STAYBRIDGE SUITES & RETAIL CENTER

3850 RESEARCH PARK DRIVE

CITY OF ANN ARBOR, WASHTENAW COUNTY, MICHIGAN

SITE PLAN APPROVAL FOR PLANNING COMMISSION
CONSTRUCTION PLANS

PROPERTY OWNER/
PETITIONER / APPLICANT

STELLAR HOSPITALITY ANN ARBOR, LLC
2600 AUBURN ROAD, SUITE 240
AUBURN HILLS, MI 48326

CONTACT: JIMMY ASMAR
PHONE: (248) 419-5555

CIVIL ENGINEER

STELLAR DEVELOPMENT, LLC
2600 AUBURN ROAD, SUITE 160
AUBURN HILLS, MI 48326

CONTACT: ANDREW ANDRE, P.E.
PHONE: (810) 444-7815

DEVELOPMENT PROGRAM

A) THE PROPOSED LAND USE IS ZONED *RE* AND IS MASTERPLANNED FOR MIXED USE (COMMERCIAL/OFFICE/RESIDENTIAL) IN ACCORDANCE WITH THE "SOUTH STATE STREET CORRIDOR PLAN" ADOPTED BY CITY PLANNING COMMISSION ON MAY 21, 2013 AND CITY COUNCIL ON JULY 15, 2013. THIS PROJECT CONSISTS OF THE DEMOLITION OF AN EXISTING BUILDING AND CONSTRUCTION OF AN EXTENDED STAY HOTEL AND RETAIL CENTER FOR A MIXED USE COMMERCIAL DEVELOPMENT. THIS PROJECT INCLUDES NEW LANDSCAPING AND STORM WATER IMPROVEMENTS. PARKING AND DENSITY CALCULATIONS ARE PROVIDED ON THE SITE LAYOUT AND PAVING PLAN INCLUDED WITHIN THIS SET.
B) THERE IS NO PROPOSED PHASING. THE ESTIMATED CONSTRUCTION COST IS IN THE RANGE OF $6,000,000.
C) THE SUBMISSION IS FOR A PLANNED PROJECT.

COMMUNITY ANALYSIS

A) THIS PROJECT WILL NOT HAVE AN IMPACT ON THE PUBLIC SCHOOLS.
B) THE RELATIONSHIP OF THIS PROJECT TO THE NEIGHBORING USE SHOULD NOT CHANGE.
C) THERE SHOULD BE NO CHANGE TO ADJACENT USES.
D) THIS PROJECT WILL NOT CHANGE THE AIR QUALITY, IT WILL IMPROVE STORMWATER MANAGEMENT BY PROVIDING DETENTION THAT IS NOT CURRENTLY PROVIDED FOR ON THE PROPERTY, IT WILL IMPROVE THE NATURAL FEATURES WITH NEW LANDSCAPING.
E) THIS PROJECT IS NOT LOCATED WITHIN A HISTORIC DISTRICT AND WILL NOT IMPACT ANY KNOWN HISTORIC SITES OR STRUCTURES.

NATURAL FEATURES STATEMENT OF IMPACT

THE IMPACT UPON THE NATURAL FEATURES WILL BE MINIMAL SINCE THE PROPERTY HAS PREVIOUSLY BEEN DEVELOPED. THERE ARE SOME ANTICIPATED REMOVAL OF TREES ON THE PROPERTY, HOWEVER REPLACEMENT TREES AND LANDSCAPE IMPROVEMENTS WILL BE PROVIDED FOR. THE EXISTING CONDITIONS ARE CONTINUING TO DETERIORATE, THEREFORE RE-DEVELOPMENT OF THE PROPERTY WILL IMPROVE THE CURRENT CONDITIONS. BASED ON THE TREE INVENTORY CONDUCTED BY ERIC OLSON, RLA, THERE ARE NOT WOODLANDS ON THE PROPERTY. THERE ARE A TOTAL OF 66 TREES IDENTIFIED ON THE PROPERTY, OF WHICH 17 ARE NOT REGULATED, 30 ARE REGULATED AS LANDMARK TREES. THERE IS AN ENCROACHMENT INTO THE CRITICAL ROOT ZONE OF THE PROTECTED LANDMARK TREES, HOWEVER THE EXISTING SITE HAS PAVEMENT WITHIN THE CRITICAL ROOT ZONE OF THE TREES. THE PROPOSED DEVELOPMENT ACTIVITIES WILL KEEP THE ENCROACHMENT AT THE SAME LOCATION. REMOVAL OF 9 LANDMARK TREES ARE PROPOSED AND THE REMAINING TREES WILL BE PROTECTED BY THE USE OF PERIMETER PLASTIC MESH FENCING PLACED AT THE DRIP LINE OF THE TREES.

TRAFFIC STATEMENT

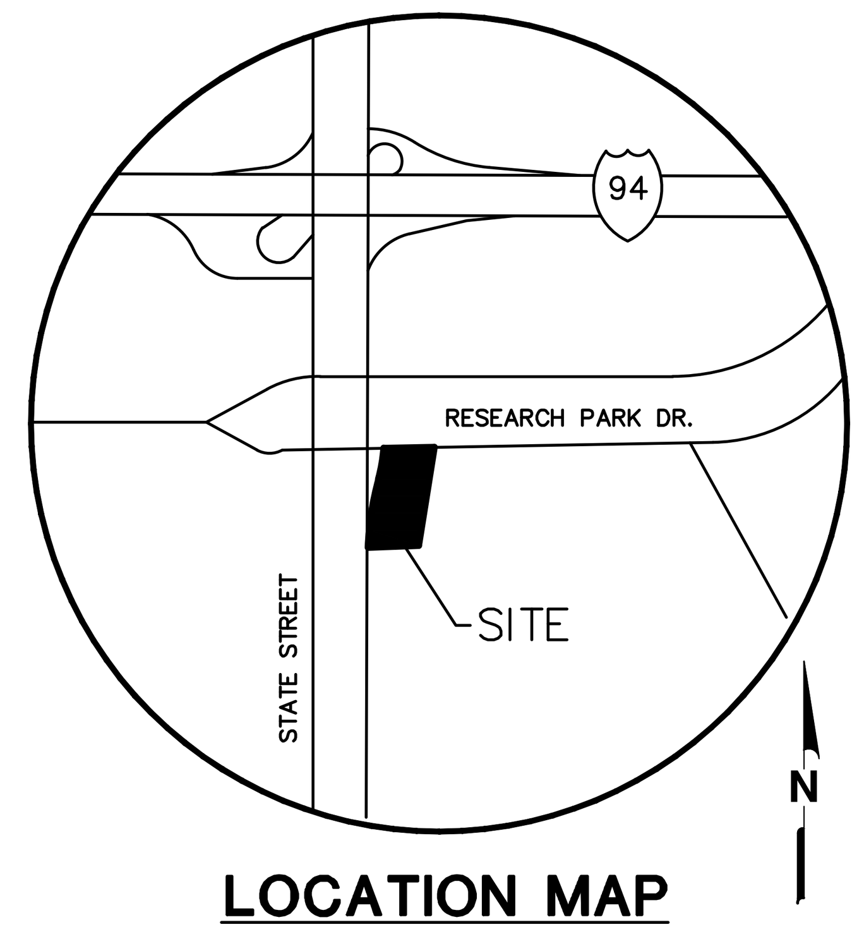
THE TRAFFIC IMPACT STUDY WILL BE SUBMITTED UNDER SEPARATE COVER.

STATEMENT OF INTEREST

THE APPLICANT IS THE OWNER OF THE PROPERTY.

SITE ANALYSIS

A) THE EXISTING LAND USE IS MASTERPLANNED FOR MIXED USE. CURRENTLY, THERE IS AN EXISTING BUILDING AND THE PROPERTY IS IN A DETERIORATED STATE.
B) A TREE INVENTORY HAS BEEN CONDUCTED FOR THE PROPERTY. THE SITE IS RELATIVELY FLAT WITH SOME RELIEF ACROSS THE PROPERTY. SOIL CONDITIONS WERE IDENTIFIED AS "FILL LAND" ACCORDING TO THE USDA-NRCS "WEB SOIL SURVEY"
C) NATURAL FEATURES
i) ENDANGERED SPECIES: THE U.S. FISH & WILDLIFE SERVICE ENDANGERED SPECIES LIST FOR WASHTENAW COUNTY WAS REVIEWED, AND THE HABITAT OF THE SUBJECT PROPERTY DOES NOT MATCH THE REQUIREMENTS FOR CORRESPONDING SPECIES
ii) 100-YEAR FLOODPLAIN: ACCORDING TO FEMA COMMUNITY PANEL 26161C04P1E EFFECTIVE 04/03/2012, THE PROPERTY IS LOCATED IN ZONE "X", WHICH IS AREAS DETERMINED TO BE OUTSIDE 0.2% ANNUAL CHANCE FLOODPLAIN.
iii) LANDMARK TREES: A TREE INVENTORY WAS CONDUCTED FOR THE PROPERTY AND IS INCLUDED WITHIN THE PLAN SET.
iv) STEEP SLOPES: THERE ARE NO STEEP SLOPES ON THE PROPERTY.
v) WATERCOURSES: THERE ARE NO WATERCOURSES ON THE PROPERTY.
vi) WETLANDS: THERE ARE NO WETLANDS ON THE PROPERTY AS INDICATED ON THE NATIONAL WETLAND INVENTORY MAP.
vii) WOODLANDS: ACCORDING TO THE TREE INVENTORY THAT WAS CONDUCTED, THERE ARE NO WOODLANDS ON THE PROPERTY.
D) THERE IS AN EXISTING BUILDING ON THE PROPERTY THAT IS SITUATED ON THE NORTHERN PORTION OF THE SITE WITH A LARGER PARKING LOT IN THE REAR.
E) EXISTING AND PROPOSED VEHICULAR, PEDESTRIAN AND BICYCLE WAYS AND ACCESS POINTS ARE INDICATED ON THE SITE LAYOUT AND PAVING PLAN.
F) UTILITIES AND PROPOSED CONNECTIONS ARE SHOWN ON THE UTILITY PLAN INCLUDED IN THE PLAN SET.
G) EXISTING AND PROPOSED GENERAL DRAINAGE PATTERN ON THE PROPERTY ARE INDICATED ON THE STORM MANAGEMENT PLANS IN THE PLAN SET.
H) THE PROPOSED MIXED USE IS CONSISTENT WITH THE MASTER PLAN. THE PROJECT WILL ENHANCE THE RESEARCH PARK AREA BY PROVIDING FOR NON-EXISTENT USES OF A HOTEL AND RETAIL. THIS PROJECT WILL ENHANCE THE AREA WITH NEW LANDSCAPING IMPROVEMENTS.



LOCATION MAP
NOT TO SCALE

811
Know what's **below.**
Call before you dig.

DRAWING INDEX

C1.0 COVER SHEET
~~C2.0 EXISTING CONDITIONS PLAN~~
~~C2.1 TREE INVENTORY PLAN~~
~~C2.2 SOIL BORING PLAN~~
~~C2.3 NATURAL FEATURES ALTERNATIVE ANALYSIS PLAN~~
C3.0 SITE LAYOUT AND PAVING PLAN
~~C3.1 SITE PHOTOMETRIC PLAN~~
~~C4.0 OVERALL GRADING AND EROSION CONTROL PLAN~~
~~C4.1 ENLARGED GRADING PLAN~~
~~C4.2 ENLARGED GRADING PLAN~~
~~C5.0 UTILITY PLAN~~
C5.1 STORM LAYOUT PLAN
C5.2 STORM MANAGEMENT PLAN
C5.3 STORM MANAGEMENT DETAILS
~~C5.4 FIRE COVERAGE PLAN~~
~~C5.5 WATER MAIN PROFILES~~
~~C5.6 WATER MAIN PROFILES~~
~~C5.7 STORM SEWER PROFILES~~
C5.8 UNDERGROUND DETENTION PLANS
C5.9 UNDERGROUND DETENTION PLANS
~~C6.0 SITE DETAILS~~
~~C6.1 CITY OF ANN ARBOR STANDARD DETAILS~~
~~C6.2 CITY OF ANN ARBOR STANDARD DETAILS~~
L1.0 LANDSCAPE PLAN AND DETAILS

STATE OF MICHIGAN
ANDREW ANDRE
ENGINEER
No. 47380
LICENSED PROFESSIONAL ENGINEER

ANDREW ANDRE, P.E.
MICHIGAN PE 47380
STELLAR DEVELOPMENT, LLC

STANDARD LEGEND

DESCRIPTION	PROPOSED	EXISTING
BUILDING		
STORM SEWER	12"	12"
SANITARY SEWER	S	12"
WATER	W	W
GAS LINE	G	G
ELECTRIC LINE	E	E
TELEPHONE LINE	T	T
MANHOLE		D S
CATCH BASIN		
ENDSECTION		
FIRE HYDRANT		
GATE VALVE & WELL		W
UTILITY POLE		
UTILITY RISER		
SIGN		
LIGHT POLE		
CURB & GUTTER		
FENCE		
SILT FENCE		
TREE – DECIDUOUS	AS NOTED ON PLANS	
TREE LINE		
SPOT ELEVATION	100.00	100.00
CONTOUR LINE	100	100
SECTION CORNER		
FOUND PROPERTY IRON		
SET PROPERTY IRON		
GAS METER		G
ELECTRICAL METER		E
TELEPHONE RISER		TPED
MAILBOX		MB
SOIL BORING LOCATION		

LEGAL DESCRIPTION

FIRST AMERICAN TITLE INSURANCE COMPANY
COMMERCIAL TITLE SERVICES
COMMITMENT NO. 14–8523
COMMITMENT DATE: SEPTEMBER 9, 2014 @ 8:00 AM

LAND SITUATED IN THE CITY OF ANN ARBOR, COUNTY OF WASHTENAW, MICHIGAN, DESCRIBED AS:
LOT 22, RESEARCH PARK, AS RECORDED IN LIBER 15 OF PLATS, PAGES 56 AND 57, WASHTENAW COUNTY RECORDS.

BENCHMARKS

B.M. #1 - SET BM ON LIGHT POLE NEAR THE NW COR OF PROPERTY
ELEV. 834.30 NAVD 88

B.M. #2 - SET BM ON TOP OF NE BOLT ON LIGHT POLE BASE ON WEST SIDE OF PROPERTY
ELEV. 835.78 NAVD 88

FLOODPLAIN INFORMATION

CITY OF ANN ARBOR
WASHTENAW COUNTY, MICHIGAN
MAP NUMBER: 26161C0401E
EFFECTIVE DATE: APRIL 3, 2012
FLOOD ZONE: X
AREA OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOODPLAIN

UTILITY CONTACTS

ELECTRIC
DTE
ONE ENERGY PLAZA
ROOM 518 S.B.
DETROIT, MI 48226
(313) 235–5632

GAS
DTE
ONE ENERGY PLAZA–WCB1836
DETROIT, MI 48226
(313) 235–5111

ZONING
CITY OF ANN ARBOR
PLANNING & DEVELOPMENT
100 N FIFTH AVE.
ANN ARBOR, MICHIGAN 48107
(734) 794–6265

WATER/SEWER
CITY OF ANN ARBOR
ENGINEERING DEPT.
301 E. HURON
ANN ARBOR, MICHIGAN 48107
(734) 794–6410

UTILITY NOTE

THE UTILITY LOCATIONS AS HEREON SHOWN ARE BASED ON FIELD OBSERVATIONS AND A CAREFUL REVIEW OF MUNICIPAL AND UTILITY RECORDS. HOWEVER, IT IS NOT POSSIBLE TO DETERMINE THE PRECISE SIZE, LOCATION, DEPTH, PRESSURE, OR ANY OTHER CHARACTERISTICS OF UNDERGROUND UTILITIES, TANKS OR SEPTIC FIELDS WITHOUT EXCAVATION. THEREFORE, WE CANNOT GUARANTEE THE ACCURACY OF COMPLETENESS OF THE BURIED UTILITY INFORMATION HEREON SHOWN. THE CONTRACTOR SHALL CALL MISS DIG (1–800–482–7171) A MINIMUM OF THREE WORKING DAYS PRIOR TO ANY EXCAVATION. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THESE UTILITY LOCATIONS PRIOR TO CONSTRUCTION AND MAKE EVERY EFFORT TO PROTECT AND/OR RELOCATE THEM AS REQUIRED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER/SURVEYOR AS SOON AS POSSIBLE IN THE EVENT A DISCREPANCY IS FOUND.

STELLAR DEVELOPMENT, LLC

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PH 810-444-7815
FX 248-553-4218

PREPARED UNDER THE DIRECTION OF:
ANDREW ANDRE, P.E.
MI #47380

APPLICANT:
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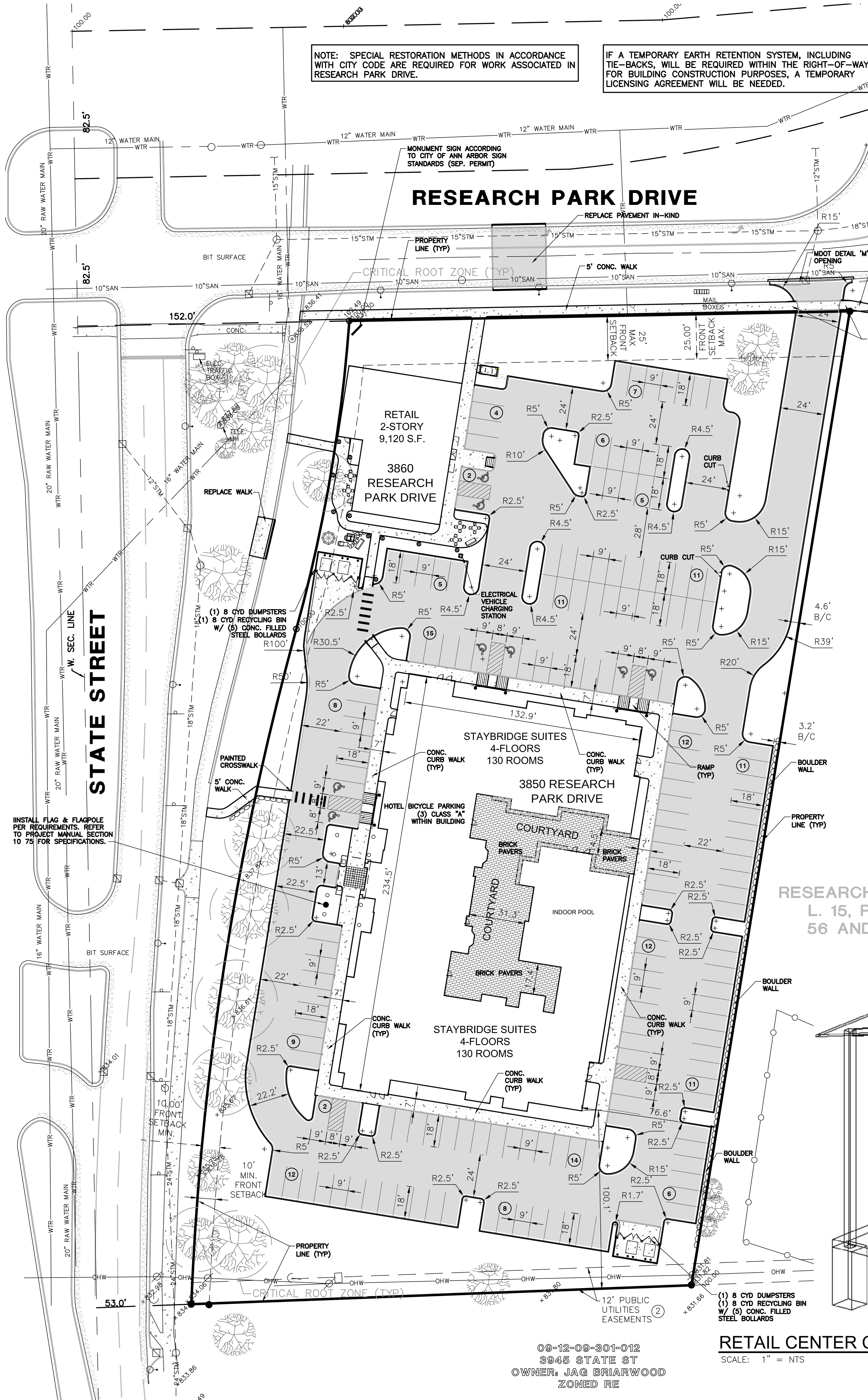
CONST PLANS	12/09/15
UG DETENTION	03/08/16
SPA	01/21/21

