

**Zoning Board of Appeals  
March 22, 2017 Regular Meeting**

**STAFF REPORT**

**Subject: ZBA17-006, 3381 Nixon Road**

**Summary:** Toll MI VI Limited Partnership, is requesting a variance from Chapter 104 Fences Section 8:434 (1)(a) and (1)(b) to allow an eight (8) foot tall, one hundred (100) percent opaque fence to be installed along the M-14/US-23 highway. The site is zoned R4A with conditions. One condition requires the site to be developed per the site plan as approved by City Council. The district requires a minimum of fifteen (15) foot and a maximum forty (40) foot front setback.

**Description and Discussion:**

The subject parcel is located at the northwest corner of Nixon and Dhu Varren Road intersection. It is bounded on three (3) sides by public rights-of-way. A front lot line is defined as any lot line abutting a right-of-way. The new community (North Oaks) is being developed by Toll Brothers shows thirteen (13) approved units to be located within forty (40) feet of east bound M-14 right of way. The proposed fence will be seven hundred (700) feet in length with mature Black and White Spruce landscaping to accompany the fence. The petitioner states the objective of the fence is to dampen and abate vehicle and truck noise as well as the views of traffic along M-14.

The applicant states that the property is unique because of the close proximity of the residential units to the highway. The units were positioned at their location due to the preservation of natural features in the interior of the site and the subject units were squeezed to the northern exterior of the subdivision. Additionally, these units are at an elevation of thirteen (13) feet above the highway. The proposed fence would reduce the decibel level by 4dba according to a third-party engineering firm specializing in residential and commercial acoustics.

The following requirements are excerpts from Chapter 104, Section 8:434(1)(a) and (1)(b):

(1) Fences located in residential districts:

(a) In the required front open space shall not exceed 4 feet in height and 50% opacity

(b) Shall not exceed 6 feet in height and 80% opacity in any part, which is 25 feet behind the front setback line.

The proposed fence would reduce the decibel level by 4dba according to a third-party engineering firm specializing in residential and commercial acoustics.

**Standards for Approval (Variance):**

The Zoning Board of Appeals has all the power granted by State law and by Section 5:99, Application of the Variance Power from the City of Ann Arbor Zoning Ordinance. The following criteria shall apply:

***The Zoning Board of Appeals of the City of Ann Arbor may, after a hearing in accordance with the established procedures of the Board, in its sound discretion and in the interests of the public health, safety or welfare of the inhabitants of the community, reduce or remit the requirements of this Chapter in individual cases.***

The petitioner states that allowing an eight (8) foot tall fence will not have a negative impact on the surrounding communities visually or acoustically. The communities include Barclay Park, Foxfire and the commercial property Green Things Farm. The closest neighboring property will be located approximately three hundred and twenty (320) feet from the fence. Additionally, the noise study indicates that Green Things Farm will be the only property that could potentially be impacted by noise reflection.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read "Jon Barrett". The signature is stylized with large, loops for the letters "J" and "B".

**Jon Barrett**  
**Zoning Coordinator**

## APPLICATION FOR VARIANCE OR NON-CONFORMING STRUCTURE ZONING BOARD OF APPEALS

### Section 1: Applicant Information

Name of Applicant: Toll MI VI Limited Partnership  
 Address of Applicant: 28004 Center Oaks Ct. #200, Wixom MI 48393  
 Daytime Phone: 248 305 4000  
 Fax: 248 305 4001  
 Email: abrown3@tollbrothersinc.com  
 Applicant's Relationship to Property: Owner

### Section 2: Property Information

Address of Property: 2999 Nixon Road, Ann Arbor MI 48105  
 Zoning Classification: R4A  
 Tax ID# (if known): 09-09-15-103-014  
 \*Name of Property Owner: Toll MI VI Limited Partnership

*\*If different than applicant, a letter of authorization from the property owner must be provided.*

### Section 3: Request Information

☒ Variance

Chapter(s) and Section(s) from which a variance is requested:

Required dimension:

PROPOSED dimension:

Code Chapter 104, Section 8:434 (1)(a)

4' high fence

8' high fence

Code Chapter 104, Section 8:434 (1)(b)

50% opacity

100% opacity

*Example: Chapter 55, Section 5:26*

*Example: 40' front setback*

*Example: 32'*

Give a detailed description of the work you are proposing and why it will require a variance (attach additional sheets if necessary)

Toll Brothers is proposing a 8 ft high, 700 ft long wooden fence at the North Oaks property line along the M-14 Frontage. The variance is required because the ordinance for "STREET FRONTAGE" property restricts fence height and opacity. Please see attached details.

### Section 4: VARIANCE REQUEST (If not applying for a variance, skip to section 5)

The City of Ann Arbor Zoning Board of Appeals has the powers granted by State law and City Code Chapter 55, Section 5:98. A variance may be granted by the Zoning Board of Appeals only in cases involving practical difficulties or unnecessary hardships when **ALL** of the following is found **TRUE**. Please provide a complete response to each item below. These responses, together with the required materials in Section 5 of this application, will form the basis for evaluation of the request by staff and the Zoning Board of Appeals. (continued...)

**1. Are there hardships or practical difficulties to complying with the ordinance? Are these hardships or practical difficulties an exception or unique to the property compared to other properties in the City?**

There are hardships that affect the property and a large number of future residents will be aggrieved. An inordinate amount of intense noise will inundate this unique location. North Oaks preserved massive quantities of natural woodlands and wetlands which pushed the development next to the highway. 8 ft fences are normally permitted in residential rear yards like these. The unfortunate "STREET FRONTAGE" designation reduces the fence height and effectiveness where it is needed most. Please see attached answer #1 for details supporting this position

**2. Are the hardships or practical difficulties more than mere inconvenience, inability to obtain a higher financial return? (explain)**

The hardships are more than mere inconveniences. Homeowners will experience a reduced quality of life without this variance. This is not a matter of financial return. Please see attached answer #2 for details supporting this position

**3. What effect will granting the variance have on the neighboring properties? \_\_\_\_\_**

Granting the variance **will not have any negative effects**, visually or acoustically, on the neighboring communities. In fact, the proposed fence **will have positive impacts** on surrounding communities and vehicular traffic along M-14. Please see attached answer #3 for details supporting this position

**4. What physical characteristics of your property in terms of size, shape, location or topography prevent you from using it in a way that is consistent with the ordinance?**

The natural characteristics of the North Oaks community present difficulties because abundant and unique natural features pushed the units to the edge of the property in close proximity to M-14. Additional physical characteristics compound the problem. Please see attached answer #4 for details supporting this position

**5. Is the condition which prevents you from complying with the ordinance self-imposed? How did the condition come about?**

The current condition of the site is in no way self imposed. It is the direct result of the city of Ann Arbor's development goals for this parcel. Please see attached answer #5 for details supporting this position

**Section 5: ALTERATION TO A NON-CONFORMING STRUCTURE**

Current use of the property Not Applicable

The proposed change is allowed in accordance with Structure Non-Conformance, Section 5:87 (1) (a) & (b), which reads as follows:

- (1) A non-conforming structure may be maintained or restored, but no alteration shall be made to a non-conforming structure unless one of the following conditions is met:
  - a. The alteration is approved by the Zoning Board of Appeals upon finding that it complies as nearly as practicable with the requirements of this Chapter and that it will not have a detrimental effect on neighboring property.
  - b. The alteration conforms to all the requirements of this Chapter and is made to a building which will be a single-family dwelling on completion of the alteration and is located in an R1,R2, R3, or R4 district.
  - c. The structure is considered non-conforming due to the following reasons

(continued . . . . .)



| <u>Existing Condition</u> | <u>Code Requirement</u> |
|---------------------------|-------------------------|
| Lot area _____            | Not Applicable _____    |
| Lot width _____           | Not Applicable _____    |
| Floor area ratio _____    | Not Applicable _____    |
| Open space ratio _____    | Not Applicable _____    |
| Setbacks _____            | Not Applicable _____    |
| Parking _____             | Not Applicable _____    |
| Landscaping _____         | Not Applicable _____    |
| Other _____               | Not Applicable _____    |

Describe the proposed alterations and state why you are requesting this approval:

Not Applicable \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

The alteration complies as nearly as is practicable with the requirements of the Chapter and will not have a detrimental effect on neighboring property for the following reasons:

Not Applicable \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Wherefore, Petitioner requests that permission be granted from the above named Chapter and Section of the Ann Arbor City Code in order to permit \_\_\_\_\_

Not Applicable \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Section 6: Required Materials

The following materials are required for all variance requests. Failure to provide these materials will result in an incomplete application and will delay staff review and Zoning Board of Appeals consideration of the request. The materials listed below must accompany the application and constitute an inseparable part of the application.

All materials must be provided on **8 ½” by 11” sheets.** (Continued.....)

- ☒ Survey of the property including all existing and proposed structures, dimensions of property, and area of property. (See Attached)
- ☐ Building floor plans showing interior rooms, including dimensions. (Not Applicable)
- ☒ Photographs of the property and any existing buildings involved in the request. (See Attached Exhibits 1 - 3)
- ☒ Any other graphic or written materials that support the request. (See Attached Exhibits 4 - 13)

## Section 7: Acknowledgement

### SIGNATURES MUST BE SIGNED IN PRESENCE OF NOTARY PUBLIC

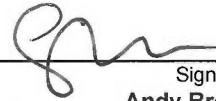
I, the applicant, request a variance from the above named Chapter(s) and Section(s) of the Ann Arbor City Code for the stated reasons, in accordance with the materials attached hereto.

734 812 9820

Phone Number

abrown3@tollbrothersinc.com

Email Address



Signature

Andy Brown

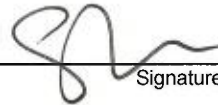
Print Name

I, the applicant, hereby depose and say that all of the aforementioned statements, and the statements contained in the materials submitted herewith, are true and correct.



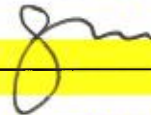
Signature

Further, I hereby give City of Ann Arbor Planning & Development Services unit staff and members of the Zoning Board of Appeals permission to access the subject property for the purpose of reviewing my variance request.



Signature

I have received a copy of the informational cover sheet with the deadlines and meeting dates and acknowledge that staff does not remind the petitioner of the meeting date and times.



Signature

On this 22 day of Feb, 2017, before me personally appeared the above named applicant and made oath that he/she has read the foregoing application by him/her subscribed and knows the contents thereof, and that the same is true as to his/her own knowledge except as to those matters therein stated to be upon his information and belief as to those matters, he/she believes them to be true.



Notary Public Signature

TRICIA DEDVUKAJ

Notary Public - Michigan

Oakland County

My Commission Expires Jan 14, 2022

Acting in the County of \_\_\_\_\_

01/14/22

Notary Commission Expiration Date

### Staff Use Only

Date Submitted: \_\_\_\_\_

Fee Paid: \_\_\_\_\_

File No.: \_\_\_\_\_

Date of Public Hearing \_\_\_\_\_

Pre-filing Staff Reviewer & Date \_\_\_\_\_

ZBA Action: \_\_\_\_\_

Pre-Filing Review: \_\_\_\_\_

Staff Reviewer & Date: \_\_\_\_\_

**Ann Arbor Zoning Board of Appeals  
Variance Application  
Toll Brothers  
February 17, 2017**

**SECTION 3: REQUEST INFORMATION**

**Give a detailed description of the work you are proposing and why it will require a variance**

North Oaks of Ann Arbor, located at Nixon and Dhu Varren Road, is a new community being developed by Toll Brothers. It will include Carriage homes in the north portion of the community (north of Dhu Varren Rd.) with a property line that extends to the limits of M-14 ROW. The current approved site plan shows 13 proposed units to be located within 40 ft of east bound M-14 ROW (see Exhibits 1 and 2). Toll Brothers is requesting a variance to Ordinance Code Chapter 104, Section 8:434 (limiting the maximum fence height along frontage to 4 ft with 50% opacity), to allow for an 8 ft high, 1"x6" wooden, board-on-board fence with 100% opacity (see Exhibit 9 and 10) along the north property line in order to dampen and abate vehicle and truck noise as well as unsightly views of traffic from M-14. The fence will exist within the designated area of disturbance, with an approximate total length of 700 ft. In addition, proposed landscaping, including mature Black and White Spruce, is planned to accompany the proposed fence.

The variance is required because a 4 ft high fence designed with 50% opacity, allowed by the ordinance, will not achieve the appropriate noise reduction for a reasonable standard of living for homeowners. A third-party engineering firm specializing in residential and commercial acoustics, conducted a 33 hour sound study that represented normal weekday and weekend traffic conditions (including rush hours), and showed that decibel levels were recorded between 60.5 and 71 dBA. If the noise was originating from other than a traffic source (such as an HVAC unit), the sound levels would be violating Ann Arbors maximum permissible noise level ordinance (see attached Acoustics Report, Table 1: Ann Arbor maximum permissible sound levels for non-vehicular noise). The study also showed sound waves continually propagating at full strength and intensity through a 4 ft high, 50% opaque fence, providing no relief for homeowners along the north property line. In addition, computer modeling that factored in proposed buildings, final grading, proposed landscaping, and typical traffic volumes was created to explore various combinations of fence heights, locations, and material (see attached Acoustics Report, Figure C6 – Figure C8). The results showed that a proposed 12 ft high wooden fence would be ideal for noise abatement. However, valuing precedent established by existing highway fences, an 8 ft fence was chosen as an ideal proposed compromise between noise reduction and current ordinances. The installation of an 8 ft high fence combined with minor re-grading and landscape enhancements along the property line would provide a reduction of 4 dBA and maintain a quality of life deserved by Ann Arbor community members.

