Director's Report

Project Name: Gateway Crossing

Description: Final site plan approval

Date on Agenda this packet pertains to: September 5, 2024

☐Public Hearing

☒Initial Submittal

☐Revised Plans

☐Preliminary Approval

☒Final Approval

☒Special Land Use

☐Rezoning

☐Other:

Contact	Consultants & Departments	Approval	Denial	Approved w/Conditions	Other	Comments
Sean O'Neil	CDD Director	☐	☐	☐	☒	
DLZ	Engineering Consultant	☐	☐	☒	☐	See letter dated 08/22/24
Matteo Passalacqua	Carlisle Wortman Associates, Inc	☐	☐	☒	☐	See letter dated 08/19/24.
Jason Hanifen	WLT Fire Marshal	☒	☐	☒	☐	See letter dated 08/22/24.

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES

INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

August 22, 2024

Sean O' Neil, Director
Community Development Department
Charter Township of White Lake
7525 Highland Road
White Lake, Michigan 48383

RE: Gateway Crossing - Final Site Plan/Final Engineering Plan Review – 2nd Review

Ref: DLZ No. 2345-7567-01 Design Professional: Boss Engineering

Dear Mr. O' Neil,

Our office has reviewed the above-mentioned revised plan prepared by Boss Engineering and dated August 6, 2024. These plans were reviewed for conformance with the Township Engineering Design Standards. We offer the following comments for your consideration:

Comments-

Please note that comments from our July 24, 2024 letter are in italics. Responses to those comments are in bold. New comments are in standard font.

General

1. *Cover Sheet 1- Add WLT Engineering Design Standards Notes A.8 a.-d. on this sheet.* **Comment addressed. Standard notes have now been added to cover sheet.**
2. *Cover Sheet 1- Sheet Index- Sheets PP-4 and PP-4.1 are incorrect. Correct labels are PP-8 and PP-8.1.* **Comment addressed. Sheet labeling has been revised.**
3. *Sheet 2- General Utility Notes-1) Note 1- Remove all language beginning at "…of uniform gradation...only for watermain" and replace with "per White Lake Township standards."; 2) Note 4- Remove all language beginning at "…of granular material…by AASHTO T99" and replace with "per White Lake Township standards."* **Comment addressed. Language has been revised.**

4. *Sheet 2- General Storm Notes – Remove Notes 2 (including 2.1-2.4) and 9.* **Comment addressed. Notes have been removed.**
5. *Sheet 2- General Storm Notes- Revise Note 6- "All flared end sections **18"** and larger…"* **Comment addressed. Note has been revised.**
6. *Sheet 2- General Sanitary Notes- Remove Note 9.* **Comment addressed. Note has been removed.**
7. *Sheet 2- General Sanitary Notes-Note 12- Change footage from "100' "to "**75' and**."* **Comment addressed. Footage has been revised.**
8. *Sheet 2- General Sanitary Notes- Note 13- Replace "XX" with "**20**."* **Comment addressed. Note has been revised.**
9. *Sheet 2- General Watermain Notes- Remove Note 1.* **Comment addressed. Note has been removed.**
10. *Sheet 2- General Watermain Notes- Note 7- Change watermain minimum cover from 5.5' to **6.0'**.* **Comment addressed. Note has been updated.**
11. *Sheet 2- General Watermain Notes- Note 11- Replace "XX" with **"20."*** **Comment addressed. Note has been revised.**
12. *Photometric Plan Sheet- Pole A cannot be placed in the location as shown as it appears that the pole will be installed directly over the proposed underground detention area. Relocate pole outside of influence of underground detention area.* **Comment partially addressed. Per design engineer, pole cannot be relocated without increasing the total number of light poles on the site that is required to illuminate the area. Engineer states there is a 6.5' separation between the bottom of the pole and top of underground storage. Please add a note to Sheet 5 and to the Detention Basin Plan view on Sheet 13 regarding light pole and show pole location on these two plan sheets. In addition, backfill over underground detention chamber shall take into account loading from light pole. Please add note to this effect on Sheet 15.**
13. Sheet 3- Survey sheet shall be signed and sealed by surveyor who performed the survey.

Sanitary Sewer

1. *Sheet 5- The utility plan shall provide sanitary sewer lengths between structures, pipe slopes, type, and diameter.* **Comment addressed. Information has now been shown on utility plan.**
2. *Sheet 5- Sanitary sewer pipe material is proposed as PVC SCH 40; SDR 26 is required for sewer mains, and SDR 23.5 is required for service leads.* **Comment addressed. Materials have been revised.**
3. *Sheet 5- In reference to the 48 LF sanitary sewer lead. Based on the inverts provided in the lead elevations table on Sheet 11, the actual pipe slope calculates to 0.90%. A minimum of 1.00% slope is required for building leads.* **Comment partially addressed. Inverts have been updated on Sheet 11;**

however, please revise pipe slope for the 9 LF from the grease interceptor to the monitoring MH to 1.5%. This is the slope we calculated based on updated inverts provided.

4. *Sheet 5- A minimum of 6" diameter is required for sanitary sewer building leads; currently 4" diameter is proposed.* **Comment addressed. All leads have been updated to 6" diameter.**
5. *Sheet 5- Provide diameter of monitoring manhole. A minimum 4' diameter is required.* **Comment addressed. Diameter (4') has been noted on plan.**
6. *Sheet 11-Provide sanitary sewer basis of design including REUs for future development on the western portion of this parcel.* **Comment partially addressed. Sanitary sewer basis of design has been provided; however, it appear that the future REUs of 7.50 were not factored/included in the total number of REUs (should be approximately 17). Please provide both currently proposed and future REU calculations. Please also use 270 gallons per day per REU per OCWRC requirements for this sewage district.**
7. *Sheet 11- Profile- Label SAN-SAN MH as Existing.* **Comment addressed. MH has been relabeled.**
8. *Sheet 11- It is not clear what the three ring shaped items are that are shown directly in the sanitary pipe. Please clarify.* **Comment addressed. Rings in pipe have been removed.**
9. *Sheet 11- Label the N, S, and E inverts as existing in the SAN-SAN MH.* **Comment addressed. Inverts have been relabeled as existing.**
10. *Sheet 11- ST X SAN 01-STORM B/P invert shown (961.95) does not match invert of 961.73 on storm sewer profile at crossing between storm sewer structure CB07 and CB 06 on Sheet 10. Please revise as needed.* **Comment addressed. Inverts now match.**
11. *Sheet 16- The proposed Schier oil/grease separator appears to be undersized. Township Engineering Standards require a 1000 gallon capacity tank. In addition, the inlet and outlet pipe diameters are shown as 4". A minimum of 6" diameter pipe size is required for all sanitary sewer leads. Reducers are not allowed.* **Comment partially addressed. A different model has now been shown. Leads in and out are now shown as 6" diameter. Please coordinate lead inverts for inlet and outlet pipes between plans and those in the sanitary lead table on Sheet 11. In addition, provide rim elevations for the two risers as per elevations shown on the grading plan.**

<u>Watermain</u>

1. *We defer to the Township Fire Department regarding hydrant spacing/coverage requirements.* **Comment addressed and remains as a notation. Per the design engineer, the Fire Department did not request changes to hydrant spacing/coverage.**
2. *Sheet 5- Specify size and material of water service lead to building.* **Comment addressed. Water service size and material has now been provided.**

3. *Sheet 5- Provide label for GV01 on plan.* **Comment addressed. Label has been provided.**
4. *Sheet 5- Water valve and temporary blowoff assembly- Correct sheet reference from Sheet 14 to* ***Sheet 19****.* **Comment addressed. Correct sheet reference has been provided.**
5. *Sheet 12-A minimum of 6.0' of cover is required over all watermain.* **Comment addressed. A minimum of 6.0' of cover is now shown over all watermain.**
6. *Sheet 12-CL 54 (excepting building water service lead) is required for all watermain.* **Comment addressed. Class 54 is now specified.**
7. *Sheet 12-HYD 02- HYD 01-Pipe size is shown as 6" diameter while 8" diameter is shown on Sheet 5. 6" diameter would be acceptable for the 14' hydrant lead since the lead length is <40'.* **Comment addressed. Pipe size is now 6" and is consistent between plan sheets.**
8. *Sheet 12-Provide slopes for all watermain profiles.* **Comment addressed. While slopes have not been provided, T/P elevations have been provided should a need for pipe slope calculation arise in the future.**
9. *Sheet 12-HYD 02-HYD 01-ST X WM 03- The elevations provided are reversed. ST T/P= 963.71 and WM B/P = 966.53.* **Comment addressed. Elevations have been updated.**
10. *Sheet 12- Label GV 01 also as a blow off assembly.* **Comment addressed. GV has been labeled.**
11. *Sheet 12-The pipe footages of 59' + 6" + 6' = 61' total versus 62' as shown on Sheet 5.* **Comment addressed. Footages have been updated.**
12. *Sheet 12- Show the existing sanitary sewer (along Bogie Lake Road) that crosses the watermain between the T/P 965.49 and the 45 degree bend.* **Comment addressed. Crossing is now shown.**
13. *Sheet 12- ST X WM 02-A minimum of 18" vertical separation is required between storm and watermain. Currently 12" of vertical separation is shown. In addition, label on crossing is incorrect and is labeled as SAN B/P. Please relabel to* ***WM B/P****.* **Comment addressed. A minimum of 18" vertical separation is now shown, and label has been updated.**
14. Sheet 12-Profile shows footage as 217' while Sheet 5 shows 216'. Please revise so footages match.
15. Sheet 12-ST X WM 02 crossing- WM T/P elevation of 963.19 does not match that shown (963.57) for the same crossing on Sheet 10. Please revise for consistency.

<u>Grading/Paving</u>

1. *Sheet 4- Site Data and Site Plan Notes(1A)- 59 total provided parking spaces are now shown. We note that the total number of spaces has been reduced by 2 spaces from the approved PSP. We defer to the Township regarding this item.* **Comment addressed. Per design engineer, the number of**

parking spaces was reduced by two (2) due to elimination of a space by the monument sign as well as the reconfiguration of the northeast parking lot.

2. *Sheet 4- 'Curb drop at sidewalk crossing to meet ADA compliance – See detail sheet 9' note along both M-59 and Bogie Lake Road entrances- We note that no such detail was found on any of the plan sheets. Please provide and provide sheet number citation.* **Comment addressed. A detail and sheet number citation have been added.**
3. *Sheet 4- Proposed 8' wide sidewalk note- Please provide a detail note and sheet number reference for the detail. Current detail shown on Sheet 16.* **Comment addressed. Detail note and sheet number reference have now been provided.**
4. *Sheet 4- Integral Sidewalk note- Please provide a detail note and sheet number reference for the detail. Current detail shown on Sheet 16.* **Comment addressed. Detail note and sheet number reference have now been provided.**
5. *Sheets-4 and 6 (ADA Details)- Westernmost ADA space scales to 7.0' on both of these sheets. Space is required to be a minimum of 8" wide.* **Comment addressed. Space scales to 8' width from edge of hatched striping to center of double striping.**
6. *Sheet 4- Proposed wall note- Please provide a detail note and sheet number reference for the detail. Current detail shown on Sheet 16.* **Comment addressed. Detail note and sheet number reference have now been provided.**
7. *Sheets 4 and 16--The proposed retaining wall references a guardrail to be mounted on the retaining wall. We defer to the Township if this is an acceptable material to use or if a decorative railing (42" high) would be more appropriate. If the proposed guardrail is acceptable, the details on the plans will need to be modified to show how the guardrail will be mounted on the proposed retaining wall.* **Comment remains. DLZ understands the Township will require this to be a decorative railing.**
8. *Sheet 4- 'Dumpster location, see arch. Dwg. Sht. PP-3 for detail.' Sheet reference is incorrect; it should be Sheet **PP-8**.* **Comment addressed. Sheet reference has been updated.**
9. *Sheet 4- Proposed 6' wide sidewalk note- Please provide a detail note and sheet number reference for the detail. Current detail shown on Sheet 16.* **Comment addressed. Detail note and sheet number reference have been provided.**
10. *Sheet 4- '8' wide boardwalk over wetland 265 LF. See detail Sheet 9' note. Correct to Sheet **16**.* **Comment rescinded. A boardwalk is no longer proposed.**
11. *Sheet 6- Show locations of all watermain and sanitary sewer structures and provide their rim elevations on this sheet.* **Comment addressed. FG/rim elevations for watermain and sanitary sewer have now been shown on grading plan.**

12. *Sheet- 15- E. Highland Road/M-59 Grading Plan- T/CONC 974.00 grade near MH 2 appears to be in error. Please remove this grade.* **Comment addressed. Spot elevation was in error and has been removed from the sheet.**
13. *Due to proposed retaining wall height, please provide calculations and report, signed and sealed, by a licensed structural engineer. The calculations and report shall demonstrate that the proposed retaining wall will provide the support necessary including for the proposed future improvements such as an internal drive/circulation lane in the areas adjacent to the proposed wall.* **Comment outstanding. Design engineer has noted that calculations for wall are in process and will be provided at a later date. Calculations will be required to be provided prior to FSP/FEP approval.**

Stormwater Management

1. *Sheet 4- Concrete Spillway note- Please provide a detail note and sheet number reference for the detail. Current detail shown on Sheet 16.* **Comment addressed. Detail note and sheet number reference have now been provided.**
2. *Sheet 5- Remove storm sewer pipe sizing calculations as these are duplicated within the plan set on Sheet 13. Please leave calculations on Sheet 13.* **Comment addressed. Duplicate calculations have been removed from Sheet 5.**
3. *Sheet 5- The utility plan shall provide storm sewer lengths between structures, pipe slopes, type, and diameter.* **Comment addressed. Information has been added to the utility plan.**
4. *Sheets 5,7 and 10- Mechanical pretreatment unit proposed in FES6- No detail has been provided on plan. Please provide type of unit and details and demonstrate that unit size will be adequate to remove a minimum of 80% of total suspended solids.* **Comment partially addressed. A KSI stormwater treatment unit has now been proposed and details have been provided on plan; however, please label bypass pipe as such on all relevant plan sheets. In addition, please clarify sizing of system, as based on storm sewer pipe sizing calculations, there would be approximately 9 cfs of flow into this unit which would require a larger unit size than the specified 1000 model.**
5. *Sheet 6- Provide underground detention inspection MH rim elevations on this plan sheet. There is a concern that there will be insufficient cover over the detention pipes. At a minimum, per Table 1 on Sheet 14, 15" minimum cover is required over a 120" diameter pipe for non-vehicle loading areas. There is also the concern that due to the steep grades in the non-paved area that there will be insufficient cover over the pipes. In addition, additional cover would be required in areas where the detention pipes are shown under the parking area based on axle loading (see Contech details on Sheet 14). Please demonstrate that there will be sufficient cover for all of the underground detention*

piping such that pipe integrity will be guaranteed and not compromised. **Comment partially addressed. Design engineer states that the minimum 15" of cover shall be provided over the underground detention unit. A detail has also been added to the plan that shows the underground system relative to surface grades. The above portion of the comment regarding MH rim elevations for the underground detention inspection manholes is still outstanding. Please provide these rim elevations on this plan sheet.**

6. *Sheet 7- Stormwater Narrative- Second paragraph- Second to last line- Correct pipe size from 24" to **30".*** **Comment addressed. Pipe size has been corrected.**
7. *Sheet 7- Drainage Area Table lists Drainage Area 2- Although negligible in terms of C_{AVG} calculations, please show this area on the drainage map on this sheet.* **Comment addressed. Drainage Area 2 has been removed from the Drainage Area Table.**
8. *Sheet 7- Note at bottom of sheet- "See Sheet 9 for basin detail…"- Correct Sheet number to **Sheet 13**.* **Comment addressed. Note has been updated.**
9. *Sheet 8—Correct spelling of 'sediumentation' on title bar.* **Comment addressed. Spelling has been corrected.**
10. *Sheet 8- Remove General Notes information; this is in duplicate and is on Sheet 4.* **Comment addressed. Notes have been removed from Sheet 8.**
11. *Sheet 8- Soil Erosion Notes- Note 1- Remove 'Oakland County Drain Commissioner' and add 'OCWRC.'* **Comment addressed. Note has been updated.**
12. *Sheet 8- Soil Erosion Notes- Note 2- Change sheet number from 15 to **Sheet 20**.* **Comment addressed. Sheet reference has been updated.**
13. *Sheet 8- Proposed Construction Schedule for the Year 2024- Please update as needed.* **Comment addressed. Schedule has been updated.**
14. *Sheet 8-The silt fencing location relative to the area of the proposed west retaining wall may be too tight with what is realistically needed for construction of the wall. Please verify and adjust as needed.* **Comment addressed. Silt fencing has been shifted further west to realistically allow for retaining wall construction.**
15. *Sheet 8- Relocate/wrap silt fencing in the area of the basin ES installation such that the silt fencing is around this area and that wetlands is protected.* **Comment addressed. Additional silt fencing is now shown around area of basin ES construction.**
16. *Sheet 10 -Utility plan inset- Move FES A label for readability on plan.* **Comment addressed. Label has been moved.**
17. *Sheet 10- CB07- Rim elevation is incorrect. Please match that shown on grading plan and storm sewer pipe sizing calculations. That rim elevation on the grading plan and storm calculations appears to be the correct one.* **Comment addressed. Rim elevation has been corrected.**

