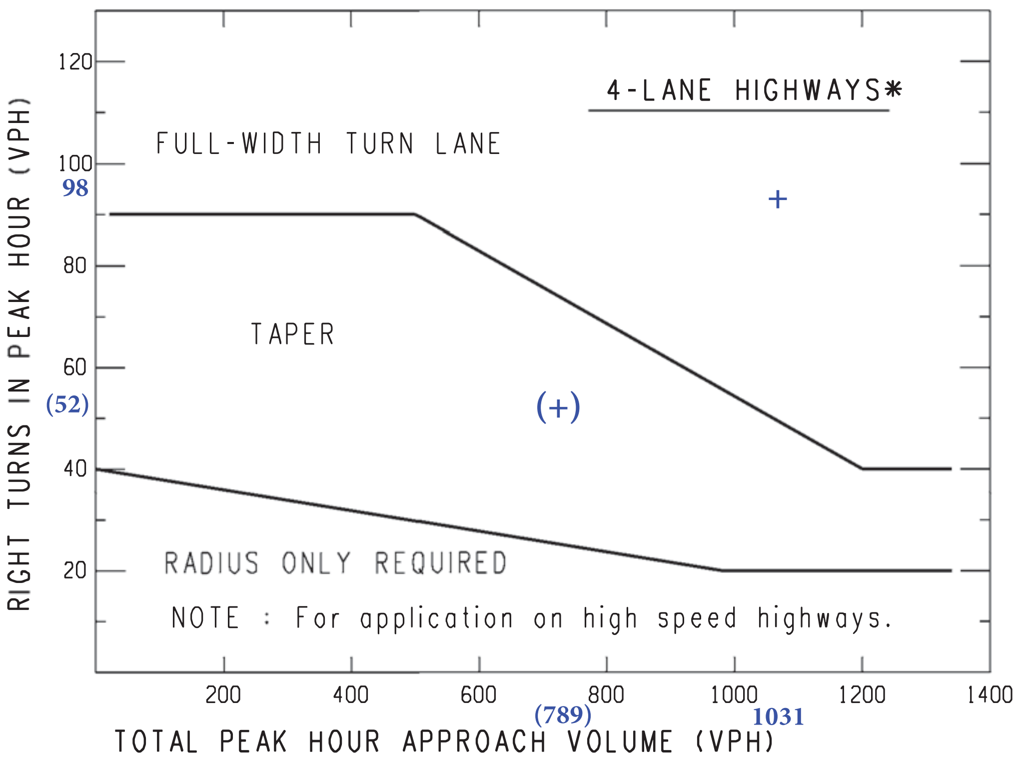


NOTE:
For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

Adjust peak hour right turns = Peak hour right turns - 20

Broadway Street @ Existing Site Driveway

Future Year (2035)



*If a center left-turn lane exists(i.e. 3 or 5 lane highway), subtract the number of left turns in approach volume from the total approach volume to get an adjusted total approach volume.

+ AM Peak-hour
(+) PM Peak-hour

Sample Problem:
The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hour is 100 vph. Determine if a right turn lane is recommended.

Solution:
Figure indicates that the intersection of 300 vph and 100 vph is located above the upper trend line; thus, a right-turn lane may be recommended.

MDOT Michigan Department of Transportation TRAFFIC AND SAFETY NOTE	TRAFFIC VOLUME GUIDELINES FOR RIGHT-TURN LANES AND TAPERS		
DRAWN BY: MTS CHECKED BY: JAT	08/05/2004 PLAN DATE:	604A	SHEET 2 OF 2
FILE: K:/DGN/ts notes/Note604A tsn.dgn		REV. 08/05/2004	

APPENDIX G

FUTURE YEAR (2035) DEPOT STREET SITE DEVELOPMENT CAPACITY ANALYSIS REPORTS

Lane Group	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	321	617	30	956	91	1411
v/c Ratio	0.62	1.03	0.26	0.92	1.20	0.74
Control Delay	34.8	79.7	18.4	34.3	167.6	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	79.7	18.4	34.3	167.6	6.2
Queue Length 50th (ft)	172	~423	9	506	~48	186
Queue Length 95th (ft)	242	#569	32	#814	m#77	144
Internal Link Dist (ft)		1428		423		156
Turn Bay Length (ft)			150		90	
Base Capacity (vph)	520	598	114	1041	76	1916
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.62	1.03	0.26	0.92	1.20	0.74

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	WBL	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	270	486	32	27	811	59	86	1000	340
Future Volume (vph)	270	486	32	27	811	59	86	1000	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1612	1846		1798	1811		1770	3323	
Flt Permitted	0.95	1.00		0.11	1.00		0.07	1.00	
Satd. Flow (perm)	1612	1846		200	1811		135	3323	
Peak-hour factor, PHF	0.84	0.84	0.84	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	321	579	38	30	891	65	91	1053	358
RTOR Reduction (vph)	0	2	0	0	13	0	0	29	0
Lane Group Flow (vph)	321	615	0	30	943	0	91	1382	0
Confl. Peds. (#/hr)	33		48	27			52		27
Heavy Vehicles (%)	6%	1%	2%	0%	4%	2%	2%	3%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			1			1	
Permitted Phases	2	2		1			1		
Actuated Green, G (s)	32.3	32.3		56.8	56.8		56.8	56.8	
Effective Green, g (s)	32.3	32.3		56.8	56.8		56.8	56.8	
Actuated g/C Ratio	0.32	0.32		0.57	0.57		0.57	0.57	
Clearance Time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Grp Cap (vph)	520	596		113	1028		76	1887	
v/s Ratio Prot		c0.33			0.52			0.42	
v/s Ratio Perm	0.20			0.15			c0.68		
v/c Ratio	0.62	1.03		0.27	0.92		1.20	0.73	
Uniform Delay, d1	28.6	33.9		11.0	19.5		21.6	16.0	
Progression Factor	1.00	1.00		1.00	1.00		0.45	0.29	
Incremental Delay, d2	5.4	45.3		5.7	14.1		146.3	1.7	
Delay (s)	34.0	79.1		16.6	33.6		156.0	6.3	
Level of Service	C	E		B	C		F	A	
Approach Delay (s)		63.7			33.1			15.4	
Approach LOS		E			C			B	

Intersection Summary			
HCM 2000 Control Delay	33.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	159	159	918	1586
v/c Ratio	0.38	0.38	0.44	0.75
Control Delay	34.1	34.1	17.2	11.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	34.1	34.1	17.2	11.4
Queue Length 50th (ft)	81	81	292	341
Queue Length 95th (ft)	142	142	m303	429
Internal Link Dist (ft)	303	327	1027	111
Turn Bay Length (ft)				
Base Capacity (vph)	414	414	2105	2124
Starvation Cap Reductn	0	0	0	1
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.38	0.38	0.44	0.75

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

Ann Arbor Station Traffic Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	113	22	11	113	22	11	811	22	22	1394	43
Future Volume (vph)	11	113	22	11	113	22	11	811	22	22	1394	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.2			6.2	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.98			0.98			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1818			1818			3523			3521	
Flt Permitted		0.97			0.97			0.92			0.93	
Satd. Flow (perm)		1774			1774			3246			3272	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	123	24	12	123	24	12	882	24	24	1515	47
RTOR Reduction (vph)	0	6	0	0	6	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	153	0	0	153	0	0	916	0	0	1584	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		23.0			23.0			64.8			64.8	
Effective Green, g (s)		23.0			23.0			64.8			64.8	
Actuated g/C Ratio		0.23			0.23			0.65			0.65	
Clearance Time (s)		6.0			6.0			6.2			6.2	
Lane Grp Cap (vph)		408			408			2103			2120	
v/s Ratio Prot												
v/s Ratio Perm		c0.09			0.09			0.28			c0.48	
v/c Ratio		0.37			0.37			0.44			0.75	
Uniform Delay, d1		32.4			32.4			8.6			12.0	
Progression Factor		1.00			1.00			1.95			0.76	
Incremental Delay, d2		2.6			2.6			0.2			2.1	
Delay (s)		35.1			35.1			17.1			11.2	
Level of Service		D			D			B			B	
Approach Delay (s)		35.1			35.1			17.1			11.2	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	51	327	897	826	1579
v/c Ratio	0.36	0.39	0.59	1.15	0.55
Control Delay	51.3	5.2	2.3	109.4	4.4
Queue Delay	9.6	0.0	0.5	0.0	0.1
Total Delay	60.9	5.2	2.8	109.4	4.5
Queue Length 50th (ft)	31	20	2	~502	145
Queue Length 95th (ft)	65	58	6	#738	180
Internal Link Dist (ft)			111		640
Turn Bay Length (ft)	300			240	
Base Capacity (vph)	144	849	1524	717	2864
Starvation Cap Reductn	0	0	246	0	0
Spillback Cap Reductn	65	0	0	0	216
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.65	0.39	0.70	1.15	0.60

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	43	0	275	0	557	286	785	1416	5
Future Volume (vph)	0	0	0	43	0	275	0	557	286	785	1416	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0		6.0		6.0		6.0	6.0	
Lane Util. Factor				1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes				1.00		1.00		0.99		1.00	1.00	
Flpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Frt				1.00		0.85		0.95		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				1805		1583		3332		1786	3572	
Flt Permitted				0.95		1.00		1.00		0.22	1.00	
Satd. Flow (perm)				1805		1583		3332		410	3572	
Peak-hour factor, PHF	0.92	0.92	0.92	0.84	0.84	0.84	0.94	0.94	0.94	0.95	0.90	0.90
Adj. Flow (vph)	0	0	0	51	0	327	0	593	304	826	1573	6
RTOR Reduction (vph)	0	0	0	0	0	153	0	52	0	0	0	0
Lane Group Flow (vph)	0	0	0	51	0	174	0	845	0	826	1579	0
Confl. Peds. (#/hr)	1		5	1		1			7	7		
Heavy Vehicles (%)	2%	2%	2%	0%	0%	2%	0%	2%	1%	1%	1%	0%
Turn Type				Prot		pt+ov		NA		D.P+P	NA	
Protected Phases		8		4		4 5		6		5	2	
Permitted Phases	8									6		
Actuated Green, G (s)				7.8		43.8		44.2		74.2	80.2	
Effective Green, g (s)				7.8		43.8		44.2		74.2	80.2	
Actuated g/C Ratio				0.08		0.44		0.44		0.74	0.80	
Clearance Time (s)				6.0				6.0		6.0	6.0	
Vehicle Extension (s)				4.0				5.0		2.0	5.0	
Lane Grp Cap (vph)				140		693		1472		717	2864	
v/s Ratio Prot				c0.03		0.11		0.25		c0.35	0.44	
v/s Ratio Perm										c0.51		
v/c Ratio				0.36		0.25		0.57		1.15	0.55	
Uniform Delay, d1				43.7		17.7		20.9		20.7	3.5	
Progression Factor				1.00		1.00		0.04		1.00	1.00	
Incremental Delay, d2				2.2		0.3		1.5		83.9	0.8	
Delay (s)				45.9		18.0		2.3		104.7	4.3	
Level of Service				D		B		A		F	A	
Approach Delay (s)		0.0			21.8			2.3			38.8	
Approach LOS		A			C			A			D	

Intersection Summary			
HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.7
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	901	145	5	286	64	90
Future Volume (Veh/h)	901	145	5	286	64	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	979	158	5	311	70	98
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1139		1381	1060
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1139		1381	1060
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		55	64
cM capacity (veh/h)			612		157	272

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1137	316	168
Volume Left	0	5	70
Volume Right	158	0	98
cSH	1700	612	209
Volume to Capacity	0.67	0.01	0.81
Queue Length 95th (ft)	0	1	145
Control Delay (s)	0.0	0.3	68.9
Lane LOS		A	F
Approach Delay (s)	0.0	0.3	68.9
Approach LOS			F

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	90	0	0	150	37	684	0	0	0	0
Future Volume (Veh/h)	0	0	90	0	0	150	37	684	0	0	0	0
Sign Control		Yield			Yield			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.74	0.92	0.92	0.87	0.87	0.87	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	122	0	0	172	43	786	0	0	0	0
Pedestrians											6	
Lane Width (ft)											0.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	657	872	0	994	872	399	0			786		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	657	872	0	994	872	399	0			786		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	89	100	100	71	97			100		
cM capacity (veh/h)	245	280	1084	173	280	601	1622			829		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	122	172	305	524
Volume Left	0	0	43	0
Volume Right	122	172	0	0
cSH	1084	601	1622	1700
Volume to Capacity	0.11	0.29	0.03	0.31
Queue Length 95th (ft)	9	29	2	0
Control Delay (s)	8.7	13.4	1.2	0.0
Lane LOS	A	B	A	
Approach Delay (s)	8.7	13.4	0.4	
Approach LOS	A	B		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	37.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	5	11	21	16	0	0	0	0	85	821	63
Future Volume (Veh/h)	0	5	11	21	16	0	0	0	0	85	821	63
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.70	0.70	0.70	0.92	0.92	0.92	0.81	0.81	0.81
Hourly flow rate (vph)	0	8	18	30	23	0	0	0	0	105	1014	78
Pedestrians		6			12							
Lane Width (ft)		12.0			12.0							
Walking Speed (ft/s)		4.0			4.0							
Percent Blockage		1			1							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1280	1281	552	751	1320	12	1098			12		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1280	1281	552	751	1320	12	1098			12		
tC, single (s)	7.5	6.5	7.2	7.5	6.6	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.1	3.3	2.2			2.2		
p0 queue free %	100	95	96	88	83	100	100			93		
cM capacity (veh/h)	102	154	446	260	137	1061	640			1604		

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	26	53	612	585
Volume Left	0	30	105	0
Volume Right	18	0	0	78
cSH	281	187	1604	1700
Volume to Capacity	0.09	0.28	0.07	0.34
Queue Length 95th (ft)	8	28	5	0
Control Delay (s)	19.1	31.6	1.8	0.0
Lane LOS	C	D	A	
Approach Delay (s)	19.1	31.6	0.9	
Approach LOS	C	D		

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	892	564	262	527
v/c Ratio	0.51	0.32	0.38	0.86
Control Delay	26.2	21.9	32.3	54.5
Queue Delay	0.3	0.3	0.0	0.0
Total Delay	26.5	22.2	32.3	54.5
Queue Length 50th (ft)	254	208	171	440
Queue Length 95th (ft)	489	182	231	562
Internal Link Dist (ft)	355	346	123	
Turn Bay Length (ft)				
Base Capacity (vph)	1765	1782	779	696
Starvation Cap Reductn	315	635	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.62	0.49	0.34	0.76

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	803	530	0	249	501
Future Volume (vph)	0	803	530	0	249	501
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6	5.6
Lane Util. Factor		0.95	0.95		1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3505	3539		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3505	3539		1770	1583
Peak-hour factor, PHF	0.90	0.90	0.94	0.94	0.95	0.95
Adj. Flow (vph)	0	892	564	0	262	527
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	892	564	0	262	527
Confl. Peds. (#/hr)					4	
Heavy Vehicles (%)	2%	3%	2%	2%	2%	2%
Turn Type		NA	NA		Prot	Prot
Protected Phases		1	1		3	3
Permitted Phases						3
Actuated Green, G (s)		70.1	70.1		55.9	55.9
Effective Green, g (s)		70.1	70.1		55.9	55.9
Actuated g/C Ratio		0.49	0.49		0.39	0.39
Clearance Time (s)		5.6	5.6		5.6	5.6
Vehicle Extension (s)		3.0	3.0		5.0	5.0
Lane Grp Cap (vph)		1706	1722		687	614
v/s Ratio Prot		c0.25	0.16		0.15	c0.33
v/s Ratio Perm						
v/c Ratio		0.52	0.33		0.38	0.86
Uniform Delay, d1		25.4	22.6		31.6	40.4
Progression Factor		0.94	0.90		1.00	1.00
Incremental Delay, d2		1.1	0.5		0.7	12.5
Delay (s)		25.0	20.7		32.4	52.9
Level of Service		C	C		C	D
Approach Delay (s)		25.0	20.7		46.1	
Approach LOS		C	C		D	

Intersection Summary			
HCM 2000 Control Delay	31.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	14.2
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	133	973	301	480	199	134
v/c Ratio	0.26	0.51	0.64	0.18	0.78	0.27
Control Delay	12.7	11.8	16.0	1.2	80.0	35.9
Queue Delay	0.0	0.1	0.2	0.3	0.0	0.0
Total Delay	12.7	11.9	16.2	1.5	80.0	35.9
Queue Length 50th (ft)	34	118	12	9	180	93
Queue Length 95th (ft)	39	94	135	20	233	112
Internal Link Dist (ft)		346		296	1476	
Turn Bay Length (ft)	220		200			
Base Capacity (vph)	507	1898	588	2633	275	625
Starvation Cap Reductn	0	144	40	1438	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.55	0.55	0.40	0.72	0.21

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	482	258	265	411	11	93	64	106	0	0	0
Future Volume (vph)	101	482	258	265	411	11	93	64	106	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1			5.7	5.7			
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			
Frpb, ped/bikes	1.00	0.97		1.00	1.00			1.00	1.00			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.95		1.00	1.00			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00			
Satd. Flow (prot)	1765	3262		1770	3522			1809	1583			
Flt Permitted	0.48	1.00		0.21	1.00			0.97	1.00			
Satd. Flow (perm)	888	3262		386	3522			1809	1583			
Peak-hour factor, PHF	0.76	0.76	0.76	0.88	0.88	0.88	0.79	0.79	0.79	0.92	0.92	0.92
Adj. Flow (vph)	133	634	339	301	467	12	118	81	134	0	0	0
RTOR Reduction (vph)	0	34	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	133	939	0	301	479	0	0	199	134	0	0	0
Confl. Peds. (#/hr)	1		12	12		1	5					
Turn Type	Perm	NA		pm+pt	NA		Split	NA	pt+ov			
Protected Phases		6		5	2		7	7	7 5			
Permitted Phases	6			2								
Actuated Green, G (s)	79.9	79.9		105.2	105.2			20.4	45.3			
Effective Green, g (s)	79.9	79.9		105.2	105.2			20.4	45.3			
Actuated g/C Ratio	0.55	0.55		0.73	0.73			0.14	0.31			
Clearance Time (s)	6.1	6.1		6.1	6.1			5.7				
Vehicle Extension (s)	5.0	5.0		3.0	5.0			5.0				
Lane Grp Cap (vph)	492	1809		466	2573			256	497			
v/s Ratio Prot		0.29		c0.09	0.14			c0.11	0.08			
v/s Ratio Perm	0.15			c0.39								
v/c Ratio	0.27	0.52		0.65	0.19			0.78	0.27			
Uniform Delay, d1	16.8	20.0		11.3	6.0			59.6	37.0			
Progression Factor	0.55	0.54		1.27	0.17			1.00	1.00			
Incremental Delay, d2	1.2	1.0		3.0	0.2			15.9	0.6			
Delay (s)	10.5	11.7		17.4	1.2			75.5	37.6			
Level of Service	B	B		B	A			E	D			
Approach Delay (s)		11.5			7.4			60.2			0.0	
Approach LOS		B			A			E			A	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	626	6	742	31	6
v/c Ratio	0.20	0.08	0.23	0.31	0.04
Control Delay	1.3	79.0	1.0	72.8	28.8
Queue Delay	0.2	0.0	0.0	0.0	0.0
Total Delay	1.5	79.0	1.0	72.8	28.8
Queue Length 50th (ft)	6	5	43	29	0
Queue Length 95th (ft)	40	m16	6	62	14
Internal Link Dist (ft)	296		2760	173	
Turn Bay Length (ft)		200		100	
Base Capacity (vph)	3085	194	3243	344	252
Starvation Cap Reductn	1532	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.40	0.03	0.23	0.09	0.02

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	561	27	5	660	27	5
Future Volume (vph)	561	27	5	660	27	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		5.2	5.2	5.6	5.2
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3508		1770	3539	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3508		1770	3539	1770	1583
Peak-hour factor, PHF	0.94	0.94	0.89	0.89	0.87	0.87
Adj. Flow (vph)	597	29	6	742	31	6
RTOR Reduction (vph)	1	0	0	0	0	6
Lane Group Flow (vph)	625	0	6	742	31	0
Confl. Peds. (#/hr)		5	5			
Turn Type	NA		Prot	NA	Prot	pt+ov
Protected Phases	2		1	6	3	1 8
Permitted Phases						
Actuated Green, G (s)	118.8		2.7	127.6	5.6	13.9
Effective Green, g (s)	118.8		2.7	127.6	5.6	8.3
Actuated g/C Ratio	0.82		0.02	0.89	0.04	0.06
Clearance Time (s)	6.1		5.2	5.2	5.6	
Vehicle Extension (s)	4.0		3.0	4.0	3.0	
Lane Grp Cap (vph)	2894		33	3135	68	91
v/s Ratio Prot	0.18		0.00	c0.21	c0.02	0.00
v/s Ratio Perm						
v/c Ratio	0.22		0.18	0.24	0.46	0.00
Uniform Delay, d1	2.7		69.6	1.2	67.7	64.0
Progression Factor	0.45		1.17	0.65	1.00	1.00
Incremental Delay, d2	0.2		2.6	0.2	4.8	0.0
Delay (s)	1.4		83.9	0.9	72.5	64.0
Level of Service	A		F	A	E	E
Approach Delay (s)	1.4			1.6	71.1	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	3.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	32.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	57	618	604	137	444	153
v/c Ratio	0.13	0.31	0.35	0.11	0.79	0.21
Control Delay	10.0	9.9	27.3	0.7	54.7	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.0	9.9	27.3	0.7	54.7	3.7
Queue Length 50th (ft)	13	72	167	0	379	0
Queue Length 95th (ft)	26	94	327	13	389	25
Internal Link Dist (ft)		2760	1391		524	
Turn Bay Length (ft)	100			150	75	
Base Capacity (vph)	442	2018	1713	1324	693	810
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.31	0.35	0.10	0.64	0.19

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	48	519	538	122	355	122
Future Volume (vph)	48	519	538	122	355	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.6	5.6	5.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1769	3539	3539	1561	1770	1583
Flt Permitted	0.36	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	673	3539	3539	1561	1770	1583
Peak-hour factor, PHF	0.84	0.84	0.89	0.89	0.80	0.80
Adj. Flow (vph)	57	618	604	137	444	152
RTOR Reduction (vph)	0	0	0	29	0	91
Lane Group Flow (vph)	57	618	604	108	444	62
Confl. Peds. (#/hr)	5			5	6	18
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	1	6	2	4	4	1 7
Permitted Phases	6			2		
Actuated Green, G (s)	80.5	80.5	68.1	113.9	45.8	58.2
Effective Green, g (s)	80.5	80.5	68.1	113.9	45.8	58.2
Actuated g/C Ratio	0.56	0.56	0.47	0.79	0.32	0.40
Clearance Time (s)	5.5	5.5	5.5	5.6	5.6	
Vehicle Extension (s)	4.0	4.5	4.5	6.0	6.0	
Lane Grp Cap (vph)	428	1978	1673	1234	562	639
v/s Ratio Prot	0.01	c0.17	c0.17	0.03	c0.25	0.04
v/s Ratio Perm	0.07			0.04		
v/c Ratio	0.13	0.31	0.36	0.09	0.79	0.10
Uniform Delay, d1	20.7	17.0	24.1	3.4	44.7	26.6
Progression Factor	0.45	0.50	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.4	0.2	0.1	9.0	0.1
Delay (s)	9.4	8.8	24.4	3.5	53.7	26.7
Level of Service	A	A	C	A	D	C
Approach Delay (s)		8.9	20.5		46.8	
Approach LOS		A	C		D	

Intersection Summary			
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	306	761	507	203	463	313
v/c Ratio	0.70	0.43	0.38	0.30	0.67	0.62
Control Delay	32.8	16.5	23.6	5.0	39.8	28.8
Queue Delay	0.1	0.0	0.0	0.0	0.0	1.8
Total Delay	32.9	16.5	23.6	5.0	39.8	30.6
Queue Length 50th (ft)	119	163	125	0	134	155
Queue Length 95th (ft)	#238	216	174	49	162	226
Internal Link Dist (ft)		355	330		239	
Turn Bay Length (ft)	150			100	140	
Base Capacity (vph)	439	1790	1318	682	689	649
Starvation Cap Reductn	0	0	0	0	0	196
Spillback Cap Reductn	3	0	0	7	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.43	0.38	0.30	0.67	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	291	723	482	193	384	260
Future Volume (vph)	291	723	482	193	384	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.94	1.00	1.00
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1675	3471	3438	1455	3467	1429
Flt Permitted	0.42	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	733	3471	3438	1455	3467	1429
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.83	0.83
Adj. Flow (vph)	306	761	507	203	463	313
RTOR Reduction (vph)	0	0	0	128	0	0
Lane Group Flow (vph)	306	761	507	75	463	313
Confl. Peds. (#/hr)	17			17	140	
Heavy Vehicles (%)	7%	4%	5%	4%	1%	13%
Turn Type	pm+pt	NA	NA	Perm	Prot	Prot
Protected Phases	1	6	2		3	8
Permitted Phases	6			2		
Actuated Green, G (s)	45.2	45.2	33.3	33.3	17.9	32.9
Effective Green, g (s)	45.2	45.2	33.3	33.3	17.9	32.9
Actuated g/C Ratio	0.50	0.50	0.37	0.37	0.20	0.37
Clearance Time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Lane Grp Cap (vph)	433	1743	1272	538	689	522
v/s Ratio Prot	c0.05	0.22	0.15		0.13	c0.22
v/s Ratio Perm	c0.31			0.05		
v/c Ratio	0.71	0.44	0.40	0.14	0.67	0.60
Uniform Delay, d1	21.2	14.3	21.0	18.8	33.3	23.2
Progression Factor	1.00	1.00	1.00	1.00	1.02	1.02
Incremental Delay, d2	9.4	0.8	0.9	0.5	5.1	1.8
Delay (s)	30.6	15.1	21.9	19.4	39.2	25.4
Level of Service	C	B	C	B	D	C
Approach Delay (s)		19.5	21.2		33.6	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	46	165	100	94	570	170	608
v/c Ratio	0.16	0.52	0.52	0.29	0.47	0.36	0.26
Control Delay	30.2	35.7	41.9	8.9	4.8	4.5	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.4	0.0	0.1
Total Delay	30.2	35.7	41.9	8.9	5.2	4.5	2.3
Queue Length 50th (ft)	21	75	49	0	88	12	22
Queue Length 95th (ft)	43	114	82	27	45	19	28
Internal Link Dist (ft)		284			239		250
Turn Bay Length (ft)			85			100	
Base Capacity (vph)	534	566	348	518	1220	473	2383
Starvation Cap Reductn	0	0	0	0	256	0	727
Spillback Cap Reductn	0	0	0	0	18	0	93
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.29	0.29	0.18	0.59	0.36	0.37

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	109	21	78	0	73	0	416	52	151	541	0
Future Volume (vph)	36	109	21	78	0	73	0	416	52	151	541	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Lane Util. Factor	1.00	1.00		1.00		1.00		1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00		0.90		0.99		1.00	1.00	
Flpb, ped/bikes	0.92	1.00		0.96		1.00		1.00		0.96	1.00	
Frt	1.00	0.98		1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1659	1733		1734		1412		1773		1628	3471	
Flt Permitted	0.95	1.00		0.59		1.00		1.00		0.40	1.00	
Satd. Flow (perm)	1659	1733		1084		1412		1773		684	3471	
Peak-hour factor, PHF	0.79	0.79	0.79	0.78	0.78	0.78	0.82	0.82	0.82	0.89	0.89	0.89
Adj. Flow (vph)	46	138	27	100	0	94	0	507	63	170	608	0
RTOR Reduction (vph)	0	10	0	0	0	77	0	3	0	0	0	0
Lane Group Flow (vph)	46	155	0	100	0	17	0	567	0	170	608	0
Confl. Peds. (#/hr)	35		37	37		35			53	53		
Heavy Vehicles (%)	0%	7%	0%	0%	3%	3%	0%	3%	12%	6%	4%	0%
Turn Type	Perm	NA		D.Pm		Perm		NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4			4		4				2		
Actuated Green, G (s)	16.1	16.1		16.1		16.1		61.8		61.8	61.8	
Effective Green, g (s)	16.1	16.1		16.1		16.1		61.8		61.8	61.8	
Actuated g/C Ratio	0.18	0.18		0.18		0.18		0.69		0.69	0.69	
Clearance Time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Vehicle Extension (s)	4.0	4.0		4.0		4.0		4.0		4.0	4.0	
Lane Grp Cap (vph)	296	310		193		252		1217		469	2383	
v/s Ratio Prot		0.09						c0.32			0.18	
v/s Ratio Perm	0.03			c0.09		0.01				0.25		
v/c Ratio	0.16	0.50		0.52		0.07		0.47		0.36	0.26	
Uniform Delay, d1	31.2	33.3		33.4		30.7		6.5		5.9	5.4	
Progression Factor	1.00	1.00		1.00		1.00		0.49		0.34	0.32	
Incremental Delay, d2	0.3	1.7		3.1		0.2		1.1		2.0	0.2	
Delay (s)	31.5	35.1		36.5		30.9		4.3		4.0	1.9	
Level of Service	C	D		D		C		A		A	A	
Approach Delay (s)		34.3			33.8			4.3			2.4	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.1
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	57	49	74	136	87	65	574	789
v/c Ratio	0.20	0.12	0.32	0.72	0.59	0.25	0.64	0.49
Control Delay	33.7	0.6	39.8	60.2	54.4	13.8	17.2	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0
Total Delay	33.7	0.6	39.8	60.2	54.4	13.8	18.0	12.0
Queue Length 50th (ft)	28	0	39	78	49	16	158	83
Queue Length 95th (ft)	43	0	61	108	76	32	179	156
Internal Link Dist (ft)				296			250	793
Turn Bay Length (ft)		25				100		
Base Capacity (vph)	292	397	229	189	148	259	899	1623
Starvation Cap Reductn	0	0	0	0	0	0	114	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.12	0.32	0.72	0.59	0.25	0.73	0.49

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	0	31	52	88	68	57	505	0	0	619	68
Future Volume (vph)	36	0	31	52	88	68	57	505	0	0	619	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Lane Util. Factor	1.00		1.00	1.00	0.95	0.95	1.00	1.00			0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.98	1.00	1.00	1.00			0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	0.96	1.00			1.00	
Frt	1.00		0.85	1.00	0.99	0.85	1.00	1.00			0.99	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1656		1615	1736	1436	1120	1728	1845			3313	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.29	1.00			1.00	
Satd. Flow (perm)	1656		1615	1736	1436	1120	529	1845			3313	
Peak-hour factor, PHF	0.63	0.63	0.63	0.70	0.70	0.70	0.88	0.88	0.88	0.87	0.87	0.87
Adj. Flow (vph)	57	0	49	74	126	97	65	574	0	0	711	78
RTOR Reduction (vph)	0	0	40	0	0	0	0	0	0	0	8	0
Lane Group Flow (vph)	57	0	9	74	136	87	65	574	0	0	781	0
Confl. Peds. (#/hr)	207		56	56		207	55					55
Heavy Vehicles (%)	9%	0%	0%	4%	20%	37%	0%	3%	0%	0%	5%	8%
Turn Type	Prot		Prot	Split	NA	Prot	Perm	NA			NA	
Protected Phases	8		8	4	4	4		2			2	
Permitted Phases							2					
Actuated Green, G (s)	15.9		15.9	11.9	11.9	11.9	43.9	43.9			43.9	
Effective Green, g (s)	15.9		15.9	11.9	11.9	11.9	43.9	43.9			43.9	
Actuated g/C Ratio	0.18		0.18	0.13	0.13	0.13	0.49	0.49			0.49	
Clearance Time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Vehicle Extension (s)	2.0		2.0	4.0	4.0	4.0	2.0	2.0			2.0	
Lane Grp Cap (vph)	292		285	229	189	148	258	899			1616	
v/s Ratio Prot	c0.03		0.01	0.04	c0.09	0.08		c0.31			0.24	
v/s Ratio Perm							0.12					
v/c Ratio	0.20		0.03	0.32	0.72	0.59	0.25	0.64			0.48	
Uniform Delay, d1	31.6		30.7	35.4	37.4	36.7	13.5	17.1			15.4	
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.80	0.79			0.72	
Incremental Delay, d2	1.5		0.2	3.7	21.0	16.0	2.2	3.2			0.9	
Delay (s)	33.1		30.9	39.1	58.4	52.7	13.0	16.8			12.0	
Level of Service	C		C	D	E	D	B	B			B	
Approach Delay (s)		32.1			51.9			16.4			12.0	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.3
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	739	62	480	816
v/c Ratio	0.75	0.17	0.25	0.50
Control Delay	31.7	5.6	5.2	17.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	31.7	5.6	5.2	17.3
Queue Length 50th (ft)	179	9	35	155
Queue Length 95th (ft)	224	m11	44	236
Internal Link Dist (ft)	1498		793	705
Turn Bay Length (ft)	200	125		
Base Capacity (vph)	1175	410	1957	1622
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.63	0.15	0.25	0.50

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	500	187	57	442	567	167
Future Volume (vph)	500	187	57	442	567	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7		6.1	6.1	6.1	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.98		1.00	1.00	0.98	
Flpb, ped/bikes	1.00		0.99	1.00	1.00	
Frt	0.96		1.00	1.00	0.97	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	3359		1726	3312	3243	
Flt Permitted	0.96		0.28	1.00	1.00	
Satd. Flow (perm)	3359		515	3312	3243	
Peak-hour factor, PHF	0.93	0.93	0.92	0.92	0.90	0.90
Adj. Flow (vph)	538	201	62	480	630	186
RTOR Reduction (vph)	48	0	0	0	26	0
Lane Group Flow (vph)	691	0	62	480	790	0
Confl. Peds. (#/hr)		16	45			45
Heavy Vehicles (%)	0%	0%	4%	9%	6%	1%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	2		1	4	3	
Permitted Phases			4			
Actuated Green, G (s)	25.0		53.2	53.2	43.1	
Effective Green, g (s)	25.0		53.2	53.2	43.1	
Actuated g/C Ratio	0.28		0.59	0.59	0.48	
Clearance Time (s)	5.7		6.1	6.1	6.1	
Vehicle Extension (s)	4.0		2.0	0.2	2.0	
Lane Grp Cap (vph)	933		358	1957	1553	
v/s Ratio Prot	c0.21		0.01	c0.14	c0.24	
v/s Ratio Perm			0.09			
v/c Ratio	0.74		0.17	0.25	0.51	
Uniform Delay, d1	29.5		12.7	8.8	16.2	
Progression Factor	1.00		0.45	0.52	1.00	
Incremental Delay, d2	3.4		0.1	0.2	1.2	
Delay (s)	32.9		5.8	4.8	17.3	
Level of Service	C		A	A	B	
Approach Delay (s)	32.9			4.9	17.3	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	19.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	869	6	954	8	8	6
v/c Ratio	0.30	0.05	0.32	0.04	0.02	0.01
Control Delay	4.7	35.6	2.6	32.8	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.7	35.6	2.6	32.8	0.0	0.0
Queue Length 50th (ft)	0	3	5	4	0	0
Queue Length 95th (ft)	196	m8	82	10	0	0
Internal Link Dist (ft)	293		1215		158	248
Turn Bay Length (ft)		200		50		
Base Capacity (vph)	2922	202	3023	410	658	656
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.03	0.32	0.02	0.01	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	764	10	5	830	0	5	0	5	0	0	5
Future Volume (vph)	0	764	10	5	830	0	5	0	5	0	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7		5.7	5.7		5.6	5.6			5.6	
Lane Util. Factor		0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes		1.00		1.00	1.00		1.00	0.99			0.99	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00			1.00	
Frt		1.00		1.00	1.00		1.00	0.85			0.86	
Flt Protected		1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3397		1770	3406		1764	1562			1587	
Flt Permitted		1.00		0.95	1.00		0.75	1.00			1.00	
Satd. Flow (perm)		3397		1770	3406		1400	1562			1587	
Peak-hour factor, PHF	0.89	0.89	0.89	0.87	0.87	0.87	0.60	0.60	0.60	0.86	0.86	0.86
Adj. Flow (vph)	0	858	11	6	954	0	8	0	8	0	0	6
RTOR Reduction (vph)	0	1	0	0	0	0	0	8	0	0	6	0
Lane Group Flow (vph)	0	868	0	6	954	0	8	0	0	0	0	0
Confl. Peds. (#/hr)	29		24	24		29	2		1	1		2
Heavy Vehicles (%)	2%	6%	2%	2%	6%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	NA		Prot	NA		Perm	NA			NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		66.1		1.3	73.1		5.6	5.6			5.6	
Effective Green, g (s)		66.1		1.3	73.1		5.6	5.6			5.6	
Actuated g/C Ratio		0.73		0.01	0.81		0.06	0.06			0.06	
Clearance Time (s)		5.7		5.7	5.7		5.6	5.6			5.6	
Vehicle Extension (s)		3.0		3.0	4.5		1.0	1.0			1.0	
Lane Grp Cap (vph)		2494		25	2766		87	97			98	
v/s Ratio Prot		0.26		0.00	c0.28			0.00			0.00	
v/s Ratio Perm							c0.01					
v/c Ratio		0.35		0.24	0.34		0.09	0.01			0.00	
Uniform Delay, d1		4.3		43.9	2.2		39.8	39.6			39.6	
Progression Factor		1.00		0.89	0.90		1.00	1.00			1.00	
Incremental Delay, d2		0.4		4.4	0.3		0.2	0.0			0.0	
Delay (s)		4.6		43.2	2.3		40.0	39.6			39.6	
Level of Service		A		D	A		D	D			D	
Approach Delay (s)		4.6			2.5			39.8			39.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	173	763	22	754	57	26	34	79	164
v/c Ratio	0.75	0.38	0.23	0.53	0.54	0.11	0.38	0.32	0.42
Control Delay	58.5	16.8	46.3	23.2	60.6	22.1	53.0	37.5	3.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.5	16.8	46.3	23.2	60.6	22.1	53.0	37.5	3.8
Queue Length 50th (ft)	95	91	12	167	32	7	19	42	0
Queue Length 95th (ft)	#200	262	36	263	61	22	50	76	6
Internal Link Dist (ft)		1215		729		257		381	
Turn Bay Length (ft)	225		150		100		180		
Base Capacity (vph)	237	2009	94	1436	106	405	90	422	488
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.38	0.23	0.53	0.54	0.06	0.38	0.19	0.34

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	164	603	122	21	688	21	44	10	10	31	73	151
Future Volume (vph)	164	603	122	21	688	21	44	10	10	31	73	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1433	3417		1444	3510		1770	1744		1504	1863	1291
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1433	3417		1444	3510		1770	1744		1504	1863	1291
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	173	635	128	22	732	22	57	13	13	34	79	164
RTOR Reduction (vph)	0	15	0	0	2	0	0	11	0	0	0	142
Lane Group Flow (vph)	173	748	0	22	752	0	57	15	0	34	79	22
Confl. Peds. (#/hr)	4					4	3		2	2		3
Heavy Vehicles (%)	26%	3%	3%	25%	2%	14%	2%	0%	0%	20%	2%	23%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												8
Actuated Green, G (s)	14.5	47.8		2.4	35.7		4.3	14.2		2.2	12.1	12.1
Effective Green, g (s)	14.5	47.8		2.4	35.7		4.3	14.2		2.2	12.1	12.1
Actuated g/C Ratio	0.16	0.53		0.03	0.40		0.05	0.16		0.02	0.13	0.13
Clearance Time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Vehicle Extension (s)	6.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	230	1814		38	1392		84	275		36	250	173
v/s Ratio Prot	c0.12	0.22		0.02	c0.21		c0.03	0.01		0.02	c0.04	
v/s Ratio Perm												0.02
v/c Ratio	0.75	0.41		0.58	0.54		0.68	0.05		0.94	0.32	0.13
Uniform Delay, d1	36.0	12.7		43.3	20.8		42.2	32.2		43.8	35.2	34.3
Progression Factor	1.05	1.35		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	16.4	0.7		23.1	1.5		21.2	0.1		127.6	1.0	0.5
Delay (s)	54.2	17.8		66.4	22.4		63.4	32.3		171.4	36.2	34.8
Level of Service	D	B		E	C		E	C		F	D	C
Approach Delay (s)		24.5			23.6			53.7			51.9	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	29.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.4
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	480	310	217	101	193	98	703
v/c Ratio	0.79	0.46	0.36	0.79	0.24	0.19	0.83
Control Delay	31.5	6.8	17.3	64.1	13.3	14.5	28.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.5	6.8	17.3	64.1	13.3	14.5	28.6
Queue Length 50th (ft)	172	17	58	37	47	25	260
Queue Length 95th (ft)	#362	79	105	#116	90	58	#466
Internal Link Dist (ft)	628		690		412		625
Turn Bay Length (ft)		250		80		150	
Base Capacity (vph)	699	745	686	128	812	505	848
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.42	0.32	0.79	0.24	0.19	0.83

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	377	285	11	122	37	80	137	16	80	503	74
Future Volume (vph)	64	377	285	11	122	37	80	137	16	80	503	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.93		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		0.94	1.00	
Frt		1.00	0.85		0.97		1.00	0.98		1.00	0.98	
Flt Protected		0.99	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1852	1477		1794		1805	1744		1639	1817	
Flt Permitted		0.92	1.00		0.93		0.15	1.00		0.64	1.00	
Satd. Flow (perm)		1722	1477		1666		278	1744		1098	1817	
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.79	0.79	0.79	0.82	0.82	0.82
Adj. Flow (vph)	70	410	310	14	156	47	101	173	20	98	613	90
RTOR Reduction (vph)	0	0	165	0	13	0	0	5	0	0	6	0
Lane Group Flow (vph)	0	480	145	0	204	0	101	188	0	98	697	0
Confl. Peds. (#/hr)	17		13	13		17	4		23	23		4
Heavy Vehicles (%)	3%	1%	2%	0%	0%	3%	0%	6%	7%	3%	2%	3%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2		2	2			1			1		
Actuated Green, G (s)		24.6	24.6		24.6		32.3	32.3		32.3	32.3	
Effective Green, g (s)		24.6	24.6		24.6		32.3	32.3		32.3	32.3	
Actuated g/C Ratio		0.34	0.34		0.34		0.44	0.44		0.44	0.44	
Clearance Time (s)		5.6	5.6		5.6		5.6	5.6		5.6	5.6	
Vehicle Extension (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		581	498		562		123	772		486	805	
v/s Ratio Prot								0.11			c0.38	
v/s Ratio Perm		c0.28	0.10		0.12		0.36			0.09		
v/c Ratio		0.83	0.29		0.36		0.82	0.24		0.20	0.87	
Uniform Delay, d1		22.2	17.7		18.2		17.8	12.7		12.4	18.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		9.8	0.4		0.5		35.0	0.2		0.3	9.9	
Delay (s)		32.0	18.2		18.8		52.8	12.9		12.7	28.3	
Level of Service		C	B		B		D	B		B	C	
Approach Delay (s)		26.6			18.8			26.6			26.4	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	72.9	Sum of lost time (s)	15.2
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	759	5	0	0	0	0	0	16	16	10	0
Future Volume (Veh/h)	0	759	5	0	0	0	0	0	16	16	10	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	825	5	0	0	0	0	0	17	17	11	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		817										
pX, platoon unblocked				0.88			0.88	0.88	0.88	0.88	0.88	
vC, conflicting volume	0			830			833	828	415	430	830	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			520			524	517	46	62	520	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	98	98	97	100
cM capacity (veh/h)	1622			912			374	403	887	794	402	1084

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	550	280	17	28
Volume Left	0	0	0	17
Volume Right	0	5	17	0
cSH	1700	1700	887	574
Volume to Capacity	0.32	0.16	0.02	0.05
Queue Length 95th (ft)	0	0	1	4
Control Delay (s)	0.0	0.0	9.1	11.6
Lane LOS			A	B
Approach Delay (s)	0.0		9.1	11.6
Approach LOS			A	B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	888	5	10	10	0	0	0	5
Future Volume (Veh/h)	0	0	0	0	888	5	10	10	0	0	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	965	5	11	11	0	0	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1301							
pX, platoon unblocked												
vC, conflicting volume	970			0			488	970	0	973	968	485
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	970			0			488	970	0	973	968	485
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			98	96	100	100	100	99
cM capacity (veh/h)	706			1622			459	252	1084	200	253	528

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	643	327	22	5
Volume Left	0	0	11	0
Volume Right	0	5	0	5
cSH	1700	1700	325	528
Volume to Capacity	0.38	0.19	0.07	0.01
Queue Length 95th (ft)	0	0	5	1
Control Delay (s)	0.0	0.0	16.9	11.9
Lane LOS			C	B
Approach Delay (s)	0.0		16.9	11.9
Approach LOS			C	B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	105	801	1014	107	72	39
v/c Ratio	0.28	0.30	0.38	0.09	0.31	0.16
Control Delay	7.5	4.6	2.9	0.5	30.3	10.4
Queue Delay	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	7.5	4.6	3.0	0.5	30.3	10.4
Queue Length 50th (ft)	13	54	22	0	30	0
Queue Length 95th (ft)	52	114	73	m4	59	22
Internal Link Dist (ft)		451	355		262	
Turn Bay Length (ft)	250			250		
Base Capacity (vph)	377	2665	2665	1218	417	403
Starvation Cap Reductn	0	0	488	0	0	0
Spillback Cap Reductn	0	172	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.32	0.47	0.09	0.17	0.10

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	97	737	933	98	66	36
Future Volume (vph)	97	737	933	98	66	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.27	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	501	3539	3539	1583	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	105	801	1014	107	72	39
RTOR Reduction (vph)	0	0	0	30	0	35
Lane Group Flow (vph)	105	801	1014	77	72	4
Turn Type	Perm	NA	NA	Perm	Prot	Prot
Protected Phases		2	6		4	4
Permitted Phases	2			6		
Actuated Green, G (s)	51.8	51.8	51.8	51.8	8.2	8.2
Effective Green, g (s)	51.8	51.8	51.8	51.8	8.2	8.2
Actuated g/C Ratio	0.72	0.72	0.72	0.72	0.11	0.11
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	360	2546	2546	1138	201	180
v/s Ratio Prot		0.23	c0.29		c0.04	0.00
v/s Ratio Perm	0.21			0.05		
v/c Ratio	0.29	0.31	0.40	0.07	0.36	0.02
Uniform Delay, d1	3.6	3.7	4.0	3.0	29.5	28.3
Progression Factor	1.00	1.00	0.58	0.40	1.00	1.00
Incremental Delay, d2	2.0	0.3	0.4	0.1	1.1	0.1
Delay (s)	5.6	4.0	2.7	1.3	30.6	28.4
Level of Service	A	A	A	A	C	C
Approach Delay (s)		4.2	2.6		29.8	
Approach LOS		A	A		C	

Intersection Summary			
HCM 2000 Control Delay	4.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	72.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT
Lane Group Flow (vph)	907	1053
v/c Ratio	0.33	0.39
Control Delay	4.9	5.3
Queue Delay	0.0	0.0
Total Delay	4.9	5.3
Queue Length 50th (ft)	0	0
Queue Length 95th (ft)	104	127
Internal Link Dist (ft)	52	451
Turn Bay Length (ft)		
Base Capacity (vph)	2735	2735
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.33	0.39

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	834	969	0	0	0
Future Volume (vph)	0	834	969	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0	2.0			
Lane Util. Factor		0.95	0.95			
Frpb, ped/bikes		1.00	1.00			
Flpb, ped/bikes		1.00	1.00			
Frt		1.00	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		3539	3539			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		3539	3539			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	907	1053	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	907	1053	0	0	0
Confl. Peds. (#/hr)						133
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Actuated Green, G (s)		18.1	18.1			
Effective Green, g (s)		18.1	18.1			
Actuated g/C Ratio		0.68	0.68			
Clearance Time (s)		2.0	2.0			
Vehicle Extension (s)		0.2	0.2			
Lane Grp Cap (vph)		2390	2390			
v/s Ratio Prot		0.26	c0.30			
v/s Ratio Perm						
v/c Ratio		0.38	0.44			
Uniform Delay, d1		1.9	2.0			
Progression Factor		1.00	1.00			
Incremental Delay, d2		0.5	0.6			
Delay (s)		2.4	2.6			
Level of Service		A	A			
Approach Delay (s)		2.4	2.6		0.0	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	2.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	26.8	Sum of lost time (s)	4.0
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

202: Broadway & Ped Crossing Performance by movement

Movement	EBT	WBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	2.3	5.1	7.4
Total Del/Veh (s)	10.3	17.8	14.5
Stop Delay (hr)	2.0	3.6	5.6
Stop Del/Veh (s)	8.6	12.8	10.9
Total Stops	405	624	1029
Stop/Veh	0.49	0.61	0.56

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	97	737	933	98	66	36
Future Volume (Veh/h)	97	737	933	98	66	36
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	105	801	1014	107	72	39
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			435			
pX, platoon unblocked	0.91				0.91	0.91
vC, conflicting volume	1121				1678	560
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	924				1539	305
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				11	94
cM capacity (veh/h)	665				81	626

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	372	534	676	445	72	39
Volume Left	105	0	0	0	72	0
Volume Right	0	0	0	107	0	39
cSH	665	1700	1700	1700	81	626
Volume to Capacity	0.16	0.31	0.40	0.26	0.89	0.06
Queue Length 95th (ft)	14	0	0	0	117	5
Control Delay (s)	4.8	0.0	0.0	0.0	160.3	11.1
Lane LOS	A				F	B
Approach Delay (s)	2.0		0.0		107.9	
Approach LOS					F	

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	366	452	12	1069	62	717
v/c Ratio	0.64	0.75	0.03	1.04	0.74	0.38
Control Delay	31.9	35.8	9.6	59.4	78.5	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.9	35.8	9.6	59.4	78.5	22.6
Queue Length 50th (ft)	175	222	3	~653	37	192
Queue Length 95th (ft)	272	#343	11	#896	m#108	257
Internal Link Dist (ft)		1428		423		156
Turn Bay Length (ft)			150		90	
Base Capacity (vph)	574	600	351	1031	84	1878
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.75	0.03	1.04	0.74	0.38

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Movement	WBL	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	344	355	70	11	989	27	59	513	168
Future Volume (vph)	344	355	70	11	989	27	59	513	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1766	1822		1792	1838		1805	3332	
Flt Permitted	0.95	1.00		0.34	1.00		0.08	1.00	
Satd. Flow (perm)	1766	1822		637	1838		153	3332	
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	366	378	74	12	1041	28	62	540	177
RTOR Reduction (vph)	0	8	0	0	15	0	0	35	0
Lane Group Flow (vph)	366	444	0	12	1054	0	62	682	0
Confl. Peds. (#/hr)	8		14	14			16		14
Heavy Vehicles (%)	1%	1%	0%	0%	3%	1%	0%	4%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			1			1	
Permitted Phases	2	2		1			1		
Actuated Green, G (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Effective Green, g (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Actuated g/C Ratio	0.33	0.33		0.55	0.55		0.55	0.55	
Clearance Time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Vehicle Extension (s)	5.0	5.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	574	593		352	1017		84	1843	
v/s Ratio Prot		c0.24			c0.57			0.20	
v/s Ratio Perm	0.21			0.02			0.41		
v/c Ratio	0.64	0.75		0.03	1.04		0.74	0.37	
Uniform Delay, d1	25.8	27.1		9.2	20.1		15.2	11.3	
Progression Factor	1.00	1.00		1.00	1.00		1.93	2.19	
Incremental Delay, d2	5.3	8.4		0.2	38.1		40.5	0.5	
Delay (s)	31.2	35.5		9.3	58.2		69.8	25.2	
Level of Service	C	D		A	E		E	C	
Approach Delay (s)		33.6			57.7			28.8	
Approach LOS		C			E			C	

Intersection Summary			
HCM 2000 Control Delay	41.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Ann Arbor Station Traffic Analysis

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	176	254	1269	835
v/c Ratio	0.63	0.50	0.66	0.46
Control Delay	38.5	23.1	3.7	10.5
Queue Delay	101.3	75.2	0.0	0.7
Total Delay	139.8	98.3	3.7	11.2
Queue Length 50th (ft)	83	85	51	78
Queue Length 95th (ft)	#159	159	m51	96
Internal Link Dist (ft)	303	327	1027	111
Turn Bay Length (ft)				
Base Capacity (vph)	280	511	1916	1831
Starvation Cap Reductn	0	0	0	616
Spillback Cap Reductn	237	399	9	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	4.09	2.27	0.67	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	27	22	11	54	168	22	1102	43	22	703	43
Future Volume (vph)	113	27	22	11	54	168	22	1102	43	22	703	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.2			6.2	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.98			0.90			0.99			0.99	
Flt Protected		0.97			1.00			1.00			1.00	
Satd. Flow (prot)		1767			1678			3516			3504	
Flt Permitted		0.54			0.98			0.93			0.89	
Satd. Flow (perm)		987			1653			3262			3112	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	123	29	24	12	59	183	24	1198	47	24	764	47
RTOR Reduction (vph)	0	7	0	0	52	0	0	3	0	0	5	0
Lane Group Flow (vph)	0	170	0	0	202	0	0	1266	0	0	830	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		25.0			25.0			52.8			52.8	
Effective Green, g (s)		25.0			25.0			52.8			52.8	
Actuated g/C Ratio		0.28			0.28			0.59			0.59	
Clearance Time (s)		6.0			6.0			6.2			6.2	
Vehicle Extension (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		274			459			1913			1825	
v/s Ratio Prot												
v/s Ratio Perm		c0.17			0.12			c0.39			0.27	
v/c Ratio		0.62			0.44			0.66			0.45	
Uniform Delay, d1		28.3			26.7			12.6			10.5	
Progression Factor		1.00			1.00			0.23			0.93	
Incremental Delay, d2		10.1			3.0			0.8			0.8	
Delay (s)		38.4			29.8			3.6			10.5	
Level of Service		D			C			A			B	
Approach Delay (s)		38.4			29.8			3.6			10.5	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Ann Arbor Station Traffic Analysis

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	117	671	1475	239	739
v/c Ratio	0.74	1.07	0.78	0.65	0.27
Control Delay	58.6	73.2	13.6	30.6	3.1
Queue Delay	0.0	0.0	0.7	0.0	0.0
Total Delay	58.6	73.2	14.3	30.6	3.1
Queue Length 50th (ft)	66	~351	165	66	47
Queue Length 95th (ft)	m#106	#552	286	146	63
Internal Link Dist (ft)			111		640
Turn Bay Length (ft)	300			240	
Base Capacity (vph)	158	626	1880	369	2779
Starvation Cap Reductn	0	0	148	0	0
Spillback Cap Reductn	0	0	0	0	67
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.74	1.07	0.85	0.65	0.27

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	108	0	617	5	1313	54	215	665	0
Future Volume (vph)	0	0	0	108	0	617	5	1313	54	215	665	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0		6.0		6.0		6.0	6.0	
Lane Util. Factor				1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Flpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Frt				1.00		0.85		0.99		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				1787		1599		3546		1769	3574	
Flt Permitted				0.95		1.00		0.95		0.09	1.00	
Satd. Flow (perm)				1787		1599		3380		170	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	117	0	671	5	1412	58	239	739	0
RTOR Reduction (vph)	0	0	0	0	0	129	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	117	0	542	0	1473	0	239	739	0
Confl. Peds. (#/hr)									20	20		
Heavy Vehicles (%)	2%	2%	2%	1%	0%	1%	0%	1%	0%	2%	1%	0%
Turn Type				Prot		pt+ov	Perm	NA		D.P+P	NA	
Protected Phases		8		4		4 5		6		5	2	
Permitted Phases	8						6			6		
Actuated Green, G (s)				8.0		28.0		50.0		64.0	70.0	
Effective Green, g (s)				8.0		28.0		50.0		64.0	70.0	
Actuated g/C Ratio				0.09		0.31		0.56		0.71	0.78	
Clearance Time (s)				6.0				6.0		6.0	6.0	
Vehicle Extension (s)				4.0				5.0		2.0	5.0	
Lane Grp Cap (vph)				158		497		1877		369	2779	
v/s Ratio Prot				0.07		c0.34				0.10	0.21	
v/s Ratio Perm								c0.44		0.36		
v/c Ratio				0.74		1.09		0.78		0.65	0.27	
Uniform Delay, d1				40.0		31.0		15.8		22.8	2.8	
Progression Factor				0.85		0.75		0.68		1.00	1.00	
Incremental Delay, d2				14.9		63.7		2.6		2.9	0.2	
Delay (s)				49.1		87.0		13.4		25.7	3.0	
Level of Service				D		F		B		C	A	
Approach Delay (s)		0.0			81.3			13.4			8.6	
Approach LOS		A			F			B			A	

Intersection Summary			
HCM 2000 Control Delay	28.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.7
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	202	62	21	605	53	106
Future Volume (Veh/h)	202	62	21	605	53	106
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	220	67	23	658	58	115
Pedestrians	1			8	11	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			298		970	272
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			298		970	272
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		79	85
cM capacity (veh/h)			1252		273	754

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	287	681	173
Volume Left	0	23	58
Volume Right	67	0	115
cSH	1700	1252	474
Volume to Capacity	0.17	0.02	0.36
Queue Length 95th (ft)	0	1	41
Control Delay (s)	0.0	0.5	16.9
Lane LOS		A	C
Approach Delay (s)	0.0	0.5	16.9
Approach LOS			C

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

Ann Arbor Station Traffic Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	42	0	0	84	74	677	0	0	0	0
Future Volume (Veh/h)	0	0	42	0	0	84	74	677	0	0	0	0
Sign Control		Yield			Yield			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.74	0.92	0.92	0.87	0.87	0.87	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	57	0	0	97	85	778	0	0	0	0
Pedestrians											6	
Lane Width (ft)											0.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	662	948	0	1005	948	395	0			778		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	662	948	0	1005	948	395	0			778		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	95	100	100	84	95			100		
cM capacity (veh/h)	280	246	1084	178	246	604	1622			834		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	57	97	344	519
Volume Left	0	0	85	0
Volume Right	57	97	0	0
cSH	1084	604	1622	1700
Volume to Capacity	0.05	0.16	0.05	0.31
Queue Length 95th (ft)	4	14	4	0
Control Delay (s)	8.5	12.1	2.2	0.0
Lane LOS	A	B	A	
Approach Delay (s)	8.5	12.1	0.9	
Approach LOS	A	B		

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	34.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	5	11	42	32	0	0	0	0	37	702	66
Future Volume (Veh/h)	0	5	11	42	32	0	0	0	0	37	702	66
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.68	0.68	0.68	0.69	0.69	0.69	0.92	0.92	0.92	0.90	0.90	0.90
Hourly flow rate (vph)	0	7	16	61	46	0	0	0	0	41	780	73
Pedestrians		9			12							
Lane Width (ft)		12.0			12.0							
Walking Speed (ft/s)		4.0			4.0							
Percent Blockage		1			1							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	930	920	436	504	956	12	862			12		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	930	920	436	504	956	12	862			12		
tC, single (s)	7.5	6.5	7.3	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	97	97	85	82	100	100			97		
cM capacity (veh/h)	186	261	518	414	249	1061	783			1604		

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	23	107	431	463
Volume Left	0	61	41	0
Volume Right	16	0	0	73
cSH	399	322	1604	1700
Volume to Capacity	0.06	0.33	0.03	0.27
Queue Length 95th (ft)	5	35	2	0
Control Delay (s)	14.6	21.6	0.9	0.0
Lane LOS	B	C	A	
Approach Delay (s)	14.6	21.6	0.4	
Approach LOS	B	C		

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	931	579	94	281
v/c Ratio	0.38	0.24	0.23	0.78
Control Delay	9.8	4.3	44.7	66.3
Queue Delay	0.3	0.2	0.0	0.0
Total Delay	10.1	4.5	44.7	66.3
Queue Length 50th (ft)	188	60	73	249
Queue Length 95th (ft)	270	m45	107	303
Internal Link Dist (ft)	355	346	123	
Turn Bay Length (ft)				
Base Capacity (vph)	2454	2454	594	532
Starvation Cap Reductn	817	983	0	0
Spillback Cap Reductn	73	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	0.39	0.16	0.53

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰	↱
Traffic Volume (vph)	0	838	550	0	80	239
Future Volume (vph)	0	838	550	0	80	239
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6	5.6
Lane Util. Factor		0.95	0.95		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3539	3539		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3539	3539		1770	1583
Peak-hour factor, PHF	0.90	0.90	0.95	0.95	0.85	0.85
Adj. Flow (vph)	0	931	579	0	94	281
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	931	579	0	94	281
Turn Type		NA	NA		Prot	Prot
Protected Phases		1	1		3	3
Permitted Phases						3
Actuated Green, G (s)		99.9	99.9		32.9	32.9
Effective Green, g (s)		99.9	99.9		32.9	32.9
Actuated g/C Ratio		0.69	0.69		0.23	0.23
Clearance Time (s)		5.6	5.6		5.6	5.6
Vehicle Extension (s)		3.0	3.0		5.0	5.0
Lane Grp Cap (vph)		2455	2455		404	361
v/s Ratio Prot		c0.26	0.16		0.05	c0.18
v/s Ratio Perm						
v/c Ratio		0.38	0.24		0.23	0.78
Uniform Delay, d1		9.2	8.1		45.3	52.1
Progression Factor		0.94	0.46		1.00	1.00
Incremental Delay, d2		0.4	0.2		0.6	11.8
Delay (s)		9.0	3.9		45.9	63.9
Level of Service		A	A		D	E
Approach Delay (s)		9.0	3.9		59.4	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	14.2
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	384	765	171	501	429	354
v/c Ratio	0.80	0.40	0.45	0.22	0.92	0.66
Control Delay	35.7	13.6	14.4	10.8	78.1	46.5
Queue Delay	0.0	0.3	0.7	0.3	0.0	0.0
Total Delay	35.7	13.9	15.0	11.2	78.1	46.5
Queue Length 50th (ft)	264	93	105	167	391	278
Queue Length 95th (ft)	#502	312	44	41	#514	358
Internal Link Dist (ft)		346		296	1476	
Turn Bay Length (ft)	220		200			
Base Capacity (vph)	478	1897	383	2241	477	537
Starvation Cap Reductn	0	509	56	1112	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.55	0.52	0.44	0.90	0.66

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	342	554	127	159	450	16	100	260	297	0	0	0
Future Volume (vph)	342	554	127	159	450	16	100	260	297	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1			5.7	5.7			
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.97		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (prot)	1787	3468		1752	3524			1845	1568			
Flt Permitted	0.47	1.00		0.28	1.00			0.99	1.00			
Satd. Flow (perm)	881	3468		507	3524			1845	1568			
Peak-hour factor, PHF	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.92	0.92	0.92
Adj. Flow (vph)	384	622	143	171	484	17	119	310	354	0	0	0
RTOR Reduction (vph)	0	11	0	0	2	0	0	0	0	0	0	0
Lane Group Flow (vph)	384	754	0	171	499	0	0	429	354	0	0	0
Confl. Peds. (#/hr)							1		5			
Heavy Vehicles (%)	1%	1%	2%	3%	2%	0%	3%	1%	3%	2%	2%	2%
Turn Type	Perm	NA		pm+pt	NA		Split	NA	pt+ov			
Protected Phases		6		5	2		7	7	7 5			
Permitted Phases	6			2								
Actuated Green, G (s)	75.9	75.9		89.1	89.1			36.5	49.3			
Effective Green, g (s)	75.9	75.9		89.1	89.1			36.5	49.3			
Actuated g/C Ratio	0.53	0.53		0.62	0.62			0.25	0.34			
Clearance Time (s)	6.1	6.1		6.1	6.1			5.7				
Vehicle Extension (s)	5.0	5.0		3.0	5.0			5.0				
Lane Grp Cap (vph)	464	1827		375	2180			467	536			
v/s Ratio Prot		0.22		0.02	0.14			c0.23	c0.23			
v/s Ratio Perm	c0.44			0.26								
v/c Ratio	0.83	0.41		0.46	0.23			0.92	0.66			
Uniform Delay, d1	28.6	20.6		13.4	12.2			52.3	40.2			
Progression Factor	0.74	0.65		0.82	0.87			1.00	1.00			
Incremental Delay, d2	15.0	0.7		0.9	0.2			23.9	4.0			
Delay (s)	36.2	14.1		11.9	10.8			76.2	44.3			
Level of Service	D	B		B	B			E	D			
Approach Delay (s)		21.5			11.1			61.8			0.0	
Approach LOS		C			B			E			A	

Intersection Summary			
HCM 2000 Control Delay	30.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	925	12	610	73	20
v/c Ratio	0.32	0.15	0.20	0.53	0.08
Control Delay	3.8	85.5	5.6	76.7	18.3
Queue Delay	0.2	0.0	0.0	0.0	0.0
Total Delay	4.0	85.5	5.6	76.7	18.3
Queue Length 50th (ft)	161	11	160	67	0
Queue Length 95th (ft)	94	36	3	104	20
Internal Link Dist (ft)	296		2760	173	
Turn Bay Length (ft)		200		100	
Base Capacity (vph)	2855	157	3082	352	315
Starvation Cap Reductn	892	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.47	0.08	0.20	0.21	0.06

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	809	42	11	561	58	16
Future Volume (vph)	809	42	11	561	58	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		5.2	5.2	5.6	5.2
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3503		1770	3539	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3503		1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.80	0.80
Adj. Flow (vph)	879	46	12	610	72	20
RTOR Reduction (vph)	1	0	0	0	0	18
Lane Group Flow (vph)	924	0	12	610	73	2
Confl. Peds. (#/hr)		9	9			2
Turn Type	NA		Prot	NA	Prot	pt+ov
Protected Phases	2		1	6	3	1 8
Permitted Phases						
Actuated Green, G (s)	112.9		4.3	123.3	9.9	19.8
Effective Green, g (s)	112.9		4.3	123.3	9.9	14.2
Actuated g/C Ratio	0.78		0.03	0.86	0.07	0.10
Clearance Time (s)	6.1		5.2	5.2	5.6	
Vehicle Extension (s)	4.0		3.0	4.0	3.0	
Lane Grp Cap (vph)	2746		52	3030	121	156
v/s Ratio Prot	c0.26		0.01	c0.17	c0.04	0.00
v/s Ratio Perm						
v/c Ratio	0.34		0.23	0.20	0.60	0.01
Uniform Delay, d1	4.6		68.2	1.8	65.1	58.6
Progression Factor	0.71		1.25	2.68	1.00	1.00
Incremental Delay, d2	0.3		2.2	0.1	8.2	0.0
Delay (s)	3.5		87.3	5.0	73.4	58.6
Level of Service	A		F	A	E	E
Approach Delay (s)	3.5			6.5	70.2	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	228	644	587	323	181	46
v/c Ratio	0.38	0.25	0.26	0.25	0.61	0.11
Control Delay	11.8	5.8	15.2	0.9	63.6	9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	5.8	15.2	0.9	63.6	9.3
Queue Length 50th (ft)	10	2	106	0	159	0
Queue Length 95th (ft)	169	253	258	18	169	16
Internal Link Dist (ft)		2760	1391		524	
Turn Bay Length (ft)	100			150	75	
Base Capacity (vph)	800	2549	2222	1342	398	534
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.25	0.26	0.24	0.45	0.09