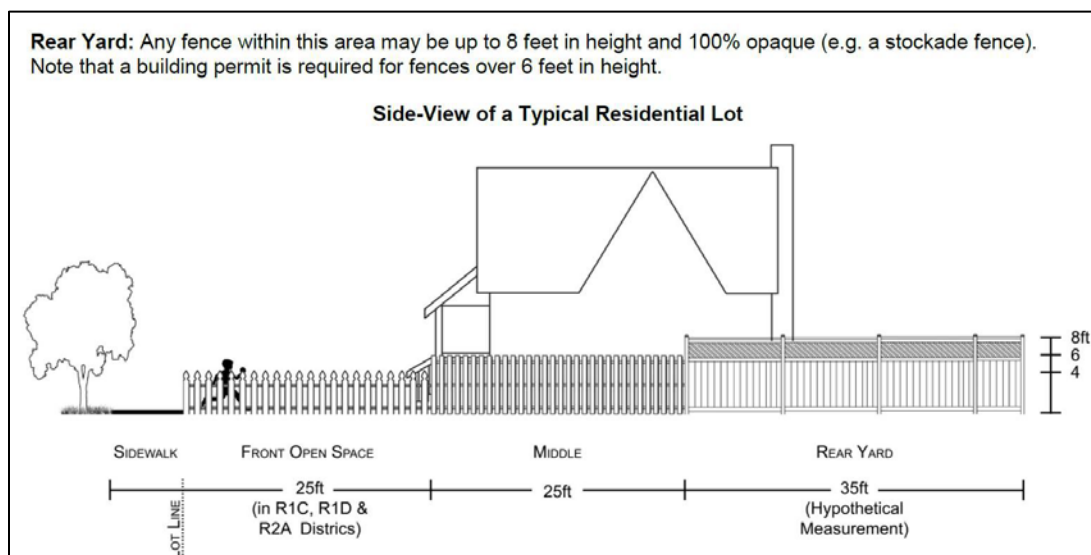
**SECTION 4: VARIANCE REQUEST**

**The City of Ann Arbor Zoning Board of Appeals has the powers granted by State law and City Code Chapter 55, Section 5:98. A variance may be granted by the Zoning Board of Appeals only in cases involving practical difficulties or unnecessary hardships when ALL of the following is found TRUE. Please provide a complete response to each item**

below. These responses, together with the required materials in Section 5 of this application, will form the basis for evaluation of the request by staff and the Zoning Board of Appeals.

**1. Are there hardships or practical difficulties to complying with the ordinance? Are these hardships or practical difficulties an exception or unique to the property compared to other properties in the City?**

The main hardship that Toll Brothers faces is the great number of Ann Arbor residents who will be constantly exposed to unsightly traffic volumes and significant traffic noise. Toll Brothers strived to preserve a massive amount of existing woodland and wetlands approximately 65% of the total property acreage. This forced a great number of Carriage homes to be pushed to this undesirable location where they will incur the maximum intensity of the highway annoyance. In this case, adhering to one important development guideline (preserving the natural features) created the hardship of the intense noise pollution that will be incurred by such a large number of residents at this unique location. This is compounded by an additional hardship because the area directly north of the units is designated as frontage (Ordinance Code Chapter 104, Section 8:434, Frontage being restricted to 4 ft high, 50% opaque fencing, see Image A, below).



**Image A: Fence Restriction Detail**

The perceived intention of the ordinance and frontage classification is to maintain a level of respectful, visually pleasing properties consistent with Ann Arbor standards emphasizing the respect for neighbors and surrounding community sight lines. These desired results are not applicable to the northern property line because the frontage exists along an inaccessible highway and will be imperceptible to neighboring communities. Furthermore, the perceived detriment to Ann Arborers, "curb appeal" and visual nuisance to its members is non-existent. This is due to the lack of a sidewalk along the property line and remote location along the north property line - pedestrian traffic will not exist and be exposed to the proposed fence.

By adhering to the ordinance, Toll Brothers would maintain a mandated, yet invisible aesthetic at the cost of zero acoustic reductions. However, the same ordinance does allow for an 8 ft high, 100% opacity fence to be installed where areas are not designated as

frontage. This is a practical and somewhat contradictory hardship that is infrequent in other Ann Arbor communities. As such, North Oaks would comply with the ordinance if not for its extreme proximity to M-14, a circumstance where a variance is needed most.

North Oaks is a unique property with a unique set of circumstances that has created this unnecessary hardship. An extremely small fraction of properties within the city of Ann Arbor are located within 40 ft of a major highway property line, have high density zoning, and has a significant amount of natural features worthy of preservation, like North Oaks has. In addition, even fewer properties have finished, living level elevations at, or less than 13 ft above the highway elevation. This compounds the sound problem greatly with respect to North Oaks. Sound waves will roll directly into the units rather than being deflected by earthen embankments or berms where the topography helps mitigate this condition. The residents will not enjoy the same benefits as other properties that are located above and away from the highway. This property is unique because it is the only place within Ann Arbor city limits where a culmination of the aforementioned physical characteristics is combined with high density zoning.

Despite the community's unique problem, there are a handful of properties with somewhat similar issues that are relevant to the variance request. They provide insight to how the city has alleviated homeowners suffering from significant nearby traffic volumes. For example, at least ten properties have a noise fences that exist approximately 150 - 200 ft from a major highway (see Exhibit 11). It is worth reiterating that nearly all of these properties are elevated anywhere from 15 – 50 ft above the adjacent highway, a topographic advantage not enjoyed by North Oaks. The length of fences range from 30 – 970 ft long and vary 8 – 11 ft in height. For example, on the south-east side of Ann Arbor, west of Spruce Knob Apartments (reference address: 1820 Riverwood Dr.) exists a 503 ft long, 8 ft high board-on-board fence that faces westbound I-94. This fence as well as the nine additional fences, have near identical design, material, and share the common objective to block highways both visually and acoustically as the proposed North Oaks fence without compromising the intention of maintaining “curb appeal”.

**2. Are the hardships or practical difficulties more than mere inconvenience, inability to obtain a higher financial return? (explain)**

The primary hardship that initial and subsequent homeowners will experience if Toll Brothers installs a fence without variance and in accordance with the current city ordinance (4 ft high at 50% opacity), is the significant reduction of quality of life. This is more than an inconvenience. In addition, computer modeling that factored in proposed buildings, final grading, proposed landscaping, and typical traffic volumes was created to explore various combinations of fence heights, locations, and material (see attached Acoustics Report, Figure C6 – Figure C8). The results showed that a proposed 12 ft high wooden fence would be ideal for noise abatement. However, valuing precedent established by existing highway fences, an 8 ft fence was chosen as an ideal compromise between noise reduction and current ordinances.

The motivations behind the variance request are not financial in nature. Toll Brothers is aware that these units will be less desirable regardless of a noise fence. Our historical experience has shown that these poorly located types of units are often reduced to a point of little or no financial return. With that in mind, Toll might actually benefit financially by avoiding the expense of building a fence, avoid the expense of conducting a sound study, and avoiding the expense of providing enhanced landscaping. More importantly, Toll

Brothers embraces and values our homeowners and their expectations of a decent quality of life that everyone deserves. These relationships will last long after the sale has ended. That is why we must pursue every possibly avenue to relieve the noise pollution that will persist indefinitely. It is for that reason we respectfully request that this board of appeals reflect on its power to grant relief and improve the welfare of the inhabitants of the community.

**3. What effect will granting the variance have on the neighboring properties?**

Allowing an 8 ft high fence will not negatively affect the immediate surrounding communities visually or acoustically (see attached Acoustics Report, Figure 5: Remote receiver locations on neighboring properties). These communities include Barclay Park Subdivision, Foxfire Subdivision, and the commercial property, Green Things Farm. The fence will be visually obscured year-round from the surrounding communities by means of dense, natural vegetation on North Oaks property, proposed buildings, and community landscaping. This is shown in Exhibits 3-6, demonstrating street level perspectives directed towards the fence. None of the three communities would be able to see the fence. In fact, the closest property (3214 Featherstone Ct.) is approximately 320 ft away from the west end of the proposed fence and is separated by extremely dense woods that completely blocks North Oaks community even during the winter months. Furthermore, computer modeling shows NEGLIGIBLE noise reflection being directed north towards Green Things Farm, which is the only property that could potentially be affected by noise reflection. It is important to note that Green Things Farm will be no more affected by noise reflection of the fence than it will be affected by the proposed buildings themselves. Barclay Park and Foxfire would not be exposed to reflected noise due to the orientation of the proposed fence (a fence running parallel to M-14 would only cause reflected waves to travel towards neighborhoods perpendicular to it). The fence, as well as the proposed North Oaks Carriage homes, will benefit the aforementioned properties by absorbing significant amounts of noise from M-14, further improving the quality of life for existing residents.

**4. What physical characteristics of your property in terms of size, shape, location or topography prevent you from using it in a way that is consistent with the ordinance?**

The ordinance allows for berms to be placed along property lines in order to reduce noise levels, however, the location and topography of North Oaks forces Toll Brothers to alternative options. Most communities within Ann Arbor that exist adjacent to a major highway have enormous tracts of 8-10 ft tall earthen berms separating the community from the highway. These structures were possible either because their topography did not contain heavily wooded preservation areas, or retained ample space for construction, or their property lines contained pre-existing hills that allowed for elevated berms. Unlike the average community, North Oaks contains large preservation areas in both the northwest and northeast corners of the property. This natural feature “squeezes” and reduces the physical area that can contain fences or berms. Furthermore, North Oaks natural topography along the north property line is at a near constant, low level elevation (elevations vary between 1 - 2 ft). Due to its flat topography, the restrictive horizontal distance between the R.O.W. and proposed buildings, and the “squeezed” nature of the buildable area, North Oaks is prevented from creating similar earthen structures in such a way that is consistent with the ordinance while adhering to current recommended berm design standards (3:1 slopes with 2 ft top cap). Deviating from the ordinance and standards would jeopardize berm stability and significantly encroach onto MDOT R.O.W. Constructing a large berm is not a viable strategy to block noise and grant homeowners a reasonable level of quality of life, leaving an extremely limited number of solutions available. The site topography combined

with hardships outlined in Question #1 force Toll Brothers to explore options outside the ordinance.

**5. Is the condition which prevents you from complying with the ordinance self-imposed? How did the condition come about?**

The current site plan, lot configurations, and conditions at North Oaks is certainly not self-imposed. Rather, a result of combined restrictions brought about by city planning, regulations, natural land features, and community requirements. For instance, the North Oaks Community development has been required to achieve a 7-10 DU/AC population density to comply with Ann Arbor City Zoning. Furthermore, the natural location of the North Oaks community includes wetlands and woodland preservation areas. In order to maintain these natural features, large Wetland Mitigation Areas and Conservation Areas were mandated to exist on the property. Approximately 65% of the 109 acres on this property have been set aside for wetland preservation. Those stipulations, combined with community wide 25 ft Natural Feature Buffers, restrict the northern portion of the community to a limited buildable area. This in turn prevents lots from being built further away from significant noise sources along M-14.

To reiterate, the condition of the proposed lots in close proximity to the highway is not self-imposed by Toll Brothers. Great efforts have been made to evaluate alternative community site plans, lot configurations, and buffering structures. Each of which failed to comply with city zoning and development goals. These requirements, whose objectives are to provide a sense of wellbeing for community members, align thoroughly with the objective of Toll Brothers for relief from the fence ordinance.

Toll Brothers has strived to create a community that can sustain a high level of quality of life for all of its current and future homeowners. This goal in itself seems achievable and without significant obstacles, however, uncommon hardships currently undermine this objective. Principally, vehicular traffic originating from M-14 along the north property line combined with unique parcel characteristics (involuntary density requirements, considerable wetland preservation areas, counter intuitive Frontage designations, naturally restrictive topography) prevent Toll Brothers from providing the necessary noise abatement and comfort residents deserve. In order to accomplish this, Toll Brothers has respectfully requested the Zoning Board of Appeals grant relief in the form of a variance to Ordinance Code Chapter 104, Section 8:434 and improve the welfare of the inhabitants of the community. The motivation to pursue a variance has not been guided by dividends or financial return, in fact, Toll Brothers would be financially incentivized not to pursue a countermeasure or supply the evidence justifying its installation. As shown in compressive data analysis and computer modeling, a simple structure, an 8 ft high wooden a fence, would be sufficient in suppressing considerable amounts of vehicular disturbances along the north property line. Supporting the collected data are multiple Ann Arbor communities who constructed similar fences along highway property lines and successfully minimized disturbances. Likewise, if such a fence were to be installed, it would not only establish an improved quality of life for both North Oaks and neighboring communities, but would remain sight unseen by surrounding properties and community members. In summation, the unfortunate criteria placed on North Oaks as well as its natural parcel characteristics has put overall resident welfare at risk. The price tag of a solution, a variance to the fence ordinance, would be minuscule in comparison to the provided benefit countless homeowners will experience for years to come.



# Toll Brothers

America's Luxury Home Builder®

February 22, 2017

WASHTENAW COUNTY BUILDING INSPECTION

705 N. ZEEB RD

P.O. BOX 8645

ANN ARBOR, MI 48107-8645

To whom it may concern:

I, hereby give Andy Brown authority to obtain building permits using Toll MI VI Limited Partnership Builders License #2102208880. I am personally noted on all the licenses as the Qualifying Officer.

Should you have any questions, please contact me at 248-305-4008.