18. *Sheet 10-CB07-CB06-Provide/show CSB near CB07 on the profile (in the area where 'Existing Surface' arrow is shown). CSB is required within the influence of pavement.* **Comment addressed. CSB has now been shown in this area.**
19. *Sheet 10- Label CB06 additionally as stormwater pretreatment unit.* **Comment addressed. Pretreatment unit has now been shown on profile.**
20. *Sheet 10- CB12-CB11- Show electric crossing.* **Comment addressed. Electric crossing is now shown.**
21. *Sheet 10-CB11-CB10- WM X ST 02-A minimum of 18" vertical separation is required between storm and watermain. Currently 12" of vertical separation is shown. In addition, label on crossing is incorrect and is labeled as SAN B/P. Please relabel to* ***WM B/P****.* **Comment addressed. 18" minimum vertical separation is now shown, and label has been corrected.**
22. *Sheet 10-FES 14-MH 14A- Please investigate whether it is possible is lessen the pipe slope to < or = 3.62% maximum pipe grade for this run of pipe. It is understood that due to steep grade constraints on the site that this may not be feasible. In addition, please review the 8.00% grades on pipe runs FES18-MH16-MH19 for the same.* **Comment addressed. Severe pipe run slopes have been reduced.**
23. *Sheet 10- OCS 2- A minimum of 3' sump is required for this structure.* **Comment addressed. A 3' sump has been provided.**
24. *Sheet 10-Basin Out – OCS2- Pipe slope calculates to 0.50% and not 0.40% based on provided inverts. Please revise.* **Comment addressed. Pipe slope has been revised.**
25. *Sheet 10- MH16- Provide 2' sump for this structure.* **Comment addressed. A 2' sump has been added.**
26. *Sheet 10-WM X ST 03- The elevations provided are reversed. ST T/P= 963.71 and WM B/P = 966.53.* **Comment addressed. Revisions have been made.**
27. *Sheet 13-Storm sewer pipe sizing calculations- Please revise the following:*
    a) *7A-7- Pipe length of 40' and diameter of 8" is not shown on Utility Plan Sheet 5.* **Comment addressed. The pipe run has been eliminated and calculations updated.**
    b) *11A-11-Pipe length is 31' per Sheet 5.* **Comment addressed. Pipe length has been updated.**
    c) *Basin-2- Actual slope used is 0.50%. Correct in two areas on these calculations.* **Comment addressed. Revisions have been made.**
28. *Sheet 13-Detention Basin Plan View- Provide sheet reference for OCS structure.* **Comment addressed. Sheet reference has now been updated.**
29. *Sheet 13- Detention Basin Plan View- 10' Contech Underground Detention note- Revise '(See details Sheet 10)' to* ***Sheet 14.*** **Comment addressed. Sheet number reference has been updated.**
30. Sheet 5- Add pipe slope to the 31 LF of roof drain going from RD 11A to CB11.
31. Sheet 10-Basin Out to OCS2 and OCS2 to FES01- Shows ADS N-12 as pipe material while Sheet 5 shows ADS SCH 40 for these two runs. Please revise for consistency between sheets.

32. Sheet 10-CB04 to MPS 3 IN and MPS 3 OUT to BASIN IN- Shows ADS N-12 as pipe material while Sheet 5 shows ADS SCH 40 for these two runs. Please revise for consistency between sheets.
33. Sheet 10-CB04 to MPS 3 IN- Sheet 5 shows length as 5'. Please revise so footages match between sheets. In addition, revise pipe slope based on correct footage.
34. Sheet 13-Section A-A-Underground profile- A back of curb elevation of 970.00 is shown; however, based on proposed T/A elevation grade of 971.00 shown on grading Sheet 6, B/C elevation at this point would be 971.50 based on a 6" curb. Please review and revise as necessary.
35. Sheet 13-Detention Basin Plan View- 28LF of 15" pipe- Pipe diameter (15") as shown does not match Sheet 5 (18"). Please revise for consistency. In addition, please provide a profile for this bypass pipe.
36. There are several items in the pipe sizing calculations which will require revision. We have attached a marked up plan sheet for the design engineer's use.

Required Permits and Approvals

The following permits and approvals will be required:

1. Permit from the Road Commission for all work within the Bogie Lake Road right of way.
2. Permit from MDOT for work within the M-59 right of way.
3. SESC permit from OCWRC
4. Wetland Permit from EGLE.
5. NPDES Notice of Coverage for stormwater discharge from EGLE.
6. Permission from White Lake Township for work within the existing sanitary sewer easement along Bogie Lake Road.
7. Part 41 Sanitary Sewer Permit from EGLE.
8. Act 399 Watermain Permit from EGLE.
9. Executed Stormwater Maintenance Agreement and exhibit.
10. 15' wide sidewalk easement for the portion of sidewalk/boardwalk that is outside of the Bogie Lake Road ROW.

Recommendation

We are not recommending approval of the plan at this time. Although the majority of our previous comments have been addressed, there are additional comments due to some changes in site utility layout. The above comments are required to be addressed and revised plans submitted for our review. ***In order to streamline the review process, we request a response letter to the above comments be provided by the engineer upon revised plan resubmittal.***

Please contact our office should you have any questions.

Sincerely,

DLZ Michigan

Michael Leuffgen, P.E.
Department Manager

Victoria Loemker, P.E.
Senior Engineer

Attachments: Red-lined plan Sheet 13

Cc: Andrew Littman, Community Development, *via email*
Matteo Passalacqua, Carlise Wortman, *via email*
Hannah Kennedy- Galley, Community Development, *via email*
Aaron Potter, DPS Director, White Lake Township, *via email*
Nick Spencer, Building Official, White Lake Township *via email*
Jason Hanifen, Fire Marshall, White Lake Township, *via email*

X:\Projects\2023\2345\756701 White Lake Townshi\FSP&FEP- Review.02\FSP and FEP Review.02.docx

OAKLAND COUNTY DETENTION BASIN CALCULATIONS

AREA (ACRES)	IMPERVIOUS FACTOR	ACRE IMPERVIOUS
2.11	0.95	2.00
0.00	0.7	0.00
0.46	0.2	0.09

COMPOUND C: 0.82

TOTAL DRAINAGE AREA: 2.56 ACRES

WATER QUALITY VOLUME V_{WQ}

V_{WQ}= 3.630(C)(A) = 7620 FT^3

V_t= 0.15(V_{WQ}) = 1143 FT^3

WATER QUALITY RATE FOR MECHANICAL STRUCTURE

T_C = MAX TIME OF CONCENTRATION = 16.42 MIN

Q_{WQ}= (C)(A)30.2/(T_C+9.17)$^{.61}$ = 4.59 CFS

CHANNEL PROTECTION VOLUME CONTROL - REQUIRED

$V_{C.P.R}$ = 4.719(C)(A) = 9906 FT^3

CHANNEL PROTECTION VOLUME CONTROL - PROVIDED

In-Situ Infiltration rate = 0 IN/HR

Are upstream infiltration BMP's provided? NO

Basin Footprint Infiltration Area Required =NO INFILTRATIO FT^2

$V_{C.P.P}$ = 0 FT^3

CHANNEL PROTECTION RATE CONTROL (EXTENDED DETENTION VOLUME)

V_{ED} = 6.897(C)(A) = 14478 FT^3

EXTENDED DETENTION OUTLET RATE

Q_{ED} = V_{ED}/(48hr) = 0.084 CFS

H_{ED} = V_{ED}/4.666 $(H)^{1/2}$ = 1.0 1" HOLES

H = 8.00 FT

$ELEV_{ED}$ = 957.69

100-YEAR ALLOWABLE OUTLET RATE

Q_{DRAIN} = Restricted Drain Rate = 0.2 CFS/ACRE

Q_{VRR} = 1.1055 - 0.206LN(A) = 0.912 CFS/ACRE

Q_{100P} = (LESSER OF Q_{DRAIN} & Q_{VRR})*A = 0.512 CFS

VARIABLE RELEASE RATE	
1 CFS/ACRE	< 2 ACRES
0.15 CFS/ACRE	> 100 ACRES

100-YEAR DETENTION VOLUME

V_{100R} = 18985 (C)(A) = 39853 FT^3

Q_{100N} = (C)(A)83.3/(T_C+9.17)$^{0.61}$ = 12.65 CFS

R = 0.206-.15(ln(Q_{100P}/Q_{100N})) = 0.6871

V_{1000} = V_{100R}-$V_{C.P.P}$ = 27382 FT^3

Is $V_{1000} \geq V_{ED}$? YES

V_{1000} = 27,382 FT^3

BASIN STORAGE PROVIDED

LINEAL FOOTAGE OF PIPE IN SYSTEM: 352 LFT

ELEVATION	INCREMENTAL VOLUME / LFT	VOLUME (FT^3)	TOTAL VOLUME (FT^3)	
962.5	4.0875	1,439	27,646	DHWL
961.5	7.0949	2,497	26,207	
960.5	8.6345	3,039	23,710	
959.5	9.5201	3,351	20,670	
958.5	9.9329	3,496	17,319	
957.5	9.9329	3,496	13,823	
956.5	9.5201	3,351	10,327	
955.5	8.6345	3,039	6,976	
954.5	7.0949	2,497	3,936	
953.5	4.0875	1,439	1,439	
952.5	0.0000			BOTTOM OF STORAGE

PROVIDED FOOTPRINT OF BASIN BOTTOM AREA 4108 FT^2

OUTLET CONTROL STRUCTURE

Q_{ED} ACTUAL

H_{ED} = 1 (1" HOLES)

A_{ED} = 0.0055 FT^2

$Q_{ED\text{-}ACTUAL}$ = (A_{ED})0.62 x (2 x 32.2 x h)$^{0.5}$) = 0.077 CFS

Q_{100ALT} OUTLET

$Q_{100\text{-}ACTUAL}$ = Q_{100P} - $Q_{ED\text{-}ACTUAL}$ = 0.435 CFS

A_{100} = $Q_{100\text{-}ACTUAL}$ / (0.62 * (2 *32.2 * ($ELEV_{DHWL}$ - $ELEV_{ED}$))$^{0.5}$) = 0.052 FT^2

AREA OF 2 INCH DIAMETER ORIFICE = 0.022 FT^2

ORIFICES = A100 / 0.005 = 2.0 ORIFICES

OVERFLOW SPILLWAY DESIGN

Design Flow Rate: Q_{100N} = 12.65 CFS

Depth of Spillway: H_{WEIR} = 9 INCHES

Width of Spillway: L_{WEIR} = Q_{100N}/3.33$H_{WEIR}^{3/2}$= 5.8 FT

BASIN DESIGN SUMMARY	
BASIN SIZE REQUIRED =	27,382 FT^3
BASIN SIZE PROVIDED =	27,646 FT^3

ORIFICE DESIGN SUMMARY		
ELEVATION	# OF HOLES	DIAMETER OF HOLES
952.50	1.0	1 -INCH
957.69	2.0	2 -INCH
OVERFLOW SPILLWAY SUMMARY		
WIDTH OF OVERFLOW SPILLWAY =		6 FT

COMMENTS TO ACCOMPANY FSP/FEP REVIEW.02

FROM	TO	DRAIN AREA	ACRES A	RUNOFF COEFF C	EQUIV. AREA A * C	INTEN-SITY I	TIME OF CONC. T_C	ADD'L RUNOFF Q	RUNOFF (CFS) Q	PIPE LENGTH (LF)	PIPE DIA. (IN)	VELOCITY FLOWING FULL (FPS)	HYDRAULIC GRADIENT SLOPE %	ACTUAL SLOPE USED	MANNING COEFFICIENT	MANNING FLOW CAPACITY	MANNING'S VELOCITY (FT/SEC)	TIME (MIN)	HG ELEV UPPER END	HG ELEV LOWER END	RIM ELEV UPPER END	RIM ELEV LOWER END	INVERT UPPER END	INVERT LOWER END	DROP DISTANCE (FT)
6	5	6	0.35	0.81	0.28	4.38	15.00		1.23	110	15	2.61	0.24%	0.50%	0.013	4.58	3.73	0.49	967.16	966.61	972.40	971.90	966.16	965.61	3.20
5	4	5	0.17	0.85	0.14	4.32	15.49	3.21	5.06	177	~~15~~ 18	5.49	1.08%	0.75%	0.013	5.61	4.57	0.65	963.99	962.08	971.90	966.50	962.41	961.08	3.00
7	5	7	0.81	0.91	0.73	4.38	15.00		3.21	29	15	3.55	0.45%	0.50%	0.013	4.58	3.73	0.13	965.55	965.41	973.00	971.90	964.55	964.41	2.00
13C	13A	13C	0.00	0.95	0.00	4.38	15.00		0.02	35	4	1.20	0.30%	1.00%	0.013	0.19	2.19	0.27	969.71	969.36	-	-	969.45	969.10	
13B	13A	13B	0.00	0.95	0.00	4.38	15.00		0.02	~~34~~ 66	4	1.20	0.30%	1.00%	0.013	0.19	2.19	0.26	969.70	969.36	-	-	969.44	969.10	
13A	13	-	-	-	-	-	15.26	0.02	0.04	~~35~~ 74	4	1.46	0.44%	1.00%	0.013	0.19	2.19	0.27	969.36	969.01	-	972.40	969.10	968.75	
13	12	13	0.24	0.69	0.17	4.38	15.00	0.04	0.77	90	12	2.41	0.28%	0.50%	0.013	2.53	3.22	0.47	969.01	968.56	972.40	972.41	968.21	967.76	
12	11	12	0.31	0.55	0.17	4.32	15.47		1.51	124	12	2.93	0.41%	0.50%	0.013	2.53	3.22	0.64	968.56	967.94	972.41	971.84	967.76	967.14	1.03
11	10	11	0.05	0.85	0.04	4.26	16.11	0.82	2.50	76	15	5.85	1.23%	2.51%	0.013	10.26	8.36	0.15	966.91	965.01	971.84	967.15	965.91	964.01	1.60
10	9	10	0.11	0.79	0.09	4.24	16.26		2.88	30	15	3.45	0.43%	0.50%	0.013	4.58	3.73	0.13	963.41	963.26	967.15	966.15	962.41	962.26	-
9	4	9	0.02	0.95	0.02	4.23	16.39		2.97	35	15	3.45	0.43%	0.50%	0.013	4.58	3.73	0.16	963.26	963.08	966.15	966.50	962.26	962.08	4.00
4	3	4	0.30	0.83	0.25	4.21	16.55	5.06	9.08	5	~~15~~ 18	4.85	0.84%	0.50%	0.013	4.58	3.73	0.02	959.10	959.06	966.50	968.15	958.08	958.06	0.07
3	BASIN	-	-	-	-	-	16.57		9.08	5	~~15~~ 18	4.85	0.84%	0.50%	0.013	4.58	3.73	0.02	958.96	958.95	968.15	-	957.99	957.96	5.46
4	BASIN	-	-	-	-	-	16.51	9.08	9.08	28	18	5.48	0.84%	0.50%	0.013	7.45	4.21	0.11	959.15	966.50	-	958.09	957.95	5.45	
11A	11	11A	0.20	0.95	0.19	4.38	15.00		0.82	31	8	3.30	0.90%	1.00%	0.013	1.21	3.47	0.15	969.91	-	971.84	969.69	969.38	3.00	
14	15	14	0.47	0.50	0.24	4.38	15.00		1.03	~~77~~ 78	15	2.61	0.24%	0.50%	0.013	4.58	3.73	0.49	967.00	966.00	-	962.39	962.00	1.92	
BASIN	2	ALL	-	-	-	-	15.00	9.08	9.08	8	24	4.22	0.34%	0.40%	0.013	14.35	4.57	0.03	954.10	954.07	-	967.00	952.50	952.47	0.01
2	1	-	-	-	-	-	15.03		9.08	51	24	4.22	0.34%	0.40%	0.013	14.35	4.57	0.19	954.06	953.86	967.00	-	952.46	952.26	
18	16	18	0.40	0.53	0.21	4.38	15.00	1.03	1.95	45	18	5.99	1.01%	3.34%	0.013	19.25	10.89	0.07	952.70	951.20	-	953.50	951.50	950.00	

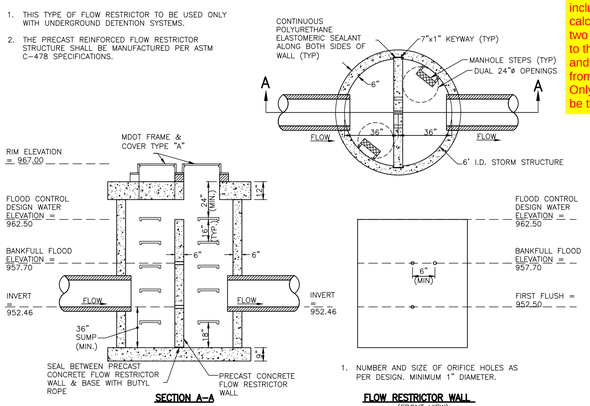
100-YEAR PIPE FLOW CALCULATION FOR OCS

BASIN	2	ALL	2.56	0.81	2.08	6.00	16.57		12.50	8	24	5.02	0.48%	0.40%	0.013	14.35	4.57	0.03	954.15	954.11	-	967.00	952.50	952.47	0.01
2	1	-	-	-	-	-	16.60		12.50	51	24	5.02	0.48%	0.40%	0.013	14.35	4.57	0.19	954.11	953.86	967.00	-	952.46	952.26	

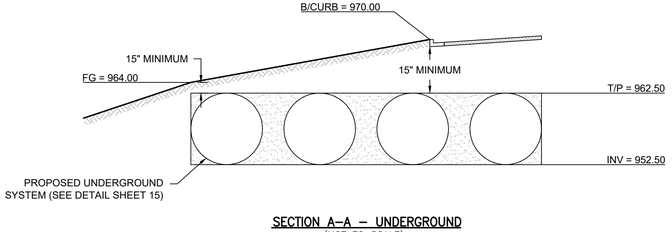
Insufficient pipe capacity based on Q runoff. Part of this may be due to error in designated pipe size.