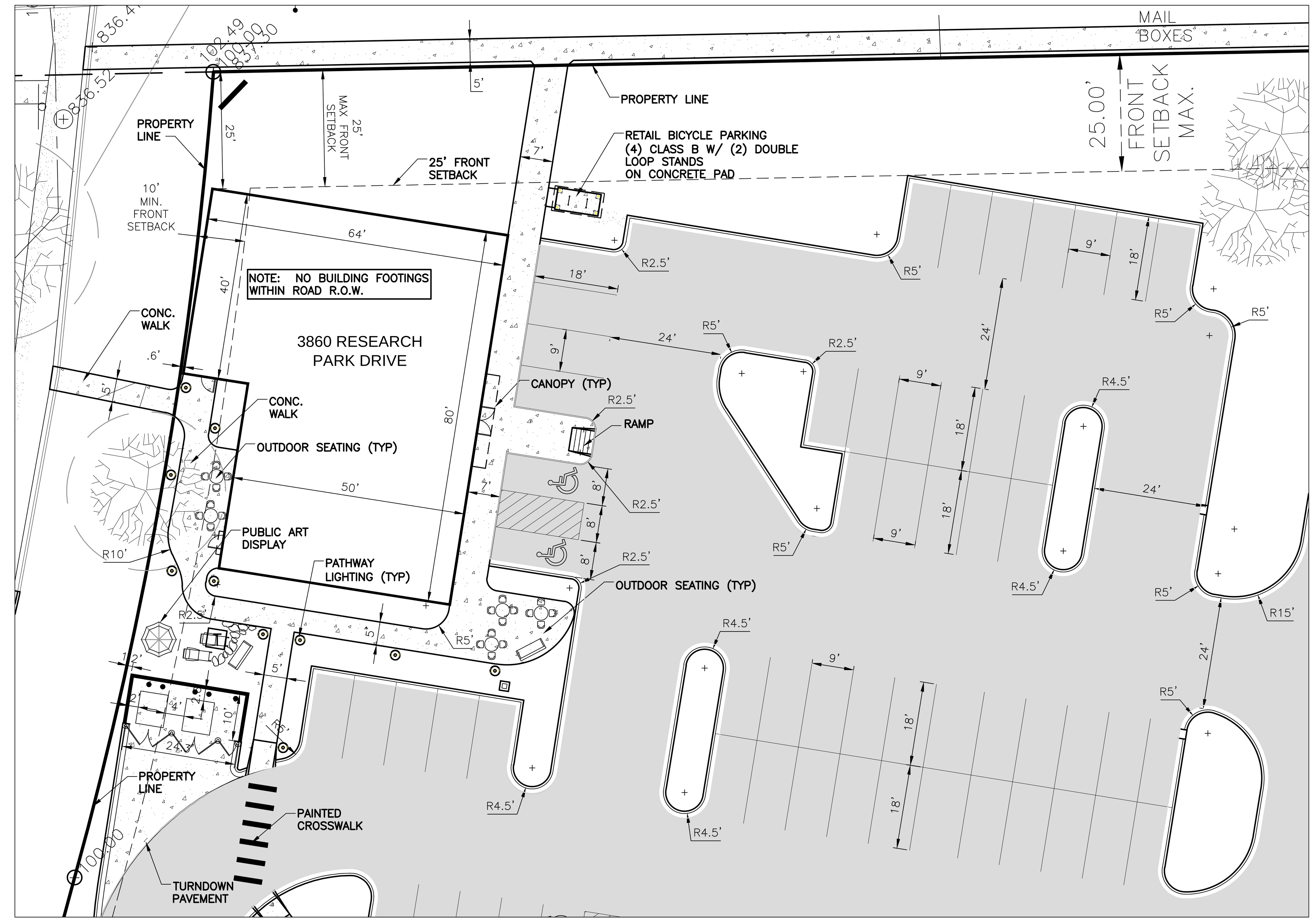
DATE :
DRAWN : ACA
CHECKED :
SCALE : NTS
JOB NO : BD-14-322
SHEET TITLE :
COVER SHEET

SHEET
C1.0



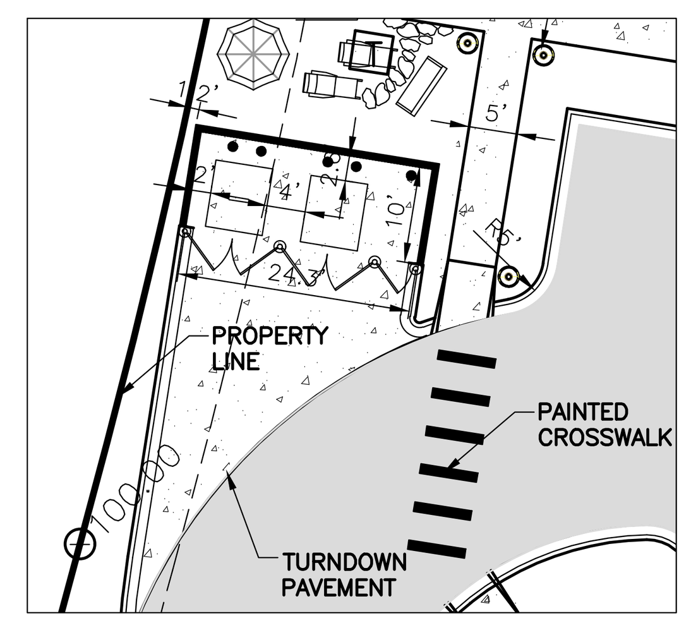
CITY OF ANN ARBOR CONSTRUCTION NOTES

1. PAVEMENT MARKINGS DISTURBED AS A RESULT OF PAVEMENT CUTS OR CONSTRUCTION ACTIVITIES SHALL BE REPLACED AS DIRECTED BY PROJECT MANAGEMENT. REPLACEMENT DURING CONSTRUCTION OF THE PROJECT MAY BE CONSIDERED TEMPORARY, WITH FINAL PAVEMENT MARKING RESTORATION TO OCCUR AT THE END OF THE PROJECT.
2. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THE EXISTING PUBLIC ROAD PAVEMENT. DAMAGE TO THE PUBLIC ROAD PAVEMENT DURING THE COURSE OF CONSTRUCTION MAY NECESSITATE MILLING AND RESURFACING OF THE DAMAGED AREAS PRIOR TO ISSUANCE OF THE CERTIFICATE OF OCCUPANCY.



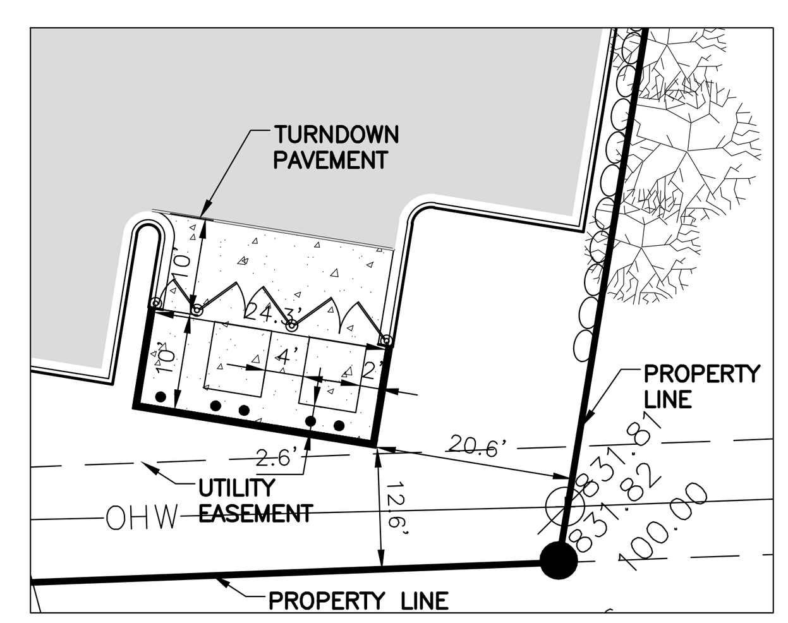
RETAIL CENTER ENLARGED PLAN

SCALE: 1" = 20'



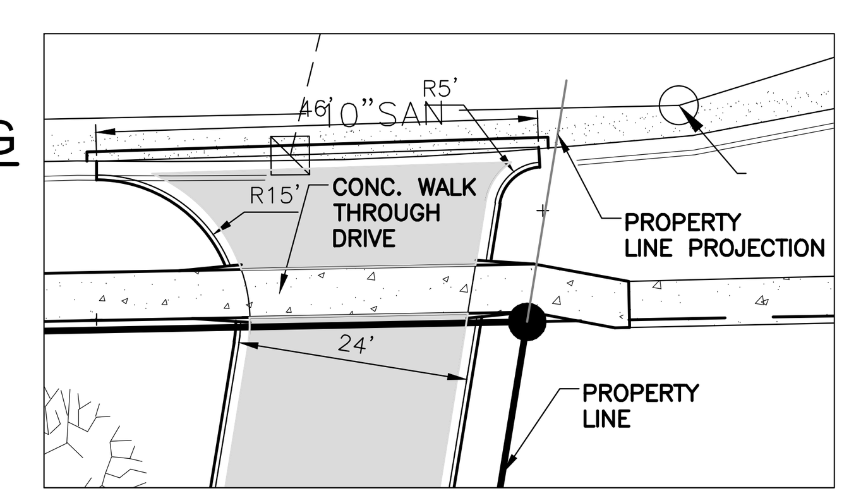
RETAIL TRASH BIN & RECYCLING ENCLOSURE

SCALE: 1" = 20'



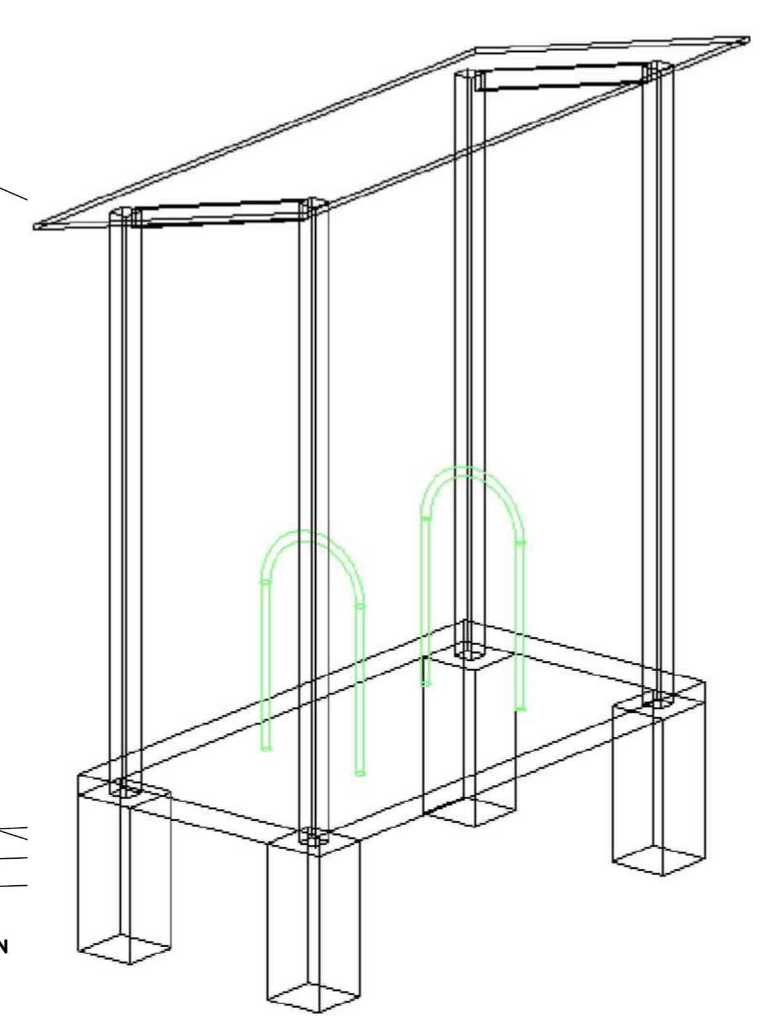
HOTEL TRASH BIN & RECYCLING ENCLOSURE

SCALE: 1" = 20'



ENTRANCE DETAIL

SCALE: 1" = 20'



RETAIL CENTER CLASS B BICYCLE PARKING

SCALE: 1" = NTS

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GENERAL NOTES

1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO SECURE ALL PERMITS AND POST ALL BONDS PRIOR TO CONSTRUCTION, OR ENSURE THAT ALL REQUIRED PERMITS AND BONDS HAVE BEEN OBTAINED PRIOR TO CONSTRUCTION.
2. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION BY CALLING MISS-DIG AT 1-800-482-7171 AT LEAST 3 WORKING DAYS PRIOR TO EXCAVATION.
3. THE CONTRACTOR SHALL ASSUME RESPONSIBILITY FOR THE PROTECTION OF ALL EXISTING UTILITIES DURING CONSTRUCTION. ALL UTILITIES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED WITH LIKE MATERIAL. THE EXACT LOCATION OF EXISTING UTILITIES SHALL BE LOCATED BY HAND DIGGING.
4. DIMENSIONS ARE TO FACE OF CURB, OUTSIDE FACE OF BUILDING, EDGE OF PAVEMENT, CENTER OF STRUCTURE OR OTHERWISE INDICATED.
5. ALL PAVING MATERIALS AND OPERATIONS SHALL BE IN CONFORMANCE WITH THE CITY OF ANN ARBOR STANDARD SPECIFICATIONS FOR CONSTRUCTION.
6. PARKING STALL SPACES TO BE 4" SOLID WHITE PAINT STRIPES. HANDICAP PARKING TO BE 4" SOLID BLUE PAINT STRIPES W/ BARRIER FREE STRIPPING OF 4" SOLID BLUE @ 2' O.C. ON 45° ANGLE.
7. ALL WORK WITHIN THE RIGHT OF WAY OF SHALL BE CONDUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF ANN ARBOR.
8. SPECIAL RESTORATION METHODS IN ACCORDANCE WITH CITY CODE ARE REQUIRED FOR WORK ASSOCIATED IN RESEARCH PARK DRIVE.
9. IF A TEMPORARY EARTH RETENTION SYSTEM, INCLUDING TIE-BACKS, WILL BE REQUIRED WITHIN THE RIGHT-OF-WAY FOR BUILDING CONSTRUCTION PURPOSES, A TEMPORARY LICENSING AGREEMENT WILL BE NEEDED.

SITE PLAN COMPARISON CHART

	EXISTING RE	REQUIRED C2B	**PROPOSED C2B**
GROSS LOT AREA	60,000 S.F.	4000 S.F.	155,349 S.F.
BUILDING SIZE			90,198 S.F. HOTEL
			9,120 S.F. RETAIL
FAR		200%	64%
NUMBER OF ROOMS			130 ROOMS HOTEL
LOT AREA PER ROOM		900 S.F. / ROOM MIN.	1,195 S.F. / ROOM
SETBACKS:			
FRONT			RETAIL
	25' MIN.	10' MIN.	0.6' **
	50' MAX	25' MAX.	25.0'
			HOTEL
	25' MIN.	10' MIN.	62.7'
	50' MAX	25' MAX.	66.0'
SIDE	NONE	NONE	78.9' HOTEL
REAR	NONE	NONE	101.9' HOTEL
BUILDING HEIGHT	55'	55'	RETAIL
	4-STORIES	4-STORIES	28'-6" AVG/35' MAX
			2-STORIES
			HOTEL
			47'-6"AVG/52'-6"MAX
			4-STORIES
VEHICULAR PARKING			RETAIL
		1 / 310 S.F. MIN.	
		29	
		1 / 265 S.F. MAX	
		34	34
			HOTEL
		1 / ROOM	
		130	137
BARRIER FREE PARKING		FEDERAL ADA	
		RETAIL - 34 SPACES	RETAIL
		2 REQUIRED	2 PROVIDED
		HOTEL - 130 SPACES	HOTEL
		5 REQUIRED	6 PROVIDED
BICYCLE PARKING			RETAIL
		1 / 3000 S.F.	
		3	4
		50% B	4
		50% C	
			HOTEL
		1 / 30 ROOMS	
		4	
		100% A	3
		Defer 40%	

PLANNED PROJECT MODIFICATIONS**

1) FRONT SETBACK TO 0.6-FEET IN ORDER TO BRING RETAIL BUILDING CLOSER TO STATE STREET. INCREASED RIGHT-OF-WAY ALONG STATE STREET AT RESEARCH PARK DRIVE PROVIDES FOR NATURAL SETBACK FROM THE ROADWAY.

CITY OF ANN ARBOR SIDEWALK REPAIR AND MAINTENANCE NOTE

SIDEWALK REPAIR AND MAINTENANCE NOTE: ALL SIDEWALKS ARE TO BE KEPT AND MAINTAINED IN GOOD REPAIR BY THE OWNER OF THE LAND ADJACENT TO AND ABUTTING THE SAME. PRIOR TO THE ISSUANCE OF THE FINAL CERTIFICATE OF OCCUPANCY FOR THIS SITE, ALL EXISTING SIDEWALKS IN NEED OF REPAIR MUST BE REPAIRED IN ACCORDANCE WITH CITY STANDARDS.

PAVEMENT INFORMATION

BITUMINOUS PAVEMENT

CONCRETE PAVEMENT

0' 40' 80' 120'

SCALE: 1" = 40'

THE LOCATION OF ALL UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE BASED ON RECORDS PROVIDED BY THE UTILITY OWNERS AND VISIBLE EVIDENCE OBTAINED IN THE FIELD. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED TO THE COMPLETENESS OR ACCURACY THEREOF.