Sincerely,

**Toll Brothers, Inc.**

**Jason R. Minock**  
Vice President  
Michigan Division

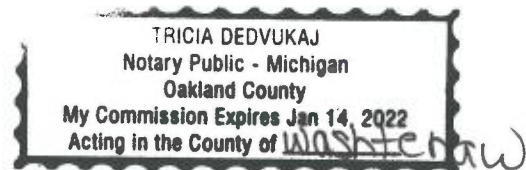
Acknowledged by Jason R. Minock before me on the 22nd day of February, 2017

Signature Tricia Dedvukaj

Printed name Tricia Dedvukaj

Notary public, State of Michigan, County of oakland

My commission expires 01/14/2022



nixon

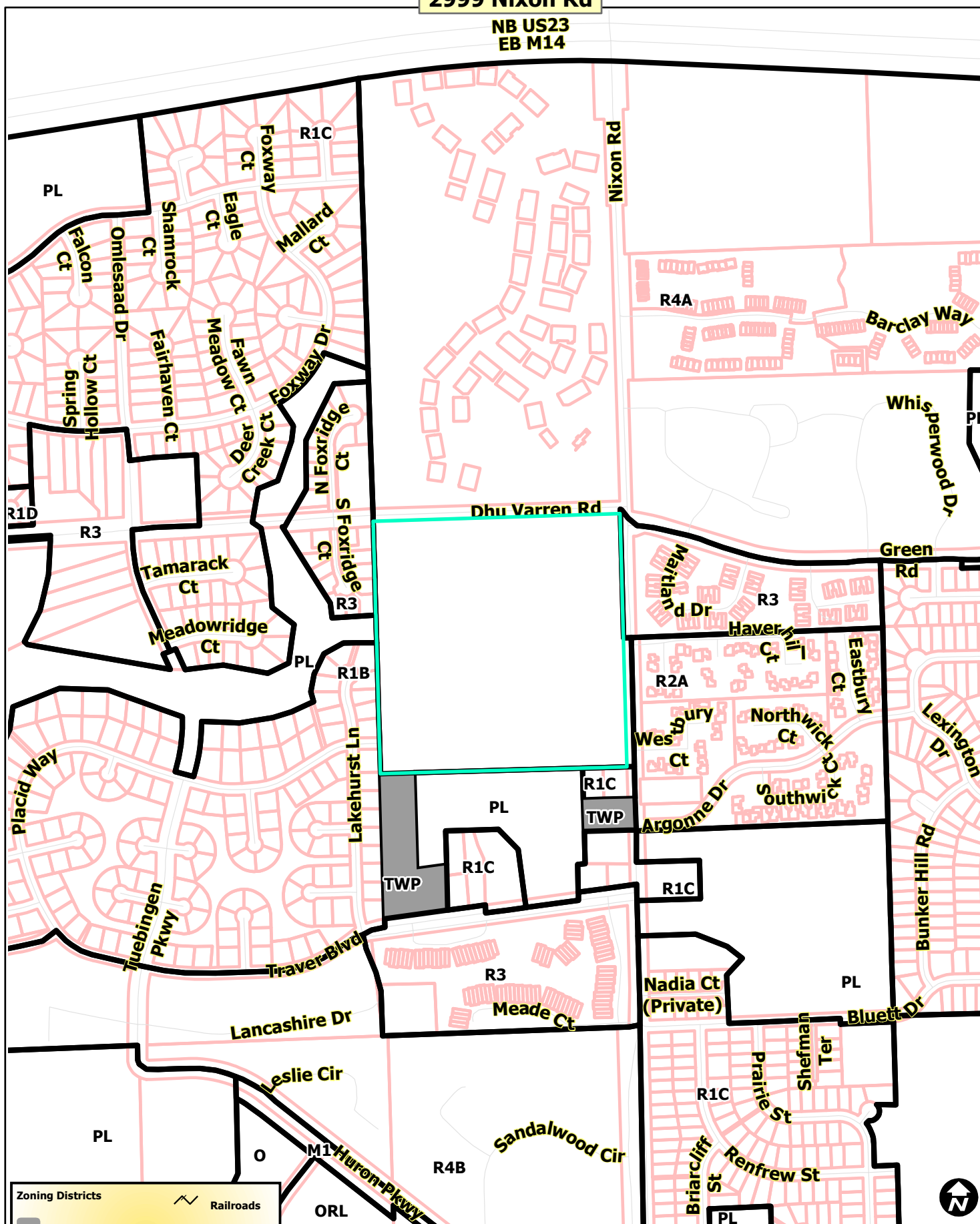
New York Stock Exchange • Symbol TOL

Michigan Division

28004 Center Oaks Dr., Suite 200, Wixom, MI 48393 • (248) 305-4000 • Fax (248) 305-4001  
tollbrothers.com

**2999 Nixon Rd**

**NB US23  
EB M14**



Map date 2/28/2017

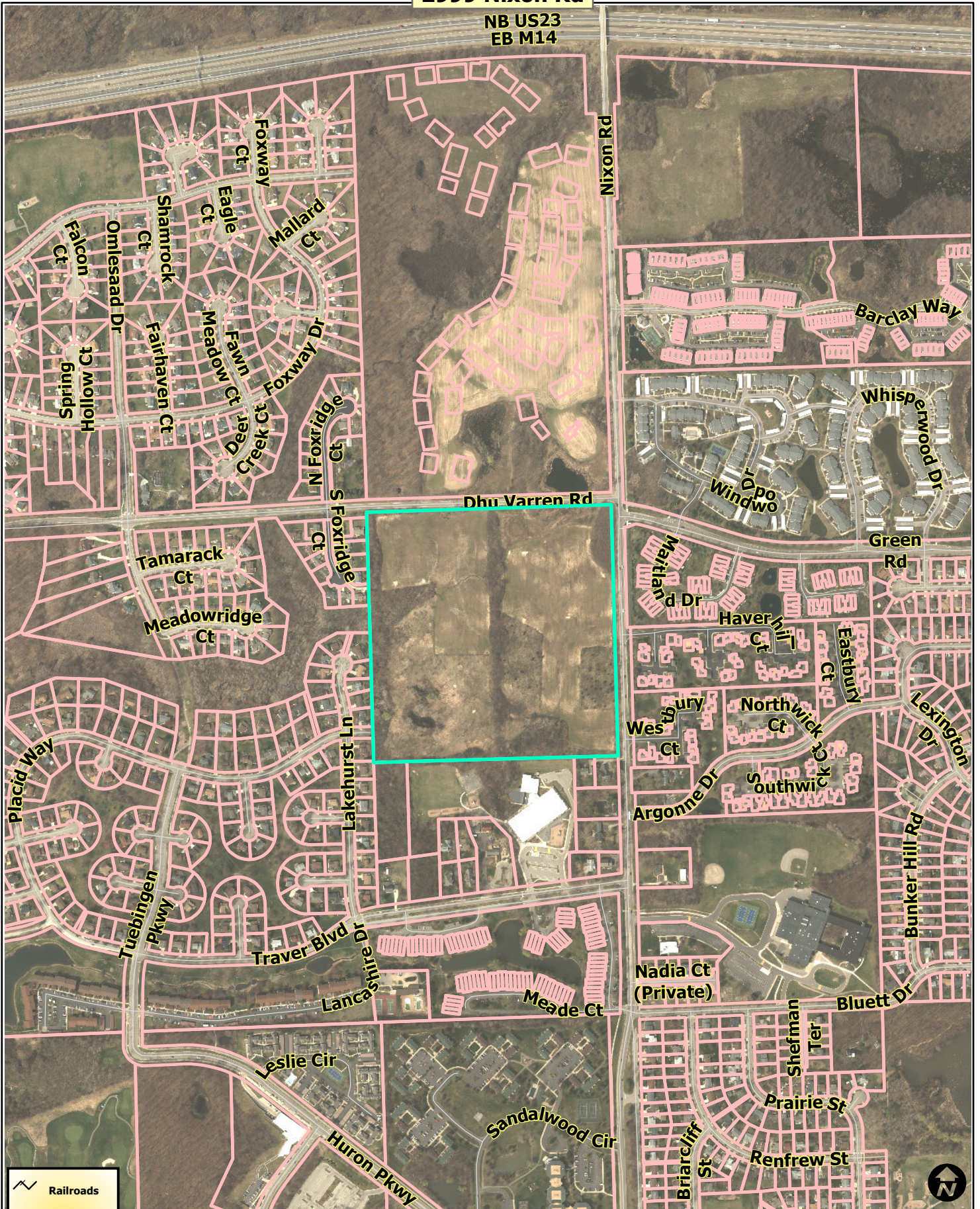
Any aerial imagery is circa 2015  
unless otherwise noted

Terms of use: [www.a2gov.org/terms](http://www.a2gov.org/terms)



# 2999 Nixon Rd

NB US23  
EB M14



- Railroads
- Huron River
- Tax Parcels



Map date 2/28/2017  
Any aerial imagery is circa 2015 unless otherwise noted  
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2999 Nixon Rd

Dhu Varren Rd

Green Rd

Nixon Rd

Haverhill Ct

Westbury Ct

Argonne Ln

Placid Way

Lakehurst Ln



Map date 2/28/2017  
Any aerial imagery is circa 2015  
unless otherwise noted  
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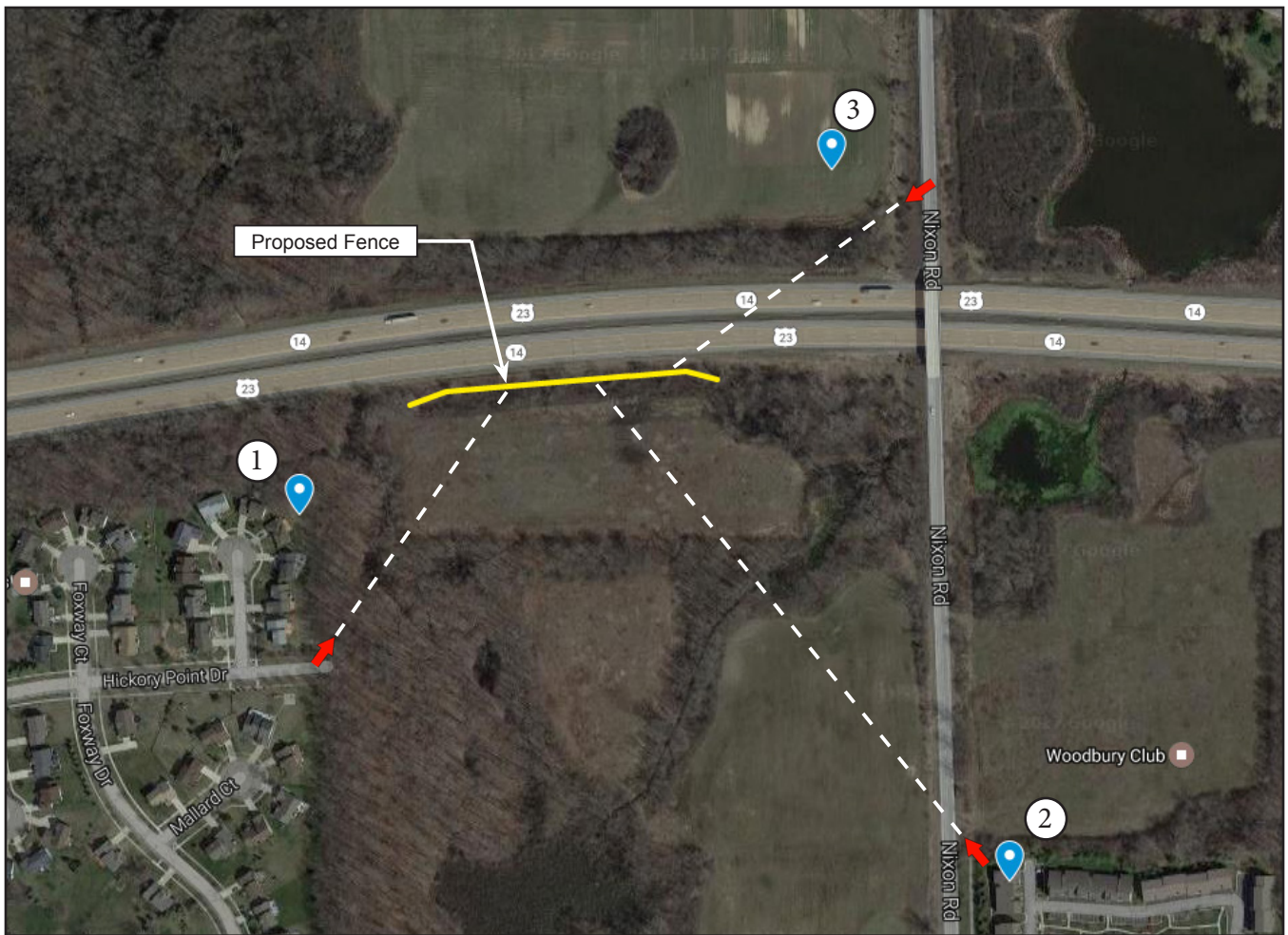


Exhibit 3: Site overview of North Oaks property and perspectives of neighboring communities facing the proposed North Oaks fence

- 1 - Sight line perspective from Foxfire Subdivision (see Exhibit 4)
- 2 - Sight line perspective from Barclay Park (see Exhibit 5)
- 3 - Sight line perspective from Green Things Farm (see Exhibit 6)





Exhibit 4: Foxfire perspective facing northeast towards proposed fence\*



Exhibit 5: Barclay perspective facing northwest towards proposed fence\*



Exhibit 6: Green Things perspective facing southwest towards proposed fence\*





Exhibit 7: North Oaks Property line facing west from Nixon Rd. and M-14\*



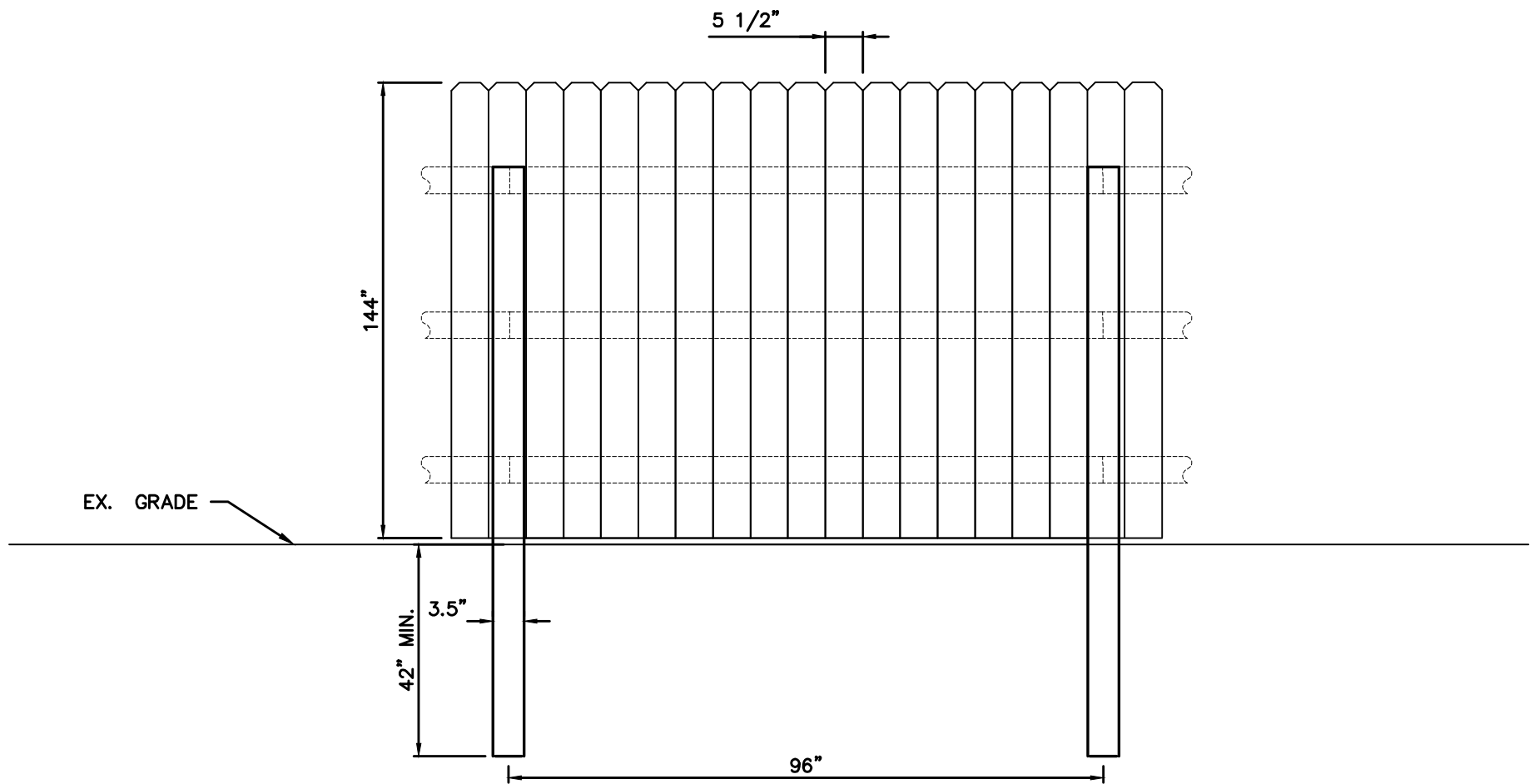
Exhibit 8: North Oaks Property line facing south from M-14\*