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	217	612	540	297	127	32
Future Volume (vph)	217	612	540	297	127	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.6	5.6	5.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1769	3539	3539	1557	1770	1583
Flt Permitted	0.40	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	751	3539	3539	1557	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.92	0.92	0.70	0.70
Adj. Flow (vph)	228	644	587	323	181	46
RTOR Reduction (vph)	0	0	0	70	0	34
Lane Group Flow (vph)	228	644	587	253	181	12
Confl. Peds. (#/hr)	2			2	14	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	1	6	2	4	4	1 7
Permitted Phases	6			2		
Actuated Green, G (s)	102.1	102.1	88.8	113.0	24.2	37.5
Effective Green, g (s)	102.1	102.1	88.8	113.0	24.2	37.5
Actuated g/C Ratio	0.71	0.71	0.62	0.78	0.17	0.26
Clearance Time (s)	5.5	5.5	5.5	5.6	5.6	
Vehicle Extension (s)	4.0	4.5	4.5	6.0	6.0	
Lane Grp Cap (vph)	587	2509	2182	1221	297	412
v/s Ratio Prot	c0.02	0.18	0.17	0.03	c0.10	0.01
v/s Ratio Perm	c0.25			0.13		
v/c Ratio	0.39	0.26	0.27	0.21	0.61	0.03
Uniform Delay, d1	11.1	7.5	12.7	4.0	55.5	39.7
Progression Factor	0.80	0.62	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.2	0.1	0.2	6.2	0.0
Delay (s)	9.5	4.8	12.8	4.2	61.7	39.7
Level of Service	A	A	B	A	E	D
Approach Delay (s)		6.0	9.8		57.3	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	211	765	787	330	496	526
v/c Ratio	0.72	0.46	0.67	0.51	0.58	0.85
Control Delay	42.6	18.5	30.2	12.1	29.3	32.5
Queue Delay	11.5	0.0	0.0	0.3	0.0	13.0
Total Delay	54.0	18.5	30.2	12.4	29.3	45.6
Queue Length 50th (ft)	76	164	214	47	137	254
Queue Length 95th (ft)	#122	186	254	103	206	420
Internal Link Dist (ft)		355	330		239	
Turn Bay Length (ft)	150			100	140	
Base Capacity (vph)	292	1646	1183	650	856	705
Starvation Cap Reductn	0	0	0	0	0	163
Spillback Cap Reductn	59	0	0	66	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.46	0.67	0.57	0.58	0.97

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	167	604	645	271	471	500
Future Volume (vph)	167	604	645	271	471	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.94	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1784	3505	3505	1492	3502	1553
Flt Permitted	0.23	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	427	3505	3505	1492	3502	1553
Peak-hour factor, PHF	0.79	0.79	0.82	0.82	0.95	0.95
Adj. Flow (vph)	211	765	787	330	496	526
RTOR Reduction (vph)	0	0	0	150	0	0
Lane Group Flow (vph)	211	765	787	180	496	526
Confl. Peds. (#/hr)	15			15	150	
Heavy Vehicles (%)	1%	3%	3%	2%	0%	4%
Turn Type	pm+pt	NA	NA	Perm	Prot	Prot
Protected Phases	1	6	2		3	8
Permitted Phases	6			2		
Actuated Green, G (s)	41.1	41.1	29.2	29.2	22.0	37.0
Effective Green, g (s)	41.1	41.1	29.2	29.2	22.0	37.0
Actuated g/C Ratio	0.46	0.46	0.32	0.32	0.24	0.41
Clearance Time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Lane Grp Cap (vph)	288	1600	1137	484	856	638
v/s Ratio Prot	c0.05	0.22	0.22		0.14	c0.34
v/s Ratio Perm	c0.28			0.12		
v/c Ratio	0.73	0.48	0.69	0.37	0.58	0.82
Uniform Delay, d1	28.8	17.0	26.5	23.4	29.9	23.6
Progression Factor	1.00	1.00	1.00	1.00	0.84	0.80
Incremental Delay, d2	15.2	1.0	3.5	2.2	2.7	8.0
Delay (s)	44.0	18.0	30.0	25.5	28.0	26.8
Level of Service	D	B	C	C	C	C
Approach Delay (s)		23.6	28.7		27.4	
Approach LOS		C	C		C	

Intersection Summary			
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	33	86	236	166	537	78	792
v/c Ratio	0.08	0.19	0.72	0.34	0.48	0.19	0.37
Control Delay	22.2	15.9	41.6	5.5	9.4	4.6	4.4
Queue Delay	0.0	0.0	0.0	0.0	1.0	0.0	0.1
Total Delay	22.2	15.9	41.6	5.5	10.4	4.6	4.5
Queue Length 50th (ft)	14	23	123	0	50	8	45
Queue Length 95th (ft)	27	42	171	38	411	m14	49
Internal Link Dist (ft)		284			239		250
Turn Bay Length (ft)			85			100	
Base Capacity (vph)	633	647	491	657	1121	411	2120
Starvation Cap Reductn	0	0	0	0	332	0	443
Spillback Cap Reductn	0	2	0	15	178	0	239
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.13	0.48	0.26	0.68	0.19	0.47

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	42	26	208	0	146	0	463	21	73	737	0
Future Volume (vph)	26	42	26	208	0	146	0	463	21	73	737	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Lane Util. Factor	1.00	1.00		1.00		1.00		1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.97		1.00		0.89		0.99		1.00	1.00	
Flpb, ped/bikes	0.90	1.00		0.95		1.00		1.00		0.95	1.00	
Frt	1.00	0.94		1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1630	1615		1714		1429		1852		1656	3505	
Flt Permitted	0.95	1.00		0.70		1.00		1.00		0.39	1.00	
Satd. Flow (perm)	1630	1615		1265		1429		1852		676	3505	
Peak-hour factor, PHF	0.79	0.79	0.79	0.88	0.88	0.88	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	33	53	33	236	0	166	0	514	23	78	792	0
RTOR Reduction (vph)	0	24	0	0	0	123	0	1	0	0	0	0
Lane Group Flow (vph)	33	62	0	236	0	43	0	536	0	78	792	0
Confl. Peds. (#/hr)	42		41	41		42			56	56		
Heavy Vehicles (%)	0%	13%	0%	0%	0%	0%	0%	0%	32%	4%	3%	0%
Turn Type	Perm	NA		D.Pm		Perm		NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4			4		4				2		
Actuated Green, G (s)	23.4	23.4		23.4		23.4		54.5		54.5	54.5	
Effective Green, g (s)	23.4	23.4		23.4		23.4		54.5		54.5	54.5	
Actuated g/C Ratio	0.26	0.26		0.26		0.26		0.61		0.61	0.61	
Clearance Time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Vehicle Extension (s)	4.0	4.0		4.0		4.0		4.0		4.0	4.0	
Lane Grp Cap (vph)	423	419		328		371		1121		409	2122	
v/s Ratio Prot		0.04						c0.29			0.23	
v/s Ratio Perm	0.02			c0.19		0.03				0.12		
v/c Ratio	0.08	0.15		0.72		0.12		0.48		0.19	0.37	
Uniform Delay, d1	25.2	25.6		30.3		25.4		9.9		7.9	9.0	
Progression Factor	1.00	1.00		1.00		1.00		0.71		0.34	0.38	
Incremental Delay, d2	0.1	0.2		7.9		0.2		1.2		0.9	0.5	
Delay (s)	25.3	25.8		38.2		25.6		8.1		3.6	3.9	
Level of Service	C	C		D		C		A		A	A	
Approach Delay (s)		25.7			33.0			8.1			3.9	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.55			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.1	
Intersection Capacity Utilization	64.2%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	110	78	82	174	139	38	608	815
v/c Ratio	0.35	0.20	0.27	0.59	0.56	0.18	0.74	0.53
Control Delay	36.3	2.3	34.8	43.2	43.6	10.7	21.1	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0
Total Delay	36.3	2.3	34.8	43.2	43.6	10.7	23.7	10.3
Queue Length 50th (ft)	56	0	41	96	76	12	299	111
Queue Length 95th (ft)	92	0	82	167	141	m13	134	76
Internal Link Dist (ft)				296			250	793
Turn Bay Length (ft)		25				100		
Base Capacity (vph)	312	388	303	295	248	215	825	1539
Starvation Cap Reductn	0	0	0	0	0	0	118	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.20	0.27	0.59	0.56	0.18	0.86	0.53

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	0	62	78	151	146	36	578	0	0	664	94
Future Volume (vph)	88	0	62	78	151	146	36	578	0	0	664	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Lane Util. Factor	1.00		1.00	1.00	0.95	0.95	1.00	1.00			0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.97	1.00	1.00	1.00			0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	0.98	1.00			1.00	
Frt	1.00		0.85	1.00	0.99	0.85	1.00	1.00			0.98	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1770		1568	1719	1675	1408	1763	1863			3448	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.26	1.00			1.00	
Satd. Flow (perm)	1770		1568	1719	1675	1408	486	1863			3448	
Peak-hour factor, PHF	0.80	0.80	0.80	0.95	0.95	0.95	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	110	0	78	82	159	154	38	608	0	0	714	101
RTOR Reduction (vph)	0	0	64	0	0	0	0	0	0	0	11	0
Lane Group Flow (vph)	110	0	14	82	174	139	38	608	0	0	804	0
Confl. Peds. (#/hr)	196		28	28		196	34					34
Heavy Vehicles (%)	2%	0%	3%	5%	3%	9%	0%	2%	0%	0%	1%	2%
Turn Type	Prot		Prot	Split	NA	Prot	Perm	NA			NA	
Protected Phases	8		8	4	4	4		2			2	
Permitted Phases							2					
Actuated Green, G (s)	15.9		15.9	15.9	15.9	15.9	39.9	39.9			39.9	
Effective Green, g (s)	15.9		15.9	15.9	15.9	15.9	39.9	39.9			39.9	
Actuated g/C Ratio	0.18		0.18	0.18	0.18	0.18	0.44	0.44			0.44	
Clearance Time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	4.0	4.0	4.0			4.0	
Lane Grp Cap (vph)	312		277	303	295	248	215	825			1528	
v/s Ratio Prot	c0.06		0.01	0.05	c0.10	0.10		c0.33			0.23	
v/s Ratio Perm							0.08					
v/c Ratio	0.35		0.05	0.27	0.59	0.56	0.18	0.74			0.53	
Uniform Delay, d1	32.5		30.8	32.0	34.1	33.9	15.1	20.7			18.2	
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.56	0.73			0.52	
Incremental Delay, d2	3.1		0.3	2.2	8.4	8.9	1.7	5.4			1.0	
Delay (s)	35.6		31.1	34.2	42.4	42.7	10.2	20.5			10.4	
Level of Service	D		C	C	D	D	B	C			B	
Approach Delay (s)		33.8			40.8			19.9			10.4	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.3
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	486	254	673	1187
v/c Ratio	0.67	0.80	0.29	0.69
Control Delay	36.0	33.9	7.8	17.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	36.0	33.9	7.8	17.1
Queue Length 50th (ft)	119	46	65	218
Queue Length 95th (ft)	m158	#125	97	336
Internal Link Dist (ft)	1498		793	705
Turn Bay Length (ft)	200	125		
Base Capacity (vph)	1171	319	2287	1727
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.42	0.80	0.29	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	328	99	208	552	716	411
Future Volume (vph)	328	99	208	552	716	411
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7		6.1	6.1	6.1	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.96	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.97		1.00	1.00	0.95	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	3385		1803	3438	3182	
Flt Permitted	0.96		0.16	1.00	1.00	
Satd. Flow (perm)	3385		308	3438	3182	
Peak-hour factor, PHF	0.88	0.88	0.82	0.82	0.95	0.95
Adj. Flow (vph)	373	112	254	673	754	433
RTOR Reduction (vph)	39	0	0	0	70	0
Lane Group Flow (vph)	447	0	254	673	1117	0
Confl. Peds. (#/hr)		14	46			46
Heavy Vehicles (%)	0%	0%	0%	5%	4%	1%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	2		1	4	3	
Permitted Phases			4			
Actuated Green, G (s)	18.3		59.9	59.9	46.9	
Effective Green, g (s)	18.3		59.9	59.9	46.9	
Actuated g/C Ratio	0.20		0.67	0.67	0.52	
Clearance Time (s)	5.7		6.1	6.1	6.1	
Vehicle Extension (s)	4.0		2.0	0.2	2.0	
Lane Grp Cap (vph)	688		319	2288	1658	
v/s Ratio Prot	c0.13		c0.06	0.20	0.35	
v/s Ratio Perm			c0.47			
v/c Ratio	0.65		0.80	0.29	0.67	
Uniform Delay, d1	32.9		22.2	6.3	15.9	
Progression Factor	1.08		0.80	1.11	1.00	
Incremental Delay, d2	2.3		9.7	0.3	2.2	
Delay (s)	37.8		27.5	7.2	18.1	
Level of Service	D		C	A	B	
Approach Delay (s)	37.8			12.7	18.1	
Approach LOS	D			B	B	

Intersection Summary			
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	74.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	5	935	985	23	7	6
v/c Ratio	0.05	0.32	0.34	0.14	0.01	0.01
Control Delay	45.0	3.2	8.5	40.2	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	3.2	8.5	40.2	0.0	0.0
Queue Length 50th (ft)	3	72	68	14	0	0
Queue Length 95th (ft)	15	140	326	26	0	0
Internal Link Dist (ft)		293	1215		158	248
Turn Bay Length (ft)	180			50		
Base Capacity (vph)	438	2941	2859	490	904	914
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.32	0.34	0.05	0.01	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	856	5	0	936	0	16	0	5	0	0	5
Future Volume (vph)	5	856	5	0	936	0	16	0	5	0	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7			5.7		5.6	5.6			5.6	
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98			0.98	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			1.00		1.00	0.85			0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	3434			3438		1796	1585			1616	
Flt Permitted	0.95	1.00			1.00		0.75	1.00			1.00	
Satd. Flow (perm)	1805	3434			3438		1425	1585			1616	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.69	0.69	0.69	0.78	0.78	0.78
Adj. Flow (vph)	5	930	5	0	985	0	23	0	7	0	0	6
RTOR Reduction (vph)	0	0	0	0	0	0	0	6	0	0	6	0
Lane Group Flow (vph)	5	935	0	0	985	0	23	1	0	0	0	0
Confl. Peds. (#/hr)	51		29	29		51	3		4	4		3
Heavy Vehicles (%)	0%	5%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA			NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	1.3	81.1			74.1		7.6	7.6			7.6	
Effective Green, g (s)	1.3	81.1			74.1		7.6	7.6			7.6	
Actuated g/C Ratio	0.01	0.81			0.74		0.08	0.08			0.08	
Clearance Time (s)	5.7	5.7			5.7		5.6	5.6			5.6	
Vehicle Extension (s)	3.0	3.0			4.5		1.0	1.0			1.0	
Lane Grp Cap (vph)	23	2784			2547		108	120			122	
v/s Ratio Prot	0.00	c0.27			c0.29			0.00			0.00	
v/s Ratio Perm							c0.02					
v/c Ratio	0.22	0.34			0.39		0.21	0.00			0.00	
Uniform Delay, d1	48.8	2.5			4.7		43.4	42.7			42.7	
Progression Factor	1.00	1.00			1.76		1.00	1.00			1.00	
Incremental Delay, d2	4.7	0.3			0.4		0.4	0.0			0.0	
Delay (s)	53.6	2.8			8.6		43.8	42.7			42.7	
Level of Service	D	A			A		D	D			D	
Approach Delay (s)		3.1			8.6			43.5			42.7	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	255	1056	11	717	98	95	39	33	298
v/c Ratio	0.88	0.51	0.10	0.53	0.75	0.33	0.32	0.15	0.68
Control Delay	70.8	12.1	44.7	25.5	79.7	33.0	51.5	39.0	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.8	12.1	44.7	25.5	79.7	33.0	51.5	39.0	13.2
Queue Length 50th (ft)	138	106	7	173	62	45	24	20	0
Queue Length 95th (ft)	#278	351	24	263	#147	87	51	39	42
Internal Link Dist (ft)		1215		729		257		381	
Turn Bay Length (ft)	225		150		100		180		
Base Capacity (vph)	291	2083	269	1362	130	456	124	445	573
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.51	0.04	0.53	0.75	0.21	0.31	0.07	0.52

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	224	785	144	10	607	52	90	62	26	31	26	238
Future Volume (vph)	224	785	144	10	607	52	90	62	26	31	26	238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1626	3457		1504	3481		1770	1806		1687	1827	1428
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1626	3457		1504	3481		1770	1806		1687	1827	1428
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.80	0.80	0.80
Adj. Flow (vph)	255	892	164	11	660	57	98	67	28	39	32	298
RTOR Reduction (vph)	0	9	0	0	5	0	0	17	0	0	0	261
Lane Group Flow (vph)	255	1047	0	11	712	0	98	78	0	39	33	37
Confl. Peds. (#/hr)	22					22	4		4	4		4
Heavy Vehicles (%)	11%	2%	2%	20%	2%	4%	2%	0%	0%	7%	4%	11%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												8
Actuated Green, G (s)	17.9	55.1		1.8	39.0		7.4	15.3		4.4	12.3	12.3
Effective Green, g (s)	17.9	55.1		1.8	39.0		7.4	15.3		4.4	12.3	12.3
Actuated g/C Ratio	0.18	0.55		0.02	0.39		0.07	0.15		0.04	0.12	0.12
Clearance Time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Vehicle Extension (s)	6.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	291	1904		27	1357		130	276		74	224	175
v/s Ratio Prot	c0.16	c0.30		0.01	0.20		c0.06	c0.04		0.02	0.02	
v/s Ratio Perm												0.03
v/c Ratio	0.88	0.55		0.41	0.52		0.75	0.28		0.53	0.15	0.21
Uniform Delay, d1	40.0	14.5		48.6	23.4		45.4	37.5		46.8	39.2	39.5
Progression Factor	1.02	0.85		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	26.5	1.1		13.1	1.5		22.8	0.8		8.5	0.4	0.8
Delay (s)	67.3	13.4		61.7	24.8		68.3	38.3		55.3	39.6	40.3
Level of Service	E	B		E	C		E	D		E	D	D
Approach Delay (s)		23.9			25.4			53.5			41.8	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	29.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.4
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	200	75	607	295	496	54	257
v/c Ratio	0.46	0.45	0.81	0.72	0.68	0.26	0.37
Control Delay	20.1	8.4	28.6	30.1	22.7	19.0	15.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.1	8.4	28.6	30.1	22.7	19.0	15.0
Queue Length 50th (ft)	60	0	213	100	164	15	63
Queue Length 95th (ft)	127	0	#392	#249	311	46	136
Internal Link Dist (ft)	628		690		412		625
Turn Bay Length (ft)		250		80		150	
Base Capacity (vph)	517	168	883	510	908	260	845
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.45	0.69	0.58	0.55	0.21	0.30

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Ann Arbor Station Traffic Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	101	64	11	366	127	280	460	11	48	159	69
Future Volume (vph)	69	101	64	11	366	127	280	460	11	48	159	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	4.0		5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	1.00		0.99		1.00	1.00		1.00	0.98	
Flpb, ped/bikes		1.00	1.00		1.00		0.98	1.00		1.00	1.00	
Frt		1.00	0.85		0.97		1.00	1.00		1.00	0.95	
Flt Protected		0.98	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1819	1553		1809		1769	1873		1805	1714	
Flt Permitted		0.57	1.00		0.99		0.57	1.00		0.28	1.00	
Satd. Flow (perm)		1067	1553		1797		1054	1873		537	1714	
Peak-hour factor, PHF	0.85	0.85	0.85	0.83	0.83	0.83	0.95	0.95	0.95	0.89	0.89	0.89
Adj. Flow (vph)	81	119	75	13	441	153	295	484	12	54	179	78
RTOR Reduction (vph)	0	0	75	0	15	0	0	1	0	0	20	0
Lane Group Flow (vph)	0	200	0	0	592	0	295	495	0	54	237	0
Confl. Peds. (#/hr)	1		3	3		1	9		4	4		9
Heavy Vehicles (%)	3%	2%	4%	0%	1%	0%	0%	1%	0%	0%	6%	0%
Turn Type	Perm	NA	NA	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		26.4	0.0		26.4		25.3	25.3		25.3	25.3	
Effective Green, g (s)		26.4	0.0		26.4		25.3	25.3		25.3	25.3	
Actuated g/C Ratio		0.39	0.00		0.39		0.37	0.37		0.37	0.37	
Clearance Time (s)		5.6			5.6		5.6	5.6		5.6	5.6	
Vehicle Extension (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		417	0		702		395	702		201	642	
v/s Ratio Prot								0.26			0.14	
v/s Ratio Perm		0.19			c0.33		c0.28			0.10		
v/c Ratio		0.48	0.00		0.84		0.75	0.70		0.27	0.37	
Uniform Delay, d1		15.4	33.8		18.7		18.3	17.9		14.7	15.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.2	0.0		9.4		8.0	3.5		1.0	0.5	
Delay (s)		16.6	33.8		28.1		26.3	21.4		15.7	15.8	
Level of Service		B	C		C		C	C		B	B	
Approach Delay (s)		21.3			28.1			23.2			15.8	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	23.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	67.5	Sum of lost time (s)	15.2
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	940	5	0	0	0	0	0	36	36	10	0
Future Volume (Veh/h)	0	940	5	0	0	0	0	0	36	36	10	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1022	5	0	0	0	0	0	39	39	11	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		817										
pX, platoon unblocked				0.89			0.89	0.89	0.89	0.89	0.89	
vC, conflicting volume	0			1027			1030	1024	514	550	1027	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			776			779	773	197	238	776	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	95	93	96	100
cM capacity (veh/h)	1622			742			246	291	719	584	290	1084

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	681	346	39	50
Volume Left	0	0	0	39
Volume Right	0	5	39	0
cSH	1700	1700	719	478
Volume to Capacity	0.40	0.20	0.05	0.10
Queue Length 95th (ft)	0	0	4	9
Control Delay (s)	0.0	0.0	10.3	13.4
Lane LOS			B	B
Approach Delay (s)	0.0		10.3	13.4
Approach LOS			B	B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

Ann Arbor Station Traffic Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	832	5	36	5	0	0	0	42
Future Volume (Veh/h)	0	0	0	0	832	5	36	5	0	0	0	42
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	904	5	39	5	0	0	0	46
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1301							
pX, platoon unblocked	0.98						0.98	0.98		0.98	0.98	0.98
vC, conflicting volume	909			0			498	909	0	909	906	454
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	868			0			448	868	0	868	865	404
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			91	98	100	100	100	92
cM capacity (veh/h)	757			1622			446	284	1084	238	284	584

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	603	306	44	46
Volume Left	0	0	39	0
Volume Right	0	5	0	46
cSH	1700	1700	419	584
Volume to Capacity	0.35	0.18	0.11	0.08
Queue Length 95th (ft)	0	0	9	6
Control Delay (s)	0.0	0.0	14.6	11.7
Lane LOS			B	B
Approach Delay (s)	0.0		14.6	11.7
Approach LOS			B	B

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		

Ann Arbor Station Traffic Analysis

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	54	773	801	57	138	74
v/c Ratio	0.11	0.30	0.31	0.05	0.51	0.24
Control Delay	5.8	5.2	5.0	2.3	33.6	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.8	5.2	5.0	2.3	33.6	8.8
Queue Length 50th (ft)	7	61	73	0	57	0
Queue Length 95th (ft)	24	110	220	23	100	30
Internal Link Dist (ft)		451	355		262	
Turn Bay Length (ft)	250			250		
Base Capacity (vph)	470	2589	2589	1173	467	472
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.30	0.31	0.05	0.30	0.16

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	50	711	737	52	127	68
Future Volume (vph)	50	711	737	52	127	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.34	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	642	3539	3539	1583	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	773	801	57	138	74
RTOR Reduction (vph)	0	0	0	17	0	64
Lane Group Flow (vph)	54	773	801	40	138	10
Turn Type	Perm	NA	NA	Perm	Prot	Prot
Protected Phases		2	6		4	4
Permitted Phases	2			6		
Actuated Green, G (s)	50.3	50.3	50.3	50.3	9.7	9.7
Effective Green, g (s)	50.3	50.3	50.3	50.3	9.7	9.7
Actuated g/C Ratio	0.70	0.70	0.70	0.70	0.13	0.13
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	448	2472	2472	1105	238	213
v/s Ratio Prot		0.22	c0.23		c0.08	0.01
v/s Ratio Perm	0.08			0.03		
v/c Ratio	0.12	0.31	0.32	0.04	0.58	0.05
Uniform Delay, d1	3.6	4.2	4.2	3.4	29.2	27.1
Progression Factor	1.00	1.00	0.99	1.82	1.00	1.00
Incremental Delay, d2	0.5	0.3	0.3	0.1	3.4	0.1
Delay (s)	4.1	4.5	4.5	6.1	32.6	27.2
Level of Service	A	A	A	A	C	C
Approach Delay (s)		4.5	4.6		30.7	
Approach LOS		A	A		C	

Intersection Summary			
HCM 2000 Control Delay	7.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	72.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT
Lane Group Flow (vph)	827	875
v/c Ratio	0.30	0.32
Control Delay	4.7	4.8
Queue Delay	0.0	0.0
Total Delay	4.7	4.8
Queue Length 50th (ft)	0	0
Queue Length 95th (ft)	93	100
Internal Link Dist (ft)	52	451
Turn Bay Length (ft)		
Base Capacity (vph)	2735	2735
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.30	0.32

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	761	805	0	0	0
Future Volume (vph)	0	761	805	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0	2.0			
Lane Util. Factor		0.95	0.95			
Frpb, ped/bikes		1.00	1.00			
Flpb, ped/bikes		1.00	1.00			
Frt		1.00	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		3539	3539			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		3539	3539			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	827	875	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	827	875	0	0	0
Confl. Peds. (#/hr)						133
Turn Type		NA	NA		Prot	
Protected Phases		4	8		6	
Permitted Phases						
Actuated Green, G (s)		18.1	18.1			
Effective Green, g (s)		18.1	18.1			
Actuated g/C Ratio		0.68	0.68			
Clearance Time (s)		2.0	2.0			
Vehicle Extension (s)		0.2	0.2			
Lane Grp Cap (vph)		2390	2390			
v/s Ratio Prot		0.23	c0.25			
v/s Ratio Perm						
v/c Ratio		0.35	0.37			
Uniform Delay, d1		1.8	1.9			
Progression Factor		1.00	1.00			
Incremental Delay, d2		0.4	0.4			
Delay (s)		2.2	2.3			
Level of Service		A	A			
Approach Delay (s)		2.2	2.3		0.0	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	2.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	26.8	Sum of lost time (s)	4.0
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

202 Broadway & Ped Crossing Performance by movement

Movement	EBT	WBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0
Total Delay (hr)	2.4	2.9	5.2
Total Del/Veh (s)	11.6	12.9	12.3
Stop Delay (hr)	2.1	1.9	4.0
Stop Del/Veh (s)	10.1	8.7	9.4
Total Stops	319	404	723
Stop/Veh	0.43	0.51	0.47

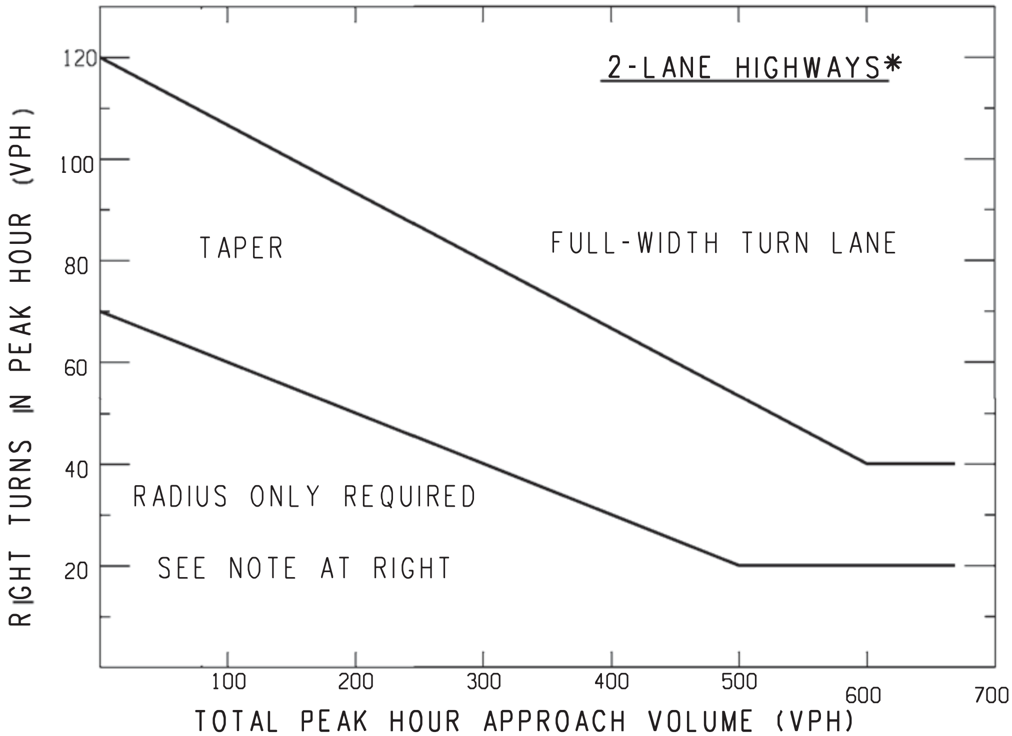
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	50	711	737	52	127	68
Future Volume (Veh/h)	50	711	737	52	127	68
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	54	773	801	57	138	74
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			435			
pX, platoon unblocked	0.94				0.94	0.94
vC, conflicting volume	858				1324	429
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	731				1224	276
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				9	89
cM capacity (veh/h)	821				151	681

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	312	515	534	324	138	74
Volume Left	54	0	0	0	138	0
Volume Right	0	0	0	57	0	74
cSH	821	1700	1700	1700	151	681
Volume to Capacity	0.07	0.30	0.31	0.19	0.91	0.11
Queue Length 95th (ft)	5	0	0	0	161	9
Control Delay (s)	2.3	0.0	0.0	0.0	110.2	10.9
Lane LOS	A				F	B
Approach Delay (s)	0.9		0.0		75.6	
Approach LOS					F	

Intersection Summary			
Average Delay	8.8		
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

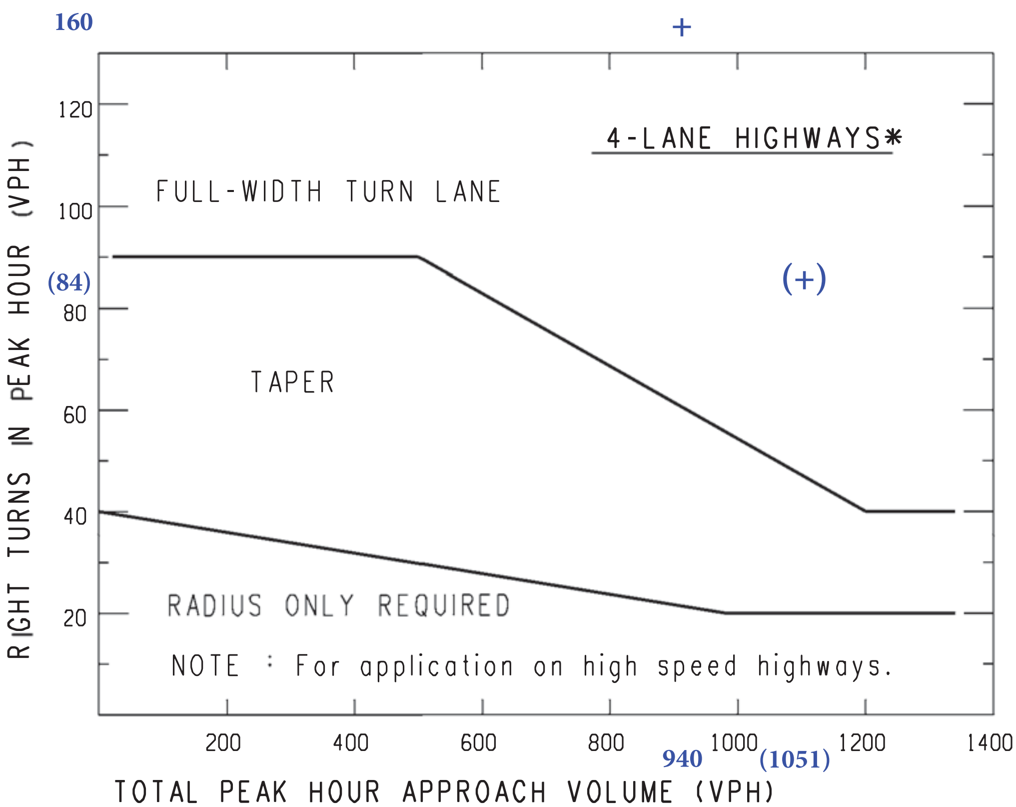
APPENDIX H

FUTURE YEAR (2035) RIGHT-TURN LANE ANALYSIS
EASTBOUND FULLER ROAD AT
EAST SITE DRIVEWAY



NOTE:
For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

Adjust peak hour right turns = Peak hour right turns - 20



Fuller Road @ Fuller Site East Driveway

Future Year (2035)

*If a center left-turn lane exists(i.e. 3 or 5 lane highway), subtract the number of left turns in approach volume from the total approach volume to get an adjusted total approach volume.

+ AM Peak-hour
(+) PM Peak-hour

Sample Problem:
The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hour is 100 vph. Determine if a right turn lane is recommended.

Solution:
Figure indicates that the intersection of 300 vph and 100 vph is located above the upper trend line; thus,a right-turn lane may be recommended.

MDOT Michigan Department of Transportation TRAFFIC AND SAFETY NOTE	TRAFFIC VOLUME GUIDELINES FOR RIGHT-TURN LANES AND TAPERS		
DRAWN BY: MTS CHECKED BY: JAT	08/05/2004 PLAN DATE:	604A	SHEET 2 OF 2
FILE: K:/DGN/ts notes/Note604A tsn.dgn	REV. 08/05/2004		

APPENDIX I

FUTURE YEAR (2035) FULLER ROAD SITE DEVELOPMENT CAPACITY ANALYSIS REPORTS

Lane Group	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	315	605	30	956	91	1411
v/c Ratio	0.61	1.01	0.26	0.92	1.20	0.74
Control Delay	34.4	74.5	18.4	34.3	167.4	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.4	74.5	18.4	34.3	167.4	5.6
Queue Length 50th (ft)	168	~390	9	506	~47	122
Queue Length 95th (ft)	237	#552	32	#814	m#76	99
Internal Link Dist (ft)		1428		423		156
Turn Bay Length (ft)			150		90	
Base Capacity (vph)	520	598	114	1041	76	1917
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	1.01	0.26	0.92	1.20	0.74

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Movement	WBL	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	265	476	32	27	811	59	86	1000	340
Future Volume (vph)	265	476	32	27	811	59	86	1000	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1612	1845		1798	1811		1770	3323	
Flt Permitted	0.95	1.00		0.11	1.00		0.07	1.00	
Satd. Flow (perm)	1612	1845		200	1811		135	3323	
Peak-hour factor, PHF	0.84	0.84	0.84	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	315	567	38	30	891	65	91	1053	358
RTOR Reduction (vph)	0	3	0	0	13	0	0	30	0
Lane Group Flow (vph)	315	602	0	30	943	0	91	1381	0
Confl. Peds. (#/hr)	33		48	27			52		27
Heavy Vehicles (%)	6%	1%	2%	0%	4%	2%	2%	3%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			1			1	
Permitted Phases	2	2		1			1		
Actuated Green, G (s)	32.3	32.3		56.8	56.8		56.8	56.8	
Effective Green, g (s)	32.3	32.3		56.8	56.8		56.8	56.8	
Actuated g/C Ratio	0.32	0.32		0.57	0.57		0.57	0.57	
Clearance Time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Grp Cap (vph)	520	595		113	1028		76	1887	
v/s Ratio Prot		c0.33			0.52			0.42	
v/s Ratio Perm	0.20			0.15			c0.68		
v/c Ratio	0.61	1.01		0.27	0.92		1.20	0.73	
Uniform Delay, d1	28.5	33.9		11.0	19.5		21.6	16.0	
Progression Factor	1.00	1.00		1.00	1.00		0.43	0.25	
Incremental Delay, d2	5.2	40.0		5.7	14.1		146.3	1.7	
Delay (s)	33.7	73.8		16.6	33.6		155.6	5.8	
Level of Service	C	E		B	C		F	A	
Approach Delay (s)		60.1			33.1			14.8	
Approach LOS		E			C			B	

Intersection Summary			
HCM 2000 Control Delay	32.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	93.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	159	159	918	1586
v/c Ratio	0.38	0.38	0.44	0.75
Control Delay	34.1	34.1	18.1	11.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	34.1	34.1	18.1	11.4
Queue Length 50th (ft)	81	81	297	341
Queue Length 95th (ft)	142	142	m315	429
Internal Link Dist (ft)	303	327	1027	111
Turn Bay Length (ft)				
Base Capacity (vph)	414	414	2105	2124
Starvation Cap Reductn	0	0	0	1
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.38	0.38	0.44	0.75

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	113	22	11	113	22	11	811	22	22	1394	43
Future Volume (vph)	11	113	22	11	113	22	11	811	22	22	1394	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.2			6.2	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.98			0.98			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1818			1818			3523			3521	
Flt Permitted		0.97			0.97			0.92			0.93	
Satd. Flow (perm)		1774			1774			3246			3272	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	123	24	12	123	24	12	882	24	24	1515	47
RTOR Reduction (vph)	0	6	0	0	6	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	153	0	0	153	0	0	916	0	0	1584	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		23.0			23.0			64.8			64.8	
Effective Green, g (s)		23.0			23.0			64.8			64.8	
Actuated g/C Ratio		0.23			0.23			0.65			0.65	
Clearance Time (s)		6.0			6.0			6.2			6.2	
Lane Grp Cap (vph)		408			408			2103			2120	
v/s Ratio Prot												
v/s Ratio Perm		c0.09			0.09			0.28			c0.48	
v/c Ratio		0.37			0.37			0.44			0.75	
Uniform Delay, d1		32.4			32.4			8.6			12.0	
Progression Factor		1.00			1.00			2.05			0.76	
Incremental Delay, d2		2.6			2.6			0.2			2.1	
Delay (s)		35.1			35.1			18.0			11.2	
Level of Service		D			D			B			B	
Approach Delay (s)		35.1			35.1			18.0			11.2	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	51	323	897	819	1579
v/c Ratio	0.36	0.38	0.59	1.14	0.55
Control Delay	51.3	5.1	2.2	105.7	4.4
Queue Delay	9.6	0.0	0.5	0.0	0.1
Total Delay	60.9	5.1	2.7	105.7	4.5
Queue Length 50th (ft)	31	18	2	~493	145
Queue Length 95th (ft)	65	56	6	#727	180
Internal Link Dist (ft)			111		640
Turn Bay Length (ft)	300			240	
Base Capacity (vph)	144	849	1524	717	2864
Starvation Cap Reductn	0	0	246	0	0
Spillback Cap Reductn	65	0	0	0	216
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.65	0.38	0.70	1.14	0.60

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	43	0	271	0	557	286	778	1416	5
Future Volume (vph)	0	0	0	43	0	271	0	557	286	778	1416	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0		6.0		6.0		6.0	6.0	
Lane Util. Factor				1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes				1.00		1.00		0.99		1.00	1.00	
Flpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Frt				1.00		0.85		0.95		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				1805		1583		3332		1786	3572	
Flt Permitted				0.95		1.00		1.00		0.22	1.00	
Satd. Flow (perm)				1805		1583		3332		410	3572	
Peak-hour factor, PHF	0.92	0.92	0.92	0.84	0.84	0.84	0.94	0.94	0.94	0.95	0.90	0.90
Adj. Flow (vph)	0	0	0	51	0	323	0	593	304	819	1573	6
RTOR Reduction (vph)	0	0	0	0	0	153	0	52	0	0	0	0
Lane Group Flow (vph)	0	0	0	51	0	170	0	845	0	819	1579	0
Confl. Peds. (#/hr)	1		5	1		1			7	7		
Heavy Vehicles (%)	2%	2%	2%	0%	0%	2%	0%	2%	1%	1%	1%	0%
Turn Type				Prot		pt+ov		NA		D.P+P	NA	
Protected Phases		8		4		4 5		6		5	2	
Permitted Phases	8									6		
Actuated Green, G (s)				7.8		43.8		44.2		74.2	80.2	
Effective Green, g (s)				7.8		43.8		44.2		74.2	80.2	
Actuated g/C Ratio				0.08		0.44		0.44		0.74	0.80	
Clearance Time (s)				6.0				6.0		6.0	6.0	
Vehicle Extension (s)				4.0				5.0		2.0	5.0	
Lane Grp Cap (vph)				140		693		1472		717	2864	
v/s Ratio Prot				c0.03		0.11		0.25		c0.34	0.44	
v/s Ratio Perm										c0.50		
v/c Ratio				0.36		0.24		0.57		1.14	0.55	
Uniform Delay, d1				43.7		17.7		20.9		20.7	3.5	
Progression Factor				1.00		1.00		0.04		1.00	1.00	
Incremental Delay, d2				2.2		0.3		1.5		80.1	0.8	
Delay (s)				45.9		17.9		2.3		100.9	4.3	
Level of Service				D		B		A		F	A	
Approach Delay (s)		0.0			21.8			2.3			37.3	
Approach LOS		A			C			A			D	

Intersection Summary			
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.7
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	933	106	5	303	64	90
Future Volume (Veh/h)	933	106	5	303	64	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1014	115	5	329	70	98
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1131		1412	1074
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1131		1412	1074
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		53	63
cM capacity (veh/h)			617		151	267

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1129	334	168
Volume Left	0	5	70
Volume Right	115	0	98
cSH	1700	617	202
Volume to Capacity	0.66	0.01	0.83
Queue Length 95th (ft)	0	1	152
Control Delay (s)	0.0	0.3	75.1
Lane LOS		A	F
Approach Delay (s)	0.0	0.3	75.1
Approach LOS			F

Intersection Summary			
Average Delay	7.8		
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	90	0	0	111	37	626	0	0	0	0
Future Volume (Veh/h)	0	0	90	0	0	111	37	626	0	0	0	0
Sign Control		Yield			Yield			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.74	0.92	0.92	0.87	0.87	0.87	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	122	0	0	128	43	720	0	0	0	0
Pedestrians											6	
Lane Width (ft)											0.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	580	806	0	928	806	366	0			720		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	580	806	0	928	806	366	0			720		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	89	100	100	80	97			100		
cM capacity (veh/h)	311	306	1084	194	306	631	1622			877		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	122	128	283	480
Volume Left	0	0	43	0
Volume Right	122	128	0	0
cSH	1084	631	1622	1700
Volume to Capacity	0.11	0.20	0.03	0.28
Queue Length 95th (ft)	9	19	2	0
Control Delay (s)	8.7	12.2	1.3	0.0
Lane LOS	A	B	A	
Approach Delay (s)	8.7	12.2	0.5	
Approach LOS	A	B		

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	33.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	5	11	21	16	0	0	0	0	85	806	42
Future Volume (Veh/h)	0	5	11	21	16	0	0	0	0	85	806	42
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.60	0.60	0.60	0.70	0.70	0.70	0.92	0.92	0.92	0.81	0.81	0.81
Hourly flow rate (vph)	0	8	18	30	23	0	0	0	0	105	995	52
Pedestrians		6			12							
Lane Width (ft)		12.0			12.0							
Walking Speed (ft/s)		4.0			4.0							
Percent Blockage		1			1							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1248	1249	530	742	1275	12	1053			12		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1248	1249	530	742	1275	12	1053			12		
tC, single (s)	7.5	6.5	7.2	7.5	6.6	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.1	3.3	2.2			2.2		
p0 queue free %	100	95	96	89	84	100	100			93		
cM capacity (veh/h)	108	161	462	265	146	1061	665			1604		

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	26	53	602	550
Volume Left	0	30	105	0
Volume Right	18	0	0	52
cSH	293	196	1604	1700
Volume to Capacity	0.09	0.27	0.07	0.32
Queue Length 95th (ft)	7	26	5	0
Control Delay (s)	18.5	30.0	1.9	0.0
Lane LOS	C	D	A	
Approach Delay (s)	18.5	30.0	1.0	
Approach LOS	C	D		

Intersection Summary				
Average Delay		2.6		
Intersection Capacity Utilization		41.5%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	819	502	262	485
v/c Ratio	0.45	0.27	0.40	0.83
Control Delay	25.4	18.7	34.3	53.5
Queue Delay	0.0	0.2	0.0	0.0
Total Delay	25.4	18.9	34.3	53.5
Queue Length 50th (ft)	232	177	179	407
Queue Length 95th (ft)	431	167	231	499
Internal Link Dist (ft)	355	346	123	
Turn Bay Length (ft)				
Base Capacity (vph)	1831	1849	779	696
Starvation Cap Reductn	0	694	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.45	0.43	0.34	0.70

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	737	472	0	249	461
Future Volume (vph)	0	737	472	0	249	461
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6	5.6
Lane Util. Factor		0.95	0.95		1.00	1.00
Frpb, ped/bikes		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3505	3539		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3505	3539		1770	1583
Peak-hour factor, PHF	0.90	0.90	0.94	0.94	0.95	0.95
Adj. Flow (vph)	0	819	502	0	262	485
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	819	502	0	262	485
Confl. Peds. (#/hr)					4	
Heavy Vehicles (%)	2%	3%	2%	2%	2%	2%
Turn Type		NA	NA		Prot	Prot
Protected Phases		1	1		3	3
Permitted Phases						3
Actuated Green, G (s)		72.8	72.8		53.2	53.2
Effective Green, g (s)		72.8	72.8		53.2	53.2
Actuated g/C Ratio		0.51	0.51		0.37	0.37
Clearance Time (s)		5.6	5.6		5.6	5.6
Vehicle Extension (s)		3.0	3.0		5.0	5.0
Lane Grp Cap (vph)		1771	1789		653	584
v/s Ratio Prot		c0.23	0.14		0.15	c0.31
v/s Ratio Perm						
v/c Ratio		0.46	0.28		0.40	0.83
Uniform Delay, d1		23.0	20.5		33.6	41.3
Progression Factor		1.00	0.83		1.00	1.00
Incremental Delay, d2		0.9	0.4		0.8	10.8
Delay (s)		23.8	17.3		34.5	52.1
Level of Service		C	B		C	D
Approach Delay (s)		23.8	17.3		45.9	
Approach LOS		C	B		D	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	14.2
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Ann Arbor Station Traffic Analysis

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	105	914	347	447	184	139
v/c Ratio	0.21	0.49	0.68	0.17	0.73	0.27
Control Delay	13.9	13.6	14.9	1.5	76.2	34.5
Queue Delay	0.0	0.1	0.3	0.2	0.0	0.0
Total Delay	13.9	13.7	15.2	1.7	76.2	34.5
Queue Length 50th (ft)	31	130	17	11	166	94
Queue Length 95th (ft)	35	98	109	23	216	112
Internal Link Dist (ft)		346		296	1476	
Turn Bay Length (ft)	220		200			
Base Capacity (vph)	512	1862	620	2644	282	632
Starvation Cap Reductn	0	221	43	1477	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.56	0.60	0.38	0.65	0.22

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	467	228	305	382	11	64	81	110	0	0	0
Future Volume (vph)	80	467	228	305	382	11	64	81	110	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1			5.7	5.7			
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			
Frpb, ped/bikes	1.00	0.97		1.00	1.00			1.00	1.00			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.95		1.00	1.00			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.98	1.00			
Satd. Flow (prot)	1765	3278		1770	3521			1823	1583			
Flt Permitted	0.49	1.00		0.22	1.00			0.98	1.00			
Satd. Flow (perm)	917	3278		415	3521			1823	1583			
Peak-hour factor, PHF	0.76	0.76	0.76	0.88	0.88	0.88	0.79	0.79	0.79	0.92	0.92	0.92
Adj. Flow (vph)	105	614	300	347	434	12	81	103	139	0	0	0
RTOR Reduction (vph)	0	29	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	105	885	0	347	446	0	0	184	139	0	0	0
Confl. Peds. (#/hr)	1		12	12		1	5					
Turn Type	Perm	NA		pm+pt	NA		Split	NA	pt+ov			
Protected Phases		6		5	2		7	7	7 5			
Permitted Phases	6			2								
Actuated Green, G (s)	78.1	78.1		105.6	105.6			20.0	47.1			
Effective Green, g (s)	78.1	78.1		105.6	105.6			20.0	47.1			
Actuated g/C Ratio	0.54	0.54		0.73	0.73			0.14	0.33			
Clearance Time (s)	6.1	6.1		6.1	6.1			5.7				
Vehicle Extension (s)	5.0	5.0		3.0	5.0			5.0				
Lane Grp Cap (vph)	497	1777		505	2582			253	517			
v/s Ratio Prot		0.27		c0.10	0.13			c0.10	0.09			
v/s Ratio Perm	0.11			c0.40								
v/c Ratio	0.21	0.50		0.69	0.17			0.73	0.27			
Uniform Delay, d1	17.0	20.7		11.3	5.9			59.4	35.7			
Progression Factor	0.60	0.59		0.97	0.21			1.00	1.00			
Incremental Delay, d2	0.9	0.9		3.8	0.1			12.1	0.6			
Delay (s)	11.1	13.2		14.8	1.4			71.5	36.3			
Level of Service	B	B		B	A			E	D			
Approach Delay (s)		13.0			7.3			56.4			0.0	
Approach LOS		B			A			E			A	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	614	6	754	31	6
v/c Ratio	0.20	0.08	0.23	0.31	0.04
Control Delay	1.2	78.0	1.0	72.8	28.8
Queue Delay	0.2	0.0	0.0	0.0	0.0
Total Delay	1.4	78.0	1.0	72.8	28.8
Queue Length 50th (ft)	7	5	44	29	0
Queue Length 95th (ft)	44	m16	8	62	14
Internal Link Dist (ft)	296		2760	173	
Turn Bay Length (ft)		200		100	
Base Capacity (vph)	3085	194	3243	344	252
Starvation Cap Reductn	1534	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.40	0.03	0.23	0.09	0.02

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	550	27	5	671	27	5
Future Volume (vph)	550	27	5	671	27	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		5.2	5.2	5.6	5.2
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3507		1770	3539	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3507		1770	3539	1770	1583
Peak-hour factor, PHF	0.94	0.94	0.89	0.89	0.87	0.87
Adj. Flow (vph)	585	29	6	754	31	6
RTOR Reduction (vph)	1	0	0	0	0	6
Lane Group Flow (vph)	613	0	6	754	31	0
Confl. Peds. (#/hr)		5	5			
Turn Type	NA		Prot	NA	Prot	pt+ov
Protected Phases	2		1	6	3	1 8
Permitted Phases						
Actuated Green, G (s)	118.8		2.7	127.6	5.6	13.9
Effective Green, g (s)	118.8		2.7	127.6	5.6	8.3
Actuated g/C Ratio	0.82		0.02	0.89	0.04	0.06
Clearance Time (s)	6.1		5.2	5.2	5.6	
Vehicle Extension (s)	4.0		3.0	4.0	3.0	
Lane Grp Cap (vph)	2893		33	3135	68	91
v/s Ratio Prot	0.17		0.00	c0.21	c0.02	0.00
v/s Ratio Perm						
v/c Ratio	0.21		0.18	0.24	0.46	0.00
Uniform Delay, d1	2.7		69.6	1.2	67.7	64.0
Progression Factor	0.41		1.15	0.66	1.00	1.00
Incremental Delay, d2	0.2		2.6	0.2	4.8	0.0
Delay (s)	1.3		82.7	1.0	72.5	64.0
Level of Service	A		F	A	E	E
Approach Delay (s)	1.3			1.6	71.1	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	3.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	32.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	57	605	581	137	444	193
v/c Ratio	0.13	0.30	0.34	0.11	0.79	0.26
Control Delay	10.1	10.0	27.1	0.7	54.7	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.1	10.0	27.1	0.7	54.7	3.6
Queue Length 50th (ft)	13	72	160	0	379	0
Queue Length 95th (ft)	26	96	314	13	389	26
Internal Link Dist (ft)		2760	1391		524	
Turn Bay Length (ft)	100			150	75	
Base Capacity (vph)	456	2018	1712	1324	693	832
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.30	0.34	0.10	0.64	0.23

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	48	508	517	122	355	154
Future Volume (vph)	48	508	517	122	355	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.6	5.6	5.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1768	3539	3539	1561	1770	1583
Flt Permitted	0.37	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	696	3539	3539	1561	1770	1583
Peak-hour factor, PHF	0.84	0.84	0.89	0.89	0.80	0.80
Adj. Flow (vph)	57	605	581	137	444	192
RTOR Reduction (vph)	0	0	0	29	0	115
Lane Group Flow (vph)	57	605	581	108	444	78
Confl. Peds. (#/hr)	5			5	6	18
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	1	6	2	4	4	1 7
Permitted Phases	6			2		
Actuated Green, G (s)	80.5	80.5	68.1	113.9	45.8	58.2
Effective Green, g (s)	80.5	80.5	68.1	113.9	45.8	58.2
Actuated g/C Ratio	0.56	0.56	0.47	0.79	0.32	0.40
Clearance Time (s)	5.5	5.5	5.5	5.6	5.6	
Vehicle Extension (s)	4.0	4.5	4.5	6.0	6.0	
Lane Grp Cap (vph)	440	1978	1673	1234	562	639
v/s Ratio Prot	0.01	c0.17	c0.16	0.03	c0.25	0.05
v/s Ratio Perm	0.07			0.04		
v/c Ratio	0.13	0.31	0.35	0.09	0.79	0.12
Uniform Delay, d1	20.2	16.9	23.9	3.4	44.7	26.9
Progression Factor	0.45	0.50	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.4	0.2	0.1	9.0	0.1
Delay (s)	9.4	8.9	24.2	3.5	53.7	27.0
Level of Service	A	A	C	A	D	C
Approach Delay (s)		8.9	20.2		45.6	
Approach LOS		A	C		D	

Intersection Summary			
HCM 2000 Control Delay	24.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	332	761	477	228	460	329
v/c Ratio	0.73	0.43	0.36	0.33	0.66	0.65
Control Delay	34.6	16.6	23.4	5.0	38.4	29.0
Queue Delay	0.3	0.0	0.0	0.0	0.0	2.3
Total Delay	34.9	16.6	23.4	5.0	38.4	31.2
Queue Length 50th (ft)	132	163	116	0	135	160
Queue Length 95th (ft)	#272	216	164	52	162	236
Internal Link Dist (ft)		355	330		239	
Turn Bay Length (ft)	150			100	140	
Base Capacity (vph)	453	1781	1310	695	697	649
Starvation Cap Reductn	0	0	0	0	0	197
Spillback Cap Reductn	10	0	0	20	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.43	0.36	0.34	0.66	0.73

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	315	723	453	217	382	273
Future Volume (vph)	315	723	453	217	382	273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.94	1.00	1.00
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1673	3471	3438	1455	3467	1429
Flt Permitted	0.44	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	767	3471	3438	1455	3467	1429
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.83	0.83
Adj. Flow (vph)	332	761	477	228	460	329
RTOR Reduction (vph)	0	0	0	144	0	0
Lane Group Flow (vph)	332	761	477	84	460	329
Confl. Peds. (#/hr)	17			17	140	
Heavy Vehicles (%)	7%	4%	5%	4%	1%	13%
Turn Type	pm+pt	NA	NA	Perm	Prot	Prot
Protected Phases	1	6	2		3	8
Permitted Phases	6			2		
Actuated Green, G (s)	45.0	45.0	33.1	33.1	18.1	33.1
Effective Green, g (s)	45.0	45.0	33.1	33.1	18.1	33.1
Actuated g/C Ratio	0.50	0.50	0.37	0.37	0.20	0.37
Clearance Time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Lane Grp Cap (vph)	445	1735	1264	535	697	525
v/s Ratio Prot	c0.05	0.22	0.14		0.13	c0.23
v/s Ratio Perm	c0.32			0.06		
v/c Ratio	0.75	0.44	0.38	0.16	0.66	0.63
Uniform Delay, d1	21.6	14.4	20.9	19.1	33.1	23.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	0.99
Incremental Delay, d2	10.9	0.8	0.9	0.6	4.8	2.3
Delay (s)	32.4	15.2	21.7	19.7	37.8	25.4
Level of Service	C	B	C	B	D	C
Approach Delay (s)		20.4	21.1		32.6	
Approach LOS		C	C		C	

Intersection Summary			
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	46	165	100	94	629	170	620
v/c Ratio	0.16	0.52	0.52	0.29	0.51	0.39	0.26
Control Delay	30.2	35.7	41.9	8.9	5.0	5.1	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.4	0.0	0.1
Total Delay	30.2	35.7	41.9	8.9	5.4	5.1	2.1
Queue Length 50th (ft)	21	75	49	0	84	10	20
Queue Length 95th (ft)	43	114	82	27	52	115	28
Internal Link Dist (ft)		284			239		250
Turn Bay Length (ft)			85			100	
Base Capacity (vph)	534	566	348	518	1224	434	2383
Starvation Cap Reductn	0	0	0	0	222	0	680
Spillback Cap Reductn	0	0	0	1	23	0	105
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.29	0.29	0.18	0.63	0.39	0.36

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	109	21	78	0	73	0	464	52	151	552	0
Future Volume (vph)	36	109	21	78	0	73	0	464	52	151	552	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Lane Util. Factor	1.00	1.00		1.00		1.00		1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00		0.90		0.99		1.00	1.00	
Flpb, ped/bikes	0.92	1.00		0.96		1.00		1.00		0.96	1.00	
Frt	1.00	0.98		1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1659	1733		1734		1412		1780		1638	3471	
Flt Permitted	0.95	1.00		0.59		1.00		1.00		0.36	1.00	
Satd. Flow (perm)	1659	1733		1084		1412		1780		627	3471	
Peak-hour factor, PHF	0.79	0.79	0.79	0.78	0.78	0.78	0.82	0.82	0.82	0.89	0.89	0.89
Adj. Flow (vph)	46	138	27	100	0	94	0	566	63	170	620	0
RTOR Reduction (vph)	0	10	0	0	0	77	0	3	0	0	0	0
Lane Group Flow (vph)	46	155	0	100	0	17	0	626	0	170	620	0
Confl. Peds. (#/hr)	35		37	37		35			53	53		
Heavy Vehicles (%)	0%	7%	0%	0%	3%	3%	0%	3%	12%	6%	4%	0%
Turn Type	Perm	NA		D.Pm		Perm		NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4			4		4				2		
Actuated Green, G (s)	16.1	16.1		16.1		16.1		61.8		61.8	61.8	
Effective Green, g (s)	16.1	16.1		16.1		16.1		61.8		61.8	61.8	
Actuated g/C Ratio	0.18	0.18		0.18		0.18		0.69		0.69	0.69	
Clearance Time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Vehicle Extension (s)	4.0	4.0		4.0		4.0		4.0		4.0	4.0	
Lane Grp Cap (vph)	296	310		193		252		1222		430	2383	
v/s Ratio Prot		0.09						c0.35			0.18	
v/s Ratio Perm	0.03			c0.09		0.01				0.27		
v/c Ratio	0.16	0.50		0.52		0.07		0.51		0.40	0.26	
Uniform Delay, d1	31.2	33.3		33.4		30.7		6.8		6.1	5.4	
Progression Factor	1.00	1.00		1.00		1.00		0.46		0.35	0.30	
Incremental Delay, d2	0.3	1.7		3.1		0.2		1.3		2.5	0.2	
Delay (s)	31.5	35.1		36.5		30.9		4.5		4.6	1.8	
Level of Service	C	D		D		C		A		A	A	
Approach Delay (s)		34.3			33.8			4.5			2.4	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.1
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	57	49	74	136	87	65	628	802
v/c Ratio	0.20	0.12	0.32	0.72	0.59	0.26	0.70	0.49
Control Delay	33.7	0.6	39.8	60.2	54.4	13.5	18.3	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Total Delay	33.7	0.6	39.8	60.2	54.4	13.5	19.4	12.4
Queue Length 50th (ft)	28	0	39	78	49	17	181	84
Queue Length 95th (ft)	43	0	61	108	76	m29	187	171
Internal Link Dist (ft)				296			250	793
Turn Bay Length (ft)		25				100		
Base Capacity (vph)	292	397	229	189	148	254	899	1624
Starvation Cap Reductn	0	0	0	0	0	0	104	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.12	0.32	0.72	0.59	0.26	0.79	0.49

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	0	31	52	88	68	57	553	0	0	630	68
Future Volume (vph)	36	0	31	52	88	68	57	553	0	0	630	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Lane Util. Factor	1.00		1.00	1.00	0.95	0.95	1.00	1.00			0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.98	1.00	1.00	1.00			0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	0.96	1.00			1.00	
Frt	1.00		0.85	1.00	0.99	0.85	1.00	1.00			0.99	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1656		1615	1736	1436	1120	1730	1845			3315	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.28	1.00			1.00	
Satd. Flow (perm)	1656		1615	1736	1436	1120	519	1845			3315	
Peak-hour factor, PHF	0.63	0.63	0.63	0.70	0.70	0.70	0.88	0.88	0.88	0.87	0.87	0.87
Adj. Flow (vph)	57	0	49	74	126	97	65	628	0	0	724	78
RTOR Reduction (vph)	0	0	40	0	0	0	0	0	0	0	8	0
Lane Group Flow (vph)	57	0	9	74	136	87	65	628	0	0	794	0
Confl. Peds. (#/hr)	207		56	56		207	55					55
Heavy Vehicles (%)	9%	0%	0%	4%	20%	37%	0%	3%	0%	0%	5%	8%
Turn Type	Prot		Prot	Split	NA	Prot	Perm	NA			NA	
Protected Phases	8		8	4	4	4		2			2	
Permitted Phases							2					
Actuated Green, G (s)	15.9		15.9	11.9	11.9	11.9	43.9	43.9			43.9	
Effective Green, g (s)	15.9		15.9	11.9	11.9	11.9	43.9	43.9			43.9	
Actuated g/C Ratio	0.18		0.18	0.13	0.13	0.13	0.49	0.49			0.49	
Clearance Time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Vehicle Extension (s)	2.0		2.0	4.0	4.0	4.0	2.0	2.0			2.0	
Lane Grp Cap (vph)	292		285	229	189	148	253	899			1616	
v/s Ratio Prot	c0.03		0.01	0.04	c0.09	0.08		c0.34			0.24	
v/s Ratio Perm							0.13					
v/c Ratio	0.20		0.03	0.32	0.72	0.59	0.26	0.70			0.49	
Uniform Delay, d1	31.6		30.7	35.4	37.4	36.7	13.5	17.9			15.5	
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.78	0.76			0.75	
Incremental Delay, d2	1.5		0.2	3.7	21.0	16.0	2.2	4.1			0.9	
Delay (s)	33.1		30.9	39.1	58.4	52.7	12.8	17.7			12.5	
Level of Service	C		C	D	E	D	B	B			B	
Approach Delay (s)		32.1			51.9			17.3			12.5	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.3
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	773	62	533	846
v/c Ratio	0.76	0.18	0.28	0.53
Control Delay	31.9	5.6	5.4	18.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	31.9	5.6	5.4	18.1
Queue Length 50th (ft)	187	8	34	169
Queue Length 95th (ft)	238	m10	45	246
Internal Link Dist (ft)	1498		793	705
Turn Bay Length (ft)	200	125		
Base Capacity (vph)	1174	389	1925	1589
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.66	0.16	0.28	0.53

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	532	187	57	490	578	184
Future Volume (vph)	532	187	57	490	578	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7		6.1	6.1	6.1	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.97	
Flpb, ped/bikes	1.00		0.99	1.00	1.00	
Frt	0.96		1.00	1.00	0.96	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	3366		1727	3312	3233	
Flt Permitted	0.96		0.27	1.00	1.00	
Satd. Flow (perm)	3366		486	3312	3233	
Peak-hour factor, PHF	0.93	0.93	0.92	0.92	0.90	0.90
Adj. Flow (vph)	572	201	62	533	642	204
RTOR Reduction (vph)	44	0	0	0	29	0
Lane Group Flow (vph)	729	0	62	533	817	0
Confl. Peds. (#/hr)		16	45			45
Heavy Vehicles (%)	0%	0%	4%	9%	6%	1%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	2		1	4	3	
Permitted Phases			4			
Actuated Green, G (s)	25.9		52.3	52.3	42.2	
Effective Green, g (s)	25.9		52.3	52.3	42.2	
Actuated g/C Ratio	0.29		0.58	0.58	0.47	
Clearance Time (s)	5.7		6.1	6.1	6.1	
Vehicle Extension (s)	4.0		2.0	0.2	2.0	
Lane Grp Cap (vph)	968		337	1924	1515	
v/s Ratio Prot	c0.22		0.01	c0.16	c0.25	
v/s Ratio Perm			0.10			
v/c Ratio	0.75		0.18	0.28	0.54	
Uniform Delay, d1	29.1		13.8	9.4	17.0	
Progression Factor	1.00		0.42	0.51	1.00	
Incremental Delay, d2	3.6		0.1	0.3	1.4	
Delay (s)	32.7		5.9	5.0	18.4	
Level of Service	C		A	A	B	
Approach Delay (s)	32.7			5.1	18.4	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	876	6	967	8	8	6
v/c Ratio	0.30	0.05	0.32	0.04	0.02	0.01
Control Delay	4.7	36.0	2.6	32.8	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.7	36.0	2.6	32.8	0.0	0.0
Queue Length 50th (ft)	0	3	5	4	0	0
Queue Length 95th (ft)	198	m8	83	10	0	0
Internal Link Dist (ft)	293		1215		158	248
Turn Bay Length (ft)		200		50		
Base Capacity (vph)	2922	202	3023	410	657	655
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.03	0.32	0.02	0.01	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	770	10	5	841	0	5	0	5	0	0	5
Future Volume (vph)	0	770	10	5	841	0	5	0	5	0	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7		5.7	5.7		5.6	5.6			5.6	
Lane Util. Factor		0.95		1.00	0.95		1.00	1.00			1.00	
Frpb, ped/bikes		1.00		1.00	1.00		1.00	0.99			0.99	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00			1.00	
Frt		1.00		1.00	1.00		1.00	0.85			0.86	
Flt Protected		1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3398		1770	3406		1764	1562			1587	
Flt Permitted		1.00		0.95	1.00		0.75	1.00			1.00	
Satd. Flow (perm)		3398		1770	3406		1400	1562			1587	
Peak-hour factor, PHF	0.89	0.89	0.89	0.87	0.87	0.87	0.60	0.60	0.60	0.86	0.86	0.86
Adj. Flow (vph)	0	865	11	6	967	0	8	0	8	0	0	6
RTOR Reduction (vph)	0	1	0	0	0	0	0	8	0	0	6	0
Lane Group Flow (vph)	0	875	0	6	967	0	8	0	0	0	0	0
Confl. Peds. (#/hr)	29		24	24		29	2		1	1		2
Heavy Vehicles (%)	2%	6%	2%	2%	6%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	NA		Prot	NA		Perm	NA			NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)		66.1		1.3	73.1		5.6	5.6			5.6	
Effective Green, g (s)		66.1		1.3	73.1		5.6	5.6			5.6	
Actuated g/C Ratio		0.73		0.01	0.81		0.06	0.06			0.06	
Clearance Time (s)		5.7		5.7	5.7		5.6	5.6			5.6	
Vehicle Extension (s)		3.0		3.0	4.5		1.0	1.0			1.0	
Lane Grp Cap (vph)		2495		25	2766		87	97			98	
v/s Ratio Prot		0.26		0.00	c0.28			0.00			0.00	
v/s Ratio Perm							c0.01					
v/c Ratio		0.35		0.24	0.35		0.09	0.01			0.00	
Uniform Delay, d1		4.3		43.9	2.2		39.8	39.6			39.6	
Progression Factor		1.00		0.90	0.90		1.00	1.00			1.00	
Incremental Delay, d2		0.4		4.4	0.3		0.2	0.0			0.0	
Delay (s)		4.7		43.7	2.3		40.0	39.6			39.6	
Level of Service		A		D	A		D	D			D	
Approach Delay (s)		4.7			2.5			39.8			39.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	174	768	22	763	57	26	34	79	166
v/c Ratio	0.75	0.38	0.23	0.53	0.54	0.11	0.38	0.32	0.42
Control Delay	58.6	16.9	46.3	23.3	60.6	22.1	53.0	37.5	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.6	16.9	46.3	23.3	60.6	22.1	53.0	37.5	3.9
Queue Length 50th (ft)	95	92	12	169	32	7	19	42	0
Queue Length 95th (ft)	#201	266	36	266	61	22	50	76	8
Internal Link Dist (ft)		1215		729		257		381	
Turn Bay Length (ft)	225		150		100		180		
Base Capacity (vph)	237	2009	94	1435	106	405	90	422	488
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.38	0.23	0.53	0.54	0.06	0.38	0.19	0.34