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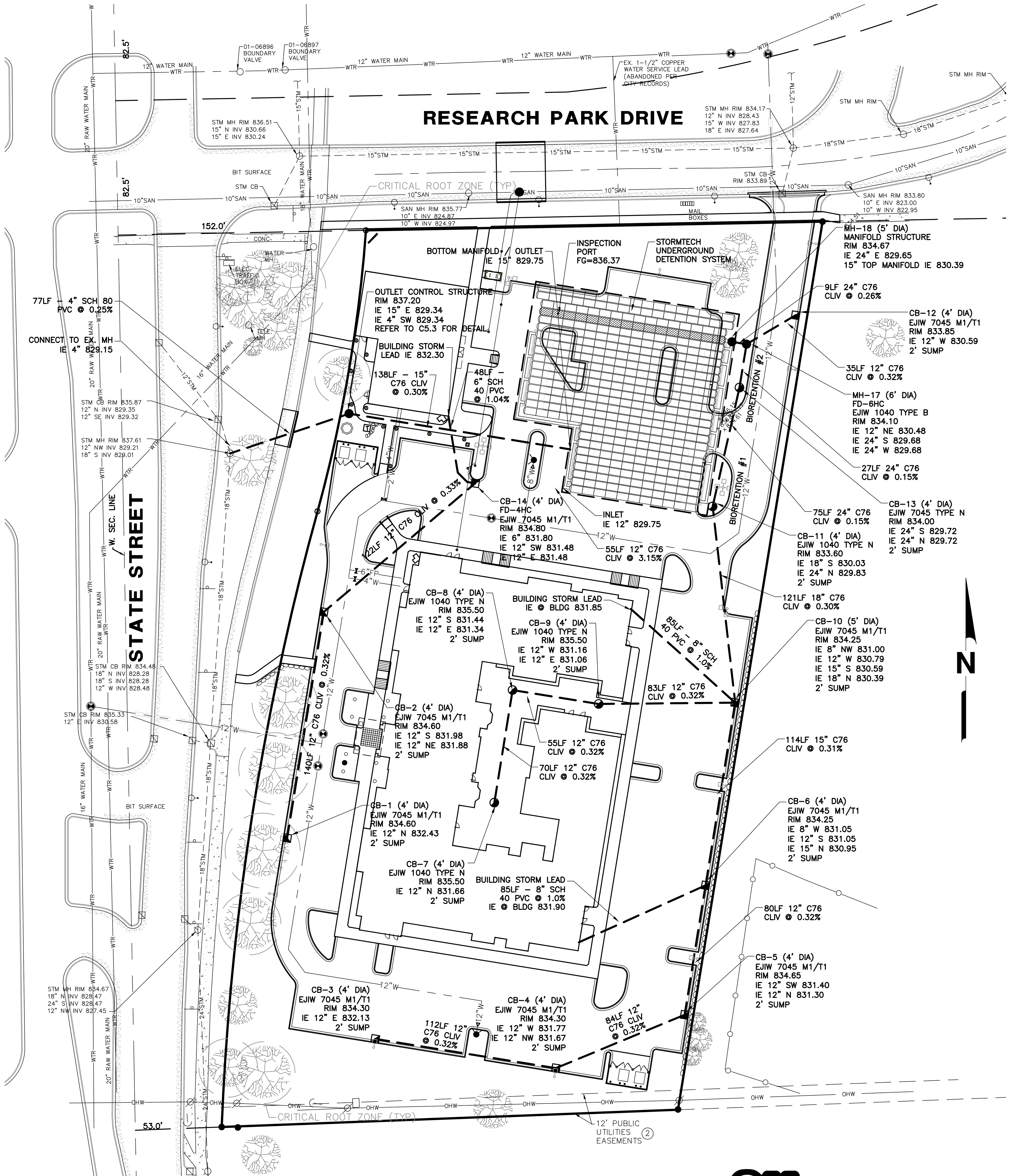

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UTILITY CONTACTS

ELECTRIC
DTE
ONE ENERGY PLAZA
ROOM 518 S.B.
DETROIT, MI 48226
(313) 235-5632

GAS
DTE
ONE ENERGY PLAZA-WCB1836
DETROIT, MI 48226
(313) 235-5111

ZONING
CITY OF ANN ARBOR
PLANNING & DEVELOPMENT
100 N FIFTH AVE.
ANN ARBOR, MICHIGAN 48107
(734) 794-6265

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301 E. HURON
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0' 40' 80' 120'
SCALE: 1" = 40'

STORMTECH VOLUME CALCULATIONS

Project: STAYBRIDGE SUITES

StormTech Detention • Retention • Water Quality — A division of ADS

Chamber Model -	SC-740	
Units -	Imperial	Click Here for Metric
	367	
Number of chambers -	373	
Voids in the stone (porosity) -	30	%
Base of Stone Elevation -	829.14	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	6	in
Area of system -	14361	sf Min. Area - 12609 sf min. area

☑ Include Perimeter Stone in Calculations

StormTech SC-740 Cumulative Storage Volumes

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Total Chamber *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch & St *(cubic feet)*	Cumulative Chamber *(cubic feet)*	Elevation *(feet)*
48	0.00	0.00	359.03	359.03	29230.97	833.14
47	0.00	0.00	359.03	359.03	28871.94	833.06
46	0.00	0.00	359.03	359.03	28512.92	832.97
45	0.00	0.00	359.03	359.03	28153.89	832.89
44	0.00	0.00	359.03	359.03	27794.87	832.81
43	0.00	0.00	359.03	359.03	27435.84	832.72
42	0.00	0.00	359.03	359.03	27076.82	832.64
41	0.00	0.00	359.03	359.03	26717.79	832.56
40	0.00	0.00	359.03	359.03	26358.77	832.47
39	0.00	0.00	359.03	359.03	25999.74	832.39
38	0.00	0.00	359.03	359.03	25640.72	832.31
37	0.00	0.00	359.03	359.03	25281.69	832.22
36	0.05	20.51	352.87	373.38	24922.67	832.14
35	0.16	60.77	340.79	401.56	24549.28	832.06
34	0.28	105.16	327.48	432.64	24147.72	831.97
33	0.60	225.28	291.44	516.72	23715.08	831.89
32	0.80	299.04	269.31	568.35	23198.36	831.81
31	0.95	354.60	252.64	607.25	22630.01	831.72
30	1.07	400.79	238.79	639.58	22022.76	831.64
29	1.18	440.32	226.93	667.25	21383.18	831.56
28	1.27	472.09	217.40	689.49	20715.93	831.47
27	1.36	505.42	207.40	712.82	20026.44	831.39
26	1.45	542.38	196.31	738.69	19313.62	831.31
25	1.52	568.72	188.41	757.13	18574.93	831.22
24	1.58	590.21	181.96	772.17	17817.80	831.14
23	1.64	612.57	175.25	787.82	17045.63	831.06
22	1.70	633.92	168.85	802.77	16257.80	830.97
21	1.75	653.84	162.87	816.71	15455.04	830.89
20	1.80	672.45	157.29	829.74	14638.32	830.81
19	1.85	691.91	151.45	843.37	13808.58	830.72
18	1.89	706.12	147.19	853.31	12965.22	830.64
17	1.93	721.38	142.61	863.99	12111.91	830.56
16	1.97	736.67	138.02	874.70	11247.91	830.47
15	2.01	749.70	134.11	883.82	10373.22	830.39
14	2.04	762.78	130.19	892.97	9489.40	830.31
13	2.07	773.96	126.84	900.80	8596.43	830.22
12	2.10	785.13	123.49	908.62	7695.63	830.14
11	2.13	795.16	120.48	915.64	6787.01	830.06
10	2.15	803.39	118.01	921.40	5871.38	829.97
9	2.18	812.04	115.41	927.46	4949.98	829.89
8	2.20	819.99	113.03	933.02	4022.52	829.81
7	2.21	823.33	112.03	935.36	3089.51	829.72
6	0.00	0.00	359.03	359.03	2154.15	829.64
5	0.00	0.00	359.03	359.03	1795.13	829.56
4	0.00	0.00	359.03	359.03	1436.10	829.47
3	0.00	0.00	359.03	359.03	1077.08	829.39
2	0.00	0.00	359.03	359.03	718.05	829.31
1	0.00	0.00	359.03	359.03	359.03	829.22

AS-BUILT INFORMATION (03/23/2017)

Event	A.B. Elev	A.B. Vol (c.f.)
First Flush:	830.41	10583
Bankfull:	831.47	20716
100-Year:	832.90	28197

STORM SEWER CALCULATIONS

$Q_R = C * I * A$

$Q_P = A \times 1.486/n \times R^{2/3} \times S^{1/2}$

$I = 170/(23 + t_c)$ for **10 year storm event**

AREA NO.	FROM MH/CB	TO MH/CB	AREA A (acres)	COEFF. C *	A x C	AREA TOTAL At (acres)	COEFF. Wt Cw	At x Cw	TIME t_c (min.)	INT. I (in/hr)	n	FLOW Q_R Q=CIA (c.f.s.)	PIPE CAP. Q_P (c.f.s.)	PIPE DIA. (in.)	PIPE LENGTH (ft)	PIPE SLOPE (%)	VEL. FULL (ft/sec)	TIME FLOW (min.)	RIM ELEV HIGH (ft)	RIM ELEV LOW (ft)	H.G.L. 10-YEAR HIGH END HGL	H.G.L. 10-YEAR LOW END HGL	INVERT ELEV. HIGH END INV	INVERT ELEV. LOW END INV
DA1	1	2	0.19	0.74	0.14	0.19	0.74	0.14	15.00	4.38	0.013	0.61	2.02	12	140	0.32%	2.57	0.91	834.60	834.60	834.25	833.67	832.43	831.98
DA2	2	14	0.23	0.76	0.17	0.42	0.75	0.31	15.91	4.37	0.013	1.37	2.04	12	122	0.33%	2.60	0.78	834.60	834.80	833.57	833.06	831.88	831.48
DA13	14	DET	0.20	0.78	0.15	0.61	0.76	0.47	16.69	4.28	0.013	2.00	6.32	12	55	3.15%	8.05	0.11	834.80	837.00	833.06	831.18	831.48	829.75
DA3	3	4	0.19	0.88	0.17	0.19	0.88	0.17	15.00	4.38	0.013	0.74	2.02	12	112	0.32%	2.57	0.73	834.30	834.30	834.27	833.81	832.13	831.77
DA4	4	5	0.15	0.88	0.14	0.34	0.88	0.30	15.73	4.39	0.013	1.33	2.02	12	84	0.32%	2.57	0.55	834.30	834.65	833.71	833.36	831.67	831.40
DA5	5	6	0.05	0.87	0.05	0.40	0.88	0.35	16.27	4.33	0.013	1.51	2.02	12	80	0.32%	2.57	0.52	834.65	834.25	833.26	832.94	831.30	831.05
DA6	6	10	0.52	0.93	0.49	0.92	0.91	0.84	16.79	4.27	0.013	3.58	3.60	15	114	0.31%	2.93	0.65	834.25	834.25	832.84	832.40	830.95	830.59
DA7	7	8	0.05	0.95	0.05	0.05	0.95	0.05	15.00	4.38	0.013	0.23	2.02	12	70	0.32%	2.57	0.45	835.50	835.50	833.46	833.17	831.66	831.44
DA8	8	9	0.04	0.95	0.04	0.10	0.95	0.09	15.45	4.42	0.013	0.41	2.02	12	55	0.32%	2.57	0.36	835.50	835.50	833.07	832.85	831.34	831.16
DA9	9	10	0.03	0.95	0.03	0.13	0.95	0.12	15.81	4.38	0.013	0.52	2.02	12	83	0.32%	2.57	0.54	835.50	834.25	832.75	832.40	831.06	830.79
DA10	10	11	0.45	0.92	0.41	1.49	0.92	1.37	17.44	4.20	0.013	5.75	5.75	18	121	0.30%	3.26	0.62	834.25	833.60	832.00	831.58	830.39	830.03
DA11	11	13	0.51	0.91	0.46	2.00	0.91	1.83	18.06	4.14	0.013	7.57	8.76	24	75	0.15%	2.79	0.45	833.60	834.00	831.38	831.25	829.83	829.72
DA13	13	17	0.23	0.91	0.21	2.23	0.91	2.03	18.51	4.10	0.013	8.33	8.76	24	27	0.15%	2.79	0.16	834.00	834.10	831.25	831.20	829.72	829.68
DA12	12	17	0.23	0.91	0.21	0.23	0.91	0.21	15.00	4.38	0.013	0.91	2.02	12	35	0.32%	2.57	0.23	833.85	834.10	832.15	832.00	830.59	830.48
- - -	17	18	0.00	0.00	0.00	2.45	0.91	2.24	18.67	4.08	0.013	9.14	11.54	24	9	0.26%	3.67	0.04	834.10	834.67	831.20	831.18	829.68	829.65

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4. MAINTAIN A MINIMUM HORIZONTAL SEPARATION BETWEEN WATER SERVICE AND ANY OTHER UTILITY OF 10-FEET. THE MINIMUM VERTICAL CLEARANCE BETWEEN A WATER MAIN AND A SEWER SHALL BE 18-INCHES.
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6. REFER TO PLUMBING PLANS TO VERIFY BUILDING UTILITY CONNECTION LOCATIONS. SITE UTILITY LOCATIONS TO TERMINATE 5' OUTSIDE OF BUILDING.
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11. CONTRACTOR SHALL FIELD VERIFY THE LOCATION AND ELEVATION OF EXISTING UTILITIES PRIOR TO CONNECTION AND REPORT ALL FINDINGS TO THE ENGINEER.

PERMANENT POST-CONSTRUCTION BMPs

1) BIORETENTION AREAS WITHIN THE PROPOSED PARKING AREAS TO PROMOTE INFILTRATION AND REDUCE RUNOFF.
2) STORM WATER QUALITY DEVICE TO REMOVE POINT SOURCE POLLUTANTS FROM STORM SEWER SYSTEM.
3) UNDERGROUND DETENTION SYSTEM WITH OPEN BOTTOM THAT PROMOTES INFILTRATION, PROVIDE FLOOD CONTROL, AND IMPROVE WATER QUALITY OF SITE STORM DISCHARGE.

DRAINAGE AREAS

Drainage Area	Area Total (S.F.)	Pervious Area (S.F.)	Pavement Area (S.F.)	Roof Area (S.F.)	C Perv	C Pavement	C Roof	*Area Total (acres)*	*Cw*
DA1	8203.05	2687.07	5335.13	180.85	0.30	0.95	0.95	*0.19*	*0.74*
DA2	9981.00	2908.53	6891.62	180.85	0.30	0.95	0.95	*0.23*	*0.76*
DA3	8272.35	827.99	7444.36	0	0.30	0.95	0.95	*0.19*	*0.88*
DA4	6708.56	744.4	5964.16	0	0.30	0.95	0.95	*0.15*	*0.88*
DA5	2305.3	280.47	2024.83	0	0.30	0.95	0.95	*0.05*	*0.87*
DA6	22789.93	634.38	7329.35	14826.2	0.30	0.95	0.95	*0.52*	*0.93*
DA7	2376.74	0.00	2376.74	0	0.30	0.95	0.95	*0.05*	*0.95*
DA8	1877.87	0.00	1877.87	0	0.30	0.95	0.95	*0.04*	*0.95*
DA9	1197.93	0.00	1197.93	0	0.30	0.95	0.95	*0.03*	*0.95*
DA10	19507.14	845.62	7682.41	10979.11	0.30	0.95	0.95	*0.45*	*0.92*
DA11	22071.56	1515.76	15995.80	4560.00	0.30	0.95	0.95	*0.51*	*0.91*
DA12	6119.52	2424.64	3694.88	0.00	0.30	0.95	0.95	*0.14*	*0.69*
DA13	9858.99	534.10	9324.89	0.00	0.30	0.95	0.95	*0.23*	*0.91*
DA14	8544.72	2177.88	6366.84	0.00	0.30	0.95	0.95	*0.20*	*0.78*
								2.98	*0.87*

Drainage Area	Area Total (S.F.)	Pervious Area (S.F.)	Pavement Area (S.F.)	Roof Area (S.F.)	C Perv	C Pavement	C Roof	*Area Total (acres)*	*Cw*
TOTAL SITE	155348.72	41114.9	83506.81	30727.01	0.30	0.95	0.95	*3.57*	*0.78*

STELLAR DEVELOPMENT, LLC
2600 AUBURN ROAD, SUITE 160
AUBURN HILLS, MI 48326
PH 810-444-7815
FX 248-553-4218

PREPARED UNDER THE DIRECTION OF:
ANDREW ANDRE, P.E.
MI #47380

APPLICANT:
STELLAR HOSPITALITY ANN ARBOR, LLC
2600 AUBURN ROAD, SUITE 240
AUBURN HILLS, MI 48326
PH 248-419-5551

STAYBRIDGE SUITES & RETAIL CENTER
3850 RESEARCH PARK DRIVE
ANN ARBOR, MI 48108

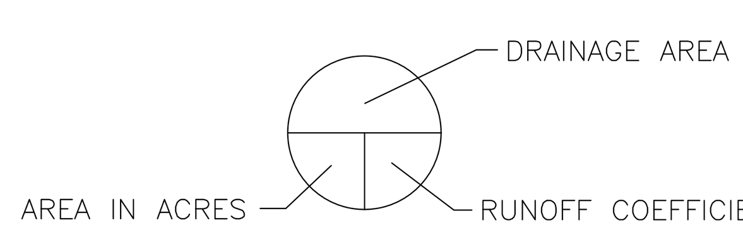
ISSUED FOR	DATE
SPA	12/29/14
SPA	02/20/15
SPA	03/25/15
SPA	04/23/15
PERMITS	06/12/15
SPA	08/17/15
CONST PLANS	09/03/15
CONST PLANS	10/02/15
CONST PLANS	11/05/15
CONST PLANS	12/09/15
STORM REVISION	01/15/16
UG DETENTION	03/08/16
RETAIL UTILITIES	03/21/18
STORM-COURTYARD	06/22/20
SPA	01/21/21

DATE :
DRAWN : ACA
CHECKED :
SCALE : 1"=40'
JOB NO : BD-14-322

SHEET TITLE :
STORM LAYOUT PLAN

SHEET
C5.1

DRAINAGE AREA PLAN



DRAINAGE AREA KEY

Know what's below. Call before you dig.