It appears that Drainage Areas 14 & 18 have been included in the OCS calculation. These two areas do not flow to the detention basin and shall be removed from the calculations. Only 9.08 cfs would be the overflow.

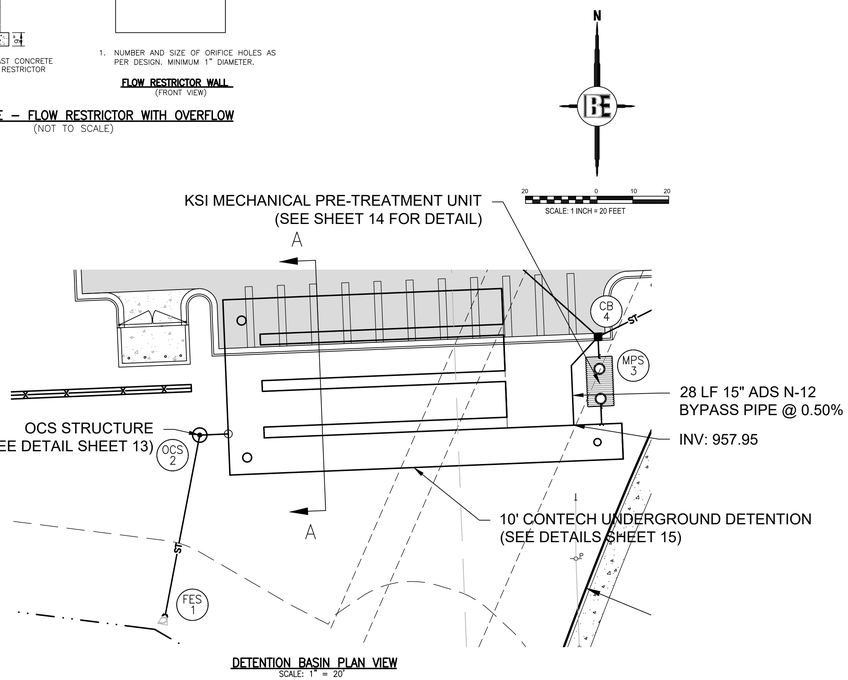
SEE SHEET 2 FOR GENERAL NOTES AND LEGEND



OCS STRUCTURE – FLOW RESTRICTOR WITH OVERFLOW
(NOT TO SCALE)



SECTION A–A – UNDERGROUND
(NOT TO SCALE)



DETENTION BASIN PLAN VIEW
SCALE: 1" = 20'

STRUCTURE TABLE	
STRUCTURE NAME	STRUCTURE DETAILS
BASIN IN	18" INV N = 957.96
BASIN OUT	24" INV W = 952.50
CB 04 DIA. 72", COVER TYPE 'K' SUMP = 2'	RIM = 966.50 18" INV S = 958.08 18" INV NW = 961.08 15" INV NE = 962.08 18" INV SW = 958.09
CB 05 DIA. 48", COVER TYPE 'D' SUMP = 2'	RIM = 971.90 18" INV SE = 962.41 15" INV N = 965.61 15" INV W = 964.41
CB 06 DIA. 48", COVER TYPE 'D' SUMP = 2'	RIM = 972.40 15" INV S = 966.16
CB 07 DIA. 48", COVER TYPE 'E' SUMP = 2'	RIM = 973.00 15" INV E = 964.56
CB 09 DIA. 48", COVER TYPE 'K' SUMP = 2'	RIM = 966.15 15" INV SW = 962.26 15" INV N = 962.26
CB 10 DIA. 48", COVER TYPE 'K' SUMP = 2'	RIM = 967.15 15" INV S = 962.41 15" INV N = 964.01
CB 11 DIA. 48", COVER TYPE 'K' SUMP = 2'	RIM = 971.84 15" INV S = 965.91 12" INV N = 967.14 8" INV NW = 966.41
CB 12 DIA. 48", COVER TYPE 'D' SUMP = 2'	RIM = 972.41 12" INV S = 967.76 12" INV W = 967.76
CB 13 DIA. 48", COVER TYPE 'D' SUMP = 2'	RIM = 972.40 12" INV E = 968.21 4" INV S = 968.75
CB 14 DIA. 48", COVER TYPE 'E' SUMP = 2'	RIM = 966.00 15" INV S = 962.39
FES 01	24" INV N = 952.26
FES 15	15" INV N = 962.00
FES 17	30" INV SE = 948.25
FES 18	18" INV S = 951.50

STRUCTURE TABLE	
STRUCTURE NAME	STRUCTURE DETAILS
FES A	30" INV NW = 946.94
FES B	30" INV N = 948.45
MH 16 DIA. 84", COVER TYPE 'A' SUMP = 2'	RIM = 953.50 30" INV NW = 948.05 18" INV N = 950.00 30" INV SW = 948.05 30" INV SE = 948.03
MH 19 DIA. 60", COVER TYPE 'A' SUMP = 0'	RIM = 953.50 30" INV S = 948.61 30" INV NE = 948.60
MPS 3 IN	18" INV N = 958.06
MPS 3 OUT	18" INV S = 957.99
OCS 2 DIA. 72", COVER TYPE 'A' SUMP = 3'	RIM = 967.00 24" INV E = 952.47 24" INV S = 952.46

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS ARE NOT GUARANTEED TO BE EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES AND STRUCTURES PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND FROM THE PLANS TO THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY
3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
FOR THE MEMBERS OF MICHIGAN

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING

PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI. 48009
248-433-7000

TITLE: DETENTION BASIN DETAILS

NO	BY	REVISION PER	DATE
2	MJD	TOWNSHIP COMMENTS	8/6/24
1	MJD	MDOT COMMENTS	7/9/24

DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: 1" = 20'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 13

BOSS Engineering

Carlisle | Wortman
ASSOCIATES, INC.
117 NORTH FIRST STREET SUITE 70 ANN ARBOR, MI 48104 734.662.2200 734.662.1935 FAX

August 19th, 2024

Revised Final Site Plan / Special Land Use Review for White Lake Charter Township, Michigan

Applicant:	Gateway Crossings LLC
Project Name:	Gateway Crossing
First Revised Plan Date:	August 6th, 2024
Original Plan Date	May 30th, 2024
Location:	Southwest corner of Bogie Lake Road and Highland Road (M-59) Parcel ID: 12-20-402-003 & 12-20-426-003
Action Requested:	Review of revised final site plan and special land use approval (Revision 1)

PROJECT NARRATIVE

The Applicant is requesting final site plan approval for a new 8,620 sqft multi-tenant retail center, which is a permitted use in the GB General Business zoning district. A portion of the development offers drive-thru and outdoor seating facilities for a food establishment. Drive-thru restaurants and outdoor seating areas are special land uses in the GB district and have additional use standards as outlined in Section 4.17 and 4.19.

The site is currently vacant. Special land use approval was granted April 4th, 2024, by the Planning Commission with a recommendation to the Township Board to approve the preliminary site plan. Preliminary site plan approval was granted April 16th, 2024 by the Township Board.

The applicant is currently completing the process of lot consolidation with the Township Assessing Department to accommodate a single parcel for the development to occupy.

The purpose of final site plan review is to determine if the proposed use and site are consistent with Township ordinances and other applicable county, state, and federal laws and regulations and to identify reasonable conditions that may be necessary to mitigate potential negative impacts to surrounding properties and the community.

Preliminary site plans are reviewed by the Planning Commission with recommendations then provided to

Benjamin R. Carlisle, *President* John L. Enos, *Vice President* Douglas J. Lewan, *Principal*
David Scurto, *Principal* Sally M. Elmiger, *Principal* R. Donald Wortman, *Principal* Craig Strong, *Principal*
Paul Montagno, *Principal* Megan Masson-Minock, *Principal* Laura Kreps, *Senior Associate*
Richard K. Carlisle, *Past President/Senior Principal*

the Township Board for approval, approval with conditions or denial. Final site plan review and approval is conducted solely by the Planning Commission.

This review focuses on revised information provided by the Applicant per updated site plan drawings dated August 6th, 2024 as well as a letter provided by Boss Engineering and dated August 8th, 2024. The following report will review whether items to be addressed identified from the planner report dated July 18th, 2024 have been satisfied or are still outstanding. Notes provided are **blue.**

SITE DESCRIPTION

Lot Area:	5.36 acres
Frontage:	Approx. 470 feet along Highland Road (M-59) Approx. 660 feet along Bogie Lake Road
Address:	TBD.
Current Use:	Vacant

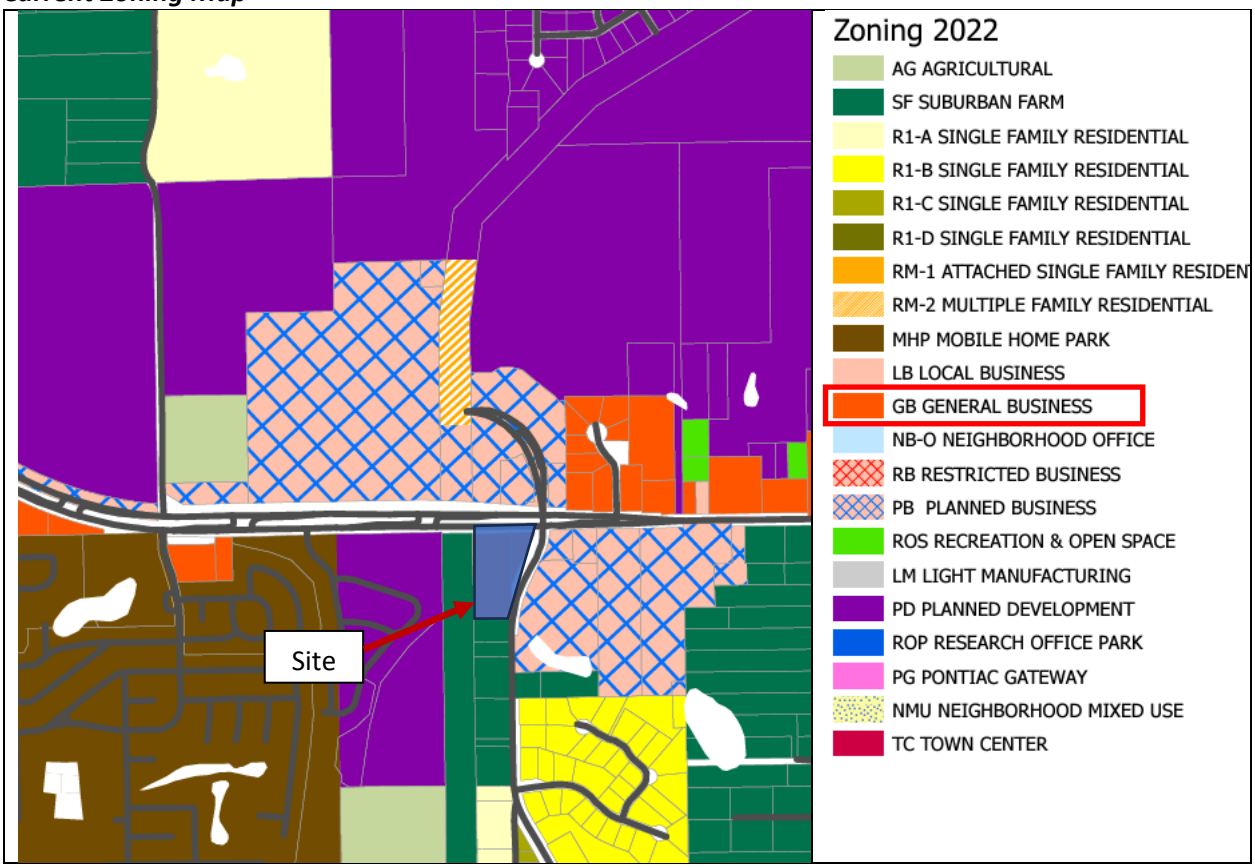
Aerial image of the site

Source: NearMap June 8, 2024

	North	East	South	West
Surrounding Zoning	*PB, Planned Business*	*PB, Planned Business*	*SF, Suburban Farm*	*SF, Suburban Farm*
Surrounding Land Uses	*Vacant*	*Gas Station / Convenient Store*	*Single Family Home*	*ITC Energy Transmission Lines*
Future Land-Use Map	*Commercial Corridor*	*Commercial Corridor*	*Neighborhood Residential*	*Neighborhood Residential*

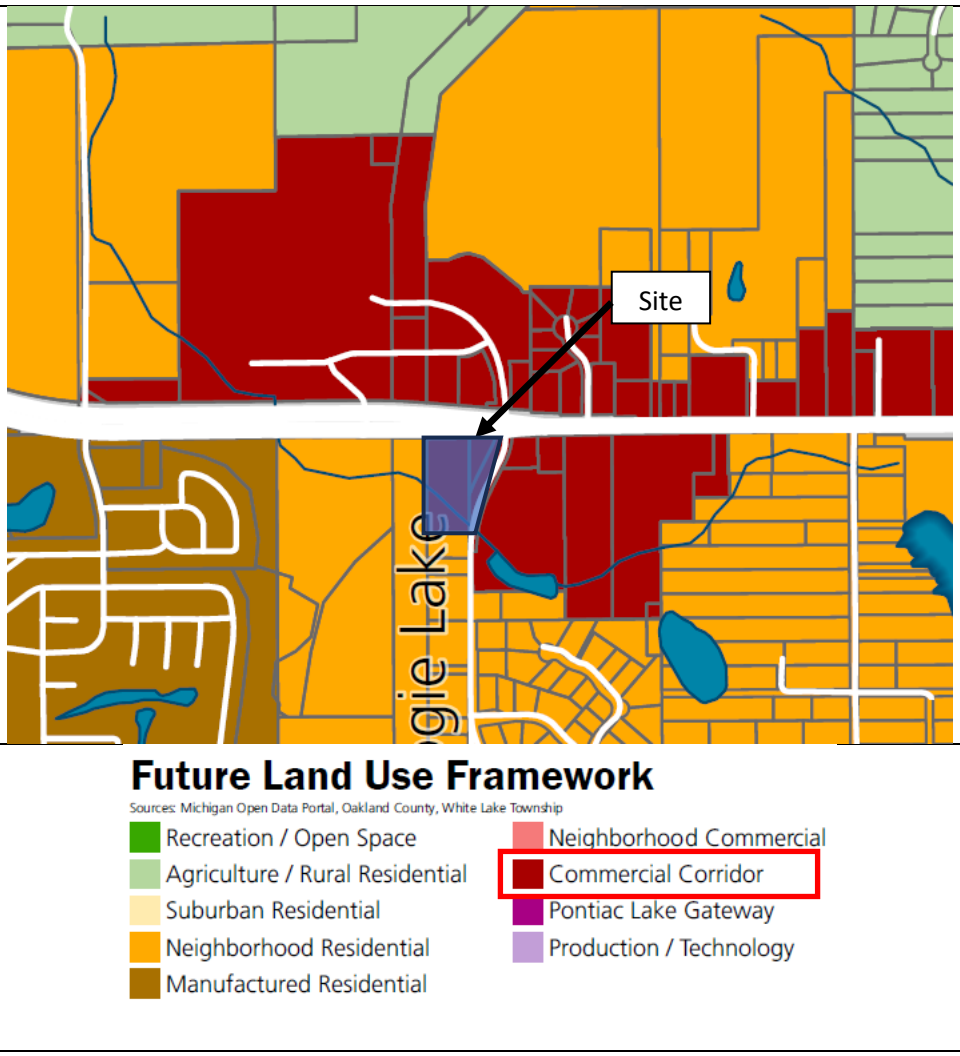
Current Zoning	**GB, General Business** *The General Business District, as established in this article, is intended to permit a wider range of business activities than those permitted in the Local Business and Restricted Business districts. The specific intent of this article is to allow those uses which would not only serve nearby residential areas, but also the entire community's comparison business, offices, services and automotive service needs, including open-air sales and uses requiring location on a major highway or street. These uses would generate larger volumes of vehicular traffic, would need more off-street parking and loading, and would require more detailed planning to provide an appropriate transition between such districts and adjacent residential areas.*

Current Zoning Map



Future Land Use	**Commercial Corridor** *Provides regional goods and services to residents and non-residents. Includes large box stores and drive-thrus.*

Future Land Use Map



Items to be Addressed: *1.) The address (six-inch-tall numbers visible from the street) locations shall be shown on building elevations on Sheet PP-8.1.* Outstanding. Response letter dated August 8, 2024 states address information added to architectural sheets however sheets are not included in revised final site plan.

NATURAL RESOURCES

Topography: Sheet 3 shows existing site topography. The area is relatively flat along the northeast and central portions of the site. A steep slope runs downwards from east to west along the western portion of the site. We note Planner review comments dated March 28th, 2024 indicate concerns with grading within the wetland setback. The review notes the Applicant has acknowledged these concerns and the requirements should the Applicant proceed with grading within the setback. We note later in this review the removal of the boardwalk over the wetland in exchange for a sidewalk adjacent to Bogie Lake Road. It should be clarified if this proposed modification is a result of the Applicant opting to minimize grading work within the wetland setback.

Wetlands: Multiple sheets indicate wetlands located in the south-central portion of the site and traversing the western lot line. Wetland setbacks are shown on Sheet 4. No improvements are proposed within the wetland setback. A wall is proposed to run alongside the sloped area leading down to the wetlands. It should be noted that the wall appears to align with the 25-foot wetland setback however it may not encroach it. Specifications for the proposed wall are shown on Sheet 16. We defer to Engineering to assess the design and placement of the proposed wall.