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	607	123	21	697	21	44	10	10	31	73	153
Future Volume (vph)	165	607	123	21	697	21	44	10	10	31	73	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1433	3417		1444	3510		1770	1744		1504	1863	1291
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1433	3417		1444	3510		1770	1744		1504	1863	1291
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.77	0.77	0.77	0.92	0.92	0.92
Adj. Flow (vph)	174	639	129	22	741	22	57	13	13	34	79	166
RTOR Reduction (vph)	0	15	0	0	2	0	0	11	0	0	0	144
Lane Group Flow (vph)	174	753	0	22	761	0	57	15	0	34	79	22
Confl. Peds. (#/hr)	4					4	3		2	2		3
Heavy Vehicles (%)	26%	3%	3%	25%	2%	14%	2%	0%	0%	20%	2%	23%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												8
Actuated Green, G (s)	14.5	47.8		2.4	35.7		4.3	14.2		2.2	12.1	12.1
Effective Green, g (s)	14.5	47.8		2.4	35.7		4.3	14.2		2.2	12.1	12.1
Actuated g/C Ratio	0.16	0.53		0.03	0.40		0.05	0.16		0.02	0.13	0.13
Clearance Time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Vehicle Extension (s)	6.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	230	1814		38	1392		84	275		36	250	173
v/s Ratio Prot	c0.12	0.22		0.02	c0.22		c0.03	0.01		0.02	c0.04	
v/s Ratio Perm												0.02
v/c Ratio	0.76	0.42		0.58	0.55		0.68	0.05		0.94	0.32	0.13
Uniform Delay, d1	36.1	12.7		43.3	20.9		42.2	32.2		43.8	35.2	34.3
Progression Factor	1.04	1.36		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	16.7	0.7		23.1	1.5		21.2	0.1		127.6	1.0	0.5
Delay (s)	54.4	17.9		66.4	22.5		63.4	32.3		171.4	36.2	34.8
Level of Service	D	B		E	C		E	C		F	D	C
Approach Delay (s)		24.7			23.7			53.7			51.8	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	29.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.4
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	497	288	217	99	191	117	679
v/c Ratio	0.78	0.41	0.34	0.79	0.25	0.24	0.84
Control Delay	29.2	5.4	15.7	65.7	14.2	16.0	30.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.2	5.4	15.7	65.7	14.2	16.0	30.3
Queue Length 50th (ft)	171	10	55	35	47	30	245
Queue Length 95th (ft)	#343	61	99	#116	93	71	#466
Internal Link Dist (ft)	628		690		412		625
Turn Bay Length (ft)		250		80		150	
Base Capacity (vph)	766	791	764	125	779	485	812
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.36	0.28	0.79	0.25	0.24	0.84

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	393	265	11	122	37	78	135	16	96	483	74
Future Volume (vph)	64	393	265	11	122	37	78	135	16	96	483	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.93		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		0.94	1.00	
Frt		1.00	0.85		0.97		1.00	0.98		1.00	0.98	
Flt Protected		0.99	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1853	1479		1795		1805	1744		1641	1815	
Flt Permitted		0.92	1.00		0.94		0.15	1.00		0.64	1.00	
Satd. Flow (perm)		1724	1479		1698		282	1744		1101	1815	
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.78	0.78	0.79	0.79	0.79	0.82	0.82	0.82
Adj. Flow (vph)	70	427	288	14	156	47	99	171	20	117	589	90
RTOR Reduction (vph)	0	0	161	0	13	0	0	5	0	0	6	0
Lane Group Flow (vph)	0	497	127	0	204	0	99	186	0	117	673	0
Confl. Peds. (#/hr)	17		13	13		17	4		23	23		4
Heavy Vehicles (%)	3%	1%	2%	0%	0%	3%	0%	6%	7%	3%	2%	3%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2		2	2			1			1		
Actuated Green, G (s)		25.2	25.2		25.2		30.3	30.3		30.3	30.3	
Effective Green, g (s)		25.2	25.2		25.2		30.3	30.3		30.3	30.3	
Actuated g/C Ratio		0.35	0.35		0.35		0.42	0.42		0.42	0.42	
Clearance Time (s)		5.6	5.6		5.6		5.6	5.6		5.6	5.6	
Vehicle Extension (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		609	522		600		119	741		467	771	
v/s Ratio Prot								0.11			c0.37	
v/s Ratio Perm		c0.29	0.09		0.12		0.35			0.11		
v/c Ratio		0.82	0.24		0.34		0.83	0.25		0.25	0.87	
Uniform Delay, d1		20.9	16.3		16.9		18.2	13.2		13.2	18.7	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		8.7	0.3		0.5		38.0	0.2		0.4	11.0	
Delay (s)		29.7	16.6		17.4		56.2	13.4		13.6	29.7	
Level of Service		C	B		B		E	B		B	C	
Approach Delay (s)		24.9			17.4			28.0			27.3	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	71.3	Sum of lost time (s)	15.2
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	869	8	0	0	0	0	0	15	56	7	0
Future Volume (Veh/h)	0	869	8	0	0	0	0	0	15	56	7	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	945	9	0	0	0	0	0	16	61	8	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		607										
pX, platoon unblocked				0.84			0.84	0.84	0.84	0.84	0.84	
vC, conflicting volume	0			954			954	950	477	488	954	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			563			563	558	0	9	563	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	98	93	98	100
cM capacity (veh/h)	1622			843			338	367	911	831	364	1084

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	630	324	16	69
Volume Left	0	0	0	61
Volume Right	0	9	16	0
cSH	1700	1700	911	724
Volume to Capacity	0.37	0.19	0.02	0.10
Queue Length 95th (ft)	0	0	1	8
Control Delay (s)	0.0	0.0	9.0	10.5
Lane LOS			A	B
Approach Delay (s)	0.0		9.0	10.5
Approach LOS			A	B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↱			↱
Traffic Volume (veh/h)	0	0	962	16	0	5
Future Volume (Veh/h)	0	0	962	16	0	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1046	17	0	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1063				1054	532
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1063				1054	532
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	651				221	492

Direction, Lane #	WB 1	WB 2	SB 1
Volume Total	697	366	5
Volume Left	0	0	0
Volume Right	0	17	5
cSH	1700	1700	492
Volume to Capacity	0.41	0.22	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	12.4
Lane LOS			B
Approach Delay (s)	0.0		12.4
Approach LOS			B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱				↱
Traffic Volume (veh/h)	780	160	0	0	0	84
Future Volume (Veh/h)	780	160	0	0	0	84
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	848	174	0	0	0	91
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1001					
pX, platoon unblocked			0.90		0.90	0.90
vC, conflicting volume			1022		848	424
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			791		597	123
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	89
cM capacity (veh/h)			739		389	810

Direction, Lane #	EB 1	EB 2	EB 3	NB 1
Volume Total	424	424	174	91
Volume Left	0	0	0	0
Volume Right	0	0	174	91
cSH	1700	1700	1700	810
Volume to Capacity	0.25	0.25	0.10	0.11
Queue Length 95th (ft)	0	0	0	9
Control Delay (s)	0.0	0.0	0.0	10.0
Lane LOS				B
Approach Delay (s)	0.0			10.0
Approach LOS				B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	893	84	0
Future Volume (Veh/h)	0	0	0	893	84	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	971	91	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				980		
pX, platoon unblocked					1.00	
vC, conflicting volume			0		486	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		474	0
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		82	100
cM capacity (veh/h)			1622		517	1084

Direction, Lane #	WB 1	WB 2	NB 1
Volume Total	486	486	91
Volume Left	0	0	91
Volume Right	0	0	0
cSH	1700	1700	517
Volume to Capacity	0.29	0.29	0.18
Queue Length 95th (ft)	0	0	16
Control Delay (s)	0.0	0.0	13.4
Lane LOS			B
Approach Delay (s)	0.0		13.4
Approach LOS			B

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

Ann Arbor Station Traffic Analysis

Lane Group	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	351	436	12	1069	62	717
v/c Ratio	0.61	0.73	0.03	1.04	0.74	0.38
Control Delay	31.0	34.3	9.6	59.4	78.5	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.0	34.3	9.6	59.4	78.5	22.6
Queue Length 50th (ft)	166	211	3	~653	37	192
Queue Length 95th (ft)	258	322	11	#896	m#108	257
Internal Link Dist (ft)		1428		423		156
Turn Bay Length (ft)			150		90	
Base Capacity (vph)	574	600	351	1031	84	1878
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.73	0.03	1.04	0.74	0.38

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Movement	WBL	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	330	340	70	11	989	27	59	513	168
Future Volume (vph)	330	340	70	11	989	27	59	513	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1766	1820		1792	1838		1805	3332	
Flt Permitted	0.95	1.00		0.34	1.00		0.08	1.00	
Satd. Flow (perm)	1766	1820		637	1838		153	3332	
Peak-hour factor, PHF	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	351	362	74	12	1041	28	62	540	177
RTOR Reduction (vph)	0	8	0	0	15	0	0	35	0
Lane Group Flow (vph)	351	428	0	12	1054	0	62	682	0
Confl. Peds. (#/hr)	8		14	14			16		14
Heavy Vehicles (%)	1%	1%	0%	0%	3%	1%	0%	4%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			1			1	
Permitted Phases	2	2		1			1		
Actuated Green, G (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Effective Green, g (s)	29.3	29.3		49.8	49.8		49.8	49.8	
Actuated g/C Ratio	0.33	0.33		0.55	0.55		0.55	0.55	
Clearance Time (s)	5.7	5.7		5.2	5.2		5.2	5.2	
Vehicle Extension (s)	5.0	5.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	574	592		352	1017		84	1843	
v/s Ratio Prot		c0.24			c0.57			0.20	
v/s Ratio Perm	0.20			0.02			0.41		
v/c Ratio	0.61	0.72		0.03	1.04		0.74	0.37	
Uniform Delay, d1	25.6	26.8		9.2	20.1		15.2	11.3	
Progression Factor	1.00	1.00		1.00	1.00		1.93	2.19	
Incremental Delay, d2	4.8	7.5		0.2	38.1		40.5	0.5	
Delay (s)	30.4	34.2		9.3	58.2		69.8	25.2	
Level of Service	C	C		A	E		E	C	
Approach Delay (s)		32.5			57.7			28.7	
Approach LOS		C			E			C	

Intersection Summary			
HCM 2000 Control Delay	41.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.9
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	176	254	1269	835
v/c Ratio	0.63	0.50	0.66	0.46
Control Delay	38.5	23.1	3.7	10.5
Queue Delay	101.3	75.2	0.0	0.7
Total Delay	139.8	98.3	3.7	11.2
Queue Length 50th (ft)	83	85	51	78
Queue Length 95th (ft)	#159	159	m51	96
Internal Link Dist (ft)	303	327	1027	111
Turn Bay Length (ft)				
Base Capacity (vph)	280	511	1916	1831
Starvation Cap Reductn	0	0	0	616
Spillback Cap Reductn	237	399	9	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	4.09	2.27	0.67	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	27	22	11	54	168	22	1102	43	22	703	43
Future Volume (vph)	113	27	22	11	54	168	22	1102	43	22	703	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.2			6.2	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.98			0.90			0.99			0.99	
Flt Protected		0.97			1.00			1.00			1.00	
Satd. Flow (prot)		1767			1678			3516			3504	
Flt Permitted		0.54			0.98			0.93			0.89	
Satd. Flow (perm)		987			1653			3262			3112	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	123	29	24	12	59	183	24	1198	47	24	764	47
RTOR Reduction (vph)	0	7	0	0	52	0	0	3	0	0	5	0
Lane Group Flow (vph)	0	170	0	0	202	0	0	1266	0	0	830	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		25.0			25.0			52.8			52.8	
Effective Green, g (s)		25.0			25.0			52.8			52.8	
Actuated g/C Ratio		0.28			0.28			0.59			0.59	
Clearance Time (s)		6.0			6.0			6.2			6.2	
Vehicle Extension (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		274			459			1913			1825	
v/s Ratio Prot												
v/s Ratio Perm		c0.17			0.12			c0.39			0.27	
v/c Ratio		0.62			0.44			0.66			0.45	
Uniform Delay, d1		28.3			26.7			12.6			10.5	
Progression Factor		1.00			1.00			0.23			0.93	
Incremental Delay, d2		10.1			3.0			0.8			0.8	
Delay (s)		38.4			29.8			3.6			10.5	
Level of Service		D			C			A			B	
Approach Delay (s)		38.4			29.8			3.6			10.5	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	117	663	1475	236	739
v/c Ratio	0.74	1.06	0.78	0.64	0.27
Control Delay	56.8	67.2	13.6	30.1	3.1
Queue Delay	0.0	0.0	0.7	0.0	0.0
Total Delay	56.8	67.2	14.3	30.1	3.1
Queue Length 50th (ft)	66	~340	165	64	47
Queue Length 95th (ft)	m#89	m#517	286	143	63
Internal Link Dist (ft)			111		640
Turn Bay Length (ft)	300			240	
Base Capacity (vph)	158	626	1880	369	2779
Starvation Cap Reductn	0	0	148	0	0
Spillback Cap Reductn	0	0	0	0	67
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.74	1.06	0.85	0.64	0.27

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	108	0	610	5	1313	54	212	665	0
Future Volume (vph)	0	0	0	108	0	610	5	1313	54	212	665	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0		6.0		6.0		6.0	6.0	
Lane Util. Factor				1.00		1.00		0.95		1.00	0.95	
Frpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Flpb, ped/bikes				1.00		1.00		1.00		1.00	1.00	
Frt				1.00		0.85		0.99		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				1787		1599		3546		1769	3574	
Flt Permitted				0.95		1.00		0.95		0.09	1.00	
Satd. Flow (perm)				1787		1599		3380		170	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	117	0	663	5	1412	58	236	739	0
RTOR Reduction (vph)	0	0	0	0	0	129	0	2	0	0	0	0
Lane Group Flow (vph)	0	0	0	117	0	534	0	1473	0	236	739	0
Confl. Peds. (#/hr)									20	20		
Heavy Vehicles (%)	2%	2%	2%	1%	0%	1%	0%	1%	0%	2%	1%	0%
Turn Type				Prot		pt+ov	Perm	NA		D.P+P	NA	
Protected Phases		8		4		4 5		6		5	2	
Permitted Phases	8						6			6		
Actuated Green, G (s)				8.0		28.0		50.0		64.0	70.0	
Effective Green, g (s)				8.0		28.0		50.0		64.0	70.0	
Actuated g/C Ratio				0.09		0.31		0.56		0.71	0.78	
Clearance Time (s)				6.0				6.0		6.0	6.0	
Vehicle Extension (s)				4.0				5.0		2.0	5.0	
Lane Grp Cap (vph)				158		497		1877		369	2779	
v/s Ratio Prot				0.07		c0.33				0.10	0.21	
v/s Ratio Perm								c0.44		0.35		
v/c Ratio				0.74		1.07		0.78		0.64	0.27	
Uniform Delay, d1				40.0		31.0		15.8		22.8	2.8	
Progression Factor				0.85		0.73		0.68		1.00	1.00	
Incremental Delay, d2				13.8		56.8		2.6		2.7	0.2	
Delay (s)				47.7		79.3		13.4		25.4	3.0	
Level of Service				D		E		B		C	A	
Approach Delay (s)		0.0			74.6			13.4			8.5	
Approach LOS		A			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	23.7
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	219	42	21	637	53	106
Future Volume (Veh/h)	219	42	21	637	53	106
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	238	46	23	692	58	115
Pedestrians	1			8	11	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	0			1	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			295		1011	280
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			295		1011	280
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		78	85
cM capacity (veh/h)			1255		258	747

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	284	715	173
Volume Left	0	23	58
Volume Right	46	0	115
cSH	1700	1255	457
Volume to Capacity	0.17	0.02	0.38
Queue Length 95th (ft)	0	1	44
Control Delay (s)	0.0	0.5	17.6
Lane LOS		A	C
Approach Delay (s)	0.0	0.5	17.6
Approach LOS			C

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	42	0	0	64	74	647	0	0	0	0
Future Volume (Veh/h)	0	0	42	0	0	64	74	647	0	0	0	0
Sign Control		Yield			Yield			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.74	0.92	0.92	0.87	0.87	0.87	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	57	0	0	74	85	744	0	0	0	0
Pedestrians											6	
Lane Width (ft)											0.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	622	914	0	971	914	378	0			744		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	622	914	0	971	914	378	0			744		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	95	100	100	88	95			100		
cM capacity (veh/h)	314	257	1084	188	257	620	1622			859		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	57	74	333	496
Volume Left	0	0	85	0
Volume Right	57	74	0	0
cSH	1084	620	1622	1700
Volume to Capacity	0.05	0.12	0.05	0.29
Queue Length 95th (ft)	4	10	4	0
Control Delay (s)	8.5	11.6	2.2	0.0
Lane LOS	A	B	A	
Approach Delay (s)	8.5	11.6	0.9	
Approach LOS	A	B		

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	5	11	42	32	0	0	0	0	37	673	27
Future Volume (Veh/h)	0	5	11	42	32	0	0	0	0	37	673	27
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.68	0.68	0.68	0.69	0.69	0.69	0.92	0.92	0.92	0.90	0.90	0.90
Hourly flow rate (vph)	0	7	16	61	46	0	0	0	0	41	748	30
Pedestrians		9			12							
Lane Width (ft)		12.0			12.0							
Walking Speed (ft/s)		4.0			4.0							
Percent Blockage		1			1							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	877	866	398	488	881	12	787			12		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	877	866	398	488	881	12	787			12		
tC, single (s)	7.5	6.5	7.3	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	98	97	86	83	100	100			97		
cM capacity (veh/h)	206	281	549	427	275	1061	835			1604		

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	23	107	415	404
Volume Left	0	61	41	0
Volume Right	16	0	0	30
cSH	426	345	1604	1700
Volume to Capacity	0.05	0.31	0.03	0.24
Queue Length 95th (ft)	4	32	2	0
Control Delay (s)	13.9	20.0	0.9	0.0
Lane LOS	B	C	A	
Approach Delay (s)	13.9	20.0	0.5	
Approach LOS	B	C		

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	790	547	94	255
v/c Ratio	0.31	0.22	0.25	0.76
Control Delay	8.9	3.6	46.8	66.9
Queue Delay	0.0	0.2	0.0	0.0
Total Delay	8.9	3.8	46.8	66.9
Queue Length 50th (ft)	133	46	74	227
Queue Length 95th (ft)	207	m31	109	280
Internal Link Dist (ft)	355	346	123	
Turn Bay Length (ft)				
Base Capacity (vph)	2509	2509	619	554
Starvation Cap Reductn	0	1030	0	0
Spillback Cap Reductn	138	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.33	0.37	0.15	0.46

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	711	520	0	80	217
Future Volume (vph)	0	711	520	0	80	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.6	5.6
Lane Util. Factor		0.95	0.95		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3539	3539		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3539	3539		1770	1583
Peak-hour factor, PHF	0.90	0.90	0.95	0.95	0.85	0.85
Adj. Flow (vph)	0	790	547	0	94	255
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	790	547	0	94	255
Turn Type		NA	NA		Prot	Prot
Protected Phases		1	1		3	3
Permitted Phases						3
Actuated Green, G (s)		102.1	102.1		30.7	30.7
Effective Green, g (s)		102.1	102.1		30.7	30.7
Actuated g/C Ratio		0.71	0.71		0.21	0.21
Clearance Time (s)		5.6	5.6		5.6	5.6
Vehicle Extension (s)		3.0	3.0		5.0	5.0
Lane Grp Cap (vph)		2509	2509		377	337
v/s Ratio Prot		c0.22	0.15		0.05	c0.16
v/s Ratio Perm						
v/c Ratio		0.31	0.22		0.25	0.76
Uniform Delay, d1		7.8	7.2		47.1	53.1
Progression Factor		1.00	0.43		1.00	1.00
Incremental Delay, d2		0.3	0.2		0.7	11.0
Delay (s)		8.2	3.3		47.8	64.2
Level of Service		A	A		D	E
Approach Delay (s)		8.2	3.3		59.8	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	14.2
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR
Lane Group Flow (vph)	339	668	192	485	449	363
v/c Ratio	0.71	0.35	0.45	0.22	0.93	0.66
Control Delay	32.9	16.5	13.5	8.6	78.6	45.8
Queue Delay	0.3	0.3	0.7	0.3	0.0	0.0
Total Delay	33.2	16.8	14.2	8.9	78.6	45.8
Queue Length 50th (ft)	185	190	118	160	411	284
Queue Length 95th (ft)	#463	299	63	44	#538	364
Internal Link Dist (ft)		346		296	1476	
Turn Bay Length (ft)	220		200			
Base Capacity (vph)	479	1885	422	2214	492	548
Starvation Cap Reductn	13	620	67	1110	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.53	0.54	0.44	0.91	0.66

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	302	525	69	179	435	16	85	292	305	0	0	0
Future Volume (vph)	302	525	69	179	435	16	85	292	305	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1			5.7	5.7			
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.98		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (prot)	1787	3508		1752	3523			1852	1568			
Flt Permitted	0.48	1.00		0.32	1.00			0.99	1.00			
Satd. Flow (perm)	895	3508		581	3523			1852	1568			
Peak-hour factor, PHF	0.89	0.89	0.89	0.93	0.93	0.93	0.84	0.84	0.84	0.92	0.92	0.92
Adj. Flow (vph)	339	590	78	192	468	17	101	348	363	0	0	0
RTOR Reduction (vph)	0	6	0	0	2	0	0	0	0	0	0	0
Lane Group Flow (vph)	339	662	0	192	483	0	0	449	363	0	0	0
Confl. Peds. (#/hr)							1		5			
Heavy Vehicles (%)	1%	1%	2%	3%	2%	0%	3%	1%	3%	2%	2%	2%
Turn Type	Perm	NA		pm+pt	NA		Split	NA	pt+ov			
Protected Phases		6		5	2		7	7	7 5			
Permitted Phases	6			2								
Actuated Green, G (s)	74.8	74.8		88.0	88.0			37.6	50.4			
Effective Green, g (s)	74.8	74.8		88.0	88.0			37.6	50.4			
Actuated g/C Ratio	0.52	0.52		0.61	0.61			0.26	0.35			
Clearance Time (s)	6.1	6.1		6.1	6.1			5.7				
Vehicle Extension (s)	5.0	5.0		3.0	5.0			5.0				
Lane Grp Cap (vph)	464	1822		412	2152			483	548			
v/s Ratio Prot		0.19		0.02	0.14			c0.24	c0.23			
v/s Ratio Perm	c0.38			0.26								
v/c Ratio	0.73	0.36		0.47	0.22			0.93	0.66			
Uniform Delay, d1	26.8	20.5		13.6	12.6			51.9	39.6			
Progression Factor	0.86	0.79		0.73	0.66			1.00	1.00			
Incremental Delay, d2	9.5	0.6		0.8	0.2			25.2	4.0			
Delay (s)	32.6	16.8		10.7	8.6			77.1	43.6			
Level of Service	C	B		B	A			E	D			
Approach Delay (s)		22.1			9.2			62.1			0.0	
Approach LOS		C			A			E			A	

Intersection Summary			
HCM 2000 Control Delay	31.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	903	12	615	73	20
v/c Ratio	0.32	0.15	0.20	0.53	0.08
Control Delay	4.2	85.0	5.3	76.7	18.3
Queue Delay	0.2	0.0	0.0	0.0	0.0
Total Delay	4.4	85.0	5.3	76.7	18.3
Queue Length 50th (ft)	163	11	154	67	0
Queue Length 95th (ft)	96	36	5	104	20
Internal Link Dist (ft)	296		2760	173	
Turn Bay Length (ft)		200		100	
Base Capacity (vph)	2852	157	3082	352	315
Starvation Cap Reductn	929	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.47	0.08	0.20	0.21	0.06

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	788	42	11	566	58	16
Future Volume (vph)	788	42	11	566	58	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		5.2	5.2	5.6	5.2
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3502		1770	3539	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3502		1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.80	0.80
Adj. Flow (vph)	857	46	12	615	72	20
RTOR Reduction (vph)	2	0	0	0	0	18
Lane Group Flow (vph)	901	0	12	615	73	2
Confl. Peds. (#/hr)		9	9			2
Turn Type	NA		Prot	NA	Prot	pt+ov
Protected Phases	2		1	6	3	1 8
Permitted Phases						
Actuated Green, G (s)	112.9		4.3	123.3	9.9	19.8
Effective Green, g (s)	112.9		4.3	123.3	9.9	14.2
Actuated g/C Ratio	0.78		0.03	0.86	0.07	0.10
Clearance Time (s)	6.1		5.2	5.2	5.6	
Vehicle Extension (s)	4.0		3.0	4.0	3.0	
Lane Grp Cap (vph)	2745		52	3030	121	156
v/s Ratio Prot	c0.26		0.01	c0.17	c0.04	0.00
v/s Ratio Perm						
v/c Ratio	0.33		0.23	0.20	0.60	0.01
Uniform Delay, d1	4.5		68.2	1.8	65.1	58.6
Progression Factor	0.80		1.24	2.53	1.00	1.00
Incremental Delay, d2	0.3		2.2	0.1	8.2	0.0
Delay (s)	3.9		86.8	4.7	73.4	58.6
Level of Service	A		F	A	E	E
Approach Delay (s)	3.9			6.3	70.2	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	228	622	575	323	181	69
v/c Ratio	0.38	0.24	0.26	0.25	0.61	0.15
Control Delay	12.4	6.1	15.0	0.9	63.6	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.4	6.1	15.0	0.9	63.6	8.1
Queue Length 50th (ft)	17	2	104	0	159	0
Queue Length 95th (ft)	144	252	251	18	169	17
Internal Link Dist (ft)		2760	1391		524	
Turn Bay Length (ft)	100			150	75	
Base Capacity (vph)	809	2549	2224	1343	398	549
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.24	0.26	0.24	0.45	0.13

Intersection Summary

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	217	591	529	297	127	48
Future Volume (vph)	217	591	529	297	127	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.6	5.6	5.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1769	3539	3539	1557	1770	1583
Flt Permitted	0.41	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	763	3539	3539	1557	1770	1583
Peak-hour factor, PHF	0.95	0.95	0.92	0.92	0.70	0.70
Adj. Flow (vph)	228	622	575	323	181	69
RTOR Reduction (vph)	0	0	0	69	0	51
Lane Group Flow (vph)	228	622	575	254	181	18
Confl. Peds. (#/hr)	2			2	14	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	1	6	2	4	4	1 7
Permitted Phases	6			2		
Actuated Green, G (s)	102.1	102.1	88.9	113.1	24.2	37.4
Effective Green, g (s)	102.1	102.1	88.9	113.1	24.2	37.4
Actuated g/C Ratio	0.71	0.71	0.62	0.79	0.17	0.26
Clearance Time (s)	5.5	5.5	5.5	5.6	5.6	
Vehicle Extension (s)	4.0	4.5	4.5	6.0	6.0	
Lane Grp Cap (vph)	594	2509	2184	1222	297	411
v/s Ratio Prot	c0.02	0.18	0.16	0.03	c0.10	0.01
v/s Ratio Perm	c0.25			0.13		
v/c Ratio	0.38	0.25	0.26	0.21	0.61	0.04
Uniform Delay, d1	10.9	7.4	12.6	4.0	55.5	39.9
Progression Factor	0.87	0.67	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2	0.1	0.2	6.2	0.1
Delay (s)	10.0	5.2	12.7	4.2	61.7	40.0
Level of Service	A	A	B	A	E	D
Approach Delay (s)		6.5	9.6		55.7	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	144.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	228	765	768	346	491	552
v/c Ratio	0.78	0.47	0.67	0.53	0.55	0.87
Control Delay	47.9	19.0	30.7	12.2	28.2	34.0
Queue Delay	21.3	0.0	0.0	0.4	0.0	28.5
Total Delay	69.2	19.0	30.7	12.6	28.2	62.5
Queue Length 50th (ft)	83	164	207	47	132	270
Queue Length 95th (ft)	#140	186	246	105	205	#446
Internal Link Dist (ft)		355	330		239	
Turn Bay Length (ft)	150			100	140	
Base Capacity (vph)	292	1612	1149	648	890	705
Starvation Cap Reductn	0	0	0	0	0	172
Spillback Cap Reductn	59	0	0	69	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.47	0.67	0.60	0.55	1.04

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	180	604	630	284	466	524
Future Volume (vph)	180	604	630	284	466	524
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.94	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1784	3505	3505	1492	3502	1553
Flt Permitted	0.23	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	435	3505	3505	1492	3502	1553
Peak-hour factor, PHF	0.79	0.79	0.82	0.82	0.95	0.95
Adj. Flow (vph)	228	765	768	346	491	552
RTOR Reduction (vph)	0	0	0	163	0	0
Lane Group Flow (vph)	228	765	768	183	491	552
Confl. Peds. (#/hr)	15			15	150	
Heavy Vehicles (%)	1%	3%	3%	2%	0%	4%
Turn Type	pm+pt	NA	NA	Perm	Prot	Prot
Protected Phases	1	6	2		3	8
Permitted Phases	6			2		
Actuated Green, G (s)	40.2	40.2	28.3	28.3	22.9	37.9
Effective Green, g (s)	40.2	40.2	28.3	28.3	22.9	37.9
Actuated g/C Ratio	0.45	0.45	0.31	0.31	0.25	0.42
Clearance Time (s)	5.8	5.8	5.7	5.7	6.1	6.1
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Lane Grp Cap (vph)	287	1565	1102	469	891	653
v/s Ratio Prot	c0.05	0.22	0.22		0.14	c0.36
v/s Ratio Perm	c0.30			0.12		
v/c Ratio	0.79	0.49	0.70	0.39	0.55	0.85
Uniform Delay, d1	29.3	17.6	27.1	24.1	29.1	23.4
Progression Factor	1.00	1.00	1.00	1.00	0.84	0.79
Incremental Delay, d2	19.9	1.1	3.7	2.4	2.3	9.2
Delay (s)	49.2	18.7	30.7	26.5	26.7	27.7
Level of Service	D	B	C	C	C	C
Approach Delay (s)		25.7	29.4		27.3	
Approach LOS		C	C		C	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	33	86	236	166	566	78	813
v/c Ratio	0.08	0.19	0.72	0.34	0.50	0.20	0.38
Control Delay	22.2	15.9	41.6	5.5	9.7	4.5	4.1
Queue Delay	0.0	0.0	0.0	0.0	1.4	0.0	0.1
Total Delay	22.2	15.9	41.6	5.5	11.2	4.5	4.3
Queue Length 50th (ft)	14	23	123	0	54	8	41
Queue Length 95th (ft)	27	42	171	38	m430	m13	49
Internal Link Dist (ft)		284			239		250
Turn Bay Length (ft)			85			100	
Base Capacity (vph)	633	647	491	657	1124	391	2120
Starvation Cap Reductn	0	0	0	0	355	0	407
Spillback Cap Reductn	0	2	0	17	200	0	266
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.13	0.48	0.26	0.74	0.20	0.47

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	42	26	208	0	146	0	489	21	73	756	0
Future Volume (vph)	26	42	26	208	0	146	0	489	21	73	756	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Lane Util. Factor	1.00	1.00		1.00		1.00		1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.97		1.00		0.89		0.99		1.00	1.00	
Flpb, ped/bikes	0.90	1.00		0.95		1.00		1.00		0.96	1.00	
Frt	1.00	0.94		1.00		0.85		0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1630	1615		1714		1429		1855		1662	3505	
Flt Permitted	0.95	1.00		0.70		1.00		1.00		0.37	1.00	
Satd. Flow (perm)	1630	1615		1265		1429		1855		643	3505	
Peak-hour factor, PHF	0.79	0.79	0.79	0.88	0.88	0.88	0.90	0.90	0.90	0.93	0.93	0.93
Adj. Flow (vph)	33	53	33	236	0	166	0	543	23	78	813	0
RTOR Reduction (vph)	0	24	0	0	0	123	0	1	0	0	0	0
Lane Group Flow (vph)	33	62	0	236	0	43	0	565	0	78	813	0
Confl. Peds. (#/hr)	42		41	41		42			56	56		
Heavy Vehicles (%)	0%	13%	0%	0%	0%	0%	0%	0%	32%	4%	3%	0%
Turn Type	Perm	NA		D.Pm		Perm		NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4			4		4				2		
Actuated Green, G (s)	23.4	23.4		23.4		23.4		54.5		54.5	54.5	
Effective Green, g (s)	23.4	23.4		23.4		23.4		54.5		54.5	54.5	
Actuated g/C Ratio	0.26	0.26		0.26		0.26		0.61		0.61	0.61	
Clearance Time (s)	6.0	6.0		6.0		6.0		6.1		6.1	6.1	
Vehicle Extension (s)	4.0	4.0		4.0		4.0		4.0		4.0	4.0	
Lane Grp Cap (vph)	423	419		328		371		1123		389	2122	
v/s Ratio Prot		0.04						c0.30			0.23	
v/s Ratio Perm	0.02			c0.19		0.03				0.12		
v/c Ratio	0.08	0.15		0.72		0.12		0.50		0.20	0.38	
Uniform Delay, d1	25.2	25.6		30.3		25.4		10.1		8.0	9.1	
Progression Factor	1.00	1.00		1.00		1.00		0.71		0.32	0.35	
Incremental Delay, d2	0.1	0.2		7.9		0.2		1.2		1.0	0.5	
Delay (s)	25.3	25.8		38.2		25.6		8.4		3.6	3.7	
Level of Service	C	C		D		C		A		A	A	
Approach Delay (s)		25.7			33.0			8.4			3.7	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.1
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Ann Arbor Station Traffic Analysis

Lane Group	EBL	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	110	78	82	174	139	38	636	835
v/c Ratio	0.35	0.20	0.27	0.59	0.56	0.18	0.77	0.54
Control Delay	36.3	2.3	34.8	43.2	43.6	10.9	22.3	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0
Total Delay	36.3	2.3	34.8	43.2	43.6	10.9	24.2	10.1
Queue Length 50th (ft)	56	0	41	96	76	12	308	70
Queue Length 95th (ft)	92	0	82	167	141	m14	150	92
Internal Link Dist (ft)				296			250	793
Turn Bay Length (ft)		25				100		
Base Capacity (vph)	312	388	303	295	248	207	825	1541
Starvation Cap Reductn	0	0	0	0	0	0	83	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.20	0.27	0.59	0.56	0.18	0.86	0.54

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	0	62	78	151	146	36	604	0	0	683	94
Future Volume (vph)	88	0	62	78	151	146	36	604	0	0	683	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Lane Util. Factor	1.00		1.00	1.00	0.95	0.95	1.00	1.00			0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.97	1.00	1.00	1.00			0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	0.98	1.00			1.00	
Frt	1.00		0.85	1.00	0.99	0.85	1.00	1.00			0.98	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1770		1568	1719	1675	1408	1765	1863			3451	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.25	1.00			1.00	
Satd. Flow (perm)	1770		1568	1719	1675	1408	469	1863			3451	
Peak-hour factor, PHF	0.80	0.80	0.80	0.95	0.95	0.95	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	110	0	78	82	159	154	38	636	0	0	734	101
RTOR Reduction (vph)	0	0	64	0	0	0	0	0	0	0	11	0
Lane Group Flow (vph)	110	0	14	82	174	139	38	636	0	0	824	0
Confl. Peds. (#/hr)	196		28	28		196	34					34
Heavy Vehicles (%)	2%	0%	3%	5%	3%	9%	0%	2%	0%	0%	1%	2%
Turn Type	Prot		Prot	Split	NA	Prot	Perm	NA			NA	
Protected Phases	8		8	4	4	4		2			2	
Permitted Phases							2					
Actuated Green, G (s)	15.9		15.9	15.9	15.9	15.9	39.9	39.9			39.9	
Effective Green, g (s)	15.9		15.9	15.9	15.9	15.9	39.9	39.9			39.9	
Actuated g/C Ratio	0.18		0.18	0.18	0.18	0.18	0.44	0.44			0.44	
Clearance Time (s)	6.1		6.1	6.1	6.1	6.1	6.1	6.1			6.1	
Vehicle Extension (s)	4.0		4.0	4.0	4.0	4.0	4.0	4.0			4.0	
Lane Grp Cap (vph)	312		277	303	295	248	207	825			1529	
v/s Ratio Prot	c0.06		0.01	0.05	c0.10	0.10		c0.34			0.24	
v/s Ratio Perm							0.08					
v/c Ratio	0.35		0.05	0.27	0.59	0.56	0.18	0.77			0.54	
Uniform Delay, d1	32.5		30.8	32.0	34.1	33.9	15.2	21.2			18.3	
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.57	0.72			0.50	
Incremental Delay, d2	3.1		0.3	2.2	8.4	8.9	1.8	6.4			1.0	
Delay (s)	35.6		31.1	34.2	42.4	42.7	10.4	21.6			10.2	
Level of Service	D		C	C	D	D	B	C			B	
Approach Delay (s)		33.8			40.8			21.0			10.2	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	20.3
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	505	254	705	1240
v/c Ratio	0.68	0.85	0.31	0.72
Control Delay	36.1	41.0	7.8	18.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	36.1	41.0	7.8	18.2
Queue Length 50th (ft)	124	45	66	235
Queue Length 95th (ft)	m163	m#137	103	362
Internal Link Dist (ft)	1498		793	705
Turn Bay Length (ft)	200	125		
Base Capacity (vph)	1171	299	2265	1713
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.85	0.31	0.72

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	345	99	208	578	735	443
Future Volume (vph)	345	99	208	578	735	443
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7		6.1	6.1	6.1	
Lane Util. Factor	0.97		1.00	0.95	0.95	
Frpb, ped/bikes	0.99		1.00	1.00	0.96	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.97		1.00	1.00	0.94	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	3389		1803	3438	3174	
Flt Permitted	0.96		0.14	1.00	1.00	
Satd. Flow (perm)	3389		275	3438	3174	
Peak-hour factor, PHF	0.88	0.88	0.82	0.82	0.95	0.95
Adj. Flow (vph)	392	112	254	705	774	466
RTOR Reduction (vph)	36	0	0	0	79	0
Lane Group Flow (vph)	469	0	254	705	1161	0
Confl. Peds. (#/hr)		14	46			46
Heavy Vehicles (%)	0%	0%	0%	5%	4%	1%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	2		1	4	3	
Permitted Phases			4			
Actuated Green, G (s)	18.9		59.3	59.3	46.3	
Effective Green, g (s)	18.9		59.3	59.3	46.3	
Actuated g/C Ratio	0.21		0.66	0.66	0.51	
Clearance Time (s)	5.7		6.1	6.1	6.1	
Vehicle Extension (s)	4.0		2.0	0.2	2.0	
Lane Grp Cap (vph)	711		298	2265	1632	
v/s Ratio Prot	c0.14		c0.07	0.21	0.37	
v/s Ratio Perm			c0.50			
v/c Ratio	0.66		0.85	0.31	0.71	
Uniform Delay, d1	32.6		23.7	6.6	16.7	
Progression Factor	1.08		0.78	1.05	1.00	
Incremental Delay, d2	2.4		15.7	0.3	2.7	
Delay (s)	37.5		34.1	7.2	19.4	
Level of Service	D		C	A	B	
Approach Delay (s)	37.5			14.3	19.4	
Approach LOS	D			B	B	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	5	947	992	23	7	6
v/c Ratio	0.05	0.32	0.35	0.14	0.01	0.01
Control Delay	45.0	3.3	8.6	40.2	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	3.3	8.6	40.2	0.0	0.0
Queue Length 50th (ft)	3	73	71	14	0	0
Queue Length 95th (ft)	15	142	328	26	0	0
Internal Link Dist (ft)		293	1215		158	248
Turn Bay Length (ft)	180			50		
Base Capacity (vph)	438	2941	2859	490	904	914
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.32	0.35	0.05	0.01	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	867	5	0	942	0	16	0	5	0	0	5
Future Volume (vph)	5	867	5	0	942	0	16	0	5	0	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7			5.7		5.6	5.6			5.6	
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98			0.98	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			1.00		1.00	0.85			0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	3434			3438		1796	1585			1616	
Flt Permitted	0.95	1.00			1.00		0.75	1.00			1.00	
Satd. Flow (perm)	1805	3434			3438		1425	1585			1616	
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.69	0.69	0.69	0.78	0.78	0.78
Adj. Flow (vph)	5	942	5	0	992	0	23	0	7	0	0	6
RTOR Reduction (vph)	0	0	0	0	0	0	0	6	0	0	6	0
Lane Group Flow (vph)	5	947	0	0	992	0	23	1	0	0	0	0
Confl. Peds. (#/hr)	51		29	29		51	3		4	4		3
Heavy Vehicles (%)	0%	5%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA		Perm	NA			NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	1.3	81.1			74.1		7.6	7.6			7.6	
Effective Green, g (s)	1.3	81.1			74.1		7.6	7.6			7.6	
Actuated g/C Ratio	0.01	0.81			0.74		0.08	0.08			0.08	
Clearance Time (s)	5.7	5.7			5.7		5.6	5.6			5.6	
Vehicle Extension (s)	3.0	3.0			4.5		1.0	1.0			1.0	
Lane Grp Cap (vph)	23	2784			2547		108	120			122	
v/s Ratio Prot	0.00	c0.28			c0.29			0.00			0.00	
v/s Ratio Perm							c0.02					
v/c Ratio	0.22	0.34			0.39		0.21	0.00			0.00	
Uniform Delay, d1	48.8	2.5			4.7		43.4	42.7			42.7	
Progression Factor	1.00	1.00			1.77		1.00	1.00			1.00	
Incremental Delay, d2	4.7	0.3			0.4		0.4	0.0			0.0	
Delay (s)	53.6	2.8			8.7		43.8	42.7			42.7	
Level of Service	D	A			A		D	D			D	
Approach Delay (s)		3.1			8.7			43.5			42.7	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Ann Arbor Station Traffic Analysis

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	258	1065	11	722	98	95	39	33	299
v/c Ratio	0.89	0.51	0.10	0.53	0.75	0.33	0.32	0.15	0.68
Control Delay	72.5	12.1	44.7	25.5	79.7	33.0	51.5	39.0	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.5	12.1	44.7	25.5	79.7	33.0	51.5	39.0	13.2
Queue Length 50th (ft)	140	107	7	174	62	45	24	20	0
Queue Length 95th (ft)	#285	355	24	265	#147	87	51	39	43
Internal Link Dist (ft)		1215		729		257		381	
Turn Bay Length (ft)	225		150		100		180		
Base Capacity (vph)	291	2083	269	1362	130	456	124	445	574
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.89	0.51	0.04	0.53	0.75	0.21	0.31	0.07	0.52

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	227	792	145	10	612	52	90	62	26	31	26	239
Future Volume (vph)	227	792	145	10	612	52	90	62	26	31	26	239
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1626	3457		1504	3481		1770	1806		1687	1827	1428
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1626	3457		1504	3481		1770	1806		1687	1827	1428
Peak-hour factor, PHF	0.88	0.88	0.88	0.92	0.92	0.92	0.92	0.92	0.92	0.80	0.80	0.80
Adj. Flow (vph)	258	900	165	11	665	57	98	67	28	39	32	299
RTOR Reduction (vph)	0	9	0	0	5	0	0	17	0	0	0	262
Lane Group Flow (vph)	258	1056	0	11	717	0	98	78	0	39	33	37
Confl. Peds. (#/hr)	22					22	4		4	4		4
Heavy Vehicles (%)	11%	2%	2%	20%	2%	4%	2%	0%	0%	7%	4%	11%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												8
Actuated Green, G (s)	17.9	55.1		1.8	39.0		7.4	15.3		4.4	12.3	12.3
Effective Green, g (s)	17.9	55.1		1.8	39.0		7.4	15.3		4.4	12.3	12.3
Actuated g/C Ratio	0.18	0.55		0.02	0.39		0.07	0.15		0.04	0.12	0.12
Clearance Time (s)	6.1	6.1		6.1	6.1		5.6	5.6		5.6	5.6	5.6
Vehicle Extension (s)	6.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	291	1904		27	1357		130	276		74	224	175
v/s Ratio Prot	c0.16	c0.31		0.01	0.21		c0.06	c0.04		0.02	0.02	
v/s Ratio Perm												0.03
v/c Ratio	0.89	0.55		0.41	0.53		0.75	0.28		0.53	0.15	0.21
Uniform Delay, d1	40.1	14.5		48.6	23.4		45.4	37.5		46.8	39.2	39.5
Progression Factor	1.02	0.85		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	28.1	1.2		13.1	1.5		22.8	0.8		8.5	0.4	0.8
Delay (s)	69.2	13.5		61.7	24.9		68.3	38.3		55.3	39.6	40.3
Level of Service	E	B		E	C		E	D		E	D	D
Approach Delay (s)		24.3			25.5			53.5			41.8	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	29.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.4
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Ann Arbor Station Traffic Analysis

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	209	62	607	291	492	63	244
v/c Ratio	0.46	0.37	0.81	0.70	0.68	0.31	0.36
Control Delay	19.8	6.1	27.8	28.8	23.0	20.3	14.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.8	6.1	27.8	28.8	23.0	20.3	14.7
Queue Length 50th (ft)	60	0	203	97	163	17	59
Queue Length 95th (ft)	132	0	#392	#237	308	54	128
Internal Link Dist (ft)	628		690		412		625
Turn Bay Length (ft)		250		80		150	
Base Capacity (vph)	538	168	896	532	922	263	857
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.37	0.68	0.55	0.53	0.24	0.28

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	109	53	11	366	127	276	456	11	56	148	69
Future Volume (vph)	69	109	53	11	366	127	276	456	11	56	148	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	4.0		5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	1.00		0.99		1.00	1.00		1.00	0.98	
Flpb, ped/bikes		1.00	1.00		1.00		0.98	1.00		1.00	1.00	
Frt		1.00	0.85		0.97		1.00	1.00		1.00	0.95	
Flt Protected		0.98	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1820	1553		1809		1768	1873		1805	1710	
Flt Permitted		0.59	1.00		0.99		0.58	1.00		0.28	1.00	
Satd. Flow (perm)		1096	1553		1797		1084	1873		537	1710	
Peak-hour factor, PHF	0.85	0.85	0.85	0.83	0.83	0.83	0.95	0.95	0.95	0.89	0.89	0.89
Adj. Flow (vph)	81	128	62	13	441	153	291	480	12	63	166	78
RTOR Reduction (vph)	0	0	62	0	15	0	0	1	0	0	21	0
Lane Group Flow (vph)	0	209	0	0	592	0	291	491	0	63	223	0
Confl. Peds. (#/hr)	1		3	3		1	9		4	4		9
Heavy Vehicles (%)	3%	2%	4%	0%	1%	0%	0%	1%	0%	0%	6%	0%
Turn Type	Perm	NA	NA	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		26.3	0.0		26.3		24.6	24.6		24.6	24.6	
Effective Green, g (s)		26.3	0.0		26.3		24.6	24.6		24.6	24.6	
Actuated g/C Ratio		0.39	0.00		0.39		0.37	0.37		0.37	0.37	
Clearance Time (s)		5.6			5.6		5.6	5.6		5.6	5.6	
Vehicle Extension (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		432	0		708		399	690		198	630	
v/s Ratio Prot								0.26			0.13	
v/s Ratio Perm		0.19			c0.33		c0.27			0.12		
v/c Ratio		0.48	0.00		0.84		0.73	0.71		0.32	0.35	
Uniform Delay, d1		15.1	33.4		18.3		18.2	18.0		15.1	15.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.2	0.0		8.8		7.0	3.7		1.3	0.5	
Delay (s)		16.3	33.4		27.1		25.2	21.7		16.3	15.7	
Level of Service		B	C		C		C	C		B	B	
Approach Delay (s)		20.2			27.1			23.0			15.9	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	22.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	66.7	Sum of lost time (s)	15.2
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	979	8	0	0	0	0	0	15	57	7	0
Future Volume (Veh/h)	0	979	8	0	0	0	0	0	15	57	7	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1064	9	0	0	0	0	0	16	62	8	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		607										
pX, platoon unblocked				0.87			0.87	0.87	0.87	0.87	0.87	
vC, conflicting volume	0			1073			1072	1068	536	548	1073	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			782			781	777	165	178	782	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	98	90	97	100
cM capacity (veh/h)	1622			722			242	284	739	653	282	1084

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total	709	364	16	70
Volume Left	0	0	0	62
Volume Right	0	9	16	0
cSH	1700	1700	739	567
Volume to Capacity	0.42	0.21	0.02	0.12
Queue Length 95th (ft)	0	0	2	10
Control Delay (s)	0.0	0.0	10.0	12.2
Lane LOS			A	B
Approach Delay (s)	0.0		10.0	12.2
Approach LOS			A	B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	984	10	0	42
Future Volume (Veh/h)	0	0	984	10	0	42
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1070	11	0	46
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1081				1076	540
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1081				1076	540
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	91
cM capacity (veh/h)	641				214	486

Direction, Lane #	WB 1	WB 2	SB 1
Volume Total	713	368	46
Volume Left	0	0	0
Volume Right	0	11	46
cSH	1700	1700	486
Volume to Capacity	0.42	0.22	0.09
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.0	0.0	13.2
Lane LOS			B
Approach Delay (s)	0.0		13.2
Approach LOS			B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	967	84	0	0	0	160
Future Volume (Veh/h)	967	84	0	0	0	160
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1051	91	0	0	0	174
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1001					
pX, platoon unblocked			0.90		0.90	0.90
vC, conflicting volume			1142		1051	526
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			931		830	245
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	74
cM capacity (veh/h)			656		277	678

Direction, Lane #	EB 1	EB 2	EB 3	NB 1
Volume Total	526	526	91	174
Volume Left	0	0	0	0
Volume Right	0	0	91	174
cSH	1700	1700	1700	678
Volume to Capacity	0.31	0.31	0.05	0.26
Queue Length 95th (ft)	0	0	0	25
Control Delay (s)	0.0	0.0	0.0	12.1
Lane LOS				B
Approach Delay (s)	0.0			12.1
Approach LOS				B

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	869	125	0
Future Volume (Veh/h)	0	0	0	869	125	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	945	136	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				980		
pX, platoon unblocked					0.93	
vC, conflicting volume			0		472	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		296	0
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		78	100
cM capacity (veh/h)			1622		627	1084

Direction, Lane #	WB 1	WB 2	NB 1
Volume Total	472	472	136
Volume Left	0	0	136
Volume Right	0	0	0
cSH	1700	1700	627
Volume to Capacity	0.28	0.28	0.22
Queue Length 95th (ft)	0	0	20
Control Delay (s)	0.0	0.0	12.3
Lane LOS			B
Approach Delay (s)	0.0		12.3
Approach LOS			B

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

APPENDIX J
FULLER ROAD/MAIDEN LANE/EMCD
ROUNDABOUT ANALYSIS MEMO

OFFICE MEMORANDUM

DATE: January 13, 2017

TO: Bob Gorski, AECOM Project Manager

FROM: Wes Butch, Jason Whitten

SUBJECT: Ann Arbor Station Traffic Impact Study –
Previous Analysis for Fuller Road/Maiden Lane/East Medical Center Drive

INTRODUCTION

The purpose of this memo is to provide traffic analysis information that was previously generated for the Fuller Road/Maiden Lane/East Medical Center Drive intersection study (henceforth referred to as "the intersection study" in this memo). This information is to be considered as part of the Ann Arbor Station Traffic Impact Study (henceforth referred to as the "AASTIS" in this memo). More specifically, this memo describes the traffic modeling that has been conducted for the intersection study. This memo also compares the traffic volumes which were evaluated at the subject intersection for the two projects.

As part of the intersection study, the City of Ann Arbor determined that an upgraded traffic signal intersection would not be feasible or practical, as it would require costly widening of the three existing bridges adjacent to the intersection. As a result, a roundabout intersection was recommended. The roundabout intersection improvements were subsequently added to the City's Capital Improvement Plan.

From the previous intersection study, the recommended roundabout geometry included:

- An inscribed circle diameter of 170 feet
- Two-lane entries and exits on all legs
- Two circulating lanes
- High Intensity Activated Crosswalk (HAWK) signals for pedestrians on all legs
- Westbound right turn bypass lane

The goal of the intersection study was to determine the optimal roundabout geometry and achieve an optimum balance between automobile and pedestrian operations at the study intersection. The roundabout geometry, traffic volumes, and pedestrian volumes were analyzed using the microsimulation software VISSIM to evaluate pedestrian and vehicular interaction and performance. The VISSIM model was established with driver and pedestrian behavior settings which would most accurately represent the expected conditions at the intersection.

Traffic Volumes

Table 1 shows the total entering volumes (i.e., traffic entering the intersection from all four legs) for both studies. As shown in this table, the year 2014 volumes from the intersection study are higher than the year 2035 projected volumes (i.e., the design year volumes) that were used in the AASTIS.

Table 1. Fuller Road/Maiden Lane/East Medical Center Drive Intersection Traffic Volume Comparison

Year 2014 Fuller Road/Maiden Lane/East Medical Center Drive Intersection Improvement Project: Total Entering Traffic Volumes		Year 2035 Ann Arbor Station TIS: Total Entering Traffic Volumes		Difference	
AM	PM	AM	PM	AM	PM
3235	3225	2593	2935	-642	-290

Roundabout Traffic Operations

The VISSIM microsimulation analysis from the intersection study showed that the proposed roundabout would operate at overall Level of Service (LOS) C (15.9 seconds of delay) during the AM peak hour. During the PM peak hour, the roundabout would operate at an overall LOS of D (26.1 seconds of delay). These delay times for a roundabout are substantially less than delays currently being experienced at the existing traffic signal controlled intersection.

Applicability to Ann Arbor Station Traffic Impact Study

The intersection study demonstrated that the roundabout would operate at an acceptable peak hour LOS with the volumes shown in Table 1. As shown in this table, the traffic volumes from the intersection study are considerably higher than the design year traffic volumes from the AASTIS. Because the traffic volumes from the AASTIS are lower than the intersection study, it is reasonable to expect that with the AASTIS design year volumes, traffic operations at this intersection would be better than the operations that were predicted as part of the intersection study. Therefore, the proposed roundabout would accommodate the AASTIS traffic volumes.

Appendix D: Ann Arbor Station—Consideration of Build Alternative 1 (North Main Street)

Date: May 16, 2016

To: Eli Cooper, Transportation Manager, City of Ann Arbor
From: Project Team

Subject: Ann Arbor Station—Consideration of Build Alternative 1 (North Main Street)

The purpose of this memorandum is to evaluate a proposed site for a potential new multi-modal, intermodal, intercity and commuter passenger rail station (Ann Arbor Intermodal Passenger Rail Station) near North Main Street and Lake Shore Drive. This location, situated approximately one mile north of downtown Ann Arbor, is identified as Build Alternative 1 (North Main Street). The memorandum includes an evaluation of the option to locate a new station at the Build Alternative 1 site. This evaluation is based on outlined criteria, and resulted in a recommendation to remove this alternative from further consideration. The Build Alternative 1 location within Ann Arbor is shown in Figure 1.

Led by the City of Ann Arbor, the Ann Arbor Station Environmental Review began in February 2014 and is scheduled to conclude in December 2014. Its stated purpose is to:

> "provide an intermodal facility that will accommodate existing and future intercity passenger rail ridership; improve intermodal connectivity, including the possibility of commuter rail in the City of Ann Arbor; and to improve the integration of the station with the City of Ann Arbor and its neighboring communities."[1]

The Environmental Review is a conceptual planning study for:

a. Defining the long-term needs for an Ann Arbor Intermodal Passenger Rail Station;
b. Identifying potential sites and station options;
c. Evaluating benefits and impacts of various station options, including Build Alternatives and a No Build Alternative (continued use of the existing station); and
d. Complying with Federal, State and local requirements, resulting in approval of a preferred alternative for an Ann Arbor Intermodal Passenger Rail Station.

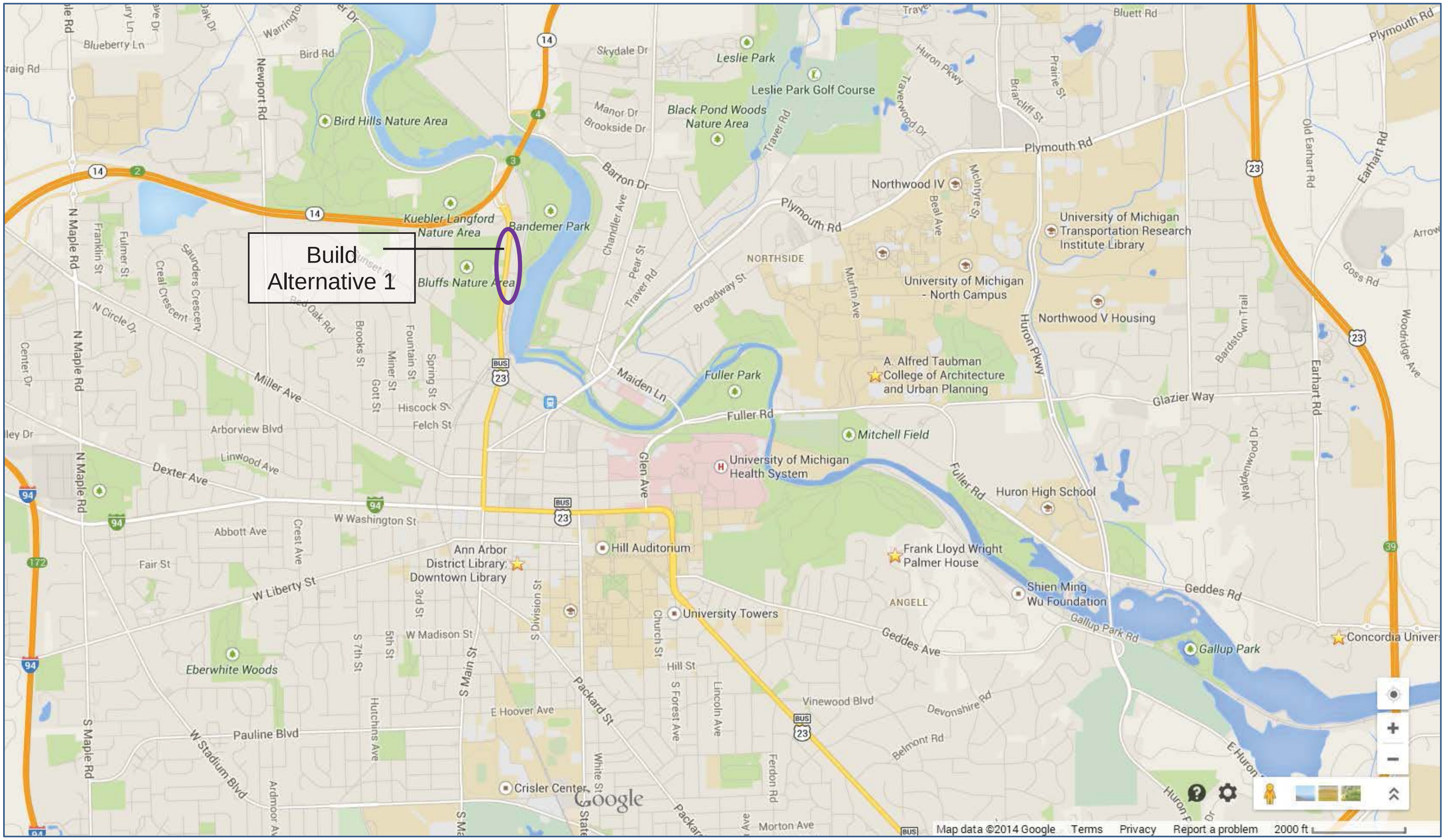
The Alternatives Analysis process is divided into two phases:

- **Phase I:** Identification of possible sites for Build Alternatives, and an initial screening of these alternatives; and
- **Phase II:** Development of site-specific station footprints for and environmental analysis of a smaller set of Build Alternatives and the No Build Alternative; and selection of and conceptual design for a Preferred Alternative.

The completed Phase I screening of alternatives is described in the following section. The Project Team has entered Phase II and completed initial conceptual designs for a smaller set of Build Alternatives.

[1] Ann Arbor Station Environmental Review Purpose and Need Executive Summary, June 24, 2014. Available at http://www.a2gov.org/departments/systems-planning/Transportation/Documents/AAS_PurposeNeed_1-Page_Summ_06-24-2014_Final.pdf

Figure 1: Location of Build Alternative 1 (North Main Street) Within Ann Arbor



Source: Google Maps

Phase I Alternatives

Phase I of the Alternatives Analysis presented eight possible locations for Build Alternatives. These locations reflect design criteria provided by the Michigan Department of Transportation (MDOT) and the National Passenger Rail Corporation (Amtrak). Both entities requested that any enhancements to the existing station, or construction of a new station, should occur along a tangent (straight) section of the MDOT railroad. This meets train operational objectives that ensure ADA compliance (manageable gaps between the trains and platforms), promotes passenger convenience and safety, and protects railroad equipment and infrastructure. Both MDOT and Amtrak stipulated that the tangent track sections should be at least 1,000 feet long to support railroad operational needs.

Eight locations with 1,000-foot tangent track segments within the city of Ann Arbor were identified. These track segments and their surrounding areas were then evaluated for their compatibility with the Ann Arbor Station program. The eight "Segments" are shown in Table 1.

Design and environmental criteria were used to screen the alternatives. These criteria stipulated that the potential sites should:

- Lie along the existing MDOT railroad corridor along which Amtrak operates, and within City of Ann Arbor limits;
- Provide convenient access to downtown Ann Arbor and major activity areas;
- Include enough land to accommodate all required site features;
- Allow convenient access to existing roadway networks;
- Support connections to public transit services and non-motorized transportation facilities; and
- Minimize impacts to environmental resources.

Table 1:
1,000-Foot Straight Track Segments along the MDOT Corridor in Ann Arbor

Segment #	Name	Approximate Track Milepost*	Approximate Length (Feet)
1	West Huron River Drive	38.5	2,300
2	Barton Shore Drive	38.4	2,200
3	North Main Street	37.9	1,500
4	Depot Street (Existing Amtrak Station)	37.3	1,200
5	Fuller Road (West)	36.8	1,300
6	Fuller Road (East)	36.2	1,600
7	Geddes Avenue (West)	35.1	2,000
8	Geddes Avenue (East)	34.8	1,700

**From the 1999 Consolidated Rail Dearborn Division track charts, Michigan Line. These mileposts appear to land within the segments and do not represent surveyed midpoints.*

These criteria were reviewed by Ann Arbor stakeholders and citizens at public meetings in April 2014 and met with general approval. An evaluation of the initial Build Alternatives (the segments) was presented at a round of meetings in June 2014. Two of the segments were initially recommended as Build Alternatives for further evaluation in Phase II: Segment 4 (Depot Street/Existing Amtrak Station) and Segment 5 (Fuller Road—West). Segment 3 (North Main

Street) was determined to not meet the criteria and was not recommended for inclusion in Phase II.

During the June meetings, stakeholders expressed interest in additional evaluation criteria, with numerous requests received to consider implementation costs and station-oriented development. Several stakeholders questioned the evaluation of Segment 3 (North Main Street) and requested its inclusion in the Phase II analysis. Of particular interest was the idea of redeveloping the area with station-oriented development. While Segment 3 did not meet the initial criteria, the Project Team agreed to further evaluate Segment 3 in Phase II of the Alternatives Analysis, which would include three Build Alternatives and a No Build scenario. The Build Alternatives are:

- Build Alternative 1: North Main Street. This alternative is located along the tracks east of North Main Street near Lake Shore Drive;
- Build Alternative 2: Depot Street/Existing Amtrak. This alternative would reuse the property currently occupied by the Ann Arbor Amtrak station, along Depot Street adjacent to the historic depot; and
- Build Alternative 3: Fuller Road (West). This location extends along the tracks south of Fuller Road near the East Medical Center Drive overpass.

As the Project Team proceeded with the Phase II analysis, further concerns arose regarding the viability of Build Alternative I. These concerns are documented in the following sections.