0' 40' 80' 120'
SCALE: 1" = 40'

DETENTION CALCULATIONS

DETENTION CALCULATIONS
Design Basis: Use the Washtenaw County Water Resource Commissioner Design Criteria

W1 Determining Cover Types, Areas, Curve Numbers and Runoff Coefficients

Proposed Site Conditions

Surface	Area (s.f.)
Impervious	109,651.1
Pervious	45,697.6
	155,348.7

Pervious Runoff Coefficient	0.30
Impervious Runoff Coefficient	0.95
Weighted Runoff Coefficient	0.78
Pervious Curve Number	68
Impervious Curve Number	98
Weighted Runoff Curve Number	89.18

W2 First Flush Runoff Calculation
Volume = (1")(1/12)(43560 sf/acre) x A x C = 10071 cf

W3 Pre-Development Bankfull Runoff Calculations
- A. 2 year / 24 hour storm event (P) = 2.35 in
- B. Pre-Development Curve Number (CN) = 81
- C. S = (1000 / CN) - 10 = 2.35 in
- D. Q = (P - (0.2 x S))^2 / (P + 0.8S) = 0.84 in
- E. Total Site Area excluding Self-Crediting BMPs = 155,348.7 sf
- F. Vbf pre = Q x (1/12) x Area = 10,836 cf

W4 Pervious Cover Post-Development Bankfull Runoff Calculations
- A. 2 year / 24 hour storm event (P) = 2.35 in
- B. Pervious Cover CN from W1 = 68
- C. S = (1000 / CN) - 10 = 4.71 in
- D. Q = (P - (0.2 x S))^2 / (P + 0.8S) = 0.32 in
- E. Total Site Area excluding Self-Crediting BMPs = 45,697.6 sf
- F. Vbf per post = Q x (1/12) x Area = 1,236 cf

W5 Impervious Cover Post-Development Bankfull Runoff Calculations
- A. 2 year / 24 hour storm event (P) = 2.35 in
- B. Impervious Cover CN from W1 = 98
- C. S = (1000 / CN) - 10 = 0.20 in
- D. Q = (P - (0.2 x S))^2 / (P + 0.8S) = 2.12 in
- E. Total Site Area excluding Self-Crediting BMPs = 109,651.1 sf
- F. Vbf imper post = Q x (1/12) x Area = 19,387 cf

W6 Pervious Cover Post-Development 100-year Storm Runoff Calculations
- A. 100 year Storm Event (P) = 5.11 in
- B. Pervious Cover CN from W1 = 68
- C. S = (1000 / CN) - 10 = 4.71 in
- D. Q = (P - (0.2 x S))^2 / (P + 0.8S) = 1.96 in
- E. Total Site Area excluding Self-Crediting BMPs = 45,697.6 sf
- F. V100 per post = Q x (1/12) x Area = 7,457 cf

W7 Impervious Cover Post-Development 100-year Storm Runoff Calculations
- A. 100 year Storm Event (P) = 5.11 in
- B. Impervious Cover CN from W1 = 98
- C. S = (1000 / CN) - 10 = 0.20 in
- D. Q = (P - (0.2 x S))^2 / (P + 0.8S) = 4.87 in
- E. Total Site Area excluding Self-Crediting BMPs = 109,651.1 sf
- F. V100 per post = Q x (1/12) x Area = 44,527 cf

W8 Determine Time of Concentration for Applicable Flow Types
Time of Concentration (Tc) = 0.31 hr

W9 Runoff Summary and Onsite Infiltration Requirement
- A. Runoff Summary from Previous Worksheets
  - First Flush Volume (Vff) = 10,071 cf
  - Pre-Development Banfull Runoff Volume (Vbf pre) = 10,836 cf
  - Pervious Cover Post-Development Bankfull Volume (Vbf per post) = 1,236 cf
  - Impervious Cover Post-Development Bankfull Volume (Vbf imp post) = 19,387 cf
  - Total BF Volume (Vbf post) = 20,623 cf
  - Pervious Cover Post-Development 100-Year Volume (V100 per post) = 7,457 cf
  - Impervious Cover Post-Development Bankfull Volume (Vbf imp post) = 44,527 cf
  - Total 100-Year Volume (V100) = 51,985 cf
- B. Determine Onsite Infiltration Requirement
  - Total Post-Development Bankfull Volume (Vbf post) = 20,623 cf
  - Pre-Development Banfull Runoff Volume (Vbf pre) = 10,836 cf
  - Bankfull Volume Difference = 9,787 cf
  - Greater of First Flush Volume & Banfull Volume Difference (Vinf) = 10,071 cf

W10 Detention/Retention Requirements
- A. Qp = 238.6 x Tc ^-0.82 = 621 cfs/in-mi^2
- B. Total Site Area excluding Self-Crediting BMPs = 3.57 acres
- C. Q100 = Q100 per + Q100 imp = 6.83 in
- D. Peak Flow (PF) = (Qp x Q100 x A) / 640 = 23.66 cfs
- E. Delta = PF - (0.15 x A) = 23.12 cfs
- F. Vdet = ((Delta / PF) x V100) - Vinf = 40,738 cf

W11 Standard Method Runoff Volume Calculations
- Infiltration Bed = 22,224 cf
- Bioretention #1 = 282 cf
- Bioretention #2 = 209 cf
- Total Reduction Credit by Proposed Structural BMPs = 22,715 cf
- Runoff Volume Infiltration Requirement (Vinf) (Worksheet 9) = 10,071 cf
- Runoff Volume Credit = 12,644 cf

REQUIRED DETENTION VOLUME = 28,094 cf

EXISTING CONDITIONS

Drainage Area	Weighted Cw	High Point	Low Point	Length	Slope (%)	Tc (min)
TIME OF CONCENTRATION						
EXISTING	0.70	839.2	831.8	548	1.3	16.00

Q = C * I * A
- C = 0.70
- I = 6.71 in/hour
- A = 3.57 acres
- Q = 16.7 cfs

THE EXISTING PROPERTY DOES NOT CONTAIN STORM DETENTION AND THE SURFACE WATER FLOWS OFF-SITE UNRESTRICTED.

EXISTING = 16.7 CFS
PROPOSED = 0.53 CFS

DETENTION CALCULATIONS

Infiltration Bed
- Surface Area Factor (SAF) = 15
- Minimum Surface Area (Contributing Imp Area / SAF) = 7,616 s.f.
- Bed Bottom Area: = 14,361 s.f.
- Infiltration Design Rate: = 3.1 in/hour
- Storage Volume (0.5-inch over the entire drainage area): = 6,473 cf
- Calculated depth of storage: = 0.45 ft
- Infiltration Period: = 6 hours
- Infiltration Volume: = 22,224 cf

Underground Detention System
StormTech SC-740 Chambers
(373) StormTech SC-740 Chambers
(52) StormTech SC-740 End Caps
Installed with 12" Cover Stone, 6" Base Stone, 30% Stone Void

StormTech Volume = 29,230 cf | RECORD = 28,197 cf

- Bottom of StormTech (X o) = 829.14
- Elevation First Flush (X ff) = 830.34
- Elevation Bankfull Flood (X bf) = 831.46
- Elevation 100-Year (X 100) = 832.88
- Top of StormTech Chamber = 832.14

	STORAGE RECORD	
	DESIGN	AS-BUILT
FF	9,823	10,583
BF	20,623	20,716
100	28,094	28,197

Outlet Control Structure
1) Flow restrictor wall

2) Flow restrictor wall outlet sizing for "First Flush" runoff
   - Qff = Vff / 24 hours / 3600 sec = 0.117 cfs
   - h = 2/3 (Xff - X o) = 0.80 ft
   - A = Qff / 0.62 * (2 * 32.2 * h)^.5 = 0.026 sf
   - Diamater of first flush orifice = 1.5 inches RECORD
   - Area of first flush orfice = 0.012 sf
   - Number of orifice holes = 2 @ Elev = 829.14
   - RECORD = 2 @ Elev = 829.16

3) Flow restrictor wall outlet sizing for "Bankfull Flood" runoff
   Bankfull flood shoud be discharged within 36 to 48 hours
   Release from first flush holes only
   - Q = A * 0.62 * (2 * 32.2 * 2/3 h) ^.5 = 0.16 cfs
   - Tff new = 17 hours
   - The volume between Bankfill and First Flush elevation
   - V bf - V ff = 10,552 cf
   - Target Detention Time = 36 hours
   - Detention Time Differential = 19 hours
   - Q bf = V difference / T difference = 0.16 cfs
   - h = 2/3 (Xbf - Xff) = 0.75 ft
   - A = Qff / 0.62 * (2 * 32.2 * h)^.5 = 0.036 sf
   - Diamater of bankfull orifice = 1.5 inches RECORD
   - Area of bankfull orfice = 0.012 sf
   - Number of orifice holes = 3 @ Elev = 830.34
   - RECORD = 3 @ Elev = 830.41

4) Flow restrictor wall outlet sizing for "100-Year Storm" runoff
   - Qa = (0.15 cfs / acre) * a = 0.53 cfs
   - h 100 = (X 100 - X o) = 3.74 ft
   - h bf = (X 100 - X ff) = 2.54 ft
   - Release from holes above
   - Q = A * 0.62 (2 * 32.2 * hff)^.5 + A * 0.62 * (2 * 32.2 * hbf)^.5 = 0.41 cfs
   - Q 100 = Qa - Q = 0.13 cfs
   - A 100 = Qff / 0.62 * (2 * 32.2 * h 100)^.5 = 0.0134999
   - Diamater of 100 orifice = 1.5 inches RECORD
   - Area of 100-Year orfice = 0.012 sf
   - Number of orifice holes = 1 @ Elev = 831.46
   - RECORD = 1 @ Elev = 831.47

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INFILTRATION TESTING RESULTS

STAYBRIDGE SUITES & RETAIL CENTER
Conducted on 12/06/2014
Temperature 35 degrees +/-
Overcast
No Precipitation
** Test conducted approximately 40-feet north of soil boring B-4**

Test Number Start	Time from Start min	Time from Start sec	Time from Start (hour) (hour)	Infiltration (ft)	Infiltration (inches)	Infiltration Rate (inches / hour)
			2:09:00 PM	0.0	0	0.0
1	0	25	2:09:25	0.1	1.2	172.8
2	1	30	2:10:30	0.2	2.4	96.0
3	4	30	2:13:30	0.3	3.6	48.0
4	8	36	2:17:36	0.4	4.8	33.5
5	11	23	2:20:23	0.5	6	31.6
6	20	14	2:29:14	0.6	7.2	21.4
7	34	53	2:43:53	0.7	8.4	14.4
8	62	2	3:11:02	0.8	9.6	9.3

MEASURED INFILTRATION RATE: 9.3
FACTOR OF SAFETY: 3
DESIGN INFILTRATION RATE: 3.1

BIORETENTION #1

BIORETENTION #1
Design Basis: Use the Washtenaw County Water Resource Commissioner Design Criteria for Infiltration Bed

I. Total Volume of Detention Area: 100-Year Storm Event
1) Developed area contributing runoff (a) = 0.51 acres
   Developed Runoff Coefficient (c) = 0.91
2) Maximum Allowable Runoff, Qa
   Qa = (0.15 cfs / acre) * a = 0.08 cfs
3) Calculate Qo = Qa / (a * c)
   Maximum outflow per acre impervious = 0.17 cfs/acre imperv.
4) Maximum storage time T = -25+(10312.5/Qo)^.5 = 224.5 minutes
5) Maximum storage required Vs = ((16500 * T) / (T + 25)) - 40QoT = 13,359 cf / acre imperv.
6) Total storage required Vt = Vs * a * c = 6,128 cf

II. Required Sediment Volume
Store 5% of the 100-year storm = 306 cf

III. Bioretention Storage Volume
Bioretention Volume = Surface Storage Volume + Soil Storage Volume + Infiltration Volume
Bioretention Volume: = 550 cf

Surface Storage Volume

ELEV	AREA (ft^2)	AVG.	VOLUME (ft^3)
833.0	0.00		0.00
		15.81	
833.1	31.61		7.90
		34.04	
833.2	36.46		24.92
		46.15	
833.3	55.84		48.00
		63.12	
833.4	70.39		79.55
		79.39	
833.5	88.39		119.25
		99.38	
833.6	110.37		168.94

Soil Storage Volume
- Area: = 82.8 sf
- Depth: = 4 ft
- Void Ratio of Storage Material: = 30%
- Soil Storage Volume: = 99.3 cf

Infiltration Volume
- Bed Area Bottom: = 182 s.f.
- Infiltration Design Rate: = 3.1 in/hour
- Infiltration Period: = 6 hours
- Infiltration Volume: = 282 cf

BIORETENTION #2

BIORETENTION #2
Design Basis: Use the Washtenaw County Water Resource Commissioner Design Criteria for Infiltration Bed

I. Total Volume of Detention Area: 100-Year Storm Event
1) Developed area contributing runoff (a) = 0.23 acres
   Developed Runoff Coefficient (c) = 0.91
2) Maximum Allowable Runoff, Qa
   Qa = (0.15 cfs / acre) * a = 0.03 cfs
3) Calculate Qo = Qa / (a * c)
   Maximum outflow per acre impervious = 0.16 cfs/acre imperv.
4) Maximum storage time T = -25+(10312.5/Qo)^.5 = 225.8 minutes
5) Maximum storage required Vs = ((16500 * T) / (T + 25)) - 40QoT = 13,374 cf / acre imperv.
6) Total storage required Vt = Vs * a * c = 2,769 cf

II. Required Sediment Volume
Store 5% of the 100-year storm = 138 cf

III. Bioretention Storage Volume
Bioretention Volume = Surface Storage Volume + Soil Storage Volume + Infiltration Volume
Bioretention Volume: = 209 cf

Surface Storage Volume

ELEV	AREA (ft^2)	AVG.	VOLUME (ft^3)
833.4	0.00		0.00
		21.54	
833.5	43.07		10.77
		110.30	
833.6	177.52		65.92
		217.96	
833.7	258.40		174.90
		290.59	
833.8	322.78		320.19
		349.05	
833.9	375.32		494.72
		401.24	
834.0	427.15		695.33

Soil Storage Volume
- Area: = 320.4 sf
- Depth: = 4 ft
- Void Ratio of Storage Material: = 30%
- Soil Storage Volume: = 384.4 cf

Infiltration Volume
- Bed Area Bottom: = 135 s.f.
- Infiltration Design Rate: = 3.1 in/hour
- Infiltration Period: = 6 hours
- Infiltration Volume: = 209 cf

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PREPARED UNDER THE DIRECTION OF:
ANDREW ANDRE, P.E.
MI #47380

APPLICANT:
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STAYBRIDGE SUITES & RETAIL CENTER
3850 RESEARCH PARK DRIVE
ANN ARBOR, MI 48108

ISSUED FOR	DATE
SPA	12/29/14
SPA	02/20/15
SPA	03/23/15
SPA	04/23/15
PERMITS	06/12/15
SPA	08/17/15
CONST PLANS	09/03/15
CONST PLANS	10/02/15
CONST PLANS	11/05/15
CONST PLANS	12/09/15
STORM REVISION	01/15/16
UG DETENTION	03/08/16
STORM-COURTYARD	06/22/20
SPA	01/21/21

DATE :
DRAWN : ACA
CHECKED :
SCALE : 1"=40'
JOB NO : BD-14-322
SHEET TITLE :
STORM MANAGEMENT PLAN
SHEET
C5.2

TASK:	STREETS	STORM SEWER SYSTEM	CATCH BASIN INLET CASINGS	OUTFLOW CONTROL STRUCTURES	STORMCEPTOR	UNDERGROUND DETENTION	SCHEDULE:
INSPECT FOR SEDIMENT ACCUMULATION		X		X	X	X	WEEKLY
REMOVAL OF SEDIMENT ACCUMULATION		X		X	X	X	AS NEED & PRIOR TO TURNOVER
INSPECT FOR FLOATABLES AND DEBRIS		X	X	X	X	X	QUARTERLY
CLEANING OF FLOATABLES AND DEBRIS		X	X	X	X	X	QUARTERLY AND AT TURNOVER
INSPECTION FOR EROSION				X	X	X	WEEKLY
REESTABLISH PERMANENT VEGETATION ON ERODED SLOPES					X	X	AS NEEDED & PRIOR TO TURNOVER
REPLACEMENT OF GRAVEL JACKETS				X			AS NEEDED
MOWING	X				X	X	0–2 TIMES PER YEAR
INSPECT STRUCTURAL ELEMENTS DURING WET WEATHER AND COMPARE TO AS–BUILT PLANS (BY PROFESSIONAL ENGINEER REPORTING TO THE CITY)		X		X	X	X	ANNUALLY AND AT TURNOVER
MAKE ADJUSTMENTS OR REPLACEMENTS AS DETERMINED BY ANNUAL WET WEATHER INSPECTION		X		X	X	X	AS NEEDED

AS NEEDED = WHEN SEDIMENT HAS ACCUMULATED TO A MAXIMUM OF ONE (1) FOOT DEPTH.

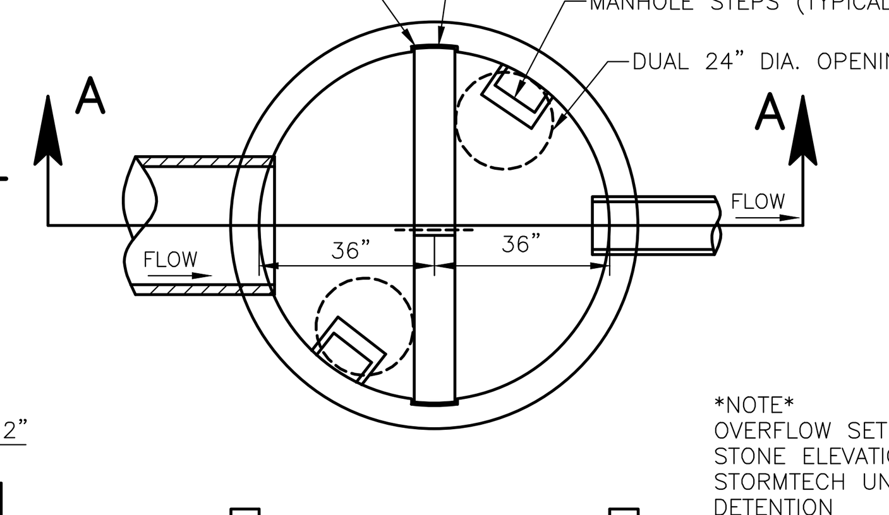
CONSTRUCTION MAINTENANCE SCHEDULE

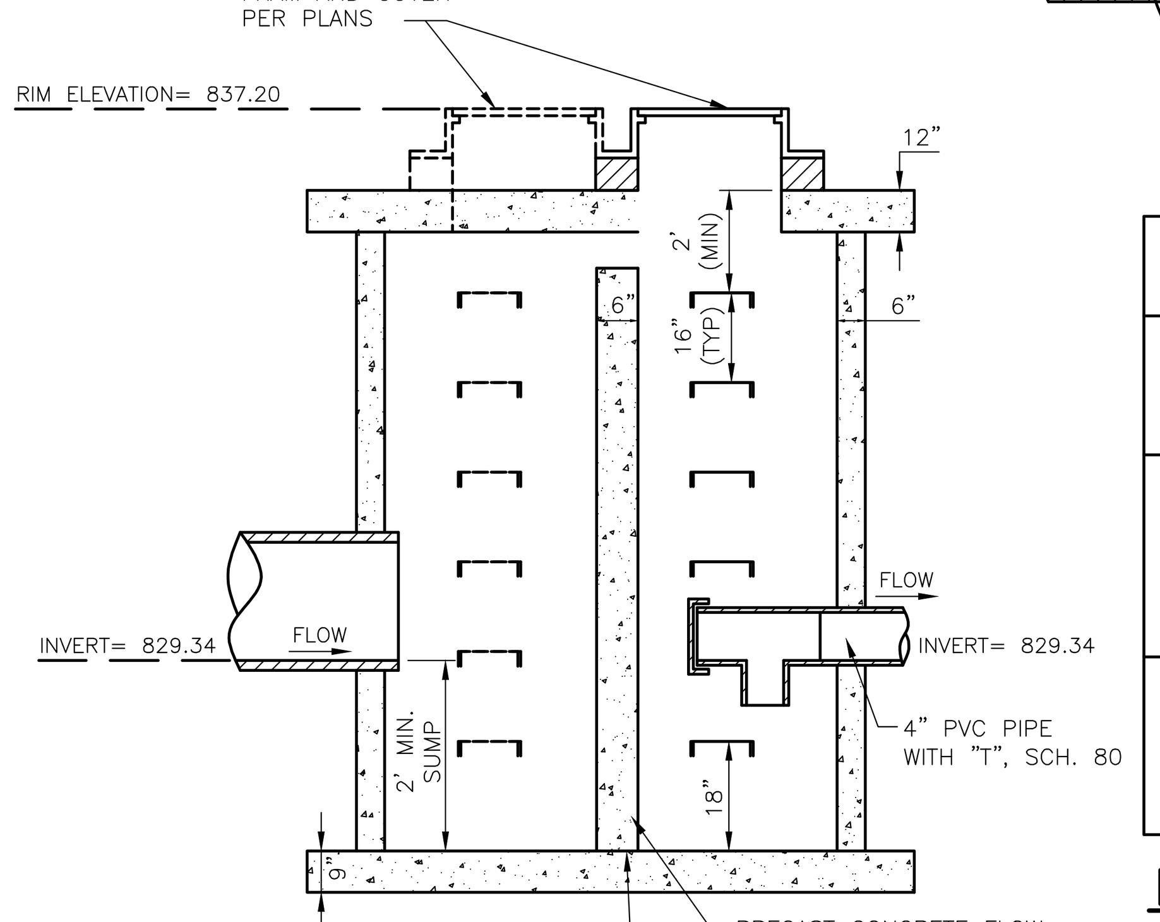
TASK:	STREETS	STORM SEWER SYSTEM	CATCH BASIN INLET CASINGS	OUTFLOW CONTROL STRUCTURES	STORMCEPTOR	UNDERGROUND DETENTION	SCHEDULE:
INSPECT FOR SEDIMENT ACCUMULATION		X		X	X	X	ANNUALLY
REMOVAL OF SEDIMENT ACCUMULATION		X		X	X	X	EVERY 5–10 YEARS AS NEEDED
INSPECT FOR FLOATABLES AND DEBRIS		X	X	X	X	X	ANNUALLY
CLEANING OF FLOATABLES AND DEBRIS		X	X	X	X	X	ANNUALLY
INSPECTION FOR EROSION				X	X	X	ANNUALLY
REESTABLISH PERMANENT VEGETATION ON ERODED SLOPES					X	X	AS NEEDED
REPLACEMENT OF GRAVEL JACKETS				X			EVERY 3–5 YEARS AS NEEDED
CLEAN STREETS	X						SEMI–ANNUALLY
MOWING	X				X	X	0–2 TIMES PER YEAR
INSPECT STRUCTURAL ELEMENTS DURING WET WEATHER AND COMPARE TO AS–BUILT PLANS (BY PROFESSIONAL ENGINEER REPORTING TO THE CITY)		X		X	X	X	ANNUALLY
MAKE ADJUSTMENTS OR REPLACEMENTS AS DETERMINED BY ANNUAL WET WEATHER INSPECTION		X		X	X	X	AS NEEDED
KEEP RECORDS OF ALL INSPECTIONS AND MAINTENANCE ACTIVITIES ARE REPORT TO CITY		X	X	X	X	X	ANNUALLY
KEEP RECORDS OF ALL COSTS FOR INSPECTIONS, MAINTENANCE AND REPAIRS. REPORT TO CITY		X	X	X	X	X	ANNUALLY
CITY REVIEWS COST EFFECTIVENESS OF THE PREVENTATIVE MAINTENANCE PROGRAM AND MAKES ADJUSTMENTS AS NEEDED		X	X	X	X	X	ANNUALLY
CITY TO HAVE A PROFESSIONAL ENGINEER CARRY OUT EMERGENCY INSPECTIONS UPON IDENTIFICATION OF SEVERE PROBLEMS		X	X	X	X	X	AS NEEDED

MAINTENANCE AFTER CONSTRUCTION WILL BE RESPONSIBILITY OF THE APPLICANT.