Sheet 7 provides drainage information for the site. Several references are made to stormwater drainage discharging into the wetland. We also note in the Planner review dated March 28th, 2024 indicates a wetland delineation report is required and has been submitted.

Woodland: Mature woodlands border the wetlands located in the southern portion of the site.

Soils: Sandy Loam, Muck and Udipsamment soils are predominant on the site.

Water: The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map indicates no floodplain is present on the site. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) Wetland Map indicates wetlands on and adjacent to the site.

Items to be Addressed: *Any cited concerns from Township Engineering.* These items appear to be addressed however we defer to Township Engineering.

AREA, WIDTH, HEIGHT, SETBACKS

Proposed building envelopes and setback standards are shown on Sheet 4. Measurements are taken from the property lines.

GB General Business District Developmental Standards

	Required:	Proposed:	Complies
Setbacks			
Front	50 feet	88.1 (Highland Road) 50 (Bogie Lake Road)	Yes
Side	15 feet / 30 feet total	245.2 feet (west)	Yes
Rear	20 feet	487.6 feet	Yes
Building Height			
	35 feet	23 feet	Yes
	2 stories	1 story	Yes

Items to be Addressed: *None.*

ACCESS & CIRCULATION

Site access management standards are outlined in Section 6.4. The site is accessed via an ingress/egress drive off Highland Road (M-59). A secondary ingress/egress drive is located along Bogie Lake Road.

The Applicant Planner review response dated March 28th, 2024 notes the minimum distance between a proposed driveway and the nearest intersection shall not be less than 455 feet when the speed limit is greater than or equal to 50 miles per hour (mph). Along the Highland Road (M-59) frontage the speed limit is 55 mph. The proposed distance of the Highland Road (M-59) driveway to the Bogie Lake Road intersection is 300 feet. Therefore, a 155-foot variance is required from the Zoning Board of Appeals. On May 23rd, 2024, the Zoning Board of Appeals granted this variance.

Sheet 4 outlines maneuvering capabilities for fire trucks. We defer to Township Engineering to assess the conformance of lot design and Public Safety to assess the conformance of maneuverability and accessibility for the site.

Items to be Addressed*: 1.) Any cited concerns from Township Engineering for items related to site traffic design.* These items appear to be addressed however we defer to Township Engineering. *2.) Any cited concerns from Township Public Safety for items related to access and maneuverability.* These items appear to be addressed however we defer to Township Engineering.

PARKING & LOADING

Section 5.11 outlines requirements for off-street parking. For drive-thru restaurants, the zoning ordinance requires one (1) space per 75 square feet of gross floor area. For general retailers, the requirement is one (1) space per 200 square feet of gross floor area. The parking calculations within the Site Data Table on Sheet 4 indicate seventy-seven (77) parking spaces and eight (8) stacking spaces are required. Fifty-six (56) general parking spaces plus three (3) barrier-free accessible parking spaces are provided. Sixteen (16) stacking spaces are proposed. A variance to allow this deviation was granted on May 23rd, 2024 by the Zoning Board of Appeals.

In the Planner review memo dated March 28th, 2024, Township planners indicate concerns with the parking layout, specifically the designs of the eastern and western parking areas. We note the layout of the northeastern portion of the layout has been modified to reduce conflicts between parked vehicles and ones exiting the drive-thru lane.

The site requires one loading zone area. Sheet 4 shows the proposed location of the loading zone being adjacent to the stacking area on the west side of the building.

***Items to be Addressed**: None*

ESSENTIAL SERVICES & UTILITIES

The following Sheets provide various utility information proposed for the site:

- Sheet 2 / General Utility Notes
- Sheet 5 / Utility Plan
- Sheet 7 / Drainage Plan
- Sheet 10 / Storm Profiles
- Sheet 11 / Sanitary Profiles
- Sheet 12 / Watermain Profiles
- Sheet 13 / Detention Basin Details
- Sheet 14 / Contech Underground Details
- Sheet 17 / Township Storm Details
- Sheet 18 / Township Sanitary Details
- Sheet 19 / Township Watermain Details

Sanitary sewer, water main and storm sewer standard detail specifications are provided in the final site plan application. Sheet 5 provides the location of water main and sanitary sewer connections to public utilities as well as the location and route of underground stormwater systems. We defer to Township Engineer to assess the design and capacity of the proposed utility system.

We do note the proposed location for the grease trap has changed from preliminary site plans to the final site plan submitted. We defer to Township Engineer if the new location conflicts with any utility design standards.

Final site plan reviews require applicants to identify the location of all underground and aboveground storage tanks for such uses as fuel storage, waste, old holding tanks, collection of contaminated stormwater, and similar uses. We do not anticipate the storage of hazardous or contaminated materials onsite.

Items to be Addressed: *1.) Any cited concerns of Township Engineering.* These items appear to be addressed however we defer to Township Engineering.

LANDSCAPING & SCREENING

Landscaping and screening details are provided on Sheets 9. Planting requirements and provided counts are notated on Sheet 9. Section 5.19.B outlines general provisions for site landscaping. Those standards are reviewed below:

Part ii: All areas are proposed to be covered with grass or natural ground cover.

Part iii: No irrigation plans or notes were provided. This information should be included on Sheet 9 and conform to the requirements regarding coverage and rain sensing technology.

Part v: Sheet 16 indicates curb sizes ranging from one point five (1.5) to two (2) feet.

Part vii: A note on Sheet 9 states no trees shall be planted closer than four (4) feet to any property line.

Part ix: No large deciduous trees are proposed within public water, sewer, or storm drainage easements.

Section 5.19.D provides requirements for screening along property lines as it relates to adjacent districts. Those standards are reviewed below:

Greenbelts

Property Line	Required	Provided	Complaint
North	Depth: 20 feet 16 large deciduous or evergreen trees AND 128 shrubs	Depth: 20 feet 16 large deciduous trees AND 128 shrubs	Yes
East	Depth: 20 feet 21 large deciduous or evergreen trees AND 168 shrubs	Depth: 20 feet 13 large deciduous trees AND 104 shrubs	No / See Waiver Request #1

South	Depth: 20 feet 1 large deciduous, 1 evergreen tree and 8 shrubs for every 30 linear feet OR 1 large deciduous or evergreen tree and 4 shrubs for every 15 linear feet AND 5 foot greenbelt adjacent to screen wall for its entire length OR Obscuring fence	Propose retaining existing vegetation	No / See Waiver Request #2
West	Depth: 20 feet 1 large deciduous, 1 evergreen tree and 8 shrubs for every 30 linear feet OR 1 large deciduous or evergreen tree and 4 shrubs for every 15 linear feet AND 5 foot greenbelt adjacent to screen wall for its entire length OR Obscuring fence	Propose retaining existing vegetation	No / See Waiver Request #2

Interior Landscaping

Interior landscaping areas are required to equal at least fifteen (15) percent of the total lot area. One (1) large deciduous, small ornamental deciduous, or evergreen tree and five (5) shrubs shall be planted for every three hundred (300) square feet of required interior landscaping area.

Standard	Required	Provided	Complaint
Lot Area	32,428 sqft (15%)	Existing woodlands and wetlands.	No / See Waiver Request #3

Deciduous Trees	108 trees	Existing woodlands	No / See Waiver Request #3
Shrubs	540 shrubs	Existing woodlands	No / See Waiver Request #3

Waivers

Per Section 5.19.B.iii and v, the Planning Commission may waive or modify certain landscaping requirements. Those parts are cited below for reference.

Part.B.iii

The Planning Commission may permit the reduction of required landscaping when, based on review of a landscape plan and other relevant information, the proposed development includes the preservation of existing trees and vegetation sufficient to provide the required screening. The Planning Commission may also permit the reduction of required landscaping in order to maintain views of lakes, wetlands, and other natural features which the Planning Commission seeks to preserve. The Planning Commission may require an increase in required landscaping where such an increase is deemed necessary by the Commission to accomplish the spirit and intent of the ordinance.

Part.B.v

The Planning Commission may modify the screening requirements where, in unusual circumstances, no good purpose would be served by compliance with the requirements.

The landscaping waivers requested by the applicant are outlined below. We offer additional information for the Planning Commission to consider when assessing whether to enforce, waive or modify these requirements.

Waiver Request # 1. To only consider approximately 400 feet of Bogie Lake Road frontage for landscape screening requirements.

CWA Comment: The Applicant states that due to utility easements, designated wetlands and boardwalk encroachments, it is not feasible to institute the buffer / screen along the southern portion of the lot along Bogie Lake Road. We note no development is being proposed along the southern portion of the lot and therefore there are no improvements requiring screening from view. Response letter dated August 8, 2024 states waiver 1 is not needed due to the southern portion of the lot along Bogie Lake Road is not buildable. We note the 25 foot wetland setback does align or crossover the property line along the lower southern end of the lot however there are still portions south of the access drive and before the wetland setback that could be accommodate a buffer. Waiver is still needed.

Waiver Request #2: Waive the requirement for landscape screening along the west and south property in turn for the retention of existing vegetation and natural features.

CWA Comment: The Applicant states there is sufficient existing vegetation along the south and west lot lines to fulfill the intent of a landscape buffer / screen. An image below shows an aerial of the site as of June 8th, 2024.

The site to the west is utilized as high-tension power lines and unlikely to be developed. The site to the south is single family residential. The home is approximately 500 feet from the improvement area and the clearing of mature vegetation would be required to meet new planting standards.

Existing conditions provide natural screening from adjacent uses. We do note that no new landscaping is proposed in the rear yard between the wetland setback and retaining wall / snow storage area. The distance between these two areas is approximately 30 feet and could support a small count of deciduous or evergreen trees to provide some screening from northbound Bogie Lake Road traffic or potential development of the vacant lot to the southeast.

Waiver Request # 3. To waive interior landscaping requirements due to a large portion of the site retaining its natural state of wetlands and mature vegetation.

CWA Comment: The Applicant states that approximately 100,300 sqft (46.4%) of the site will remain open space with existing wetlands and 40-55 mature trees. Sheet 9 does not indicate any landscaping being proposed near building entrances or foundations. Pedestrian pathways on, and adjacent to, the site are adequately lined with shrub and tree varieties. Only seeded lawn is proposed in the western central portion of the site between the parking lot and retaining wall.

Parking Lot Landscaping

Any off-street parking areas containing ten (10) or more parking spaces shall have parking lot landscaping as prescribed in the table provided in Section 5.19.G. Additional standards require:

1. *One (1) large deciduous tree or small deciduous ornamental tree and three (3) shrubs for every one-hundred (100) square feet of required parking lot landscaping area.*

2. *Parking lot landscaping areas shall be curbed with 6 inch concrete curbing. Planting islands containing trees shall not be less than fifty (50) square feet in area and not have any dimension across the island of less than five (5) feet.*

The applicant requested, and was granted, a variance reducing the number of required parking spaces on May 23rd, 2024. Fifty-nine (59) spaces and sixteen (16) stacking spaces have been approved.

Commercial Use	Required	Provided	Complaint
Lot Area	1,180 sqft	2,810 sqft	Yes
Deciduous or Ornamental Trees	12 trees	12 trees	Yes
Shrubs	36 shrubs	36 shrubs	Yes
Curbs	6 inch concrete	1’6” to 2’	Yes
Lot Islands	50 sqft area minimum and at least 5 feet wide	One (1) Island	Yes

Minimum Plant Size

Large deciduous trees and shrubs throughout the site meet the caliper and height/spread requirements outlined in the Section.

Trash Receptacles

All requirements for trash receptacles have been satisfied.

Mechanical Equipment Screening

No exterior or rooftop mechanical equipment is shown on the site plan. We note the roof line of the building is six (6) feet lower than the facades indicating rooftop equipment will be screen by the six (6) foot difference.

Pathways

Pathway and sidewalk standards are required for preliminary site plan review. Sheet 4 of the preliminary site plan, dated February 28, 2024, provides a note and illustrates a boardwalk over the wetlands along the southeastern portion of the site. The Sheet 4 of the final site plan submitted proposes a modification converting the pathway to a six (6) foot wide sidewalk. The sidewalk traverses along dryland and terminates at the southern property line. We note a portion of the sidewalk is strictly on the applicant's property. A note on Sheet 4 indicates a variable width sidewalk easement. The response letter dated August 8, 2024 notes necessary easements will be created upon approval of location.

This modification will require review and approval by the Planning Commission. All other portions of the sidewalks and pathways remain unchanged.

Snow Storage

Snow storage areas are shown on Sheet 9 and are located along the southern and western parking lot spaces. We note the storage area to the south is located over an area with slopes leading to the wetland area. We defer to the Township Engineer as it relates to any concerns with runoff from snow melt into the wetland.

Items to be Addressed: *1.) Waive the requirement for landscape screening along the west and south property in turn for the retention of existing vegetation and natural features.* Comment remains as a notation. *2.) Waiver to allow for the landscape screening requirement along Bogie Lake Road to be 400 feet of frontage from the intersection with Highland Road (M-59), south.* Comment remains as a notation. *3.) Waive requirement for interior landscaping per existing conditions.* Comment remains as a notation. *4.) Determination of the sidewalk along the southeastern portion of the lot, in-lieu of the originally proposed boardwalk along with the addition of necessary easements dedicating use to the public for portions not within the right-of-way.* Comment remains as a notation.

LIGHTING & NOISE

Lighting Requirements

Sheet 24-29986_V1 provides proposed pole and building mounted lighting fixture locations as well as a photometric layout for the site. Specification sheets for both building and pole mounted lighting were provided. Below is a review of lighting information provided as it relates to the requirements outlined in Section 5.18.G of the zoning ordinance.

i. The Planning Commission or Building Official shall determine if the proposed light levels meet the minimum necessary to provide safe and secure illumination. We note exterior lighting footcandle ranges only exceed a portion of the northern and eastern property lines however the max footcandles shown in these areas is 0.3 which below the max allowable at a property line of 1 footcandle along non-residential properties. No light is shown to encroach the residential property to the south.

ii. The specification information for pole and building mounted light fixtures are provided.

iii. Light poles located along Highland Road (M-59) and Bogie Lake Road appear to be less than five (5) feet from property lines. The distance from the light poles along the northern and eastern portion of the site to the adjacent property lines should be shown on Sheet 24-29986_V1. All light poles are directed away from neighboring sites.

iv. Given the containment of footcandles along site property lines, glare does not appear to be an issue.

v. Specification sheets provided for proposed fixtures indicate LED lighting which meets the intent of utilizing high efficiency lighting.

vi. A note should be added to Sheet 24-29986_V1 indicating that all site lighting will be stationary and will not flicker, flash or oscillate. The response letter dated August 8, 2024 indicates a note has been added to the "General Notes" note 4 providing this statement however no note exists on Sheet 2 and a revised photometric plan was not provided.

vii. Sheet 4 shows the distance between light poles and Highland Road (M-59) and Bogie Lake Road. The response letter dated August 8, 2024 states these fixtures will be mounted 16 feet high however this note should be added to Sheet 4.

viii. A lighting statistics table is provided on the photometric plan. The only specific areas analyzed are the parking lot and property lines. However average footcandle measurements are required for the general site, driveway, parking, walks, building and loading area. We do note the maximum footcandle averages for the parking area and general site are not exceeded. Driveway, walks, building and loading area calculations should be provided. Response letter dated August 8, 2024 states area footcandle calculation information has been added to the lighting plan however sheets are not included in revised final site plan.

ix. No flood lighting is proposed.

x. A proposed monument sign is shown on Sheet 4 and Sheet 24-29986_V1 however no specific lighting is proposed for the sign.

Noise Requirements

Final site plan requires details regarding location of loudspeakers and purpose for public address sound systems be submitted for Township review and approval. No specifications were provided on the drive-thru speaker system and sound decibels it is proposed to create. This information should be submitted to the Township for review and approval prior to operation. Noise level regulations are outlined in Section 5.18.A.

Items to be Addressed: *1.) Planning Commission consideration of allowing current footcandle lighting levels per onsite safety.* Comment remains as a notation. *2.) A note should be added to Sheet 24-29986_V1 indicating that all site lighting will be stationary and will not flicker, flash or oscillate.* Outstanding *3.) The distance between the proposed light poles along Highland Road (M-59) and Bogie Lake Road and the adjacent property lines should be added to Sheet 24-29986_V1 and conform to the maximum height*

requirements outlined in Section 5.18.G.vii. Outstanding, light fixture mounting height should be added to Sheet 4 *4.) Driveway, walks, building and loading area footcandle average calculations should be provided on Sheet 24-29986_V1.* Outstanding. *6.) Drive-thru speaker specifications should be provided to the Township for review and approval prior to operation.* Comment remains as a notation.

SIGNAGE

Proposed monument signage is shown on Sheet 4 near the Highland Road (M-59) ingress/egress drive. Details of the sign are shown on Sheet PP-8. Signs are reviewed and permitted administratively by the Township however applications may be presented to the Planning Commission for review. The monument proposed monument signage meets dimensional and location zoning standards.

Sheet 4 shows proposed signage and pavement marking locations. Sheet 16 provides general details and dimensions of site signage including "ONE WAY DO NOT ENTER", "NO PARKING FIRE LANE" and VAN ACCESSIBLE" ADA parking signage.

Items to be Addressed: *Applications for site signage will need to conform to the requirements in Section 5.9.*

ARCHITECTURE & LAYOUT

Architectural information required at final site plan review includes the types of facing materials to be used on structures. Sheet PP-8.1 indicates all elevations will be faced with primarily dark, medium and light brown brick veneer with EFIS being used along rooflines. We note that no material was included in the final stie plan. These materials will need to be available for the Planning Commission upon final site plan review.