Considerations Regarding Build Alternative 1 (North Main Street)

Location Description

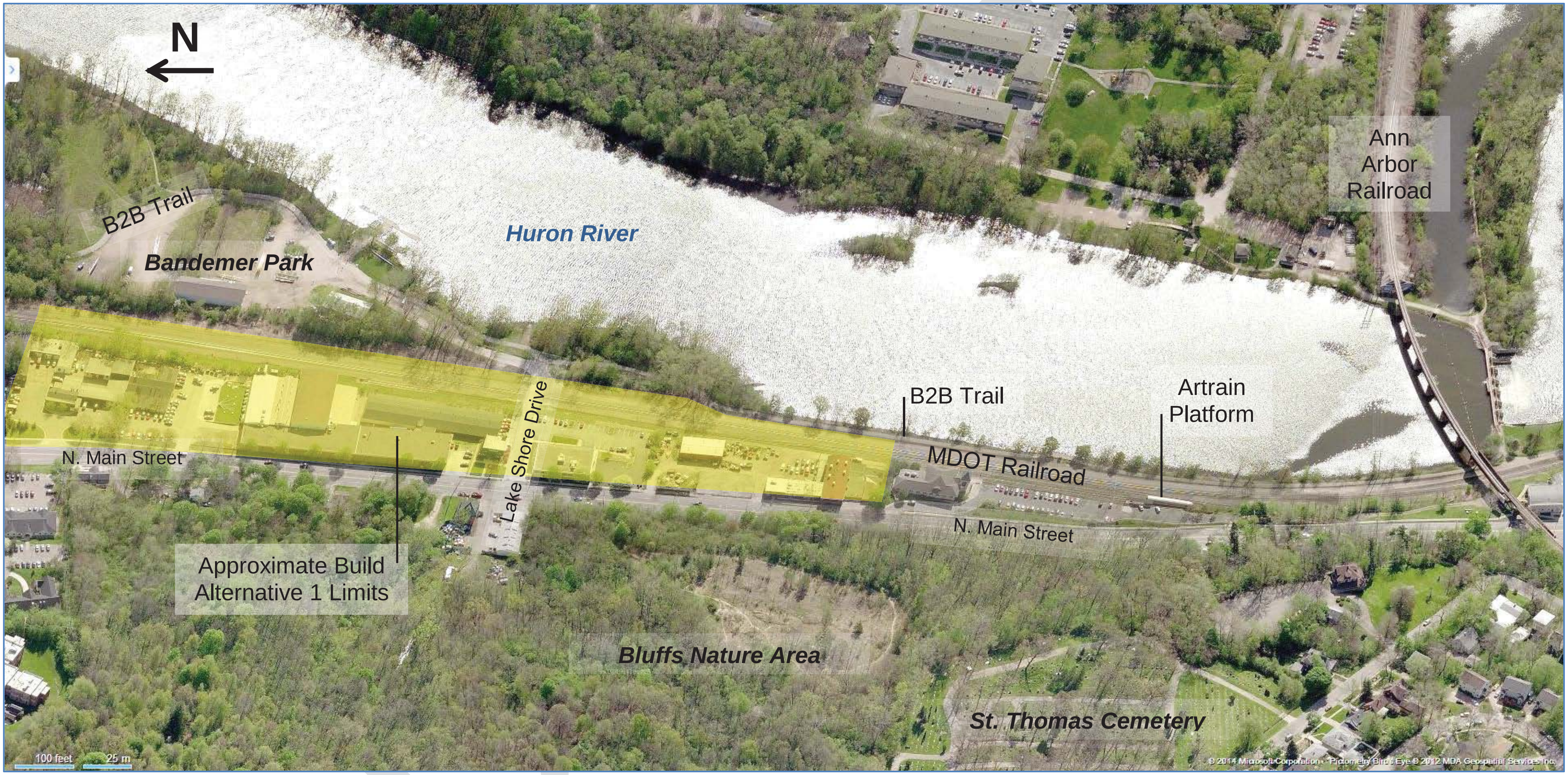
Build Alternative 1 is located approximately one mile northwest of downtown Ann Arbor, near the intersection of North Main Street and Lake Shore Drive (a private road). Here the tracks extend between two contrasting uses: a light industrial zone lining North Main Street, and Bandemer Park. The Build Alternative 1 area is shown in Figure 2. Two conceptual designs for the alternative are provided in Attachment 1.

The track area and Bandemer Park are accessed via Lake Shore Drive, a private roadway that connects perpendicularly with North Main Street and crosses the tracks at grade. Lake Shore Drive is also the only access point in the area for the Border-to-Border (B2B) Trail shared-use pathway, which extends through the park. At the southern end of the 1,000-foot track segment, the B2B Trail transitions to an easement provided by the railroad. Here the tracks and B2B Trail are immediately adjacent to the Huron River.

The railroad right-of-way is exceptionally wide through much of the Build Alternative 1 area. Historically, this area included industrial access yard tracks. Artrain/Mid America Railcar Leasing LLC (http://www.midamericarailcar.com/index.html) uses two remaining siding tracks to store vintage railroad cars here. A trackside platform and shelter serves provides access to the cars.

The Artrain rail shelter sits adjacent to a parking lot for the NEW Center, a facility housing non-profit organizations at 1100 North Main Street. The parking lot contains just over 50 parking spaces adjacent to the tracks.

Figure 2: Build Alternative 1 Area Overview



Source: Bing Maps

Phase I Evaluation

Criterion: Convenient Access to Downtown Ann Arbor and Major Trip Generators

The one mile distance between Build Alternative 1 and downtown Ann Arbor is greater than the national walking tolerance average of one-half mile to fixed guideway transit. Other major activity areas are farther from the segment. (The other two Build Alternatives are located within one-half mile of major activity areas.) The primary connection to the area is North Main Street, which offers a sidewalk along the east side of the roadway and few other amenities for walking or bicycling between Downtown, Ann Arbor neighborhoods, and the site. The B2B Trail provides regional bicycle access to the area, with the only connection to the train tracks in the area at Lake Shore Drive.

Upon further consideration, the station program would require relocating Lake Shore Drive. Vehicular access to Bandemer Park would likely be shifted to a new roadway, to be constructed about 500 feet to the north of the existing Lake Shore Drive alignment. This is required because no roadways can cross the train platforms, which would be nearly centered on the existing Lake Shore Drive. A pedestrian overpass to Bandemer Park and the B2B Trail would be provided in the area of the present Lake Shore Drive. This bridge would provide elevators on either side of the tracks and is required to access train platforms that would be located on both sides of the tracks.

Criterion: Suitable Land for a Station

The wedge of properties between North Main Street and the tracks contains several light industrial and office uses. The Project Team's initial expectation was that one or more of these properties would need to be acquired in order to locate a multi-modal station in the area.

In August 2014, the team developed two conceptual designs for the alternative (Attachment 1). Both designs assumed a station building above the tracks due to the narrow site. Both concepts included structured parking. Both concepts placed transit multi-modal facilities on the ground floor of a parking deck. Concept A placed kiss and ride, taxi, and short term parking facilities outside of the parking deck. Concept B placed these facilities under the parking deck to reduce the site footprint. Both concepts assumed higher parking demand than is currently assumed. Should the plans be revised to reflect current assumptions, the parking decks would be taller but would likely have a similar footprint.

The team concluded that the relatively narrow site required an elongated form extending several hundred feet in each direction from the existing Lake Shore Drive. This is reflected in the concept plans. Thus, the team assumed that the alternative would require more property than was initially assumed: between 6.25 and 10 acres of property to fit the station program at the site. Accordingly, all properties between the tracks and North Main Street, and within at least 600 feet of Lake Shore Drive, would be required for the station program. This would necessitate relocating multiple manufacturing and office uses.

Criterion: Convenient Access to Existing Roadways

North Main Street is a major four-lane arterial through this area with connections to Downtown and M 14. Upon further consideration, North Main Street would likely require at least two signalized intersections plus a turn lane at vehicular entry points.

Criterion: Public Transit Connections

Only one AAATA bus route, Route 13, travels in the general Build Alternative 1 area. It operates about three blocks from the southern limit of the potential station. Other bus routes would need to make major diversions to serve the area. The proposed Washtenaw and

Livingston Line (WALLY) commuter rail service may be implemented within one-quarter mile of the southern end of Build Alternative 1. The Ann Arbor Railroad, along which WALLY would operate, crosses above the MDOT railroad at this point. Both railroads navigate sharp curves at the crossing point. The WALLY project has not proposed a station in the vicinity of the crossing point. Track curvature makes a direct railroad-to-railroad vertical transfer at the crossing unfeasible.

Criterion: Minimizing Environmental Impacts

The Build Alternative 1 need for land from office and industrial properties would be greater than initially anticipated. This relocation would increase the alternative's costs. Potential uses of nearby park areas would also need consideration. One elevator tower for the pedestrian crossing would be immediately adjacent to parkland and may require parkland usage. A new roadway to replace the Lake Shore Drive crossing would use an undeveloped edge of Bandemer Park, with associated park land impacts. Also to be considered: the cost to redesign North Main Street and nearby intersections to provide multi-modal site access.

Phase II Evaluation

Additional Evaluation Criteria Requested by Stakeholders

Station-Oriented Development

The subjects of most frequent comment supporting further evaluation of this site were redevelopment and station-oriented development. Repeatedly mentioned was the recent North Main-Huron River Corridor Vision Project, which advocated a multi-modal streetscape and improved connections to the B2B Trail and riverfront.[2] These requests were the primary justification for retaining Build Alternative 1 in the Phase II analysis.

The potential for station-oriented development in the immediate Build Alternative 1 area is limited. As previously stated, the station program would require up to 10 acres, including all land between North Main Street and the tracks, within at least 600 feet of Lake Shore Drive. The station program would leave no ground space for redevelopment. The entire area would be required for features such as a bus transfer facility, parking structure, and passenger drop-off area. Development east of the site is prevented by Bandemer Park and the river. Development west of the site is prevented by the Bluffs Nature Area. Remaining areas include:

West of Main:

- A small industrial area at 1251 North Main;
- A few single family homes along Main; and
- A newer office and assisted living redevelopment at Huronview Boulevard.

East of Main:

- The New Center non-profit organization redevelopment south of the site (existing redevelopment); and
- Industrial properties at 1342 North Main and extending north to the M14 interchange.

Lost in the transition would be a recently-constructed office building at 1250 North Main and relocated employment facilities. In short, station-oriented development potential at and around Build Alternative 1 is highly constrained.

[2] This project was active between spring 2012 and summer 2013. Sources: Renew North Main at http://www.renewnorthmain.org/; and Stanton, R.J., Ann Arbor News, May 8, 2012. "New task force will develop vision for connecting North Main Street and Huron River." http://www.annarbor.com/news/new-task-force-will-develop-vision-for-connecting-north-main-street-and-huron-river/.

Conclusions

It appears possible to locate an intermodal passenger rail station at the Build Alternative 1 (North Main Street) location. The prospect of acquiring several properties along the segment and relocating businesses raises the capital and socioeconomic costs of locating a station here. Access and roadway conditions create problems for vehicular and non-motorized access between the site and major activity areas and require parkland uses. This site has limited potential for transit connections compared to the other remaining alternatives. The site's environmental constraints are complex, and thus the Project Team initially did not recommend advancing this alternative for further analysis. Based on subsequent analysis requested by stakeholders, the initial recommendation to eliminate Build Alternative 1 (North Main Street) from further consideration has been verified.

Recent developments for a separate project are also relevant to the Build Alternative 1 evaluation. The Regional Transit Authority of Southeast Michigan (RTA) has partnered with MDOT to refine commuter / regional rail alternatives in the existing Amtrak Wolverine corridor between Ann Arbor and Detroit. The proposed Locally Preferred Alternative (scheduled for Board review and potential adoption in May 2016) includes rail facilities at the Build Alternative 1 site. These include a reversing siding and layover yard, which would incorporate a connection track between the MDOT and Ann Arbor railroads. The connection track can be located at this site only, and no other layover site at the Ann Arbor end of the corridor is currently under consideration. The Build Alternative 1 station layout would directly conflict with these proposed facilities.

Appendix E: Ridership and Revenue Forecasts and Operating and Maintenance Costs

PREPARED FOR:

MDOT
Michigan Department of Transportation

MICHIGAN PASSENGER RAIL
RIDERSHIP AND REVENUE FORECASTS UPDATE
TECHNICAL MEMORANDUM

PREPARED BY:

TEMS

TRANSPORTATION ECONOMICS & MANAGEMENT SYSTEMS, INC.

TABLE OF CONTENTS

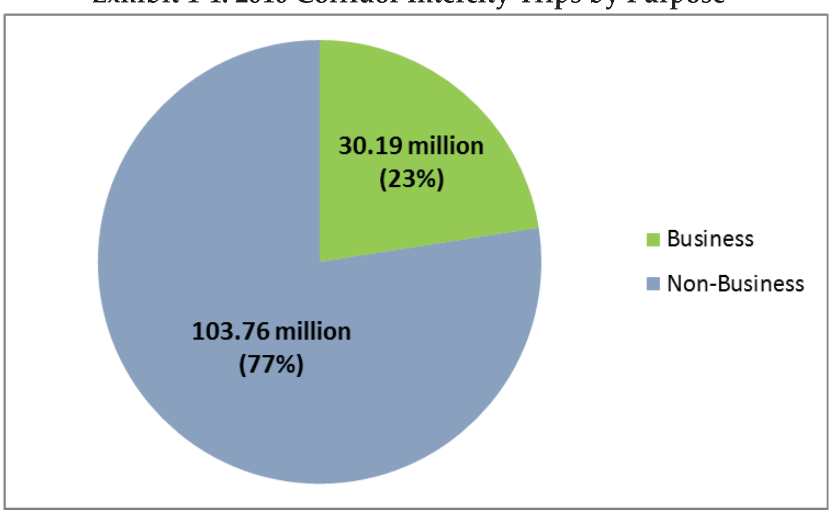
1. INTRODUCTION

1.1 Existing Michigan System

The Michigan intercity passenger rail system, consisting of three corridors, is among the most populated and busiest in the Midwest region. The state of Michigan has 83 counties with a population of 9.88 million in 2010. It is the eighth most populated state in the U.S. and known for its highly developed manufacturing industry. The Michigan passenger rail corridors are distinguished from other Midwest intercity corridors by their high population density and high employment. Michigan hosts a large number of finance and business services, manufacturing facilities, famous universities, media centers, and research and high-tech facilities. Michigan has more than five million jobs and per capita income was more than $36,000 in 2010. Projections show that Michigan's demographic and economic growth will continue over the next few decades; the population is projected to be 11 million in 2040, employment will be 6.7 million in 2040, and per capita income in 2030 is projected to be $58,300 in 2010 dollars.

The Michigan corridors have a high level of business and commuter travel among its urban areas together with significant social and tourist travel that is local, nationwide and international. The total annual intercity trips in the three Michigan corridors are currently 134 million. As shown in Exhibit 1-1, 23 percent of the intercity trips are business trips and 77 percent of the trips are non-business commuter, social and tourist trips.

Exhibit 1-1: 2010 Corridor Intercity Trips by Purpose



Sources:
- Michigan DOT
- Illinois DOT
- Federal Aviation Administration (FAA)
- Greyhound, Megabus and Indian Trails
- 2004 MWRRI Study

Exhibit 1-2 shows the current Michigan intercity passenger rail system. The mainline runs from Chicago to Detroit and Pontiac, it has three daily round trips. In addition, there are two branch lines: Chicago to Grand Rapids with one daily round trip and Chicago to Battle Creek and Port Huron with one daily round trip. The system serves 22 Michigan communities (see Appendix B). The total ridership in these corridors in 2010 fiscal year was 739,398, with 479,782 riders in the Chicago-Detroit-Pontiac Corridor, 101,907 riders in the Chicago-Grand Rapids Corridor and 157, 709 riders in the Chicago-Battle Creek-Port Huron Corridor.

Exhibit 1-2: Michigan's Intercity Passenger Rail System

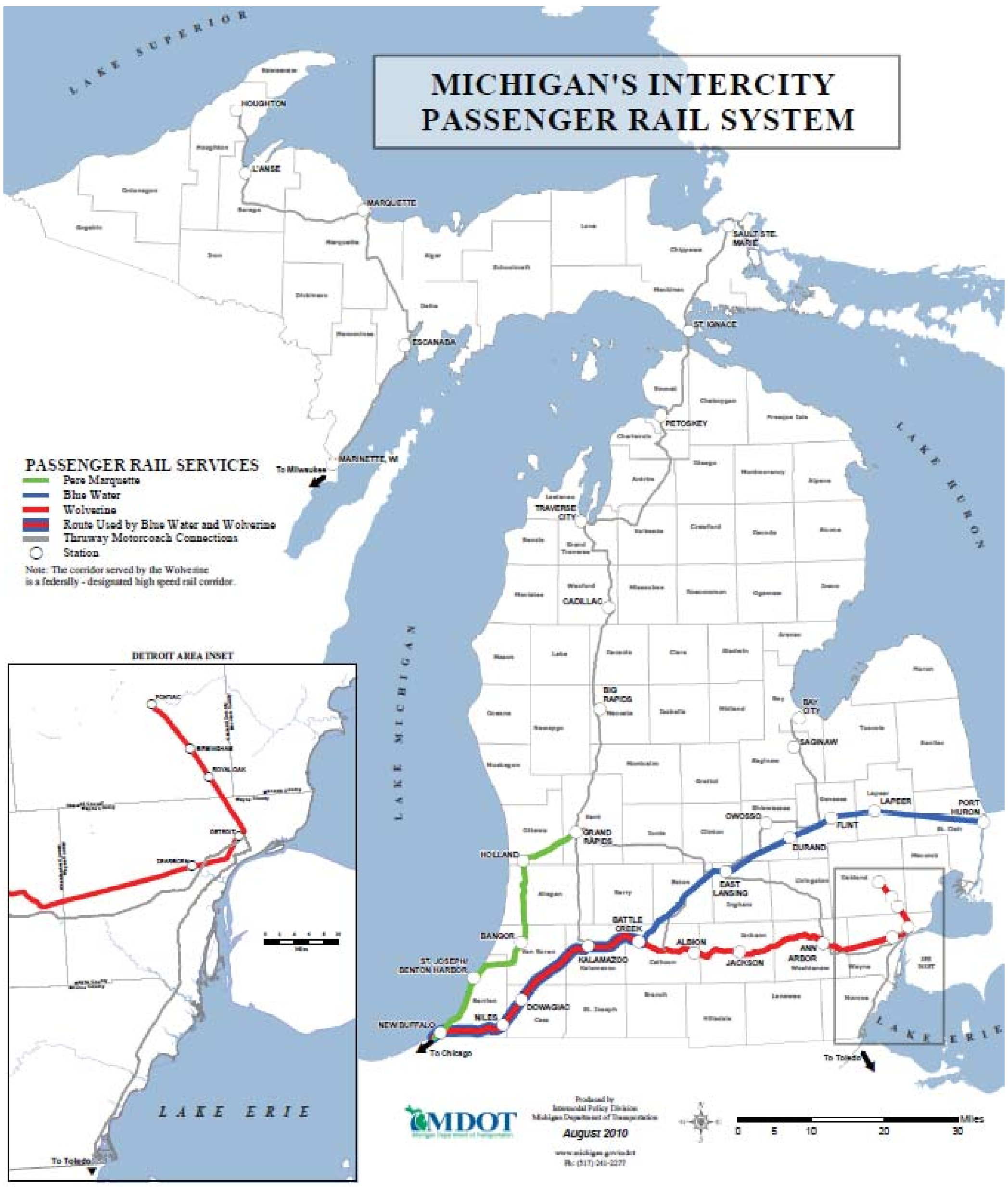
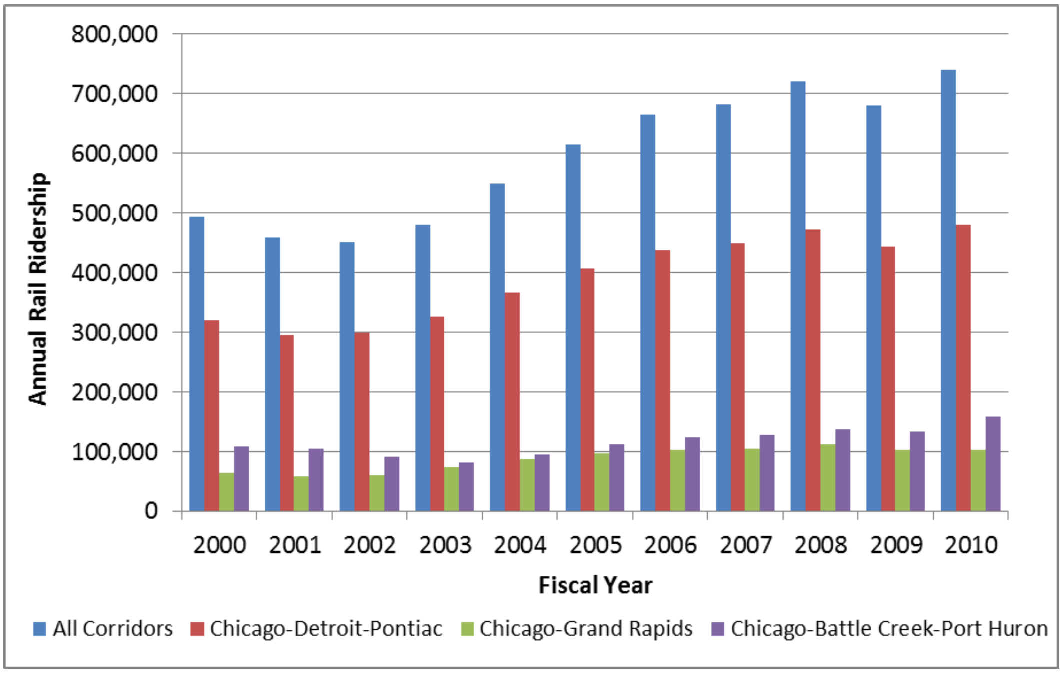


Exhibit 1-3 shows the historical Michigan rail ridership data from 2000 to 2010. The data indicates a trend of passenger rail travel growth in Michigan. The passenger rail travel decreases occurring in 2001 and 2009 were due to economic recessions where ridership drops were seen nationwide. It can be seen that the rail ridership increases from 493,474 in 2000 to 739,398 in 2010, a 49.8 percent increase or an average annual growth of 4.12 percent.

Exhibit 1-3: Historical Michigan Rail Travel Data



1.2 Proposed Michigan Passenger Rail System*

The Michigan rail system is one of the seven major rail corridors evaluated in 2004 for the Midwest Regional Rail Initiative (MWRRI). The 2004 MWRRI plan proposed the implementation of the region's rail corridor system in seven discrete phases. Michigan's improvements, which are the focus of this analysis, are being made in Phases 1 and 3. Phase 1 of the MWRRI plan envisioned improved level of service for the Chicago-Detroit-Pontiac rail corridor with new rolling stock and six daily round trips (DRTs). In Phase 3 implementation, there would be capacity upgrades for the two Michigan branch lines that go to Grand Rapids and Port Huron. In the full implementation phase, there would be 10 DRTs for the main line (Chicago-Detroit-Pontiac) and four DRTs for the branch lines. Four of the mainline DRTs would be the express service.

* The proposed Michigan passenger rail system presented in this section is based on Implementation Plan (chapter 8) of Midwest Regional Rail Initiative Project Notebook by TEMS in association with HNTB, June 2004

Consistent with the MWRRI plan, six implementation variants were defined for evaluation in this study, as follows:

- **2020 Case 1 with Chicago Hub** – this implementation has three DRTs on the mainline and one DRT on the two branch lines, the Chicago-Grand Rapids branch line uses the existing Lake Michigan shoreline route. The evaluation includes the Chicago Hub effect with connecting trips to St. Louis and Milwaukee. The service starts in 2020.
- **2020 Case 1 without Chicago Hub** – this implementation has the same assumptions as the previous one but the Chicago Hub effect is not included in the evaluation.
- **2020 Case 2 with Chicago Hub** – this implementation has six DRTs on the mainline and one DRT on the two branch lines, the Chicago-Grand Rapids branch line will use the proposed Holland-Grand Rapids-Kalamazoo route. The evaluation includes the Chicago Hub effect with connecting trips to St. Louis and Milwaukee. The service starts in 2020.
- **2020 Case 2 without Chicago Hub** – this implementation has the same assumptions as the previous one but the Chicago Hub effect is not included in the evaluation.
- **2030 with Chicago Hub** – this implementation has 10 DRTs on the mainline and four DRTs on the two branch lines, the Chicago-Grand Rapids branch line will use the proposed Holland-Grand Rapids-Kalamazoo route. The evaluation includes the Chicago Hub effect with connecting trips to St. Louis and Milwaukee. The service starts in 2030.
- **2030 without Chicago Hub** – this implementation has the same assumptions as the previous one but the Chicago Hub effect is not included in the evaluation.

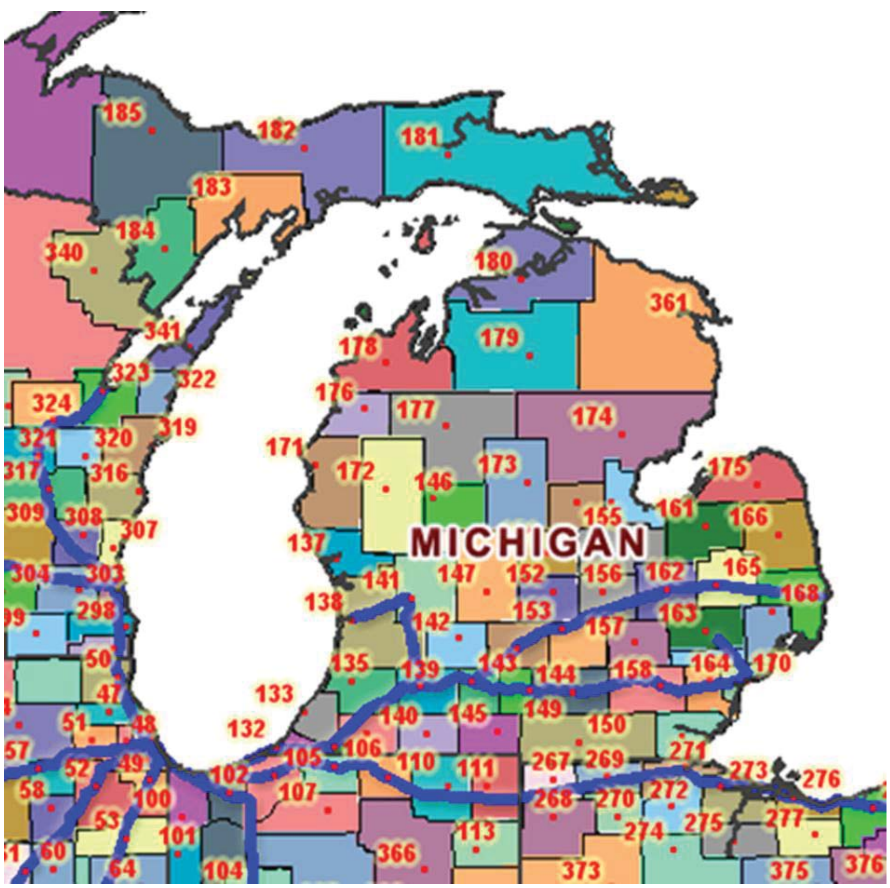
2. DATABASE DEVELOPMENT

2.1 The Zone System and Transportation Network Development

The zone system provides a representation of the market areas among which travel occurs from origins to destinations. For intercity passenger rail planning, most rural zones can be represented by county-level or larger designation. However, where it is important to identify more refined trip origins and destinations in urban areas, counties are split into finer zones. The travel demand model forecasts the total number of trip origins and destinations by mode and by zone pair.

A new 383-zone system has been developed for the Midwest region based on the 2004 MWRRI study zone system. Compared to the old zone system, finer zones have been used for more accurate representation of the study area. Fifty-six (56) zones of the new zone system are Michigan zones, Exhibit 2-1 shows the Michigan zone system used in this study.

Exhibit 2-1: Michigan Zone System

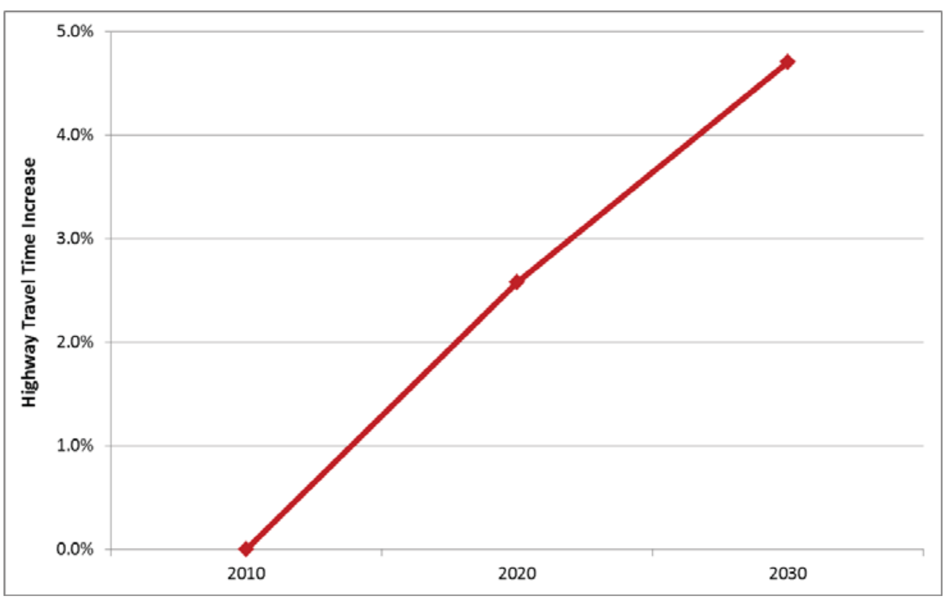


Network data for all four modes of auto, bus, air, rail for the entire region was updated to base year 2010. It was necessary to update the entire region, and not just the study corridor, because of the study requirement to assess the impact on the corridor of MWRRI connecting trips. The network data assembled for the study included the following attributes for all the zone pairs.

- For private mode (auto):
  - Travel time, including rest time
  - Travel cost (vehicle operating cost and tolls)
- For public travel modes (bus, air and rail):
  - Access/egress times and costs (e.g., travel time to a station, time/cost of parking, time walking from a station, or time/cost of taking a taxi to the final destination, etc.)
  - Waiting at terminal and delay times
  - In-vehicle travel times
  - Number of interchanges and connection times
  - Fares
  - On-time performance
  - Frequency of service

For auto mode, the driving cost was updated using current gas prices and driving time was updated to reflect the current highway link Average Annual Daily Traffic (AADT) and congestion. Exhibit 2-2 shows the projected travel time increase of the Interstate 94 corridor between Chicago and Detroit for 2020 and 2030 with data from Michigan DOT and Illinois DOT.

Exhibit 2-2: Interstate 94 Corridor Highway Travel Time Increase Projection



As shown in Exhibit 2-2, the highway travel time of the Chicago-Detroit corridor will increase by nearly five percent in 2030, an average annual increase of 0.23 percent.

The bus network was developed based on the information obtained from several bus operators including Greyhound, Megabus and Indian Trails. Bus travel times and costs are updated to the current base year 2010. The air network was updated to base year 2010 using information from the Federal Aviation Administration (FAA) 10 percent ticket sample and airlines that serve the region.

The passenger rail network was developed based on the Amtrak train schedule and cost data and information from the Transportation Management Systems (TMS) maintained by Michigan DOT. Exhibits 2-3 and 2-4 show the passenger rail networks used in this study. Exhibit 2-3 shows the passenger rail network with Chicago Hub connections to St. Louis and Milwaukee; Exhibit 2-4 shows the stand-alone Michigan passenger rail corridor without Chicago Hub. The Chicago-Grand Rapids shoreline route was also used in developing the 2020 Case 1 forecast.

Exhibit 2-3: Rail Network with Chicago Hub Connections to St. Louis and Milwaukee

Exhibit 2-4: Rail Network without Chicago Hub Connections to St. Louis and Milwaukee

The rail level-of-service attributes of travel time, on-time performance and frequency used for each rail service scenario described in Section 1.2 are consistent with the MWRRI Implementation Plan. Exhibit 2-5 shows the Chicago to Detroit rail level of service used in these scenarios.

Exhibit 2-5: Chicago to Detroit Rail Level of Service

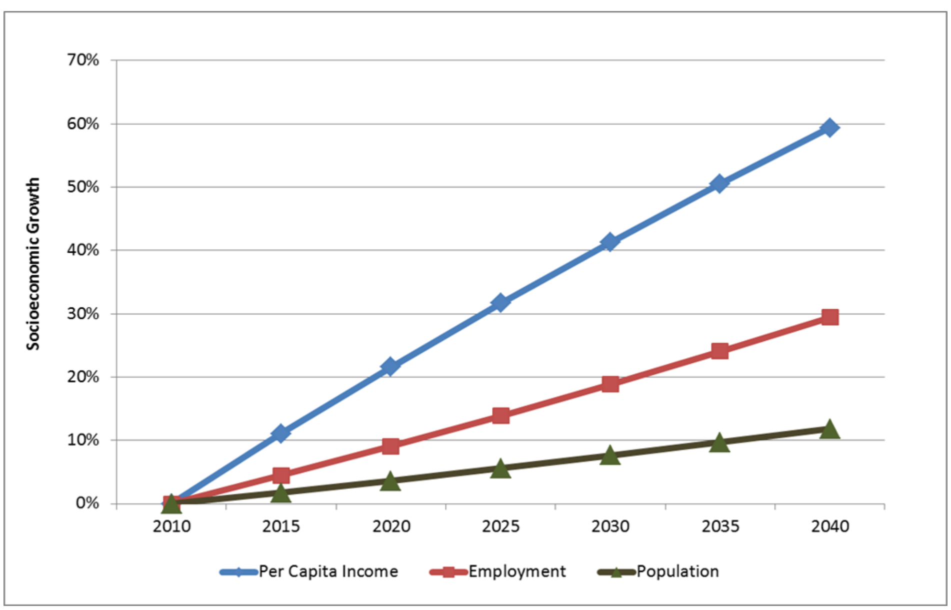
Rail Service Scenario	Travel Time (hr:min)	On-Time Performance	Frequency (DRTs)
2010	5:40	72%	3
2020 Case 1	4:50	80%	3
2020 Case 2	4:50	85%	6
2030	4:24	95%	10
2030 Express Service	3:46	95%	4 of 10

2.2 Socioeconomic Data

The travel demand forecasting model requires base year estimates and future growth forecasts of three socioeconomic variables – population, employment and per capita income – for each of the zones in the study area. A socioeconomic database was established for the base-year (2010) and for each of the forecast years (2015-2040). The data was developed at five-year intervals using the most recent census data, as well as the latest economic forecasts.

Base-year estimates were developed using U.S. Census data and recent estimates from the Bureau of Economic Analysis (U.S. Department of Commerce), and Woods & Poole Economics, a firm that specializes in long-term demographic and economic projections that have been widely used by government agencies, consulting firms and retailers. Forecasts by zone were made using the Bureau of Economic Analysis historical data (between 1990 and 2010[1]) and Woods & Poole Economics (2011) socioeconomic forecasts. According to the data developed from these sources, the population of Michigan will increase from 9.88 million in 2010 to 11 million in 2040, the total employment of Michigan will increase from 5.17 million to 6.69 million in 2040, and per capita income will increase from 36.57 thousand in 2010 to 58.29 thousand in 2040 in 2010 dollars. Exhibit 2-6 shows the socioeconomic growth projections for Michigan. Appendix A has the projected socioeconomic growth rates by zone for Michigan.

Exhibit 2-6: Michigan Socioeconomic Projections



[1] Historical socioeconomic data can be found at www.bea.gov/regional/

2.3 Origin-Destination Trip Data

The multi-modal intercity travel analyses model requires the collection of Base Year 2010 origin-destination (O-D) trip data describing annual passenger trips between zone pairs. For each O-D zone pair, the annual passenger trips are identified by mode (auto, air, rail and bus) and by trip purpose (Business and Other). Because the goal of the study is to evaluate intercity travel, the O-D data collected for the model reflects travel between zones (i.e., between counties, neighboring states and major urban areas) rather than within zones.

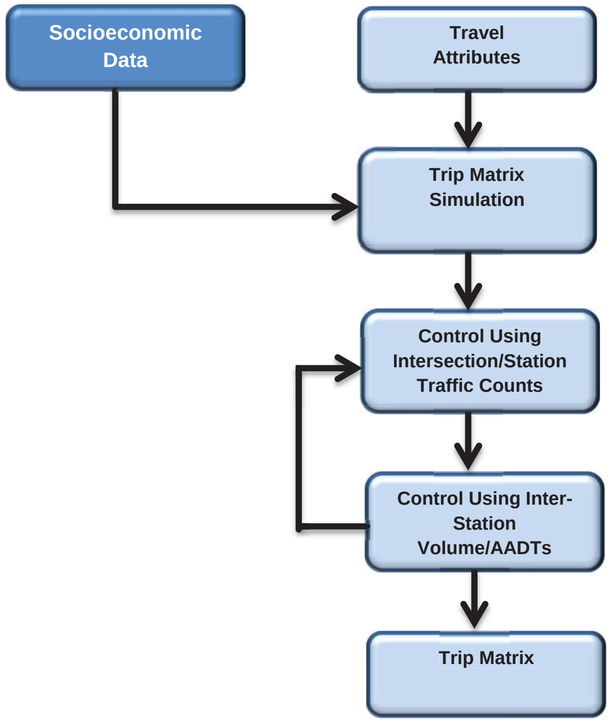
TEMS extracted, aggregated and validated data from a number of sources in order to estimate base travel between origin-destination pairs in the study area. The data sources for the origin-destination trips in the study are:

- 2004 MWRRI Study Database
- 2008 and 2010 Chicago-Milwaukee-Madison Passenger Rail Study
- Amtrak station-to-station trips from TMS of Michigan DOT
- Annual average daily traffic (AADT) from state DOTs
- FAA 10 percent Ticket Samples
- Bus station volume data from TMS of Michigan DOT

The travel demand forecast model requires the base trip information for all modes between each zone pair. In some cases this can be achieved directly from the data sources, while in other cases the data providers only have origin-destination trip information at an aggregated level (e.g., AADT data, station-to-station trip volume and station volume data). Where that is the case, a data enhancement process of trip simulation and access/egress simulation needed to be conducted to estimate the zone-to-zone trip volume. The data enhancement process is shown in Exhibit 2-7.

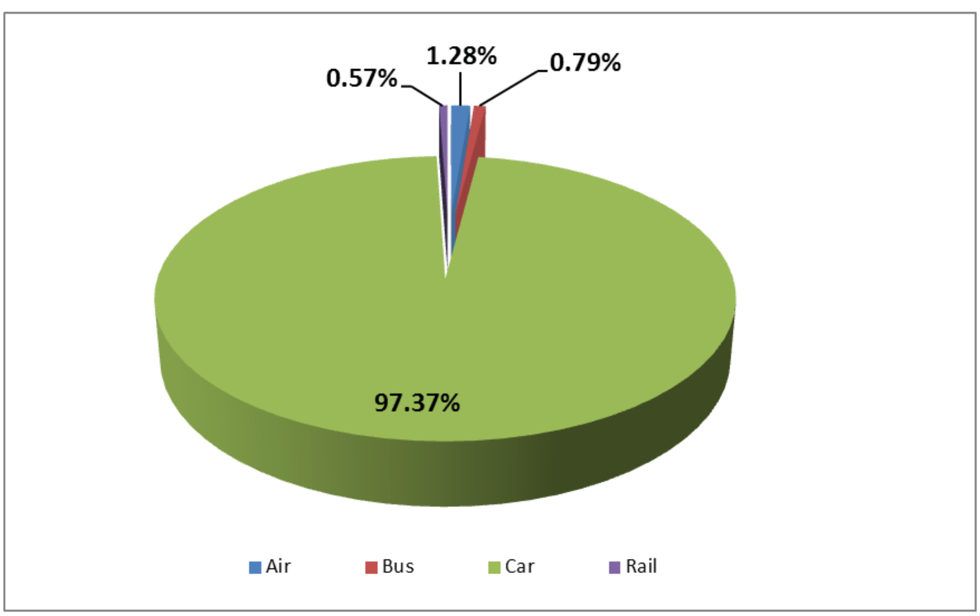
For the auto mode, the quality of the origin-destination trip data was assured by comparing it to AADTs and traffic counts on major highways and adjustments have been made when necessary. For public travel modes, the origin-destination trip data was validated by examining station volumes and segment loadings.

Exhibit 2-7: Origin-Destination Trip Matrix Generation and Validation



The 2010 intercity and interurban travel market of the Michigan corridor was estimated to be 134 million. Exhibit 2-8 shows the base 2010 travel market share of air, bus, car and rail modes. It can be seen that auto mode dominates the travel market with more than 97 percent of market share. Public modes have less than three percent of travel market share. Rail has 21 percent market share of the public modes.

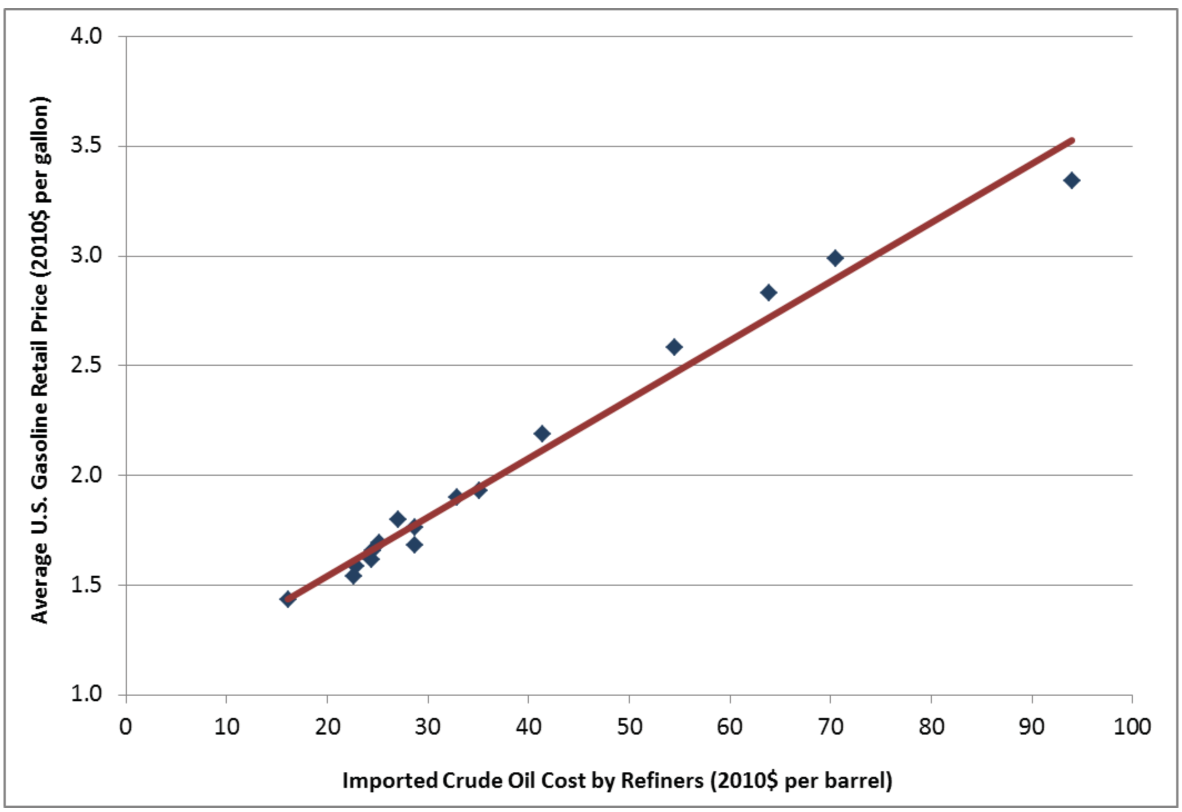
Exhibit 2-8: 2010 Base Travel Market Share



2.4 Future Fuel Cost Forecasts

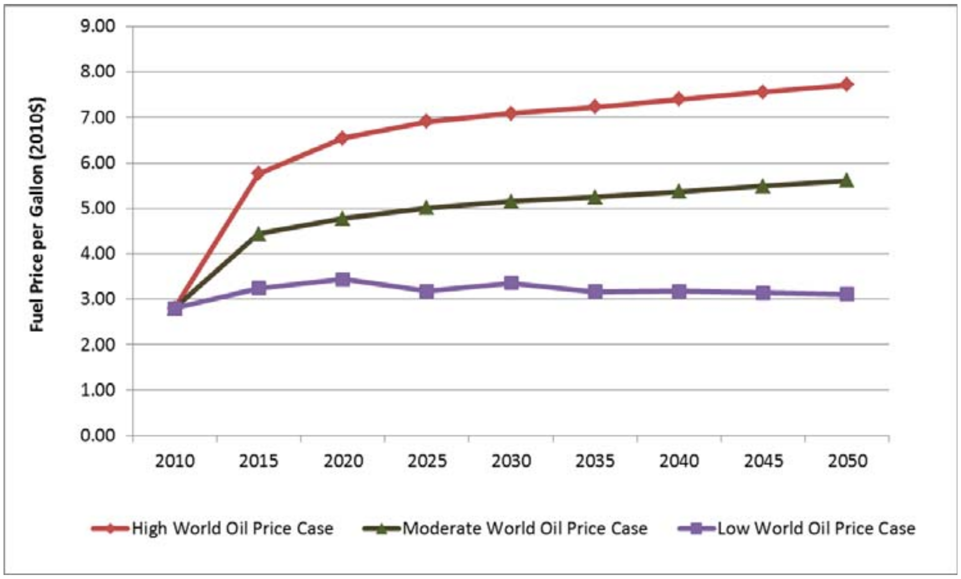
An important factor in the future attractiveness of passenger rail is the price of gas. Forecasts of crude oil prices from the Energy Information Agency (EIA)[1] suggest that crude oil prices will increase to $109 per barrel (2010$) in 2020 and will remain at that high level increasing to $127 per barrel (2010$) in 2035. Exhibit 2-9 shows the relationship of gas prices to oil acquisition cost from 1993 to 2010. It shows that gas prices rise directly with oil prices. EIA developed three future retail gas price forecasts, namely, high world oil price case, moderate world oil price case and low world oil price case. The EIA retail gas price forecasts are shown in Exhibit 2-10. The implication of this is a central case gas price of $5 per gallon, with a high case price of $7 per gallon and a low case price of $3 per gallon. Since gas is currently $3.50 a gallon in a weak economy environment, $5 per gallon once the economy starts to grow again seems realistic.

Exhibit 2-9: Correlation of U.S. Retail Gasoline Prices and Crude Oil Prices



[1] EIA periodically updates historical and projected oil prices at www.eia.gov/forecasts/aeo/tables_ref.cfm

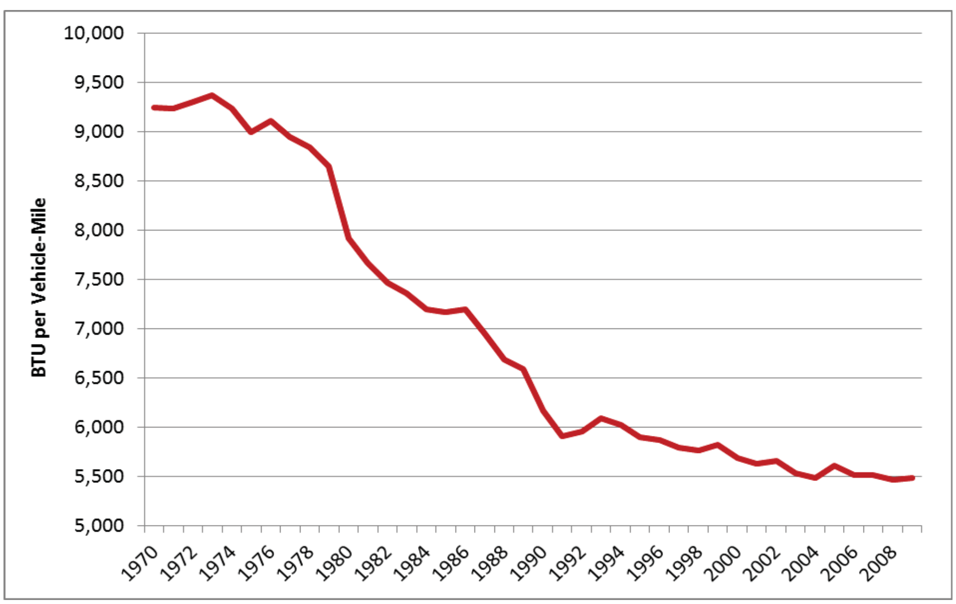
Exhibit 2-10: U.S. Retail Gasoline Prices Forecast by EIA*



* EIA projects gas price to 2035, the gas price projections after 2035 were estimated based on historical gas prices and EIA projections.

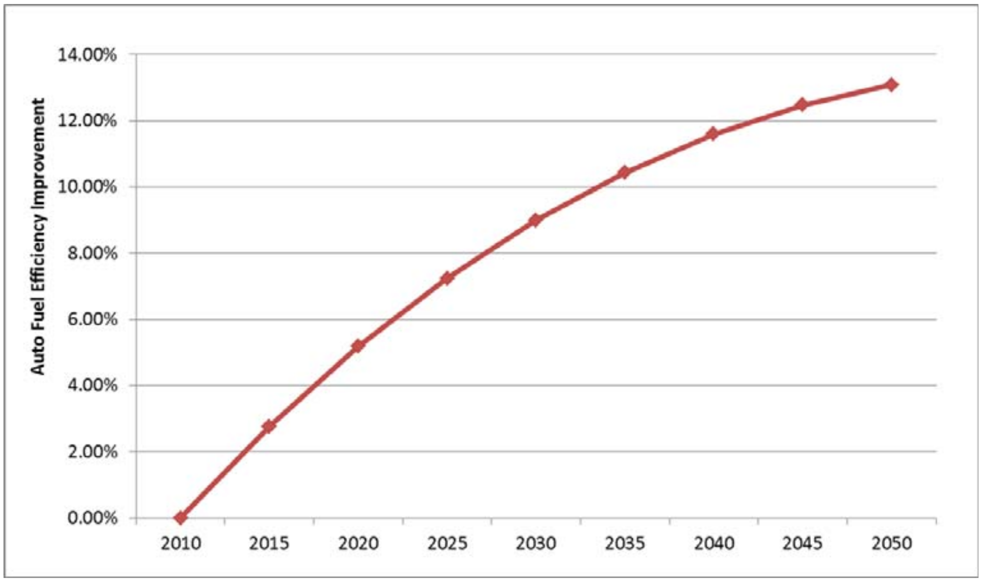
Future improvement in automobile technology is likely to reduce the impact of high gas prices on auto fuel cost with better fuel efficiency. The Energy Intensities of Highway Passenger Modes Data Table from the EIA has the historical Btu (British thermal unit) per vehicle-mile data for autos from 1970 to 2009 as show in Exhibit 2-11.

Exhibit 2-11: Historical Highway Automobile Energy Intensities Data



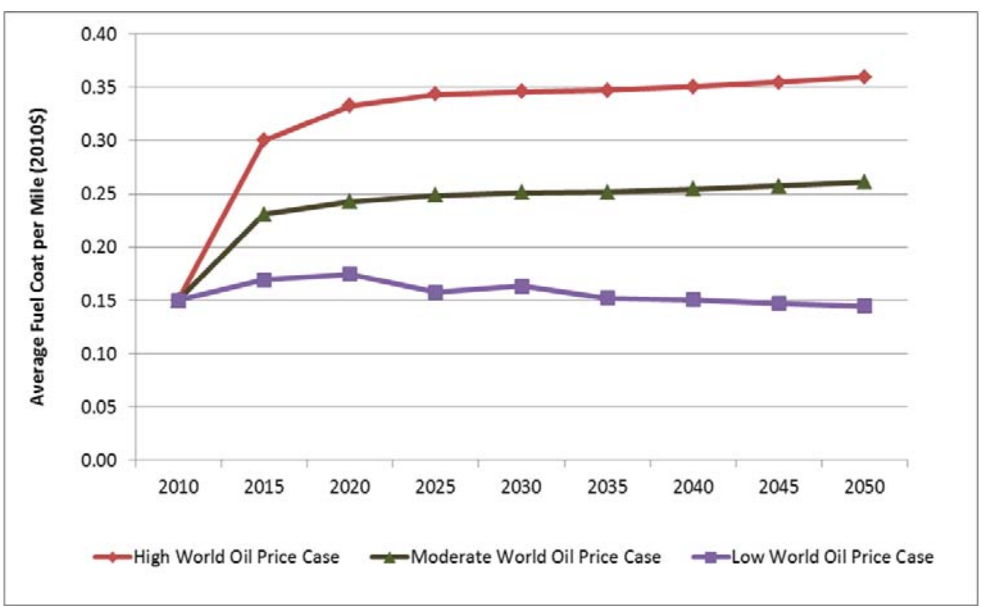
From Exhibit 2-11 it can be seen that auto fuel efficiency has been improving gradually during the past few decades. Future auto fuel efficiency improvement was projected and shown in Exhibit 2-12 is based on the historical auto fuel efficiency data. It shows that auto fuel efficiency is expected to improve by nearly 12 percent by 2040.

Exhibit 2-12: Auto Fuel Efficiency Improvement Projection



By combining future gas price and auto fuel efficiency forecasts, the future auto fuel costs can be estimated as shown in Exhibit 2-13. It can be seen that in 2010 the average auto fuel cost is 15 cents per mile (equivalent to fuel efficiency of 20 miles per gallon) and in 2040 it will be 35 cents per mile in the high oil price case, 25 cents per mile in the moderate oil price case, and 15 cents per mile in the low oil price case.

Exhibit 2-13: Auto Fuel Cost Projections with Fuel Efficiency Improvement



3. Ridership and Revenue Forecasts

3.1 Basic Structure of the COMPASS™ Demand Forecast Model

The *COMPASS*™ Multimodal Demand Forecasting Model is a flexible demand forecasting tool used to compare and evaluate alternative passenger rail network and service scenarios. It is particularly useful in assessing the introduction or expansion of public transportation modes such as air, bus or high-speed rail into markets. Exhibit 3-1 shows the structure and working process of the *COMPASS*™ Model. As shown, the inputs to the *COMPASS*™ Model are base and proposed transportation networks, base and projected socioeconomic data, value of time and value of frequency from Stated Preference surveys, and base year travel data obtained from Metropolitan Planning Organizations (MPO), State Department of Transportation (DOT), other government agencies and service operators.

The *COMPASS*™ Model structure incorporates two principal models: a Total Demand Model and a Hierarchical Modal Split Model. These two models are calibrated separately. In each case, the models are calibrated for origin-destination trip making in the study area. The Total Demand Model provides a mechanism for replicating and forecasting the total travel market. The total number of trips between any two zones for all modes of travel is a function of (1) the socioeconomic characteristics of the two zones and (2) the travel opportunities provided by the overall transportation system that exists (or will exist) between the two zones. Typical socioeconomic variables include population, employment and income. The quality of the transportation system is measured in terms of total travel time and travel cost by all modes.

The role of the *COMPASS*™ Modal Split Model is to estimate relative modal shares of travel given the estimation of the total market by the Total Demand Model. The relative modal shares are derived by comparing the relative levels of service offered by each of the travel modes. Three levels of binary choice were used in this study (see Exhibit 3-2). The first level separates rail services from bus services. The second level of the hierarchy separates air travel, the fastest and most expensive mode of travel, from surface modes of rail and bus services. The third level separates auto travel with its perceived spontaneous frequency, low access/egress times, and highly personalized characteristics, from public modes (i.e., air, rail and bus). The model forecasts changes in riders, revenue and market share based on changes travel time, frequency and cost for each mode.

Exhibit 3-1: Structure of the *COMPASS*™ Model

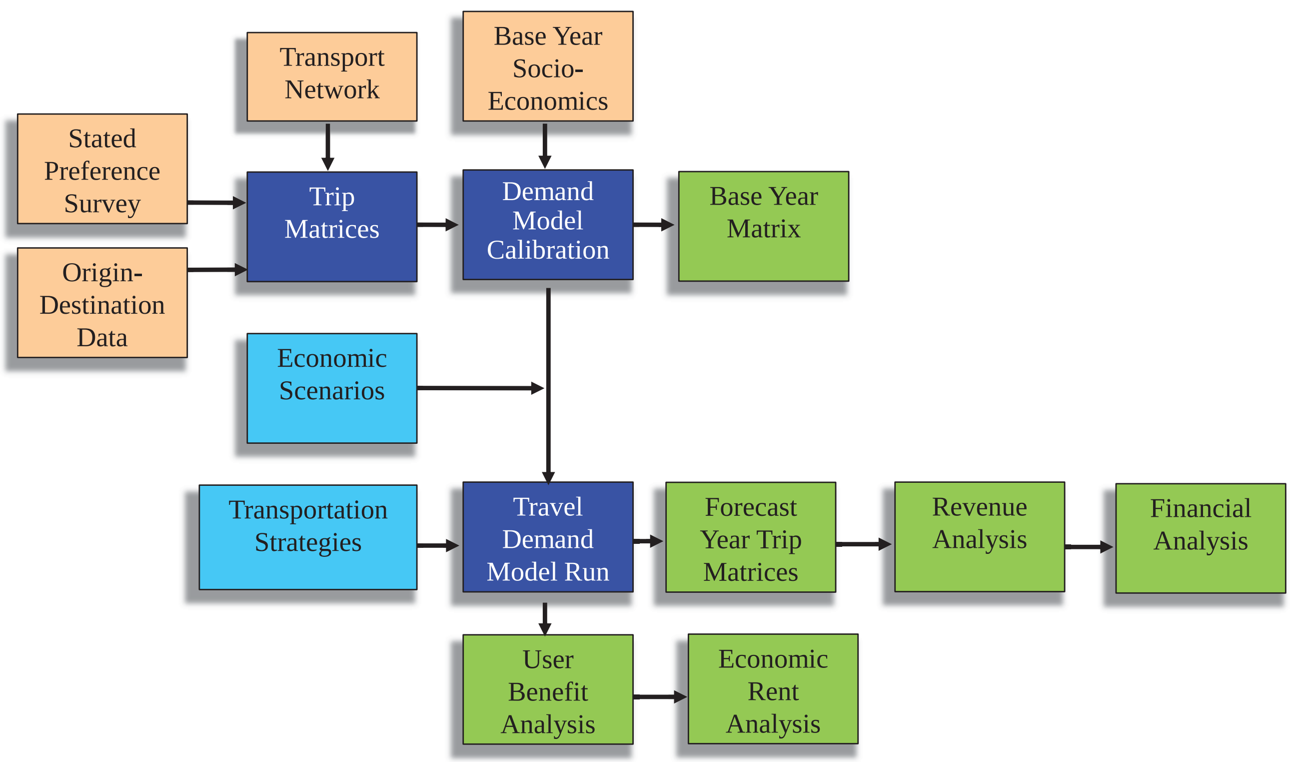
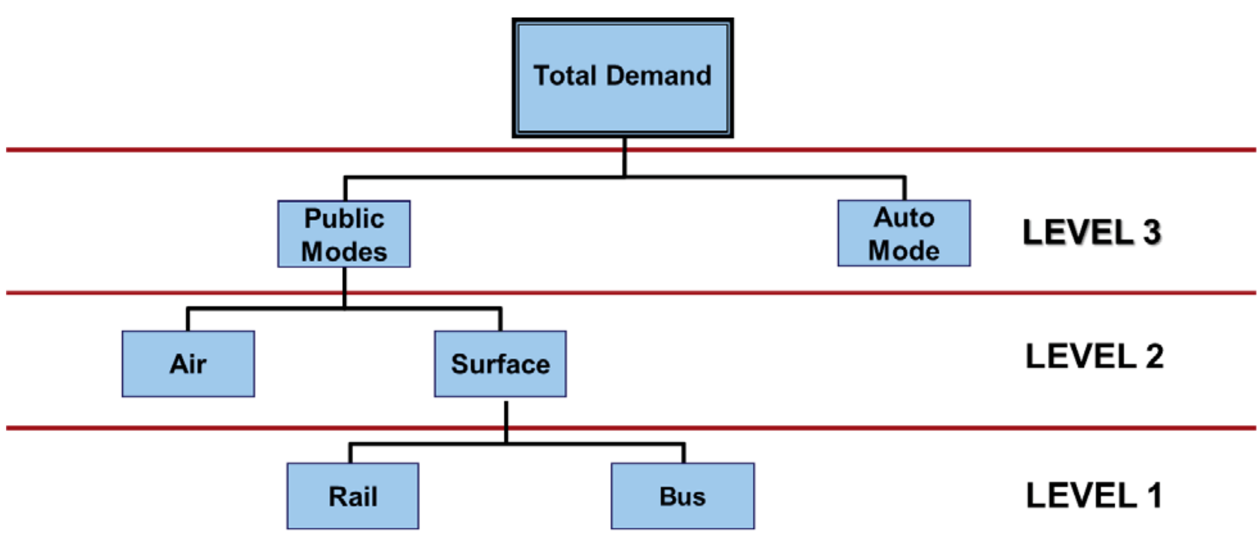


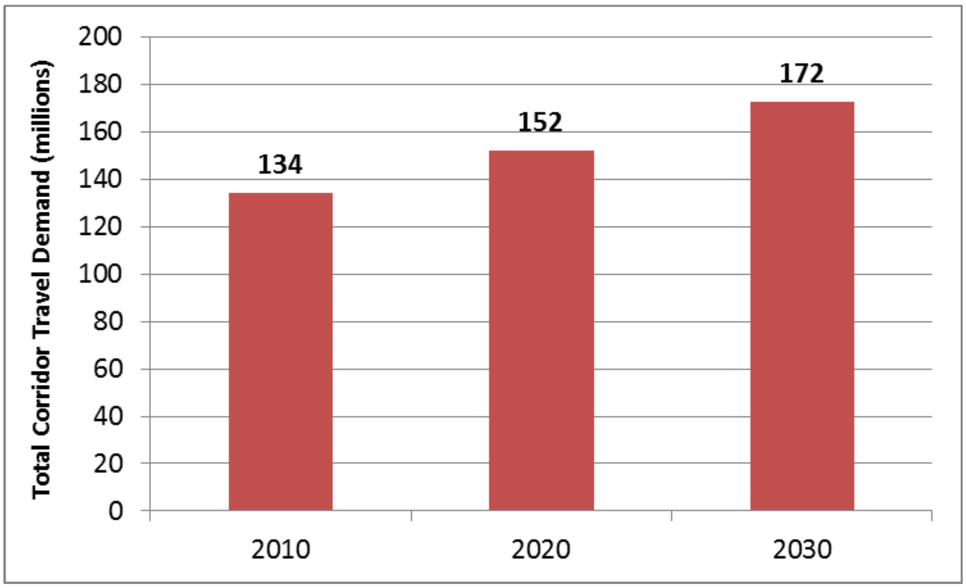
Exhibit 3-2: Hierarchical Structure of the Modal Split Model



3.2 Total Travel Demand Projection of the Corridor

Exhibit 3-3 shows the total travel demand by all modes for the Michigan corridor from 2010 to 2030. It shows that the travel market will have 172 million person trips in 2030, which is 29 percent more than in 2010. The average annual growth rate of one percent is in line with the socioeconomic growth rate.

Exhibit 3-3: Total Travel Demand Projection in Michigan Corridor (2010-2030)



3.3 Passenger Rail Ridership and Revenue Forecasts

This study evaluates the impact of rail service improvements, including train technology, train speed, train reliability and frequency. Ridership forecasts have been projected for six cases described in Section 1.2. For all forecasts, the MWRRI fare structure was used, which ranges from 15 cents per mile to 28 cents per mile based on train technology and type of fare (business or non-business). Exhibits 3-4 and 3-5 show the ridership and revenue forecasts of six cases for all routes of the Michigan corridor. Exhibits 3-6 and 3-7 show the ridership and revenue forecasts for the six cases by the mainline and branch lines of the Michigan corridor. In all of these exhibits, the ridership and revenue for the 2010 fiscal year are also shown. The Michigan passenger rail ridership and revenue stream from 2010 to 2040 is given in Appendix E.