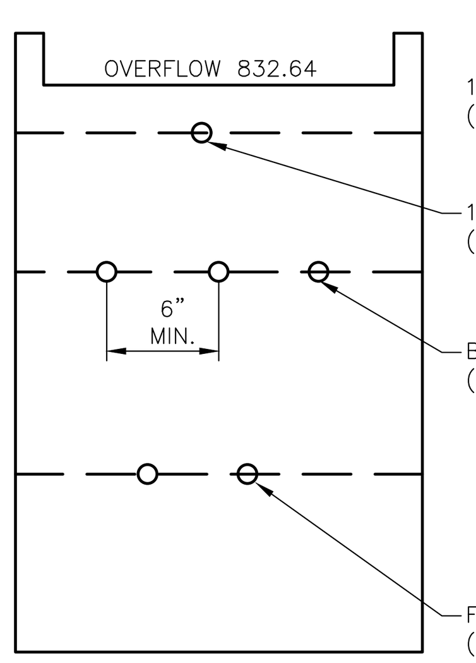
MAINTENANCE SCHEDULE

NOTE: REFER TO "UNDERGROUND STORMWATER MANAGEMENT SYSTEM CERTIFICATION" FORM FOR AS–BUILT INFORMATION





SECTION A–A



NOTE OVERFLOW SET TO TOP OF STONE ELEVATION FOR THE STORMTECH UNDERGROUND DETENTION

FLOW RESTRICTOR WALL

FRONT VIEW

NUMBER AND SIZE OF HOLES AS PER DESIGN.

FLOW RESTRICTOR WITH OVERFLOW

OUTLET CONTROL STRUCTURE

NO SCALE

CITY OF ANN ARBOR, MICHIGAN

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Phone (734) 794-6267 Fax (734) 994-8460 www.a2gov.org

UNDERGROUND STORMWATER MANAGEMENT SYSTEM CERTIFICATION

Project Name Staybridge Suites & Retail Center
Project Address 3850 Research Park Drive
Permit Number SOIL____

OUTLET STRUCTURE

First Flush: Design 2 # of holes 1.5 inches in diameter area at elevation 829.14.
As Built 2 # of holes 1.5 inches in diameter area at elevation 829.16.

Bankfull: Design 3 # of holes 1.5 inches in diameter area at elevation 830.34.
As Built 3 # of holes 1.5 inches in diameter area at elevation 830.41.

100-Year: Design 1 # of holes 1.5 inches in diameter area at elevation 831.46.
As Built 1 # of holes 1.5 inches in diameter area at elevation 831.47.

STORAGE VOLUME

Infiltration: ☐ No X Yes (If yes, include stone pores in the volume calculations) - 30% Stone Void
First Flush: Design Volume is 9823 c.f.. As-built Volume is 10,583 c.f..
Bankfull: Design Volume is 20,623 c.f.. As-built Volume is 20,716 c.f..
100-Year: Design Volume is 28,094 c.f.. As-built Volume is 28,197 c.f..
*Refer to attached documentation and calculations

STORAGE ELEVATION

First Flush: Design Elevation is 830.34. As-built Elevation is 830.41.
Bankfull: Design Elevation is 831.46. As-built Elevation is 831.47.
100-Year: Design Elevation is 832.64. As-built Elevation is 832.90.

STORM WATER MANAGEMENT SYSTEM INFORMATION – UNDERGROUND DETENTION

Water Quality Structure: Design Model FD-4HC & FD-6HC. As-built Model FD-4HC & FD-6HC
Pipe Length: --_-in diameter: Design ------ L.F. As-built ------ L.F.
Pipe Length: --_-in diameter: Design ------ L.F. As-built ------ L.F.
Pipe Length: --_-in diameter: Design ------ L.F. As-built ------ L.F.

AS-BUILT INFORMATION
ADS StormTech System
SC-740 Chambers = 373 A.B.
SC-740 End Caps = 52 A.B.
Refer to attached documentation

COMMENTS (Please describe any deviations from the approved site plan): Certification pertains to documentation of conditions as of 03/13/2017. BDE was not responsible for neither construction management nor construction quality. Landwise Inc. performed the field verification surveys on 03/02/17 and 03/23/17.

I hereby certify that the storm water detention facilities of the aforementioned Site is complete, and that I have inspected and verified that the structures have been installed in accordance with the approved construction plans and the City of Ann Arbor's Standards and Specifications.

Date: March 23, 2017

Signed: ____________________
Architect or Professional Engineer

Affix Architect or Engineer's Seal

Doc. Ver. Nov 2012

Hydro International®

First Defense®

Cost-effective stormwater treatment with adaptability to meet demanding site requirements

Product Profile

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes sediment total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints (Table 1, next page).

Components

1. Inlet Grate (optional)
2. Inlet Chute
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Precast Vortex Chamber
6. Internal Bypass
7. Outlet Chute
8. Outlet Pipe
9. Oil and Floatables Storage
10. Sediment Storage Sump

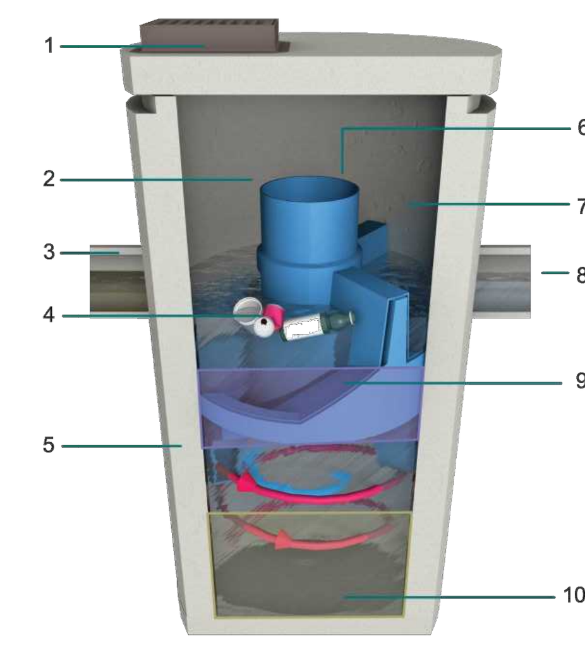

Fig.1 The First Defense® has internal components designed to efficiently capture pollutants and prevent washout at peak flows.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

How it Works

The First Defense® has internal components designed to remove and retain gross debris, total suspended solids (TSS) and hydrocarbons (Fig.1).

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An integral bypass conveys infrequent peak flows directly to the outlet chute, eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Stormwater Solutions
Turning Water Around...®

First Defense®

Maintenance

The First Defense® needs minimal maintenance, but like all structural best management practices maintenance is necessary for the long-term protection of the environment.

Sediments captured by the First Defense® are stored in the sump; floatable trash and hydrocarbons are stored on the surface of the standing water. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.2).

More information can be found in the First Defense® Operation and Maintenance Manual, available at http://www.hydro-int.com/us/products/first-defense.

Fig.2 Maintenance is performed with a vactor truck.

First Defense® Sizing & Design

Design Options for Inlet and Internal Bypass Arrangements

For maximum flexibility the First Defense® inlet and internal bypass arrangements are available in two configurations (Fig.3a & 3b). Model parameters and design criteria are shown in Table 1.

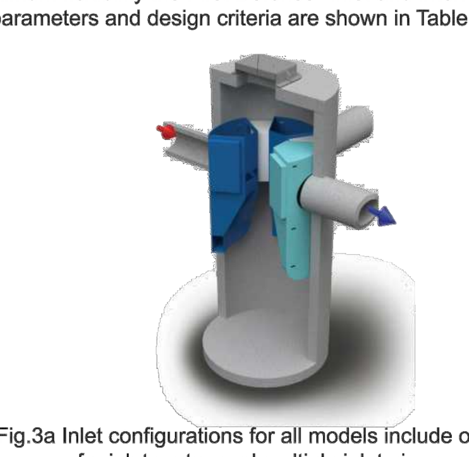

Fig.3a Inlet configurations for all models include options for inlet grates and multiple inlet pipes.

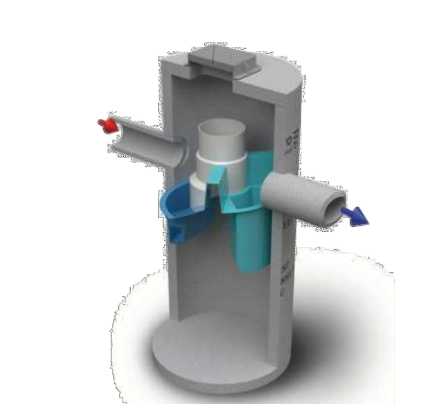

Fig.3b First Defense®-*HC* with higher capacity internal bypass and larger maximum pipe diameter.

Table 1. First Defense® Models and Design Criteria.

First Defense® Model Number	Diameter	Typical Flow Rates for TSS Treatment		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		106µm	230µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-4	4 / 1.2	0.7 / 20	1.2 / 34	6 / 170	18 / 450	180 / 681	1.3 / 1.0	3.1 / 1.1	5.47 / 1.7
FD-4HC				18 / 510	24 / 600	191 / 723		2.3 - 3.9 / 0.7 - 1.2	
FD-6	6 / 1.8	2.2 / 63	3.8 / 108	18 / 510	24 / 600	420 / 1,590	3.3 / 2.5	4.0 / 1.2	6.52 / 2.0
FD-6HC				32 / 906	30 / 750	496 / 1,878		3.0 - 5.1 / 0.9 - 1.6	

[1]Contact Hydro International when larger pipe sizes are required.

[2]Contact Hydro International when custom sediment storage capacity is required.

[3]The minimum distance for the 4HC and 6HC models depends on pipe diameter.

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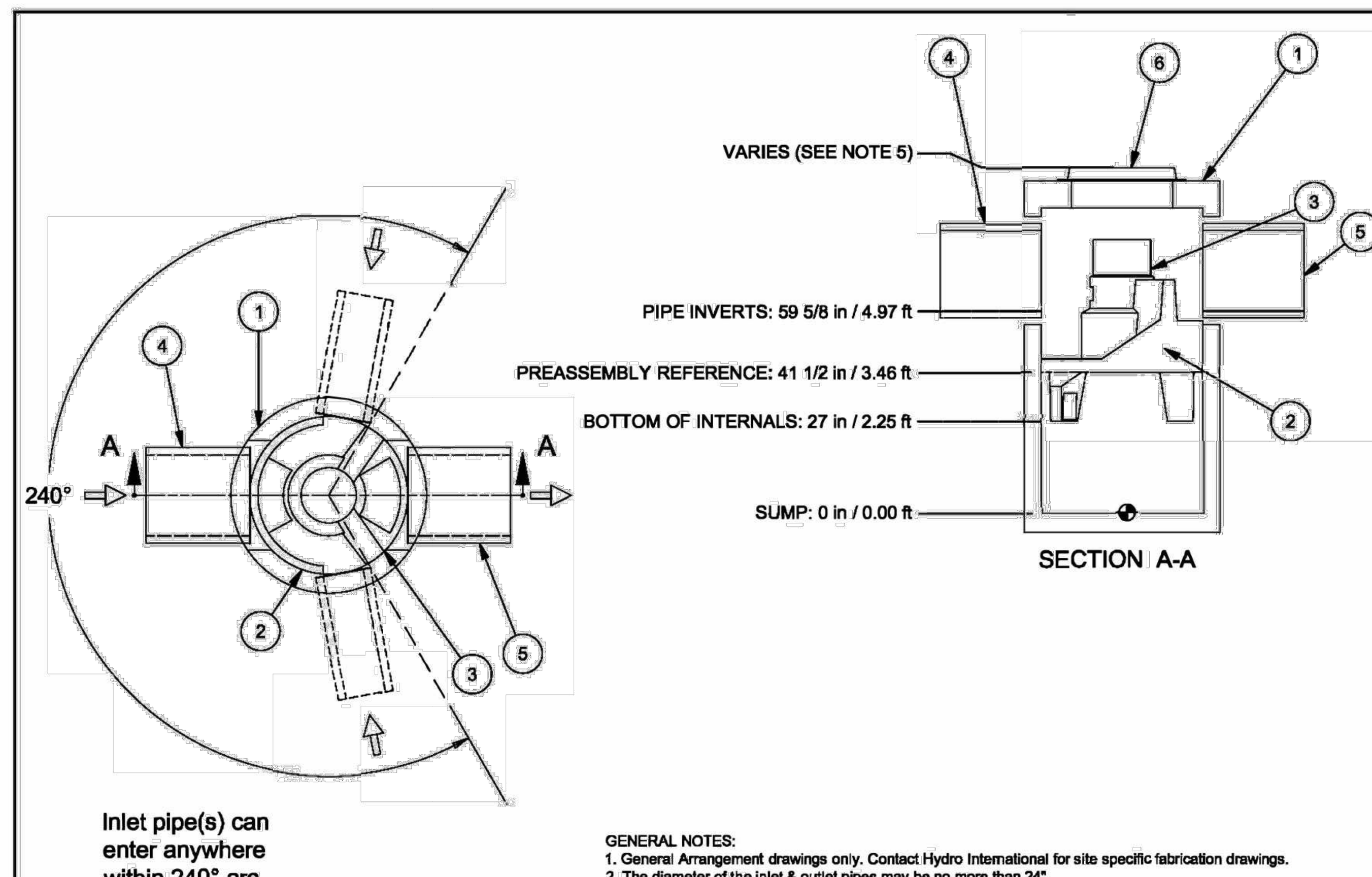
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

Stormwater Solutions
Turning Water Around...®
FDSS1502/F

FIRST DEFENSE PRE-TREATMENT UNITS

NO SCALE



Notes

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING FIRST DEFENSE MANHOLE.
3. CONTRACTOR TO CONFIRM RIM, PIPE INVERTS, PIPE DIA. AND PIPE ORIENTATION PRIOR TO RELEASE OF UNIT TO FABRICATION.

REV	BY	DATE	DESCRIPTION
A	JL	11/5/15	SUMP DEPTH

REVISION HISTORY

Date	Scale
11/25/14	1/4" = 1'0"

Drawn	Checked	Approved
RC		

Title: 4-FT DIAMETER FIRST DEFENSE — HIGH CAPACITY GENERAL ARRANGEMENT

GENERAL NOTES:

1. General Arrangement drawings only. Contact Hydro International for site specific fabrication drawings.
2. The diameter of the inlet & outlet pipes may be no more than 24".
3. Multiple inlet pipes possible (refer to project plans).
4. Inlet/outlet pipe angle can vary to align with drainage network (refer to project plans).
5. Peak flow rate and minimum height limited by available cover and pipe diameter.
6. Larger sediment storage capacity may be provided with a deeper sump depth.

Parts List

ITEM	SIZE (in)	DESCRIPTION
1	48	I.D. PRECAST MANHOLE
2		LEDGER SUPPORT
3		SEPARATION MODULE
4	24	INLET PIPE (BY OTHERS)
5	24	OUTLET PIPE (BY OTHERS)
6	30	FRAME AND COVER (OR GRATE) (ROUND)

PRODUCT SPECIFICATIONS:

A. The treatment system shall use an induced vortex to separate pollutants from stormwater runoff.
B. The treatment system shall fit within the limits of excavation (area and depth) as shown in the project plans and will not exceed the dimensions for the design flow rates specified herein.
C. The treatment system shall remove greater than or equal to 90% of TSS based on the Target Particle Size (TPS) of 106 microns and/or 80% of TSS based on the TPS of 230 microns at 0.7 cfs and 1.2 cfs, respectively.
D. The treatment system shall convey the Peak On-line Flow Rates of up to 18 cfs without causing upstream surcharge conditions. Full-scale independant laboratory scour testing shall demonstrate effluent control of less than or equal to 5 mg/L for all flows up to 200% of MTFR-106.
E. The treatment system shall be capable of capturing and retaining fine silt and sand size particles. Analysis of captured sediment from full-scale field installations shall demonstrate particle sizes predominately in the 20-micron range

Hydro International®

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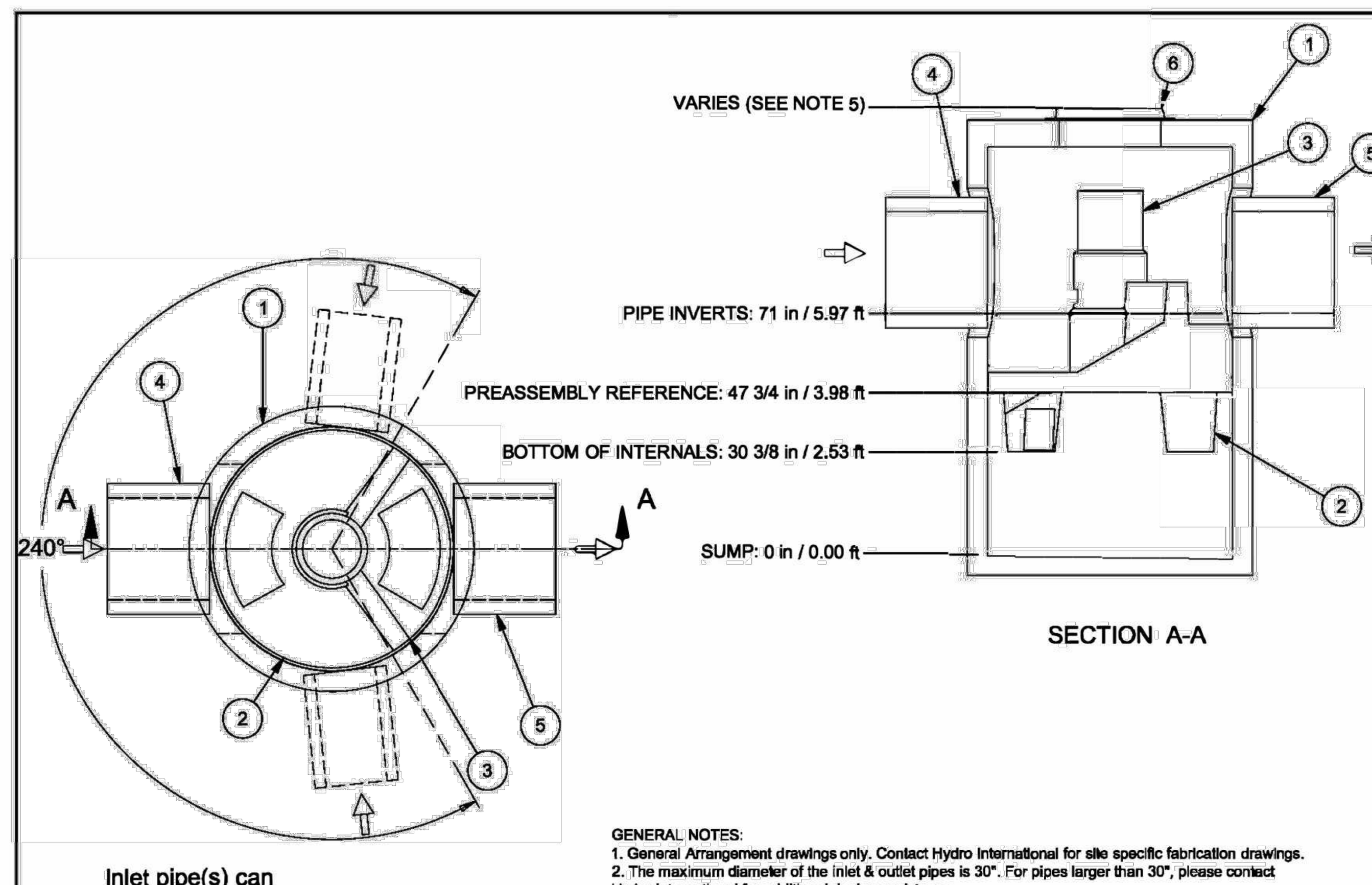
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

CAD Ref: F4HC-MAX
Project No. XX-XXXX
Drawing No. F4HCS1 Rev. A

FIRST DEFENSE FD-4HC

NO SCALE



Notes

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING FIRST DEFENSE MANHOLE.
3. CONTRACTOR TO CONFIRM RIM, PIPE INVERTS, PIPE DIA. AND PIPE ORIENTATION PRIOR TO RELEASE OF UNIT TO FABRICATION.