Per Section 6.8.E, window coverage standards have been met for the north façade along Highland Road (M-59). In the preliminary site plan dated February 28th, 2024, the east facade along Bogie Lake Road showed window coverage of 9.27%. 30% is required for all front facades. Revised elevations on the final site plan shown Sheet PP-8.1 show east façade window coverage of 30.19%. We note that the majority of the windows specified for the east frontage is spandrel glass.

The Planner response memo dated March 28th, 2024 cites additional information needed for the proposed exterior patio located in the northeast corner of the building. The memo states the requirement that details for the items to be located on the patios and details for the patios' surfacing shall be provided at final site plan. These materials will be required to present to the Planning Commission for final site plan consideration. We note no additional information on the patio was provided between preliminary and final site plan applications.

Items to be Addressed: *1.) Exterior construction material board will be required for Planning Commission review.* Comment remains as a notation. *2.) Samples of items to be located on proposed patio as well as patio surfacing materials will be required for Planning Commission review.* Comment remains as a notation.

SPECIAL LAND USE / SPECIFIC USE STANDARDS

Section 6.10 provides general standards for special land uses. Citing any concerns provided by Township Engineering and/or Public Safety, we note no conflicts with the general special land use standards.

Section 4.17 provides for additional standards applicable to drive-in or drive-thru window service establishments. Upon review of these standards, we find the following items in need of addressing:

Part A: A front yard setback of at least sixty (60) feet shall be required.

CWA Comment: A note on Sheet 4 indicates the drive thru window is more than sixty (60) feet from the Bogie Lake Road lot line. However, the building is fifty (50) feet from the side lot line. The applicant is requesting an interpretation through the Zoning Board of Appeals to allow the current setup to qualify for this requirement.

Part B: Entrance and exit drives shall be at least one hundred (100) feet from any street intersection and two hundred (200) feet from any residential district.

CWA Comment: We note the Highland Road driveway is not two-hundred (200) feet from the residential zoning district to the west however, this district is currently utilized by ITC for electrical transmission and therefore unlikely to be developed as residential. A variance is required to accommodate this proposed design. On May 23rd, 2024, the Zoning Board of Appeals granted this variance.

Part C: Outdoor lights must meet the performance standards of Section 5.18.

CWA Comment: See comments in the Lighting and Noise section of this review.

Part D: An obscuring fence, screen wall, or land form buffer shall be provided in accordance with the provisions of Section 5.19 on all sides abutting a residential district.

CWA Comment: See comments in the Landscaping section of this review.

Part E: Adequate off-street waiting space shall be provided to prevent drive-through customers from waiting on a public or private street.

CWA Comment: We note adequate stacking space has been provided to ensure vehicles do not encroach upon public or private streets.

Section 4.18 provides for additional standards applicable to eating establishments with outdoor seating establishments. Upon review of these standards, and the exceptions of the lighting and noise comments in the Lighting and Noise section of this review, we note no conflicts with the specific special land use standards.

Items to be Addressed: *Waive the requirement for landscape screening along the west and south property in turn for the retention of existing vegetation and natural features.* Comment remains as a notation.

VARIANCES

All of the following variances were granted on May 23rd, 2024 to allow for the proposed final site plan to valid.

1. *Variance granted from the Zoning Board of Appeals to allow the relocation of the Highland Road (M-59) access drive as it relates to proximity to a residential district and the intersection of Highland Road (M-59) and Bogie Lake Road.*
2. *Variance granted from the Zoning Board of Appeals for a reduction in parking requirements.*
3. *Variance granted from the Zoning Board of Appeals for the drive-thru setback requirements.*

SUMMARY

With the exception of sample material requirements, we note several items requiring additional information are minor in nature and can be approved administratively. We recommend the application be presented to the Planning Commission for final site plan consideration.

As noted above, the Applicant will be required to provide sample materials for the exterior construction of the building as well as patio paver/concrete and patio material samples for the Planning Commission consideration.

The Planning Commission will need to address the waivers and determinations listed below at final site plan review.

Waivers / Modifications / Determinations

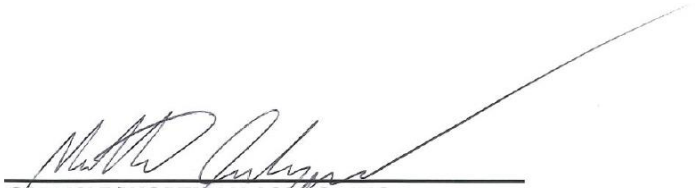
1. *Waive the requirement for landscape screening along the west and south property in turn for the retention of existing vegetation and natural features.*
2. *Allow for the landscape screening requirement along Bogie Lake Road to be 400 feet of frontage from the intersection with Highland Road (M-59), south.*
3. *Waive requirement for interior landscaping per existing conditions.*
4. *Determination of the sidewalk along the southeastern portion of the lot, in-lieu of the originally proposed boardwalk along with the addition of necessary easements dedicating use to the public for portions not within the right-of-way.*
5. *Planning Commission consideration of allowing current footcandle lighting levels per onsite safety.*

Conditions to Approval

1. *Any cited concerns from Township Engineering are addressed.*
2. *Any cited concerns from Township Public Safety are addressed.*
3. *The address (six-inch-tall numbers visible from the street) locations shall be shown on building elevations on Sheet PP-8.1.*
4. *A note should be added to Sheet 24-29986_V1 indicating that all site lighting will be stationary and will not flicker, flash or oscillate.*
5. *Light fixture mounting height should be added to Sheet 4.*
6. *Driveway, walks, building and loading area footcandle average calculations should be provided on Sheet 24-29986_V1.*

7. *Drive-thru speaker specifications should be provided to the Township for review and approval prior to operation.*
8. *Exterior construction material board will be required for Planning Commission review.*
9. *Samples of items to be located on proposed patio as well as patio surfacing materials will be required for Planning Commission review.*

Respectfully,



CARLISLE/WORTMAN ASSOC., INC.
Matteo Passalacqua
Community Planner

Site / Construction Plan Review

To: Sean O'Neil, Planning Department Director

Date: 08/22/2024

Project: Gateway Crossing

Job #: 22-029-1

Date on Plans: 08/06/2024

The Fire Department has the following comments with regards to the Final site plans for the project known as Gateway Crossing

The Fire Department has no further comments at this time.

Jason Hanifen
Fire Marshal
Charter Township of White Lake
(248)698-3993
jhanifen@whitelaketwp.com

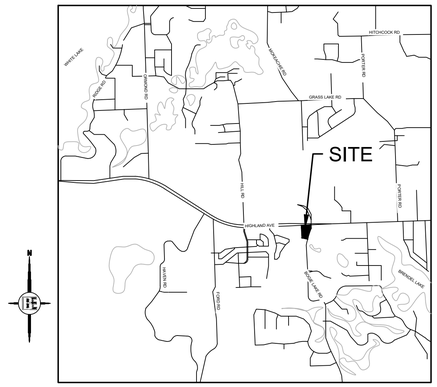
Plans are reviewed using the International Fire Code (IFC), 2015 Edition and Referenced NFPA Standards.

FINAL SITE & ENGINEERING PLAN
FOR
GATEWAY CROSSING
PART OF NORTHEAST QUARTER OF SOUTHEAST QUARTER, SECTION 20
WHITE LAKE TOWNSHIP, OAKLAND COUNTY, MICHIGAN

PROPERTY DESCRIPTION:

DESCRIPTION OF COMBINED PARCEL, AS SURVEYED BY KIEFT ENGINEERING, INC., JOB NO. KE 2012.247, DATED 1-30-13, AS SHOWN ON SURVEY BY ALPINE ENGINEERING, INC., JOB NO. 15-113, DATED 2-10-15:

PART OF THE NORTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 20, T3N-R8E, WHITE LAKE TOWNSHIP, OAKLAND COUNTY, MICHIGAN, DESCRIBED AS BEGINNING AT A POINT ON THE SOUTH RIGHT-OF-WAY LINE OF HIGHLAND ROAD (M-59, 70 FOOT HALF WIDTH) LOCATED S88°58'48"E 1032.50 FEET AND S01°25'12"W 70.00 FEET FROM THE CENTER OF SECTION 20, T3N-R8E; THENCE S88°58'48"E 480.35 FEET TO A POINT ON THE WESTERLY RIGHT-OF-WAY LINE OF BOGIE LAKE ROAD; THENCE ALONG SAID WESTERLY RIGHT-OF-WAY LINE ON A CURVE TO THE RIGHT 119.37 FEET, SAID CURVE HAVING A RADIUS OF 356.47 FEET, A DELTA OF 19°11'09" AND A LONG CHORD OF S18°14'12"W 118.81 FEET; THENCE S27°49'46"W 242.55 FEET; THENCE ALONG ON A CURVE TO THE LEFT 127.93 FEET, SAID CURVE HAVING A RADIUS OF 1060.72 FEET, A DELTA OF 06°54'37" AND A LONG CHORD OF S23°39'55"W 127.85 FEET; S01°58'42"W 203.96 FEET; THENCE N88°58'48"W 287.70 FEET; THENCE N01°25'12"E 652.00 FEET TO THE POINT OF BEGINNING. SUBJECT TO THE RIGHTS OF THE PUBLIC IN BOGIE LAKE ROAD. CONTAINING 5.36 ACRES.



LOCATION MAP
NO SCALE

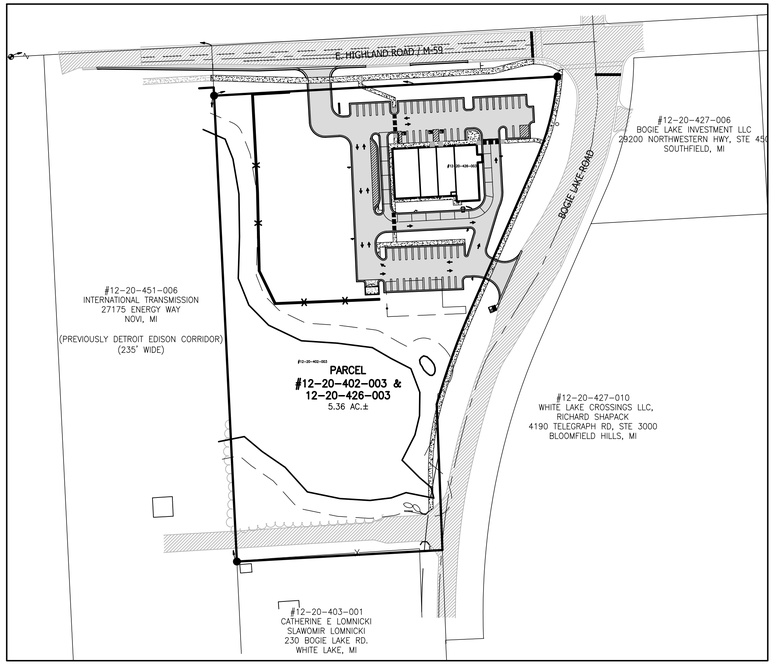
CONSTRUCTION NOTES

THE CONTRACTOR SHALL COMPLY WITH THE FOLLOWING NOTES AND ANY WORK INVOLVED SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.

1. THE CONTRACTOR SHALL HOLD HARMLESS THE DESIGN PROFESSIONAL, MUNICIPALITY, COUNTY, STATE AND ALL OF ITS SUB CONSULTANTS, PUBLIC AND PRIVATE UTILITY COMPANIES, AND LANDOWNERS FOR DAMAGES TO INDIVIDUALS AND PROPERTY, REAL OR OTHERWISE, DUE TO THE OPERATIONS OF THE CONTRACTOR AND/OR THEIR SUBCONTRACTORS.
2. A GRADING PERMIT FOR SOIL EROSION-SEDIMENTATION CONTROL SHALL BE OBTAINED FROM THE GOVERNING AGENCY PRIOR TO THE START OF CONSTRUCTION.
3. IF DUST PROBLEM OCCURS DURING CONSTRUCTION, CONTROL WILL BE PROVIDED BY AN APPLICATION OF WATER, EITHER BY SPRINKLER OR TANK TRUCK.
4. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH LOCAL MUNICIPAL STANDARDS AND SPECIFICATIONS.
5. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL REQUIRED TOWNSHIP, COUNTY, AND STATE OF MICHIGAN PERMITS.
6. PAVED SURFACES, WALKWAYS, SIGNS, LIGHTING AND OTHER STRUCTURES SHALL BE MAINTAINED IN A SAFE, ATTRACTIVE CONDITION AS ORIGINALLY DESIGNED AND CONSTRUCTED.
7. ALL BARRIER-FREE FEATURES SHALL BE CONSTRUCTED TO MEET ALL LOCAL, STATE AND A.D.A. REQUIREMENTS.
8. ANY DISCREPANCY IN THIS PLAN AND ACTUAL FIELD CONDITIONS SHALL BE REPORTED TO THE DESIGN ENGINEER PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL SETBACKS, EASEMENTS AND DIMENSIONS SHOWN HEREON BEFORE BEGINNING CONSTRUCTION.
9. THE CONTRACTOR SHALL CONTACT ALL OWNERS OF EASEMENTS, UTILITIES AND RIGHTS-OF-WAY, PUBLIC OR PRIVATE, PRIOR TO THE START OF CONSTRUCTION.
10. THE CONTRACTOR SHALL COORDINATE WITH ALL OWNERS TO DETERMINE THE LOCATION OF EXISTING LANDSCAPING, IRRIGATION LINES & PRIVATE UTILITY LINES. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO EXISTING LANDSCAPING, IRRIGATION LINES, AND PRIVATE UTILITY LINES.
11. THE CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE UPON COMPLETION OF THE PROJECT.
12. THE CONTRACTOR SHALL MAINTAIN THE SITE IN A MANNER SO THAT WORKMEN AND PUBLIC SHALL BE PROTECTED FROM INJURY, AND ADJOINING PROPERTY PROTECTED FROM DAMAGE.
13. THE CONTRACTOR SHALL KEEP THE AREA OUTSIDE THE "CONSTRUCTION LIMITS" BROOM CLEAN AT ALL TIMES.
14. THE CONTRACTOR SHALL CALL MISS DIG A MINIMUM OF 72 HOURS PRIOR TO THE START OF CONSTRUCTION.
15. ALL EXCAVATION UNDER OR WITHIN 3 FEET OF PUBLIC PAVEMENT, EXISTING OR PROPOSED SHALL BE BACKFILLED AND COMPACTED WITH SAND (MDOT CLASS II).
16. ALL PAVEMENT REPLACEMENT AND OTHER WORKS COVERED BY THESE PLANS SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF THE TOWNSHIP, INCLUDING THE LATEST MICHIGAN DEPARTMENT OF TRANSPORTATION (MDOT) SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.
17. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO EXISTING UTILITIES.
18. NO ADDITIONAL COMPENSATION WILL BE PAID TO THE CONTRACTOR FOR ANY DELAY OR INCONVENIENCE DUE TO THE MATERIAL SHORTAGES OR RESPONSIBLE DELAYS DUE TO THE OPERATIONS OF SUCH OTHER PARTIES DOING WORK INDICATED OR SHOWN ON THE PLANS OR IN THE SPECIFICATION OR FOR ANY REASONABLE DELAYS IN CONSTRUCTION DUE TO THE ENCOUNTERING OR EXISTING UTILITIES THAT MAY OR MAY NOT BE SHOWN ON THE PLANS.
19. DURING THE CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL NOT PERFORM WORK BY PRIVATE AGREEMENT WITH PROPERTY OWNERS ADJACENT TO THE PROJECT.
20. IF WORK EXTENDS BEYOND NOVEMBER 15, NO COMPENSATION WILL BE DUE TO THE CONTRACTOR FOR ANY WINTER PROTECTION MEASURES THAT MAY BE REQUIRED BY THE ENGINEER.
21. NO TREES ARE TO BE REMOVED UNTIL MARKED IN THE FIELD BY THE ENGINEER.
22. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE PROPERTY BEYOND THE CONSTRUCTION LIMITS INCLUDING BUT NOT LIMITED TO EXISTING FENCE, LAWN, TREES AND SHRUBBERY.
23. ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE NORMAL CONSTRUCTION LIMITS OF THE PROJECT SHALL BE SODDED OR SEEDED AS SPECIFIED OR DIRECTED BY THE ENGINEER.
24. ALL ROOTS, STUMPS AND OTHER OBJECTIONABLE MATERIALS SHALL BE REMOVED AND THE HOLE BACKFILLED WITH SUITABLE MATERIAL. WHERE GRADE CORRECTION IS REQUIRED, THE SUBGRADE SHALL BE CUT TO CONFORM TO THE CROSS-SECTION AS SHOWN IN THE PLANS.
25. TRAFFIC SHALL BE MAINTAINED DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL SIGNS AND TRAFFIC CONTROL DEVICES. FLAG PERSONS SHALL BE PROVIDED BY THE CONTRACTOR IF DETERMINED NECESSARY BY THE ENGINEER. ALL SIGNS SHALL CONFORM TO THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES AT NO COST TO THE TOWNSHIP. NO WORK SHALL BE DONE UNLESS THE APPROPRIATE TRAFFIC CONTROL DEVICES ARE IN PLACE.
26. ALL DEMOLISHED MATERIALS AND SOIL SPOILS SHALL BE REMOVED FROM THE SITE AT NO ADDITIONAL COST, AND DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
27. AFTER REMOVAL OF TOPSOIL, THE SUBGRADE SHALL BE COMPACTED TO 95% OF ITS UNIT WEIGHT.
28. ALL GRADING IN THE PLANS SHALL BE DONE AS PART OF THIS CONTRACT. ALL DELETERIOUS MATERIAL SHALL BE REMOVED FROM THE SUBGRADE PRIOR TO COMPACTING.
29. NO SEEDING SHALL BE DONE AFTER OCTOBER 15 WITHOUT APPROVAL OF THE ENGINEER.
30. ANY EXISTING APPURTENANCES SUCH AS MANHOLES, GATE VALVES, ETC. SHALL BE ADJUSTED TO THE PROPOSED GRADE AND SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.
31. SOIL EROSION MEASURES SHALL BE MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION HAS BEEN RE-ESTABLISHED.
32. ALL PERMANENT SIGNS AND PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF THE MICHIGAN MUTCD MANUAL AND SHALL BE INCIDENTAL TO THE CONTRACT.