\* Red arrow indicates approximate location of proposed fence





Exhibit 9: Rendering of the North Oaks proposed fence, eastbound M-14 facing south perspective



12' BOARD ON BOARD FENCE SKETCH  
NTS

EXHIBIT 10: PROPOSED FENCE DETAIL  
PROJECT NO.: 13001862  
DATE: DECEMBER 12, 2016



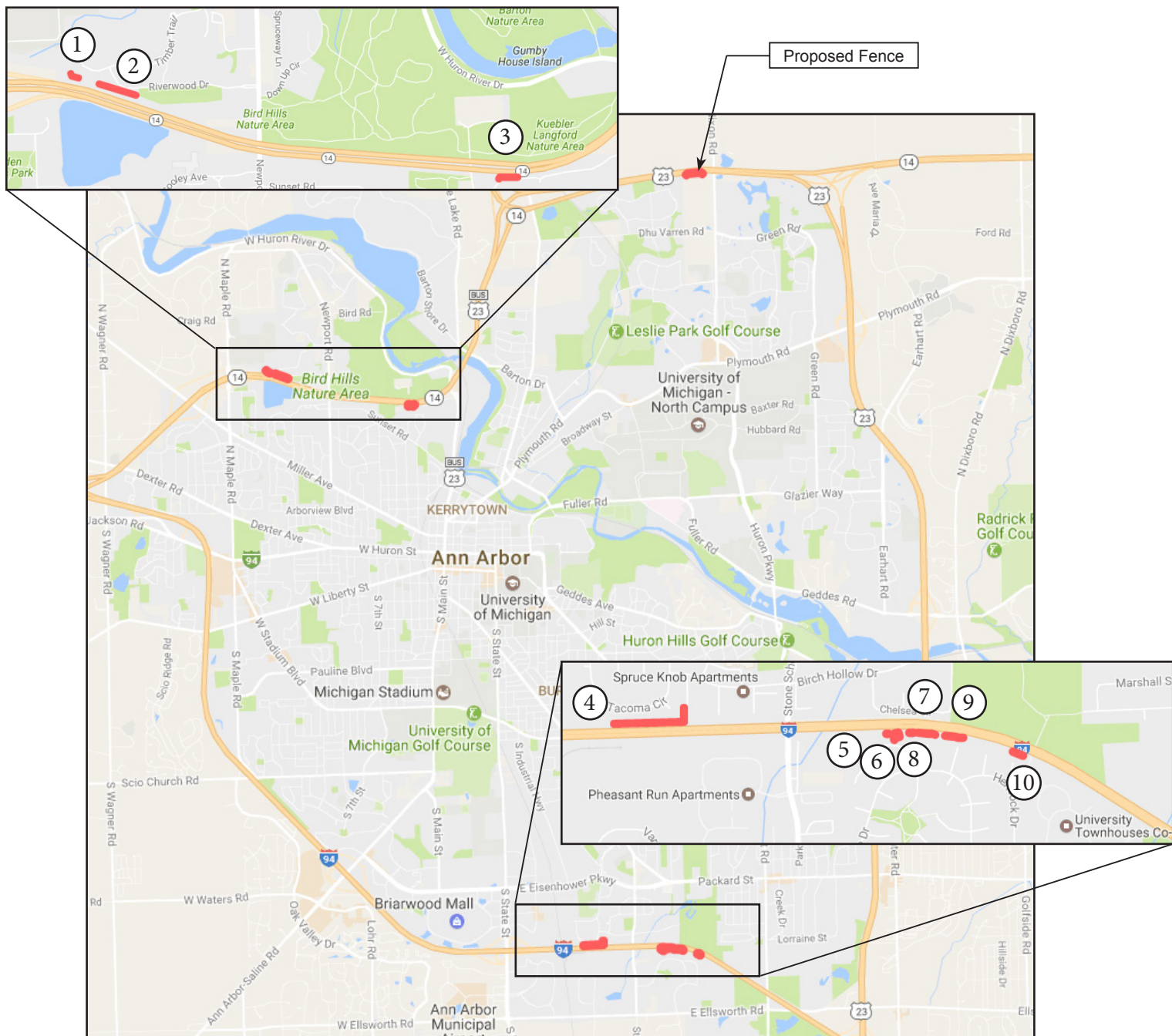


Exhibit 11: Ann Arbor communities with wooden board on board highway fencing at least 8 ft high

| Property/Address   | Fence Details                         | Length (ft)* | Height (ft)* | Ref. # |
|--------------------|---------------------------------------|--------------|--------------|--------|
| 1915 Timber Trail  | Faces WB M-14, private fence          | 140          | 8-9          | 1      |
| 1820 Riverwood Dr. | Faces WB M-14, community fence        | 530          | 8-9          | 2      |
| 423 Huron Blvd.    | Faces EB M-14, private fence, stained | 265          | 10-11        | 3      |
| 3359 Tacoma Cir.   | Faces WB I-94, community fence        | 970          | 8            | 4      |
| 18 Metroview Ct.   | Faces EB I-94, private fence          | 30           | 8-9          | 5      |
| 14 Metroview Ct.   | Faces EB I-94, private fence          | 175          | 8            | 6      |
| 10 Metroview Ct.   | Faces EB I-94, private fence          | 50           | 9            | 7      |
| 12 Faust Ct.       | Faces EB I-94, community fence        | 200          | 8            | 8      |
| 12 Trowbirdge Ct.  | Faces EB I-94, community fence        | 210          | 8            | 9      |
| 9 Plainview Ct.    | Faces EB I-94, private fence, stained | 120          | 8            | 10     |

\* Lengths and heights are approximate due to property location, heavy vegetation, or private property restrictions. All fences border highway ROW and are 1"x6" wood, board on board design

March 14, 2017

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Assistant Project Manager  
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Toll Brothers, Inc.  
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Wixom, MI 48393

**Subject: Nixon Farm North  
Ann Arbor, Michigan  
Acoustics report - prediction of noise barrier performance**

Dear Andy:

Soundscape Engineering LLC has completed the prediction of sound levels in the back yards of the Nixon Farm North buildings closest to US23/M14. The goal of the project is to reduce the traffic noise by use of an 8 foot tall noise barrier fence. This report presents the project background information, the results of our analysis and our recommendations for noise mitigation.

## **Executive Summary**

Soundscape Engineering LLC was commissioned to measure the existing sound level at the project site, calculate the sound level in the back yards of the buildings to be constructed using the measurement for calibration of the model, evaluate different noise barriers, and recommend a barrier height that provides a reasonable amount of sound reduction. Since the City of Ann Arbor Noise Control ordinance does not apply to traffic noise, the goal selected was to allow comfortable conversation in the back yards of the buildings closest to US23/M14. The reduction in level is not obligatory but a desire on the part of the Developer to provide a more comfortable environment for residents.

Soundscape Engineering monitored the sound level at the site for a 33-hour period. The data are believed to be representative of a typical weekday evening rush hour and Saturday traffic conditions. After completing the sound level measurements, a 3-D computer model of the site was created and used to determine noise propagation on the property. The model was calibrated using the measured sound levels.

The maximum allowable height of the barrier is 8 feet per the ordinance. To provide the best level of noise reduction given this constraint, we recommend grading the back yards to raise the base of the barrier by a few feet from the currently proposed elevation. While the target sound levels in the low 60 dBA range are not quite achieved, the realized reduction of 3-7 dBA (depending on distance from the barrier) will make it more comfortable for conversation in the back yards of Buildings 44 through 46. Building 47 benefits from being further from the highway and thus the barrier does not need to be extended between it and the highway. A psychological benefit to the screening of the highway may also be a benefit for occupant comfort.

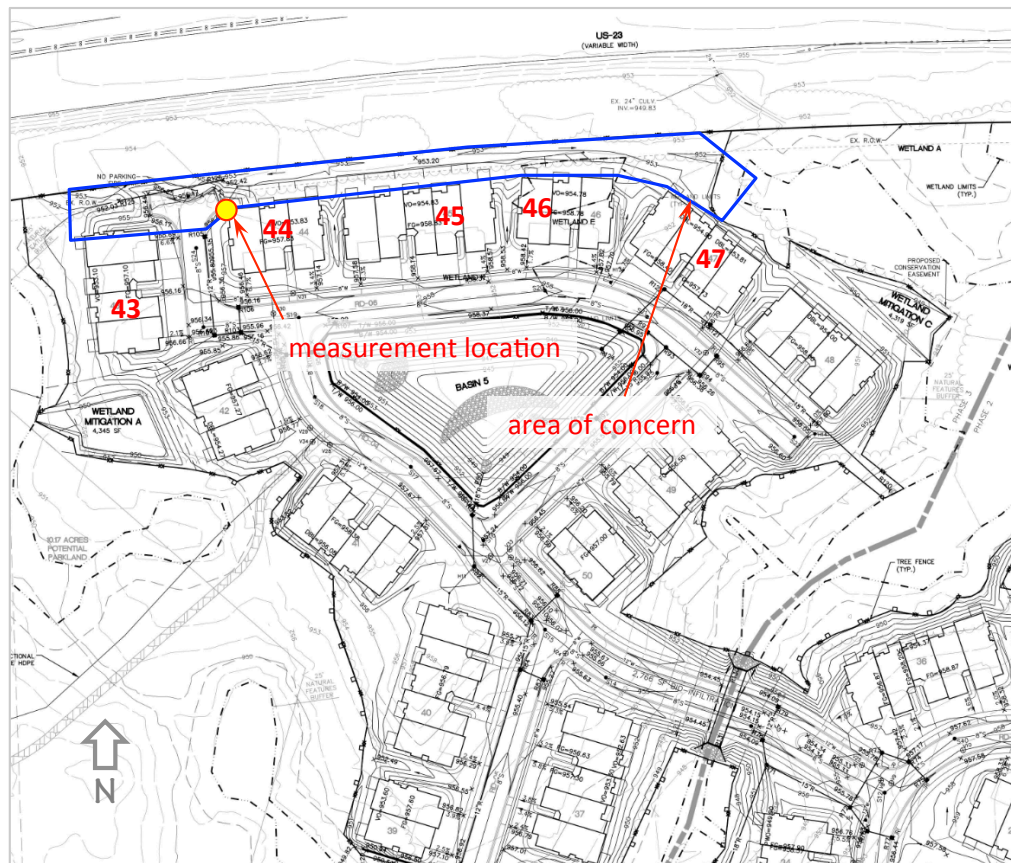


### **Ann Arbor Noise Ordinance and Acoustical Target**

The Ann Arbor maximum permissible sound levels per Chapter 119 – Noise Control. The traffic noise on this property is exempt from the Ann Arbor Noise Control ordinance, which is a common allowance in noise ordinances. If it were a different type of noise source, such as an air handling unit, the sound levels in Table 1 would apply, as taken from Article 1, Non-vehicular Noise section of the city ordinance.

As the developers of the property, you have expressed an interest in providing for comfortable conversation in the back yards of Lots 43 through 47. These units are labeled in Figure 1 as well as the area of concern, outlined in blue. The location where we took an ambient measurement is shown as a yellow dot. Table 2 on Page 3 provides miscellaneous noise sources and their approximate sound levels as an aid in understanding this report. Note that distance to the source is important when describing how loud it is. The sound level is expressed as an A-weighted sound pressure level, abbreviated dBA. Normal conversation between two individuals at 3 feet separation tends to be in the 60-65 dBA range. For reasonable speech intelligibility for normal hearing persons, the sound level in the back yards should not exceed this range.

A brief glossary of pertinent acoustics terminology is provided in Appendix A. You may find the glossary helpful when reading this report.



**Figure 1: Nixon Farm northern portion**

**Table 1: Ann Arbor maximum permissible sound levels for non-vehicular noise**

| USE OF PROPERTY<br>RECEIVING THE SOUND | 7:00 a.m. to<br>10:00 p.m. | 10:00 p.m. to<br>7:00 a.m. |
|----------------------------------------|----------------------------|----------------------------|
| Residential                            | 61                         | 55                         |
| Commercial                             | 71                         | 61                         |

All limits expressed in dB(A).

**Table 2: Miscellaneous sound sources and their approximate sound levels**

| Level (dBA) | Noise Source                                    |
|-------------|-------------------------------------------------|
| 130         | Threshold of pain                               |
| 120         | Loud rock band near loudspeaker                 |
| 110         | Train siren at 50 ft                            |
| 100         | Loud automotive horn at 10 ft                   |
| 90          | Subway train at 20 ft<br>Printing press plant   |
| 80          | Lawn mower at 10 ft                             |
| 70          | Boeing 757 aircraft cabin during flight         |
| 60          | Conversational speech at 3 ft                   |
| 50          | Average open office background sound            |
| 40          | Soft background music<br>Wind in trees (10 mph) |
| 30          | Average residence – no activity                 |
| 20          | Whisper                                         |
| 10          | Human breathing                                 |
| 0           | Threshold of audibility                         |



## Measurement Results

A measurement from 2:00 PM on Friday, January 14 to 7:00 PM on Saturday, January 15 was made to establish the existing sound level on the receiving property and allow calibration of the model. The location of the ambient measurement is shown as a yellow dot in Figure 1.