Exhibit 3-4: Michigan (All Routes) Rail Ridership Forecast

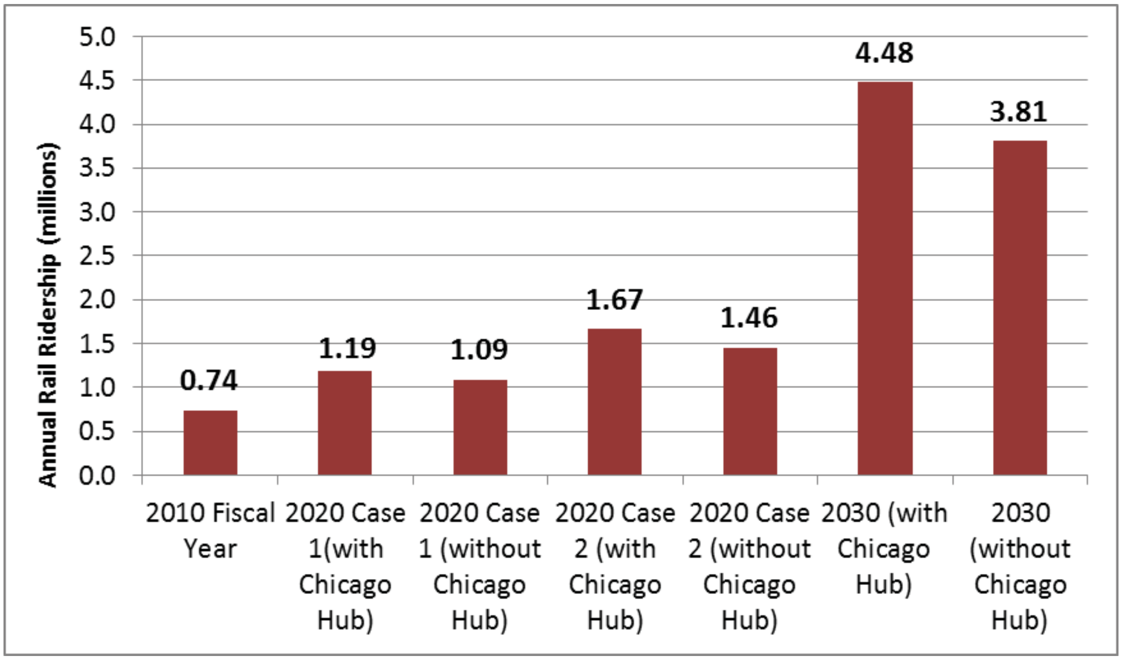


Exhibit 3-5: Michigan Rail Ridership Forecast by Route

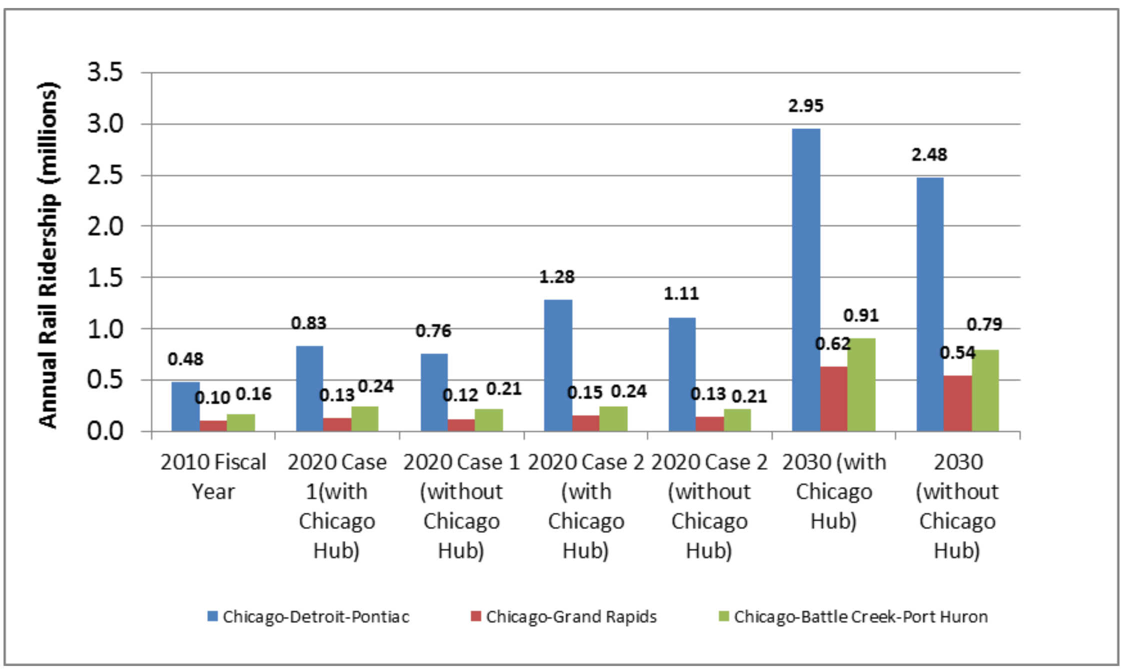


Exhibit 3-6: Michigan (All Routes) Rail Revenue Forecast

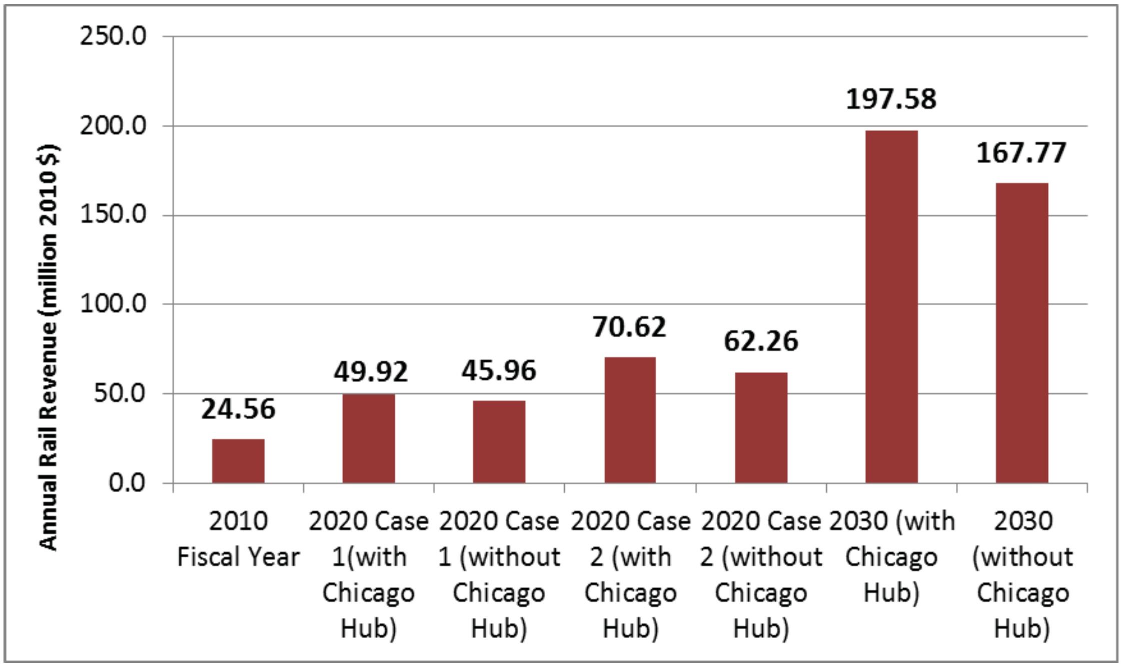
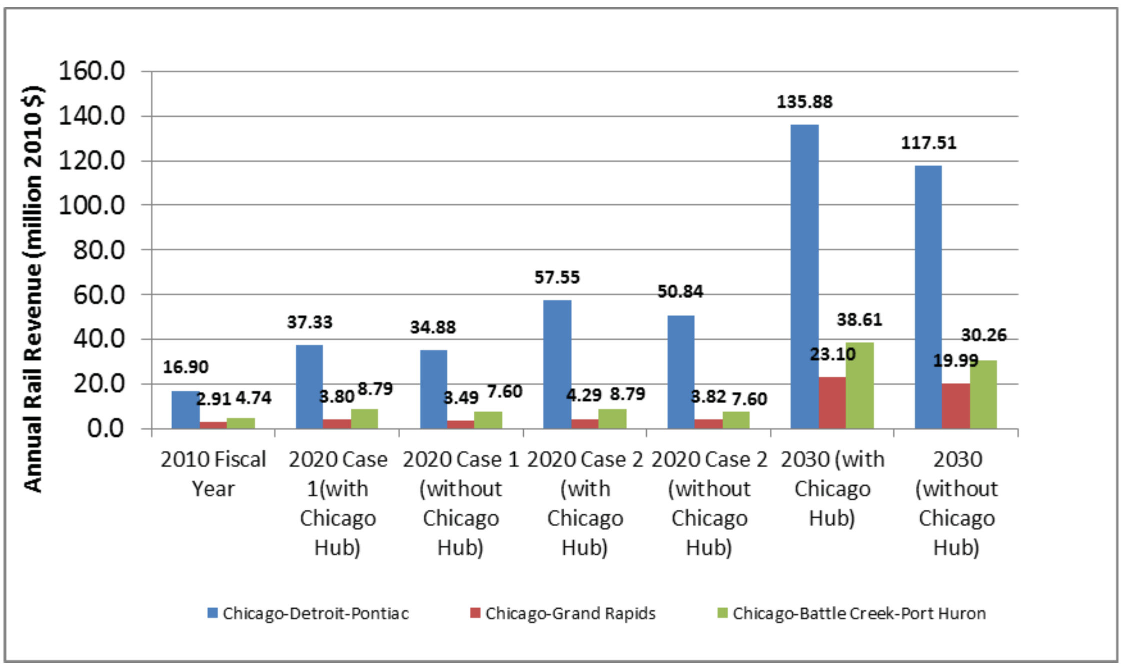


Exhibit 3-7: Michigan Rail Revenue Forecast by Route



It can be seen from Exhibits 3-4 through 3-7 that –

- The 2020 Case 1 ridership will be 1.19 million, which is 60 percent higher than the base 2010 passenger rail ridership. This is due to travel markets natural growth, better train equipment, faster train speed and better on-time performance. The ridership increases to 1.67 million in 2020 Case 2 scenario, the increase is due to three DRTs on the Chicago-Detroit-Pontiac mainline. In 2030, the rail ridership is 4.48 million due to travel market natural growth, improved frequencies, faster train speed, shorter travel times and better on-time performance. Exhibit 3-8 shows the rail service feature impacts on the 2030 rail ridership forecast. It can be seen that base rail ridership (includes natural growth) accounts for 37 percent of the 2030 ridership forecast, travel time reduction contributes 20 percent of the ridership, frequency increases accounts for 22 percent of the ridership, improved on-time performance brings 11 percent to the ridership and better train equipment accounts for 11 percent of the 2030 rail ridership forecast.

- The Chicago Hub effects on rail ridership forecasts are reflected in ridership differences between the scenario with Chicago Hub connections to St. Louis and Milwaukee and the scenario without Chicago Hub connections. Exhibit 3-9 shows the Chicago Hub effects for all cases. It can be seen that the hub effect will increase if the passenger rail levels of service increase. The hub effect increases from 8.4 percent in 2020 Case 1 to 14.95 percent in 2030. This is because the connecting passengers are more sensitive to some rail service factors such as transfer time and transfer waiting time and the improvement on such service factors for the Michigan corridor will attract more connecting passengers that come from St. Louis and Milwaukee.

- The ridership and revenue distribution among the three routes of the rail corridor are consistent for all cases studied, which is in line with the socioeconomic and rail service data that have been developed for each route. The Chicago-Detroit-Pontiac mainline accounts for 65 to 70 percent of ridership and revenues of the whole corridor, the Chicago-Grand Rapids branch line has 11 to 14 percent of the share and the Battle Creek-Port Huron branch line has 16 to 24 percent of the total corridor ridership and revenue.

Exhibit 3-8: Rail Service Feature Impacts on 2030 Ridership

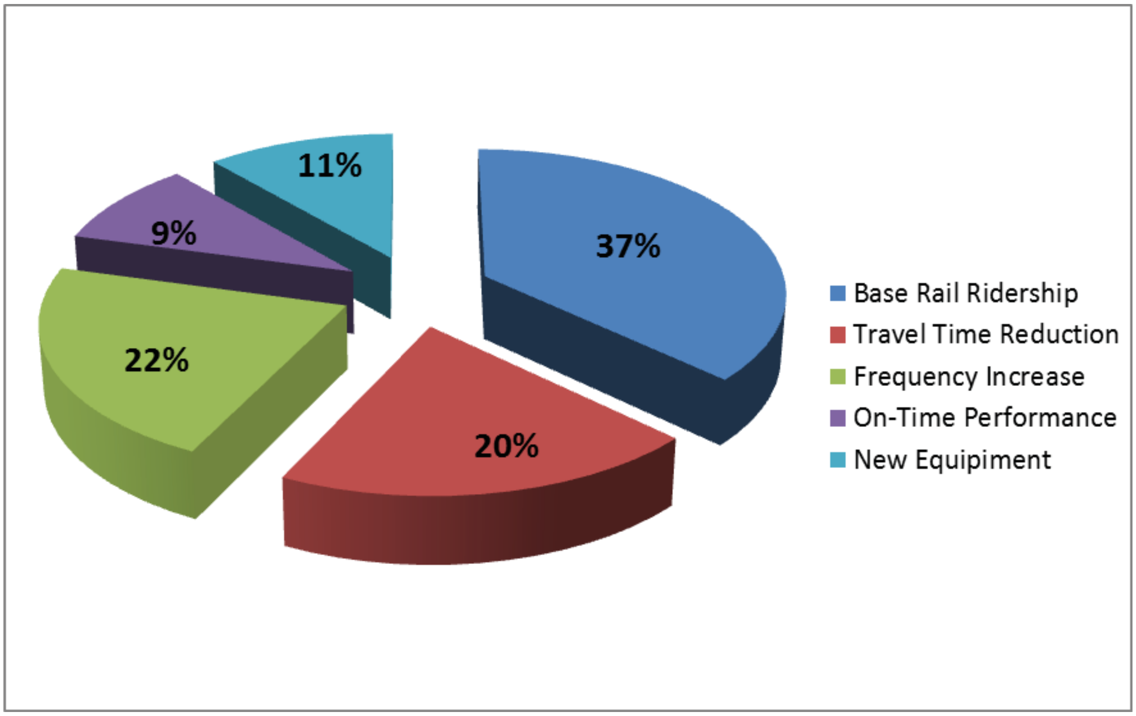


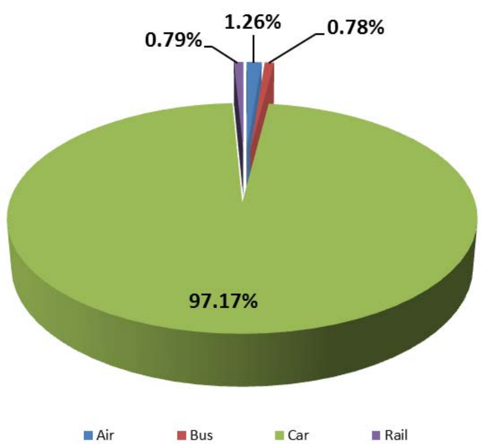
Exhibit 3-9: Chicago Hub Effect with Connections to St. Louis and Milwaukee

Cases	Annual Transfer Rail Trips in Chicago (millions)	% of Total Annual Rail Trips
2020 Case1	0.10	8.4%
2020 Case 2	0.20	12.57%
2030	0.67	14.95%

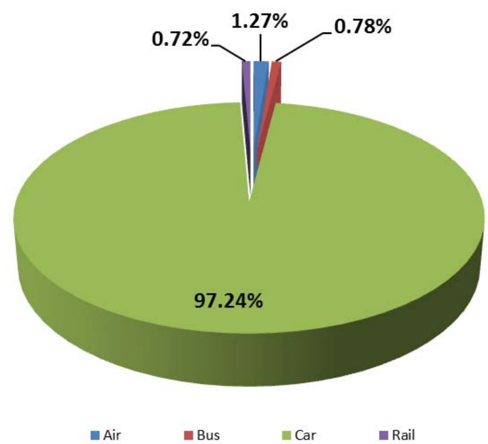
Exhibit 3-10 shows the market share of rail in the travel market for each of the six cases that have been studied. The rail market share ranges from 0.72 percent in 2020 Case 1 without Chicago Hub to 2.6 percent in 2030 with Chicago Hub.

Exhibit 3-10: Rail Market Share Projections

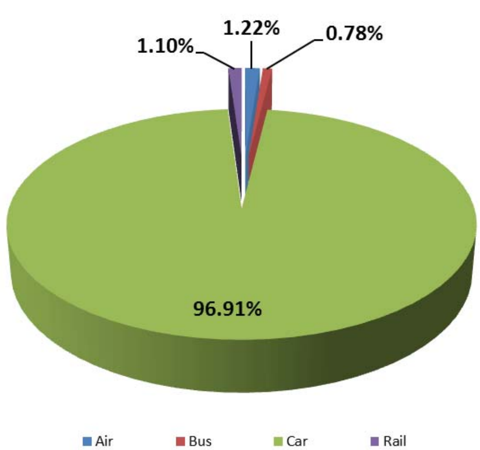
- **2020 Case 1 with Chicago Hub**



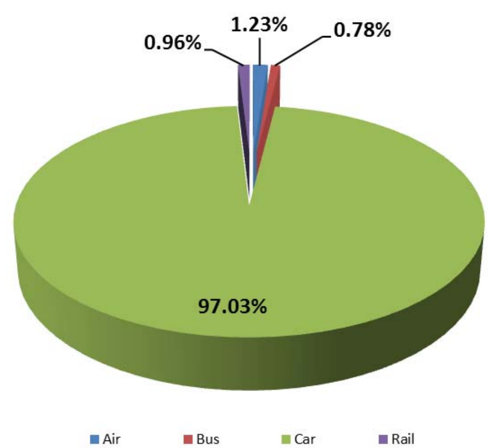
- **2020 Case 1 without Chicago Hub**



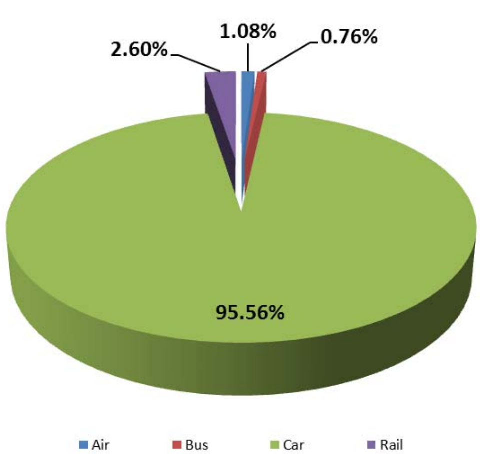
- **2020 Case 2 with Chicago Hub**



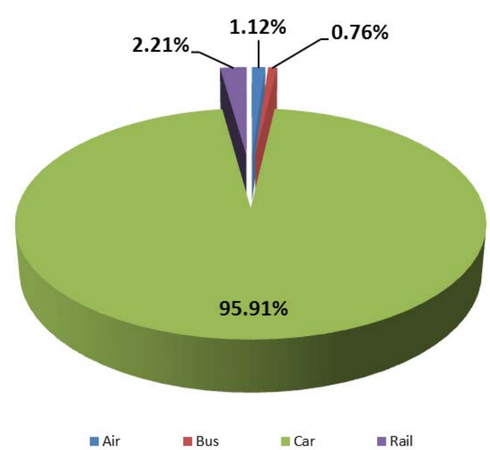
- **2020 Case 2 without Chicago Hub**



- **2030 with Chicago Hub**



- **2030 without Chicago Hub**

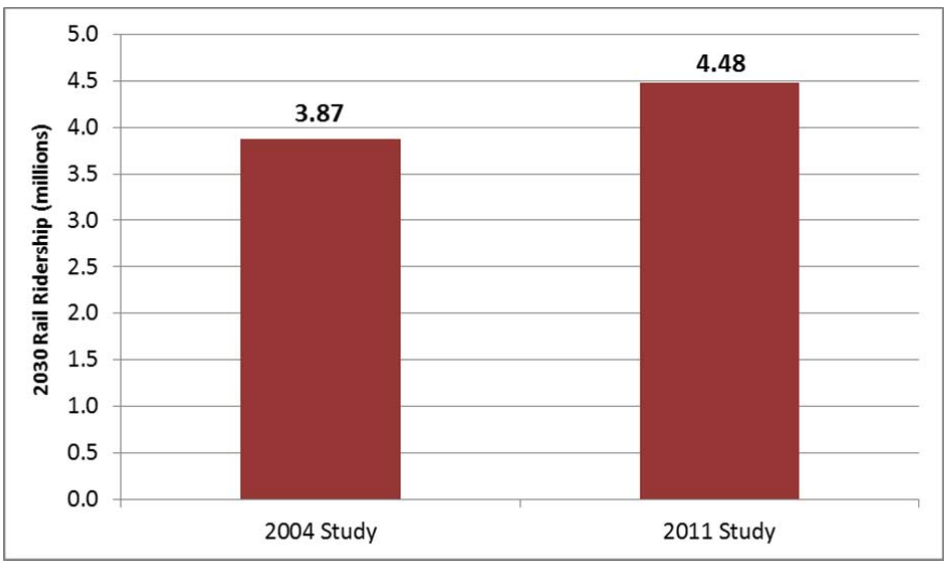


3.4 Ridership and Revenue Forecast Validation

The rail ridership forecast of this study was compared to the 2004 MWRRI study rail ridership forecast as shown in Exhibit 3-11. It can be seen that the 2030 rail ridership forecasted in this study is 0.61 million more than the ridership forecast in the 2004 study. The ridership forecast difference is due to the following reasons:

- In this study, the socioeconomic projections were updated using the 2010 census.
- Gas price projections and their impact on highway travel cost were included in this study and not in the 2004 study.
- Highway travel time projections were included in this study and not in the 2004 study.

Exhibit 3-11: 2030 Annual Rail Ridership Forecast Compared to 2004 Study

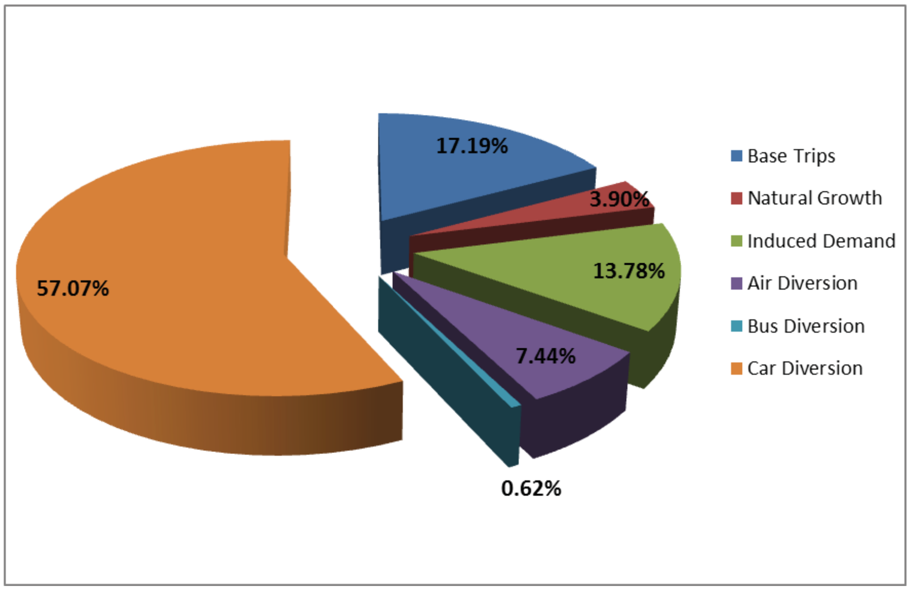


The sources of the 2030 Michigan intercity passenger rail ridership were obtained from the demand forecast model. Exhibit 3-12 shows that the 2030 rail ridership is comprised of the following:

- 17.19 percent is base 2010 ridership.
- 3.90 percent is due to the natural growth of the travel market.
- 13.78 percent is induced demand stimulated by the improved rail system.
- 7.44 percent is diverted from the air market because travel time by rail will be significantly improved and the cost is very competitive to air travel.

- 0.62 percent is diverted from bus due to the small base year market share of bus mode and the low values of time of bus travelers that will make many of them stay with the bus mode for its low fare rates.
- 57.07 percent is diverted from the auto travel market as the result of improved rail service, higher gas prices and the increased highway travel time projected for 2030.

Exhibit 3-12: Sources of 2030 Rail Ridership with Chicago Hub Connections



As mentioned before, the MWRRI fare structures were used in this study. To examine the ridership and revenue sensitivities on fare rates, two other rail fare strategies were tested and compared to the results of the MWRRI fare structures. The first fare strategy tested assumed 20 percent lower fares than the MWRRI fares and the second fare strategy assumed fares to be 20 percent higher than the MWRRI fares. Exhibits 3-13 and 3-14 show the rail ridership and revenue of the three fare strategies. It can be seen that the low fare strategy has about 16 percent more ridership than the MWRRI fare and the high fare strategy has about 17 percent less ridership than the MWRRI fare. In revenue forecasts, the MWRRI fare yields the highest revenue, the low fare strategy has about seven percent less revenue and the high fare strategy has about one percent less revenue, which shows that the MWRRI fare structure is close to being the revenue optimizing fare strategy.

Forecasts of Michigan passenger rail segment loadings and trips between major city pairs are shown in Appendices C and D.

Exhibit 3-13: Rail Ridership Sensitivity on Fare Rate

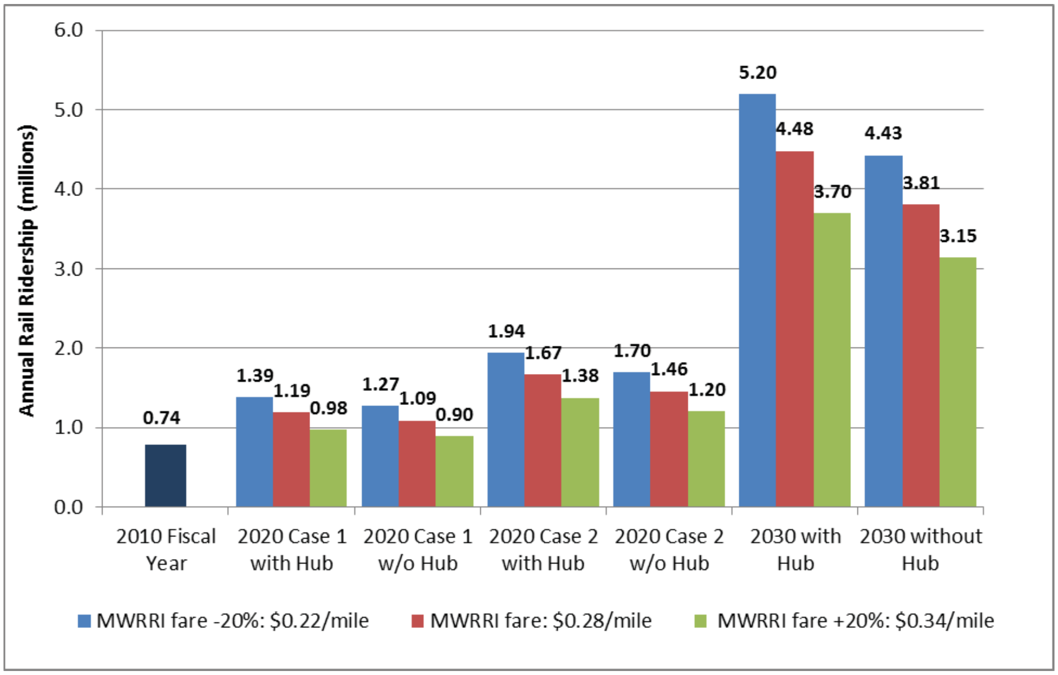
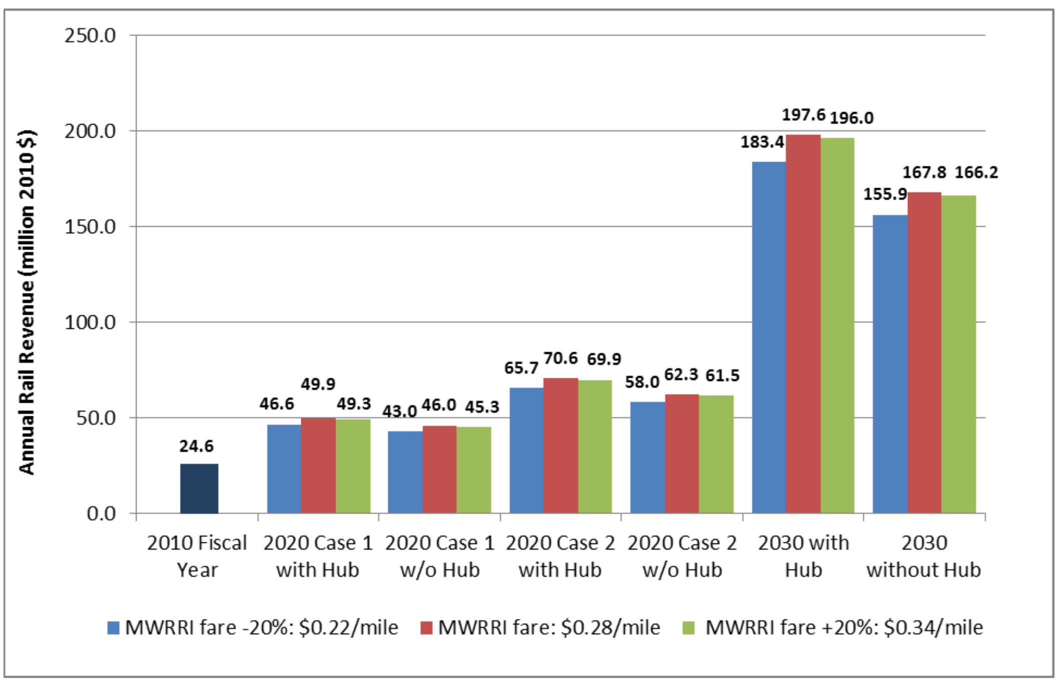


Exhibit 3-14: Rail Revenue Sensitivity on Fare Rate



4. Conclusions

The focus of this study has been to assess the service improvement of the three routes in the Michigan intercity passenger rail system. The ridership and revenue forecasts show that this corridor has strong potential to support the proposed service improvement scenarios. The Michigan rail corridor can support passenger rail service on its own right and as part of the Midwest Passenger Rail System. The demand for travel in the corridor can be further improved with passengers connecting from the Chicago Hub.

Following are the key findings of this study.

- The Michigan rail corridor ridership has been growing rapidly (49.8 percent increase in ridership between 2000 and 2010) and the ridership growth will continue with socioeconomic growth, gas price increases and the growing highway congestion.
- The State of Michigan, according to Woods & Poole Economics, will have continuous socioeconomic growth. From 2010 to 2040, the population will grow by 11.3 percent, employment will grow by 29.4 percent and per capita income will increase by 59.4 percent.
- In 2020 with no increase in frequencies the annual rail travel demand will increase to 1.19 million, a 60 percent increase compared to 2010 with improved train equipment, faster train speed, shorter travel times and improved on-time performance.
- In 2020 with six DRTs on the Chicago-Detroit-Pontiac mainline, the annual rail demand will increase to 1.67 million.
- The proposed 2030 level of service with 10 DRTs on the mainline and 4 DRTs on the branch lines will result in 4.48 million annual rail trips in 2030.
- The Chicago Hub connecting trips from the St. Louis and Milwaukee corridors account for 8.4 to 14.95 percent of the total rail travel demand of the Michigan rail system.
- The MWRRI fare structure used in this study (the same as that used in the 2004 MWRRI study) is close to the fare strategy that maximizes the ticket-box revenue of the passenger rail service.

- A 20 percent reduction in the fare structure would result in a 16.8 percent increase in ridership (from 1.19 million to 1.39 million). This holds true for all scenarios.

APPENDIX A: Michigan Socioeconomic Growth Projection by Zone (2010 - 2040)

TEMS Zone	Zone Description	Projected Annual Population Growth Rate (2010-2040)	Projected Annual Employment Growth Rate (2010-2040)	Projected Annual Income Growth Rate (2010-2040)
132	New Buffalo	-0.01%	0.43%	2.17%
133	Benton Harbor	-0.01%	0.43%	1.90%
134	Niles	0.08%	0.53%	1.87%
135	Bangor	0.87%	1.24%	2.09%
136	Cassopopolis	0.55%	1.30%	2.35%
137	Muskegon	0.26%	1.18%	2.00%
138	Holland	1.02%	1.08%	2.20%
139	Kalamazoo	0.53%	0.85%	1.97%
140	Three Rivers	0.23%	0.51%	1.88%
141	Grand Rapids	0.77%	1.00%	2.10%
142	Hastings	1.11%	1.25%	2.12%
143	Battle Creek	0.17%	0.33%	2.04%
144	Albion	0.17%	0.33%	2.14%
145	Coldwater	0.44%	0.94%	1.97%
146	Big Rapids	1.07%	1.16%	2.16%
147	Ionia	0.71%	1.00%	2.01%
148	Lansing	0.74%	1.17%	1.98%
149	Jackson	0.16%	0.80%	1.91%
150	Hudson	0.15%	0.78%	1.93%
151	Alma (Ithaca)	0.30%	0.75%	1.97%
152	St. Johns	0.96%	1.55%	2.25%
153	E.Lansing	0.16%	0.83%	1.85%
154	Midland	0.54%	1.01%	2.04%
155	Saginaw	-0.16%	1.04%	1.67%
156	Durand	0.09%	0.49%	1.72%
157	Howell	1.36%	1.44%	2.36%
158	Ann Arbor	0.93%	1.29%	2.02%
159	Ida	0.55%	0.94%	2.06%
160	Bay City	-0.16%	0.71%	1.71%
161	Caro	0.16%	0.48%	1.67%

APPENDIX A: Michigan Socioeconomic Growth Projection by Zone (2010 - 2040) (continued)

TEMS Zone	Zone Description	Projected Annual Population Growth Rate (2010-2040)	Projected Annual Employment Growth Rate (2010-2040)	Projected Annual Income Growth Rate (2010-2040)
162	Flint	0.04%	0.80%	1.53%
163	Pontiac	0.54%	0.92%	1.80%
164	Garden City	-0.48%	0.46%	1.15%
165	Lapeer	0.92%	1.29%	2.02%
166	Sandusky	0.37%	0.81%	2.01%
167	Port Huron	0.74%	0.88%	2.02%
168	Sterling Hts.	0.50%	0.86%	1.95%
169	Southfield	0.54%	0.92%	2.15%
170	Detroit	-0.48%	0.46%	2.01%
171	Ludington	0.78%	0.87%	2.15%
172	Lilley	1.25%	1.37%	2.22%
173	Mt. Pleasant	0.64%	1.36%	2.25%
174	Skidway Lake	0.54%	0.82%	2.00%
175	Bad Axe	0.06%	0.80%	1.98%
176	Manistee	0.32%	0.70%	2.12%
177	Cadillac	0.36%	0.40%	2.16%
178	Traverse City	1.01%	0.97%	2.37%
179	Grayling	0.73%	1.00%	2.22%
180	Petoksey	1.12%	1.36%	2.32%
181	Sault Ste. Marie	0.37%	1.02%	2.03%
182	Shingleton	0.13%	0.37%	1.96%
183	Escanaba	0.17%	0.57%	1.92%
184	Menominee	0.11%	0.24%	1.82%
185	Ishpeming	0.18%	0.90%	1.94%
186	Land O'Lakes	0.04%	0.65%	1.92%
361	Alpena	0.38%	0.62%	1.98%

APPENDIX B: Intercity Passenger Rail Station Volumes (in thousands, 2010 - 2040)

Station Name	2010	2020 Case 1 with Chicago Hub	2020 Case 1 without Chicago Hub	2020 Case 2 with Chicago Hub	2020 Case 2 without Chicago Hub	2030 with Chicago Hub	2030 without Chicago Hub	2040 with Chicago Hub	2040 without Chicago Hub
Chicago, IL	668	1,040	936	1,440	1,232	3,889	3,218	5,227	4,325
Hammond Whiting, IN	7	12	11	21	18	52	46	70	62
Michigan City, IN	4	7	5	13	8	32	20	43	27
New Buffalo, MI	12	20	20	32	31	80	78	107	105
Niles, MI	19	32	32	53	52	136	134	183	180
Dowagiac, MI	3	6	5	9	9	25	24	33	32
Kalamazoo, MI	114	195	181	303	270	735	653	988	877
Battle Creek, MI	52	89	80	134	114	307	260	412	350
Albion, MI	2	3	2	5	3	11	6	15	8
Jackson, MI	29	50	47	73	67	162	149	218	201
Ann Arbor, MI	145	248	227	371	324	833	725	1,120	974
Dearborn, MI	83	140	133	204	188	454	416	609	559
Detroit, MI	71	120	114	176	162	391	359	525	483
Royal Oak, MI	37	62	60	89	85	198	188	266	253
Birmingham, MI	24	41	39	58	56	130	124	175	167
Pontiac, MI	16	28	27	39	38	87	84	117	112
St. Joseph-Benton Harbor	10	13	12	-	-	-	-	-	-
Bangor, MI	4	5	4	-	-	-	-	-	-
Plainwell, MI	-	-	-	8	7	34	29	46	39
Holland, MI	37	47	45	52	49	215	199	289	268
Grand Rapids, MI	52	66	60	78	68	328	274	441	368
East Lansing, MI	62	76	64	83	64	412	302	554	406
Durand, MI	10	13	11	13	11	62	52	84	70
Flint, Mi	32	39	31	43	31	215	145	289	194
Lapeer, MI	9	11	10	11	10	52	43	70	58
Port Huron, MI	19	23	19	24	19	117	86	157	116
Total Station Volume	**1,520**	**2,386**	**2,177**	**3,332**	**2,915**	**8,957**	**7,616**	**12,038**	**10,235**

The total station volume of a corridor is twice the ridership of that corridor. This is because ridership is the number of trips passengers make within a corridor, and one trip includes boarding a train at one station and deboarding at another station, therefore, two station counts are produced by each trip.

APPENDIX C: Intercity Passenger Rail Segment Loadings (in thousands, 2010 - 2040)

Rail Segment	2010	2020 Case 1 with Chicago Hub	2020 Case 1 without Chicago Hub	2020 Case 2 with Chicago Hub	2020 Case 2 without Chicago Hub	2030 with Chicago Hub	2030 without Chicago Hub	2040 with Chicago Hub	2040 without Chicago Hub
Chicago, IL-Hammond Whiting, IN	668	1,040	936	1,440	1,232	3,889	3,218	5,227	4,325
Hammond Whiting, IN-Michigan City, IN	686	1,049	945	1,453	1,247	3,922	3,257	5,271	4,377
Michigan City, IN-New Buffalo, MI	673	1,048	947	1,452	1,251	3,920	3,268	5,269	4,391
New Buffalo, MI-Niles, MI	564	905	815	1,438	1,238	3,911	3,260	5,256	4,381
Niles, MI-Dowagiac, MI	565	907	817	1,440	1,241	3,918	3,269	5,266	4,394
Dowagiac, MI-Kalamazoo, MI	565	906	816	1,438	1,239	3,914	3,266	5,260	4,390
Kalamazoo, MI-Battle Creek, MI	518	822	746	1,155	1,004	3,008	2,517	4,042	3,383
Battle Creek, MI-Albion, MI	361	612	570	897	804	1,993	1,781	2,679	2,393
Albion, MI-Jackson, MI	360	611	570	895	804	1,989	1,781	2,673	2,393
Jackson, MI-Ann Arbor, MI	340	576	538	844	759	1,878	1,682	2,523	2,260
Ann Arbor, MI-Dearborn, MI	228	387	370	561	522	1,245	1,158	1,674	1,556
Dearborn, MI-Detroit, MI	146	248	238	359	337	797	747	1,071	1,003
Detroit, MI-Royal Oak, MI	76	130	126	186	177	413	394	554	529
Royal Oak, MI-Birmingham, MI	40	68	66	97	93	217	207	291	279
Birmingham, MI-Pontiac, MI	16	28	27	39	38	87	84	117	112
New Buffalo, MI-St. Joseph-Benton Harbor	100	127	117	-	-	-	-	-	-
St. Joseph-Benton Harbor-Bangor, MI	92	117	107	-	-	-	-	-	-
Bangor, MI-Holland, MI	89	113	104	-	-	-	-	-	-
Holland, MI-Grand Rapids, MI	52	66	60	52	49	215	199	289	268
Kalamazoo, MI-Plainwell, MI	-	-	-	136	122	572	497	769	668
Plainwell, MI-Grand Rapids, MI	-	-	-	128	115	535	465	719	625
Battle Creek, MI-East Lansing, MI	123	149	124	162	124	802	571	1,078	767
East Lansing, MI-Durand, MI	68	82	68	89	68	433	312	582	419
Durand, MI-Flint, Mi	57	70	57	76	57	372	261	500	351
Flint, Mi-Lapeer, MI	27	33	28	35	28	168	128	226	172
Lapeer, MI-Port Huron, MI	19	23	19	24	19	117	86	157	116

APPENDIX D: Passenger Rail Trips between Major City Pairs (in thousands, 2010 - 2040)

City Pair	2010	2020 Case 1 with Chicago Hub	2020 Case 1 without Chicago Hub	2020 Case 2 with Chicago Hub	2020 Case 2 without Chicago Hub	2030 with Chicago Hub	2030 without Chicago Hub	2040 with Chicago Hub	2040 without Chicago Hub
Chicago-Kalamazoo	78	135	121	207	175	471	395	633	531
Chicago-Ann Arbor	113	191	170	287	240	643	535	865	719
Chicago-Detroit	51	86	79	125	111	276	245	371	329
Chicago-Grand Rapids	51	65	58	68	58	289	235	389	316
Chicago-Port Huron	14	16	13	18	13	87	56	117	75
Kalamazoo-Ann Arbor	9	16	16	23	23	51	51	68	68
Kalamazoo-Detroit	5	9	9	12	12	28	28	37	37
Kalamazoo-Grand Rapids	-	-	-	0.4	0.4	1.8	1.8	2	2
Kalamazoo-Port Huron	1.1	1.4	1.4	1.4	1.4	6	6	9	9
Ann Arbor-Detroit	7	12	12	18	18	42	42	57	57

APPENDIX E: Intercity Passenger Rail Ridership and Revenue Stream (2010 - 2040)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Ridership (millions)	0.74	0.77	0.80	0.84	0.87	0.91	0.94	0.98	1.02	1.06
Revenue (million 2010$)	24.56	25.67	26.82	28.03	29.29	30.61	31.89	33.23	34.63	36.08

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Ridership (millions)	1.67	1.73	1.79	1.86	1.92	1.99	2.06	2.13	2.20	2.28
Revenue (million 2010$)	70.62	73.37	76.24	79.21	82.30	85.51	88.59	91.78	95.08	98.50

	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Ridership (millions)	4.48	4.62	4.76	4.91	5.06	5.22	5.37	5.53	5.69	5.85	6.02
Revenue (million 2010$)	197.58	204.10	210.84	217.79	224.98	232.40	239.61	247.04	254.70	262.59	270.73

The rail ridership and revenue stream assumes that starting from 2020 there will be six daily round trips (DRTs) on Chicago-Detroit-Pontiac and one DRT on two branch lines; starting from 2030 there will be 10 DRTs on the Chicago-Detroit-Pontiac route and four DRTs on two branch lines.

Appendix F: Public Meeting Notes

Ann Arbor Station Environmental Review

Citizen Working Group

May 13, 2015

Agenda

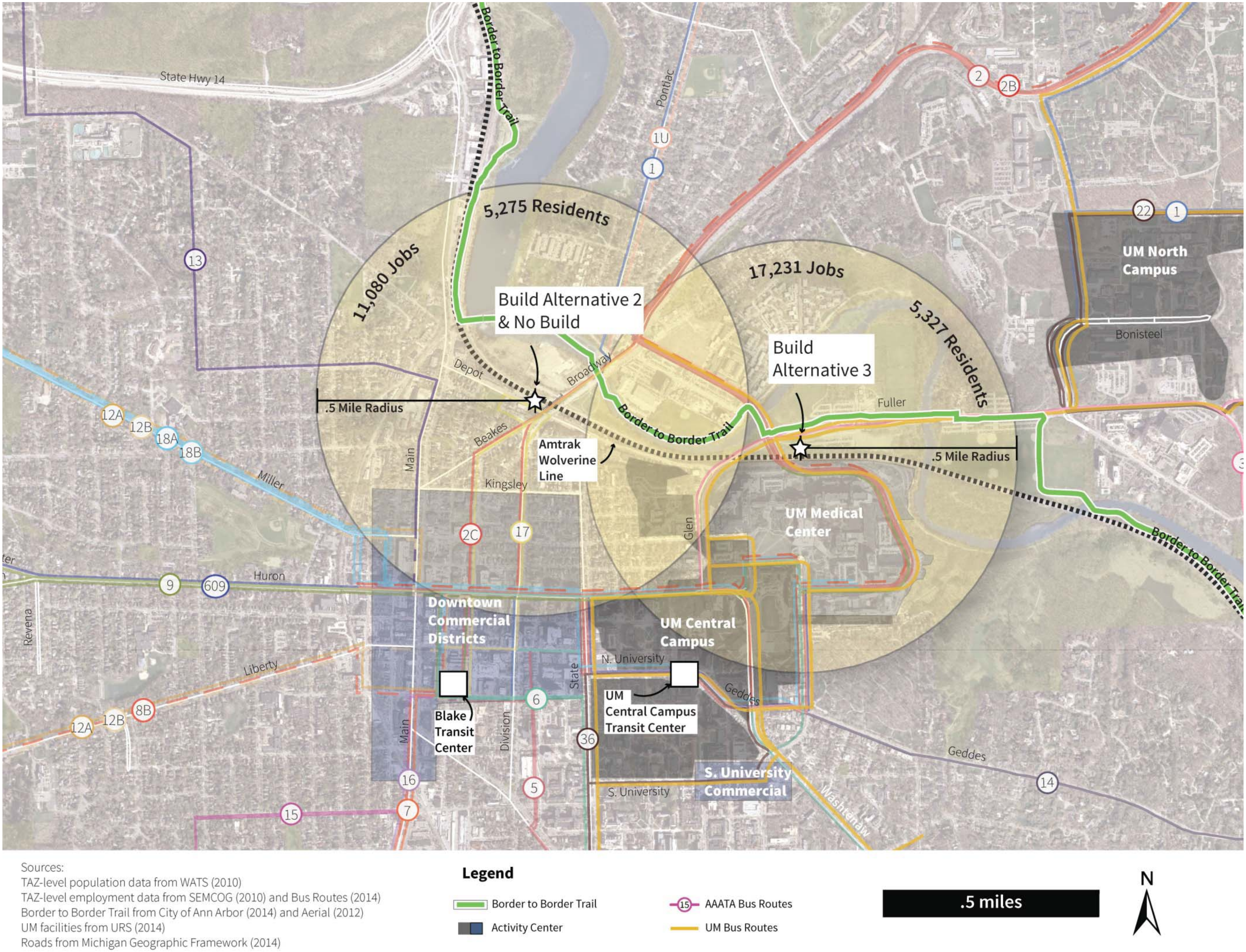
- **Project Update**
- **Review of Activities**
  - ~ Last meeting September 15 (Site Tour)
  - ~ Elimination of North Main Street (Build Alternative 1)
- **Final Documents**
  - ~ Purpose and Need
- **Recently Developed Information**
  - ~ Updated parking need estimates
  - ~ Updated waiting room size estimate
  - ~ Coordination with DTE
  - ~ Reuse of Michigan Central Station (new Option for Build Alternative 2)

- **Next Steps**
  - ~ Next Meetings LAG/CWG/Public Meeting – June
  - ~ Prepare EA
  - ~ Public hearing
  - ~ FONSI

Project Update

Review of Activities

- Last Meeting was September 15 (Site Tour)
- Eliminated Build Alternative 1 (North Main Street)
- Three Alternatives Remain:
  - Build Alternative 2 (Depot Street/Existing Amtrak)
  - Build Alternative 3 (Fuller Road—West)
  - No Build Alternative
- Analysis is underway—to be presented in June



Sources:
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Final Documents

- Purpose and Need
  - Accepted by FRA

Purpose & Need

Purpose: Provide an intermodal facility that will

- accommodate existing and future intercity passenger rail ridership;
- improve intermodal connectivity within the City of Ann Arbor and its neighboring communities, including proposed commuter rail; and
- improve the integration of the station within the City of Ann Arbor.

Purpose & Need

Needs

- Insufficient quality and comfort provided for passengers by the existing station
- Inadequate space for intermodal connectivity at the existing station
- Substantial existing and projected future passenger demand
- Limited Integration of the Existing Station within Ann Arbor and Limited Access to City Neighborhoods and the Region

Recently Developed Information

- Updated parking need estimate
- Updated waiting room size estimate
- Coordination with DTE
- Reuse of Michigan Central Station (New Option for Build Alternative 2)

Parking Needs Estimate

- Amtrak request: **870 parking spaces**
  - Team performed an analysis reaching a similar conclusion for intercity travel
    - Amtrak's initial estimate was much higher (2,200 spaces, based on long-distance travel model and not reflecting urban context)
  - Additional spaces would be needed for intercity bus and commuter rail
  - No change to the footprint of the parking structure

Station Building Estimates

- Station waiting room for intercity passengers is smaller than initial concept
  - Based on travel estimates for the Chicago-Detroit/Pontiac intercity rail corridor
    - Reflects simultaneous train arrivals
    - Train capacity = 460 passengers
    - About 35% of westbound passengers expected to board in Ann Arbor = approx. 160 passengers/train
    - About 20 intercity passengers expected on eastbound trains

Station Building Estimates

- **NEED: Waiting Room space for 180 intercity rail passengers** (approx. 2,700 square feet)
  - As more intercity trains are offered, more commuters would ride
    - Commuters don't have the same waiting room needs as intercity passengers
    - Also prepare for riders on proposed commuter rail
  - Waiting Room space needed for intercity bus passengers also

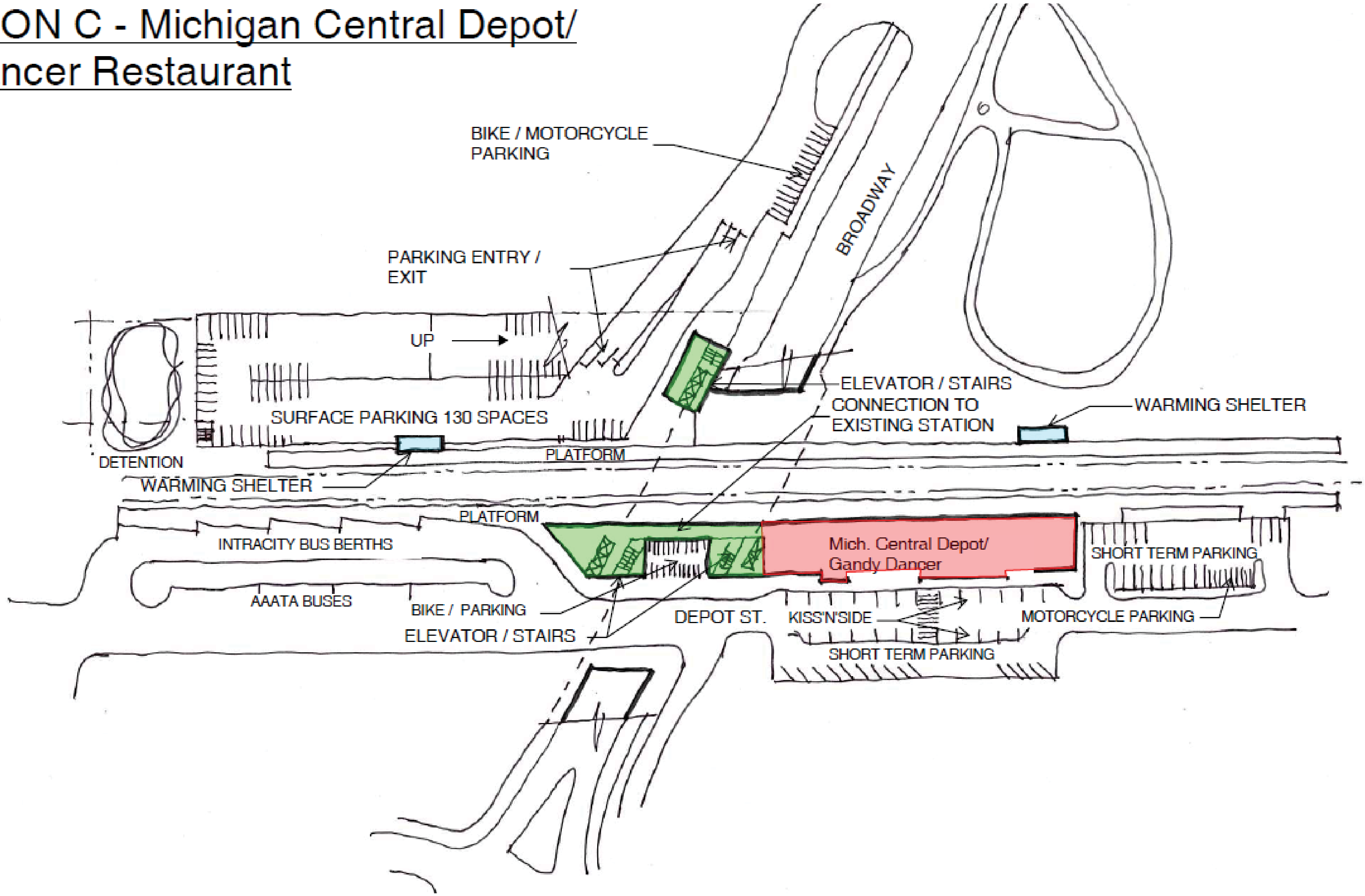
Coordination with DTE

- Coordination pertains to Build Alternative 2 (Depot Street/Existing Amtrak)
  - Does not imply this alternative has been selected as the Preferred Alternative
- The City, MDOT and DTE have met to discuss using some DTE land should Build Alternative 2 advance
  - All parties have expressed a willingness to cooperate

Michigan Central Depot

- Reuse of the "Gandy Dancer" building for the station explored
- One of three explored Options for Build Alternative 2 (others options include a new station building, either ground level or elevated)

BA2 OPTION C - Michigan Central Depot/ Gandy Dancer Restaurant



Michigan Central Depot

- Some complications with Reuse:
  - Modifications required to this National Register of Historic Places listed property in a local Historic District
  - Section 4(f) Environmental Process
  - Cost to relocate the restaurant
  - Removes tax generation from property
  - Challenging access

Next Steps

- Next Meetings LAG/CWG/Public Meeting – June
- Select Preferred Alternative
- Prepare Environmental Assessment
- Public Hearing
- Finding of No Significant Impact (FONSI)

Thank You

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Ann Arbor Station Environmental Review

Leadership Advisory Group

May 13, 2015

CITY OF ANN ARBOR MICHIGAN

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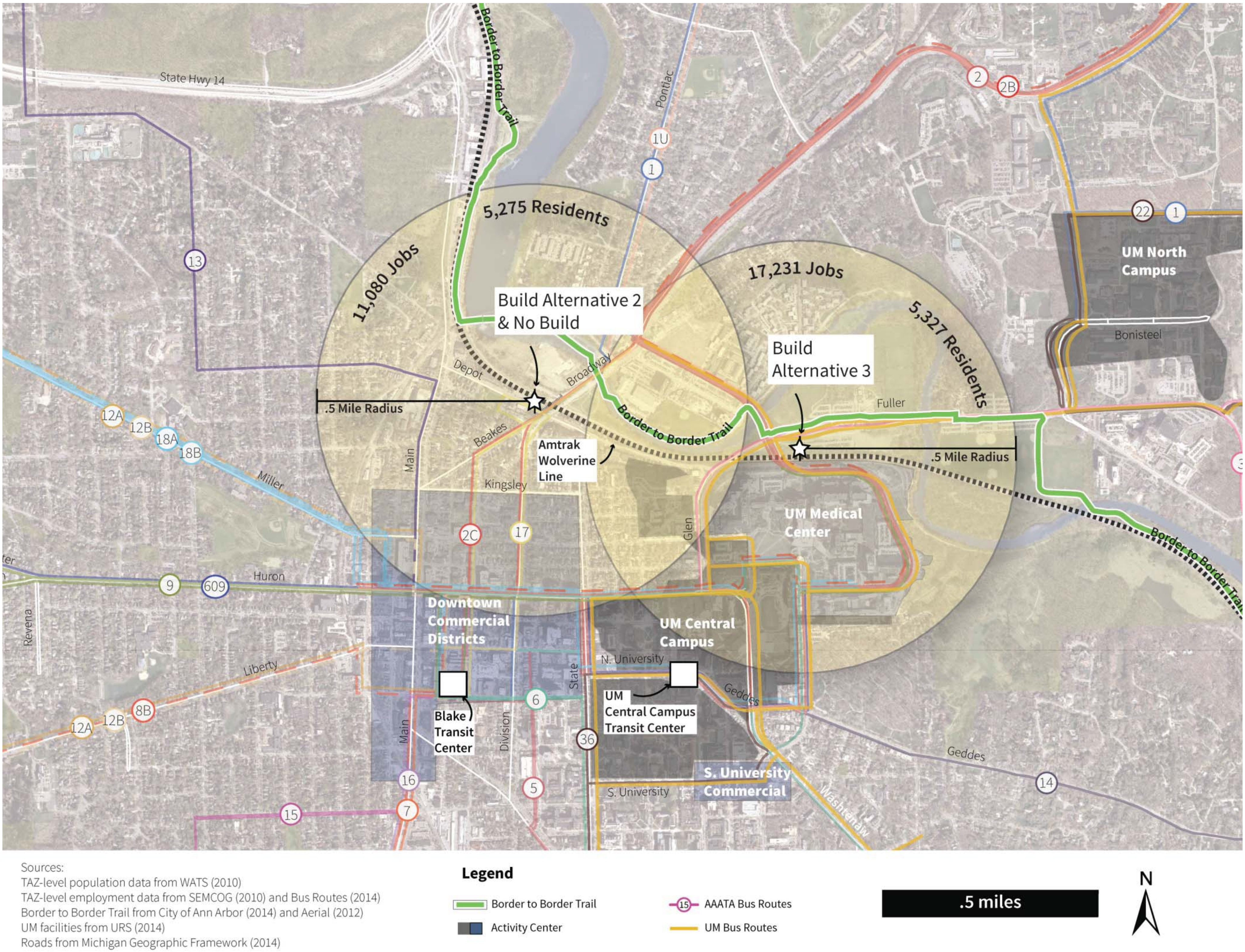

Border to Border Trail
State Hwy 14
Pontiac
1U
1
2
2B
22
UM North Campus
Bonisteel
13
5,275 Residents
11,080 Jobs
17,231 Jobs
5,327 Residents
Build Alternative 2 & No Build
Build Alternative 3
Depot
Broadway
Fuller
.5 Mile Radius
.5 Mile Radius
Beakes
Amtrak Wolverine Line
Kingsley
Main
Miller
12A
12B
18A
18B
2C
17
Glen
UM Medical Center
Huron
9
609
Revena
Downtown Commercial Districts
UM Central Campus
N. University
Liberty
State
Geddes
8B
6
Blake Transit Center
UM Central Campus Transit Center
Division
36
16
5
S. University
S. University Commercial
Washtenaw
14
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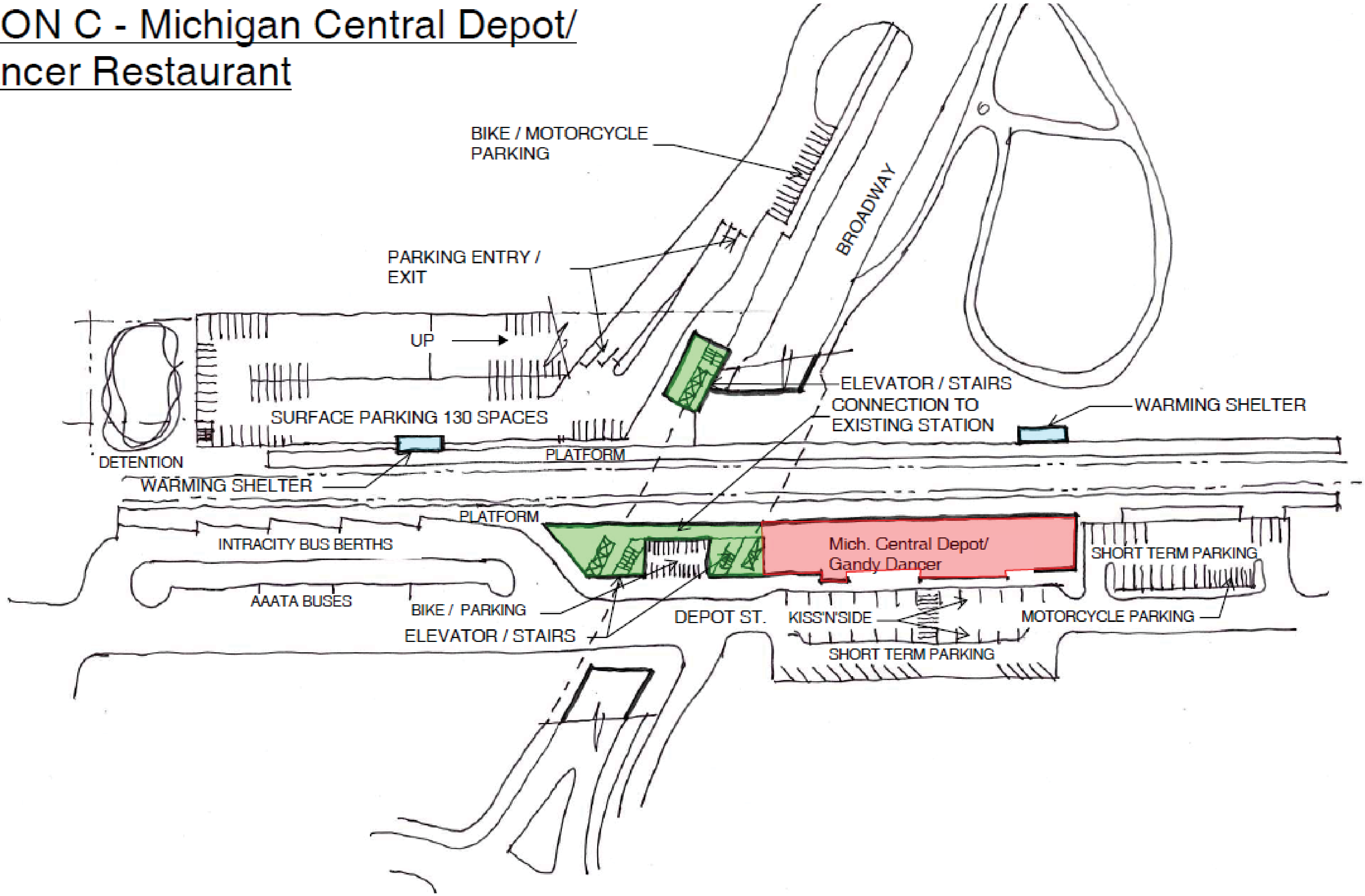
Michigan Central Depot

- Reuse of the “Gandy Dancer” building for the station explored
- One of three explored Options for Build Alternative 2 (others options include a new station building, either ground level or elevated)

BA2 OPTION C - Michigan Central Depot/ Gandy Dancer Restaurant



Michigan Central Depot

- Some complications with Reuse:
  - Modifications required to this National Register of Historic Places listed property in a local Historic District
  - Section 4(f) Environmental Process
  - Cost to relocate the restaurant
  - Removes tax generation from property
  - Challenging access

Next Steps

- Next Meetings LAG/CWG/Public Meeting – June
- Select Preferred Alternative
- Prepare Environmental Assessment
- Public Hearing
- Finding of No Significant Impact (FONSI)

Thank You

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SPRING 2014

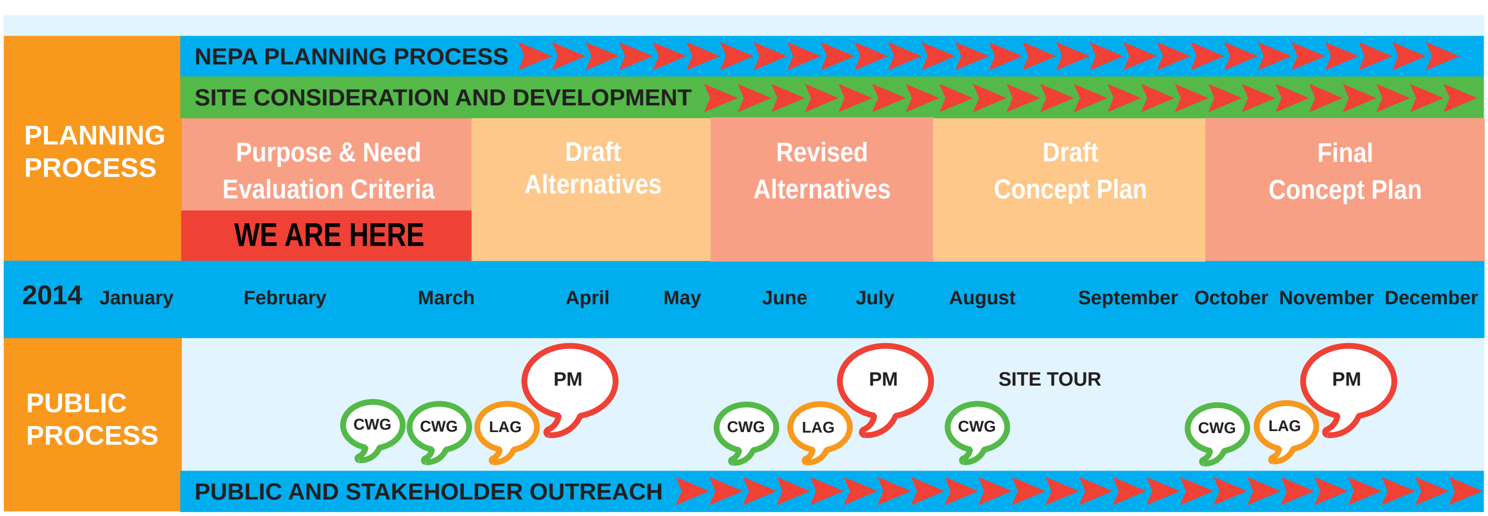
Ann Arbor Station Environmental Review

The Ann Arbor Station, located at 325 Depot Street, is the busiest Amtrak station in the State of Michigan, and served nearly 160,000 passengers in 2013. The Amtrak Wolverine service, operating between Pontiac and Chicago, currently stops at the station six times per day (three trains in each direction). Future plans for enhancements will improve on-time performance, decrease travel times by 10-20%, and potentially lead to significant increases in ridership. Additional train trips are also planned for the corridor.

The Ann Arbor Station Environmental Review study represents a new opportunity to examine the station and how it will function in the future. Building from the City's Transportation Master Plan (adopted in 2009), which placed a high priority on enhancing the railroad passenger station and developing an intermodal facility, the study will evaluate options for improving accessibility and accommodating anticipated increases in ridership. Options could include improvements to the existing station site or finding a new station location in the City of Ann Arbor.

This study has been initiated to provide the citizens of Ann Arbor with the best information to make a decision. In the end, voters or their representatives will decide whether a new train station or improvements to the existing one is in the best interest of Ann Arbor. On October 15, 2012, the Ann Arbor City Council resolved that proceeding with the construction of the station will be voted upon by the citizens of Ann Arbor: "RESOLVED, That at or before the completion of a final design for the Ann Arbor Station project, City Council will set a date by which the City will submit the question of moving forward with construction to a vote of the citizens of Ann Arbor."

PROJECT TIMELINE



CWG=Citizen Working Group Meetings LAG=Leadership Advisory Group Meetings PM=Public Meetings

WHAT IS THE ANN ARBOR STATION ENVIRONMENTAL REVIEW?

The purpose of the Ann Arbor Station Environmental Review study is to take a closer look at the current Amtrak station and create a vision for the future. This project was outlined in the City's adopted 2009 Transportation Plan Update, and gives the citizens of Ann Arbor an opportunity to shape that vision.

The City of Ann Arbor, the Michigan Department of Transportation, and the Federal Rail Administration are preparing an Environmental Assessment (EA), as required under the National Environmental Policy Act (NEPA) of 1969. NEPA requires that for projects using federal funds, a thorough evaluation of the socioeconomic and environmental impacts of the proposed action be undertaken and presented to the public for comment.

The EA document includes three essential elements:

- The purpose and need for the project.

- An evaluation of alternatives that address the purpose and need for the project.

- Documentation of the environmental and socioeconomic impacts associated with each alternative.

PURPOSE AND NEED

During the initial public meetings in March and April we will be discussing draft the purpose and need statement, and taking comments on the factors included. In general, the purpose defines the objective to be achieved by the proposed project, and the need outlines that the problem exists and provides the data to support the purpose.

ALTERNATIVE EVALUATION

Over the next several months, the evaluation in the EA will include several alternative sites for the station and the impacts associated with them. The alternatives will be presented at public meetings throughout the study where comments will be encouraged. As the study progresses, the station site criteria, documented impacts, and consideration of agency, stakeholder and public comments will be factors in determining the chosen, or preferred alternative for the Ann Arbor Station site. The selection of the preferred alternative is scheduled to take place in late 2014.

Public input and comments are critical to the development of these documents. All comments that are communicated to project team members, mailed, emailed, or called in to the City of Ann Arbor will be reviewed.

THE EVALUATION PROCESS

Several factors will be considered as the alternative sites for the station are evaluated:

- Does the alternative meet the defined purpose and need?
- Does the alternative meet the defined design criteria? Examples include:
    - The station will be located next to the Amtrak Wolverine service tracks.
    - The station site will include space for parking.
    - Bus service in Ann Arbor will connect passengers to the train station.
- What are the environmental and socioeconomic impacts (positive or negative) resulting from this alternative?