WHITE LAKE TOWNSHIP NOTES:

a. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE TOWNSHIP'S CURRENT STANDARDS AND SPECIFICATIONS.
b. THE CONTRACTOR SHALL NOTIFY THE TOWNSHIP ENGINEER AND/OR AUTHORITY HAVING JURISDICTION, 48 HOURS PRIOR TO THE BEGINNING OF CONSTRUCTION.
c. CONTRACTOR SHALL CONTACT MISS DIG AT 800-482-7171, 72 HOURS IN ADVANCE OF CONSTRUCTION, FOR EXISTING UNDERGROUND UTILITY LOCATIONS.
d. IN ORDER TO VERIFY COMPLIANCE WITH APPROVED PLANS, FULL-TIME CONSTRUCTION OBSERVATION WILL GENERALLY BE REQUIRED DURING ALL PHASES OF UNDERGROUND SITE CONSTRUCTION INCLUDING INSTALLATION OF SANITARY SEWER, STORM SEWERS, DRAINS, WATERMAINS AND APPURTENANCES AS WELL AS PRIVATE STREET CURBING AND PAVING CONSTRUCTION. INTERMITTENT OBSERVATIONS WILL BE MADE FOR SITE GRADING, PARKING LOT CURBING AND PAVING, RETAINING WALL CONSTRUCTION AND OTHER CURFACE ACTIVITY.



OVERALL SITE MAP
1" = 100'

SHEET INDEX

SHEET NO.	DESCRIPTION
1	COVER
2	GENERAL NOTES & LEGEND
3	EXISTING CONDITIONS & DEMOLITION PLAN
4	SITE PLAN
5	UTILITY PLAN
6	GRADING PLAN
7	DRAINAGE PLAN
8	SOIL EROSION & SEDIMENTATION PLAN
9	LANDSCAPE PLAN
10	STORM PROFILES
11	SANITARY PROFILES
12	WATERMAIN PROFILES
13	DETENTION BASIN DETAILS
14	MECHANICAL PRETREATMENT DETAILS
15	CONTECH UNDERGROUND DETAILS
16	M-59 ENTRANCE DETAILS
17	M-59 MDOT LAYOUT PLAN
18	CONSTRUCTION DETAILS
19	TOWNSHIP STORM DETAILS
20	TOWNSHIP SANITARY DETAILS
21	TOWNSHIP WATERMAIN DETAILS
22	OAKLAND COUNTY SESC DETAILS
SHEET NO.	DRAWINGS BY OTHERS
1 of 1	PHOTOMETRIC PLAN
SHEET NO.	DRAWINGS BY DETROIT ARCHITECTURAL GROUP
PP-8	MULTI-TENANT BUILDING PRELIMINARY FLOOR PLAN & DETAILS
PP-8.1	MULTI-TENANT BUILDING PRELIMINARY ELEVATIONS

PERMITS & APPROVALS

AGENCY	DATE SUBMITTED	DATE APPROVED
• TOWNSHIP ENGINEERING APPROVAL	6/26/2024	–
• RCOC	6/28/2024	–
• OCWRC – SESC	7/22/2024	–
• MDEGLE ACT 399	–	–
• MDEGLE PART 41	–	–
• MDEGLE WETLANDS	7/25/2024	–

INDEMNIFICATION STATEMENT

THE CONTRACTOR SHALL HOLD HARMLESS THE DESIGN PROFESSIONAL, MUNICIPALITY, COUNTY, STATE AND ALL OF ITS SUB CONSULTANTS, PUBLIC AND PRIVATE UTILITY COMPANIES, AND LANDOWNERS FOR DAMAGES TO INDIVIDUALS AND PROPERTY, REAL OR OTHERWISE, DUE TO THE OPERATIONS OF THE CONTRACTOR AND/OR THEIR SUBCONTRACTORS.

PREPARED FOR:

GATEWAY CROSSING, LLC
600 N. OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
BRIAN NAJOR
248.433.7000
BRIAN@NAJORCOMPANIES.COM

ARCHITECT:

DETROIT ARCHITECTURAL GROUP
1644 FORD AVENUE
WYANDOTTE, MI 48192
JAKE ROOT, PRINCIPAL
734-556-3259
JROOT@DETROITARCH.COM

PREPARED BY:

BEBOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670
CONTACT: SCOTT TOUSIGNANT
EMAIL: SCOTTT@BOSSENG.COM

STATE OF MICHIGAN
SCOTT T. TOUSIGNANT
ENGINEER
No. 47402
PROFESSIONAL ENGINEER

NO	BY	CK	REVISION	DATE	
					1
2	MJD	ST	TOWNSHIP COMMENTS	8/6/24	
1	MJD	ST	MDOT COMMENTS	7/9/24	ISSUE DATE: 05/30/24
					JOB NO: 22-029-1

GENERAL NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL REQUIRED TOWNSHIP, COUNTY, AND STATE OF MICHIGAN PERMITS.
2. A GRADING PERMIT FOR SOIL EROSION–SEDIMENTATION CONTROL SHALL BE OBTAINED FROM THE GOVERNING AGENCY PRIOR TO THE START OF CONSTRUCTION.
3. IF DUST PROBLEM OCCURS DURING CONSTRUCTION, CONTROL WILL BE PROVIDED BY AN APPLICATION OF WATER, EITHER BY SPRINKLER OR TANK TRUCK.
4. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH LOCAL MUNICIPAL STANDARDS AND SPECIFICATIONS.
5. PAVED SURFACES, WALKWAYS, SIGNS, LIGHTING AND OTHER STRUCTURES SHALL BE MAINTAINED IN A SAFE, ATTRACTIVE CONDITION AS ORIGINALLY DESIGNED AND CONSTRUCTED.
6. ALL BARRIER–FREE FEATURES SHALL BE CONSTRUCTED TO MEET ALL LOCAL, STATE AND A.D.A. REQUIREMENTS. WHERE EXISTING CONDITIONS AND/OR THE REQUIREMENTS OF THE PLANS WILL RESULT IN FINISHED CONDITIONS THAT DO NOT MEET ADA REQUIREMENTS, THE CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER PRIOR TO WORK COMMENCING.
7. ANY DISCREPANCY IN THIS PLAN AND ACTUAL FIELD CONDITIONS SHALL BE REPORTED TO THE DESIGN ENGINEER PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL SETBACKS, EASEMENTS AND DIMENSIONS SHOWN HEREON PRIOR TO BEGINNING CONSTRUCTION.
8. THE CONTRACTOR SHALL CONTACT ALL OWNERS OF EASEMENTS, UTILITIES AND RIGHT–OF–WAY, PUBLIC OR PRIVATE, PRIOR TO THE START OF CONSTRUCTION.
9. THE CONTRACTOR SHALL COORDINATE WITH ALL OWNERS TO DETERMINE THE LOCATION OF EXISTING LANDSCAPING, IRRIGATION LINES & PRIVATE UTILITY LINES. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO EXISTING LANDSCAPING, IRRIGATION LINES, AND PRIVATE UTILITY LINES.
10. THE CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE UPON COMPLETION OF THE PROJECT.
11. THE CONTRACTOR SHALL MAINTAIN THE SITE IN A MANNER SO THAT WORKMEN AND PUBLIC SHALL BE PROTECTED FROM INJURY, AND ADJOINING PROPERTY PROTECTED FROM DAMAGE.
12. THE CONTRACTOR SHALL KEEP THE AREA OUTSIDE THE "CONSTRUCTION LIMITS" BROOM CLEAN AT ALL TIMES.
13. THE CONTRACTOR SHALL CALL MISS DIG A MINIMUM OF 72 HOURS PRIOR TO THE START OF CONSTRUCTION.
14. ALL PAVEMENT REPLACEMENT AND OTHER WORKS COVERED BY THESE PLANS SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF THE TOWNSHIP, INCLUDING THE LATEST MICHIGAN DEPARTMENT OF TRANSPORTATION (MDOT) SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.
15. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO EXISTING UTILITIES.
16. NO ADDITIONAL COMPENSATION WILL BE PAID TO THE CONTRACTOR FOR ANY DELAY OR INCONVENIENCE DUE TO THE MATERIAL SHORTAGES OR RESPONSIBLE DELAYS DUE TO THE OPERATIONS OF SUCH OTHER PARTIES DOING WORK INDICATED OR SHOWN ON THE PLANS OR IN THE SPECIFICATION OR FOR ANY REASONABLE DELAYS IN CONSTRUCTION DUE TO THE ENCOUNTERING OR EXISTING UTILITIES THAT MAY OR MAY NOT BE SHOWN ON THE PLANS.
17. DURING THE CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL NOT PERFORM WORK BY PRIVATE AGREEMENT WITH PROPERTY OWNERS ADJACENT TO THE PROJECT.
18. IF WORK EXTENDS BEYOND NOVEMBER 15, NO COMPENSATION WILL BE DUE TO THE CONTRACTOR FOR ANY WINTER PROTECTION MEASURES THAT MAY BE REQUIRED BY THE ENGINEER.
19. NO TREES ARE TO BE REMOVED UNTIL MARKED IN THE FIELD BY THE ENGINEER.
20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE PROPERTY BEYOND THE CONSTRUCTION LIMITS INCLUDING BUT NOT LIMITED TO EXISTING FENCE, LAWN, TREES AND SHRUBBERY.
21. TRAFFIC SHALL BE MAINTAINED DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL SIGNS AND TRAFFIC CONTROL DEVICES. FLAG PERSONS SHALL BE PROVIDED BY THE CONTRACTOR IF DETERMINED NECESSARY BY THE ENGINEER. ALL SIGNS SHALL CONFORM TO THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES AT NO COST TO THE TOWNSHIP. NO WORK SHALL BE DONE UNLESS THE APPROPRIATE TRAFFIC CONTROL DEVICES ARE IN PLACE.
22. ALL DEMOLISHED MATERIALS AND SOIL SPOILS SHALL BE REMOVED FROM THE SITE AT NO ADDITIONAL COST, AND DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
23. ANY EXISTING APPURTENANCES SUCH AS MANHOLES, GATE VALVES, ETC. SHALL BE ADJUSTED TO THE PROPOSED GRADE AND SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.
24. ALL PERMANENT SIGNS AND PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF THE MICHIGAN MUTCD MANUAL AND SHALL BE INCIDENTAL TO THE CONTRACT.
25. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL ITEMS REQUIRED FOR CONSTRUCTION OF THE PROJECT ARE INCLUDED IN THE CONTRACT. ANY ITEMS NOT SPECIFICALLY DESIGNATED IN THE PLANS SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.
26. THE CONTRACTOR IS RESPONSIBLE FOR HAVING A SET OF APPROVED CONSTRUCTION PLANS, WITH THE LATEST REVISION DATE, ON SITE PRIOR TO THE START OF CONSTRUCTION. IN THE EVENT OF ANY QUESTIONS PERTAINING TO THE INTENT OF THE CONSTRUCTION PLANS OR SPECIFICATIONS, THE CONTRACTOR SHALL CONTACT THE DESIGN ENGINEER FOR A FINAL DETERMINATION FROM THE DESIGN ENGINEER.
27. THE CONTRACTOR, NOT THE OWNER OR THE ENGINEER, ARE RESPONSIBLE FOR THE MEANS, METHODS, AND SEQUENCE OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR SAFE EXECUTION OF THE PROJECT SCOPE IN ACCORDANCE WITH THE APPROVED CONSTRUCTION PLANS.
28. THE CONTRACTOR IS RESPONSIBLE FOR PRESERVING CONSTRUCTION STAKING AS NECESSARY. CONTRACTOR TO NOTIFY CONSTRUCTION SURVEYOR OF REPLACEMENT STAKES NEEDED WHICH SHALL BE AT THE CONTRACTORS EXPENSE.
29. THE OWNER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING FRANCHISE UTILITY SERVICES (CABLE, ELECTRIC, GAS, ETC.) OWNER AND/OR CONTRACTOR SHALL WORK WITH UTILITY COMPANIES ON FURNISHING SITE UTILITY LAYOUTS AND PROVIDING CONDUIT CROSSINGS AS REQUIRED.
30. DAMAGE TO ANY EXISTING UTILITIES OR INFRASTRUCTURE (INCLUDING PAVEMENT, CURB, SIDEWALK, ETC.) SHALL PROMPTLY BE REPLACED IN KIND AND SHALL BE AT THE CONTRACTORS EXPENSE.
31. COORDINATION OF TESTING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND PER ALL CITY/TOWNSHIP/COUNTY REQUIREMENTS. COPIES OF ALL TEST REPORTS SHALL BE FURNISHED TO THE DESIGN ENGINEER.
32. PRIOR TO THE START OF CONSTRUCTION, PROTECTION FENCING SHALL BE ERECTED AROUND THE TREE DRIPLINE OF ANY TREES INDICATED TO BE SAVED WITHIN THE LIMITS OF DISTURBANCE.
33. THE CONTRACTOR SHALL MAINTAIN DRAINAGE OF THE PROJECT AREA AND ADJACENT AREAS. WHERE EXISTING DRAINAGE FACILITIES ARE IMPACTED/DISTURBED DUE TO CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE ANY NECESSARY TEMPORARY DRAINAGE PROVISIONS.
34. SOIL BORING LOGS ARE REPRESENTATIVE OF SPECIFIC POINTS ON THE PROJECT SITE, AND IF PROVIDED TO THE CONTRACTOR ARE FOR INFORMATIONAL PURPOSES ONLY.
35. WHERE CITY/TOWNSHIP STANDARD CONSTRUCTION DETAILS/SPECIFICATIONS ARE PROVIDED AND ARE IN CONFLICT WITH NOTES AND SPECIFICATIONS HEREIN, THE CITY/TOWNSHIP STANDARD SHALL GOVERN.

INDEMNIFICATION STATEMENT

THE CONTRACTOR SHALL HOLD HARMLESS THE DESIGN PROFESSIONAL, MUNICIPALITY, COUNTY, STATE, AND ALL OF ITS SUB CONSULTANTS, PUBLIC AND PRIVATE UTILITY COMPANIES, AND LANDOWNERS FOR DAMAGES TO INDIVIDUALS AND PROPERTY, REAL OR OTHERWISE, DUE TO THE OPERATIONS OF THE CONTRACTOR AND/OR THEIR SUBCONTRACTORS.

CONTRACTOR TO FOLLOW MANUFACTURER SPECS/RECOMMENDATIONS THAT SUPERCEDE PLANS

GENERAL GRADING & SESC NOTES

1. THE CONTRACTOR SHALL HAVE IN PLACE ALL REQUIRED EROSION CONTROL METHODS AS INDICATED ON THE CONSTRUCTION PLANS AND AS REQUIRED BY GENERAL PRACTICE. SPECIFIC MEANS, METHODS AND SEQUENCES OF CONSTRUCTION MAY DICTATE ADDITIONAL SOIL EROSION CONTROL MEASURES BE NEEDED. THE CONTRACTOR SHALL COORDINATE WITH THE DESIGN ENGINEER ON THESE ANTICIPATED METHODS. ADDITIONAL SOIL EROSION CONTROL METHODS SHALL BE INCIDENTAL TO THE SCOPE OF WORK.
2. ACTUAL FIELD CONDITIONS MAY DICTATE ADDITIONAL OR ALTERNATE SOIL EROSION CONTROL MEASURES BE UTILIZED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DEFICIENCIES OR FIELD CONDITIONS THAT WARRANT ADDITIONAL AND/OR ALTERNATIVE SESC MEASURES BE UTILIZED.
3. AT THE CLOSE OF EACH DAY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING ALL CONSTRUCTION OPERATIONS, MATERIALS, DEBRIS, ETC ARE CONTAINED ON–SITE.
4. AT THE CLOSE OF EACH WORKING DAY, ALL DRAINAGE STRUCTURES SHALL BE FREE OF DIRT AND DEBRIS AT THE FLOW LINE.
5. ALL SOIL EROSION CONTROL MEASURES SHALL BE INSTALLED IN ACCORDANCE PER MDEGLE REGULATIONS AND BEST PRACTICES, ALL SOIL EROSION CONTROL MEASURES SHALL BE MAINTAINED BY THE CONTRACTOR.
6. THE SOIL EROSION CONTROL MEASURES SHALL BE KEPT IN PLACE UNTIL SUCH A TIME THAT THE SITE IS DETERMINED TO BE ESTABLISHED WITH ACCEPTABLE AMOUNT OF VEGETATIVE GROUND COVER.
7. ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE NORMAL CONSTRUCTION LIMITS OF THE PROJECT SHALL BE SODDED OR SEEDED AS SPECIFIED OR DIRECTED BY THE ENGINEER.
8. AFTER REMOVAL OF TOPSOIL, THE SUBGRADE SHALL BE COMPACTED TO 95% OF ITS UNIT WEIGHT.
9. ALL GRADING IN THE PLANS SHALL BE DONE AS PART OF THIS CONTRACT. ALL DELETERIOUS MATERIAL SHALL BE REMOVED FROM THE SUBGRADE PRIOR TO COMPACTING.
10. ALL ROOTS, STUMPS AND OTHER OBJECTIONABLE MATERIALS SHALL BE REMOVED AND THE HOLE BACKFILLED WITH SUITABLE MATERIAL. WHERE GRADE CORRECTION IS REQUIRED, THE SUBGRADE SHALL BE CUT TO CONFORM TO THE CROSS–SECTION AS SHOWN IN THE PLANS.
11. ALL EXCAVATION UNDER OR WITHIN 3 FEET OF PUBLIC PAVEMENT, EXISTING OR PROPOSED SHALL BE BACKFILLED AND COMPACTED WITH SAND (MDOT CLASS II).