The energy-averaged sound level ( $L_{eq}$ ) for each hour is the parameter reported in Figure 2. This is the type of measurement that would be taken to compare sound levels with the noise ordinance, if it were to apply.

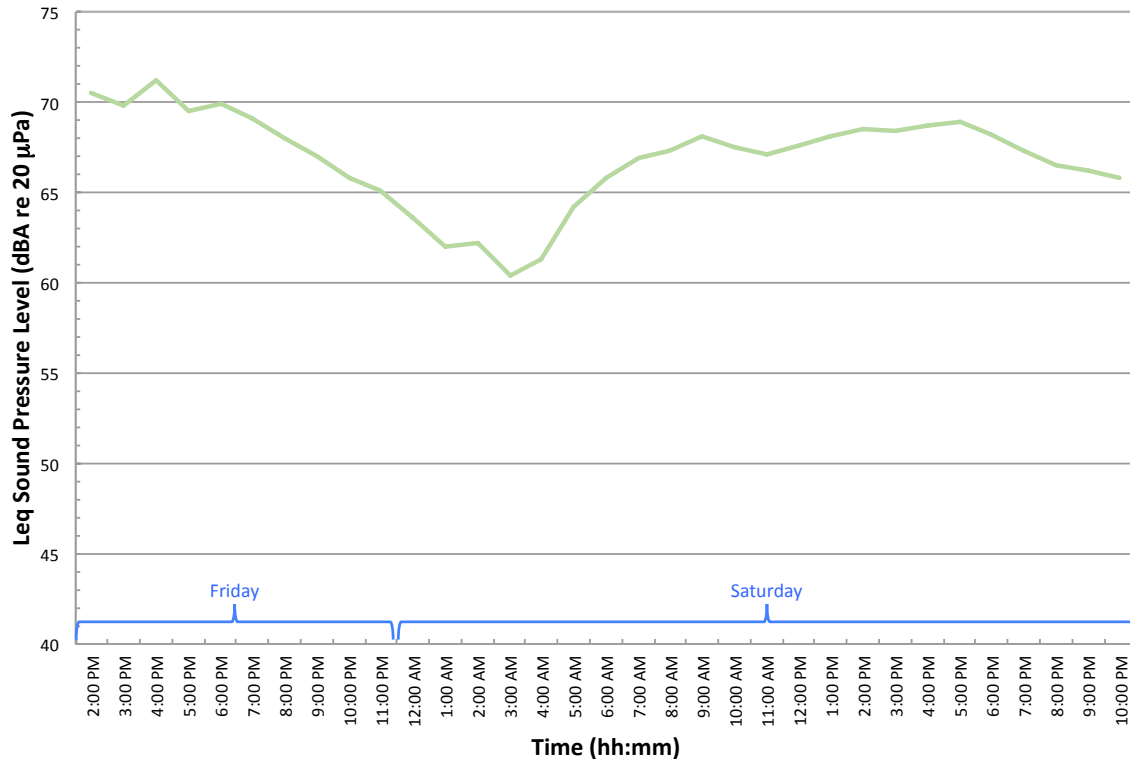


Figure 2: Measured  $L_{eq}$  sound level

## Barrier Materials

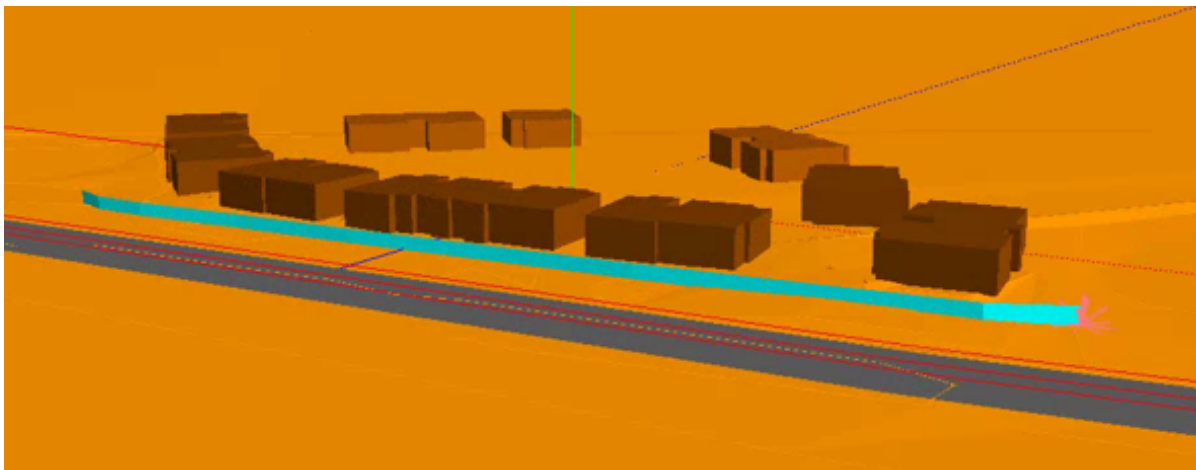
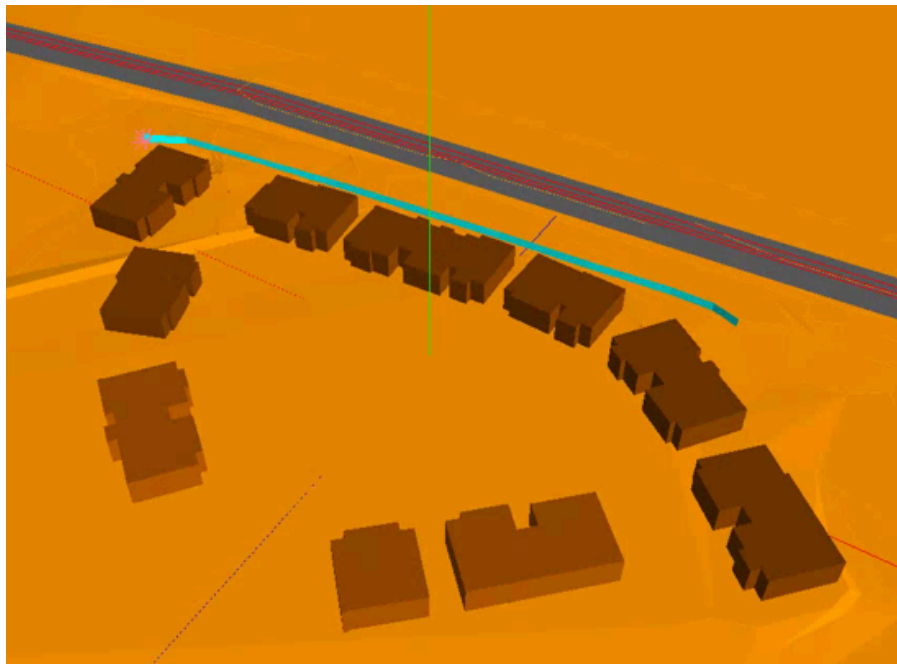
A discussion of barrier design and materials is provided in Appendix B. A link to an extensive discussion by the U.S. Federal Highway Administration is also provided in the appendix for further reading.

The effectiveness of a barrier depends mainly on its height, but another parameter is the ability of the material to prevent sound from penetrating through. In general, the sound blocking performance of the material needs to be STC 33 or higher. This is easily accomplished by masonry. Wood, metals and plastics need to be evaluated to verify that their thicknesses will perform well. For example, slats in a wood fence may be  $\frac{3}{4}$ " thick typically, but to adequately block sound a minimum thickness of 2 inches is necessary. The penalty is reduced performance of about 1 dB when going from a nominal 2x to a 1x board. Heavier wood species will block sound better. Also, no gaps can exist in the noise barrier. Tongue and groove boards can help reduce gaps. For ease and expediency of installation, manufacturers make purpose-built panel systems that meet these requirements.

### **Noise Modeling with SoundPLAN**

The commercially available and widely used computer software called SoundPLAN was used to create a 3-D model the existing site and vicinity. A sound source was placed in the model to represent the highway traffic. The sound propagation was calculated, and the model was calibrated using the sound levels measured at the site.

The site was evaluated with and without the noise barrier. Figure 3 shows the building site. Future buildings are shown in brown and the noise barrier is shown in cyan. The highway is gray with a red line at its center.



**Figure 3: Birdseye views of the buildings and barrier in the SoundPLAN model**



### **Sound Level Prediction**

The highest sound level for one hour was used as the basis for evaluation as a worst-case assessment. That hour is Friday from 4:00 to 5:00 PM at 71 dBA. The Saturday worst-case hour is 2 dBA less (5:00 to 6:00 PM). Note that all measured levels are higher than the noise ordinance would permit, if it applied to traffic noise.

We were asked to evaluate different types of fencing to determine the effectiveness. One type, a 4' high 50% open fence, was not modeled because it will not change the sound level by its presence. The other barriers are listed below.

- 8' high barrier with proposed grading
- 8' high barrier with revised grading at 2' higher in elevation
- 12' high barrier

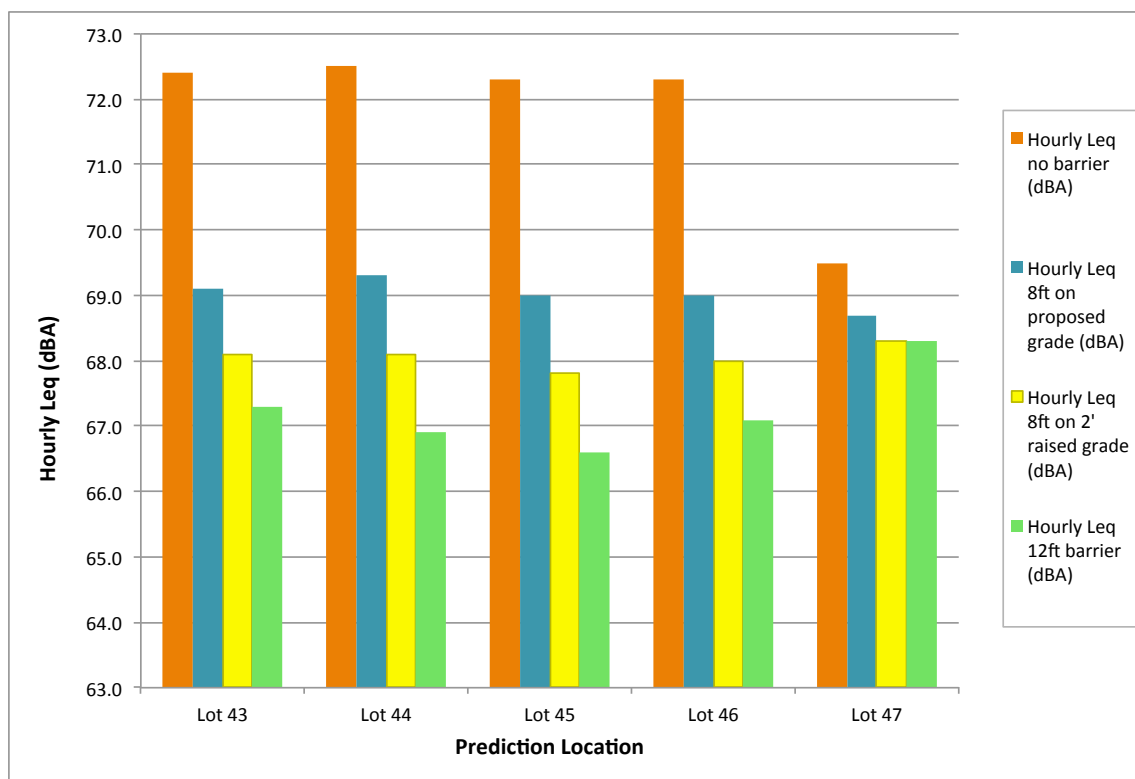
The receiver locations were selected at approximately the midway point between the buildings and barrier. The predicted levels are summarized in Figure 4. The levels without the barrier, in orange, are approximately 4 dBA higher than an 8 foot barrier raised grade (by 2 feet). If a 1x board is used for the fence, the reduction will be 3 dBA. A 4 dBA reduction in level will be noticeable, though not considerable. A 3 dBA reduction is a just noticeable difference.

The best performance is realized with a 12 foot tall barrier, or a 10 foot barrier on raised grade. The additional 1 dBA reduction brings the reduction into the subjective realm of "clearly noticeable" (see Appendix A for a discussion on relative sound levels). The calculations and mapping program output are provided in Appendix C.

The performance improves as a listener moves closer to the barrier. An additional 2 dBA is gained by moving from mid-yard to 10' from the fence. At 5' from the fence, a gain of 4 dBA is realized. This results in a barrier performance of 5-7 dBA, which is clearly noticeable.

Lot 47 does not see a substantial benefit from the barrier since the proposed barrier does not extend to this building, though the length of the fence is needed for shielding Lot 46. However, its noise exposure is less than the other locations without the barrier because it is further away from the highway. The result is that its unprotected exposure is approximately the same as the other locations with the barrier.

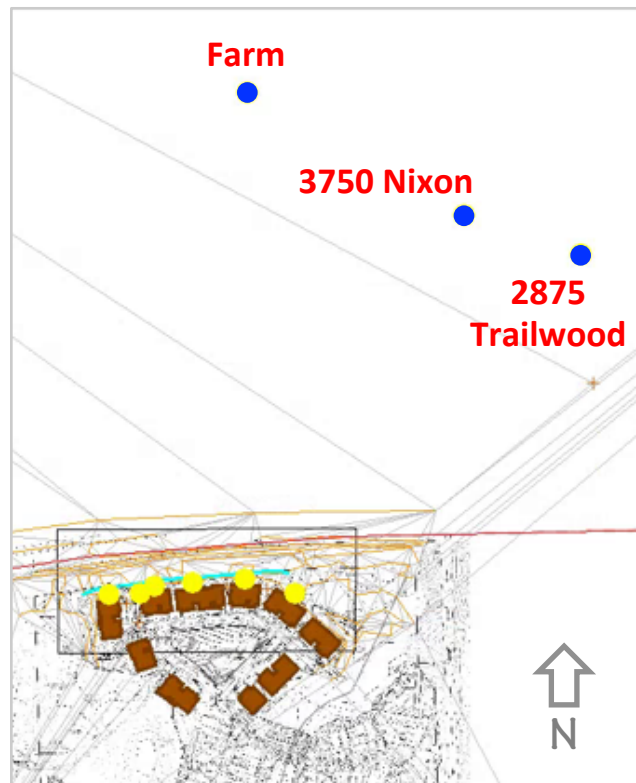
Note that a single or double row of trees and bushes does not provide a measurable reduction in the sound level. A 50 to 100 foot wide band is needed to provide a substantial reduction in the sound level. However, a thin row may provide psychological effect in blocking the line of sight to the source. One study showed that people tended to believe that the sound source had been reduced up to 5 dBA when screened by vegetation. This "out of sight, out of mind" effect would logically apply to the noise barrier, which also provides a real and measurable reduction in the sound. We understand that both will be used at this site. Unfortunately, it is not possible to quantify the total benefit of the barrier performance plus the psychological effect, as the latter varies for different people.