We are asking for your input on these factors as we move through the process. These factors will guide the team in determining which alternative sites will be eliminated from consideration and which sites will be carried forward in the study, ultimately leading to the chosen station site, or the preferred alternative. We will have detailed information on these factors at the public meeting, and we are asking for your comments to help shape the criteria that will be used to select the location for the station.

A SNAPSHOT LOOK AT OTHER PROJECTS UNDERWAY

The Ann Arbor Station is an important gateway to the City of Ann Arbor, and any changes from the existing station will need to be based on local input and decision making. At the same time, the station is part of a broader network of transportation facilities that has links both within the state and throughout the Midwest. The concepts for the Ann Arbor Station will be informed by the significant plans and projects for upgrading intercity rail service, including the recent or ongoing efforts discussed below.

Midwest Regional Rail Initiative (MWRRI)

The MWRRI is a group consisting of participants from several Midwestern states (Illinois, Wisconsin, Michigan, Indiana, Ohio, Minnesota, Iowa, Nebraska, and Missouri) and in partnership with the FRA and Amtrak to increase the level and quality of passenger rail service in the Midwest, emanating from Chicago. The MWRRI prioritized several corridors in the Midwest, including the Detroit/Pontiac-to-Chicago corridor.

Chicago-Detroit-Pontiac Rail Corridor

Consistent with the MWRRI, MDOT and its partner agencies in Indiana and Illinois have been working to improve the speed and reliability of intercity passenger rail along the Amtrak Wolverine service corridor. Numerous portions of the rail line, including the portion through Ann Arbor, have been purchased by the state in order to make the necessary infrastructure improvements and to ensure that passenger rail service is prioritized in the long-term infrastructure planning. Complementary improvements have been made to station facilities throughout the corridor, including recent upgrades to the facilities in Dearborn and Troy/Birmingham.

Dearborn Intermodal Passenger Rail Station

This station property is almost three times bigger than Ann Arbor's. The existing Dearborn Station serves about half as many passengers as Ann Arbor. The station will have several bus bays for bus/rail transfers and abundant space for passenger loading, shuttles and taxis. A large surface parking lot is designed for future consolidation in a structure to enable station-oriented development. A sustainably designed building will feature free Wi-Fi for customers and food concessions. The station will connect directly to the Greenfield Village/Henry Ford Museum property.

Troy Transit Center/Birmingham-Troy Amtrak

This new station and bus transfer facility is located a few steps from a regional shopping center. A new 2,400 square foot station building includes space for concessions. Over 100 parking spaces are immediately adjacent to the station building. A pedestrian bridge over the tracks has elevators for barrier-free travel. Regional buses will connect directly with the station at four bus bays. The existing Birmingham-Troy Amtrak Station served about 23,000 passengers in 2013*, or 15% of Ann Arbor's passengers.

Grand Rapids Amtrak

This new station has been constructed immediately adjacent to the city's multi-modal transportation center. It is located on Amtrak's Pere Marquette route between Grand Rapids and Chicago. The station served nearly 52,000 passengers in 2013*, less than one-third of Ann Arbor's passengers.

(*Source: Amtrak Fact Sheet, Fiscal Year 2013)

GET INVOLVED

Join the conversation and provide your thoughts and opinions about the Ann Arbor Station Environmental Review. The City of Ann Arbor encourages you to get involved by providing your feedback throughout the study. Your input is especially valuable at key study milestones linked to the environmental review, such as the purpose and need and evaluation of the alternatives. Project updates also will be available through the project website: www.a2gov.org/annarborstation.

PUBLIC MEETING—JOIN US ON WEDNESDAY, APRIL 2

Plan on attending our Public Meeting where City of Ann Arbor staff and consultants will be available to answer specific questions. Presentations of current study information will occur at 4:30 pm and 7:00 pm. The remainder of the meeting time will be an open house.

Wednesday, April 2, 2014
4:00-5:30 pm AND 6:30 – 8:30 pm
Ann Arbor District Library, Downtown, Lower Level Multipurpose Room
343 South Fifth Avenue, Ann Arbor, Michigan 48104

CAN'T COME IN PERSON? SHARE YOUR COMMENTS DIRECTLY WITH THE CITY OF ANN ARBOR BY VISITING THE PROJECT WEBSITE AT WWW.A2GOV.ORG/ANNARBORSTATION

ADDITIONAL OPPORTUNITIES FOR PARTICIPATION

In addition to the three public meetings scheduled throughout this project, a Citizen's Working Group (CWG) is also being formed. The CWG is a group of citizen stakeholders that meet regularly to discuss issues related to the project. The goal of the CWG is to gather direct feedback and input on the project from the community on an ongoing basis. Over the next year the CWG will meet at least five times to provide input and comment on various aspects of the project.

Citizen Working Group Meetings
Wednesday, March 19 AND Tuesday, March 25, 2014
6:30-8:30 p.m.
Fourth floor meeting room, Ann Arbor District Library, Downtown Branch, 343 S. 5th Ave.

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Ann Arbor Station Environmental Review
Citizen Working Group
Meeting Notes—Meeting #4

Date: Wednesday, May 13, 2015
Location: Ann Arbor DDA Offices
Attendees: 15 citizen attendees

The fourth meeting of the Citizen Working Group included a presentation on the overall scope of the Ann Arbor Station Environmental Review and the Alternatives Analysis process. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: http://www.a2gov.org/departments/systems-planning/Transportation/Pages/Ann-Arbor-Station.aspx.

Michigan Central Depot

- I would like to propose another meeting to discuss the preservation of the historical station. I think the federal government asked you to review the station. The City could obtain ownership and it would be a tremendous benefit for the area. I can see that as a need we would incorporate into the Purpose & Need. I want to make sure that's still on the radar.
  The Purpose and Need is not site specific, but the Michigan Central Depot is still an Alternative that is being considered.

- Why did the FRA want you to further review the Michigan Central Depot?
  Given the FRA's experience, they felt there was an opportunity for further review. This structure wasn't the same dynamic that they had seen in other abandoned or crumbling historic structures. When we went out on the Site Tour it wasn't one of our considerations, but the FRA asked us to provide more analysis.

- People need to understand that both sides of the track have to be served. So this brings in the possibility of access from Broadway Bridge. There has to be access over the track.
  Yes, and at each of the alternative sites, both sides of the tracks have to accessible there will be access, as an overhead crossing, built in to the site concepts.

- Why doesn't the floodplain show on the map? The station is one of the few places outside of the floodplain. I'd like to have all maps include floodplain information.
  All the environmental issues were considered. We'll be sharing that in the Alternatives Analysis documents.

- Has the Gandy Dancer given any reaction?
  We reached out to the Gandy Dancer and we have received no response.

- If you can't consider the Gandy Dancer, you should consider the fact that the structure is Romanesque, a place maker? All you have at Fuller Park is a structure and a waiting room. There is no opportunity for transit-oriented development.
  If something went into Fuller Park you would want to limit the footprint as much as possible. If it were to be that site you do have parkland and there is also a major medical location. There are elements that have been discussed. People have envisioned restaurants, museums, etc.at the station itself, as air rights developments. Transit-Oriented Development is considered to be development within ¼ mile. There are TOD opportunities in Lower Town with the Fuller Road alternative.

Purpose & Need

- I object to your last point in the Purpose & Need. The present location is integrated into the community. It couldn't be located better for connecting with the City.
  Some of what is included in the last statement of the Purpose & Need is the positioning and visibility of the existing station. One could drive past the station on Depot Street, or above it on Broadway Street and could miss it.

- I'm concerned that the Purpose & Need statements are stated as negatives. I don't understand the approach.
  Some of this is the semantics. The current station has its inadequacies. The Purpose & Need is really about why do we even need to look at a potential new station. When we began the process we outlined the Purpose & Need in the initial Citizen Working Group meetings. Whether it's a positive or negative we had to write the report to comply with the federal agencies. We introduced these as statements of need and subjected it to public review. The comments were sent to MDOT and FRA as well. They have accepted these statements. We may not unanimously agree with everything here, but we have to agree that we are considering everyone's input and complying with technical analysis as well. As of right now we have received the FRA's acceptance of the Purpose & Need.

- I feel like the last statement is wrong. (Limited integration of this Existing Station within Ann Arbor and limited access to City neighborhoods and the region).
  Our intent is to listen to you and include your comments as well as present the technical recommendations. We send everything in draft to the FRA. We establish our items and then they refine them so we are in the right place in relation to their rules.

- Can you define what limited integration means?
  Some of the integration means that if you use Broadway you don't necessarily know the station is there. So it includes visibility of the station as well. The Purpose & Need statements are not necessarily related to a specific location of an alternative, but rather what needs to be addressed.

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Parking

- Was the parking number reduced because the University built a parking structure?
  No, it's because Amtrak was using a long-distance train model, rather than an urban model in the parking numbers they gave us. Once the urban model was used, the parking numbers was reduced. The calculations were also checked against the anticipated ridership developed by Michigan DOT for the Chicago to Detroit/Pontiac service improvements.

- Are you taking to account that you would be using the Fuller Road parking and did you tell the University you would need their spaces?
  This parking number is independent of a particular site. This is the need for our station project to accommodate the intercity passenger rail service to be functional for the station.

- Why is this number higher than other stations on the line?
  The busiest station in Michigan is the Ann Arbor Station. The technical models and tools lead us to this number. The City isn't going to provide 846 parking spots immediately, this is a planning level estimate for the full build out of 10 round trip trains per day.. Additional levels to the parking structure can be added when needed. We need to look at the planning and needs as we go through site selection and design.

- I think the parking number is too high. There are a lot of people who don't have cars and students who aren't bringing cars. There is a change in focus away from cars. We don't want to build a structure that gets filled just because it's there. There is a change in attitude about cars.
  870 parking spots are for the 10 round trips a day. We are considering what the potential need will be. We have to see what sites will accommodate what the models show us. When you take federal funds you are committing to 20 years of funding a station and the parking needs to support that.

- How high would the structure need to be based on the two parking options, the previous and the new?
  When it was 2,220 spots it might have been 8 stories. This new count would allow the structure to be 3 or 4 levels.

- The need for the 870 does that mean on the busiest day you would find a spot, or is it a median demand?
  The models are based on right sizing for the majority of the year. On the day before Thanksgiving you may not find a parking spot. This will function like an airport parking lot. When you start to think about the structure and the adequate design, it starts to build it's own footprint.

- Over the last several years at Thanksgiving I've done car counts and they have had 175 cars. If you build a structure and charge, you'll find that people will have others drop them off.
  We need a number for ultimate build out. As the project advances we will come to an agreement with the State and the FRA about the number of spots.

- Regarding parking, did you look at off site parking?
  We didn't look at off-site parking. Working with FRA we were looking at locating everything on site. For FRA we are required to have everything located in one location for 20 years. In order to have the economic impacts you want you will need to have a place for people to park.

General Comments

- At what point in the process with the FRA do our options get limited as to what features we can incorporate?
  We are identifying the sites that can accommodate the project. Then there is the preliminary engineering. That's where we look at the more detailed elements. That's 6-9 months with public involvement. And then there's final design where we refine the engineering drawings where they can go out for bidding. The drawings now are very basic, but they will be refined as we determine what the buildable elements will be.

- *Why can't we build a station that serve both the Wally commuter train and the High-speed train at the intersection of the N-S and E-W tracks?*
  One of the requirements for a station was that we needed 1000 feet of straight track. These tracks are curved at the intersection and the tracks superelevation, or tilt, would not allow for the train to stop in that section. The train would be tilted on its side as people would exit the train. It is not ADA-compliant.

Next Project Steps/Funding

- So what is the endpoint for building a station?
  We would need to send out an RFP for an engineering firm for design. That will most likely be January of 2016 if we receive the FONSI in December 2015. We have budget and authority as staff to proceed through engineering. Then we would need to begin the process of soliciting a grant. FRA needs to approve all of our documents. Final design is a 6-9 month process. Following final design we would need to have a vote of the City. That would roughly be in 2017. It could be constructed as early as 2018.

- Old Alternative #3, the North Main site, Could you tell us why that ultimately failed?
  We hadn't originally recommended that site. When we met with the public people wanted to look at redevelopment of that area. So we took a look at it, but when we reviewed it, to make it viable we needed all the property that was there. There wouldn't be anything left to redevelop. So that was a fatal flaw. The station also needs 1,000 feet of straight track and that wouldn't be possible.

- I would like to think that we would be thinking intermodally. I always use a cab rather than use a car to park. There are always cabs available.

- What is the current station waiting area?
  The existing Amtrak station is 3,200 G.S.F.

- Why are we not considering more forward-thinking ideas rather than just a box?
  We will consider other options. At this point we are talking about general conceptual ideas. The innovative concepts you have can come through as we begin the design phase.

- Who will pay the other 20% for the station?
  The local cost share could be from state funding, county, local, or private funding. There are also in-kind values that could be used for the 20% local share.

- That would make Depot St. an ideal location. How many people take the train to the hospital?

- Good transit service may enlarge the effect the station will have on the City and the region. The Depot site doesn't have much opportunity for development.

- I have written two columns in The Ann Arbor News about the station:

  www.annarbor.com/news/ann-arbor-will-need-commuter-trains-and-the-fuller-road-train-station/

  www.annarbor.com/news/are-higher-speed-trains-between-chicago-detroit-economically-feasible/

  One of the columns I wrote was about high-speed rail. There was a comment about the 870 spaces, but the thing is that the high-speed rail improvements will transform the economics of the route. People will find no merit in using Metro Airport for regional trips. Once higher speed rail is in place and assuming it's reliable you're going to see a huge surge in demand. The cost of air travel will be high as well. So there will be a high increase in demand. The service will be a profitable business and that's why the legislature funded the $17 million in gap funding. There's also been a lot of discussion about property taxes and the loss of the Gandy Dancer. The highest valued real estate in the city is anything in within walking distance of the medical center. When we talk about coming up with funds for the station we could build air rights above the station. Revenue from offices or condo developments could pay for the cost of the station.

- With the Fuller Road site we are looking at parkland. If you have a major station at Fuller with the elements of The Connector it really changes the park. Anything that is done must be done with the approval of the public. I'm not sure I would write off the current station.

Comments From MDOT

You are going to see some activity at the current station. It's an ADA project. A grant was received from the federal government to build a modular platform that can go out to the train and then come back. It's a two-year demonstration. They are aiming for late July for a ribbon-cutting.

Ann Arbor Station Environmental Review
Citizen Working Group
Meeting Notes—Meeting #3

Date: Wednesday, June 18, 2014
Location: Ann Arbor District Library
Attendees: 14 citizen attendees

The third meeting of the Citizen Working Group included a presentation on the overall scope of the Ann Arbor Station Environmental Review and the Alternatives Analysis process. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: www.a2gov.org/annarborstation.

General Comments

- Can you describe the criteria used by Amtrak to project the rail ridership? Going 20 years ahead it seems rather high compared to population projections.
  We would need to check with the Michigan Department of Transportation (MDOT) and the Federal Railroad Administration (FRA) on their methodology. The original numbers that were shared were from 2006. MDOT's transportation model is used to create the ridership numbers. These numbers represent the total volume of train boardings plus alightings (ons and offs) at the Ann Arbor station. The increases may reflect modest population growth projections, but most of the ridership growth is from improved train service: more trains, higher travel speeds, and improved reliability. In short, the projected increased station volume at Ann Arbor represents travelers who shift to train travel from driving or flying.

- Does the 155,000 figure represent just ons (boardings) at Ann Arbor, or both ons and offs?
  The number represents the total volume of ons and offs at the station in 2013.

- I think historic ridership is important. I started using the trains in the 1940's and the trains were crowded.
  Train travel peaked in the 1940s. After declining for decades, it is once again growing rapidly. Amtrak didn't have a reservation system in the past. Adding this strengthened MDOT's position to acquire new equipment to meet the growing demand for train travel. Eventually new equipment was harder to acquire and ridership leveled off.

- The presentation showed a projected number of about 1.5 million riders by 2035. Does that reflect the entire line between Detroit and Chicago, or is that just station activity at Ann Arbor?
  The number represents total volume of ons and offs at the station in 2035 including intercity passenger rail (Amtrak) and commuter rail.

Purpose and Need

- I don't understand why in the Purpose and Need you show that the station has poor integration. It's been there for years.
  What we are trying to show here are the constraints of the current station facilities, including outdated pedestrian infrastructure (such as stairways or long, circuitous barrier-free walking routes) and a lack of intermodal options between surrounding communities and the existing station. The Purpose and Need intends to convey that a new, adequate station can possibly be located at the existing Amtrak station site.

- There's an issue that is overlooked. The current station has only one track. With two tracks there will need to be an elevator or something to cross the tracks. What's there now will not work for that.
  That's correct. A new multi-modal passenger rail station in Ann Arbor would have a pedestrian bridge over the tracks with elevators and other circulation options.

- When you say a "benefit to the community" do you mean benefits to commuters?
  The station is anticipated to benefits many different stakeholders. Intercity passengers would benefit from comfortable, sufficient station facilities. Commuters would benefit from new travel options. The surrounding community would benefit from improved infrastructure near the station and economic development. The City, State and FRA are station funding sponsors, but they don't want to say what is should look like. The station will have a community flavor, but the funding process must be backed-up that up with the federal environmental process.

- The economic benefit has to be considered when evaluating the cost.
  The Phase II analysis will consider both costs and benefits.

- My understanding is that we were looking at improving the current station, not an intermodal facility. I think intermodal is still up for debate. The Fuller Road location was an original proposal and no one wanted that option.
  The original conversation about the station came from the City's transportation master plan in 2009. That plan considers how people come in and out of town. In that spirit, the Project Team needs to consider how station improvements can support this travel. That includes studying how travelers arrive in the City and what do they do once they get here. We need to move those people throughout the system, and our study showed that our existing station and access system can't handle the projected increase in rail travel.

- From a general transportation viewpoint, it's better to involve people in seamless transportation modes. Having an intermodal facility makes more sense that having a lot of different facilities. If you go to places in Europe or Asia they have systems with a central location.

- I think people would like to see more Park and Ride lots.
  That's a good example. If you live in Chelsea, Howell, Ypsilanti or an outlying area, you might go to a Park and Ride and catch a bus or commuter train to Ann Arbor. Once here, you can catch a train to Chicago.

- The rating system makes it look like it was designed by someone who doesn't use the trains and isn't from Ann Arbor. I think the current roads are handling the traffic now. When looking at the ratings, Fuller Road isn't any better really than any other road.
When considering traffic, the Project Team needs to work with City staff to consider capacity and future growth. The initial list of 8 sites is being narrowed down; once we do that we can really hone in on the screened sites. The scoring is just to help us get through the process, but once we go into the next set of sites we will do further evaluation.

- Last time you said we would eliminate some of the sites, so why are they still here?
At the March and April meetings we presented site identification criteria and the 8 identified track segments where stations might be located. The Project Team had not yet analyzed the sites. At the June meetings the Team shared its analysis for screening out some sites. The Federal process requires that we show our evaluation of sites that met that initial criteria.

- I am confused why the bubbles on the map with the access to downtown are not on the proposed site locations. Why do they have points within them?
The Project Team identified approximate center points for Downtown and other activity areas. The circles represent the half-mile radius distance from those points, which is a standard gauge for a comfortable walking distance. In Phase II of the Alternatives Analysis, the Project Team will develop conceptual station designs and perform demographic and transportation evaluations of the station areas. That means that in the next phase you'll see analysis circles that are centered on the alternative station sites.

Segments

- In Ann Arbor, we've been considering redevelopment options for the Segment 3 (North Main Street) area for a long time.
The Project Team will look at how a station can fit in that area and see what stakeholders think about it. The Project Team did not initially recommend a station along that segment because to do that the City would need to acquire several properties and relocate businesses.

- Segment 3 (North Main Street) also has a lack of space for a building and parking. It has just one street access.
That's true—properties would need to be purchased to make a station fit there. At this morning's Leadership Advisory Group meeting there was also a lot of discussion about Segment 3.

- Are we allowed to use private land for some of this project?
We aren't prohibited, but we would need to consider the financial and socioeconomic costs of acquiring property and relocating current property users.

- There is land at Segment 3 (North Main Street) that isn't used in an optimal way. A lot of that property is underutilized.

- A station an Segment 4 (Depot Street/Existing Amtrak) is close to Segment 3 (North Main Street) and might be another way to support redevelopment of North Main Street.

- Regarding access to existing roadways, the rating for that seems low for Segment 4 (Depot Street/Existing Amtrak). At that location you have access from multiple roadways.

- I think the "suitable land" rating for Segment 4 (Depot Street/Existing Amtrak) is low. MDOT has opportunities for grants to help cleanup brownfields. I think transit-oriented development should be part of your scoring grid.
The Project Team will generally consider transit-oriented and economic development potential and the remaining sites as part of the Phase II analysis.

- There is a potential to improve flood zone conditions in the area of Segment 4 (Depot Street/Existing Amtrak).
We will coordinate with the City to understand flood zone planning in the Segment 4 area.

- Except for the athletic activities, Segment 5 (Fuller Road—West) is not a destination.
A University of Michigan study shows over 30,000 daily trips in and out of the Segment 5 area. The Project Team understands this travel may not represent trips that many Ann Arbor residents make.

- I'm wondering about the contour of the land at Segment 5 (Fuller Road—West). The UM Medical Campus is way uphill from the tracks. You are taking a park and thus your rating scale for environmental impacts at that site should be negative. Fuller Park is a main park in the City. The Huron River is a major visual asset. Over time much of the land around the river has been acquired by the City. The University has also acquired land. Visually that part of Fuller Park is now a parking lot and that should change.
There's a whole series of environmental categories to be reviewed, including the fact that it's a park. Despite the fact that the parking lot next to Segment 5 is in parkland, the Project Team recommends looking at station options there a little further.

- What is the latest information on the roundabout at Maiden Lane & Fuller Road? There are a huge number of pedestrians and bikes at that location and the roundabout won't benefit them.
That project is still on the City's radar. The roundabout would be near Segment 5. The Project Team will coordinate with that roundabout if it advances.

- What about The Connector? It is planned to travel through the Segment 5. Can The Connector be extended or modified to reach the station if it is built in an area other that Segment 5?
The Project Team will coordinate with The Connector to develop plans for both projects in harmony.

- Fuller Road and Plymouth Road are main access roads to downtown. There is already a considerable amount of traffic going into the UM Medical Center area. It's congested now. Do you have hourly traffic flow rates and the impact of have the station at the location?
During Phase II the Project Team work with the City to consider traffic impacts of stations at the remaining alternative locations.

- I'd like to reinforce that you add the category transit-oriented development to the Alternatives Analysis. You won't want to take parkland for that. I would hope if Segment 5 advances you would take that into account. Is there a reason why we can't add transit-oriented development?
Based on the input we have been receiving today and tonight the team will give extra attention to transit-oriented development during Phase II of the Alternatives Analysis.

General Comments

- Before the Project Team recommends a Preferred Alternative, the public needs an opportunity to comment on the criteria and assumptions in the final analysis. We want to see the traffic studies and all that background information. We will provide feedback and details on all of the potential segments. We will provide a recommended alternative, but all potential segments will be shown. We'll provide this information in a draft memo that describes the process prior to the next Citizen's Working Group meeting.

- How can you make any selection without cost figures? Will you make a presentation about cost? Since there will be a local cost we need to see estimates.
The Phase II analysis will include conceptual designs and rough order of magnitude cost estimates for each alternative.

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Ann Arbor Station Environmental Review
Citizen Working Group
Meeting Notes—Meeting #1

Date: Wednesday, March 19, 2014
Location: Ann Arbor District Library
Attendees: 22 citizen attendees

The first meeting of the Citizen Working Group (CWG) included a presentation that detailed the overall scope of the Ann Arbor Station Environmental Review. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: www.a2gov.org/annarborstation.

Potential Station Locations

- We should consider the old train station as a viable option for Ann Arbor It's outside the flood plain. If we are talking millions of dollars it could be renovated and used again. It has potential to be a tourist attraction.

- Amtrak owns the current station, does anything preclude building on that same property?
  Amtrak is supportive of the project and improvements to improve service and operations. The existing station site is limited in size and may preclude if the station future needs cannot be accommodated.

Buses

- Provide information on the frequency of buses currently at the station and in the future.
- Include AirRide as part of multimodal operations.

Other Comparison Stations

- Of the stations that are being compared, how many have free parking?
  Niles and Dearborn

- On the City website it says there are other local rail improvements, but local communities are responsible to those improvements. Has Amtrak mandated that cities have to maintain stations?
  No

- How many other stations have paid the 20%.
  Most of the other federal capital grants are 100%, planning grants are 80/20. What Troy and Dearborn did was donate city time to the construction project. 100% funding was a special American Recovery and Reinvestment Act of 2009 (ARRA) provision. This Act was a response to the "Great Recession" and fully granted shovel-ready transportation projects to stimulate the

economy. 100% federal funding should not be anticipated for future projects. Substantial local planning investments positioned other Michigan stations for ARRA funding.

The Project Process

- Discuss the environmental assessment and the alternatives and which comes first.
  The process is concurrent where various alternatives will be assessed environmentally.

- The Purpose and Need has a requirement for access to historic data and projections that rely on assumptions. How will the CWG get access to the current and historical data?
  The Michigan Department of Transportation website has historic ridership at Ann Arbor for the past 10 years. The station-specific data for Ann Arbor and other stations represents boardings and alightings—all station activity.

- What about the projections for traffic?
  Projections were originally developed a number of years ago as part of the Midwest Regional Rail Initiative that the State of Michigan participated. The State is currently studying the Chicago to Detroit/Pontiac corridor and will update the projected ridership. The current 2040 forecasted ridership for Ann Arbor is 448,704 versus 155,000 in 2013.

- Is there a NEPA as part of the study because there is public land?
  NEPA is required because of the federal funding.

- My understanding with NEPA and 4f is that part of it becomes that you have demonstrate a feasible alternatives you have to demonstrate options you have to show no alternatives.
  As part of the NEPA process we will be reviewing alternatives with the goal of avoidance of any impacts. If an impact cannot be avoided it will be minimized and efforts made to mitigate.

Environmental Issues

- Will you be considering the floodplain as that station is along the river?
  Yes

- I want to make sure this group respects the Huron River and the floodplain issues. I built my house near the floodplain. I was told not to build my house there. We should have a standard that isn't any less than a home. Fuller Park is in the floodplain.

- I think there are restrictions for building in the floodplain.
  That will be key to the design criteria.

- One concern I have is security. If it's at the Fuller Road will it be the City or the University. I saw a spill there and the University didn't follow-up. If you put a station at the Fuller Road site, whose rules apply, federal, state or University?
  MDOT owns the railroad right of way. There will have to be overarching language and negotiation depending upon where it's located.

- I'd like to know about the 1.4 dioxin level at the site. Do not let Pall get a third-party person to measure that.

Station Improvements

- When do you anticipate the new improved rail and second rail and 10 round trips?
  MDOT is installing double track in many places along the Chicago-Detroit corridor now. They anticipate that 10 round trips and the necessary infrastructure to support these trips will be implemented by 2020.

- Will freight still be allowed to travel when build out is complete?
  Yes

- It sounds like there is limited capacity on the trains now. What do you know about that?
  There is on certain trips. It is one of the reasons the Michigan Department of Transportation (MDOT) is procuring more equipment.

- You might not need more stations, but more trains.
  There is an equipment shortage, as well as station capacity constraints.

- The current station closes when the train leaves. I'd like the new station to stay open until after people leave.

Comments Regarding Previous Studies

- With the study that was conducted in the past, parking space was altered, trees were taken down. How does that affect this study?
  The improvements that were made at the Fuller Road site were approved by Council for the sewer system. This is a clean slate, and our first meeting. URS was not a party to the previous study

- Apparently we are starting from scratch. So someone should remind you that the former site being considered was on Fuller Road. Most of the land along the river the parkland. There is a parking lot, but it was supposed to be temporary. If you use that parcel it is landlocked.

Other Partners

- How much is the University of Michigan involved?
  They are a stakeholder and an important transportation provider in our community. The Environmental Review is a City study. UM is one of many stakeholders. They are invited to the Leadership Advisory Group meeting next week.

Accessibility

- We haven't talked about accessibility. We need to discuss this.
Accessibility is an important issue with that site. It is a significant Federal and Amtrak requirement. They have people who work on just those issues. That's a high priority.

- To ease accessibility other stations have a platform that can fold back for freight.
That's part of the design criteria and an MDOT consideration for all new stations along the line.

- I'd like to reiterate the ADA issue. Ann Arbor-ites are getting older. I'd like to see bicycle access on trains. I think we need to look at the carbon footprint. We're going to be asked by the federal government to step up. We can increase ridership.

Decision-Making/Voting On The Station

- At the end result it says that it will be voted upon on by the voters or their representatives. Which is it?
The City Council resolution is for a vote of the people. If all parties agree that station improvements are a good idea and don't require a vote, then the investments would be up to Council. The decision to put it to a vote is made by elected officials.

- Before getting to the point of a vote it sounds like there will be a lot of decisions. How will those be made?
As the project team we will review the data. We will test against the Purpose and Need, the criteria. There will be constant input along the process.

Other Comments

- Who owns the right of way in the old Michigan Central line? My understanding is that Amtrak doesn't own it.
Amtrak owns Kalamazoo to Porter, IN. MDOT owns Kalamazoo to Dearborn.

- Who will be the owner of the facility when it's completed?
Right now it's a City project, so it depends on who is the landowner. It depends on property acquisition. The City isn't always the one who has to assume the costs. The station owner will work with station operators to recover costs.

- I was wondering about Wally and The Connector.
Those are other studies that we need to be aware of and coordinate with other projects. As part of the federal regulations we need to provide information on other studies underway. The impact they would have offers an opportunity for collaboration.

- Since the federal government will only cover part of the costs for the station, local money will have to be found. Is there any chance that if Ann Arbor Area Transportation Authority (AAATA) funds were uncommitted these could they be used for the station?
Once we identify who the partners are, the City will try to recapture costs. Anyone providing service to the facility would be asked to share costs.

- I'm concerned about AAATA money going to the station and not being able to meet their needs.
  As a stakeholder they can identity their role during those discussions.

- If Wally happens I'm not supporting it, but we should build a station that supports North South and East West. We could put it at a location that will be compatible.
  Straight track is required for new Amtrak stations. At the location where the two lines cross, both lines are on sharp curves.

Additional Written Comments (Please note that written comments are transcribed verbatim)

- "The following should be provided: 1. Continuity of the Border-to-Border Trail and the existing and planned trails that connect to it. 2. Access from the trails to the station by people on bicycles, on foot, and in wheelchairs. 3. Ability for passengers to roll their bicycles onto trains."

- "There seem to be a lot of people with very specific agendas in the room. This does not look like an easy project—several do not seem to be approaching this with an open mind."

- "URS was very fortunate that people asked questions because the presentation was limited in content. Thank you for providing the info online soon."

- "I am concerned that if it is built at the "Fuller Park" location that who will administer security? Near that location an unsolved environmental spill occurred and the U of M police failed at solving it. They didn't bother bringing in the DNR/EPA/state police as they exercised their authority, autonomy and failed at solving that crime. If the Fuller lot is built, security and environmental laws must fall under the city and state officials, and not the autonomy of the University. Also, wherever they build it, I'd like to know the 1,4 Dioxan level at that spot. Do not let Pall Corporation calculate this level. It is a carcinogen spreading in A2."

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Ann Arbor Station Environmental Review
Citizen Working Group
Meeting Notes—Meeting #5

Date: Wednesday, September 21, 2016
Location: Ann Arbor City Hall, Council Chambers
Attendees: 15 citizen attendees

The fifth meeting of the Citizen Working Group included a presentation on the overall scope of the Ann Arbor Station Environmental Review and the Alternatives Analysis process. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: http://www.a2gov.org/departments/systems-planning/planning-areas/transportation/Pages/Ann-Arbor-Station.aspx.

Alternative 2B

- Could you be more specific about how passengers will cross the tracks with option 2B.
  Passengers will use an elevated walkway connected by elevator or stairs to get from one side of the tracks to the other.

Michigan Central Depot

- Why is the Federal Railroad Administration (FRA) asking you to re-examine the Gandy Dancer location? Is that location on the national historic register?
  The FRA looks for opportunities to evaluate existing stations and return them to their initial designed use. The Gandy Dancer is on the National Register of Historic Places.

- Is there a funding source for rehabilitating the Gandy Dancer location?
  None beyond USDOT or FRA funds for system improvements, which have not been identified.

- I'd like to suggest that the Gandy Dancer builds a restaurant if that location is chosen. Then there would be a preserved station that the City would own and it would be a win-win for everyone.

- The City should build a restaurant next to the Gandy Dancer and preserve the historic station.

The Environmental Assessment

- Who is doing the Environmental Assessment? And who will score it?
  AECOM is preparing the Environmental Assessment in partnership with the FRA, State of Michigan, and the City of Ann Arbor. FRA ultimately is the responsible party who will sign off on the final report. The EA report will be released, then there will be a 30-day review during which time a public hearing will be held.

- How will the decision [on the station] be made?
  The FRA, State of Michigan, and the City of Ann Arbor will use the Environmental Assessment and public comments to guide the decision. Once the design is complete, the decision whether to build the station will be up for a public vote.

- *Is there a vote on whether Fuller Park will be sold?*
  City Council language states that there will be a vote on the station. The information about the proposed location will be coming at a later stage.

- When will the final vote be held?
  Preliminary engineering will bring the project to about 30% of completion, and then there is the final design phase. The vote will take place when sufficient information is available. Council's resolution requires the vote to occur before or upon completion of final design . Final Design efforts are dependent on available funding. Current funding is only secured through preliminary engineering.

- What exactly with the vote be? Will it be "do you support building a station at X location?"
  The details will be defined at that time once the vote is scheduled.

Traffic-Related Topics

- I notice the Fuller Road option doesn't have a traffic light. Does the traffic study look at what would be needed to add a light? Does the traffic study include a roundabout?
  The traffic impact study will be prepared for the Fuller Road option to determine what improvements will be required to accommodate the station. The City also has a separate project that is evaluating intersection improvements at Fuller/Maiden Lane.

- Will the traffic study take into consideration the emergency vehicles entering the hospital and those who are in stress heading to the emergency room.
  It does to the extent we recognize emergency vehicles will be given the right-of-way and interrupt traffic for time to time. As for "those in stress heading to the ER", we provided reasonable and acceptable level-of-service and capacity at the intersections.

- Are you also including pedestrians, bicycles and other forms of transportation when you conduct the traffic study?
  Data is collected related to pedestrians and the use bicycles and transit are also taken into account.

Site-Related Topics

- A lot of time what I hear from Council is that the infrastructure isn't built until it's needed so I am wondering why we need a new station?
  The station today lacks the capacity to meet the current need. This project and all other City projects are rated and presented to the City Planning Commission and they evaluate the prioritization of projects as the city develops its Capital Improvements Program. This station will support the 10 roundtrips per day, and the work to accomplish that is underway.

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- I'm curious about how you make comparisons between all options to Fuller. If Fuller is workable it has to be measured against the other three. You will also need to study the traffic up on Broadway and also consider the neighbors in the old 4th Ward and how it impacts them. I have a hard time myself making a decision comparing them among themselves and also dealing with the environmental impacts.
  There are four design alternatives proposed to be forwarded from the Alternatives analysis Phase II report. A no-build alternative using the existing station is required under National environmental Policy Act (NEPA). . So there will be five alternatives entering into the Environmental Assessment. We will be looking at a number of intersections related to access for each location.

- There's nothing specifically beneficial to converting Fuller Road to more development, and the same applies to the Gandy Dancer. It's not the numbers of businesses and development it's about destroying the nature and character of the area. There is an analysis of the floodplains that was recently completed and it that being taken into effect?
  We are aware of the Allen Creek Berm study and the effect it will have if the improvements are made.

- The current RFP references an elevated station so it looks like a decision has been made.
  If there is any reference to an elevated station in the RFP that is currently out it is clearly marked as illustrative. Elevated and ground-based stations are still under consideration, so we wanted the responders to include that experience in their proposals. The design will examine whichever option is chosen in the Environmental Assessment.

- For 2C, is there any contaminated brownfield under that station?
  Yes, information describes the contamination on the DTE site.

- Regarding Alternative 2C, did you look at the potential to interface with Wally?
  Yes, it cannot work. The issue is rail passenger platforms needs tangent (straight) track for a station. The intersection of the two tracks, l is in a curve on both tracks and therefore fails the tangent track requirement. This was evaluated and discussed during the Phase I Alternatives Analysis

Site-Related Comments

- We all want transit and it has great urban benefits. Any station will attract development. We are sort of freezing this in today's terms. There may be as many as 60 trains going each day. So we want a bus-linked station and I don't think you can do that at Fuller Road. At a Depot Street station, a new town center development could connect to Lower Town and relieve some pressure from downtown. The DTE site has tremendous development potential. So I prefer the Depot locations.

- One issue that has not been addressed is the DTE site and the pollution on that site. I have to think that site is heavily contaminated. The City has an obligation to get DTE to clean up that site.

- Parks and train stations don't work well together.

- The city has changed since the Depot was built. It is no longer in the center of things.

- I think a Fuller Park location is not centrally located. The existing site is more centrally located. There is talk at these meetings that once the station is there then the park will be history. I am not sure the UM will have that many staff riding the train.

- Reserve parking at the station for only those people from outside of Ann Arbor to reduce the parking need. Locals can take a taxi or transit.

- My approach comes from The Connector. The Depot Street location cannot be accessed by light rail and that's a historic issue. Only three buses currently serve the station, versus where the location being considered on Fuller is served by seven AAATA buses and UM buses. I think there is a lot of merit to the fact that people move to where there is transit. I think it would be negligent if just a double-track is used as I think there will be a need for four tracks. Also, the density potential is better at Fuller Road. It provides more transit accessibility, ease of gradients, walking paths, and more.

- I'm for keeping the station where it is. The Gandy Dancer location would be nice. I use the current station and don't want to be dumped off in the middle of nowhere. Fuller Road seems University-centric. There are businesses at the current station location and it takes away business from them. I would love to see the location used for citizens to go to Detroit for opera and other events. We have been promoting density downtown. Moving it out to Fuller Park, the University is already an interloper in our parks. The University has a fabulous bus system. I think the University could create a shuttle to the hospital. The rail system in Canada runs really well with elevated or underground access to vehicles.

- The report includes a reference to a memorandum of understanding with the University for parking and I think it should be removed. For us to use Fuller Road for something we couldn't get back again would be shame because we already have a site that can be used.

- Since we are discussing an environmental assessment, and I am coming as an advocate for Fuller Park. If I honestly felt that the RTA was endangering Fuller Park I would vote against it. Fuller Park is a major benefit to the City. It is Ann Arbor's beach and a place for kids and families. Significant work has been done to the infrastructure and it's in high demand for sports and recreation. Fuller Pool is my home in the summer months, and it's a major attraction for the City and we would lose that if a facility is built at Fuller Road.

- It seems like the green space between the park and the hospital has been taken up by cars.

- The University could provide a shuttle from depot for its employees.

- I'd like to encourage everyone to vote for the RTA. Also, the Fuller Road station is on MDOT property and would only use land that is currently a parking lot for the parking lot. The south side does not impact current actual park. It would be nice to put parking offsite. The site has to be accessible by transit.

- I am disappointed that this new report does not include our input. We said in our May meeting that the depot was accessible to downtown. The hospital is within walking distance. But none of that is here. Convenience of a station does matter. I do not want to be plunked off in green space. I want to be in the center of town. The main advantage to Depot is that it's in the main activity area, and Fuller is in the middle of a park. I would like what we have said to show up in the present report.

- The previous Environmental Assessment had some ridership information from 2010 or 2011. They didn't anticipate the collapse in gas prices or the State of Michigan's financial situation. For intercity only, I have difficulty seeing ridership going up so much.

- If you read the report, about half of the riders are U of M students. Fuller Road is not the middle of nowhere. There are buses running.

- Transit and accessibility should be key factors considered.

Parking and Access

- Could you talk more about the parking requirements?
There will 870 spots for intercity, 200 for commuter, 50 for short-term parking. That need is for the full build-out in 20 years with 10 round trips per day. The parking structure will be an incremental build-out. We verified these numbers with the FRA. In many ways the parking operates like an airport parking structure. It's spread out over the day. We are preparing a traffic impact study to document what's happening today. We are also looking at traffic patterns over the next 20 years as well. We are also looking at the multimodal impact at least a mile around the station.

- How will the walkway be engineered on the steep slope at Fuller Road?
The platforms would be adjacent to the track so they would be at level grade. There will be stairs and elevators to get to the station. The station is elevated over the tracks and a walkway is provided to Medical Center Drive. As we move forward we would do further engineering to refine.

- Could you talk about the access at Broadway?
For all of these options, passengers will be going over the tracks via stairs or an elevator which will be accessible from Broadway. There would be pull-ins for AAATA and other buses.

- We are still looking at 800 parking spaces for intercity travel and this assumes the increase in trains back and forth. I have difficulty wrapping myself around that figure. How did you come up with that figure?
The 870 number was provided by Amtrak. We looked at ridership projections from the Chicago to Detroit High Speed Rail project and then reviewed the equipment (number of coaches) they were going to run to validate the ridership. We also applied a factor to look at the number of parking space taking into account that Ann Arbor also has a lot of non-motorized users.

- I wanted to bring attention to the original train schedules for the Michigan Central Station. The original stops were sometimes at every mile or every few miles. Then we had many more stations. Regarding parking, is there a potential to have the parking offsite to coordinate with The Connector? Most other stations do not have a lot of parking.
  The approach all along in coordination with FRA and MDOT, is that we are keeping all the parking in one spot for the parking ramp footprint would be environmentally cleared, but the parking levels could be added as parking is needed.

- Is there any consideration for parking management and perhaps high parking fees.
  We are not including high priced parking in our options, we are trying to encourage ridership. For all four alternatives there is proximity to the platforms to allow people to easily access and ride. One of the management ideas is to make intermodal vehicles have the best access. There is not sufficient bus service to have robust transit from far communities to Ann Arbor.

Other Comments

- You are now down to four options and you call them 2A, 2B, and 2C and 3A which makes it look like 3A is the better option. We haven't discussed the politics of planning. The City tends to cater to the University of Michigan. Once the project started the City Council and University made it clear that they were focused on the Fuller location. Anytime a city council has a strong bias and they use a consultant the consultant goes with what the city wanted. How will you stay unbiased?

- I have a problem with the fact that the vast majority of our City voted for a Greenbelt and I don't see much green space being preserved in the City of Ann Arbor. I think residents value green space, and I don't think we should give it up. In Kalamazoo, they have a beautiful station without a lot of parking spaces. I think the river could become a tourist attraction. We could encourage people to go to the river.

Ann Arbor Station Environmental Review
Citizen Working Group
Meeting Notes—Meeting #2

Date: Tuesday, March 25, 2014
Location: Ann Arbor District Library
Attendees: 26 attendees

The second meeting of the Citizen Working Group included a presentation that detailed the overall scope of the Ann Arbor Station Environmental Review, the Purpose and Need, Design Criteria and Site Selection. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: www.a2gov.org/annarborstation.

General Comments

- Can you walk us through the 8 potential sites?
  The 8 segments identified are locations where there is at least 1000' of tangent (straight) track, one is the current Amtrak station location.

- Is this the entire inventory of 1,000-foot straight track segments along the tracks through the City of Ann Arbor?
  Yes.

- *Does this project need to fall within the City of Ann Arbor?*
  Yes, the City submitted the application to federally fund the Environmental Review effort, so it makes sense for a new station to be located in the City. A prior Ann Arbor Station relocation study completed in the early 1980s looked at siting an Amtrak station between Ann Arbor and Ypsilanti, but the City resolved to keep the station within Ann Arbor.

- Do we need 2 platforms?
  Yes, 2 platforms are required, one for train travel in each direction—per Federal Railroad Administration (FRA) requirements.

- Do the sites shown in the presentation just represent 1,000 feet of straight track? Previous studies looked only for station sites on public land. Adjacent to the track they only considered sites that contained about 3 acres.
  Thus far the team has identified only track segments that contain 1,000 feet of straight track.

- How many parking spaces will you need? Amtrak also owns the lot on Depot Street and you can tell which ones are used by Amtrak riders because those cars have Amtrak placards in them.
  The existing Amtrak station contains about 70 long-term parking spaces on the north side of the railroad tracks. The number of parking spaces at a new station would reflect ridership demand and adopted parking management methods.

- In the Amtrak long-term parking lots, can we distinguish Amtrak cars from Kellogg Eye Center cars?
  The Amtrak ticket agents have distinguished some Eye Center visitors park in the existing lot.

- I take Amtrak regularly and come back at 11:30 pm and the lot is full. At that hour, those must be Amtrak vehicles.

- I hate to use that lot because you have to navigate two long stairways at either end of the bridge.

- If bus service to the existing Amtrak station were more frequent, perhaps fewer people with feel compelled to drive to the station.
  As we are going through the site selection, the team will consider all modes of access to the station, including transit buses and parking.

- If there are 10 round-trip trains, would the station need less waiting space?
  The rider peaking patterns would change with more trains. The frequency and associated projected ridership will be considered in estimating the station's needs.

- You say there's going to be double track at the Ann Arbor Station? How much of that is planned?
  Michigan DOT intends to construct double track where possible and also increase the length of sidings to allow trains to pass where there is only a single main line. There would be a need for two tracks and two platforms at stations.

- I need to ask about the 1,000 feet of straight track. If this station is meant to serve Ann Arbor, why consider sites that are not close to downtown?
  The team wanted to identify all segments of 1,000-foot straight track in the City as a starting point. This allows all of the options to be explored. The budget and scope was to evaluate up to 10 optional station sites within the City of Ann Arbor. We found 8 track segments that met the initial criteria.

- The main issue for me is station location. The old and present depots are not at their respective locations by accident. This area is where the town started. The present depot is about 2 blocks from downtown. If location and access to the city and downtown mean anything, the existing station site is the best location. But the existing station building is too small, and parking access is a major problem. The solution to all of our problems is to buy back the historic station building, now the Gandy Dancer restaurant. It isn't in the floodplain, it has parking along Depot Street, and it's a building of the size and quality that is needed.

Purpose and Need

- Why is congestion along Depot Street part of the Purpose and Need? You could also say there's congestion around other sites as well, for example near the hospital emergency room.
  Amtrak staff has expressed concern about congestion on Depot Street near the existing station. The Environmental Review will consider traffic impacts at each optional station site. This will include an analysis of the existing station site with a new station located there and with no new station constructed within Ann Arbor.

- The types of buses and other vehicles that would connect to the station. I don't see them as a negative, but just part of the station.

- The main station need is the transportation need. If the station functions well for transportation I'll be happy.

- The destination is the city or other place you are travel to by train. The station is just the means. Do we really need showers for bikers? How many bus services do we need?

- There was talk of using the DTE lot adjacent to the existing Amtrak long-term parking lot for commuter rail parking. When will the commuter rail demonstration project start operating? I'd rather see that used for parking than properties at other station sites.
  It is currently unknown when the commuter rail demonstration project will start operating. This project is being led by SEMCOG and supported by Michigan DOT.

- I have heard such mixed messages about how to get to parking. There's a lot of space at the existing station, but crossing the bridge with its stairways is a real problem. Would a new station have a pedestrian bridge with elevators for crossing the tracks? What other amenities might the station have?
  Yes, a new station would include a pedestrian passage over or under the tracks. Crossing the tracks at track level in most places is not allowed by the railroad; it is considered trespassing. Regarding other amenities: many station communities want amenities to offset station costs. Station tenants of all kinds—train and bus operators, restaurants, etc.—pay to use the station and thus offset the station owner's costs. Amenities attract more station users, which also increases the safety of a facility.

- At the meeting this morning someone from the community suggested adding education features. She talked about historic resources and possibly cultural spaces at the station. That reminded me that designers are trying to make the new University parking structure on Wall Street more historical by adding plaques about Lower Town. Doing that sort of thing at the station might cost more civic dollars but could benefit the community.

- You've established the fact that having many travel modes converge at the station is important to City, but what makes you say that?
  The Purpose and Need reflects collaboration between the City, MDOT, FRA and others. In 2009, the City updated its Transportation Master Plan and reviewed data. The plan reflects projections that the community will continue to grow. One of the Master Plan's recommendations was to initiate a study of the Amtrak station. The need for improved transportation, and seamless travel between transportation modes, reflects a regional perspective.

- I'm trying to put together Americans with Disabilities Act (ADA) requirements and quality and comfort for all passengers. I thought I heard about the possibility of two platforms, one for train travel in each direction. An accessible passage across the tracks is a need now for passengers.

- Ann Arbor is a destination. How this is reflected in station siting and design will affect ridership.

- In terms of establishing the Purpose and Need, I think we need more delineation between intercity rail and commuter rail needs. In terms of commuter rail it's not a definite need. We heard in 2009 that commuter rail was right around the corner. We need to be clear about what we are defining and plan for the future.

Design Criteria

- I wanted to suggest that we always talk about this as an intermodal station. It would help us define what it is. It would help us keep open the possibilities. If you call it a train station people think only of railroad service.

- MDOT spoke about having a ticket office for the train or bus, but our bus station was just built and they searched for a way to do that. I think we aren't talking about a real bus station.
  Amtrak operates a bus themselves that runs between Lansing and its station in Toledo, stopping at Ann Arbor. There are a variety of private transportation providers serving the city. We need to identify each of them in order to engage them. Greyhound, Megabus, Indianflyer, AirRide and others can then enter the conversation. Each train could carry between 400-600 people. That would be a fleet of buses to disperse people to their jobs. You need robust intermodal capacity connecting trains to workplaces and other trip attractors.

- Greyhound is losing their space. The need a new home--possibly at the Blake Transit Center, but maybe at a new Amtrak station? This is the time to consider that.

- I have a concern on the FAQ sheet as it refers to high speed rail. We need to clarify the difference between high speed rail in Europe and Asia, and higher speed rail in this country that shares tracks with freight trains.
  The federal government recently began using the term "higher speed rail" for corridor with top speeds of up to 110 mph. The State is adopting that terminology, and is not looking at train service faster than 110 mph.

- One thing we haven't talked about is the average speed.
  The team can include average train travel speeds in future information.

- We have a lot of people who walk across the tracks at Gallup Park. Every morning and afternoon you see people crossing those tracks. A lot of parents are worried about faster train speeds. I heard from MDOT that the speeds will be slow as they are approaching the community. We need clarification for people who cross the tracks there today.

- Are the items listed as "optional" features truly "optional."
  Yes

Site Selection

- One of the problems with the existing Amtrak station is limited bus connections and bus service hours. We need connectivity with other modes. The Fuller Road (West) site is well served by buses today.

- It would be good to create a list of travel modes that could potentially connect at the station. I'm not sure if it's necessary for these to be co-located. It would be helpful to understand a range or ranking of needs.
  The project team started work in January. As we move forward, more detailed information will be presented and we will have dialogue about it.

- There's been little discussion related to future commuter rail. If the station were located near the hospital—a major generator of work trips--then the station would be used for work trips. Consideration of where people want to go should influence the station site selection. The present station isn't the most convenient location for hospital trips.

- Another thing to keep in mind is that the river corridor is an important place to enjoy natural features. One of the values here is to minimize impacts on that portion of the river. Almost all of the station sites under consideration are abutting parks and prime recreation areas. We're going to have to deal with that.

- Does the current station meet the requirements of a station?
  As we develop ridership we can then do a comparison of the existing station and future needs.

- How many acres will you need?
  The current site is about 3 acres. We aren't looking to take a suburban approach that is land-consumptive. Considering vertical design options will be important. The number of acres will be dictated by the ridership, design considerations, and transportation management.

- Are you going to conduct your own ridership survey?
  The State is updating the future ridership estimates. About 150,000 Amtrak passengers used Ann Arbor Station last year. Past projections for the corridor suggest that Ann Arbor riders could triple.

- The improved and more frequent train service will shift some travel from airlines.

- Thank you for making this as open a process with the public as possible.

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Ann Arbor Station Environmental Review
Leadership Advisory Group
Meeting Notes—Meeting #2

Date: Wednesday, June 18, 2014
Location: Ann Arbor City Hall, Council Chamber

Leadership Advisory Group Members in Attendance:

Jim Kosteva, University of Michigan
Michael Benham, AAATA
Nancy Shore, GetDowntown
Trevor Bryson, SEMCOG
Nathan Voght, Washtenaw County
Eric Tuomey, McKinley Properties
Bill Milliken, Milliken Realty Company
Andrew Selinger, Oxford Company
Laura Rubin, Huron River Watershed Council
Paul Krutko, Ann Arbor SPARK
Maura Thompson, Main Street Area Association
Jane Lumm, Ann Arbor City Council
Christopher Taylor, Ann Arbor City Council
Margie Teall, Ann Arbor City Council
Chuck Warpehoski, Ann Arbor City Council
Roy Townsend, Washtenaw County Road Commission
Anne Brown, Office of Representative David Rutledge
Nancy Shiffler, Sierra Club
Representative Gretchen Driskell
Andy Hodges, MDOT
Therese Cody, MDOT
John Bender, Amtrak
Annika Doner, Office of Senator Rebekah Warren

RSVP, but did not attend:

Jesse Gordon, Malletts Creek Watershed Group
Jennifer Hall, Ann Arbor Housing Commission

Members of the Public in Attendance:

James d'Amour
Laurence J. Krieg, PhD
Larry Deck
Rita Mitchell

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The second meeting of the Leadership Advisory Group included a presentation on the overall scope of the Ann Arbor Station Environmental Review and the Alternatives Analysis process. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: www.a2gov.org/annarborstation.

General Comments

- Has there been any consideration for adding office space at the station? At the Dearborn station do they have office space use?
  The Dearborn station is partnering with The Henry Ford to provide exhibit space. As far as office space, they don't have that now. There is the potential to add office space to the Ann Arbor Station.

- You're saying that the existing Ann Arbor Station building is inadequate, but does that assume that the size is inadequate.
  The building itself is inadequate now in terms of size and facilities available. The site as it is configured today is inadequate for parking, pedestrian access, and multi-modal connections (train-to-bus connections, etc.). The integration of the existing site with the local area is poor as well. This is measured in terms of barrier-free walking and biking routes and roadway connections. The site may be sufficient if additional land is acquired and connections to and through the site are improved.

Evaluation Process/Segments

- I'm struggling with the "public transit connection potential" category. If you locate at any of these stations they would adjust the route to go to that station, right?
  Public transit access potential is measured in terms of how many existing or planned transit routes and facilities travel near the track segments. Existing land uses and zoning were also considered, since a dense concentration of jobs or residences are more supportive of sustainable transit than sparse development. Extending or diverting bus routes to reach a new area adds operating cost to each of those routes. A station in the right place will naturally draw transit trips without burdening transit operator budgets.

- What's the definition for "suitable land for station facilities?" Was the square footage considered?
  Ridership dictates the size requirements of both the station building and site. The Project Team's current ballpark square footage estimate for a station building accommodating only essential railroad functions is 10-11K square feet for intercity rail, or around 12K square feet if commuter rail is added. The Team's initial estimate was that sites with less than about three developable acres would not have enough land to meet the station program. That land estimate will likely increase.

- If you are including parking in your look at suitable land, there are a lot of cities, like Denver, where little parking is provided near the main railroad stations. How much are you considering parking in your suitable sites?
  Looking at the ridership projections, the parking requirement that Amtrak shared with us is more than 2,000 spaces. Now, that's not what would be built immediately, if ever. If the project advances there would be phased construction. We would want the flexibility to expand if needed.

- To me there is a big difference between convenient access to downtown and major activity centers.
  The graphic shared at the June project meetings shows the proximity of alternative track segments to both Downtown and other activity areas, and distinguishes between these. Ideally, the station would offer convenient access to Downtown and other areas as well. Ideally, the station would be located within a half-mile or so of activity centers (including Downtown) to promote walking trips and convenient access for all travel modes. The Phase II analysis will consider how many jobs and residences are in proximity of each alternative station site. Connections to Downtown will be considered in detail.

- Is the assumption that the industrial locations can't be changed at segment #3?
  That could change, but it would require land purchases and displacing many businesses. Yes, the land use could change though.

- When looking at segments #3 and #4, I am reminded of the idea of the connection between a North-South and East-West rail line. I know it's on a curve, but was that factor considered?
  Yes, and that was brought up during the initial public meetings. The issue with that is that in order for this to function for Amtrak, the east-west line needs to have 1,000 feet of straight track where a station would be located. As noted, where the tracks cross both lines pass through sharp curves. The crossing point is relatively near both Segments 3 (North Main Street) and 4 (Depot Street/Existing Amtrak). Should AAATA determine that it can locate a WALLY station along the curve, it may be possible to facilitate a walking transfer between WALLY and an east-west line station at either Segment 3 or Segment 4.

- You say that Segment 4 (Depot Street/Existing Amtrak) has suitable land for the station, but it's in a flood plain, etc. When looking at other sites you mentioned that businesses would have to be displaced. In order to move into the land at #4 would have to move into DTE land?
  Site #4 is vacant right now; at other locations there are currently businesses occupying the space.

- Can some of the limitations of sites be addressed in site design for Segment 4 (Depot Street/Existing Amtrak)? Can you move some of the ratings from 1s up to 2s?
  The rating system used for the Phase I Alternatives Analysis was a rough measurement used to screen out sites that are disadvantageous for a new station. Those ratings represented the best professional judgment of the Project Team for the three segments recommended for Phase II analysis.

- One thing not in the criteria is transit-oriented development. It seems that Segment 4 has that as a plus.
  Yes, Segment 4 offers many opportunities for infill development in the immediate and surrounding area. Transit-oriented development potential at the remaining alternative station sites will be considered in Phase II.

- Does the Project Team assume a vertical parking structure at the selected station location?
  Yes, a vertical structure approach will be used for both parking and the station building.

- If you are including transit-oriented development in your consideration, Segment 5 (Fuller Road—West) is surrounded by parkland. You don't have any nearby area for that kind of expansion. I'm also not sure it's that convenient to downtown.
  The Segment 5 area already includes concentrated development and has further development potential in surrounding non-park areas. The Project Team feels that there are enough positives to include Segment 5 in the Phase II analysis.

- The Phase I analysis doesn't adequately consider that Segment 5 (Fuller Road—West) is adjacent to parkland on its north side.
  The June presentations and meeting handouts depict park areas in green. The Project Team is aware of Segment 5's proximity to parkland and will consider that in the Phase II analysis.

- Are there discussions at the University for connecting the medical and central campus?
  The Connector study is evaluating a fixed-guideway/semi-exclusive right-of-way transit connection between the UM Central and Medical campuses. During Phase II, the Project Team will consider existing and potential future transit connections and the implications these have for the passenger rail station location.

- Most people would avoid the Medical Campus unless they need to go there. So to give
  Segment 5 a score of 2 (best possible) for access to Downtown and activity centers seems high.

- The University of Michigan's estimation is that 35,000 people travel in and out of the Medical Campus every day.

- I think there's the potential that if someone works in Detroit, they could live in Ann Arbor and have convenient access to transit.

- What makes Segment 5 (Fuller Road—West) positive for the "accessed by existing roadways" rating?
  The roadways near Segment 5 facilitate higher traffic volumes than roads at some of the other locations. They also have the capacity to expand.

- Right now the differentiation between Segments 4 and 5 is exiting roadways and transit connections. Is it fair to say that traffic generated by a station would be more easily accommodated Segment 5 than Segment 4??

A concern with the existing Amtrak site (Segment 4) is the ability of these roads to absorb station traffic. Site access challenges and traffic impacts for each of the remaining sites will be evaluated in detail during Phase II of the analysis.

- If you look at the traffic patterns, whatever happens on Fuller Road will cause traffic jams on Depot Street. Either place you put it there will be traffic impacts.
  Yes, for the remaining locations there needs to be careful consideration of traffic impacts.

- I think it's critical that you look at the traffic levels today and the impacts of additional traffic at Segment 5 (Fuller Road—West).
  The Project Team will sit down with City traffic staff, document traffic conditions today and project future traffic growth.

- I think you could potentially give more points to Segment 3 (North Main Street). That area holds redevelopment potential and transit connectivity could work there. I wound up with a score or 4, 5, or 6 for Segment 3. Maybe you shouldn't dismiss that one yet.

- Access to existing roadways has the best potential at Segment 3. Our biggest traffic problem is on US-23. We have data at SPARK that shows that over 60,000 people come to Ann Arbor from outside the county.

- I think you might be missing a scoring item related to solving some of the City's traffic problems. If you could show us what traffic problems might be solved by each location it might help evaluate the sites. I think the numbers for Segment 3 are low.
  One of the concerns with Segment 3 is that it is a further from Downtown and activity areas that Segments 4 and 5. Also, it lacks some pedestrian and bicycle advantages that Segments 4 and 5 offer.

  - Consider Segment 3 for transit oriented development and as a gateway to the City.

  - Consider how a station at Segment 5 (Depot Street/Existing Amtrak) can support redevelopment along North Main Street.

Ridership/Parking

- What are the "ons" and "offs" at the existing station?
  Rail ridership often considers only individuals boarding trains. Station volume, or station activity, considers boardings and alightings: people getting on and off trains at a station. There were about 150,000 ons and offs at Ann Arbor Station last year. Ann Arbor is the busiest Amtrak station in Michigan.

- Do we have data on the intermittent traveler?
  MDOT can request that data from Amtrak. The City wants the station to be walkable and the State and FRA support this. FRA also recognizes that intercity travelers often want long-term

automobile parking at stations. We have to find the right balance of station parking so that travellers don't avoid use of the station.

- You can't necessarily say that a station at one location would have the same number of ons and offs as another location. If we want an environmentally sound approach we should maximize the use of the station for a positive impact.

- We should have a transportation management plan for the station that includes information about where people will be coming from, how that station will be marketed, what displays will be there, etc.

- One thing I don't see on the maps are underground facilities (gas pipelines) at these locations. The Phase I graphics showed City water, sewer, and some other utilities. During Phase II, segment-area utilities will be documented in further detail.

Other Comments

- Will there be any additional meetings?
  Yes, there will be a site tour, two more Citizen Advisory Group meetings, another of these Leadership Advisory Group meetings and a public meeting.

- Will we have access to the Alternative Analysis document?
  The Alternatives Analysis memo will be included in the final project report.

- Could you provide us with case studies of peer stations?
  Yes, we can do that.

- Why is 1,000 feet of track required?
  That is an Amtrak regulation to avoid gaps between the trains and station platforms. It meets ADA guidelines for train access.

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Ann Arbor Station Environmental Review
Leadership Advisory Group
Meeting Notes—Meeting #4

Date: Wednesday, September 21, 2016
Location: Ann Arbor City Hall, Council Chambers

Leadership Advisory Group Members in Attendance:

Sue Gott, University of Michigan
Jim Kosteva, University of Michigan
Michael Benham, AAATA
Trevor Bryson, SEMCOG
Jane Lumm, Ann Arbor City Council
Nancy Shiffler, Sierra Club
Nathan Voght, Washtenaw County
Therese Cody, MDOT
John Bender, Amtrak

Members of the Public in Attendance:

Chris Babuska
Clark Charnetski
Chris Crockett
Ruth Dixon
Rita Mitchell
Gwen Nystuen
Ethel Potts
Ed Vielmetti

The fourth meeting of the Leadership Advisory Group included a presentation on the overall scope of the Ann Arbor Station Environmental Review and the Alternatives Analysis process. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: http://www.a2gov.org/departments/systems-planning/planning-areas/transportation/Pages/Ann-Arbor-Station.aspx.

Alternative 2B

- How do passengers get to the other side of the tracks with this option?
  An overhead walkway is proposed with an elevator option for people to use.

- It isn't clear here how buses that need to turn left will turn.
  At Alternative 3A, the existing Fuller Road turnaround will be relocated. There will be a bus-only lane and passenger vehicles only entrances.

Alternative 3A

- How many cars will there be in the garage/parking structure?
  There will 870 spots for intercity, 200 for commuter, 50 for short-term parking. That need is for the full build-out in 20 years with 10 round trips per day. It will be an incremental build out and will continue to include spaces available to park users.

The Environmental Assessment

- When is the preferred alternative going to be released?
  The preferred alternative will be identified in the Environmental Assessment.

- Why does the NEPA process affect the old station (Gandy Dancer) option?
  The FRA is asking us to look at the historic station. The remaining four options are recommended as reasonable alternatives and will be evaluated in the Environmental Assessment.

- How many months with the Environmental Assessment take?
  As soon as the public engagement is complete and we get all the public feedback, we will begin preparing the Environmental Assessment. The timeline for the Environmental Assessment is relatively short. Federal funds must be utilized by May, 2017. So here we are in September, we expect comments by October and so we will be back fairly quickly, hopefully in October or November. The Environmental Assessment will then be made available for public review.

Traffic-Related Topics

- Could you describe more about traffic related to the parking and also about road capacity. Also, when you look at the multimodal nature of our community how are you evaluating transit, pedestrians, non-motorized, etc. How will that be incorporated into the Environmental Assessment?
  In many ways the parking operates like an airport parking structure. The parking demand spread out over the day. We are preparing a traffic impact study to document what's happening today. We are also looking at traffic patterns over the next 20 years as well. We are also looking at the multimodal impact at least a mile around the station. Working with the City we are evaluating key intersections that would be affected by the improvements..

  We recognize that a lot of trips are pedestrian, transit and bicycle and those were considered as well. We began by reviewing at proposed ridership and typical Amtrak guidance for parking needs, and adjusted/reduced parking based on those types of users that are more common in Ann Arbor. The parking ramp can be phased, so it can be adjusted to the numbers of passengers using other transportation modes to access the station.

- I'm wondering about Uber and taxis. Are buses on Depot Street? Why can't they be on Broadway? For buses on Broadway, why not add a loop under the bridge and avoid left turns.

  AAATA buses operate on both Depot and Broadway. Adding a loop under the bridge would require park land.

  - How tall are the anticipated parking structures?
    There would be about 250 vehicles per level in the structure at full build out, so approximately 4 – 5 levels at full build-out. If the Fuller site would be selected, the ground level would be for transit interface, so there would be an additional parking level needed. The parking levels can be added as the need arises.

  - In an effort to minimize the use of automobiles we are creating a lot of infrastructure for automobiles. What will the destinations be for people who use these cars? Where are cars coming from that will use the station? Currently there is ever increasing traffic on US Hwy. 23.
    The station has the highest ridership in the State of Michigan. There are people coming from the surrounding region and using the site as documented in the Corridor wide Tier I EISI. The Environmental Assessment will include an impact assessment of local traffic. As an Amtrak intercity rail project, the people coming to the station from the surrounding region will access the station via the road network as there are few transit options for accessing the rail service. For the purposes of intercity rail, the travel patterns and the ridership projections bring us to the parking levels we have presented. One of the first things we looked at with the FRA was the parking, and since the start of the project we have reduced it by 50%.