GENERAL LANDSCAPE NOTES:

1. ALL PLANT MATERIAL SHALL CONFORM TO THE REQUIREMENTS AND SPECIFICATIONS OF THE GOVERNING MUNICIPALITY. ALL STOCK SHALL BE NURSERY GROWN, CONFORMING TO ANSO Z60.1 "AMERICAN STANDARD FOR NURSERY STOCK", AND IN ACCORDANCE WITH GOOD HORTICULTURAL PRACTICE. STOCK SHALL EXHIBIT NORMAL GROWTH HABIT AND BE FREE OF DISEASE, INSECTS, EGGS, LARVAE, AND DEFECTS SUCH AS KNOTS, SUN–SCALD, INJURIES, ABRASIONS, OR DISFIGUREMENT. ALL PLANT MATERIAL SHALL BE SUBJECT TO THE APPROVAL OF THE LANDSCAPE ARCHITECT.
2. ALL PLANT MATERIALS SHALL BE BALLED AND BURLAPPED OR CONTAINER STOCK. NO BARE ROOT STOCK IS PERMITTED. ALL PLANT BALLS SHALL BE FIRM, INTACT, AND SECURELY WRAPPED AND BOUND.
3. ALL PLANT BED MATERIALS SHALL BE EXCAVATED OF ALL BUILDING MATERIALS, OTHER EXTRANEOUS OBJECTS, AND POOR SOILS TO A MINIMUM DEPTH OF 12–INCHES AND BACKFILLED TO GRADE WITH SPECIFIED PLANTING MIX (SEE BELOW).
4. PLANTING MIXTURE SHALL CONSIST OF 5 PARTS TOPSOIL FROM ON–SITE (AS APPROVED), 4 PARTS COARSE SAND, 1 PART SPHAGNUM PEAT MOSS (OR APPROVED COMPOST), AND 5 LBS OF SUPERPHOSPHATE FERTILIZER PER CU. YD. OF MIX. INGREDIENTS SHALL BE THOROUGHLY BLENDED FOR UNIFORM CONSISTENCY.
5. ALL PLANT BEDS AND INDIVIDUAL PLANTS, NOT OTHERWISE NOTED SHALL BE MULCHED WITH A 4–INCH LAYER OF SHREDDED BARK MULCH. EDGE OF MULCH BEDS AS SHOWN. DECIDUOUS TREES IN LAWN AREAS SHALL RECEIVE A 5–FT DIAMETER CIRCLE OF MULCH AND CONIFER TREES 8–FT (PLANTED CROWN OF TREE) UNLESS OTHERWISE NOTED.
6. LANDSCAPE STONE SHALL BE INSTALLED WHERE NOTED OR INDICATED (HATCHED). STONE SHALL BE 3/4"–1–1/4" WASHED RIVER GRAVEL OR AS SELECTED AND SHALL BE INSTALLED TO A MINIMUM DEPTH OF 3–INCHES.
7. ALL LANDSCAPE BEDS, UNLESS OTHERWISE NOTED SHALL BE INSTALLED OVER WEED BARRIER FABRIC – WATER PERMEABLE FILTRATION FABRIC OF NON–WOVEN POLYPROPYLENE OR POLYESTER FABRIC. FABRIC SHALL BE OF SUITABLE THICKNESS FOR APPLICATION.
8. ALL PLANTS AND PLANT BEDS SHALL BE THOROUGHLY WATERED UPON COMPLETION OF PLANTING AND STAKING OPERATIONS.
9. THE CONTRACTOR SHALL GUARANTEE ALL PLANT MATERIALS FOR A PERIOD OF 2 GROWING SEASONS FROM THE DATE THE WORK IS ACCEPTED, IN WRITING, BY THE LANDSCAPE ARCHITECT. THE CONTRACTOR SHALL REPLACE, WITHOUT COST TO THE OWNER, WITHIN A SPECIFIED PERIOD OF TIME, ALL DEAD PLANTS, AND ALL PLANTS NOT IN A VIGOROUS, THRIVING CONDITION, AS DETERMINED BY THE LANDSCAPE ARCHITECT, DURING AND AT THE END OF THE GUARANTEE PERIOD. REPLACEMENT STOCK SHALL CONFORM TO THE ORIGINAL SPECIFICATIONS. THE MUNICIPALITY MAY REQUIRE A BOND OR LETTER OF CREDIT – TO BE DETERMINED AT A PRE–CONSTRUCTION MEETING.
10. EDGING SHALL BE PROVIDED FOR ALL LANDSCAPE BEDS NOT ADJACENT TO CONCRETE PAVEMENT. EDGING SHALL BE BLACK ALUMINUM EDGING, 3/16–INCH X 4–INCH. INSTALL PER MANUFACTURER'S INSTRUCTIONS, ALL EDGING SHALL BE INSTALLED IN STRAIGHT LINES OR SMOOTH CURVES WITHOUT IRREGULARITIES.
11. SOD SHALL BE DENSE, WELL ROOTED TURF, FREE OF WEEDS. IT SHALL BE COMPRISED OF A BLEND OF AT LEAST TWO KENTUCKY BLUE GRASSES AND ONE FESCUE. IT SHALL HAVE A UNIFORM THICKNESS OF 3/4–INCH AT TIME OF PLANTING, AND CUT IN UNIFORM STRIPS NOT LESS THAN 10–INCHES BY 18–INCHES. SOD SHALL BE KEPT MOIST AND LAID WITHIN 36–HOURS AFTER CUTTING.

    IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH A DENSE LAWN OF PERMANENT GRASSES, FREE OF LUMPS AND DEPRESSIONS. ALL SODDED AREAS THAT BROWN–OUT OR HAVE NOT FIRMLY KNITTED TO THE SOIL BASE WITHIN A PERIOD OF 1 MONTH SHALL BE REPLACED BY THE CONTRACTOR, AT NO COST TO THE OWNER.
12. ALL AREAS OF THE SITE THAT BECOME DISTURBED DURING CONSTRUCTION AND ARE NOT TO BE PAVED, STONED, LANDSCAPED, OR SODDED SHALL BE SEEDED AND MULCHED.

    SEED MIXTURE SHALL BE AS FOLLOWS:

KENTUCKY BLUEGRASS (CHOOSE 3 VARIETIES – ADELPHI, RUGBY, GLADE, OR PARADE)	30%
RUBY RED OR DAWSON RED FINE FESCUE	30%
ATLANTA RED FESCUE	20%
PENNFINE PERENNIAL RYE	20%

    THE ABOVE SEED MIXTURE SHALL BE SOWN AT A RATE OF 250 LBS PER ACRE. PRIOR TO SEEDING, THE TOPSOIL SHALL BE FERTILIZED WITH A COMMERCIAL FERTILIZER WITH A 10–0–10 ANALYSIS:

    10% NITROGEN – MIN 25% FROM A UREA FORMALDEHYDE SOURCE
    0 % PHOSPHATE
    10% POTASH – SOURCE POTASSIUM SULFATE OR POTASSIUM NITRATE

    THE FIRST FERTILIZER APPLICATION SHALL BE AT A RATE OF 10 LBS PER 1000 SQ FT OF BULK FERTILIZER.

    IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH A DENSE LAWN OF PERMANENT GRASSES, FREE OF LUMPS AND DEPRESSIONS. ANY PART OF THE AREA THAT FAILS TO SHOW A UNIFORM GERMINATION SHALL BE RE–SEEDED AND SUCH RE–SEEDING SHALL CONTINUE UNTIL A DENSE LAWN IS ESTABLISHED. DAMAGE TO SEEDED AREAS RESULTING FROM EROSION SHALL BE REPAIRED BY THE CONTRACTOR.
13. ALL AREAS OF THE SITE SCHEDULED FOR SEEDING OR SODDING SHALL FIRST RECEIVE A 6–INCH LAYER OF CLEAN, FRIABLE TOPSOIL. THE SOIL SHALL BE DISCED AND SHALL BE GRADED IN CONFORMANCE WITH THE GRADING PLAN.
14. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION OF ALL UTILITIES AND TO INFORM THE LANDSCAPE ARCHITECT OF ANY CONFLICTS PRIOR TO COMMENCING LANDSCAPING.
15. DECORATIVE LANDSCAPE BOULDERS, WHEN INDICATED, SHALL BE OF 'FIELD STONE' TYPE GENERALLY CONSISTING OF METAMORPHIC QUARTZITE OR GLACIAL TILL STONE SUITABLE FOR LANDSCAPE APPLICATION. PROVIDE A VARIETY OF SIZES RANGING FROM A MINIMUM OF 16–INCHES THROUGH 42–INCHES.
16. ALL LANDSCAPED AREAS WITHIN THE PROJECT AREA SHALL BE PROVIDED WITH AN UNDERGROUND AUTOMATIC LANDSCAPE & LAWN IRRIGATION/SPRINKLER SYSTEM – DESIGN–BUILD THROUGH GENERAL CONTRACTOR. THE SYSTEM SHALL INCLUDE A RAIN SENSOR TO PREVENT WATERING DURING OR SHORTLY THEREAFTER A PRECIPITATION EVENT, IN ADDITION TO A PROGRAMMABLE 7–DAY CLOCK AND ZONE CONTROLS. SUBMITTAL DRAWINGS SHALL BE PROVIDED FOR REVIEW.
17. MAINTENANCE: THE PROPERTY OWNER SHALL MAINTAIN ALL LANDSCAPING IN A HEALTHY CONDITION, FREE FROM REFUSE, AND DEBRIS.
18. INSTALL SOIL EROSION CONTROL FABRIC ON ALL SLOPES STEEPER THAN 6:1 UNLESS OTHERWISE NOTED.

GENERAL UTILITY NOTES

1. BEDDING SHALL EXTEND A MINIMUM OF 4" BELOW THE PIPE, UNLESS OTHERWISE NOTED ON THE PLANS. BEDDING SHALL BE PER WHITE LATE TOWNSHIP STANDARDS.
2. WHERE UNSTABLE GROUND CONDITIONS ARE ENCOUNTERED, STONE BEDDING SHALL BE USED AS DIRECTED BY THE ENGINEER.
3. BACKFILL SHALL BE OF A SUITABLE MATERIAL AND SHALL BE FREE OF ANY ORGANIC MATERIALS AND ROCKS.
4. BACKFILL ABOVE THE PIPE SHALL BE PER WHITE LAKE TOWNSHIP STANDARDS.
5. 18" MINIMUM VERTICAL SEPARATION AND 10' HORIZONTAL SEPARATION IS TO BE MAINTAINED BETWEEN WATERMAIN AND SANITARY/STORM SEWER TO THE MAXIMUM EXTENT POSSIBLE.

GENERAL STORM NOTES

1. ALL STORM PIPE LENGTHS ARE SHOWN FROM C/L TO C/L OF STRUCTURE OR FROM C/L OF STRUCTURE TO DISCHARGE END OF FLARED END SECTION.
2. STORM PIPE JOINTS SHALL MEET THE REQUIREMENTS OF ASTM D3212. HDPE AND PP PIPE GASKETS SHALL MEET THE REQUIREMENTS OF ASTM F477.
3. ALL STORM PIPE TO HAVE WATERTIGHT PREMIUM JOINTS, UNLESS OTHERWISE NOTED ON THE PLANS.
4. STORM DRAINAGE STRUCTURES SHALL BE FURNISHED WITH STEPS WHICH SHALL BE STEEL ENCASED WITH POLYPROPYLENE PLASTIC OR EQUIVALENT. STEPS SHALL BE SET AT 16" CENTER TO CENTER.
5. ALL FLARED END SECTIONS 18" AND LARGER SHALL BE FURNISHED WITH AN ANIMAL GRATE.
6. FLARED END SECTIONS DISCHARGING STORM WATER SHALL RECEIVE A MINIMUM OF 10 SQ YDS OF PLAIN COBBLESTONE RIP RAP WITH A MINIMUM STONE SIZE OF 6" AND SHALL BE PLACED ON A GEOTEXTILE FABRIC WRAP.
7. ALL CATCH BASINS WITHIN THE ROADWAY SHALL INCLUDE INSTALLATION OF 6" DIAMETER PERFORATED PIPE SUBDRAIN.

GENERAL SANITARY NOTES

1. ALL SANITARY PIPE LENGTHS ARE SHOWN FROM C/L OF STRUCTURE TO C/L OF STRUCTURE.
2. SANITARY PIPE MATERIALS SHALL BE AS FOLLOWS:
   2.1. PVC SDR–26 (SANITARY MAIN)
   2.2. PVC SDR–23.5 (SANITARY LEADS)
   2.3. HDPE DR–11 (SANITARY FORCEMAIN)
3. ALL PVC SDR SANITARY SEWER PIPE SHALL MEET THE REQUIREMENTS OF ASTM D3034 AND D2241. PVC SCHD 40 PIPE SHALL MEET THE REQUIREMENTS OF ASTM D1785. GASKET JOINTS FOR SANITARY PIPE SHALL MEET THE REQUIREMENTS OF ASTM D3139 AND D3212.
4. SANITARY STRUCTURES SHALL BE FURNISHED WITH STEPS WHICH SHALL BE STEEL ENCASED WITH POLYPROPYLENE PLASTIC OR EQUIVALENT. STEPS SHALL BE SET AT 16" CENTER TO CENTER.
5. ALL NEW MANHOLES SHALL BE MINIMUM 4' DIAMETER, PRECAST MANHOLE SECTIONS AND AN ECCENTRIC CONE. PRECAST MANHOLE JOINTS SHALL BE INSTALLED WITH BUTYL ROPE MEETING THE REQUIREMENTS OF ASTM C990.
6. MANHOLES SHALL BE CONSTRUCTED WITH FLOW CHANNEL WALLS THAT ARE FORMER, AT A MINIMUM, TO THE SPRINGLINE OF THE PIPE.
7. ALL NEW MANHOLES SHALL HAVE AN APPROVED FLEXIBLE, WATERTIGHT SEALS WHERE PIPES PASS THROUGH MANHOLE WALLS.
8. WHEREVER AN EXISTING MANHOLE IS TO BE TAPPED, THE STRUCTURE SHALL BE CORED AND A KOR–N–SEAL BOOT UTILIZED FOR THE PIPE CONNECTION.
9. A MAXIMUM OF 12" OF GRADE ADJUSTMENT RINGS SHALL BE USED TO ADJUST THE FRAME ELEVATION. BUTYL ROPE SHALL BE USED BETWEEN EACH ADJUSTMENT RING.
10. SANITARY SEWER LATERALS SHALL HAVE A MINIMUM SLOPE OF 1.0%.
11. CLEANOUTS SHALL BE INSTALLED EVERY 75', AT ALL BENDS AND STUBS.
12. PUBLIC SANITARY SEWER SHALL BE CENTERED WITHIN A 20 FOOT WIDE SANITARY SEWER EASEMENT.

GENERAL WATERMAIN NOTES

1. WATERMAIN FITTINGS SHALL BE OF DUCTILE IRON WITH CEMENT MORTAR LINING AND MECHANICAL JOINTS CONFORMING TO AWWA C110.
2. WATERMAINS SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA C651. BAC–T SAMPLES SHALL BE TAKEN IN ACCORDANCE WITH R235.11110 OF THE ADMINISTRATIVE RULES PROMULGATED UNDER MICHIGAN SAFE DRINKING WATER ACT, 1976 PA 399, AS AMENDED.
3. ALLOWABLE LEAKAGE OR HYDROSTATIC PRESSURE TESTING SHALL BE IN ACCORDANCE WITH AWWA C600 AND C605.
4. MAXIMUM DEFLECTION AT PIPE JOINTS SHALL BE IN ACCORDANCE WITH PIPE MANUFACTURERS CURRENT RECOMMENDATIONS AND AWWA SPECIFICATIONS.
5. A FULL STICK OF PIPE SHALL BE LAID CENTERED AT A PIPE CROSSING IN ORDER TO MAINTAIN THE MAXIMUM SEPARATION OF WATERMAIN JOINT TO THE CROSSING PIPE.
6. WATERMAIN SHALL BE INSTALLED WITH A MINIMUM OF 6.0' OF COVER FROM FINISHED GRADE TO TOP OF PIPE AND NO MORE THAN 8' OF COVER, UNLESS SPECIAL CONDITIONS WARRANT.
7. WATERMAIN VALVES SHALL BE IRON BODY RESILIENT WEDGE GATE VALVES, NON–RISING STEMS, COUNTERCLOCKWISE OPEN, AWWA C509.
8. FIRE HYDRANTS SHALL BE INSTALLED WITH AN AUXILIARY VALVE WITH CAST IRON VALVE BOX. THE HYDRANT PUMPER HOSE CONNECTION SHALL FACE THE ROADWAY.
9. THE BREAKAWAY FLANGE AND ALL BELOW GRADE FITTINGS SHALL HAVE STAINLESS STEEL NUTS AND BOLTS.
10. PUBLIC WATERMAIN SHALL BE CENTERED WITHIN A 20 FOOT WIDE WATERMAIN EASEMENT.