**Figure 4: Predicted  $L_{eq}$  sound level at receiver locations**



We also evaluated the impact on the structures to the north that sound reflections from an 8 foot high wall on the higher grade. Some structures have a direct acoustical line of sight to the new development, and others are shielded by the Nixon Road overpass berm. Because we did not have berm elevation information on hand, we made a worst-case assumption that all neighboring structures have a direct line of sight to the barrier. The locations are shown as blue dots in Figure 5. The light gray lines are topographical calculation information that the computer uses in the calculations.



**Figure 5: Remote receiver locations on neighboring properties**

The predicted levels with and without the barrier are provided in Table 3. An increase of less than 0.5 dBA with the barrier is predicted for all remote neighboring locations, and this difference is not detectable.

**Table 3: Sound level predictions for neighboring receiver locations**

| Condition       | Farm     | 3750 Nixon | 2875 Trailwood |
|-----------------|----------|------------|----------------|
| Without barrier | 54.0 dBA | 56.1 dBA   | 56.8 dBA       |
| With barrier    | 54.4 dBA | 56.3 dBA   | 56.9 dBA       |
| Change in Leq   | +0.4 dBA | +0.2 dBA   | +0.1 dBA       |

### **Recommendations**

We recommend as high a barrier as allowable in order to provide the best performance. As we understand, a noise barrier/fence cannot be taller than 8 feet per the ordinance. To improve the performance while keeping within the ordinance limits, we recommend that the grading of the area behind Units 43-46 be raised a few feet in elevation or a berm be located under the barrier, such that the barrier is raised above its current proposed elevation.

For optimal performance, the barrier material must have a minimum performance of STC 33. However, we have taken into consideration the effect of using 1x boards and estimate that the sound reduction will be approximately 3 dBA mid-yard from an 8' high barrier on a 2' berm, and as much as 5-7 dBA close to the barrier. This coupled with the screening vegetation should provide noise relief for the residents.

### **Conclusions and Final Notes**

The predicted performance of an 8 foot high barrier on a 2 foot high berm adheres to the City of Ann Arbor regulation height while providing 4 dBA of improvement for residents in the buildings closest to US23/M14. This amount of measurable improvement will be noticeable by a listener, and the screening may provide additional psychological advantages.

Our recommendations and comments only address the outdoor sound level prediction. We cannot comment on such things as local codes, life safety requirements or any other non-acoustical issues. Should alternate designs be proposed, please present to us for consideration.

Thank you for the opportunity to assist you with this project. Please contact us if you have any questions.

Sincerely,

**Soundscape Engineering LLC**

Per:



Mandy Kachur, PE, INCE.Bd.Cert.  
Principal Consultant  
mkachur@SoundscapeEngineering.com  
(734) 494-0322

cc: N. Sevener (Soundscape)



## **Appendix A: Acoustical Terminology**

**Sound level** is measured in units called decibels (abbreviated dB). Decibels are logarithmic rather than linear quantities and thus a doubling of the sound level does not translate to a doubling of decibels. The human ear does not interpret a doubling of sound energy as a doubling of loudness. The logarithmic nature of dB and the human subjective perception of relative sound levels result in the following approximate rules for judging increases in noise.

- 3 dB sound level increase or decrease - barely perceptible
- 5 dB sound level increase or decrease - perceptible and is often considered significant
- 10 dB sound level increase or decrease - perceived as twice as loud/half as loud
- 20 dB sound level increase or decrease - perceived as four times as loud/one quarter as loud
- These perceived changes in the noise level are mostly independent of the absolute noise level. That is, a 35 dB noise will be perceived as twice as loud as a 25 dB noise, and a 60 dB noise will be perceived as twice as loud as a 50 dB noise.

**A-weighted sound level** - Humans do not hear equally well at all frequencies. We are especially poor at hearing low frequency sound and are best at hearing sound in the frequency range of human speech. A microphone does not have these same characteristics. Therefore, when sound is being measured to determine how people will hear it, a "weighting" or microphone-to-human correction factor is applied to the sound level measured using a microphone. The most common weighting is the "A-weighting" and the resulting sound level is expressed in A-weighted decibels (dBA). This weighting reduces the microphone-measured low frequency sound, slightly increases the sound at the dominant frequencies of human speech, and slightly lowers the sound level at high frequencies.

**Sound Transmission Class (STC)** is a single number rating of the sound blocking ability of a partition or an element in a partition, such as a door or window. It is mainly indicative of the partition performance in the frequency range of speech. Higher numbers mean better performance.

**Equivalent Sound Level ( $L_{eq}$ )** is the average sound level in an environment where the sound level changes. However, the  $L_{eq}$  is not a simple arithmetic average of the sound level over time, but is a logarithmic average.  $L_{eq}$  is the "energy" average noise level over a period of time.

## **Appendix B: Noise barrier screen walls**

Noise barrier screen walls and berms are often used to reduce the sound level at a listener's location. The sound is referred to as the source and the listener as the receiver.

In order for a screen wall or berm to have acoustical value, it must break the line of sight between the source and receiver. Otherwise, the sound traveling along the direct path without the barrier (i.e., in the direct line of sight of the source) is not attenuated by the barrier, but by distance and atmospheric absorption only.

The taller the wall is with respect to the source and receiver, the more effective it is acoustically. The acoustical performance of a screen wall or berm is referred to as the insertion loss, measured in dB. This is the difference in sound level at a receiver location with and without the barrier in place. The barrier performance is frequency dependent, with higher frequency sounds being more easily blocked than low frequency sounds.

Figure B1 provides an illustration of a noise barrier and how it blocks sound. The sound source is shown as a person and the receiver can be assumed for our purposes to be halfway between the house and barrier.

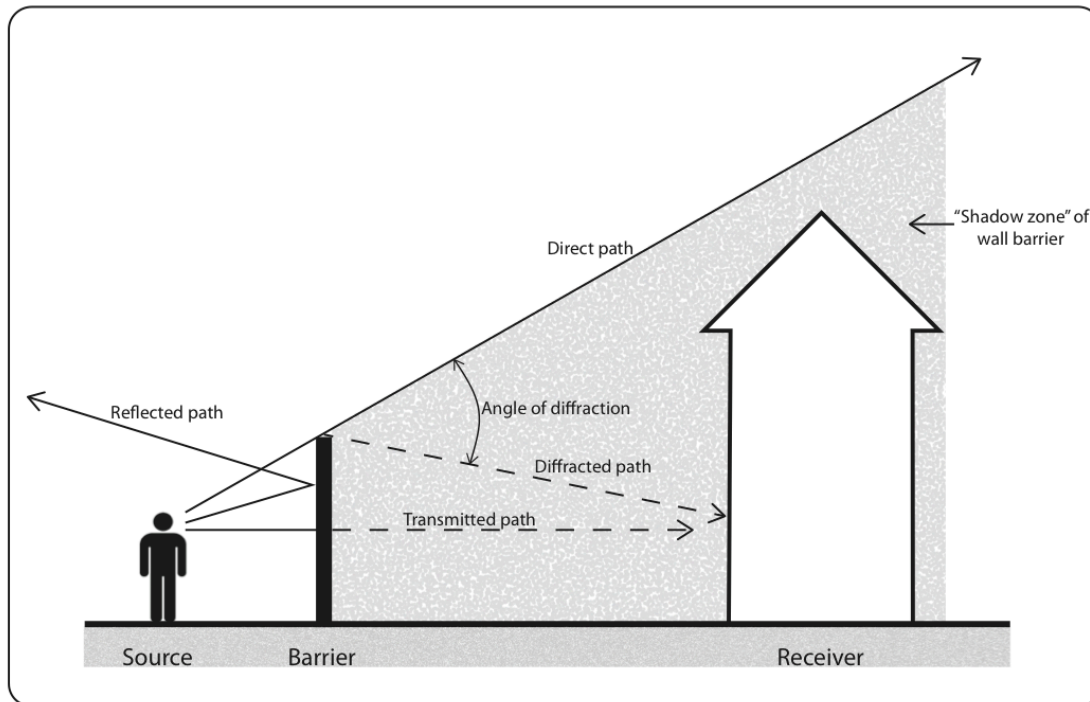
A noise barrier blocks sound in an area called the shadow zone of the barrier. This is depicted in Figure B1 as the shaded area on the house side of the barrier wall. The sound level in this shaded area depends on the sound level of the source and the amount of sound diffracted (or bent downward) over the top of the wall. The amount of diffraction depends on the frequency of the sound (shown as "angle of diffraction"). This amount is calculated by an equation.

Noise barrier walls have a practical upper performance limit of approximately 24 dB of reduction in the upper frequencies. Often the performance is less in the lower frequencies because the diffraction phenomenon over the top and ends of the wall is more prevalent at lower frequencies. The performance is dependent on how close the source and receiver are to the barrier and the distance that the barrier breaks the line of sight.

Different materials can be used for the noise barrier as long as the following conditions are met:

1. The amount of sound going through the barrier material is much less than the sound going (diffracting) over the barrier. For practical purposes, this means that the barrier material must be at least STC 33.
2. The material has no gaps or acoustically weak points that allow sound to pass through.
3. The selected material is appropriate for the amount of maintenance that it will receive.





**Figure B1: Noise barrier wall sound paths**

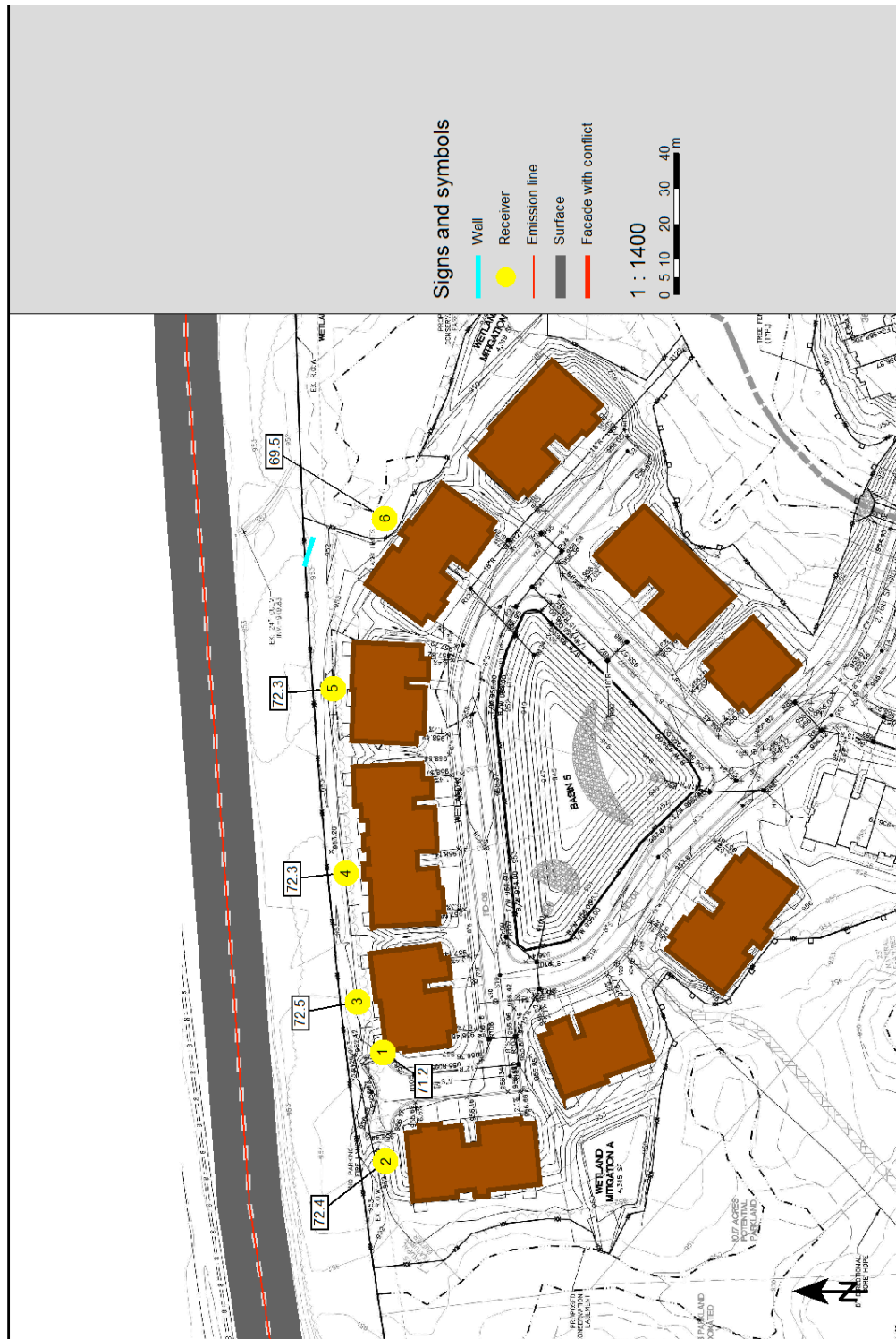
A description of various noise barrier materials is provided for your consideration. Further details can be found in the Noise Barrier Design Handbook at the US Department of Transportation - Federal Highway Administration website at the link below.