REV	BY	DATE	DESCRIPTION
A	JL	11/5/15	SUMP DEPTH

REVISION HISTORY

Date	Scale
11/25/14	1/4" = 1'0"

Drawn	Checked	Approved
RC		

Title: 6-FT DIAMETER FIRST DEFENSE — HIGH CAPACITY GENERAL ARRANGEMENT

GENERAL NOTES:

1. General Arrangement drawings only. Contact Hydro International for site specific fabrication drawings.
2. The maximum diameter of the inlet & outlet pipes is 30". For pipes larger than 30", please contact Hydro International for additional design assistance.
3. Multiple inlet pipes possible (refer to project plans).
4. Inlet/outlet pipe angle can vary to align with drainage network (refer to project plans).
5. Peak flow rate and minimum height limited by available cover and pipe diameter.
6. Larger sediment storage capacity may be provided with a deeper sump depth.

Parts List

ITEM	SIZE (in)	DESCRIPTION
1	72	I.D. PRECAST MANHOLE
2		LEDGER SUPPORT
3		SEPARATION MODULE
4	30	INLET PIPE (BY OTHERS)
5	30	OUTLET PIPE (BY OTHERS)
6	30	FRAME AND COVER (OR GRATE) (ROUND)

PRODUCT SPECIFICATIONS:

A. The treatment system shall use an induced vortex to separate pollutants from stormwater runoff.
B. The treatment system shall fit within the limits of excavation (area and depth) as shown in the project plans and will not exceed the dimensions for the design flow rates specified herein.
C. The treatment system shall remove greater than or equal to 90% of TSS based on the Target Particle Size (TPS) of 106 microns and/or 80% of TSS based on the TPS of 230 microns at 2.2 cfs and 3.8 cfs, respectively.
D. The treatment system shall convey the Peak On-line Flow Rates of up to 32 cfs without causing upstream surcharge conditions. Full-scale independent laboratory scour testing shall demonstrate effluent control of less than or equal to 5 mg/L for all flows up to 200% of MTFR-106.
E. The treatment system shall be capable of capturing and retaining fine silt and sand size particles. Analysis of captured sediment from full-scale field installations shall demonstrate particle sizes predominately in the 20-micron range

Hydro International®

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CAD Ref: F6HC-MAX
Project No. XX-XXXX
Drawing No. F6HCS1 Rev. A

FIRST DEFENSE FD-6HC

NO SCALE

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AUBURN HILLS, MI 48326
PH 810-444-7815
FX 248-553-4218

PREPARED UNDER THE DIRECTION OF:
ANDREW ANDRE, P.E.
MI #47380

APPLICANT:
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2600 AUBURN ROAD, SUITE 240
AUBURN HILLS, MI 48326
PH 248-419-5551

STAYBRIDGE SUITES & RETAIL CENTER

3850 RESEARCH PARK DRIVE
ANN ARBOR, MI 48108

ISSUED FOR	DATE
SPA	12/29/14
SPA	02/20/15
SPA	03/23/15
SPA	04/23/15
PERMITS	06/12/15
SPA	08/17/15
CONST PLANS	09/03/15
CONST PLANS	10/02/15
CONST PLANS	11/05/15
CONST PLANS	12/09/15
STORM REVISION	01/15/16
UG DETENTION	03/08/16
SPA	01/21/21

DATE :
DRAWN : ACA
CHECKED :
SCALE : NTS
JOB NO : BD-14-322

SHEET TITLE :
STORM MANAGEMENT DETAILS

SHEET
C5.3

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER:	CHRIS OWEN 248-431-1361 CHRIS.OWEN@ADS-PIPE.COM
ADS SALES REP:	ANDY KELLER 248-417-4693 ANDY.KELLER@ADS-PIPE.COM
PROJECT NO:	93256

ADVANCED DRAINAGE SYSTEMS, INC.

STAYBRIDGE SUITES & RETAIL CENTER

ANN ARBOR, MICHIGAN

STORMWATER CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

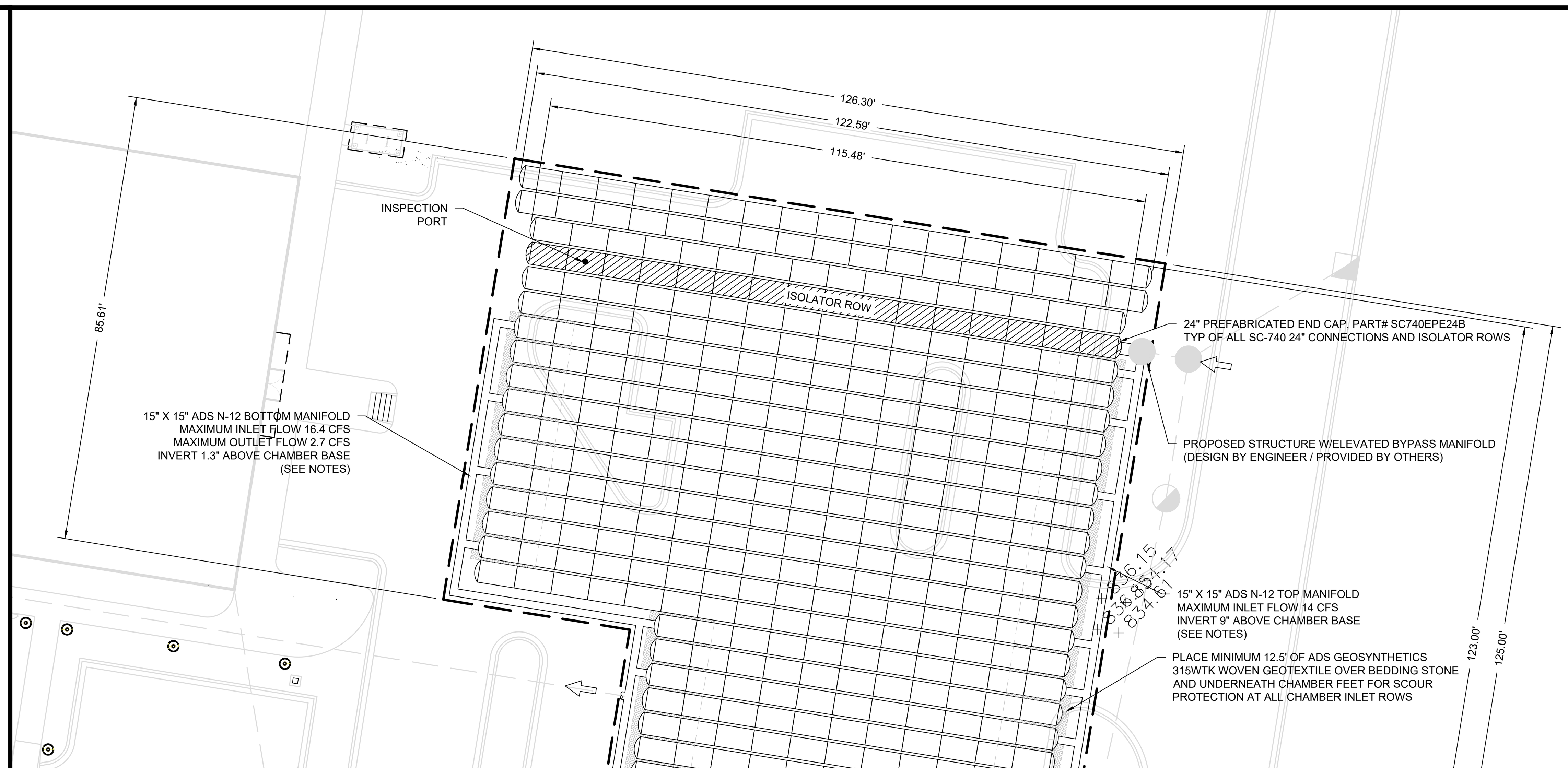
   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.



PROPOSED LAYOUT

(373) STORMTECH SC-740 CHAMBERS
(52) STORMTECH SC-740 END CAPS
INSTALLED WITH 12" COVER STONE, 6" BASE STONE, 30% STONE VOID
INSTALLED SYSTEM VOLUME: 29,230 CF (PERIMETER STONE INCLUDED)
AREA OF SYSTEM: 14,361 FT²
PERIMETER OF SYSTEM: 502 FT

PROPOSED ELEVATIONS

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	840.14
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	834.14
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	833.64
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	833.64
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	833.64
TOP OF STONE:	832.64
TOP OF CHAMBER:	832.14
15" TOP MANIFOLD INVERT:	830.39
15" BOTTOM MANIFOLD INVERT:	829.75
24" ISOLATOR ROW INVERT:	829.65
BOTTOM OF CHAMBER:	829.64
UNDERDRAIN INVERT:	829.14
BOTTOM OF STONE:	829.14

NOTES:

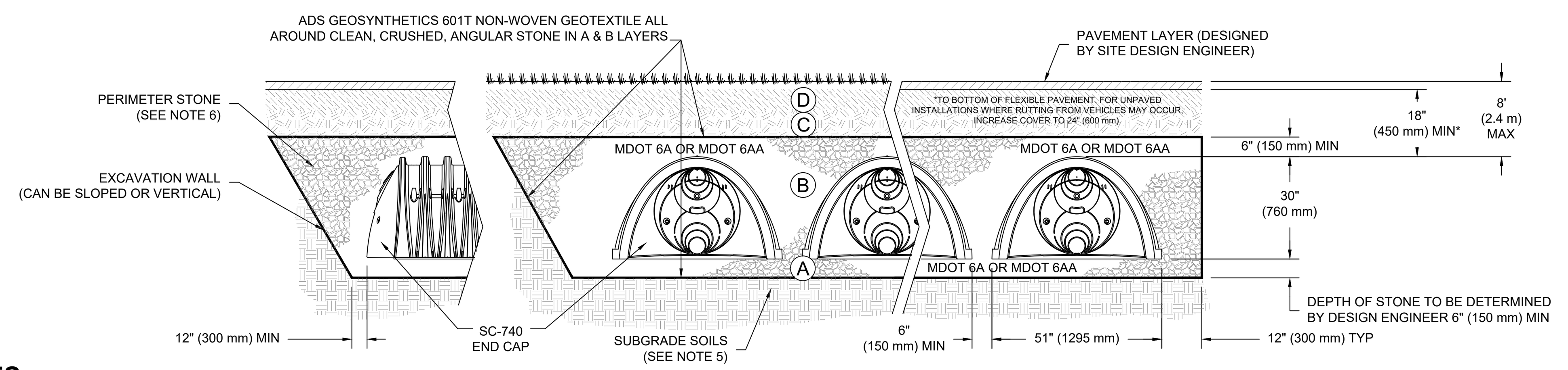
- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH SHEET #7 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.

SHEET 2 OF 5

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57 MDOT 6A OR MDOT 6AA	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57 MDOT 6A OR MDOT 6AA	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-740 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

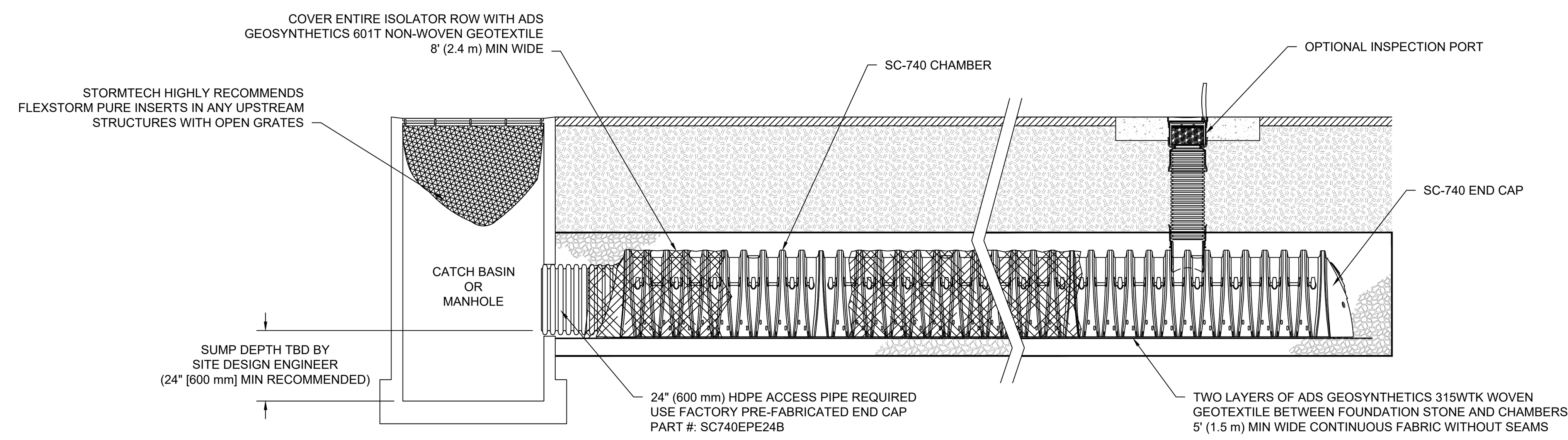
STAYBRIDGE SUITES & RETAIL ANN ARBOR, MICHIGAN — DATE: 3-24-15 — DRAWN: SKR — PROJECT #: 93256 — CHECKED: GFI

REV	DATE	DRW	CHK	DESCRIPTION
	4-23-15	SKR	KMB	VOLUME INCREASED
	5-5-15	SKR	GFI	30% STONE VOIDS
	12-30-15	SKR	WFT	CHANGED COVER OF STONE
	1/5/16	DAF	KP	CHANGES PER ENG
	1/15/2016	DAF	GFI	ELEV CHANGE

StormTech — Detention • Retention • Water Quality — 70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067 — 860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS — 4640 TRUEMAN BLVD HILLIARD, OH 43026 1-800-733-7473

SHEET 3 OF 5



SC-740 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

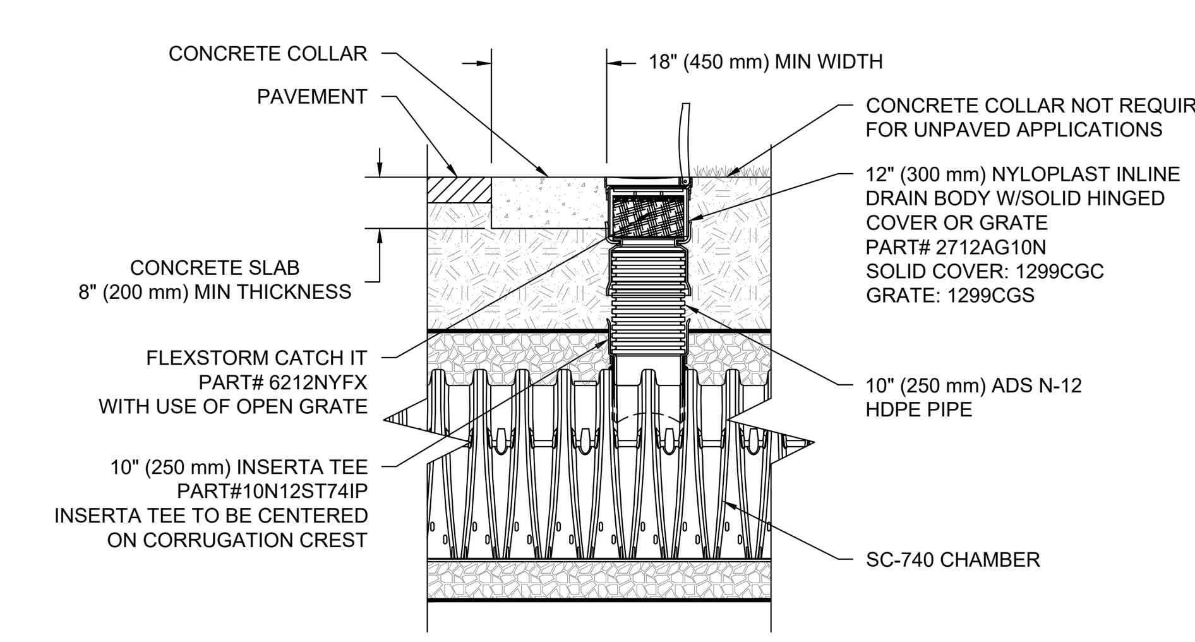
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



SC-740 INSPECTION PORT DETAIL
NTS

SHEET 4 OF 5

STELLAR DEVELOPMENT, LLC
2600 AUBURN ROAD, SUITE 160
AUBURN HILLS, MI 48326
PH 810-444-7815
FX 248-553-4218

PREPARED UNDER THE DIRECTION OF:
ANDREW ANDRE, P.E.
MI #47380

APPLICANT:
STELLAR HOSPITALITY ANN ARBOR, LLC
2600 AUBURN ROAD, SUITE 240
AUBURN HILLS, MI 48326
PH 248-419-5551

STAYBRIDGE SUITES & RETAIL CENTER
3850 RESEARCH PARK DRIVE
ANN ARBOR, MI 48108

ISSUED FOR	DATE
UG DETENTION	03/08/16
SPA	01/21/21

DATE:
DRAWN: ACA
CHECKED:
SCALE: AS NOTED
JOB NO: BD-14-322

THE LOCATION OF ALL UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE BASED ON RECORDS PROVIDED BY THE UTILITY OWNERS AND VISIBLE EVIDENCE OBTAINED IN THE FIELD. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED TO THE COMPLETENESS OR ACCURACY THEREOF.

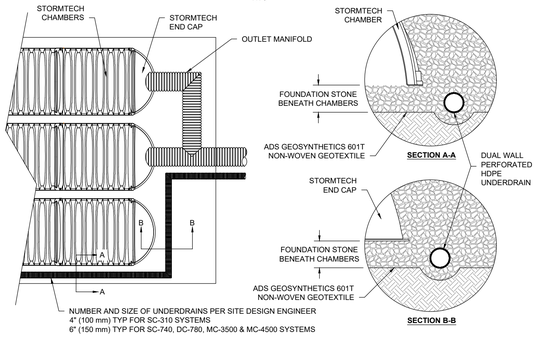
811 Know what's below. Call before you dig.