  - We are all excited by rail opportunities and I want to thank you for stewarding this exciting project. On the Fuller site, we have been looking at a high-capacity corridor and I assume that as part of that that there would be increased trip generation. Are you being trip sensitive when looking at parking when it comes to walkability, connections to light rail, etc. Will the EA be more qualitative rather than quantitative?
    The parking number hasn't changed based on the location. As The Connector project comes online we will be able to look at that more carefully and we can take a better look at that connectivity. We will have considered the multi-modal aspects for parking needs. Some factors in discussed in the EA will be qualitative.

  - I want to know about the transportation studies that are being used to make your estimates. I'd like to know if those studies are available. Is the material about these studies and what you have done for this process available? What data are you using now and can it be made available?
    The team will prepare a traffic impact study for each alternative. We will share that as part of the Environmental Assessment. Data or studies prepared will be made available as part of the Environmental Assessment.

  - Who will be doing the traffic impact study for the City of Ann Arbor?
    The City of Ann Arbor's contract with AECOM includes the traffic study.

- Will we be looking at Fuller Road, Geddes Road and the impacts to the west?
  Yes, those roads will be included. The study includes Main Street, Plymouth and Barton, Fuller and Glenn, about approximately a mile around the station alternatives.

- Are the traffic studies being done at comparable times during the day?
  Yes, the counts were done during peak hours in the morning and the afternoon at each of the intersections.

- What time of year was the traffic counted? Shouldn't you do it during the school year?
  The traffic data was collected in the summer and compared to traffic collected during the school year and calibrated.

- I haven't heard you talk about traffic impacts from the South and how it might impact the area to the south. I know you looked at the Gandy Dancer area, but did you look at the area south of that in the old fourth ward?
  A deeper look will be done during the Environmental Assessment. The study does cover the intersections to Barton in the historic districts to the south.

Site-Related Topics

- Since this is a very futuristic issue, it's an impact that will last half a century. The gridlock downtown is unbelievable. What kind of square footage do you have in the alternatives for things we don't anticipate? Where is the biggest site that gives us the most flexibility?
  Based on Amtrak guidelines and anticipated ridership we estimate the station building will be approximately 8,500 square feet to accommodate the required inner city passenger rail program. Each site is limited in available size and in some cases we have to acquire land to fulfill the program needs.

- Can you speak to the difference to the criteria you used to narrow down to the four alternatives as opposed to the Environmental Assessment? Is it normal to have four alternatives?
  For the Environmental Assessment the criteria will be those outlined in the NEPA process. For the Alternative Analysis Phase II Report process we used was Location Within the Community, Accessibility and Site Assessment. We originally anticipated having only one alternative evaluated in the Environmental Assessment. The decision to include four was based on guidance received from the Federal Railroad Administration (FRA).

- Several times you mentioned property acquisition. The present station is not owned by the City. Have you discussed it with Amtrak about acquiring property? If the station was moved, the current property could be reused. It would also allow the DTE site to be enlarged.
  We have not formally discussed with Amtrak about acquiring their property but they are aware of our efforts and will coordinate once a decision on a preferred alternative is made.

Amtrak Comments:
We have not had detailed discussions about property acquisitions. We have not discussed what acquisitions would look like whether it would be a dollar amount or a partnership. We have not had that conversation yet. We will need to if we move down that road.

- Most everyone in the room is most likely pleased that rail has been reinvigorated. Stations have a lot of opportunity for economic development. Have you been looking at that?
  Yes, this was evaluated as part of the Alternatives Analysis Phase II Report.

- One of the issues around the Fuller Road site is looking at the impact on parks around Fuller. One of the things you brought up in the analysis is that the parking area on one side of Fuller is used by the park users and the University of Michigan. What would be the mitigation if that parking is removed?
  The intention is that if the Fuller Road site is chosen, park users would continue to have access to parking. The proposed parking would not accommodate University of Michigan users.

- The preferred alternative will be selected and that one site will be considered for the Preliminary Engineering, correct?
  Yes

- I am a little puzzled about the ranking for floodplains, and known hazardous materials, etc. in the Phase II Alternatives Analysis. In general, the ranking and rating process. In some cases like transit, at Depot Street there are 3,000 riders, at Fuller road, 38,000 riders, but they are both ranked the same. The options at each site were compared to one another, not all options for all sites.
  The FRA directed us to look at each site on its own and alternatives for each site in relation to each other only at that site. Therefore, when we looked at each site, Depot or Fuller Road options, we ranked the alternatives based on that site location only.

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Ann Arbor Station Environmental Review
Leadership Advisory Group
Meeting Notes—Meeting #1

Date: Tuesday, March 25, 2014
Location: Ann Arbor City Hall, Council Chamber

Leadership Advisory Group Members in Attendance:

Michael Benham, AAATA
Nancy Shore, GetDowntown
Ryan Buck, WATS
Trevor Bryson, SEMCOG
Sue Gott, University of Michigan
Nathan Voght, Washtenaw County
Peter Allen, Peter Allen Assoc.
Albert Berriz, McKinley Properties
Andrew Selinger, Oxford Company
Frances Todoro-Hargreaves, State Street Area Association
Joan Doughty, Community Action Network
Sabra Briere, Ann Arbor City Council
Jane Lumm, Ann Arbor City Council
Chuck Warpehoski, Ann Arbor City Council
Alma Wheeler Smith, Regional Transit Authority
Anne Brown, Office of Representative David Rutledge
Nancy Shiffler, Sierra Club
Evan Pratt, Washtenaw County Water Resources Commission

RSVP, but did not attend:

Michael Ford, AAATA
Stephen Dolen, University of Michigan
Paul Ganz, DTE
Jean Henry, Zingerman's
Maura Thompson, Main Street Area Association
Liz Gerber, Regional Transit Authority
Travis Gonyo, Office of Representative John Dingell
Dennis Rice, Washtenaw County Conservation District
Jennifer Hall, Ann Arbor Housing Commission
Roy Townsend, Washtenaw County Road Commission

Members of the Public in Attendance:

George Gaston
Don Salberg
James d'Amour
Clark Charnetski
Rita Mitchell
Laurence J. Krieg, PhD
Larry Deck

The first meeting of the Leadership Advisory Group included a presentation on the overall scope of the Ann Arbor Station Environmental Review, the Purpose and Need, Design Criteria and Site Selection. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: www.a2gov.org/annarborstation.

General Comments

- For the station, is there a consideration for key places people need to go in the City?
  Yes, convenient access to major activity centers is one of the considerations.

- How do you factor in The Connector, commuter rail, and other planning efforts?
  Those are separate studies and efforts that we need to be aware of and coordinate with. As part of the federal regulations we need to provide information on other studies underway and coordinate efforts.

- Right now we only have 3 trips, but this will more than double to 10, is that right?
  Yes, the State of Michigan anticipates 10 roundtrips a day by 2035. Service is expected to increase incrementally between now and then.

- Will the tracks from Kalamazoo to Dearborn being expanded from single track to double track?
  The State of Michigan is restoring double track from Dearborn westbound. Where the State cannot expand track they will add sidings. The right-of-way and track beds are in place, and are a relatively simple process to lay rails and upgrade signals and crossings.

- So far I am hearing a lot of functional criteria, but have you considered the station as a destination for children's groups, possibly including gallery or educational spaces? This could be an educational center as well as a meeting space. You're on the river so you have the option to make it a destination. It could be a place for receptions and meetings.

Multi-function and cultural spaces are something that the team will explore. The Design Criteria considers both required station spaces and other amenities that are important to the community. The City of Dearborn included amenity spaces in their new station design. The station will also be a gateway to the Henry Ford, with direct Greenfield Village access. It will be a destination for school groups and serve a school at the Henry Ford.

- Is there any possibility of train service to Toronto and other points east?
  In the past we had Port Huron to Toronto. MDOT is exploring passenger rail through a rail tunnel between Detroit and Windsor or Walker to connect to Canada. Toronto could be reached via this connection. An existing rail tunnel in Detroit makes that crossing today.

- When you say it has the highest ridership in the state do you know if those are people from the University, or where they are coming from?
  The State of Michigan provides station ridership information on its website at http://mdotcf.state.mi.us/public/railstats/. MDOT also performed a 2011 ridership survey the offers demographic and travel information for rail passengers on Michigan Amtrak corridors. This information is available in a report titled "Analysis of the 2011 Michigan DOT Intercity Rail and Bus Passenger Surveys." The report is available at http://www.michigan.gov/documents/mdot/MDOT_2011_Analysis_Intercity_Rail_Bus_Surveys_407633_7.pdf. The trail rider description is presented in Chapter 3.

- You mentioned that you get the ridership data from SEMCOG. There's a give and take with location and ridership. If it connects with downtown it can affect commuter rail.
  Part of the site selection criteria is proximity to downtown and destinations that folks will want to travel. That criteria and the effect on ridership will influence the site selection process.

- If you're talking about 10 intercity round trips a day, that's 20 trains per day. If you add commuter rail to that, how many train trips is that?
  A planned peak for commuter rail could be 15 round trips per day. SEMCOG plans to operate a demonstration commuter rail service, and we anticipate incremental increases in travel at our station.

Purpose and Need

- I think it might be helpful to clarify existing deficiencies. When you were describing needs you were describing what will be addressed. But if one doesn't understand the deficiencies it isn't clear. So a separate list of those would be helpful.
  Yes, for example when we spoke to the Amtrak staff they identified parking capacity and access as an issue. We can share identified deficiencies.

- You've got more needs listed and we need to respond to all the needs. Maybe another point would be to prioritize those needs. If we're talking about accommodating intermodal passengers it isn't clear what that means.

- Have we seen any projections for ridership? You interviewed people at that station, what is the capacity and how many people are waiting.
  The Midwest Regional Rail Initiative developed the future ridership but the state is updating those. SEMCOG developed the commuter rail future ridership. During interviews with the Amtrak ticket agents at the station they mentioned as many as 100 passengers waiting for trains.

- When you provide those ridership numbers it would be helpful to provide how you derived those numbers. Also, the station amenities depend upon the ridership.
  Yes, we will have that information for you and there are Amtrak guidelines on those elements as well. We will also be looking at similar communities and how they planned.

- It seems like we are being asked to comment on the Purpose and Need without all the details.
  Staff is here to take a deeper dive and provide additional information for you. We're looking for information from you and will be actively listening. We will also be posting the draft Purpose and Need on the website. Please feel free to give us your input directly as well.

- One of the things that has been referred to in intercity bus. Greyhound has to move soon and I know they have contacted AAATA. A Greyhound depot at the train/intermodal station should be looked at seriously. In other cities long distance buses connect to trains at the station.

- How long is the entire project? Whether we build a new station or not, there will still be more trains. How long before we start seeing an increase in people coming through the station?
  The ridership has been steadily increasing, so it will continue to grow. A build-out to 10 round trip trains is anticipated by 2035, and many service improvements in the Chicago-Detroit-Pontiac corridor are included in a 20-year MDOT plan. We don't really know if the Ann Arbor to Detroit route is where we will see the biggest increase, but that's what the trends are showing us. Amtrak is adding Wi-Fi for businesspeople. Time will tell, and MDOT thinks it can predict corridor travel, but we don't know until we live it. When you have more trips you may not have 300 people at the 8 am train because there is a 9 am train. The ridership may even out. East Lansing only has one train in each direction to Chicago, and those trains are packed. That's where Amtrak comes in and provides some guidance. Trends show increasing rail use. We're hoping that federal support continues for corridor improvements. We're not here to give you instructions on where to put a station or what it should look like. We're here to support the NEPA process. We want every community to develop individual looks and functions for their stations. We find more success when the community helps design the station and it reflects the community.

- In the communities that have built stations, what percentage of the cost comes from the community?
  It's usually an 80/20 federal/local split for station capital investments.

- What about operations?
  Typically Amtrak pays their share of use. All station users, such as bus operators or restaurants, pay an operating fee. These fees offset the station owner's operating costs.

- For the Dearborn station, were both construction and operating costs federally funded?
  Construction costs were federally funded. Operating costs are not federally funded. Amtrak, as the tenant of the station, provides the operating funds.

- It's difficult but it would be nice to make the station more inviting to the City. I feel like that's a need. We'd like to welcome people to the community.

Design Criteria

- The existing station program and its parking are at grade. For a project at this size, does it become economical to build vertically?
  At any of these sites there will be limitations, and vertical structuring is an approach that will be considered to accommodate.

- One of the interesting points of discussion is an assumption that Ann Arbor will be point of origin for commuter trips. We need to consider how many people will be commuting to Ann Arbor as well.
  Ann Arbor is a destination station which means 50% of the people may be commuting to Ann Arbor and 50% will commute to other destinations.

- AirRide airport bus service has been very successful; a connection to the station should be considered. I'm thinking about tradeoffs and if we want to add the maximum number of parking spots. I wonder if we can think about where the station can connect so people think it's easy to connect.
  A need that has identified is a station that is intermodal and can accommodate a service like the AirRide.

- One of the questions I'd like to have open is this opportunity for other uses for the site. When we built the Blake Transit Center we built it for other potential future use. I'd like us to think about the station as an opportunity for an urban site. You list stormwater requirements; there might be opportunities to work with the stormwater infrastructure above and beyond the station's needs. Can we look at this as a staged project? We know what our current ridership is; can we build for the next steps and be future ready?
  A need that has been identified is to accommodate current and future rail passengers. The planning effort will also consider the ability and flexibility to expand if necessary in the future to accommodate future demand.

- How many people look at the station as a destination? A lot of people are just there to get off the train.

- In some of those other stations has mixed-use helped pay for the station?
  Yes: examples are the two commuter rail stations in Tinley Park, IL. In one station vending was added, then subsequently catering. Community movie nights were programmed at the station, and a beer garden was added. When a second new station was built in the town, it included a full-service restaurant that is very popular.

Site Selection

- At this point, is it safe to ignore all identified station sites except those along track segments 4 and 5 (Depot Street/Existing Amtrak, and Fuller Road--West)? To me one of the criteria that should apply is proximity to downtown.
  The team will consider the sites where there are 1000-foot straight track segment in the City. These segments will be further reviewed to their proximity to where travelers want to go.

- The community's goals for riverfront planning include open space. Segment 4 (Depot Street/Existing Station) differs from the others in that it is a little further from the river.

- For me one of the important criteria is access to other transportation networks. It's difficult if we can't provide transit connections. When I look at segment #3 (N. Main Street), I see turning motions on a busy roadway. We need to look at how it works with other parts of the system.
  The new Dearborn Station provides an example of a busy roadway (Michigan Ave) where a signalized intersection was added for station access.

- Wherever the station is built is an opportunity to improve the environment. Options we provide for sustainable transportation, including non-motorized modes, the better. We need to give people options to connect.

- I think the sequencing of how people get to and from the station is important. North Main Street conditions need to be fixed whether there is a station there or not. Add addresses to the map.

- The next most important criteria is the layout of The Connector. Is there anything more important than The Connector that will get people to the station?
  The environmental process requires that we look at other projects. Opportunities to link with The Connector will be considered during the alternatives analysis.

Other Comments

- This is an environmental review; how far will this effort develop station design?
  The Environmental Review scope includes conceptual design only. Using aerial photos, the team will explore fitting the station building, transit, parking, and other site requirements along the different straight track segments.

- How will leaders who didn't attend get information?
  We will provide information to those who attended and those who did not attend. Leaders may not have as much time to commit so we abbreviated the number of meetings for them. However, they will be invited to public informational meetings as well. All those that attended and were invited will receive summary and follow-up information.

- What is the role of the University?
  The University is a stakeholder and an important transportation provider in our community. The Environmental Review is a City study. UM is one of many stakeholders.

- One of the things you mentioned was reaching consensus. How will you know when you reach consensus?
  There will be a decision-making process. A majority position will emerge, however minority positions will be recorded. Consensus means we will reach agreement, but realize that not necessarily everyone will agree.

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Ann Arbor Station Environmental Review
Leadership Advisory Group
Meeting Notes—Meeting #3

Date: Wednesday, May 13, 2015
Location: Ann Arbor City Hall, Council Chamber

Leadership Advisory Group Members in Attendance:

Steve Dolen, University of Michigan
Jim Kosteva, University of Michigan
Michael Benham, AAATA
Trevor Bryson, SEMCOG
Paul Ganz, DTE
Andrew Selinger, Oxford Company
Sabra Briere, Ann Arbor City Council
Jane Lumm, Ann Arbor City Council
Chuck Warpehoski, Ann Arbor City Council
Nancy Shiffler, Sierra Club
Martha Valadez, Wake Up Washtenaw
Therese Cody, MDOT
Craig Hupy, City of Ann Arbor

Members of the Public in Attendance:

James d'Amour
Clark Charnetski
Laurence J. Krieg, PhD
Larry Deck
Rita Mitchell
Gwen Nystuen
John Nystuen
Ethel Potts
Alice Ralph
Don Salberg

The third meeting of the Leadership Advisory Group included a presentation on the overall scope of the Ann Arbor Station Environmental Review and the Alternatives Analysis process. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: http://www.a2gov.org/departments/systems-planning/Transportation/Pages/Ann-Arbor-Station.aspx.

Michigan Central Depot

- You mentioned all the difficulties with using the old station. Are you saying it's off the table?
  It's not off the table at this point. It's being reviewed by the City, State and the FRA and in 30-45 days we will present our recommendation.

- When you evaluated the Michigan Central Depot did you engage any historical experts? You also said there wouldn't be any business advantage to using the Depot either and I'd like more detail about that.
  We worked with our project architect who has historic preservation experience, to look at how the station could have worked. More detail will be in the Alternatives Analysis.

  It's important to recognize that the experts we have are doing the detailed work we need. We worked with files that the City had from the past that included locations of kitchens, restrooms, etc. There are other challenges that need to be overcome and to meet the needs of that station. In the future the station needed a larger footprint. We also wanted to sensitively add space without damaging the historic value.

- The layout of the current station is not designed for a modern station. In the past more staff were needed and they had separate offices. I can see problems using it as a station. Kalamazoo is still used but it has a more open design.
  When we looked at the floor plans and looked at where we would put things, locate restrooms, etc. We actually went so far as to design a station that could work and we tried to create a station that was viable. Keeping in mind that there is viability, there isn't necessarily a preference. We are still working through that and will include that going forward.

Cost of the Station

- When can we expect a cost to local taxpayers and will there be design choices along with cost?
  We will include a range of costs for each site, but the details on cost will be provided during the design phase. We will be looking at the footprint, and some design choices. We are in the Environmental Review. We need the environmental clearance and then there will preliminary engineering design and then finally building the station. The costs won't be detailed until we get into the design process. This is the front end that will be followed by more details.

- Aren't you risking the fact that the voters will reject the project based on cost?
  Ann Arbor is a community that makes appropriate investments for the needs. We have to make a compelling argument to the community that we need the right location, and design and financial particulars that are acceptable to the community and meet our needs. That's one reason we took the time to look at parking, size, etc. The ridership and service is incremental and we would want expandability. The process here is to environmentally clear the footprint.

- When will we be presented with the estimated costs for each option? It's hard to peel off aspects of each project without seeing the design. I would encourage us to provide the community with a ballpark idea for cost for each site and the parking estimate costs. Could we have an estimate of other locations with a similar amount of parking?
A range of costs will be presented when we meet in 30-45 days. Forecasting out you can look at structured parking being $30,000-$40,000 per stall. So that's a $30-40 million station including intermodal operations so $30-$50 million in total. We believe that the historic grant ratio of 80-20 (20 local) is what we are looking at. It's premature to estimate how much would be born by the users of the facility. Currently the project is included with the City of Ann Arbor FY2016 - 2021 Capital Improvements Plan with an estimated construction cost of $44,500,000 and programmed for construction in 2018. http://www.a2gov.org/departments/systems-planning/capital-improvements/Documents/FY2016-2021/FY2016-2021_Project%20Revenues%20Summary%20AlphaRev.pdf

- It sounds like the biggest cost will be the parking structure.
Yes, given the costs outlined, the provision of parking and intermodal operations will outweigh the costs for the station building.

General Comments

- For each of the options did you consider the amount of parking needed and will that be released to the public?
Yes, each option is being considered including the number of parking spaces. The Alternatives Analysis document includes effects on traffic and that will be included in that document.

- Did you look at how traffic would be affected by each of the alternatives?
Yes, traffic was looked at and each alternative requires something a bit different as part of the site planning.

- Are you including the fact that the transit operations will be relocated from the Blake?
This study is looking at passenger rail. We haven't looked at relocating the Blake, rather what we are studying is the need of locating local bus operation with rail operation. The details about the number of buses will be determined later. If AAATA wanted to move their operations that would be discussed, but there have been no discussions like that.

- You mentioned that two sites are still under consideration. What is the status of Site #3?
That site is still in the mix, but there wasn't a great deal of work done since we last. It will be part of the Alternatives Analysis document.

- I have a concern about the assumptions about the number of jobs in the area. For the site by the hospital you said 17,000 people. But we know that there are about 20,000 people working at the medical complex. If your no-build alternative doesn't take into account the additional job growth it won't take into account the cost of doing nothing.
The information presented there is from census data, but we also are getting information from the University and others. It's part of the evaluation. As we move into further phases we may enhance that data. Over the course of the last decade there has been a movement to show that

there is more growth. We are required to use the federal processes to show the local area growth.

- What sorts of variables are being factored in as you are considering the other alternatives?
  We are using the environmental criteria as outlined by NEPA. We are looking at inner city passenger rail and including that in our considerations, but we aren't necessarily including commuter rail in our numbers.

- When you talked about parking and the 870, is that exclusively for intercity?
  Yes, that's just for intercity passenger rail. That's 10 roundtrips, today we have three. We wouldn't build the full 870 at once, but if commuter rail comes we would have to work with the City and State to consider that. There are agencies that fund these projects including the FRA, FTA, and FHA. Commuter rail falls under FTA. If we were to seek application to the FRA it would be for inner city rail. Local funding can come from a variety of sources. The level of match might raise your chances of receiving grant funding.

- I don't believe there will be a seven-fold increase in ridership over the time period you are thinking about. What will be the driving force for all these new riders?
  The primary basis is that in the next few decades the airport and highway capacity is going to be consumed and rail will be become more attractive in terms of travel time and cost. The number of trips back and forth and those calculations are what the federal government asked us to use.

- For the local match, as you look at each site are you looking at how likely they might bring a local match with land and how much they meet those needs?
  We're looking at each location and evaluating who pays for each site. The Environmental Assessment is a evaluation of each location. We won't have the detail about what those costs would be at each location, rather a range of costs. We need federal authorization for the locations before we can move forward.

Next Project Steps/Funding

- For the June public meetings, what are the alternative modes for people who cannot attend meetings? When is the public hearing and what will be happening?
  We have these meetings (the Leadership Advisory Group), Citizen Working Group meetings, and public meetings. There is information on the dedicated website as well. People can also contact Eli Cooper directly as well. In 30-45 days we will present our preferred alternative. We will have another round of meetings and a public meeting. We will then prepare our environmental document which will be approved by the city and state and federal government. That will be prepared over the summer. We will then post the Environmental Assessment for everyone to review. The public hearing will be in early fall. That's our tentative schedule.

- For some stations the match is different depending upon a variety of factors. In a number of cities on the coast they don't need all of the parking we are talking about. People with UM passes don't just use them to park just during their working hours. There may be spaces available that aren't being used on weekends.

I want everyone to be cautious about the 20% match. In a competitive application process a city or county that offers a 25% match may be looked upon more favorably. The ownership of stations varies. Down the road, there is no set in stone way to fund stations, but anytime a local community can provide buy-in, it's better.

- What kind of environmental analysis is going into the decision-making for the preferred alternative? Are we going to have access to that analysis before the next meetings so we can read them and comment on them?
  All of the environmental criteria that are part of the NEPA process. It also includes socioeconomic factors. The information will be available in advance of the meeting. The Alternatives Analysis document will be provided a week prior to the next round of meetings.

- Can you tell me who will be operating the station and will they be responsible for the station operations?
  Amtrak operates the service now. As far as the station, most likely Amtrak will operate it, but maintaining it would be the City. It's premature to think about how that may play out. We still need to get to a preferred alternative.

Comments from MDOT

You are going to see some activity at the current station. It's an ADA project. A grant was received from the federal government to build a modular platform that can go out to the train and then come back. It's a two-year demonstration. They are aiming for late July for a ribbon-cutting.

Ann Arbor Station Environmental Review
Park Advisory Commission Working Session
Meeting Notes—5-20-14

Attendees: **PAC Members**: Ingrid Ault (Chair), Graydon Krapohl (Vice Chair), Robert Galardi, Alan Jackson, Melissa Stults, Karen Levin, David Santacroce, Paige Morrison. **Ex-Officio Members Representing City Council:** Mike Anglin

Eli Cooper, City of Ann Arbor
Robert Gorski, URS

- Please identify where the 8 segments are located.
  Each segment is identified on the map, and right now they just represent 1,000 feet of track. Each segment is adjacent to and may include some amount of parkland.

- Is #7 where pedestrians cross right now?
  Yes. We do want to be near where there is traffic. The outliers (6,7,8) don't make a lot of sense right now.

- Is #5 at Fuller and East Medical.
  Yes.

- Is the Fuller Road segment where the previous project was going to be?
  These are segments that currently meet MDOT's criteria. Our project is a new review of locations.

- Can the track be realigned at these locations?
  Yes, the tracks could be. The State has not evaluated where they are going to flatten out the curves. So much is dictated by the existing geography in this area. This was just looking at what's out there today at 1,000 ft.

- When you were talking about parks impact I was thinking that it is an opportunity. The opportunity to place the station in an attractive location that showcases Ann Arbor's park system. But the project could also have some negative impacts. What do you take into review? There's the criteria you are looking at, 8 spots right now, and then what happens?
  In terms of environmental review we have identified that parkland is one of the key criteria. We are also looking at wetlands, floodplains, etc. In looking at the alternatives our goal is to avoid impacts, if we can't avoid it then we need to minimize it as much as possible. We won't be there until the next round of public meetings and we get consensus on which sites to review. Then we will do the detailed design and look at if we have impacts how to avoid them.

- When you say 155,000 people what does that mean?
  Each of those represents a single-one-way trip.

- Right now there are 3 trips per day?
  3 round trips, 6 trains per day through Ann Arbor.

- When you say 10 per day, are you just talking about Chicago? I'm tripling the 155,000.
  Yes, it would just be 10 round trips to Chicago. It's important to note that there is an art and science to ridership forecasting. About 2-3 weeks ago we heard from MDOT that those numbers are triple that again. We are now looking at tripling the number of trips, investing in higher speed rail. The rail will be more efficient and we'll see higher ridership. In 2040 according to the recent MDOT ridership projections we are looking at approximately 1,000,000 discrete trips.

- When you talk about these round trips, are people using it as a shuttle for Detroit/Ann Arbor?
  Yes, that's part of the ridership projection. It may be underrepresented as the travel market between Ann Arbor and Detroit for commuting via rail is impractical today. The model starts with a base of current travel choices. As more round trips are added, the practicality of using rail for commuting trips becomes a reality.

- Have you looked at what modes passengers use once they arrive in Ann Arbor (bus, taxi, etc.)?
  Currently, The Ride is limited to serving the midday train. The feedback from the Amtrak ticket agents was that travellers were using cabs. People are also using their bikes as well.

- We are reframing this study and characterizing Ann Arbor as a destination. That's why the multimodal discussion is important.

- From a parks perspective, when there was a discussion about the Fuller Road site previously...there were issues. I'm wondering how we can navigate that?
  At this point, the project is required to have an environmental review if we need to acquire public recreation lands. With regards to the Purpose and Need, if we agree that it's not appropriate to have an undersized station, and each segment will effect on parks. The responsibility of the team is to lay out the considerations for each segment. Then the team will overlay mitigation and potential use of parks. We have heard from the public that they would like to see the station as a destination. We also hear from the PAC that it would be nice to be connected to bike routes, rentals, lockers, etc. A place to grab a snack, etc. We want to minimize the impact, and we want your input.

- I think we need to make choices and they aren't always without consequences. Promoting mass transit is important. I like your approach making this a good thing for the community overall.

- Can you provide a summary of 4f?
  Any federal investment that goes through an environmental review requires a 4f review. There is an extra burden for any investment to be made on such lands. All non Section 4(f) sites would need to be thoroughly reviewed and found to be not feasible or practical as alternatives as part of the process of evaluating a 4(f) impacted property.

- When will there be a discussion about design of the station?
  We had an opportunity to hear from people in the first set of meetings. As we move forward with specific sites we'll get detail, but this isn't a design project. That will come later. We will also be doing a site tour later. You won't see what the building looks like, but the elements you want included.

- In this process as we move into the Concept Plan, traffic is bad at the current site. Is traffic being considered? Is there any consideration of whether or not traffic will increase in the future?
  Yes, and that's something that was brought up in other meetings. It's part of the process looking at existing traffic and projected traffic and the impact of a proposed facility

- MDOT and the State are going to approve funding for roads. Will that affect this project?
  The MDOT projection for ridership and the station is separate from MDOT's responsibility for maintaining the roads. MDOT has made a commitment to the upgrade to rail and is investing several hundred million dollars in addition to their road initiatives.

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Ann Arbor Station Environmental Review
Combined Work Session of the Energy, Environmental and Planning Commissions
Meeting Notes—5-13-14

Attendees: **Environmental Commission:** Susan Hutton, Kirk Westphal
Energy Commission: Wayne Appleyard (Chair), Mark Clevey (Vice Chair), Erik Eibert, Elizabeth Gibbons, Charles Hookham, Shoshannah Lenski, Brigit Macomber, Mike Shriberg, Ken Wadland, David Wright
Planning Commission: Kirk Westphal (Chair), Wendy Woods, Ken Clein, Paras Parekh, Eleanore Adenekan, Jeremy Peters, Bonnie Bona, Sabra Briere, Diane Giannola

Wendy Rampson, City of Ann Arbor
Matt Naud, City of Ann Arbor
Nate Geisler, City of Ann Arbor
Eli Cooper, City of Ann Arbor
Robert Gorski, URS

A brief introduction by Eli Cooper followed by Introduction of Robert, Bob, Gorski, URS.
Bob presented a PowerPoint overview of the Ann Arbor Station Environmental Review.

Questions and answer period followed concluding with a period of direct comments offered by the attendees. The following list presents the issues discussed during the question and comment periods:

- Some of the sites appear remote and should not be subject to further consideration
- How are the ridership projections being developed? *Provided by MDOT. Discussion of the Midwest Regional rail Initiative and linking together areas from Minneapolis, St. Louis, Chicago and Detroit, among others.*
- What percentage of the project is funded by the federal government, city? *80% federal – 20% local may not all be city.*
- Who approves the project? *FRA approves Environmental review. The Station as a City project will be approved by Council. Existing City Council resolutions place this project before the voters for their consideration.*
- The facility should be designed relying on the low impact and sustainable features
- Is the Environmental Review (ER) process comprehensive enough to reach a decision to proceed with this investment? *An ER does not include fiscal considerations, among others.*
- Has the process included consideration of services such as Mega bus?
- Gateway–As a visitors' first impression of Ann Arbor this site should be provide a message about sustainable Ann Arbor.

- Deemphasize parking for autos. The Ann Arbor transportation program encourages alternatives modes including walking, biking and local transit. Less emphasis is needed to accommodate parking. Parking, if provided, encourages more driving and automobile access to the station.
- Include mixed-use or multiple-use considerations going forward. The more activity on a site the more sustainable it is.
- Include consideration of increased mixed-use around the station or contained within it such as offices.
- Parking decisions should not just be accepted, We need to “turn their (AMTRAK’s) numbers on their head.
- Construction of a larger concrete parking structure will consume a large amount of energy. An assessment of the amount of energy needed to build this facility should be conducted.
- This station should be an energy “net zero” station. We should emphasize the need to comply with the City’s climate Action Plan
- UM hospital is the largest employer within walkability access to the proposed 8 sites and should receive consideration in the siting process.
- Providing parking should be done incrementally. It does not have to all be provided at once.
- Consider a shuttle bus strategy as an alternative to providing parking at the station.

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Ann Arbor Station Environmental Review
Public Meeting
Meeting Notes—Meeting #1

Date: Wednesday, April 2, 2014
Location: Ann Arbor District Library
Attendees: 9 attendees (4:00 pm session), 9 attendees (6:30 pm session)

The first public meeting included a presentation that detailed the overall scope of the Ann Arbor Station Environmental Review, the Purpose and Need, Design Criteria and Site Selection. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: www.a2gov.org/annarborstation.

General Comments

- The funding for the study and for the building, how much is local and how much is non-local? How much is Amtrak covering, what does it involve in terms of local financial input?
  The City applied for and received an 80% federal and 20% local funding grant that must be used by 2017. The planning and conceptual design is part of our initial FRA grant application. We would likely apply to the federal government for the capital investment. The local involvement could be state funding, county, local, or private funding. There are also in-kind values that could be used for the 20% local share. Amtrak is not contributing funding for the study.

- Should the station proposal include any park land, would it require a vote of the citizens?
  No park land is currently proposed for station uses. Should the preferred alternative include any transfer of land from the park system, the City Council stated that it would be presented to a vote of the people.

- In the event that the city decides to build a new station, no matter where it is, it will go to a vote of the people.

- What is the current City investment in the station project? Is the Ann Arbor Area Transportation Authority (AAATA) providing any funding?
  The City is providing the local match for the Environmental Review. The city's share is 20% of the study's $824,875 budget, $165,000; the remainder is a federal grant. The City previously invested $750,000 in consultant resources and staff time in consideration of a station prior to the URS contract. The AAATA is not providing funding in this phase of work.

- What is the realistic cost to build a new station? Would that come from the City general fund?
  The anticipated capital improvement cost for the station is $20-30 million. But that's without knowing where the station would be located and what specific components it would include. The City of Dearborn received 100% federal funding to construct its new station; that was a highly

unusual arrangement funded through the American Recovery and Reinvestment Act of 2009 (ARRA). No one anticipates that will happen again. The typical funding ratio is 80% federal and 20% local. It's premature to say where construction funding would come from.

- When you talk about 10 round trips, does that include commuter rail?
No, it only includes intercity (Chicago to Detroit). MDOT anticipates that 10 intercity trains (Amtrak) will make 10 daily round trips along the Chicago-Detroit-Pontiac corridor by 2035. (3 round trip trains operate in the corridor today.) Some of these intercity trips will be added prior to 2035, and all trains are expected to stop at Ann Arbor. Any commuter rail trips the Southeast Michigan Council of Governments (SEMCOG) is planning would be in addition to the intercity train trips.

- For commuter travel, is the future Ann Arbor Station considered more of a destination or a departure point?
For commuter trips, it is likely more of a destination station.

- Did you say you don't know where the funding will come from for construction? How can you assure that there will be an 80/20 federal/local funding split?
The City cannot apply for federal construction funding until the Environmental Review and preliminary design is complete. It is assumed that the Federal Railroad Administration along with the State would continue to support the project and make construction funding available.

- Where would the money come from for station maintenance?
Typically Amtrak pays to maintain its stations along with vendors and other operators using the station. If the City's lease rate with Amtrak is too low to cover costs, the City would have to offset that. Station amenities not required by Amtrak or other operators are the City's responsibility to maintain. The City could add an amenity such as a community room and charge for its use to offset costs.

- Is there experience in the State of Michigan where a City pays for the station?
Not exclusively, for construction or operations. Regarding operating costs, the state has several examples of users other than Amtrak contributing. In Holland, the local transit provider operates from the station. The Tulip Time festival share space in the building and contributes financially. Insurance companies have offices in some stations.

- If the City were to provide amenities that need to be leased out, that would cause the City to be a landlord—not necessarily a position the City wants to be in. I understand that Dearborn's station construction and operating costs were federally funded for 20 years.
In Dearborn's agreement, the station needs to stay open for 20 years. Amtrak has agreed to pay for their square footage for 20 years and is an ongoing tenant. The City has an acre on their site that they are hoping to redevelop in order to offset capital costs. Their operating agreement with Amtrak covers 100% of operating costs.

- It seems like the next set of meetings will be looking at the alternatives. How will those decisions be made? I don't fully understand the evaluation criteria.
  We'll be using input from the public as well as the evaluation criteria we've presented so far. A station requirement we've discussed is 1000 feet of straight track. Some of the other criteria include proximity to downtown and activity areas, access to roadways and other transportation connections, available land for the station, etc. We'll use these criteria to reduce the set of alternative sites. Anticipated ridership will influence how much parking will be provided and the land needed for parking. The next step for the Project Team is to perform an analysis of the potential sites based on the criteria. The results of this analysis will be presented to the public in June, and we'll ask you if we got it right. The Purpose and Need document helps us understand what our recommendations will be as well. Some station elements are required and others are optional; the Team wants to hear about features the community desires.

- What's the difference between the Leadership Advisory Group and Citizen Working Group?
  The Leadership Advisory Group includes business people, organizations and government officials. The Citizen Working Group is open to anyone who was willing to participate in the series of meetings throughout the year.

- In order to make a decision you need to know how many people will be on each train, where they are traveling to or from, and the purpose of their trip. I hope that will be provided. There is parking nearby the current station; if you're going to build on any of those other locations it will affect cost and location. I saw another station that included an elevator, escalator and bridge that got people from one side of the tracks to the other. Features like this would add significantly to a station's cost.
  The City has received direction from the Federal Railroad Administration (FRA) that a new Ann Arbor Station should have two platforms—one on either side of the tracks. The Team is proceeding with that assumption. Passengers will not be allowed to walk across the tracks at track level, and the station will need to meet Americans with Disabilities Act (ADA) requirements. This will require vertical circulation above or below the tracks and either ramps or elevators. The new Dearborn and Troy/Birmingham stations have bridges over the tracks and elevators on both sides of the tracks.

- Ann Arbor has the Amtrak railroad and the private Ann Arbor Railroad. The Ann Arbor Railroad conceivably connects Ann Arbor with Lansing and Toledo. How does the Ann Arbor Railroad and proposed WALLY rail service to Howell affect the Amtrak Station?
  As part of the federal regulations, the Environmental Review needs to provide information on and coordinate with other studies underway. The WALLY project is being led by AAATA. The City's website has information about past studies in the "model for mobility" section. Also, look at The Connector project led by AAATA has information on its website (aaconnector.com). Those are some studies that the Project Team needs to be aware of and coordinate with.

- At what point will the Environmental Review be completed? Will it reflect AAATA services and potential service changes?
  It is anticipated the Environmental Review will be completed by the end of 2014. The Project Team will coordinate with AAATA as we plan the station. AAATA's millage vote will be in May, and it may change the modes or means of access to the station. Amtrak and potential commuter

rail service through 2040 will grow evolutionarily. There will be adjustments over time by all the operators.

- You mention ADA. How is the current facility non-compliant with ADA?
  The existing station is ADA compliant, but would be designed differently if built according to today's standards. We interviewed the staff and some of their concerns were just getting in and out of the station. The doors are not automatic. They are using a manual lift to access trains and that's not a preferred option.

- Parking for persons with disabilities is a problem at the existing station. There are only two "blue" parking spaces at the station.

- Will there be level boarding (between the platform and trains) at Dearborn?
  Yes, as soon as the new, ordered train sets arrive that allow level boarding.

- If Ann Arbor gets a new train station I'd like the City to consider using the historic station, now the Gandy Dancer restaurant. It would be a destination for some people. We need to be sure and have bike accessibility and bicycle storage both at the station and onboard the trains. More and more commuters will want to incorporate bicycling. We need to try to encourage that.

- You're going to be performing the alternatives analysis and then presenting the results at our next meetings. Will we be able to see the detailed criteria used in the analysis?
  Yes, we will show you the different criteria and how we applied it. At this point we have 8 possible tracks segments along which a station could be located. We will apply these criteria to each segment and present our results ant the upcoming LAG and CWG meetings prior to the next public meeting. We'll present draft documents and then take your feedback. We'll then need to make decisions so those documents can be finalized. There will be opportunities for you to provide feedback to us. The FRA will be reviewing these documents and the Project Team needs to get started in order to move the work along.

- What's the weighting of the City Transportation Plan related to the limitations of the site, Amtrak's needs, etc. What is the total investment in the station the project so far?
  The City Transportation Plan included a new Amtrak station. When the City was awarded a FRA grant for this project, the City Council voted to proceed. The total value of the Environmental Review and Conceptual Design is $824,875 and the city is responsible for 20% of that cost, or about $165,000. This is the project that started in January 2014. This does not include preliminary engineering or construction which comes later, or any previous efforts. When the Environmental Assessment is complete, the total Federal and City investment toward a new station, including previous efforts, will be $7.5 million. This does not include drainage investments near the Fuller Road (West) segment, which is not related to the station.

- If we do go with a new station I'd like the City to consider a green roof, porous pavement, and other green design elements. If you look at these options they save taxpayers money.
  The City has adopted a sustainable design framework. All stakeholders can encourage the City to follow this framework.

- Is ridership part of the alternative analysis? Please consider how proximity to downtown and other major trip generators, and walkability, impact ridership.
  Yes, ridership is a consideration in the Environmental Review, as is access to the station. Right now there are three daily round trip trains with about 155,000 annual riders in 2013. There is a plan to go to 10 round trip trains between Chicago, Detroit and Pontiac by 2035 and tripling the existing ridership. The study will consider how riders will travel between the station and local activity centers.

- I hope you don't conduct the site tour during a busy time such as Labor Day.
  The purpose of the site tour is to visit all the potential sites, not just the existing station. We will be careful not to skew our needs assessment by only visiting the existing station during the highest usage periods.

- How do you participate in the Citizen Working Group?
  For the Citizen's Working Group, the Project Team was looking for people who would commit to attending all meetings throughout the year. Everyone is welcome. We ask that new participants review the materials from previous meetings and come prepared. The Leadership Advisory Group is meeting three times and receives the same materials. These group meetings are part of our effort to engage the community in our decision making.

- Are you engaging SEMCOG and the Regional Transit Authority (RTA) in this project, particularly regarding commuter rail?
  We are looking at various groups to meet with directly regarding the Environmental Review. SEMCOG and the RTA are both represented on the Leadership Advisory Group.

- I think the Fuller Park (Fuller Road—West) location could flood in the future and I am not in favor of that location for a new station.

- The floodplain is a critical consideration for station sites.
  The City has recently updated the floodplain map and that will be a consideration.

- When you look at impacts will you consider the local impacts of parking?
  Yes. We recognize that parking impacts are an issue at the existing station, and these will be considered for each alternative station site. Amtrak staff has identified that people park at the station who are not taking the train. Both parking demand and parking management methods will be considered as the study continues.

- I think we should make the station very accommodating for those with disabilities and the elderly.

- If we could have a station where the north-south (WALLY) and east-west (Amtrak and potential commuter rail) meet it would be great.
  Straight track is required for new Amtrak stations. At the location where the two lines cross, both lines are on sharp curves.

Purpose and Need

- When you look at the future needs are you considering AAATA bus service, The Connector and others?
  We are coordinating with the agencies and others that are working on those projects. We want to be sure not to preclude any potential uses.

Design Criteria

- What is the difference in station size between a station with or without commuter rail?
  The focus of the Environmental Review is intercity rail, but the Project Team will consider the needs of commuter rail. The station building may not change much, but parking and other site features probably would. The station will be conceptually designed in a way that does not preclude future commuter rail.

Site Selection

- How does ownership of the site affect your selection?
  Sites along the straight track segments that are currently owned by the State or City are preferred.

Other Comments

- Commuter rail is a vision rather than a plan. Parking is free at the current station. If you build the new station at another site, there will need to be more parking options.

Ann Arbor Station Environmental Review
Public Meeting
Meeting Notes—Meeting #2

Date: Wednesday, June 24, 2014
Location: Ann Arbor District Library
Attendees: 40 citizen attendees

The second public meeting of the Ann Arbor Station Environmental Review included a presentation on the overall scope of the project and the Alternatives Analysis process. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: www.a2gov.org/annarborstation.

General Comments/Ratings

- How will the rating systems be used in the next phase for the 3 recommended sites?
  The Project Team will evaluate each site using the required environmental criteria. Beginning with a conceptual design for each segment each criterion will be reviewed and an evaluation provided.

- Will cost come into play in the next stage?
  Yes, to the extent that we can. A level of magnitude estimate will be developed.

- What's the definition of the area that you are considering for rail traffic for the existing station?
  The State of Michigan, working with the Federal Railroad Administration (FRA), plans for a second main track. There is enough right-of-way to accommodate a second track and there was a second track previously. The Ann Arbor Station project will accommodate the second main with an additional platform and pedestrian bridge over the tracks.

- The North Main location is horrible for biking. If you choose that location will you include a biking plan for that area?
  Some of the other locations have better connectivity for biking and walking. We will be evaluating these as criteria for the segments advanced.

- In your environmental factors study I am concerned about CO2 emissions. The station could encourage people to get out of their cars. Are you going to be able to model how many people might leave their cars behind? If the station has better connectivity more people will use it.
  We will be looking at the future volume of traffic. The projected station activity volumes account for people switching modes from auto to train. To do a quantitative analysis we'd need a lot more information, but we do know that the station will take cars off the road.

- There was a Geddes study with the University, and AAATA did a study about vehicles that travel on rails and then go off the rails onto the road. Will you be considering that technology?
  Not for this study.

- Does the increase in traffic figure in to the amount of land needed? We're going to have a substantial increase in traffic so you'll need more land for parking. Is there a point in time you are using to calculate that? Does that include transportation corridors?
  Station parking demand estimates are based on anticipated rail ridership. Ridership is expected to ramp up over time. The Project Team will consider how to phase station expansion to accommodate what is needed in the future. Amtrak has guidelines for station building square footage and parking based on anticipated station activity volumes. Amtrak, FRA, the Michigan Department of Transportation (MDOT), and the Project Team have heard from stakeholders that the philosophy and long-range plans for the city of Ann Arbor mean that citizens don't want a big parking lot at the station. At the same time, Amtrak understands that intercity riders often want to drive to the station and the City wants to provide reasonable accommodations for station parking. The Project Team will coordinate with City transportation and urban planning and promote multi-modal station access in the conceptual station designs.

- What is the realistic timeline for completion of the station? When is the timeline for ramp up to 10 trains?
  Our study is 12 months. Beyond that there is preliminary and final engineering then construction. All is dependent on available funding. If a preferred site is identified it would be incorporated into the capital improvements plan for the City. Then the City staff would look for funding. Then it would be budgeted as a project. City Council has also agreed that there will be a public vote on the project. As far as the increase from 3 intercity train round trips to 10, MDOT anticipates that improvements between Pontiac, Detroit and Chicago will enable 10 round trip trains by 2035.

- Do you foresee that before the new station is built there would be the 10 trains?
  The increase in trains would be phased in over time and not happen all at once. Ann Arbor Station will need improvements to accommodate near-term increases in train traffic and travel. MDOT is the best source for the timing of the increases in train frequency. What would probably happen is that once the City approved moving forward there would have to be a search for funds from a variety of sources. Current stations have been 100% funded by the federal government but that probably won't happen in the future. The State is looking for opportunities for 20-year agreements with local entities to maintain and operate stations.

- Has anyone for the University of Michigan approached you with a picture of what they think the station should look like?
  No one has done that yet.

- What are the noise receptors on the map?
  They represent any properties (parks, hospitals, etc.) that are sensitive to noise.

- Has the ridership been looked at from Chelsea, Ypsilanti, and other areas beyond the Ann Arbor community?
  The Chicago to Detroit/Pontiac Passenger Rail Corridor Program, which is led by MDOT, has developed forecasted ridership that has looked at areas beyond the Ann Arbor Community. The Project Team knows that the station will be a draw for people from beyond Ann Arbor city limits.

- How many parking spaces are you looking at?
  For just intercity passenger rail (Amtrak) projected station volume, Amtrak anticipates demand for more than 2,000 parking spaces.

- What type of projection is the ridership?
  The projection developed by MDOT and approved by the FRA includes both continuing with the existing service (3 round trips/day) and planned service increase (10 round trips/day). The growth in riders is associated more with the attractiveness of improved train service (more frequency, faster travel times, more reliability) than population changes.

- Are we allowed to discuss the assumptions about scoring? Can we propose other scores, such as environmental, if one place has a -1, another has 1? I disagree with the scoring for environmental for Segment 4 (Depot Street/Existing Amtrak). It looks like there is a bias toward Segment 5 (Fuller Road—West).
  The scoring was a tool used to narrow down the alternatives. After this phase the scoring will not be used and decisions will be made based on a separate, detailed analysis.

- When a rail station a built, an economic zone is typically created. If we did that at the current station site it would create an opportunity to make that area vibrant. I don't think we'd want to focus economic development in our park areas.

- There are some criteria that seem implicit, but not explicit. Is there any consideration for a site that would enhance opportunities for businesses to move in? Also, patronage…some sites would encourage patronage and others wouldn't. The University of Michigan will be a player; people will want to come to the hospital and they won't be able to drive. Some sites could generate more patronage.
  Yes, we are looking at all of that—especially which sites would be adaptable for station-oriented development and how it translates to riders and usage.

- It seems to me that wherever a station is located it needs to link with The Connector. There's only one site that would connect so it seems like a deal breaker.
  One of the criteria the team will consider is how the alternative station sites would interface with transit in the area, including the planned Connector.

- What is the size of the building you are looking at? What is the cost? Can you address the environmental impact at Segment 5 (Fuller Road—West), and couldn't a station there be win-win? Right now it's just a parking lot.
  The station building square footage is dictated by the projected station volume. The approximate projected station building size, without either optional building spaces or commuter rail is 10,000 to 11,000 square feet. With commuter rail users but still no optional building spaces the square footage requirement is about 12,000. The current station is only 3,500 square feet. The biggest factor that drives the station size is waiting room space.

- Tell us about the capacity of the waiting room. If you have 10 trains it should distribute the ridership so they would be spread out.
  The current station capacity is not adequate with the current service (3 round trips/day) based on our interviews with the ticket agents. The existing station waiting room offers 60 seats for over 100 passengers boarding trains today. A second main track and increased train frequency will create more events where passengers are simultaneously waiting for trains traveling in both directions. The trains may also grow in length, thus accommodating more passengers. The Project team is confident that the existing station in its current form will not accommodate the projected intercity passenger and commuter rail growth. That does not mean that the existing Amtrak Station location cannot accommodate a new, expanded station.

- Is the increase in riders based on people moving to Ann Arbor and the surrounding area?
  Some anticipated area growth is probably considered. However, the increase in riders (station volume) developed by MDOT is largely a function of mode shift. The projection anticipates that the growth is from riders who would have driven or flown previously and choose passenger rail instead.

- When you set up your next analysis will you provide the criteria to the public before making final recommendations?
  Yes, our effort here was to narrow down to the 3 sites. For Phase II of the Alternatives Analysis we will measure potential benefits and impacts using all of the National Environmental Policy Act (NEPA) environmental categories. During the site tours and next Citizen Working Group meeting we can engage participants in that process.

- How did the City's non-motorized plan figure into the Phase I analysis?
  All of those plans are being considered as we work on each of these sites.

- How will we reach consensus on this project? We need some clarification on the process towards consensus. Who are the stakeholders?
  In general consensus will be reached when we collectively decide the Locally Preferred Alternative. The stakeholders have been defined as the Leadership Advisory Group and Citizen Working Group, as well as the general public. The Project Team will perform the analysis and test against evaluation criteria and Purpose and Need. There will be constant input along the process, including an opportunity to review and comment on the evaluation criteria. There is also a City Council resolution for a vote by the citizens whether or not to fund station construction.

- Can each of the sites accommodate double tracking?
  Yes, the 3 recommended locations for further analysis can all accommodate a second main line track.

- I'd like some clarification on how Segment 5 (Fuller Road—West) scored higher than the other locations for roadways connections and transit potential
  The Phase I analysis considered the number of existing adjacent roadways and their ability to accept additional capacity or expansion. We know that traffic will be an issue at all of the segments in terms of the existing and anticipated future volumes at a passenger rail station. .

During Phase II, traffic impacts will be evaluated at all three alternative locations for a new station.

- No one knows what the future holds, but we should take into account our experience. Amtrak has improved on-time performance. If we get 10 round trips there's going to be considerable patronage. MDOT's projections are reasonable.

- Will this expansion restrict freight trains in Ann Arbor?
  There isn't a lot of freight right now. A participant shared that there are 4 freight trains per day in Ann Arbor, divided between the north-south and east-west lines. Amtrak will be taking over dispatching on the Chicago to Detroit line and will prioritize passenger over freight operations.

- I'd like to lobby for the historic station. There's a fair amount of space at that location and expandability. It's also not a park space.
  Some initial concerns regarding the historic station building is that the building in its current form cannot accommodate the projected 2035 station volume of over 1 million annual riders. It is privately owned and the building and surrounding brick streets are in the Division Street Local Historic District, which could limit alteration and new construction.

- I think the current station works well and it could work with The Connector.

- If you put the station in a park you have some serious impact on the adjacent area and the environment. If you start in a greenfield the site will have negative impacts. If we reduce the floodway area near Segment 4 (Depot Street/Existing Amtrak) then there are houses that cannot remain in that area. There might be more workable area near where the station is right now. A more integrated approach at that site may create more consensuses.
  That's exactly the kind of detail we will be getting into as we advance into the next stage.

- I think one of the problems with the scores is that we are seeing it after the criteria are applied. Is there a way when we get down to the details that we could have a public discussion of the scoring and the elements that need to be considered? People need to be involved before the final scores are made.
  We want you to be hands-on and that's our job to engage you as we go forward. The site visits will be useful as we look at the criteria. We will not be using the Phase I scoring after this meeting.

- There's also the potential to acquire property. There seems to just be a given footprint, but there is the possibility to add property to the site.
  As the conceptual design alternatives are developed we will evaluate the need for additional property to accommodate the projected program needs.

- Is purchasing land more important than parkland?
  Land acquisition and parkland are equally important and both will be evaluated during the Phase II portion of alternatives analysis.

CITY OF ANN ARBOR, MICHIGAN

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Ann Arbor Station Environmental Review
Public Meeting
Meeting Notes—Meeting #3

Date: Monday, September 26, 2016
4:00 p.m.-5:30 p.m., 6:30 p.m.-8:30 p.m. (presentations at 4:30 p.m. and 7:00 p.m.)
Location: Ann Arbor District Library
Attendees: 68 citizen attendees

The third public meeting of the Ann Arbor Station Environmental Review included a presentation on the overall scope of the project and the Alternatives Analysis process. During the presentation, and after, attendees had numerous comments and suggestions for the project team. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics.

Additional information about the project can be found here: http://www.a2gov.org/departments/systems-planning/planning-areas/transportation/Pages/Ann-Arbor-Station.aspx.

The Environmental Assessment

- What is NEPA?
  The National Environmental Policy Act.

- What happens if they find a significant impact?
  Under NEPA there are levels of analysis. If there are impacts then the Federal Railroad Administration could seek to have mitigation provided or direct additional effort for another round of environmental review.

- The traffic and parkland are mentioned, what else is in the Environmental Assessment?
  Here's the link to the FRA Environmental procedures that details what is assessed: *http://www.fra.dot.gov/eLib/details/L02561*

- Is that listed on the website or in the documents/ It would be helpful to know that all of these things are being looked at?
  http://www.fra.dot.gov/eLib/details/L02561

Traffic-Related Topics

- Is there a traffic study being done?
  A traffic study will be prepared for each alternative and included with the Environmental Assessment.

- How much work will have to be done on the Broadway Bridge?
  At a minimum buses would be stopping on the bridge without impeding traffic so the intention in widening the bridge Additionally a new left and right turn lanes may be required based on the future traffic and the entrance to the proposed parking structure

- How do the results of the traffic study get integrated into the project?
  The traffic study provides the basis of need for roadway improvements required for a 20 year horizon.

Site-Related Topics

- There seems to be a mistake in the Fuller Road diagram it doesn't show the eastern and western lines.
  The information shown in the diagram is based on data provided by the City, All property affected by the Fuller alternative is owned by the City of and the State of Michigan..

- Will this hookup with Wally?
  Not directly, the stations will be connected via transit.

- How do you study and find out information about the entrance on Broadway?
  The traffic study examines the existing and proposed operations at this intersection and makes recommendations for improvements warranted by the project.

- I am surprised that you are still studying Fuller Road since it is parkland.
  That site meets the Purpose & Need, and in discussion with the City, State and FRA we all felt it was appropriate to advance.

Comments from the FRA
As part of the Environmental Assessment there will be a Section 4(f) analysis, which looks at parkland and other resources. The Environmental Assessment will look and see if there are reasonable alternatives. As part of the current phase, you don't get into that level of detail.

- How do you integrate this with the needs of the University?
  The University is part of the Leadership Advisory Group and we have coordinated regarding their transit system and the desire to service a new station.

- Last week City Council signed off on $250,000 to hire a 4f specialist. It sounded like they were hiring someone to put the station where they wanted to. With parking at 3 million, but we have 47 million in the CIP for this project. I thought the idea was to get rid of parking decks. We spend so much to park cars.

Comments from the FRA
All the projects along this corridor including those in Chicago to Detroit, the Section 4(f) specialist is preparing a report, but it is reviewed by FRA and is reviewed by the Department of the Interior. And we take their guidance on the effect on resources. Not everyone can write these reports. There are a lot of eyes on it. The law is very complex and the analysis is very complex. You need someone who has a background in it.

- We could grow the station at option 3A; it's hard to imagine asking of the City Council for the cost perspectives on more than one option.

- I have asked two of my graduate classes to review the site. I think the station is best left closer to downtown, less congested because of the additional lanes, plenty of room for the required parking structure, it can also be linked to the Connector with a shuttle bus to the Fuller locations, and it can trigger and has space for transit-oriented development. There is plenty of land not in the flood plain. Fuller Road is next to an existing jobs center, but it is fatally flawed because it is already a bottleneck. It's crazy not have the station near a bustling hub. Fuller is not a reasonable option.

- One thing that surprises me was the question about if something was missing from the report. I find it mind-boggling that three of the four options would be put in the flood plain. Where is the storm water going to be? To me the only site that will be the cheapest, service the most people is the Fuller Road site. Any option like 3 is better.

- This is supposed to be an intermodal station and there are no options for biking and walking.
  At this scale we are showing border-to-border trails at a high level.

- I have been to a lot of wonderful transit station and they are often related to buses. How will our station be related to buses?
  Yes, we would accommodate Greyhound, AAATA, and University buses

- I would add that the Main Street area and a station would be a magnet. At the Dearborn station they have 300 parking spaces but a 16,000 square foot building. It would make sense for the station to be proportional to the parking.

- Is the Depot site a smaller footprint, but you said 3A is bigger.
  3A's first floor will be where the buses will travel.

- You are hearing division between people about Depot Street and Fuller. Could there be a compromise and have a platform at Fuller Road?
  It is possible. The City has done evaluation of a potential commuter rail platform. There is going to be significant discussion if that becomes a preferred location. People will wan to be headed east-west so we need to accommodate commuters. We will also need to include park-user parking.

- We are already building on wetlands and floodplains. Maybe it shouldn't be a factor here.

- I think it's important to have conversations with DTE because these proposals require getting land from DTE. And they may or may not want to do it.
  The team has coordinated with DTE and they are part of our LAG.

- I am encouraged to hear that we are using a local firm for the evaluation of the 4f. We will get serious analysis of all of these details. Then we can go back to City Council and tell them it's clearly this one. I am encouraged that people are asking these questions which will show up in the Environmental Analysis. I prefer to see something over the Broadway bridge.

- Where would the buses be located? How would buses get into the station?
  At Alternative 2A, B, and C the buses would be located on Broadway and Depot. At Alternative 3A the buses would travel to the first floor of the parking structure. There might be fewer buses on Fuller depending upon The Connector project. A portion of the buses would be diverted into the station. If The Connector vision is fulfilled there might be a different picture.

- When you look at Fuller Park station will there be additional access roads? Will they need more access? You show two points of entry.
  There will not be additional access roads, the existing driveways will be relocated. One entry will be dedicated to buses and the other for cars. Amtrak guidelines desire the traffic be separate.

- For the pedestrians along Fuller what would happen?
  They would continue to cross at the intersection. They would have to cross driveways, but part of our traffic study will take into account pedestrians. The border-to-border trail is on the North side of Fuller. There is a need for improvements at the intersection and those could utilize the bridges and under-crossings. The City of Ann Arbor has had some discussions with the Washtenaw Biking and Walking Coalition as well about the pedestrian crossings and making connections at the east end of Fuller Park and loop in under the road so there would a grade-separated crossing. Part of the design of the Fuller Road/Maiden Lane and East Medical Center Drive intersections strategy would be looking at the bridges.

- Are there proposed amenities due to moving business away from Casey's and the Gandy Dancer?
  No, this phase of the station project is focused on accommodating intercity and commuter rail and is evaluating four alternatives. .

- The distance that those who are disabled can travel is limited and as I look at the four designs, the two that have the station over the track have the best balance for shorter distances for people who find that taxing. The other two would require a long travel distance and would require longer times.

- On the Fuller site, the trip to get the bus is going to be a long journey. It looks like a parking garage with station behind it. It doesn't look every attractive to me. This area is not very pedestrian-friendly. It's a very auto-centric area. There's a qualitative aspect to the walking component as well.

- I heard that a good reason for Fuller was lots of employment, and then I heard Depot was better because of DTE. Is there any way that no matter where it's located you could have shuttles?
  Yes, there could be shuttles. With growth in rail service there may be a desire to meet demand with additional shuttles or bus service at those locations.

- I look at Fuller and if I work at the hospital, it doesn't look inviting. I see DTE asking the City to makes a big station and it's a site that's a thousand times better and I'd like to see it there.

- There is an assumption that hospital employees will use the train, if there are employees who are women with children at home and if I was that type of employee I would want to take my car. A lot of the evaluation isn't taking that into account. The report makes it clear that Fuller Road is meant only for intercity travel.
  The parking demand is based on the ridership and Amtrak requirements. That's why there is not differentiation among sites. The spaces are designed to meet the regional needs of a station that services trips as far away as Brighton. The designs and numbers are to meet intercity and passenger demand. The primary purpose is for intercity travel. We don't underestimate the need of workers and others for travel.

- Can I get clarification about non-motorized infrastructure? Do you want the public to identify the non-motorized infrastructure so we can be assured that you will cover the big picture? Will they be in the final proposal?
  The team has already included the non-motorized infrastructure consistent with City planning.

- I would like to take a different approach about location. Most people are focused on features built around buildings. I have great confidence in the process. I want to talk about the benefit to the community including the residents of Ann Arbor, students, and graduate students. Businesses and resident pay taxes. I am discouraged that some much has gone on without a clear financial analysis. As well as what the continuing obligation are. The Depot Street location serves the downtown and our central business community, which also draws visitors. The Fuller location serves rails users and serves people around Ann Arbor. I didn't see in the report an appreciation of Ann Arbor's vibrant downtown. Depot Street can be adjacent to that. There is developable land around 2A including the DTE property. DTE also has plans that would be symbiotic with lower town. I think the Gandy Dancer as a restaurant could be incorporate into the whole complex. I'd like to suggest looking at 2A, 2B, and 2C as an integrated complex that would serve as an entrance to the city.

- In the future you could increase the Depot location by making the north entranceway to Ann Arbor with a four-way entrance.

- I want to point out that there is enough appreciation of Fuller Park's use. The area has a high density but the lowest amount of open space. We haven't give attention to the recreation uses of Fuller. It's a central park of Ann Arbor and our parks that we have strived to keep.

- There has been a lot of discussion about land use, and to review the purpose of this station is to accommodate intermodal travel. FRA has guidelines that it should have direct access to bus, rail, taxi, etc. There are many more buses already traveling on Fuller.

Michigan Central Depot/Gandy Dancer

- How would people cross the tracks at the Gandy Dancer?
  There would be an elevated access to get across the tracks.

- Property assessments are public information. Do you know the assessed value of the Michigan Central Depot? Does the historic value of the Michigan Central Depot enter into your evaluation? There are several historic stations that have been rehabilitated. Which, using a new or old station, has been able to generate more travel.
  We will be determining the assessed value of the Michigan Central Depot which we would have to acquire property, but it would also mean displacing a business. In terms of reuse of a station it's having the ability retrofit. The historic value of the Michigan Central Depot is part of our evaluation in the Environmental Assessment.

- What have you heard from the owners of the Gandy Dancer?
  The City of Ann Arbor has reached out them and there has not been a response. That has not prevented us from including it in the Alternative Analysis. We are going through this process and keeping it at the same level of analysis as other sites.

- Why would you consider destroying the Gandy Dancer?
  It's an existing station and the FRA wanted the Project Team and study to consider it as an alternative, additionally during our public engagement it was suggested that it be considered.

- I want to make sure that everyone knows that the parking lot is a temporary lot and a lot of people would like it restored as a park. We have several stations along this route that are real gems. The Gandy Dancer is a unique building and there aren't many like that in Ann Arbor.

- Could you move parking for the Gandy Dancer to the parking area that is already in existence to the right of the building?
  We currently have short-term parking there. AAATA and other buses are along Depot now; we would now accommodate those on-site keeping in mind the historic district.

Parking Topics

- How many parking spots are currently being shown at Fuller Road?
- *There will 870 spots for intercity, 200 for commuter, 50 for short-term parking. That need is for the full build-out in 20 years with 10 round trips per day. It will be an incremental build out.*

- Is the projected need applicable to each of the station options?
  Yes

- Where do the cars go when the station is put in the where the current UM people are parking?
  They will have to be relocated.

Next Steps

- What is the projected opening date for any of these stations?
  We don't have an estimated date yet. We would need approval from FRA and to go through the voting process.

- At this next stage will cost be looked at? This stage doesn't talk about cost, when does that become a factor? Does cost become a deciding factor?
  Cost will be evaluated as part of the Environmental Assessment

- You're asking us to give us feedback on one of four options, but you haven't given us costs. The amount of information in order to get to this point, each alternative has the identical program, the same station size, parking space, so the cost is irrelevant for this phase.
  As we move forward in the Environmental Assessment we will have more measurable information and that will be shared with the public. The cost for the station building within each of the four options is within 10%. There will be different utility implications, roadway improvements and ROW needs

Comments from the FRA
It would be helpful to clarify where we are now. We want to be sure we are capturing the range of available alternatives for building a station for Ann Arbor. It's less about weighing the four alternatives, and more about capturing the reasonable alternatives. The first part of the process focused on the sites, in the second phase we were looking at design alternatives. The goal is to narrow down the alternatives using standard of reasonableness. We aren't going into full designs right now. The next step will involve advancing the design into the Environmental Assessment to get good apples to apples with all of the alternatives.

- Is the genesis of this project that there were funds that Florida turned down?
  The initial thinking about this started in 2005-2006 as we had a City Model for Mobility. The recognition was that the city was becoming a regional employment center with more commuters and looking to initiate more sustainable mobility. Looking at the future transportation needs we saw that the current station was inadequate. This concept was added to the City's master plan updated adopted by City Council in 2009.

- What about station ownership? If we retrofit the current station who would own it? Is that for all four stations? What is the advantage?
  The intention is for the City to own it. Having control over it is an advantage and making it a public amenity.