[https://www.fhwa.dot.gov/environment/noise/noise\\_barriers/design\\_construction/design/design00.cfm](https://www.fhwa.dot.gov/environment/noise/noise_barriers/design_construction/design/design00.cfm)

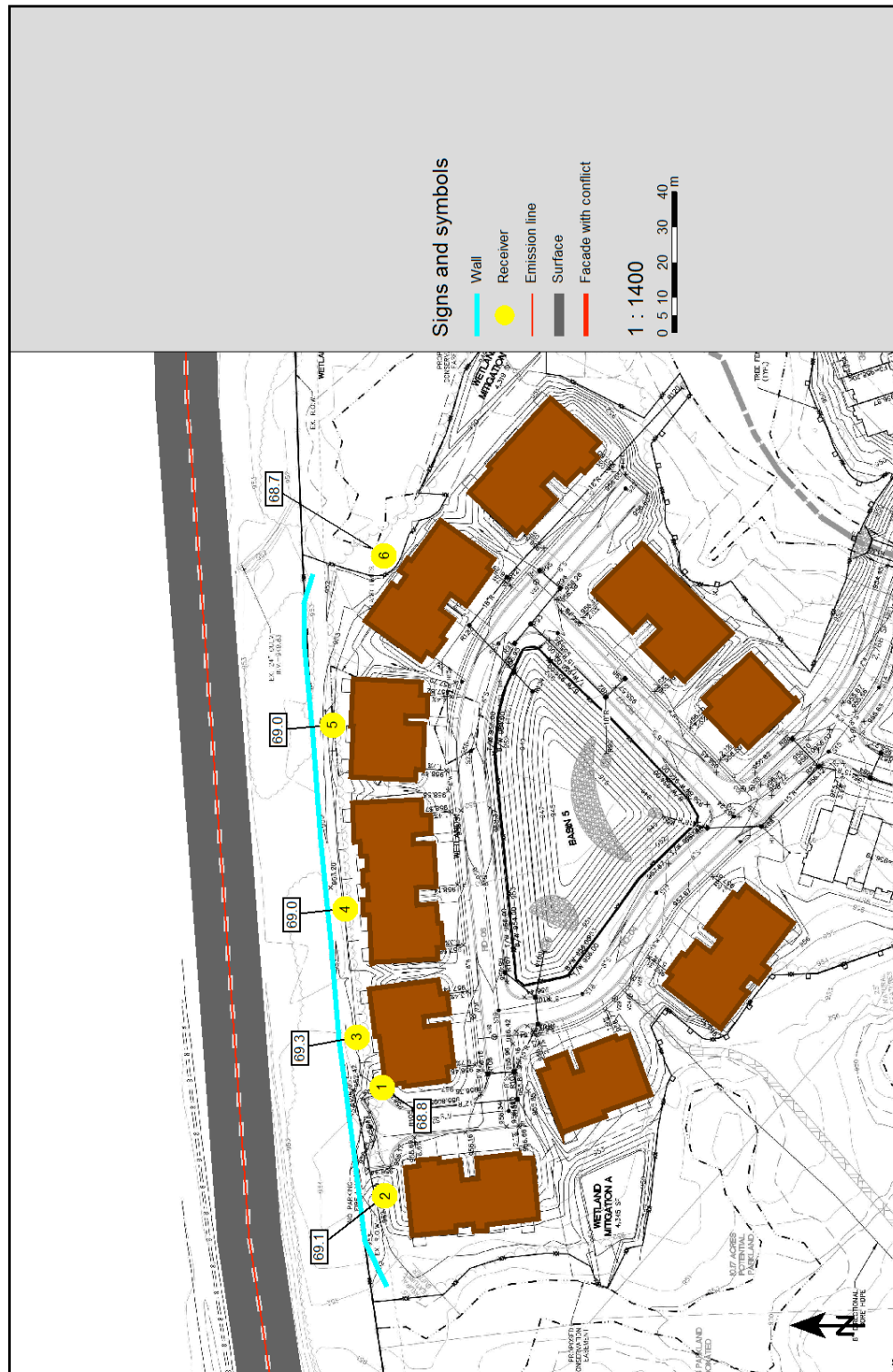
- **Concrete:** Cast-in-place or precast panels can form the barrier. Concrete is a durable material that easily meets the STC requirement of a barrier wall. Precast panels can be erected quickly.
- **Brick and Masonry Block:** Hand-laid or preassembled panels are options with this material. A continuous concrete foundation is required. Both materials meet the STC requirements for a noise barrier wall. This type of material may not be as durable as concrete should it come into contact with deicing salts.
- **Metal:** These panels are lighter than concrete or masonry. Typical materials are steel, aluminum or stainless steel. The STC of these panels may not meet the minimum requirement, but corrugations or ribs will improve the performance. The manufacturer should submit test data to demonstrate the STC performance. Also, the typical 18 to 22 gauge thickness may not be structurally strong enough to withstand impact or other types of damage.
- **Wood:** Pressure preservative treated lumber, plywoods and glue laminated products are common materials used for wood barrier walls. This material may be aesthetically more desirable near residential areas. The main issues with wood are warping and shrinkage, which can open up cracks and gaps. This can be partially solved by specifying deeper than standard tongue and groove construction or screwing multiple sheet layers together. The STC rating of the material should be verified so that it meets the required performance.
- **Transparent Panels:** These panels block sound while allowing scenic views and reducing the visual impact of the barrier. They can cost up to twenty times that of concrete or steel panels.
- **Plastics:** These engineered panels of polyethylene, PVC and fiberglass are lightweight and potentially recyclable. Some materials or products may not be dimensionally stable and over time and could deform, opening cracks in the wall.
- **Recycled Rubber:** This material should be tested for its STC rating prior to selection. Some products may be too porous to meet the required performance.
- **Composites:** Combinations of the above materials may be available. Again, the STC rating of the assembly should be verified prior to specification.



**Appendix C: SoundPlan output images**



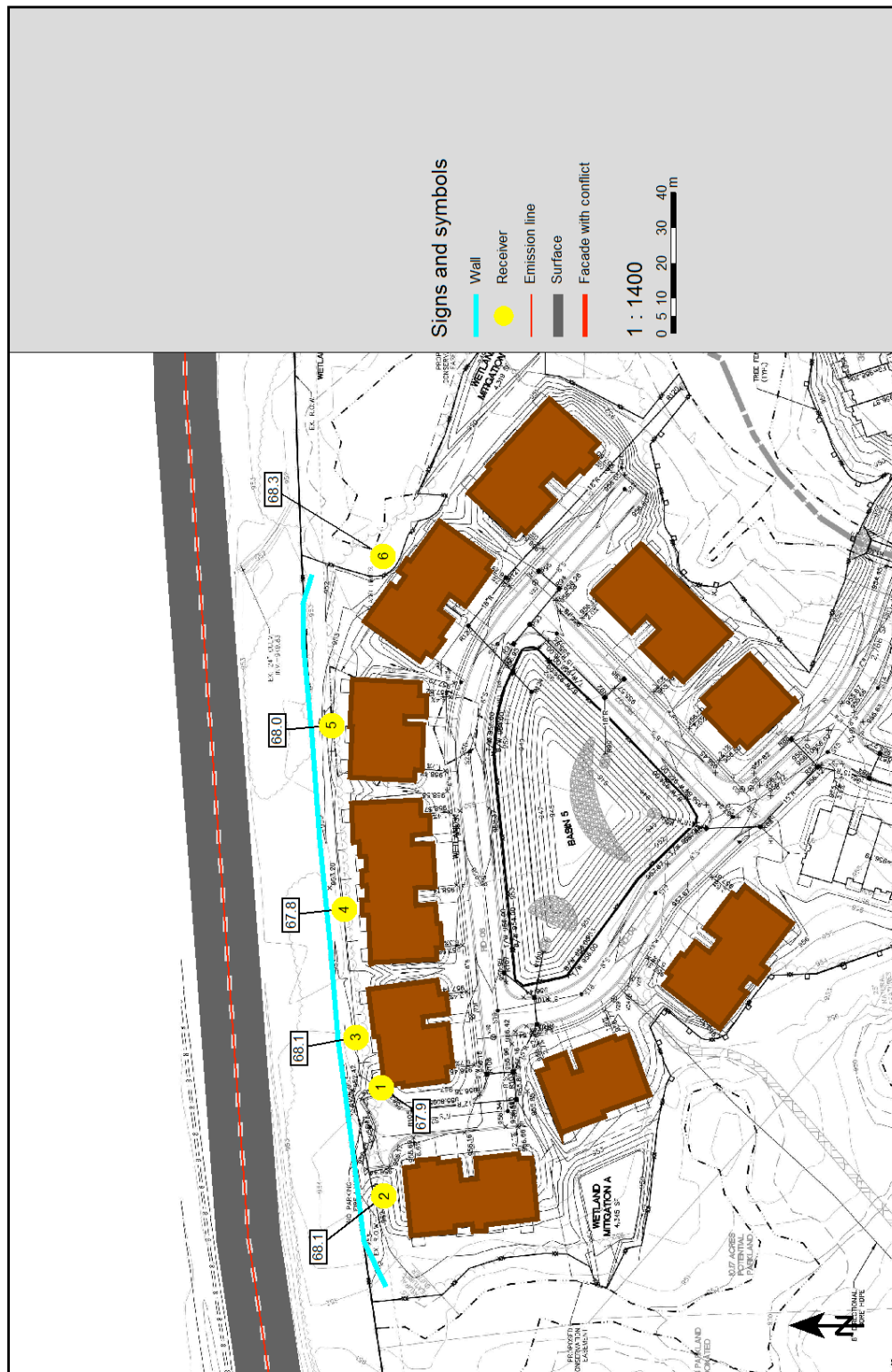
**Figure C1: Prediction for no barrier**



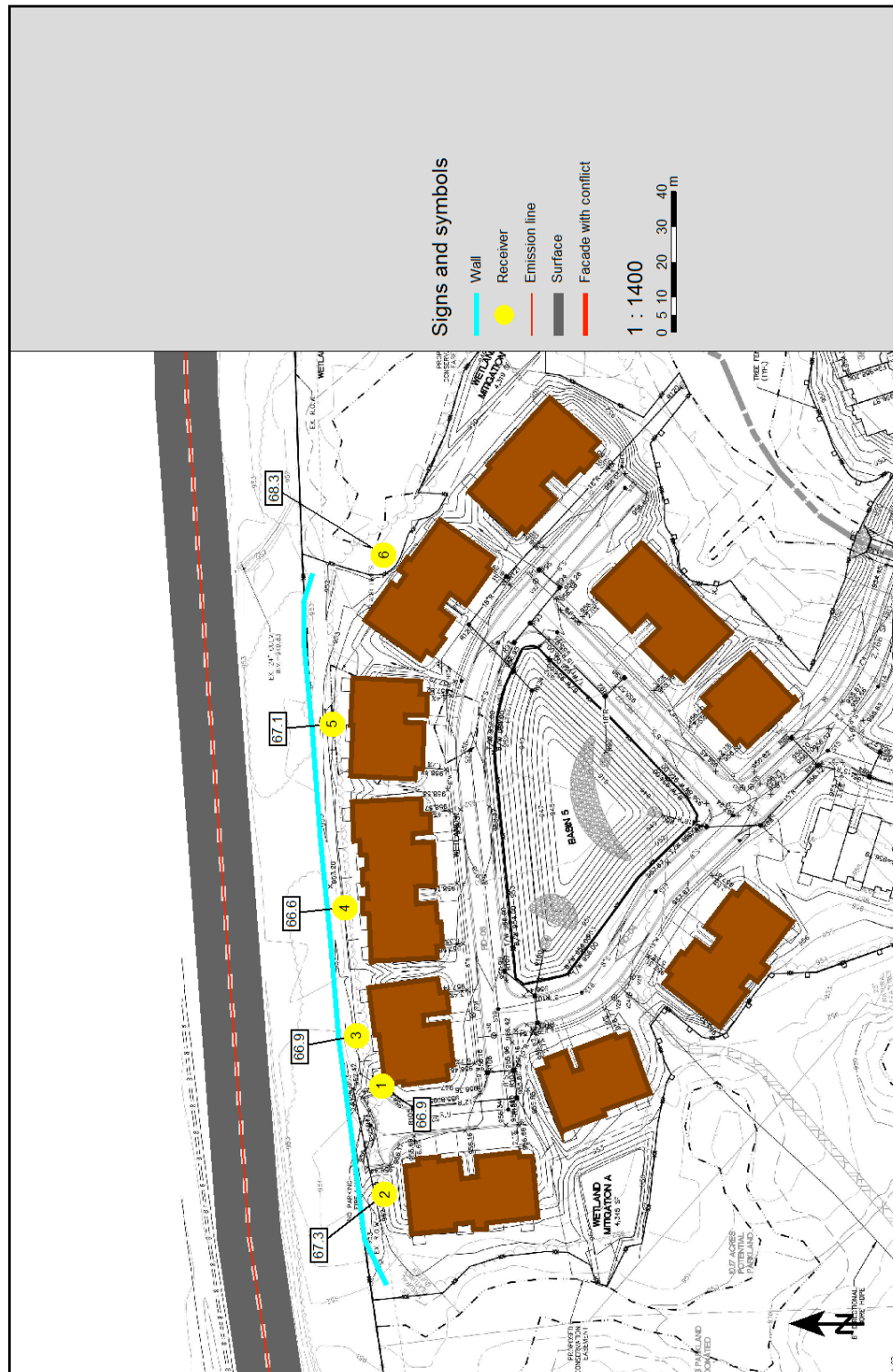
**Figure C2: Prediction for 8 foot high barrier on proposed grading**