SHEET TITLE:
UNDERGROUND DETENTION PLANS

SHEET
C5.8

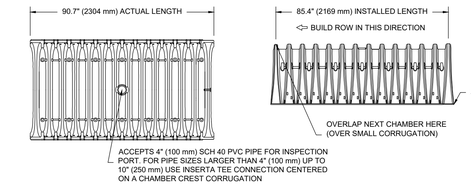
UNDERDRAIN DETAIL

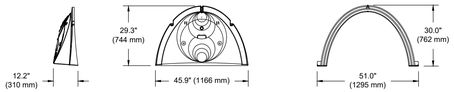
NTS



SC-740 TECHNICAL SPECIFICATION

NTS

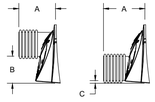




NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE-CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740EPE24B THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

INTENTIONALLY LEFT BLANK

STAYBRIDGE SUITES & RETAIL
ANN ARBOR, MICHIGAN

DATE: 3-24-15 | DRAWN: SKR | CHECKED: GFI | PROJECT #: 89256

REV	DRW	CHK	DESCRIPTION
1	SKR	GFI	HOLDING TANK ADDED
2	SKR	GFI	30% STONE VOIDS
3	RFT	GFI	CHANGED COVER OF STONE
4	DAF	GFI	CHANGED PER ENG
5	DAF	GFI	ELEV CHANGE

StormTech
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860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
(800) 245-7473

SHEET 5 OF 5

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE DESIGN IS SUITABLE FOR THE SPECIFIC PROJECT CONDITIONS AND THAT THE DESIGN COMPLIES WITH ALL APPLICABLE CODES, REGULATIONS AND SPECIFICATIONS. ADS ASSUMES NO RESPONSIBILITY FOR ENGINEERING DESIGNS, CALCULATIONS OR DRAWINGS PREPARED OR STAMPED BY OTHERS.

UTILITY NOTES

1. ALL WORK MUST BE DONE IN ACCORDANCE WITH CURRENT STANDARDS, SPECIFICATIONS AND GENERAL CONDITIONS OF THE CITY OF ANN ARBOR.
2. SHOP DRAWINGS SHALL BE SUBMITTED BY THE UNDERGROUND CONTRACTOR FOR ALL WATER, SANITARY AND STORM INSTALLATION.
3. CONTRACTOR SHALL SUBMIT RECORD "AS-BUILT" PLANS AFTER CONSTRUCTION.
4. MAINTAIN A MINIMUM HORIZONTAL SEPARATION BETWEEN WATER SERVICE AND ANY OTHER UTILITY OF 10-FEET. THE MINIMUM VERTICAL CLEARANCE BETWEEN A WATER MAIN AND A SEWER SHALL BE 18-INCHES.
5. NO GROUNDWATER, STORM WATER, CONSTRUCTION WATER, DOWNSPOUT DRAINAGE OR WEEP TILE DRAINAGE SHALL BE ALLOWED TO ENTER ANY SANITARY SEWER INSTALLATION.
6. REFER TO PLUMBING PLANS TO VERIFY BUILDING UTILITY CONNECTION LOCATIONS. SITE UTILITY LOCATIONS TO TERMINATE 5' OUTSIDE OF BUILDING.
7. SANITARY CLEANOUT ASSEMBLIES TO BE NEENAH R-7506-D, OR OTHERWISE APPROVED EQUAL.
8. SANITARY SEWER PIPE SHALL BE SDR 35 PVC.
9. THE LOCATION AND SIZE OF THE FRANCHISE UTILITY SERVICES SHALL BE DESIGNED AND INSTALLED BY THE UTILITY COMPANY.
10. MAINTAIN 5.5' MIN. DEPTH OF BURY TO FINISHED GRADE FOR WATER SERVICE. ALL WATER MAIN PIPE SHALL BE CLASS 50 ANSI/AWWA C150/A21.50 AND POLYETHYLENE WRAPPED.
11. PIPE DEFLECTION SHALL CONFORM TO THE ALLOWABLE STANDARDS IN CITY OF ANN ARBOR PUBLIC SERVICES DEPARTMENT STANDARD SPECIFICATIONS DIV IV.3C.
12. VERTICAL BEND FITTINGS REQUIRE RESTRAINED PUSH-ON JOINTS.
13. CONTRACTOR SHALL CHECK FOR TRANSMISSION MAIN SHUTDOWNS. WATER PLAN SUPERINTENDENT MUST APPROVE SHUTDOWN, AND REQUIRES A MINIMUM 48-HOUR NOTICE PRIOR TO ACTUAL SHUTDOWN.
13. ALL UTILITIES TO BE REMOVED SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE ENVIRONMENTAL AND/OR REGULATORY REQUIREMENTS.
15. CONTRACTOR SHALL FIELD VERIFY THE LOCATION AND ELEVATION OF EXISTING UTILITIES PRIOR TO CONNECTION AND REPORT ALL FINDINGS TO THE ENGINEER.
16. FIRE BOOSTER PUMP ANTICIPATED FOR FIRE SUPPRESSION SYSTEM. SYSTEM DESIGN AND PERMITTING BY OTHERS.
17. CONTRACTOR SHALL IDENTIFY ANY EXISTING FOOTING DRAINS THAT CONNECT TO THE SANITARY SEWER SYSTEM AND REMOVE IN ACCORDANCE WITH THE CITY OF ANN ARBOR STANDARDS AND SPECIFICATIONS.
18. POOL BACKWASH WATER MUST BE TREATED AND DIRECTED TO THE STORM SYSTEM.
19. THE CITY'S HYDRAULIC MODEL WAS USED TO ANALYZE THE IMPACTS TO DOWNSTREAM SANITARY SEWER SYSTEM. CAPACITY CONSTRAINTS DURING WET WEATHER EVENTS HAVE BEEN IDENTIFIED IN THE TRUNKLINE SANITARY SEWERS DOWNSTREAM FROM THIS DEVELOPMENT. THEREFORE, IN ACCORDANCE WITH THE DEVELOPMENT SEWAGE FLOW OFFSET MITIGATION PROGRAM, THE FLOW MITIGATION MUST BE PERFORMED WITHIN THE APPROPRIATE DEVELOPER OFFSET MITIGATION ZONE AS APPROVED BY CITY COUNCIL IN JUNE 2015.

THE LOCATION OF ALL UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE BASED ON RECORDS PROVIDED BY THE UTILITY OWNERS AND VISIBLE EVIDENCE OBTAINED IN THE FIELD. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED TO THE COMPLETENESS OR ACCURACY THEREOF.

811 Know what's below. Call before you dig.

STELLAR DEVELOPMENT, LLC

2600 AUBURN ROAD, SUITE 160
AUBURN HILLS, MI 48326
PH 810-444-7815
FX 248-553-4218

PREPARED UNDER THE DIRECTION OF:
ANDREW ANDRE, P.E.
MI #47380

APPLICANT:
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AUBURN HILLS, MI 48326
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STAYBRIDGE SUITES & RETAIL CENTER

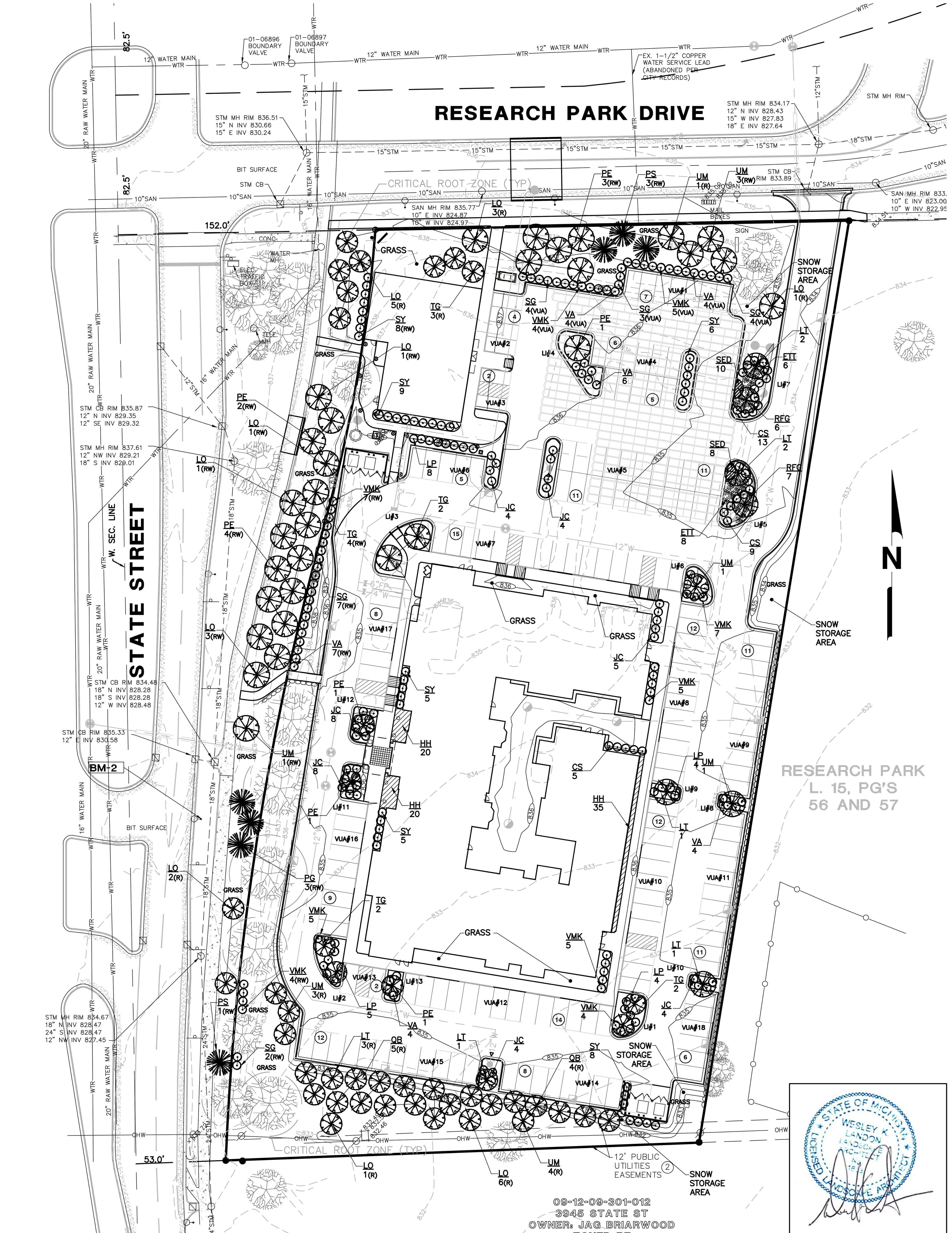
3850 RESEARCH PARK DRIVE
ANN ARBOR, MI 48108

ISSUED FOR	DATE
UG DETENTION	**03/08/16**
SPA	**01/21/21**

DATE :
DRAWN : ACA
CHECKED :
SCALE : **AS NOTED**
JOB NO : BD-14-322

SHEET TITLE :
UNDERGROUND DETENTION PLANS

SHEET
C5.9



WESLEY K. LANDON, ASLA
LANDSCAPE ARCHITECT
NATIVE EDGE, LLC
PO BOX 140021
GRAND RAPIDS, MI 49514

TREE REPLACEMENT

91" CALIPER REPLACEMENT REQUIRED

REPLACEMENT REQUIRED
18 LO @ 2.5" = 45"
8 UM @ 2" = 16"
9 QB @ 2" = 18"
3 TG @ 2" = 6"
3 LT @ 2" = 6"
TOTAL = 91"

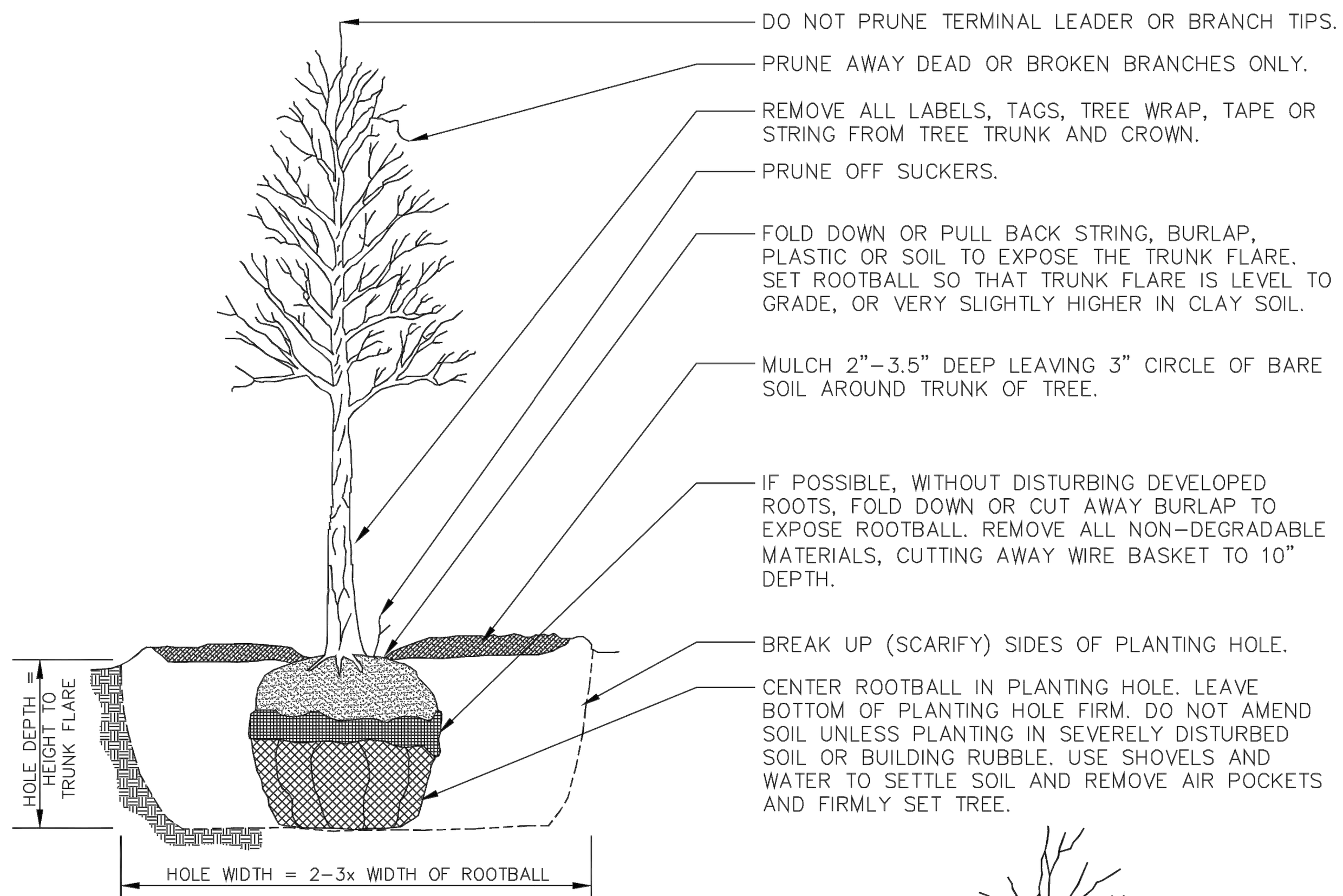
(R) = REPLACEMENT TREES

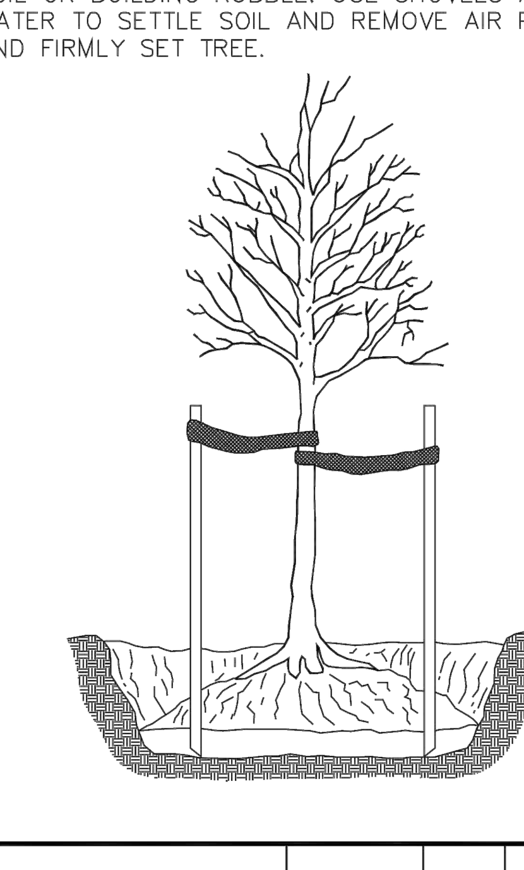
Know what's **below.** **Call** before you dig.

THE LOCATION OF ALL UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE BASED ON RECORDS PROVIDED BY THE UTILITY OWNERS AND VISIBLE EVIDENCE OBTAINED IN THE FIELD. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED TO THE COMPLETENESS OR ACCURACY THEREOF.

0' 40' 80' 120'
SCALE: 1" = 40'

LANDMARK TREE REPLACEMENT CALCULATIONS				
Tree	dbh			
2421	21			
2422	24			
2423	19			
2424	17			
2426	23			
2427	21			
2440	18			
2441	20			
2444	19			
	182	INCHES Caliper replacement required		
	50%	Replacement Ratio (50% DBH)		
	91	Required Caliper (inches) Replacement		





DO NOT STAKE UNLESS IN HEAVY CLAY SOIL, WINDY CONDITIONS, 3" OR GREATER DIAMETER TREE TRUNK OR LARGE CROWN. IF STAKING IS NEEDED DUE TO THESE CONDITIONS:

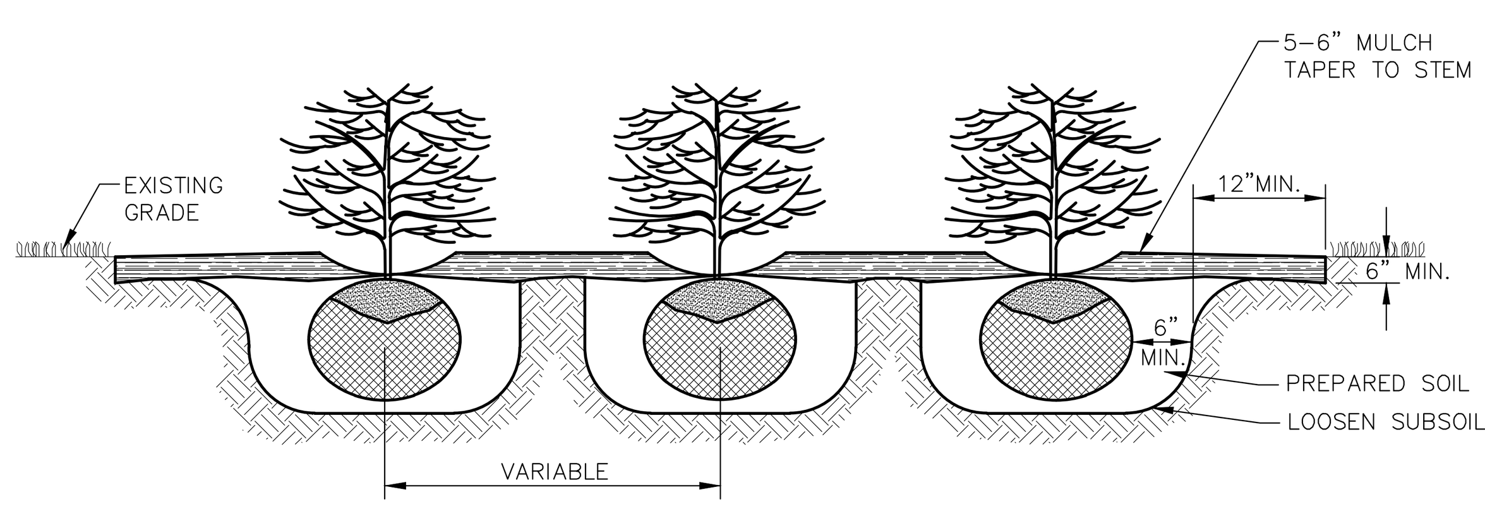
- STAKE WITH 2 x 2 HARDWOOD STAKES, OR APPROVED EQUAL, DRIVEN 6"–8" OUTSIDE OF ROOTBALL.
- LOOSELY STAKE TREE TRUNK TO ALLOW FOR TRUNK FLEXING.
- STAKE TREES JUST BELOW FIRST BRANCH WITH 2"–3" WIDE BELT-LIKE, NYLON OR PLASTIC STRAPS (2 PER TREE ON OPPOSITE SIDES OF TREE, CONNECT FROM TREE TO STAKE HORIZONTALLY. DO NOT USE ROPE OR WIRE THROUGH A HOSE.)
- REMOVE ALL STAKING MATERIALS AFTER 1 YEAR.