Comments from MDOT
Amtrak doesn't want to own stations. We want communities to own them because they reflect the community. We try to put stations back into the community.

- I am interested in hearing about lessons learned from other projects in developing this project.
  The State of Michigan has recently made improvements in Dearborn, Grand Rapids, East Lansing, Battle Creek and Troy. That experience has informed the Ann Arbor Station Project.

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- At the current station no one really has a reason to stay at the station. Have you considered for the locations people who will need to spend multiple hours or substantial time at the station?
  The space provided in the station is based on Amtrak standard guidelines for stations.

- If you were to put amenities I would spend more time there. If I was using the border-to-border trail I might stop at the station. It could be an amazing amenity.

- How many hoops are there after the FONSI is reached?
  Once the FONSI is received the additional steps include Preliminary Engineering, Final Design and then construction. There would also be a vote of the people per City Council after Final Design on whether to proceed with Construction.

- What is the state of the double-tracking?
  The Michigan Department of Transportation long-term intention is to have double tracks. The Dearborn to Ann Arbor area is a priority now. The DRAFT EIS for Chicago to Detroit High Speed Rail includes Infrastructure Improvements between Kalamazoo and Dearborn, Michigan. The Build Alternative would include additional maintenance upgrades for the Corridor east of Kalamazoo, Michigan to Dearborn, Michigan, now owned by MDOT. Additionally, new siding tracks are needed between the existing Ann Arbor Station and Control Point (CP) Ypsi to accommodate full build-out service.

Ann Arbor Station Environmental Review
Site Tour/Citizen Working Group
Meeting Notes

Date: Monday, September 15, 2014
Time: 12:10-1:00 PM
Location: Ann Arbor City Hall/Council Chambers
Attendees:

State Representative Gretchen Driskell
Michael Benham, AAATA
Sabra Briere, Ann Arbor City Council
Ryan Buck, WATS
Therese Cody, MDOT
Deb Freer, AAATA
Paul Ganz, DTE Energy
Diane Keller, A2Y Chamber
Jane Lumm, Ann Arbor City Council
Andrew Selinger, Oxford Companies
Eric Toumey, McKinley Commercial

Wayne Appleyard
Larry Baird
Clark Charnetski
George Gaston
Karen Hart
Nancy Kaplan
Larry Krieg
Rita Mitchell
Kai Petainen
Kirk Westphal

City of Ann Arbor
Eli Cooper
Nate Geisler

The Site Tour for the Ann Arbor Station Environmental Review was held on Monday, September 15, 2014 from 10:00 AM to 12:00 PM. A group of representatives from the Citizen Working Group, Leadership Advisory Group, and general public attended the tour. The group was taken by bus to visit the three Build Alternatives under consideration. Upon conclusion of the tour, the group reconvened at City Hall for a brief meeting from 12:10 PM until 1:00 PM. This report summarizes the main areas that were commented upon during the meeting. Responses are in italics. Additional information about the project can be found here: www.a2gov.org/annarborstation.

- **There aren't a lot of people represented here. Can you explain the process for decision-making?**
  In addition to the Site Tour, we plan Citizen Working Group and Leadership Advisory Group meetings as well as a public meeting. We'll be presenting our recommended Preferred Alternative for the station and gathering additional feedback. We will also be placing all of the tour materials on the project website.

  Once the input is received and considered, the Preferred Alternative will be incorporated into the Environmental Assessment. This report will be presented publically for comment, and forwarded to the FRA for their review and approval. Pending the FRA's direction additional public engagement may be needed.

- **The North Main Street site still looks like a great opportunity for redevelopment. It's also well connected to the highway.**
  We are not recommending further consideration of Build Alternative 1 (North Main Street) for the following reasons:
  - *The site is not near major activity areas. The closest, downtown Ann Arbor, is about one mile away—farther than the standard walk tolerance distance of one-half mile. Other alternatives are closer to activity areas. No public transit routes currently serve the site.*
  - *North Main Street is not a conducive environment for non-motorized access;*
  - *In the Phase I Alternatives Analysis, this site was not recommended for further consideration. Several stakeholders, however, requested further consideration of the site. The primary justification we heard for this request was a desire to redevelop the North Main Street area. The Project Team consented, and developed conceptual site plans for the area. The Team's conclusion was that the station program would require all properties between North Main Street, Bandemer Park and the Huron River within about 700 feet of Lake Shore Drive. This would necessitate relocating several businesses, including newly redeveloped areas. Due to parklands north and south of the site, very little land would remain for potential station-oriented development. The remaining large parcels are north of the site, surrounded by the M14 access ramps. Build Alternative 2 (Depot Street/Existing Amtrak) is approximately one-half mile from the site. Should Build Alternative 2 advance, it offers an opportunity for North Main Street redevelopment that is close to passenger transportation and transit;*
  - *The prospect of acquiring several properties along the segment and relocating businesses raises the capital and socioeconomic costs of locating a station here; and*
  - *Build Alternative 1 would require parkland uses. Lake Shore Drive would need to shift a few hundred feet to the north or be eliminated. Either scenario impacts Bandemer Park. A new park and river access road would cut through forested parkland. Federal regulations stipulate that an alternative that requires parkland uses will not be selected unless no other feasible and prudent alternative exists.*

- **Why isn't station-oriented development included in your list of environmental criteria?**
  The Federal Railroad Administration (FRA) provides the environmental categories that must be considered as part of the Environmental Review. Station and transit-oriented development can be included as socioeconomic criteria, but are not a stand-alone environmental category. That said, redevelopment opportunities can still be considered in the Phase II Alternatives Analysis and factor into the selection of a Preferred Alternative.

- **How will you be evaluating the environmental criteria?**
  We are looking for input on which are the important or critical criteria for consideration. The Project Team will proceed with analysis of appropriate Build alternatives (Build Alt. 2 Depot Street/Existing Amtrak, and Build Alt. 3 Fuller Road—West) and the No Build scenario (use of the existing Amtrak Station facilities). As we evaluate the criteria, we will be looking for which site presents the fewest environmental impacts, includes opportunities for mitigation and contains the most potential for success. The detailed analysis will be available for review prior to the next round of meetings. We look forward to your critique of the analysis.

- **The map of Build Alternative 2 (Depot Street/Existing Amtrak) shows a series of green dots representing hazardous materials, but the map of Build Alt. 3 (Fuller Road—West) does not. This gives the impression of a bias towards Build Alternative 3. Hazardous materials were indicated on a previous map of the Fuller Road—West site.**
  The map of the Fuller Road—West site shared in previous meetings indicated sites of potential hazardous materials concern. After more detailed analysis, these sites do not appear to require environmental remediation and thus their markers were removed from the latest maps. The maps shared at the September 15 Site Tour represent the best available hazardous materials information to date.

- **Build Alternative 2 (Depot Street/Existing Amtrak) has streets radiating from it connecting to many Ann Arbor neighborhoods. Build Alternative 3 (Fuller Road—West) does not offer as many connections in my opinion. The maps presented today do not make this distinction.**
  The Project Team has considered and will continue to consider connections between each Build Alternative location, its immediate surroundings, Ann Arbor neighborhoods, and the region. The team agrees that Build Alternative 2 (Depot Street/Existing Amtrak) offers strong connections to Ann Arbor neighborhoods. The Phase II Alternatives Analysis will include graphical depictions of these connections.

- **Have any changes been made to the ratings that were being used at the last set of meetings?**
  Those ratings pertained only to the Phase I Alternatives Analysis, which reduced the candidate sites for Build Alternatives from 8 to 3. That rating system will not be used for further analysis.

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- **My concern is climate change and I support car-independent lifestyles. My request is that the analysis should take into account where people work and how to make it easier for people to get to where they work without a car.**

The Phase II Alternatives Analysis will include a comparison of employment within one-half mile of the Build Alternative locations. One-half mile is a widely used measurement for a comfortable walking distance to and from passenger transportation. The analysis will also consider other non-automobile access opportunities, including bicycles and public transportation.

- **There's been a lot of talk today about station and transit-oriented development. None of the Build Alternative sites appear to offer much room for nearby development. We need to consider the station development footprint—how much influence a station will have on developable land. Putting a station near other transit such as the proposed Connector increases the development footprint. Please show the Connector on maps for the alternatives.**

The Phase II Alternatives Analysis will offer consideration of both existing development near Build Alternative locations and the potential for infill development near the these locations.

- **Is there still a planned roundabout at the Fuller Road/Maiden Lane/East Medical Center Drive intersection?**

There is ongoing analysis at that location and a design project is underway. A roundabout is still under consideration.

- **If the station is Amtrak owned or City owned would private development still generate income?**

A new station will likely be owned by the City. Income could be generated for the City from parties leasing space in the station.

- **It was shared today that the station's parking structure has been designed for anticipated future Amtrak and commuter rail demand for over 2,000 cars. How does that compare in size to existing municipal structures? Can spaces be added to the structure incrementally as needed, or does it need to open with enough spaces to meet anticipated future demand?**

Ann Arbor's largest municipal parking structure has 700 spaces. As more intercity train trips are added and train travel speeds increased, the station parking demand characteristics may begin to resemble an airport in its intercity demand. We expect that the station can open with fewer than 2000 spaces. To that end, the City is planning for providing significant multimodal access opportunities and managing parking aimed at supporting transportation options. Transit connections, walk and bike access options are to be emphasized. Recent communication with Amtrak also indicates a smaller parking demand; it may be that a 2,000-space garage may never be needed. The Project Team still believes it necessary to select a site that can accommodate a large structure to accommodate planned and potential future needs. The approach to meeting anticipated parking demand is to install adequate parking capacity in the initial phase of construction, and then incrementally providing parking needed to accommodate future demand.

Appendix G: Coordination Letters

Agency	Title	First Name	Last Name	Job Title	Entity	District/Section/Region	Office	Address 1	Address 2	City	State	Zip Code
Federal Government	Mr.	Ernest	Gubry	Environmental Specialist	Federal Aviation Administration		Detroit Airports District Office	11677 S. Wayne Rd.	Suite 107	Romulus	MI	48174
Federal Government	Mr.	Dale	Shipley	Regional Director	Federal Emergency Management Agency			536 S. Clark St.	6th Floor	Chicago	IL	60605
Federal Government	Ms.	Kimberly	Majerus		Federal Highway Administration		Office of Planning & Program Development	19900 Governors Dr.	Suite 301	Olympia Fields	IL	60461
Federal Government	Dr.	Sharunda	Buchanan		Centers for Disease Control		National Center for Envir. Health, EEHS	4770 Buford Hwy, N.E.	Mail Stop F-60	Atlanta	GA	30341-3724
Federal Government	Mr.	Ernie	Quintana	Regional Director	National Park Service	Midwest Region		601 Riverfront Dr.		Omaha	NE	68102-4226
Federal Government	Ms.	Charlene	Dwin Vaughn	Asst. Director	Advisory Council on Historic Preservation	Federal Permitting, Licensing & Asst. Section	Office of Federal Agency Programs	1100 Pennsylvania Ave., NW	Suite 809	Washington	DC	20004
Federal Government	Ms.	Carol	Borgstrom	Director	Office of NEPA, Policy and Assistance		Department of Energy	1000 Independence Ave., S.W.	Room 3E-094, EH42	Washington	DC	20585
Federal Government	Mr.	Garry	Lee	State Conservationist	U. S. Dept. of Agriculture		Natural Resource Conservation Service	3001 Coolidge Rd.	Suite 250	E.ast Lansing	MI	48823
Federal Government	Mr.	Blair	Stanifer	Commander D.P.B., Bridge Management Specialist	U.S. Coast Guard	Ninth Coast Guard Dist.		1240 E. Ninth St.		Cleveland	OH	44199-2060
Federal Government				NEPA Coordinator	U.S. Department of Commerce		National Oceanic & Atmospheric Administration	14t St. & Constitution Ave., NW	Room 6217	Washington	DC	20230
Federal Government				Office of the Secretary	U.S. Dept. of Agriculture			1400 Independence Ave., SW	Room 200-A, Whitten Bldg	Washington	DC	20250
Federal Government	Ms.	Carmen E.	Reverón	Field Environmental Officer	U.S. Department of Housing & Urban Development		McNamara Federal Bldg.	477 Michigan Ave.	Room 1710	Detroit	MI	48226-2592
Federal Government	Mr.	Scott	Hicks	Field Supervisor	U.S. Dept. of Interior - Fish & Wildlife Service			2651 Coolidge Rd.		E. Lansing	MI	48823
Federal Government					U.S. Environmental Protection Agency		Office of Federal Activities, EIS Filing Section	Ariel Rios Bldg (S. Oval Lobby) Mail Code 2252A	1200 Pennsylvania Ave. N.W.	Washington	DC	20460
					Homeland Security							
State of Michigan	Mr.	Gerald	Fulcher, P.E.		Michigan Department of Environmental Quality	Water Resources Division	Transportation & Flood Hazard Mgt. Unit	Constitution Hall - First Floor	P.O. Box 30458	Lansing	MI	48909
State of Michigan	Dr.	William	Moritz	Resource Management Deputy	Michigan Department of Natural Resources			Mason Building- Sixth Floor	P.O. Box 30028	Lansing	MI	48909
State of Michigan	Ms.	Jamie	Clover Adams	Director	Michigan Department of Agriculture & Rural Development			Constitution Hall - Sixth Floor North	P.O. Box 30017	Lansing	MI	48909
State of Michigan	Mr.	Nick	Lyon	Deputy Director	Michigan Department of Community Health		Health Policy, Regulation and Professions Administration	Capitol View Building	201 Townsend	Lansing	MI	48913
State of Michigan	Mr.	Brian	Conway	State Historic Preservation Officer	Michigan State Historic Preservation Office			702 W. Kalamazoo	P.O. Box 30740	Lansing	MI	48909
	Mr.	Dennis	Muchmore	Executive Director	Michigan United Conservation Clubs, Inc.			P.O. Box 30235		Lansing	MI	48909
	Ms.	Rachel	Hood	Executive Director	West Michigan Environmental Action Council			1007 Lake Drive		Grand Rapids	MI	49506
	Mr.	Jordan	Lindberg		Northern Michigan Environmental Action Council		Central Michigan University Dept. of Philosophy & Religion	115 Anspach Hall		Mount Pleasant	MI	49685
	Mr.	Chris	Fries	President	Upper Peninsula Environmental Coalition			205 E Michigan		Marquette	MI	49855
	Ms.	Anne	Woiwode	Director	Sierra Club		Mackinac Chapter	109 East Grand River Avenue		Lansing	MI	48906
	Mr.	Paul	Tait	Executive Director	Southeastern Michigan Council of Governments			535 Griswold Street	Suite 300	Detroit	MI	48226
	Mr.	Charles	Reisdorf	Executive Director	Region 2 Planning Commission		Jackson County Tower Building	120 West Michigan Avenue		Jackson	MI	49201
	Mr.	David	Bee		West Michigan Regional Planning Commission			820 Monroe NW	Suite 214	Grand Rapids	MI	49503-3027
	Ms.	Diane	Rekowski	Director	Northeast Michigan Countil of Governments			121 East Mitchell	P.O. Box 457	Gaylord	MI	49735
	Mr.	Alton	Shipstead	Director	Northwest Michigan Council of Governments			2200 Dendrinos, Suite 201	P.O. Box 506	Traverse City	MI	49685-0506
	Ms.	Sue	Fortune	Executive Director	East Central Michigan Planning and Development Region			3535 State Street		Saginaw	MI	48602
	Mr.	John	Campbell	Executive Director	Eastern upper Peninsula Regional Planning and Development Commission			524 Ashmun	P.O. Box 520	Sault Ste. Marie	MI	49783
	Mr.	Dave	Gillis	Executive Director	Central Upper Peninsula Planning and Development District			2415 14th Avenue South		Escanaba	MI	49829
	Mr.	James L.	Stingle	Director	Western U.P. Planning & Development Commission			326 Shelden Avenue	P.O. Box 365	Houghton	MI	49931
	Mr.	Sandeep	Dey	Executive Director	West Michigan Shoreline Regional Development Commission			137 Muskegon Mall	P.O. Box 387	Muskegon	MI	49443-0387
	Mr.	Jon	Coleman	Executive Director	Tri-County Regional Planning Commission			913 West Holmes Road	Suite 201	Lansing	MI	48910
	Mr.	Rand D.	Bowman	Executive Director	Southcentral Michigan Planning Council (SMPC)			P.O. Box 2137		Portage	MI	49081
	Mr.	Chapin	Cook	Fiscal Officer	GLS Region V Planning and Development Commission			1101 Beach Street	Room 223	Flint	MI	48502-1470

March 14, 2014

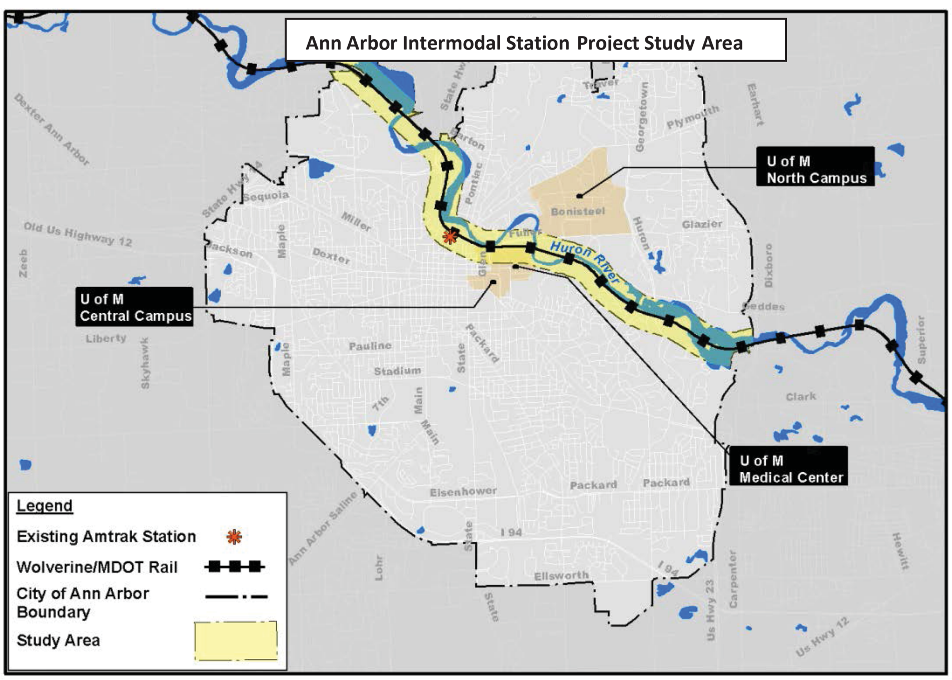
To: [Recipient]

Subject: Ann Arbor Intermodal Station Environmental Assessment:
Early Project Coordination

Dear [Recipient Name]:

The City of Ann Arbor, the Michigan Department of Transportation, and the Federal Railroad Administration are beginning the process to prepare an Environmental Assessment (EA), as defined by the National Environmental Policy Act (NEPA), to study alternatives for a new intermodal station in the City of Ann Arbor, Michigan.

The proposed station will serve intercity rail passengers along Amtrak's Wolverine service, from Chicago, Illinois to Detroit/Pontiac, Michigan; local and regional rail and bus transit services; as well as bicycle and pedestrian traffic. This proposed station will provide transportation connections within the city, state and region. The Project Study area map is included below. The final EA will include a preferred alternative for the station location, within the Study area. The Study is scheduled to conclude in late 2014.



The City of Ann Arbor will be hosting a Public Meeting on Wednesday, April 2nd with two sessions from 4:00pm to 5:30pm, and from 6:30pm to 8:30pm at the Ann Arbor District Library, in the lower level multipurpose room. At the meeting we will discuss the project, the purpose and need for the project, and the range of alternative sites identified, including the existing Ann Arbor Amtrak station site.

Public comments as well as public engagement will be encouraged throughout this Study. Comments received from interested parties during the preparation of the EA will be identified and addressed, as appropriate. A website will be available for updates on the Study as it progresses at www.a2gov.org/annarborstation.

Please identify any concerns or information you may have regarding the project and send them to me at the above address, email me at ecooper@a2gov.org, or call me at (734) 794-6430 ext. 43710. We hope to see you at the April 2nd Public Meeting, and thank you for your interest and participation in the development of the Ann Arbor Intermodal Station Study.

Sincerely,

Eli Cooper, AICP
Transportation Program Manager
City of Ann Arbor

From: Gorski, Robert
Sent: Wednesday, March 19, 2014 9:42 AM
To: Eli Cooper (ecooper@a2gov.org)
Cc: Cooper, Carrie; Winsor, Jeromie
Subject: Ann Arbor Coordination_Homeland Security

Hi Eli – here is the address to use.

U.S. Department of Homeland Security
Intercity Passenger Rail (IPR)
500 C Street SW,
Washington, DC 20472

(202) 646-2500

USDA

United States Department of Agriculture

Natural
Resources
Conservation
Service

Michigan State Office

3001 Coolidge Road
Suite 250
East Lansing, MI
48823-6321

Telephone:
(517) 324-5270
Fax:
(855) 701-4363

www.mi.nrcs.usda.gov

March 24, 2014

Eli Cooper
Transportation Program Manager
City of Ann Arbor
Public Services Area/Systems Planning
301 East Huron Street
P.O. Box 8647
Ann Arbor, Michigan 48107

Dear Mr. Cooper:

The Natural Resources Conservation Service (NRCS) under Part 523 of the Farmland Protection Policy Act has reviewed the proposed Intermodal Station Project. This review was conducted with respect to the effect(s) that the proposal may have on prime and/or unique farmland. Subpart B of Part 523 of the Farmland Protection Policy Act states that 'Lands identified as "urbanized area" (UA) on the Census Bureau maps' are not covered by the act. Since the area of the proposed project extent is UA on the 2010 Census Bureau Reference Map for Ann Arbor, MI (see enclosed map), we have concluded that this proposal will have no negative impact on prime and/or unique farmland.

Should the scope of the project change to where expansion will occur, please resubmit the proposal for our review.

Sincerely,

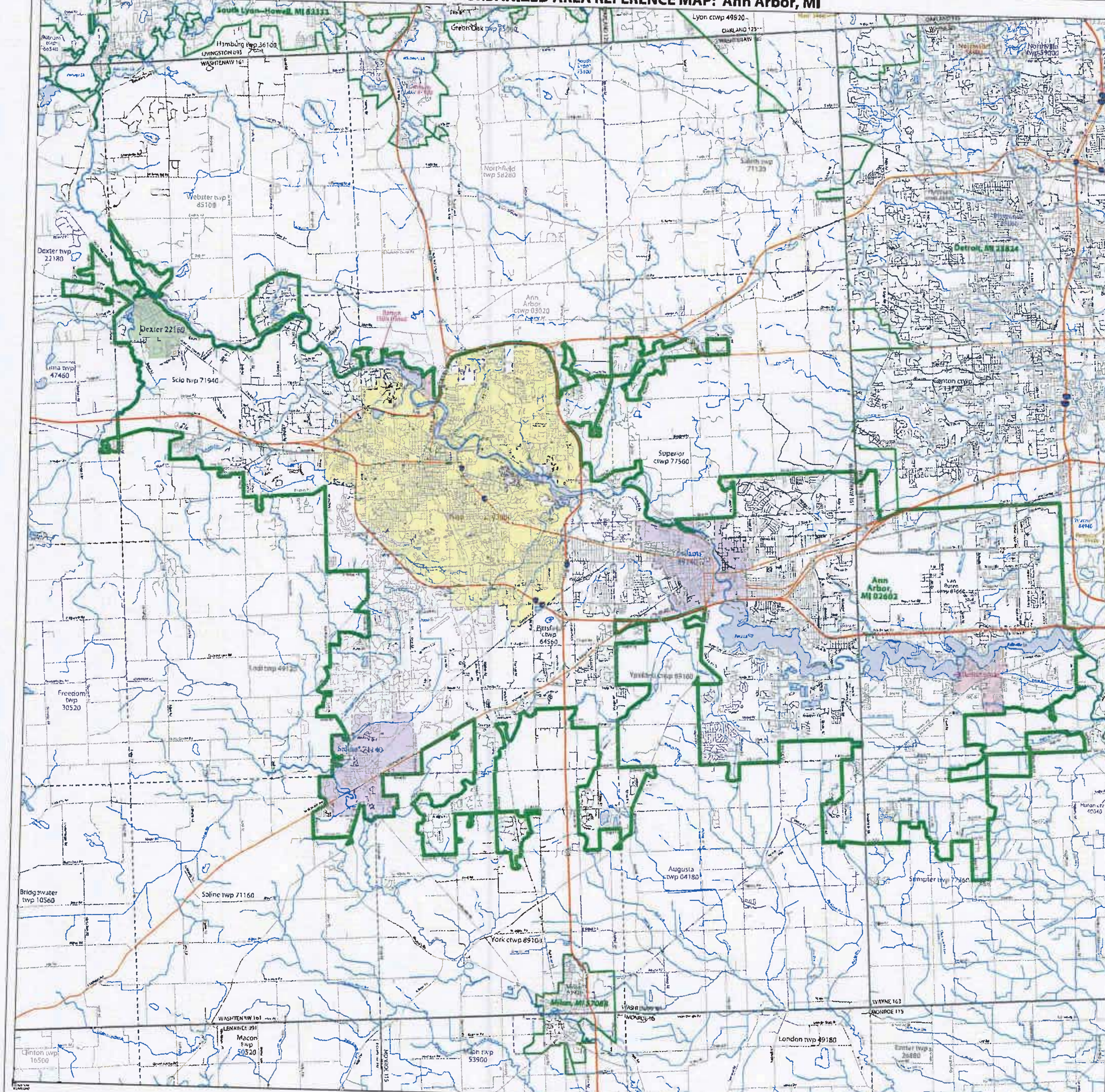
Garry Lee

GARRY LEE
State Conservationist

Enclosure

cc:
Albert Jones, Area Conservationist, NRCS, Flint, MI
Stephen Olds, District Conservationist, NRCS, MI

2010 CENSUS - URBANIZED AREA REFERENCE MAP: Ann Arbor, MI



LEGEND

SYMBOL DESCRIPTION	LABEL STYLE
International	CANADA
Federal American Indian Reservation	L'ANSE RES 1880
Off-Reservation Trust Land	T1880
Urbanized Area	Dover, DE 24580
Urban Cluster	Tooele, VT 88057
State (or statistically equivalent entity)	NEW YORK 36
County (or statistically equivalent entity)	ERIE 029
Minor Civil Division (MCD)	Bristol town 07485
Consolidated City	MILFORD 47500
Incorporated Place	Davis 18100
Census Designated Place (CDP)	

Where international, state, county, and/or MCD boundaries coincide, the map shows the boundary symbol for only the highest ranking of these boundaries.

1 A following an MCD name denotes a false MCD. A following a place name indicates that a false MCD exists with the same name and FIPS code as the place; the false MCD label is not shown.

2 MCD boundaries are shown in the following states in which some or all MCDs function as general-purpose governmental units: Connecticut, Illinois, Indiana, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, South Dakota, Vermont, and Wisconsin. (Note that Illinois and Nebraska have some counties covered by nongovernmental precincts and Missouri has most counties covered by nongovernmental townships.)

3 Place label color corresponds to the place fill color.
Label colors: Davis Davis Davis Davis Davis

SUBJECT AREA COUNTIES ON MAP SHEET
26161 Washtenaw
26163 Wayne

All legal boundaries and names are as of January 1, 2010. Urban areas are based on results from the 2010 Decennial Census. The boundaries shown on this map are for Census Bureau statistical data collection and tabulation purposes only; their depiction and designation for statistical purposes does not constitute a determination of jurisdictional authority or rights of ownership or entitlement.

Geographic Vintage: 2010 Census reference date: January 1, 2010
Data Source: U.S. Census Bureau's MAF/TIGER database (TAB10)
Map Created by Geography Division: March 09, 2012

U.S. DEPARTMENT OF COMMERCE Economics and Statistics Administration U.S. Census Bureau

Census

PARENT SHEET 1

Total Sheets: 1
- Index Sheets: 0
- Parent Sheets: 1

UA NAME: Ann Arbor, MI
UA CODE: 02602
ENTITY TYPE: Urbanized Area (UA)
ST: Michigan (26)

From: andrea.martin@dot.gov
Sent: Monday, March 31, 2014 7:36 AM
To: Cooper, Carrie
Subject: letters

Good morning Carrie; The Ann Arbor letters should go out this week. We aren't going to invite the Army Corps at this time to be a cooperating agency if we can send a normal public agency letter or email to them:

Federal Government
Mr. John Konik
Chief
U.S. Army - Corp of Engineers
Detroit District
Regulatory Functions Branch Construction - Operations Div.
McNamara Bldg., 7th Floor
477 Michigan Ave., Detroit, MI 48231

I will forward the PDF of the official signed letter (once signed) this week to you, Eli, and Therese.

Thank you, Andrea

ANDRÉA E. MARTIN
Environmental Protection Specialist
(d) 202.493.6201
FRA | Federal Railroad Administration

From: **Cooper, Carrie**
Sent: **Thursday, April 03, 2014 8:53 AM**
To: **Gorski, Robert**
Subject: FW: letters

Hi Bob--

This should go to the city so they can send a coordination letter to the corps. We may want to take out the public meeting info in the letter since it has passed.

Thanks,

Carrie

From: andrea.martin@dot.gov [andrea.martin@dot.gov]
Sent: Monday, March 31, 2014 7:35 AM
To: Cooper, Carrie
Subject: letters

Good morning Carrie; The Ann Arbor letters should go out this week. We aren't going to invite the Army Corps at this time to be a cooperating agency if we can send a normal public agency letter or email to them:

Federal Government
Mr. John Konik
Chief
U.S. Army - Corp of Engineers
Detroit District
Regulatory Functions Branch Construction - Operations Div.
McNamara Bldg., 7th Floor
477 Michigan Ave., Detroit, MI 48231

I will forward the PDF of the official signed letter (once signed) this week to you, Eli, and Therese.

Thank you, Andrea

Andréa E. Martin
Environmental Protection Specialist
(d) 202.493.6201
FRA | Federal Railroad
Administration<http://www.fra.dot.gov/Page/P0001>

From: **andrea.martin@dot.gov**
Sent: **Wednesday, March 19, 2014 9:41 AM**
To: **Cooper, Carrie**
Subject: RE: Ann Arbor Coordination

Thanks. I will forward to you the additional letters that FRA won't send out as cooperating. Sometimes
my supervisor will make the list shorter. The City will have to send those letters when I have that information. They are in Texas this week. I apologize it is taking so long, but such are the reviews and signatures from my office.

From: Cooper, Carrie [mailto:carrie.cooper@urs.com]
Sent: Wednesday, March 19, 2014 10:38 AM
To: Martin, Andrea (FRA)
Subject: RE: Ann Arbor Coordination

Thanks Andrea. I'll get this over to the city, so they can include them in their mailing, which I believe is going out today.

Carrie Cooper| URS Corporation
Environmental Planner
342 North Water Street, 7th Floor
Milwaukee, WI 53202
carrie.cooper@urs.com
414-831-4148

From: andrea.martin@dot.gov [mailto:andrea.martin@dot.gov]
Sent: Wednesday, March 19, 2014 9:37 AM
To: Cooper, Carrie
Subject: RE: Ann Arbor Coordination

U.S. Department of Homeland Security
Intercity Passenger Rail (IPR)
500 C Street SW,
Washington, DC 20472
(202) 646-2500

From: Cooper, Carrie [mailto:carrie.cooper@urs.com]
Sent: Wednesday, March 19, 2014 10:06 AM
To: Martin, Andrea (FRA)
Subject: RE: Ann Arbor Coordination

Thanks Andrea. Do you have an address/contact for Homeland Security? I added that agency to MDOT's list because I know we've coordinated with them on the Milwaukee Intermodal Station, but I don't have a contact for them.

Carrie Cooper| URS Corporation
Environmental Planner
342 North Water Street, 7th Floor
Milwaukee, WI 53202
carrie.cooper@urs.com
414-831-4148

From: andrea.martin@dot.gov [mailto:andrea.martin@dot.gov]
Sent: Wednesday, March 19, 2014 9:01 AM
To: Cooper, Carrie
Subject: RE: Ann Arbor Coordination

Hi Carrie; please send Homeland Security the coordination letter. I am still working on getting the cooperating agency letters out. Much of my supervisory staff has been out of the office. I will send you a list of the letters that they decide not send out to be cooperating agencies, and those agencies will receive a coordination letter as well.

Thank you, Andrea

ANDRÉA E. MARTIN
Environmental Protection Specialist
(d) 202.493.6201
FRA | Federal Railroad Administration

From: Cooper, Carrie [mailto:carrie.cooper@urs.com]
Sent: Monday, March 17, 2014 12:21 PM
To: Martin, Andrea (FRA)
Subject: Ann Arbor Coordination

Hi Andrea—

I left you a voicemail as well. At the kickoff meeting in January, we had discussed some coordination with Homeland Security for the Ann Arbor intermodal station. Do you think we should send them the early coordination letter? And if so, do you have a contact name & address? Otherwise, would we work with them later on the design of the station?
Thanks,

Carrie Cooper| URS Corporation
Environmental Planner
342 North Water Street, 7th Floor
Milwaukee, WI 53202
carrie.cooper@urs.com
414-831-4148

STATE OF MICHIGAN
DEPARTMENT OF AGRICULTURE
AND RURAL DEVELOPMENT

RICK SNYDER
GOVERNOR

JAMIE CLOVER ADAMS
DIRECTOR

April 2, 2014

Mr. Eli Cooper, AICP
Transportation Program Manager
Public services Area/Systems Planning
City of Ann Arbor
P.O. Box 8647
Ann Arbor, MI 48107

Re: Ann Arbor Intermodal Station - Environmental Assessment Early Project Coordination

Dear Mr. Cooper:

I received your request for review and comment as part of the Environmental Assessment (EA) Early Coordination Process for the proposed Ann Arbor Intermodal Station. I have reviewed the map and brief discussion of the proposed project with Michigan Department of Agriculture and Rural Development (MDARD) staff.

The proposed project is in a highly developed corridor. While it is not clear if its construction will be conducted entirely within the existing MDOT and Amtrak right of way, this appears to be the case. With that in mind, we note no major impacts to agriculture as a result of this project. Our main concern then, would be the potential impact on established intra- and inter-county drains. It is possible that drain infrastructure may be impacted, either directly or indirectly, by this project although it is difficult to determine at this point. It is important that this project work with the office of Evan Pratt, Washtenaw County Water Resources Commissioner, to determine any potential impacts and, if any, to coordinate project work with their on-going drain maintenance work. Beyond this, to the best of our knowledge, we have no additional concerns regarding the preliminary project plans and issues identified during this Early Coordination Process.

We appreciate being included in this EA Early Coordination Process. Feel free to contact me at 517/284-5612, if we can be of further assistance on this project.

Sincerely,

Abigail S. Eaton
Environmental Resource Specialist
Environmental Stewardship Division

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

April 2, 2014

Eli Cooper, AICP
Transportation Program Manager
City of Ann Arbor
Public Services Area/System Planning
P.O. Box 8647
Ann Arbor, Michigan 48107

Dear Sir/Madam:

SUBJECT: Early Coordination Ann Arbor Intermodal Station Environmental Assessment
Michigan Department of Environmental Quality (MDEQ)
Water Resources Division (WRD)
File Number 14-81-5001

Thank you for your March 17, 2014, early coordination letter regarding the proposed alternatives study for a new intermodal rail station in the City of Ann Arbor, Michigan. The proposed study corridor follows the Amtrak Wolverine rail line within the City of Ann Arbor. The proposed station will serve rail traffic as well as bus, bicycle, and pedestrian traffic. Your letter indicates that your agency is in the process of preparing an Environmental Assessment.

The WRD has the following comments.

a) Most of the study area follows the Huron River. Any filling ,occupation, or grading within the 100-year floodplain of the Huron River will require a permit under the State's Floodplain Regulatory Authority, found in Part 31 , Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). Structures should be located outside of the floodway of the Huron River. Commercial structures must be elevated or floodproofed to 1 foot above the 100-year floodplain elevation. Compensating cut for more than 300 cubic yards of fill in the floodplain will be required.

b) Any work below the ordinary high water mark of a regulated lake or stream will require a permit under Part 301, Inland Lakes and Streams, of the NREPA.

c) It is not clear if any wetlands would be impacted by the proposed project. Available maps indicate the presence of hydric soils and wetlands near the eastern and western ends of the proposed project. If there are wetland impacts, they should be field verified, and their types, functions, and values properly described. Impacts to wetlands due to filling, grading, or draining will require a permit under Part 303, Wetlands Protection, of the NREPA. Mitigation will be required for any unavoidable impacts to wetlands. Additional information on wetlands and the mitigation requirements can be found at www.michigan.gov/deqwetlands.

d) A National Pollution Discharge Elimination System (NPDES) permit will be required for storm water discharges associated with construction activities in accordance with Rule 2190 promulgated in accordance with Part 31, Water Resources Protection, of the Natural Resources Environmental Protection Act, 1994 PA 451, as amended.

e) A review of our database indicates potential State and/or Federal Threatened and Endangered species in sections 16, 17, 20, 21, 26, 27, 28, 35, and 36, T2S, R6E of Ann Arbor Township. It is recommended that you hire a qualified biologist to determine whether your potential site location will impact one of these species. If there are impacts then a permit will be needed from the Department of Natural Resources and/or the U.S. Fish & Wildlife Service.

f) A review of our database indicates potential Part 201 sites being located in sections 16, 20, 21, 27, 28, and 36, T2S, R6E of Ann Arbor Township. If your project is located near a Part 201 site it is recommended that you contact Mr. Mitch Adelman of the MDEQ's Remediation and Redevelopment Division (RRD) in the Jackson District Office at adelmanm@michgan.gov;

If you have any further questions, or wish to arrange a site inspection, please contact Mr. John Skubinna of our office at 517-284-5501, skubinnaj@michigan.gov; or you may contact me at 517-284-5504, fulcherg@michigan.gov; or MDEQ, WRD, P.O. Box 30458, Lansing, Michigan 48909-7958.

Sincerely,

Gerald W. Fulcher, Jr., P.E., Chief
Transportation and Flood Hazard Unit
Water Resources Division
517-284-5504

cc: Mr. Mitch Adelman, MDEQ, RRD
Mr. John Russell, MDEQ, WRD
Mr. John Skubinna, MDEQ, WRD

U.S. Department
of Transportation

Federal Railroad Administration APR - 4 2014

1200 New Jersey Avenue, SE
Washington, DC 20590

Mr. Russell L. Jorgenson, Division Administrator
Federal Highway Administration
Michigan Division
315 W. Allegan, Room-201
Lansing, MI 48933

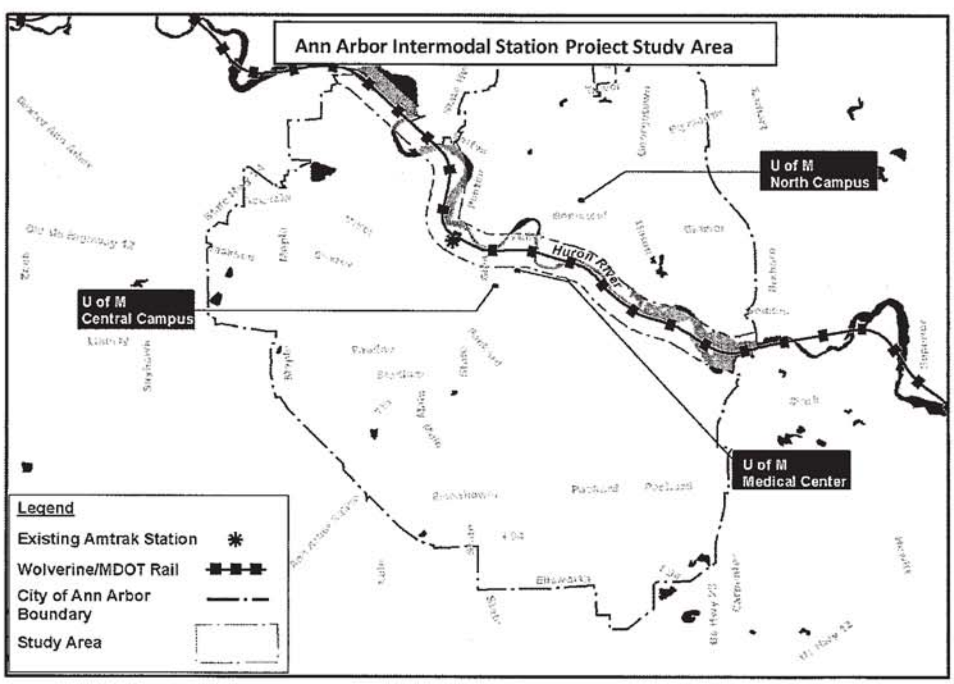
Subject: Ann Arbor Intermodal Station Environmental Assessment

Dear Mr. Russell L. Jorgenson;

The Federal Railroad Administration (FRA), in cooperation with the Michigan Department of Transportation (MDOT) and the City of Ann Arbor, Michigan (City) are preparing an Environmental Assessment (EA), in compliance with the National Environmental Policy Act of 1969 (NEPA), to study alternatives for an Ann Arbor Intermodal station (Project).

The FRA, MDOT and the City are inviting your agency to become a cooperating agency in the development of the EA because your agency may have jurisdiction by law or special expertise with respect to the proposed Project in accordance with 40 CFR 1501.6. The designation does not imply that your agency supports the Project.

The proposed station will serve intercity rail passengers along Amtrak's Wolverine service, from Chicago, Illinois to Detroit/Pontiac, Michigan; local and regional rail and bus transit services; as well as bicycle and pedestrian traffic. This proposed station will provide transportation connections within the city, state and region. The Project Study area map is included below. The final EA will include a preferred alternative for the station location, within the Study area, and is anticipated to conclude in late 2014.



Cooperating agencies will be invited to:

1. Provide meaningful and early input on defining the purpose and need, determining the range of alternatives to be carried forward, and the methodologies and level of detail required in the alternatives analysis;
2. Participate in coordination meetings and joint field reviews, as appropriate; and
3. Provide timely review and comment on the pre-draft or pre-final environmental documents to reflect the views and concerns of your agency on the adequacy of the document, alternatives considered, and the anticipated impacts and mitigation.

Please respond in writing to our office at the above listed address, accepting or declining this invitation to be a cooperating agency, prior to April 30, 2014. If your agency declines to be a cooperating agency, you will have an opportunity to comment on the development of the EA. In addition to the invitation to participate as a cooperating agency, the FRA is also requesting any initial comments regarding the Project's potential impacts to resources that your agency has jurisdiction over to ensure the full range of issues related to the proposed action and the reasonable alternatives are addressed and all significant impacts are identified.

Your agency will be contacted by the study team as appropriate to provide environmental setting data you may have on file and to coordinate on the requirements of state and federal environmental laws and regulations that you administer.

If you have any questions or would like to discuss in more detail the Project or our agencies' respective roles and responsibilities during the preparation of the EA, please contact Andrea Martin of my staff at (202) 493-6201, or by email Andrea.Martin@dot.gov .

Thank you for your cooperation and interest in this Project.

Sincerely,

David Valenstein
Division Chief, Environment and Systems Planning
Federal Railroad Administration

cc:

Therese Cody, MDOT
Eli Cooper, City of Ann Arbor

U.S. Department
of Transportation

**Federal Railroad
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

APR - 4 2014

Ms. Sheila Clements, Director
Federal Transit Administration
Region 5, Office of Planning and Program Development
200 West Adams Street, Suite 320
Chicago, IL 60606

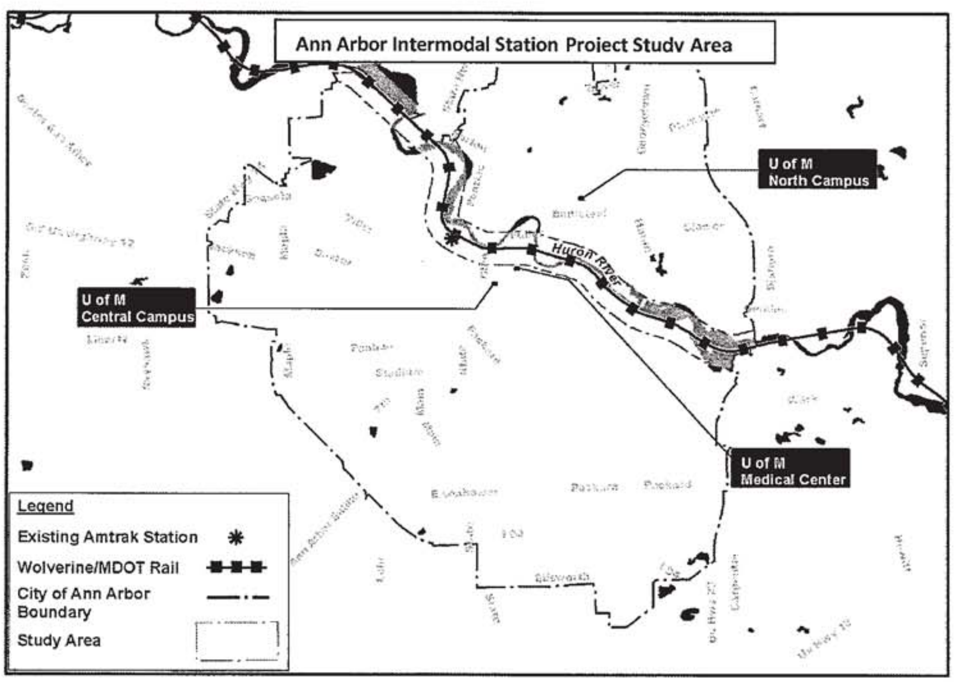
Subject: Ann Arbor Intermodal Station Environmental Assessment

Dear Ms. Sheila Clements;

The Federal Railroad Administration (FRA), in cooperation with the Michigan Department of Transportation (MDOT) and the City of Ann Arbor, Michigan (City) are preparing an Environmental Assessment (EA), in compliance with the National Environmental Policy Act of 1969 (NEPA), to study alternatives for an Ann Arbor Intermodal station (Project).

The FRA, MDOT and the City are inviting your agency to become a cooperating agency in the development of the EA because your agency may have jurisdiction by law or special expertise with respect to the proposed Project in accordance with 40 CFR 1501.6. The designation does not imply that your agency supports the Project.

The proposed station will serve intercity rail passengers along Amtrak's Wolverine service, from Chicago, Illinois to Detroit/Pontiac, Michigan; local and regional rail and bus transit services; as well as bicycle and pedestrian traffic. This proposed station will provide transportation connections within the city, state and region. The Project Study area map is included below. The final EA will include a preferred alternative for the station location, within the Study area, and is anticipated to conclude in late 2014.



Cooperating agencies will be invited to:

1. Provide meaningful and early input on defining the purpose and need, determining the range of alternatives to be carried forward, and the methodologies and level of detail required in the alternatives analysis;
2. Participate in coordination meetings and joint field reviews, as appropriate; and
3. Provide timely review and comment on the pre-draft or pre-final environmental documents to reflect the views and concerns of your agency on the adequacy of the document, alternatives considered, and the anticipated impacts and mitigation.

Please respond in writing to our office at the above listed address, accepting or declining this invitation to be a cooperating agency, prior to April 30, 2014. If your agency declines to be a cooperating agency, you will have an opportunity to comment on the development of the EA. In addition to the invitation to participate as a cooperating agency, the FRA is also requesting any initial comments regarding the Project's potential impacts to resources that your agency has jurisdiction over to ensure the full range of issues related to the proposed action and the reasonable alternatives are addressed and all significant impacts are identified.

Your agency will be contacted by the study team as appropriate to provide environmental setting data you may have on file and to coordinate on the requirements of state and federal environmental laws and regulations that you administer.

If you have any questions or would like to discuss in more detail the Project or our agencies' respective roles and responsibilities during the preparation of the EA, please contact Andrea Martin of my staff at (202) 493-6201, or by email Andrea.Martin@dot.gov .

Thank you for your cooperation and interest in this Project.

Sincerely,

David Valenstein
Division Chief, Environment and Systems Planning
Federal Railroad Administration

cc:

Therese Cody, MDOT
Eli Cooper, City of Ann Arbor

U.S. Department
of Transportation

Federal Railroad
Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

APR - 4 2014

Mr. Kenneth A. Westlake, Supervisor
U.S. Environmental Protection Agency – NEPA Implementation
Office of Enforcement & Compliance Assurance
Region 5, E- 19J
77 W. Jackson Blvd.
Chicago, IL 60604-3590

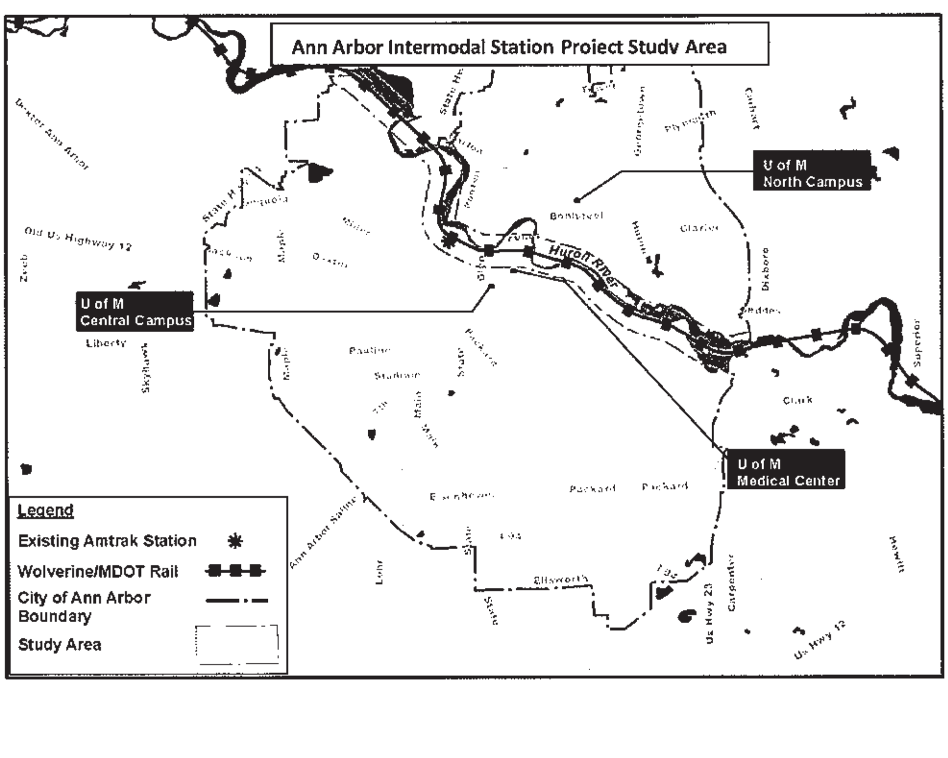
Subject: Ann Arbor Intermodal Station Environmental Assessment

Dear Mr. Kenneth A. Westlake;

The Federal Railroad Administration (FRA), in cooperation with the Michigan Department of Transportation (MDOT) and the City of Ann Arbor, Michigan (City) are preparing an Environmental Assessment (EA), in compliance with the National Environmental Policy Act of 1969 (NEPA), to study alternatives for an Ann Arbor Intermodal station (Project).

The FRA, MDOT and the City are inviting your agency to become a cooperating agency in the development of the EA because your agency may have jurisdiction by law or special expertise with respect to the proposed Project in accordance with 40 CFR 1501.6. The designation does not imply that your agency supports the Project.

The proposed station will serve intercity rail passengers along Amtrak's Wolverine service, from Chicago, Illinois to Detroit/Pontiac, Michigan; local and regional rail and bus transit services; as well as bicycle and pedestrian traffic. This proposed station will provide transportation connections within the city, state and region. The Project Study area map is included below. The final EA will include a preferred alternative for the station location, within the Study area, and is anticipated to conclude in late 2014.



Cooperating agencies will be invited to:

1. Provide meaningful and early input on defining the purpose and need, determining the range of alternatives to be carried forward, and the methodologies and level of detail required in the alternatives analysis;
2. Participate in coordination meetings and joint field reviews, as appropriate; and
3. Provide timely review and comment on the pre-draft or pre-final environmental documents to reflect the views and concerns of your agency on the adequacy of the document, alternatives considered, and the anticipated impacts and mitigation.

Please respond in writing to our office at the above listed address, accepting or declining this invitation to be a cooperating agency, prior to April 30, 2014. If your agency declines to be a cooperating agency, you will have an opportunity to comment on the development of the EA. In addition to the invitation to participate as a cooperating agency, the FRA is also requesting any initial comments regarding the Project's potential impacts to resources that your agency has jurisdiction over to ensure the full range of issues related to the proposed action and the reasonable alternatives are addressed and all significant impacts are identified.

Your agency will be contacted by the study team as appropriate to provide environmental setting data you may have on file and to coordinate on the requirements of state and federal environmental laws and regulations that you administer.

If you have any questions or would like to discuss in more detail the Project or our agencies' respective roles and responsibilities during the preparation of the EA, please contact Andrea Martin of my staff at (202) 493-6201, or by email Andrea.Martin@dot.gov .

Thank you for your cooperation and interest in this Project.

Sincerely,

David Valenstein
Division Chief, Environment and Systems Planning
Federal Railroad Administration

cc:

Therese Cody, MDOT
Eli Cooper, City of Ann Arbor

From: **Cooper, Eli <ECooper@a2gov.org>**
Sent: **Wednesday, April 09, 2014 4:03 PM**
To: **Cooper, Carrie**
Subject: RE: Additional Coordination letters returned as undeliverable

Thanks!

From: Cooper, Carrie [mailto:carrie.cooper@urs.com]
Sent: Wednesday, April 09, 2014 4:01 PM
To: Cooper, Eli
Cc: Gorski, Robert; Bookvich, Patty; Slotten, Cresson; Debra Power
Subject: RE: Additional Coordination letters returned as undeliverable

Hi Eli—

These letters do not need to be resent.
Thanks,

Carrie

Carrie Cooper| URS Corporation
Environmental Planner
342 North Water Street, 7th Floor
Milwaukee, WI 53202
carrie.cooper@urs.com
414-831-4148
Please consider the environment before printing this email.

From: Cooper, Carrie
Sent: Wednesday, April 09, 2014 8:08 AM
To: 'Cooper, Eli'; Debra Power
Cc: Gorski, Robert; Bookvich, Patty; Slotten, Cresson
Subject: RE: Additional Coordination letters returned as undeliverable

I'll check with Lori Noblet on these & get back to you.
Thanks,

Carrie

Carrie Cooper| URS Corporation
Environmental Planner
342 North Water Street, 7th Floor
Milwaukee, WI 53202
carrie.cooper@urs.com
414-831-4148
Please consider the environment before printing this email.

From: Cooper, Eli [mailto:ECooper@a2gov.org]
Sent: Tuesday, April 08, 2014 10:28 AM
To: Debra Power; Cooper, Carrie
Cc: Gorski, Robert; Bookvich, Patty; Slotten, Cresson
Subject: Additional Coordination letters returned as undeliverable

Debra/Carrie,

The post office just returned the following Early Project Coordination letters:

* Rand D. Bowman, Southcentral Michigan Planning Council
* Sue Fortune, East Central Michigan Planning and Development

Can you check your database and make sure we have the proper name and addresses. Please let me know if you have new addresses and if we need to resend letters to these agencies.

Thanks
Eli

From: **andrea.martin@dot.gov**
Sent: **Thursday, April 17, 2014 11:06 AM**
To: **Cooper, Carrie**
Subject: RE: Ann Arbor Cooperating Agency letters

Hi Carrie; I am sorry, I totally forgot about the tribal letters. I appreciate the reminder. I will get them out early next week based off the addresses Lori had sent. Thank you, Andrea

ANDRÉA E. MARTIN
Environmental Protection Specialist
(d) 202.493.6201
FRA | Federal Railroad Administration

From: Cooper, Carrie [mailto:carrie.cooper@urs.com]
Sent: Thursday, April 17, 2014 11:43 AM
To: Martin, Andrea (FRA)
Subject: RE: Ann Arbor Cooperating Agency letters

Hi Andrea—

Were there also Tribal letters that have been sent out?
Thanks,

Carrie

Carrie Cooper| URS Corporation
Environmental Planner
342 North Water Street, 7th Floor
Milwaukee, WI 53202
carrie.cooper@urs.com
414-831-4148
Please consider the environment before printing this email.

From: andrea.martin@dot.gov
[mailto:andrea.martin@dot.gov]
Sent: Wednesday, April 09, 2014 7:01 AM
To: ECooper@a2gov.org; CodyT@michigan.gov
Cc: NOBLETL@michigan.gov; wynne.davis@dot.gov
Subject: Ann Arbor Cooperating Agency letters

Please see attached your copies of the Ann Arbor Station Cooperating Agency letters sent by the FRA on
April 4, 2014. I am available if you have any questions.

Thank you, Andrea

ANDRÉA E. MARTIN
Environmental Protection Specialist

FRA | Federal Railroad Administration
1200 New Jersey Avenue SE, Mail Stop 20, W38-215
Washington, DC 20590
(d) 202.493.6201 (f) 202.493.6333
andrea.martin@dot.gov

Ketegitigaaning Ojibwe Nation
Lac Vieux Desert Band of Lake Superior Chippewa Indians

April 28, 2014

Project ID: Tower Notifications

Booshoo,

The Lac Vieux Desert Tribal Historic Preservation Office received your request for information related to properties of traditional religious and cultural significance within the vicinity of the proposed facility and any comments or concerns for affects to those properties as according to your obligations under Section 106 of the National Historic Preservation Act and the Native American Graves Protection Act.

The Ketegitigaaning Ojibwe Nation Tribal Historic Preservation Office does not release information related to properties of traditional religious and cultural significance to anyone. However, through government-to-government consultation, the LVD THPO will review project documents to determine whether or not any of these sites exist within the Area of Potential Effects and if so what those effects may be. If we have identified any sites of concern in our research of the project area, we will notify you of the fact.

Please forward the following information: a short summary of the proposed ground disturbing activity, Legal Description of the Area of Potential Effects, Topo maps identifying the proposed area, and copies of any studies that have already been conducted regarding cultural resources and archaeology in their full format, including reports on archaeological and cultural sites identified.

To enable us to participate fully, t**he Ketegitigaaning Ojibwe Nations fee for such services is $100. $50.00 for historical/cultural records research and $50.00 for archaeological records review per section of land**. The fee must be submitted so that the research can be done. At that time we will review and make our determinations with the appropriate information that we have on file with our Tribe pertaining to this area.

All Collocation Projects will be handled in the same manner as new projects UNLESS the Ketegitigaaning Ojibwe Nation commented on the original project.

Should you have any questions, please feel free to contact me at 906-358-0137.

Miigwetch,

Giiwegiizhigookway Martin

giiwegiizhigookway Martin, THPO

Fee can be sent along with the requested information to:
Make Check Payable to:

Ketegitigaaning Ojibwe Nation THPO
P.O. 249
Watersmeet, Michigan 49969
Office: 906-358-0137
Fax: 906-358-4850 Email: gmartin@lvdtribal.com

From: **andrea.martin@dot.gov**
Sent: **Tuesday, May 27, 2014 2:11 PM**
To: **Cooper, Carrie**
Subject: FW: Interest on Projects
Attachments: **Interest Letter.doc**

For our records. I am checking on the list of letters sent.
Thanks!

ANDRÉA E. MARTIN
Environmental Protection Specialist
(d) 202.493.6201
FRA | Federal Railroad Administration

From: Giiwegiizhigookay Martin
[mailto:gmartin@lvdtribal.com]
Sent: Monday, April 28, 2014 4:57 PM
To: Martin, Andrea (FRA)
Subject: Interest on Projects

I am in receipt of your letter date 4/24/2014 – Ann Arbor Intermodal Station Environmental Assessment. However we do have a fee associated with each project such as this. I have attached that letter.

Ms. giiwegiizhigookway Martin
Tribal Historic Preservation Officer
Ketegitigaaning Ojibwe Nation
Lac Vieux Desert Band of Lake Superior Chippewa
P.O. Box 249 (Mailing USPS)
E23857 Poplar Circle (FedEx or UPS)
Watersmeet, MI 49969
Phone: 906-358-0137
Fax: 906-358-4850
Cell: 906-284-1425

Pokégnek Bodéwadmik • Pokagon Band of Potawatomi
Department of Language and Culture

32142 Edwards Street • Dowagiac, MI 49047 • www.PokagonBand-nsn.gov
(269) 462-4325 • (269) 783-0452 fax

May 30, 2014

David Valenstein
Division Chief, Environmental and Systems Planning
Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

RE: Ann Arbor Intermodal Station Environmental Assessment

Dear Mr. Valenstein:

My name is Marcus Winchester and I am the Tribal Historic Preservation Officer for the Pokagon Band of Potawatomi Indians. My position is responsible for handling Section 106 consultation on behalf of the tribe. I am writing to inform you that after reviewing the Ann Arbor Intermodal Station project details, we determined that we are unaware of any historical, religious, or culturally significant resources to the Pokagon Band of Potawatomi Indians in the vicinity of the project area. However, if any archaeological resources are uncovered during this undertaking, please contact me immediately. Should you have any other questions, please don't hesitate to contact me at your earliest convenience.

Sincerely,

M Winchester

Marcus Winchester
Tribal Historic Preservation Officer
Pokagon Band of Potawatomi Indians
Office: (269) 462-4224
Cell: (269) 783-9269
marcus.winchester@pokagonband-nsn.gov

From: **Cooper, Eli <ECooper@a2gov.org>**
Sent: **Thursday, March 27, 2014 3:15 PM**
To: **Cooper, Carrie**
Subject: RE: Coordination letter returned as undeliverable

Thanks

From: Cooper, Carrie [mailto:carrie.cooper@urs.com]
Sent: Thursday, March 27, 2014 4:13 PM
To: Cooper, Eli
Cc: Gorski, Robert; Bookvich, Patty; Debra Power
Subject: RE: Coordination letter returned as undeliverable

Hi Eli—

I talked to Lori Noblet this afternoon, and she doesn't think it's necessary to resend the letter to Ms. Majerus. Her role is more related to freeway projects, and we have included FHWA on the list we sent to the FRA for agencies that would be invited to be a Cooperating Agency, so we should be covered with FHWA.
Thanks,

Carrie

Carrie Cooper| URS Corporation
Environmental Planner
342 North Water Street, 7th Floor
Milwaukee, WI 53202
carrie.cooper@urs.com
414-831-4148

From: Cooper, Carrie
Sent: Thursday, March 27, 2014 9:11 AM
To: 'Cooper, Eli'
Cc: Gorski, Robert; Bookvich, Patty; Debra Power
Subject: RE: Coordination letter returned as undeliverable

Hi Eli—
I'll give Lori Noblet a call at MDOT & track down the correct contact info.

Thanks,

Carrie
Carrie Cooper| URS Corporation
Environmental Planner
342 North Water Street, 7th Floor
Milwaukee, WI 53202
carrie.cooper@urs.com
414-831-4148

From: Cooper, Eli [mailto:ECooper@a2gov.org]
Sent: Tuesday, March 25, 2014 2:36 PM
To: Debra Power
Cc: Cooper, Carrie; Gorski, Robert; Bookvich, Patty
Subject: Coordination letter returned as undeliverable
Importance: High

Debra/Carrie,

The post office just returned the letter addressed to Ms. Kimberly Majerus, FHWA. The address we were provided is:

Office of Planning and Program Development
19900 Governors Dr., Mail Stop F-60
Olympia Fields, IL 60461

Can you check your database and make sure we have the proper name and address.

Thanks
Eli

From: andrea.martin@dot.gov
Sent: Wednesday, May 28, 2014 9:13 AM
To: Cooper, Carrie
Subject: tribal letters

Hi Carrie; below is the information you requested. Please let me know if I can be of further assistance. Thank you, Andrea

ANDRÉA E. MARTIN
Environmental Protection Specialist
(d) 202.493.6201
FRA | Federal Railroad Administration

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Letters were sent by certified mail on April 21, 2014 from FRA to the following federally recognized
tribes within Michigan:

Pokagon Band of Potawatomi Indians
Keweenaw Bay Indian Community
Lac Vieux Desert Band of Lake Superior Chippewa Indians
Bay Mills Indian Community
Little River Band of Ottawa Indians
Match-E-Be-Nash-She-Wish Band of Potawatomi Indians (Gun Lake Tribe)
Sault Ste. Marie Tribe of Chippewa Indians
Little Traverse Bay Bands of Odawa Indians
Nottawaseppi Huron Band of Potawatomi Indians
Saginaw Chippewa Indian Tribe of Michigan
Hannahville Indian Community
Grand Traverse Band of Ottawa and Chippewa Indians

One response email was received by FRA from the Lac Vieux Desert Band of Lake Superior Chippewa
Indians on April 28, 2014.

From: andrea.martin@dot.gov
Sent: Wednesday, June 11, 2014 9:34 AM
To: Cooper, Carrie
Subject: letter for file
Attachments: image2014-06-11-101805.pdf

Please see the attached letter for our records.

Thank you, Andrea

ANDRÉA E. MARTIN
Environmental Protection Specialist

(d) 202.493.6201

FRA | Federal Railroad Administration

Cooper, Carrie

From: Hicks, Scott <scott_hicks@fws.gov>
Sent: Wednesday, October 29, 2014 8:31 AM
To: Cooper, Carrie
Cc: nobletl@michigan.gov; CodyT@michigan.gov; Cooper, Eli (ECooper@a2gov.org); Gorski, Robert; Jack Dingledine; Sandra Kubilis
Subject: Re: Ann Arbor Intermodal Station Environmental Assessment Comments Requested

Thank you for the opportunity to provide comments. We do not have any concerns/comments regarding the proposed project.
Scott

U.S. Fish and Wildlife Service
East Lansing Field Office
2651 Coolidge Road, Suite 101
East Lansing, Michigan 48823

Phone: 517-351-6274
Fax: 517-351-1443

On Tue, Oct 28, 2014 at 1:44 PM, Cooper, Carrie <carrie.cooper@urs.com> wrote:

Dear Mr. Scott Hicks:

The City of Ann Arbor, the Michigan Department of Transportation, and the Federal Railroad Administration are preparing an Environmental Assessment, as defined by the National Environmental Policy Act (NEPA), to study alternatives for a new intermodal station in the City of Ann Arbor, Michigan. A letter was mailed to you from Eli Cooper, City of Ann Arbor, dated 3/17/2014 requesting comments from the Fish and Wildlife Service regarding this project. Please feel free to contact Eli Cooper at (734) 794-6430 ext. 43710 or at ecooper@a2gov.org for additional information or if you have any questions. We look forward to your comments.

Sincerely,

Carrie Cooper

Carrie Cooper| URS Corporation

Environmental Planner

342 North Water Street, 7th Floor

Milwaukee, WI 53202

carrie.cooper@urs.com

414-831-4148

Please consider the environment before printing this email.