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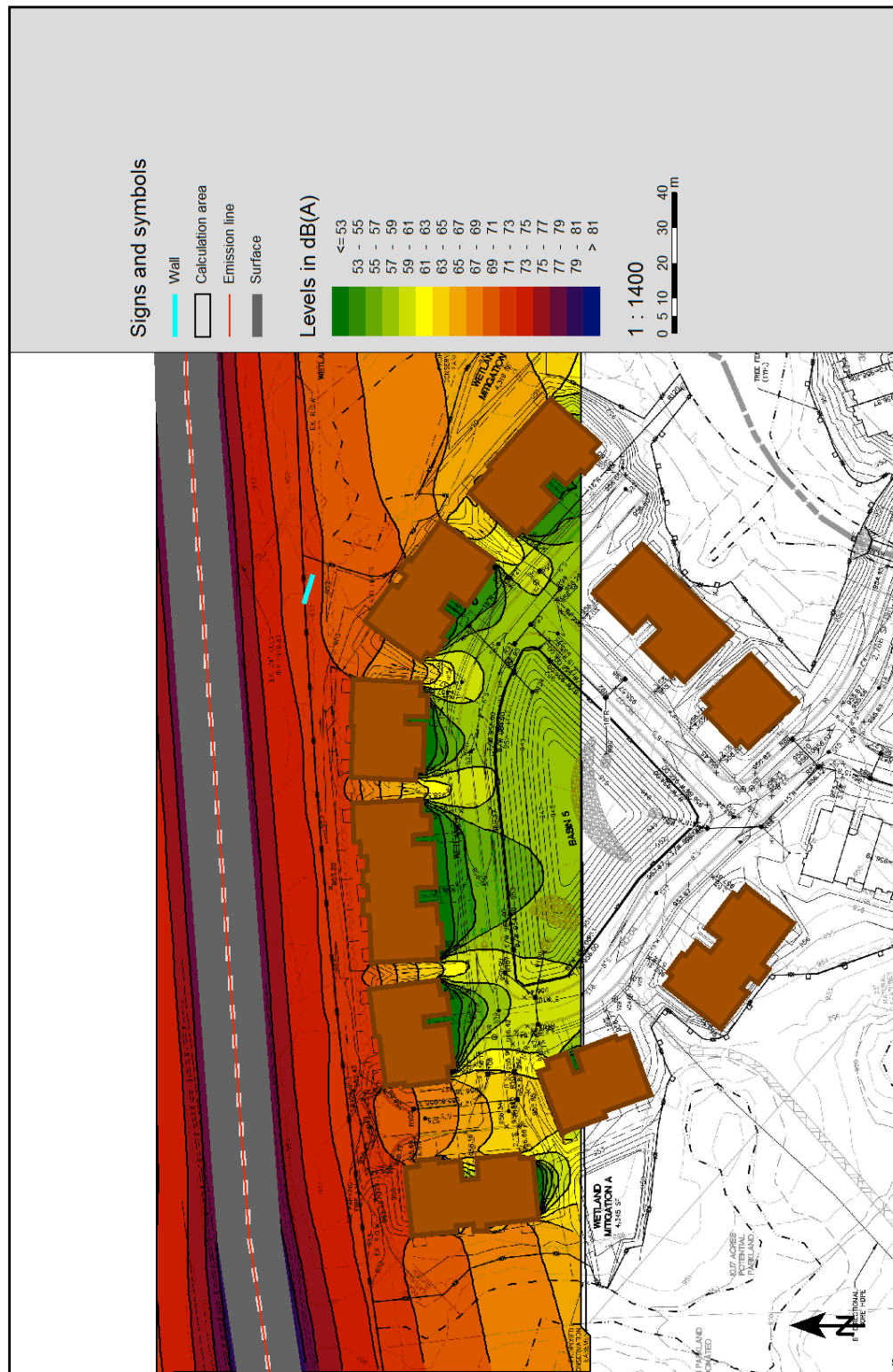


**Figure C3: Prediction for 8 foot high barrier on raised grading by 2 feet**

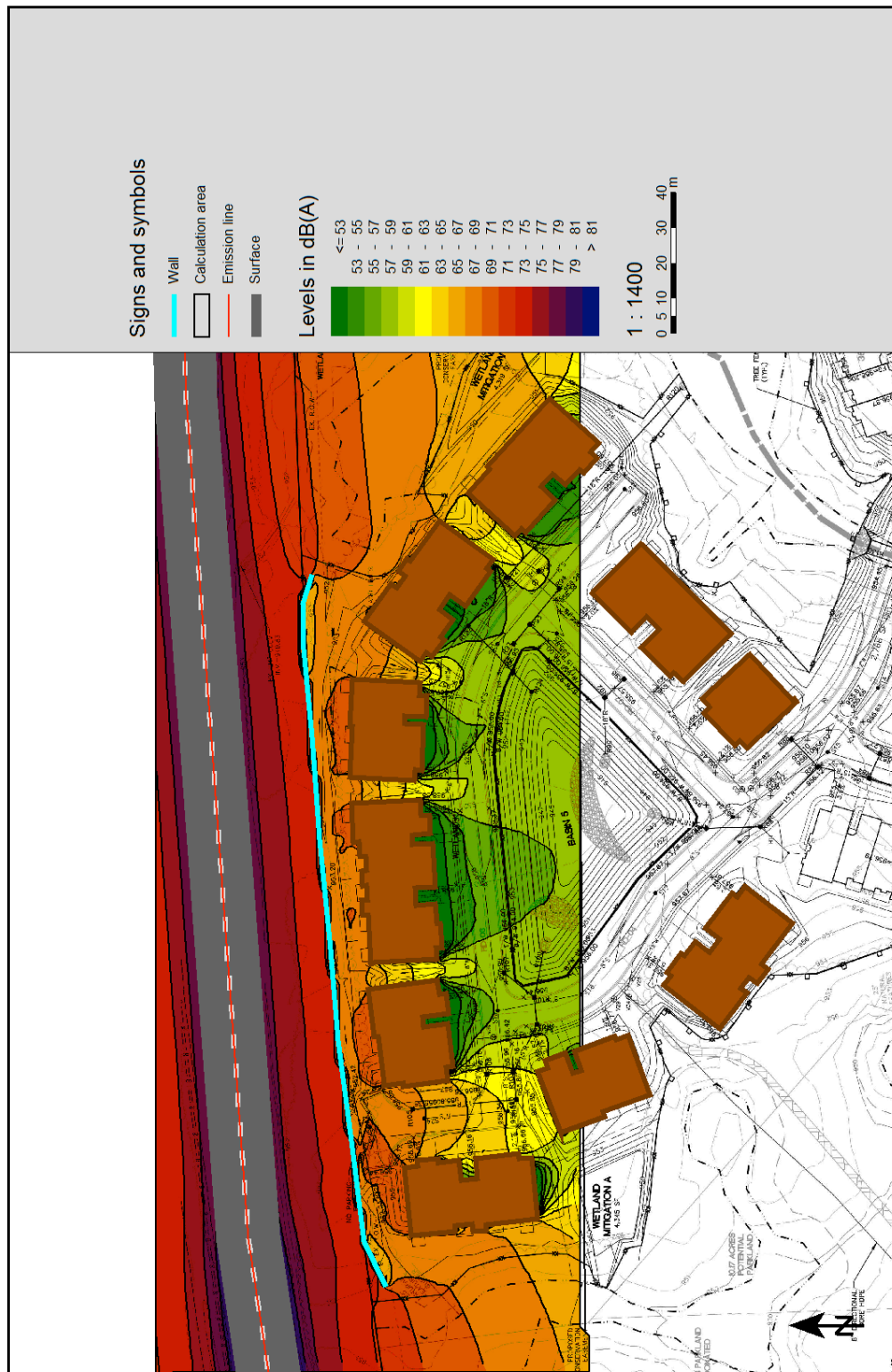


**Figure C4: Prediction for 12 foot high barrier (or 10 foot barrier on 2 foot raised grading)**

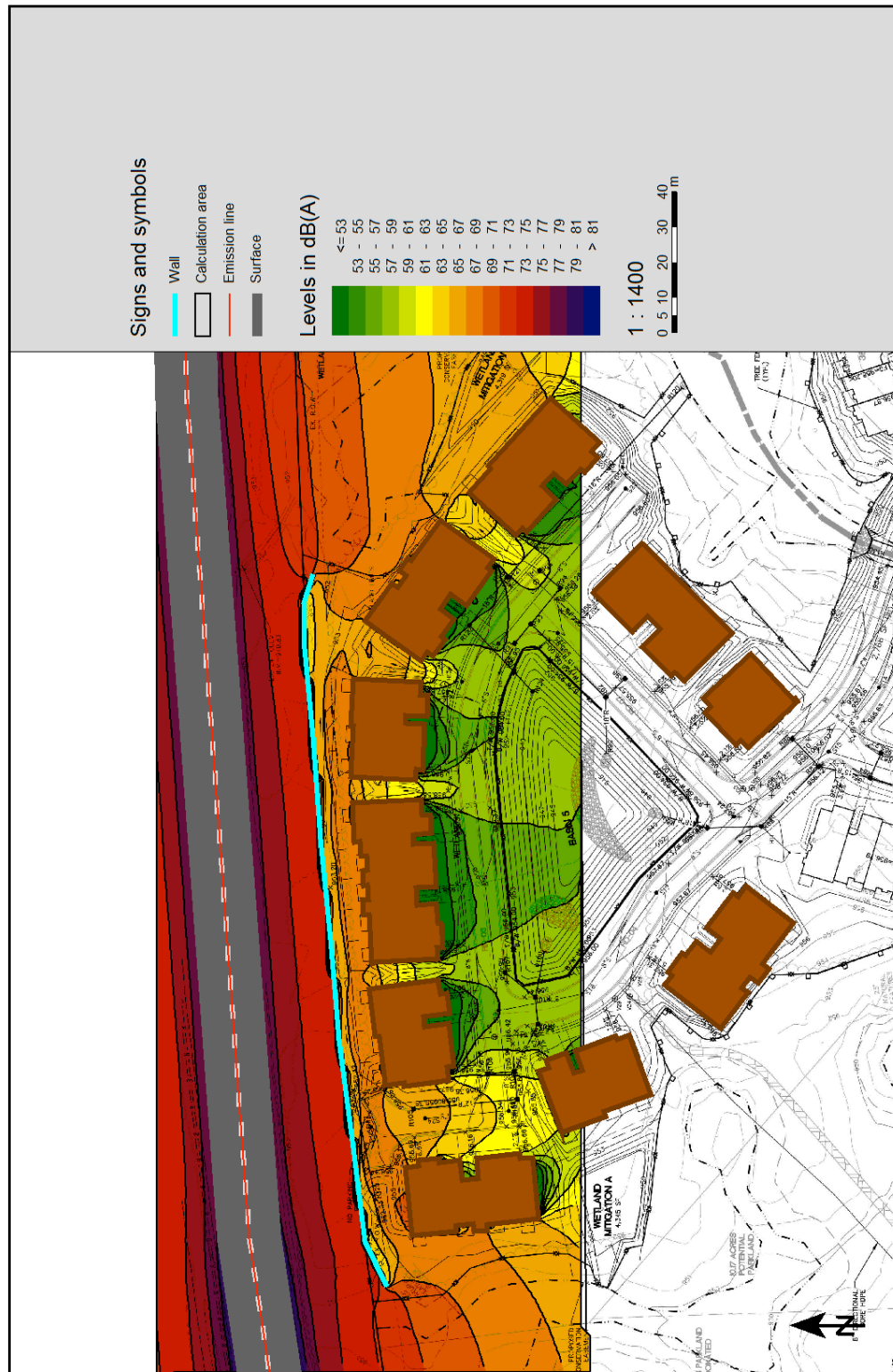




**Figure C5: Noise mapping for no barrier**

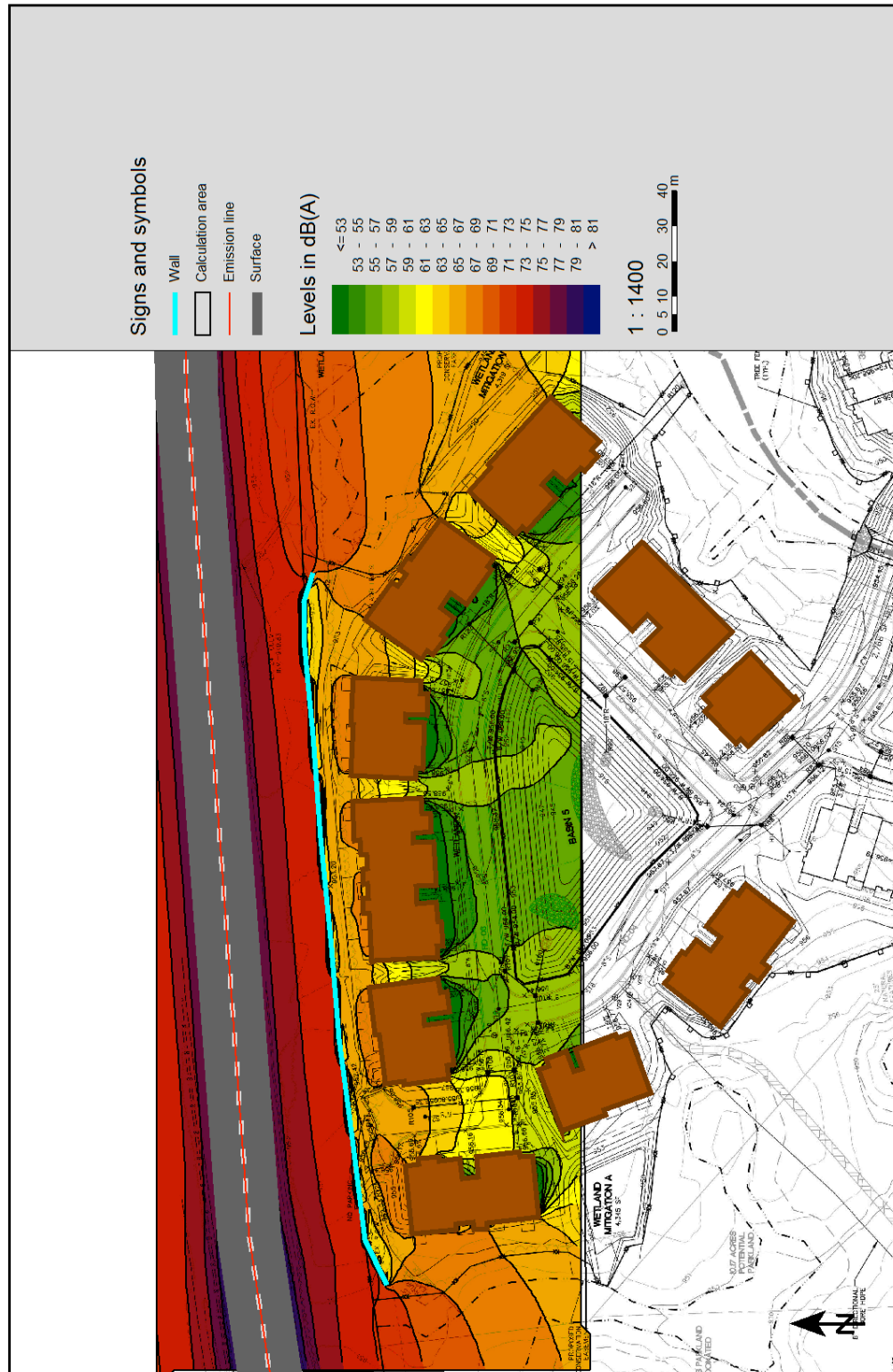


**Figure C6: Noise mapping for 8 foot high barrier on proposed grading**



**Figure C7: Noise mapping for 8 foot high barrier on raised grading by 2 feet**





**Figure C8: Noise mapping for 12 foot high barrier (or 10 foot barrier on 2 foot raised grading)**