REVISIONS	REV. NO.	DR.BY	CH. BY	DATE

PUBLIC SERVICES DEPARTMENT
CITY OF ANN ARBOR

TREE PLANTING DETAIL

DR. BY	ARG	CH. BY	CSS	DRAWING NO.
SCALE	NONE	DATE	7-23-10	SD-L-3
INCH				SHEET NO. ___ OF ___



–FIRST AND SECOND WATERING AND CULTIVATION SHALL INCLUDE SHRUB BEDS.
–CUT 6" X 12" (MIN.) EDGING AROUND THE PERIMETER OF ALL SHRUB BEDS SHOWN ON THE PLANS. SPRAY A NON-PERSISTANT GLYPHOSATE HERBICIDE TO ENTIRE SHRUB BEDS PRIOR TO PLANTING AND BARK PLACEMENT.
–SHRUB BEDS ARE TO BE PAID FOR BY THE PAY ITEM 'SITE PREPARATION'.
–ALL PLANTS SHALL BE SET PLUMB AND HAVE THE BEST SIDE OF PLANT FACING THE MAIN VIEWING DIRECTION.

SHRUB BED DETAIL

SCALE: NONE

PLANT LIST				
QUANITITY	KEY	BOTANICAL NAME	COMMON NAME	SIZE
75	HH	HEMEROCALLIS 'HAPPY RETURNS'	HAPPY RETURNS DAYLILLY	#1 POT
18	SED	SEDUM X. 'NEON'	NEON SEDUM	#1 POT
14	ETT	ECHINACEA 'TIKI TORCH'	TIKI TORCH ORANGE CONEFLOWER	#1 POT
13	RFG	RUDBECKIA FULGIDA S. 'GOLDSTRUM'	GOLDSTRUM ORANGE CONEFLOWER	#1 POT
27	CS	CORNUS SERICEA	RED TWIG DOGWOOD	24" HT B&B
41	SY	TAXUS S.M. 'SEBIAN'	SEBIAN YEW	24" HT B&B
21	LP	SPIRAEA JAPONICA 'LITTLE PRINCESS'	LITTLE PRINCESS SPIRAEA	24" HT B&B
20	SG	SPIREA JAPONICA 'GOLDFLAME'	GOLDFLAME SPIRAEA	24" HT B&B
46	VMK	VIBURNUM X.B. 'MOHAWK'	MOHAWK VIBURNUM	24" HT B&B
29	VA	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	24" HT B&B
37	JC	JUNIPERUS C. 'SEAGREEN'	SEA GREEN JUNIPER	24" HT B&B
4	PS	PINUS STROBUS	EASTERN WHITE PINE	8' HT.
3	PG	PICEA GLAUCA	WHITE SPRUCE	8' HT.
14	UM	ULMUS AMERICANA 'VALLEY FORGE'	VALLEY FORGE AMERICAN ELM	2" CAL B&B
24	LO	GLEDITSIA T. INERMIS 'SKYCOLE'	SKYLINE LOCUST	2-1/2" CAL B&B
13	TG	TILIA CORDATA 'GREENSPIRE'	GREENSPIRE LINDEN	2" CAL B&B
10	LT	LIRIODENDRON TULIPIFERA	TULIPTREE	2" CAL B&B
9	QB	QUERCUS BICOLOR	SWAMP WHITE OAK	2" CAL B&B
13	PE	PLATANUS X EXCLAMATION	LONDON PLANETREE	2" CAL B&B

INTERIOR LANDSCAPE ISLANDS	
LI#	S.F.
1	409
2	444
3	604
4	534
5	586
6	300
7	567
8	165
9	165
10	165
11	275
12	275
13	165
14	214
	4868

VEHICULAR USE AREAS	
VUA#	S.F.
1	1134
2	648
3	432
4	1782
5	3563.41
6	816.1
7	2717.70
8	1948.09
9	1781.8
10	2087.54
11	1943.78
12	2267.53
13	467.95
14	1619.64
15	1952.57
16	1466.67
17	1421.68
18	971.91
	29022.37

Total: =	29,022.37
Use Ratio =	20
Req. S.F. =	1452
DEPRESSED BIORETENTION	
Req. % =	50%
Area =	1452
Req Area =	726
UTILIZE ISLANDS	
5	586
7	567
Total Prov. =	1153

STREET TREE ESCROW CALCULATION	
SOUTH STATE STREET	
	558 LF ROADWAY
	12 # EX. TREES
	45 LF DEDUCT / TREE
	540 DEDUCT
	18 LF
$	1.30 RATE
$	23.40 ESCROW
RESEARCH PARK DRIVE	
	280 LF ROADWAY
	2 # EX. TREES
	45 LF DEDUCT / TREE
	90 DEDUCT
	190 LF
$	1.30 RATE
$	247.00 ESCROW

SOUTH STATE STREET RIGHT-OF-WAY LANDSCAPING

1 TREE / 30 L.F. OF FRONTAGE
558 L.F. / 30 = 18.6 = 19 TREES
R.O.W. LANDSCAPING REQUIRED = 19 TREES
R.O.W. LANDSCAPING PROVIDED = 21 TREES

(RW) = RIGHT-OF-WAY TREES

RESEARCH PARK DRIVE RIGHT-OF-WAY LANDSCAPING

1 TREE / 30 L.F. OF FRONTAGE
280 L.F. / 30 = 9.3 = 9 TREES
R.O.W. LANDSCAPING REQUIRED = 9 TREES
R.O.W. LANDSCAPING PROVIDED = 9 TREES

(RW) = RIGHT-OF-WAY TREES

VEHICULAR USE AREA LANDSCAPING

1 SHRUB / 4 L.F. OF V.U.A. FRONTAGE
64 L.F. / 4 = 16 SHRUBS
V.U.A. LANDSCAPING REQUIRED = 16 SHRUBS
V.U.A. LANDSCAPING PROVIDED = 16 SHRUBS

(VUA) = VEHICULAR USE AREA RIGHT-OF-WAY PLANTINGS

GENERAL NOTES

1. CONTRACTOR TO PROVIDE DESIGN AND INSTALLATION OF UNDERGROUND IRRIGATION SYSTEM IN ACCORDANCE WITH PROJECT SPECIFICATIONS AND REGULATORY AGENCY REQUIREMENTS. ALL LANDSCAPING AND GRASS AREAS TO BE IRRIGATED. IRRIGATION CONTROL PANEL SHALL BE LOCATED WITHIN THE HVAC ENCLOSURE.
2. ALL GREEN SPACES AND PLANTING AREAS SHALL BE IRRIGATED.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO SECURE ALL PERMITS AND POST ALL BONDS PRIOR TO CONSTRUCTION.
4. REFER TO PLUMBING PLANS FOR LOCATION OF IRRIGATION METER.
5. ALL GRASS AREAS TO BE SODDED.
6. SPACE ALL SHRUBS AT 5-FEET ON CENTER UNLESS OTHERWISE INDICATED ON THE PLANS
7. ALL DISTURBED LAWN AREAS SHALL BE RESTORED TO AT LEAST PREVIOUS CONDITION IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
8. THE GENERAL CONTRACTOR SHALL INCLUDE TOPSOIL IN BASE BID. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE AMOUNT OF TOPSOIL AVAILABLE ON-SITE.

DESCRIPTION

THIS WORK SHALL CONSIST OF PROVIDING ALL NECESSARY MATERIALS, LABOR, EQUIPMENT, TOOLS AND SUPERVISION REQUIRED FOR THE EXECUTION AND GUARANTEE OF ALL PLANTINGS AND RELATED WORK AS SHOWN ON THE DRAWINGS.

PLANT MATERIALS SHALL CONFORM TO THE SIZES STATED ON THE PLANT LIST AND SHALL BE OF A MINIMUM SIZE OR LARGER. ALL MEASUREMENTS OF SPREAD, CALIPER, BALL SIZE, TRUNK CROWN RATIO, QUALITY DESIGNATIONS, ETC., SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE "ANSI STANDARDS FOR NURSERY STOCK". PLANT MATERIAL SHALL BE NURSERY GROWN AND INSPECTED BY THE OWNER'S REPRESENTATIVE AT THE SITE PRIOR TO PLANTING. THE OWNER'S REPRESENTATIVE RESERVES THE RIGHT TO REJECT ANY PLANT MATERIAL AT ANY TIME.

NURSERY STOCK SHALL BE PREPARED FOR SHIPMENT IN ACCORDANCE WITH THE REQUIREMENTS OF THE CURRENT ANSI SPECIFICATION Z60.1 AND SHALL BE ENCLOSED OR COVERED DURING TRANSPORTATION TO PREVENT DRYING.

SITE PREPARATION

THE CONTRACTOR SHALL VERIFY ALL EXISTING AND PROPOSED UTILITY LOCATIONS PRIOR TO CONSTRUCTION AND PROTECT AND REPAIR UTILITIES ENCOUNTERED DURING CONSTRUCTION WHETHER SHOWN ON THE PLANS OR NOT.

INDIVIDUAL HOLES SHALL BE CENTERED AT STAKED PLANT LOCATIONS. CONTRACTOR IS TO STAKE PRIOR TO PLACEMENT OF PLANT MATERIAL AND OBTAIN APPROVAL FROM THE OWNER'S REPRESENTATIVE. PLANTING HOLES SHALL BE DUG LARGE ENOUGH TO PERMIT PLACING PREPARED TOPSOIL 18" LATERALLY BEYOND THE ENDS OF THE ROOT BALLS FOR SHADE AND EVERGREEN TREES AND 6" LATERALLY FOR SHRUBS UNLESS OTHERWISE SPECIFIED.

EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE AT THE TIME THE HOLE IS DUG. THE PLANTING HOLE SHALL BE BACKFILLED WITH PREPARED TOPSOIL THE SAME DAY THEY ARE DUG.

TOPSOIL SHALL AT FERTILE, FRIABLE NATURAL TOPSOIL OF CLAY LOAM CHARACTER CONTAINING AT LEAST 5% BUT NOT MORE THAN 20% BY WEIGHT OF ORGANIC MATTER WITH A PH RANGE FROM 6.0 TO 7.0. TOPSOIL SHALL BE FREE OF CLAY LUMPS, COURSE SAND, STONES, PLANT ROOTS, STICKS OR OTHER FOREIGN MATTER.

CARE FOR PLANTS BEFORE PLANTING

PLANTS DESIGNATED "BB" SHALL BE BALLED AND BURLAPPED WITH FIRM NATURAL BALLS OF EARTH. CRACKED, LOOSENED OR BROKEN BALLS SHALL NOT BE PLANTED. THEY SHALL BE MARKED WITH SPRAY PAINT AND IMMEDIATELY REMOVED FROM THE JOB SITE. IMMEDIATELY FOLLOWING DELIVERY AT THE JOB SITE, ALL PLANTS THAT WILL NOT BE PLANTED THAT SAME DAY SHALL BE "HEELED IN" WITH SHREDDED BARK OR MOIST SOIL AND KEPT MOIST UNTIL PLANTED.

THE TRUNKS AND BRANCHES OF ALL TREES SHALL BE PROTECTED FROM INJURY OF ANY KIND DURING ALL OPERATIONS. THE OWNER'S REPRESENTATIVE SHALL REJECT ANY TREES THAT ARE INJURED.

PLANTING

THE CONTRACTOR IS RESPONSIBLE FOR PLANTING MATERIALS PLUMB. SET THE TOP OF THE ROOT BALL AT OR SLIGHTLY HIGHER THAN THE SURROUNDING GRADE. PLANTS SHALL BE FACED TO GIVE THE BEST APPEARANCE OR RELATIONSHIP TO ADJACENT STRUCTURES. NO FILLING WILL BE PERMITTED AROUND TRUNK OR STEMS. WHEN THE PLANT HAS BEEN PROPERLY SET, THE HOLE SHALL BE BACKFILLED TO 1/2 THE DEPTH OF THE BALL WITH PREPARED TOPSOIL MIXTURE, FIRMLY PACKED AND WATERED-IN AT TIME OF PLANTING. LOOSED AND REMOVE BURLAP AND LACING FROM UPPER 1/3 OF THE ROOT BALL. BACKFILL WITH PREPARED TOPSOIL, WHICH AFTER COMPACTION IS FLUSH WITH THE SURROUNDING GROUND.

MULCHING

ALL PLANT MATERIAL SHALL BE ENCIRCLED WITH A COVERING OF NON-DYED SHREDDED BARK MULCH TO 6" OUTSIDE THE PLANTING HOLE. MULCH SHALL NOT BE TOUCHING THE TRUNK OF ANY TREE. SUBMIT SAMPLE TO THE OWNER'S REPRESENTATIVE FOR APPROVAL BEFORE PLACEMENT. WOOD CHIPS SHALL NOT BE ALLOWED ON THIS JOB. MULCHING SHALL FOLLOW THE CITY OF ANN ARBOR PLANTING DETAILS.

STEEL LANDSCAPE EDGING

4" STEEL LANDSCAPE EDGING SHALL BE USED ON THIS PROJECT. ALUMINUM OR PLASTIC EDGING WILL NOT BE ALLOWED.

PRUNING

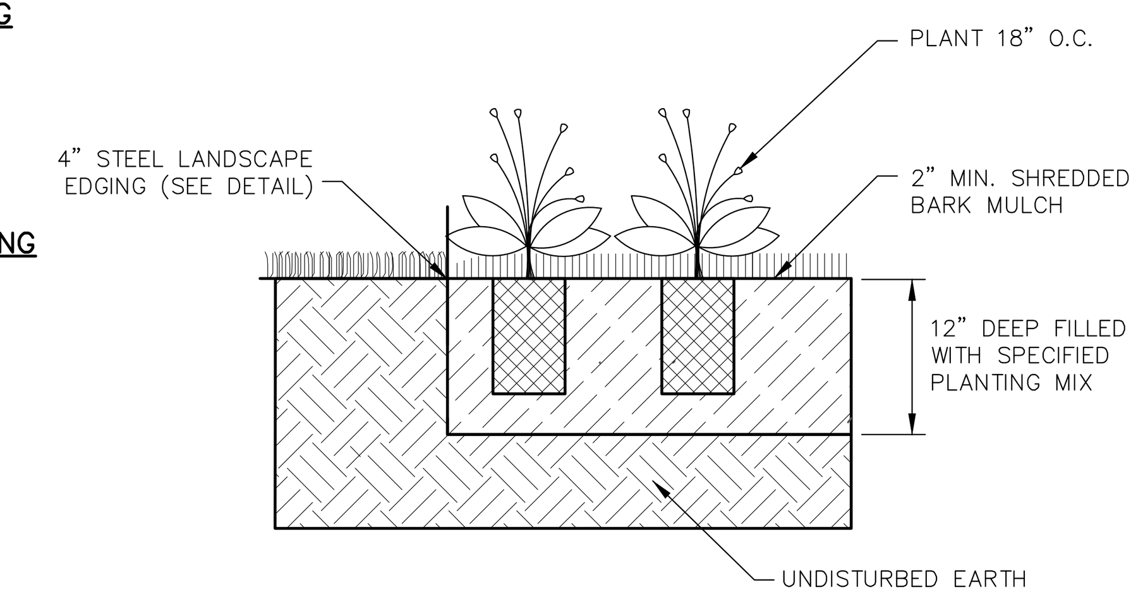
UPON COMPLETION, ONLY PRUNE DEAD OR BROKEN BRANCHES FROM TREES. THE AMOUNT OF PRUNING SHALL BE LIMITED TO THE MINIMUM NECESSARY TO REMOVE DEAD OR INJURED BRANCHES. PRUNING PAINT SHALL NOT BE USED.

FINISHING AND CLEANING UP

IMMEDIATELY UPON COMPLETION OF THE WORK, THE CONTRACTOR SHALL CLEAN UP THE AREA OF SURPLUS MATERIALS. THE CONTRACTOR SHALL REPAIR AND RE-ESTABLISH TURF IN RUTTED AREAS.

WARRANTY

THE LANDSCAPE INSTALLATION CONTRACTOR SHALL REPLACE ALL UNHEALTHY VEGETATION AND PLANTINGS WITHIN ONE (1) YEAR OF INITIAL PLANTING OR SUBSEQUENT PLANTING PERIOD.



PERENNIAL PLANTING BED

SCALE: NONE

CITY OF ANN ARBOR LANDSCAPE NOTES

LANDSCAPE CONTRACTOR SHALL REFER TO CITY OF ANN ARBOR LANDSCAPE AND SCREENING ORDINANCE (CHAPTER 62)

1. COMPACTED SOILS SHALL BE SCARIFIED TO A DEPTH OF 6" TO ELIMINATE ANY SOIL COMPACTION CREATED DURING CONSTRUCTION.
2. ALL DISEASED, DAMAGED, OR DEAD MATERIAL SHALL BE REPLACED IN ACCORDANCE WITH CHAPTER 62 BY THE END OF THE FOLLOWING PLANTING SEASON.
3. SNOW STORAGE AREAS ARE INDICATED ON THE PLAN. SNOW SHALL NOT BE PUSHED ON TO THE INTERIOR LANDSCAPE ISLANDS.
4. THE CITY OF ANN ARBOR HAS ADOPTED AN ORDINANCE LIMITING PHOSPHORUS IN FERTILIZER. TO ASSIST IN COMPLIANCE WITH THE STATE MANDATED TMDL FOR PHOSPHORUS WITHIN THE MIDDLE HURON RIVER BASIN, APPLICATIONS OF FERTILIZER BEYOND THE INITIAL TOPSOIL AND SEEDING SHALL BE A FERTILIZER WITH NO PHOSPHORUS

STELLAR DEVELOPMENT, LLC
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3850 RESEARCH PARK DRIVE
ANN ARBOR, MI 48108

ISSUED FOR	DATE
SPA	12/29/14
SPA	02/20/15
SPA	03/23/15
SPA	04/23/15
PERMITS	06/12/15
SPA	08/17/15
CONST PLANS	09/03/15
CONST PLANS	10/02/15
CONST PLANS	11/05/15
CONST PLANS	12/09/15
UG DETENTION	03/08/16
LANDSCAPE REV.	04/04/17
LANDSCAPE REV.	04/07/17
SPA	01/21/21

DATE :
DRAWN : ACA
CHECKED :
SCALE : 1"=40'
JOB NO : BD-14-322

SHEET TITLE :
LANDSCAPE PLAN AND DETAILS

SHEET
L1.0