LINES & HATCHES LEGEND

PROPOSED (PR)	EXISTING (EX)	
900	900	CONTOUR
T/C XXX.XXX	T/C XXX.XX	SPOT ELEVATION
SN	SN	SANITARY SEWER
SL	SL	SANITARY LEAD
FM	FM	FORCE MAIN
PS	PS	PRESSURE SEWER
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
FO	FO	FIBER OPTIC
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
X	X	FENCE
		SILT FENCE
		WETLAND BOUNDARY
		LIMITS OF GRADING/CLEARING
		LIMITS OF DRAINAGE
		MODIFIED CURB
		CONCRETE
		HIGH STRENGTH CONCRETE
		ASPHALT
		HIGH STRENGTH ASPHALT
		WETLAND
SAN 1"		SANITARY SEWER LABEL
ST 18"		STORM SEWER LABEL
GV 12		WATER MAIN LABEL
541		SOIL EROSION CONTROL MEASURE (P=PERMANENT, T=TEMPORARY)

LIGHTING LEGEND

PROPOSED (PR)	EXISTING (EX)	
		DOUBLE FIXTURE LIGHT POLE
		SINGLE FIXTURE LIGHT FIXTURE
		WALL MOUNTED LIGHT FIXTURE
		GROUND LIGHT FIXTURE
.0.1	.0.1	FOOT CANDLES ON SITE
.2.5	.2.5	FOOT CANDLES OFF SITE
5		FOOT CANDLES CONTOURS
		CANOPY MOUNTED LIGHT FIXTURE

LANDSCAPE LEGEND

- EXISTING CONIFER TREE
- EXISTING DECIDUOUS TREE
- PROPOSED CONIFER TREE
- PROPOSED DECIDUOUS TREE
- PROPOSED TREE PROTECTION
- PROPOSED ORNAMENTAL TREE
- PROPOSED DECIDUOUS SHRUBS
- SOD
- PROPOSED GRASSES & PERENNIALS
- SEED
- PROPOSED LANDSCAPE BOULDER
- MULCH

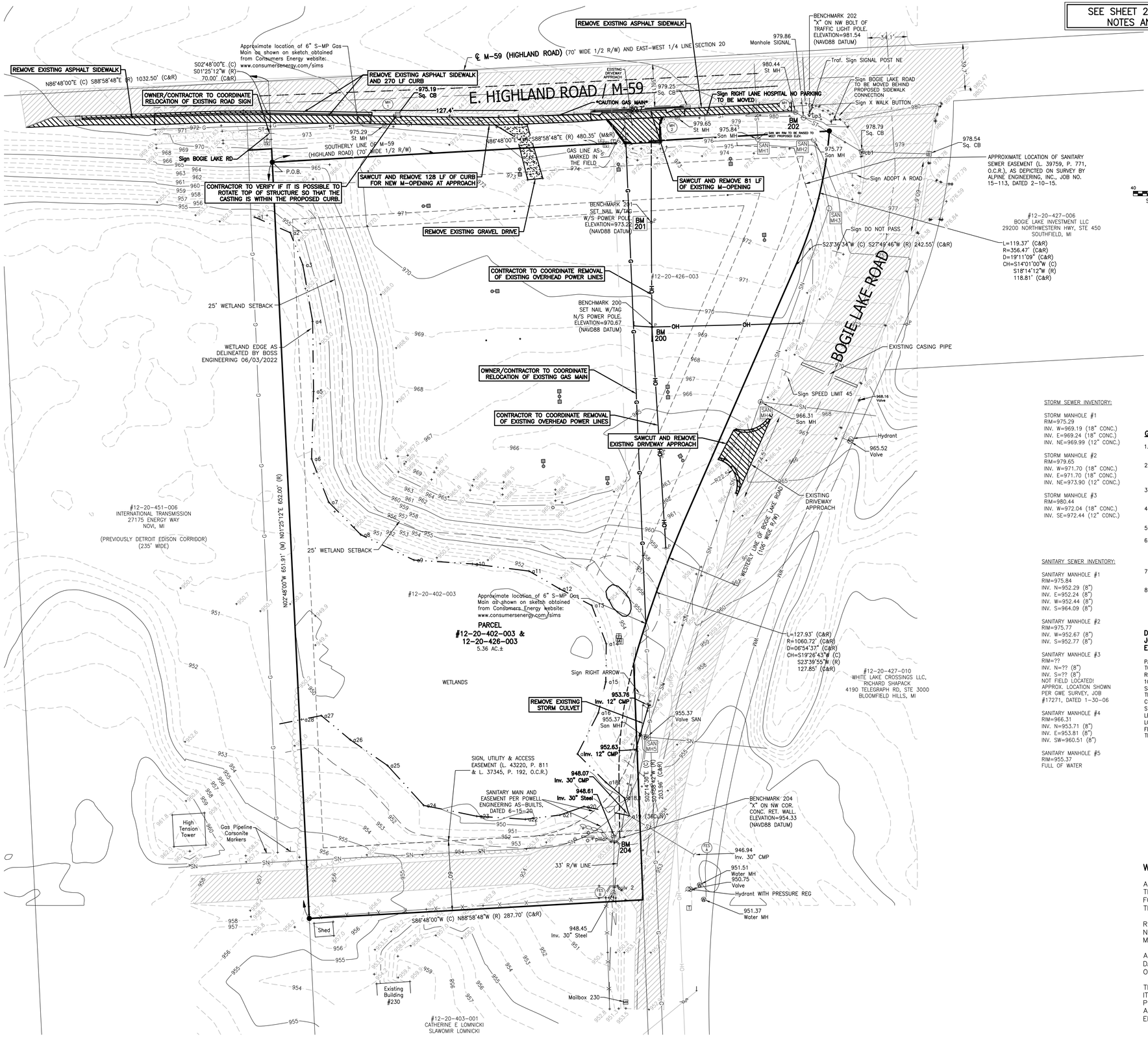
ABBREVIATIONS

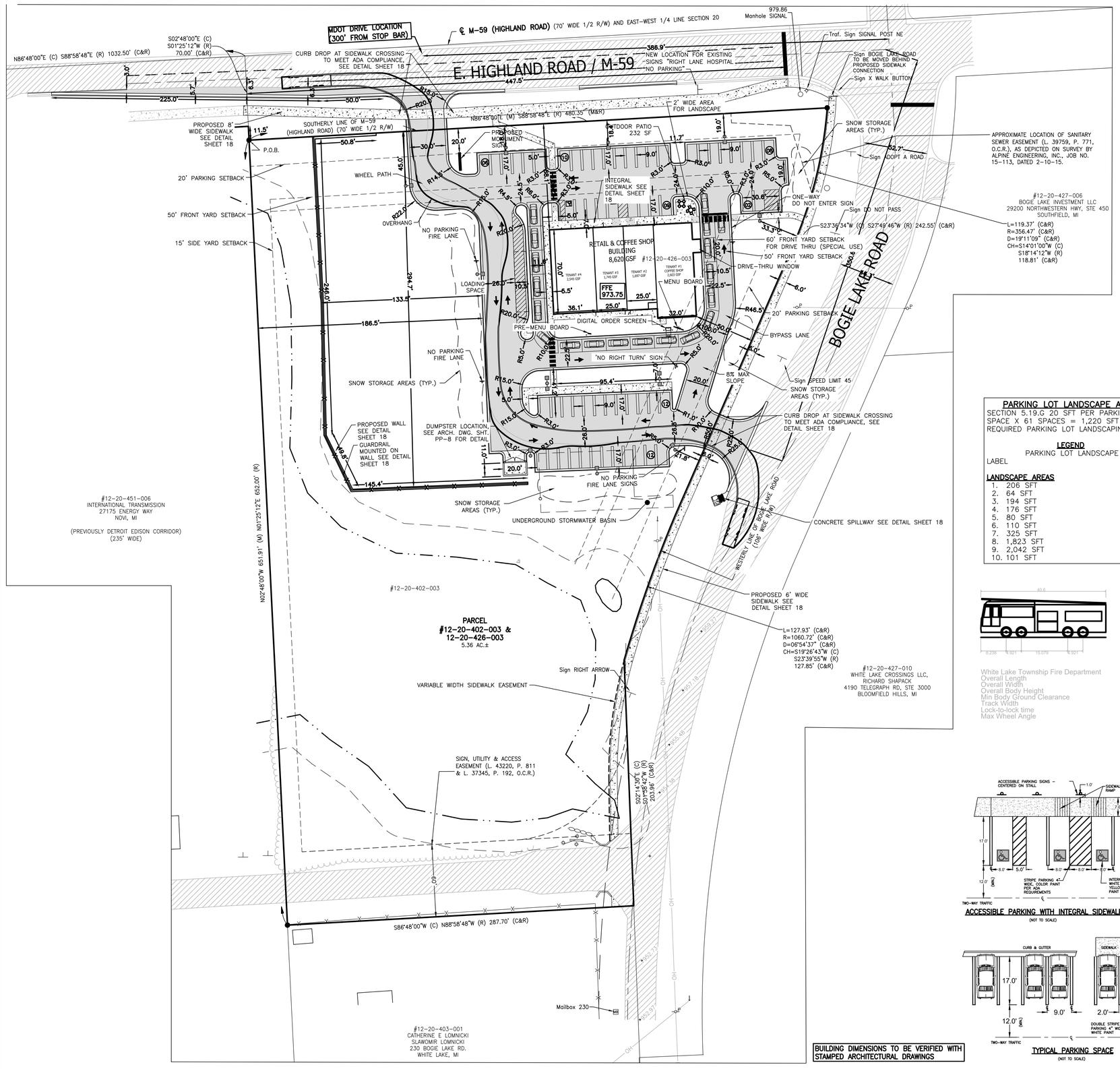
FFE	FINISHED FLOOR ELEVATION
BFE	BASEMENT FLOOR ELEVATION
GFE	GARAGE FLOOR ELEVATION
FG	FINISHED GRADE
T/A	TOP OF ASPHALT
T/C	TOP OF CONCRETE/CURB
T/W	TOP OF WALK
T/P	TOP OF PIPE
B/P	BOTTOM OF PIPE
F/L	FLOW LINE
RIM	RIM ELEVATION (AT FLOW LINE)
INV	INVERT ELEVATION
MH	MANHOLE
CB	CATCH BASIN
RY	REAR YARD
YD	YARD DRAIN
RD	ROOF DRAIN
FES	FLARED END SECTION
CMP	CORRUGATED METAL PIPE
CPP	CORRUGATED PLASTIC PIPE
RCP	REINFORCED CONCRETE PIPE
HDPE	HIGH DENSITY POLYETHYLENE
PVC	POLYVINYL CHLORIDE
DIP	DUCTILE IRON PIPE
GV	GATE VALVE
GVW	GATE VALVE IN WELL
GVB	GATE VALVE IN BOX
HYD	HYDRANT
FDC	FIRE DEPARTMENT CONNECTION
UP	UTILITY POLE
NFV	NOT FIELD VERIFIED
TBR	TO BE REMOVED
L.	LIBER
P.	PAGE
L.C.R.	LIVINGSTON COUNTY RECORDS
(M&R)	MEASURED AND RECORD
L.O.B.	POINT OF BEGINNING

SYMBOL LEGEND

- STORM DRAINAGE FLOW
- GUY WIRE
- POWER POLE
- TRANSFORMER PAD
- ELECTRICAL RISER
- U.G. ELECTRIC MARKER
- ELECTRICAL METER
- AIR CONDITIONING UNIT
- TELEPHONE RISER
- U.G. TELEPHONE MARKER
- GAS RISER
- U.G. GAS MARKER
- GAS METER
- CABLE TV RISER
- U.G. CABLE TV MARKER
- MAILBOX
- WELL
- WATER MANHOLE
- GATE VALVE (EXISTING)
- GATE VALVE (PROPOSED)
- HYDRANT (EXISTING)
- HYDRANT (PROPOSED)
- CATCH BASIN (EXISTING)
- YARD CATCH BASIN (EXISTING)
- CATCH BASIN (PROPOSED)
- STORM MANHOLE (EXISTING)
- STORM MANHOLE (PROPOSED)
- END SECTION (EXISTING)
- END SECTION (PROPOSED)
- SANITARY MANHOLE (EXISTING)
- SANITARY MANHOLE (PROPOSED)
- PUMP CHAMBER
- TRAFFIC SIGN
- SIGN (EXISTING)
- SIGN (PROPOSED)
- SOIL BORING
- STEEL ROD SET
- STEEL ROD OR PIPE FOUND
- WOOD LATH SET
- HUB SET
- MONUMENT FOUND
- SECTION CORNER
- GAS PUMP
- ANTENNA
- SATELLITE DISH
- NEWSPAPER BOX
- PARKING METER
- PHONE BOOTH
- HANDICAP SYMBOL
- BENCHMARK
- LIGHT POLE

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS AND IS NOT GUARANTEED TO BE EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL UTILIZE THE SERVICES OF THE UTILITY COORDINATION SERVICE TO DETERMINE THE LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES CONSTRUCTED UNDER THIS CONTRACT. IN ADDITION, THE GENERAL CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO


SEE SHEET 2 FOR GENERAL NOTES AND LEGEND
℄ M-59 (HIGHLAND ROAD) (70' WIDE 1/2 R/W) AND EAST-WEST 1/4 LINE SECTION 20
E. HIGHLAND ROAD / M-59
REMOVE EXISTING ASPHALT SIDEWALK
REMOVE EXISTING ASPHALT SIDEWALK AND 270 LF CURB
OWNER/CONTRACTOR TO COORDINATE RELOCATION OF EXISTING ROAD SIGN
CONTRACTOR TO VERIFY IF IT IS POSSIBLE TO ROTATE TOP OF STRUCTURE SO THAT THE CASTING IS WITHIN THE PROPOSED CURB.
SAWCUT AND REMOVE 128 LF OF CURB FOR NEW M-OPENING AT APPROACH
SAWCUT AND REMOVE 81 LF OF EXISTING M-OPENING
REMOVE EXISTING GRAVEL DRIVE
CONTRACTOR TO COORDINATE REMOVAL OF EXISTING OVERHEAD POWER LINES
OWNER/CONTRACTOR TO COORDINATE RELOCATION OF EXISTING GAS MAIN
SAWCUT AND REMOVE EXISTING DRIVEWAY APPROACH
REMOVE EXISTING STORM CULVET
Sign BOGIE LAKE RD
Sign RIGHT LANE HOSPITAL NO PARKING TO BE MOVED
Sign BOGIE LAKE ROAD TO BE MOVED BEHIND PROPOSED SIDEWALK CONNECTION
Sign X WALK BUTTON
Sign ADOPT A ROAD
Sign DO NOT PASS
Sign SPEED LIMIT 45
Sign RIGHT ARROW
BOGIE LAKE ROAD
EXISTING CASING PIPE
EXISTING DRIVEWAY APPROACH
WESTERLY LINE OF BOGIE LAKE ROAD (105' WIDE R/W)
BENCHMARK 200 SET NAIL W/TAG N/S POWER POLE, ELEVATION=970.67 (NAVD88 DATUM)
BENCHMARK 201 SET NAIL W/TAG W/S POWER POLE, ELEVATION=973.22 (NAVD88 DATUM)
BENCHMARK 202 "X" ON NW BOLT OF TRAFFIC LIGHT POLE, ELEVATION=981.54 (NAVD88 DATUM)
BENCHMARK 204 "X" ON NW COR. CONC. RET. WALL, ELEVATION=954.33 (NAVD88 DATUM)
BM 200
BM 201
BM 202
BM 204
P.O.B.
SOUTHERLY LINE OF M-59 (HIGHLAND ROAD) (70' WIDE 1/2 R/W)
GAS LINE AS MARKED IN THE FIELD
Approximate location of 6" S-MP Gas Main as shown on sketch obtained from Consumers Energy website: www.consumersenergy.com/sims
25' WETLAND SETBACK
WETLAND EDGE AS DELINEATED BY BOSS ENGINEERING 06/03/2022
WETLANDS
#12-20-451-006 INTERNATIONAL TRANSMISSION 27175 ENERGY WAY NOVI, MI
(PREVIOUSLY DETROIT EDISON CORRIDOR) (235' WIDE)
#12-20-402-003
#12-20-426-003
#12-20-427-006 BOGIE LAKE INVESTMENT LLC 29200 NORTHWESTERN HWY, STE 450 SOUTHFIELD, MI
#12-20-427-010 WHITE LAKE CROSSINGS LLC, RICHARD SHAPACK 4190 TELEGRAPH RD, STE 3000 BLOOMFIELD HILLS, MI
#12-20-403-001 CATHERINE E LOMNICKI SLAWOMIR LOMNICKI
PARCEL #12-20-402-003 & 12-20-426-003 5.36 AC.±
APPROXIMATE LOCATION OF SANITARY SEWER EASEMENT (L. 39759, P. 771, O.C.R.), AS DEPICTED ON SURVEY BY ALPINE ENGINEERING, INC., JOB NO. 15-113, DATED 2-10-15.
SIGN, UTILITY & ACCESS EASEMENT (L. 43220, P. 811 & L. 37345, P. 192, O.C.R.)
SANITARY MAIN AND EASEMENT PER POWELL ENGINEERING AS-BUILTS, DATED 6-15-26
High Tension Tower
Gas Pipeline Carsonite Markers
Shed
Existing Building #230
Mailbox 230
Hydrant
Valv. 2
Inv. 12" CMP
Inv. 30" CMP
Inv. 30" Steel
Valve SAN
Water MH
Inv. 30" CMP
Hydrant WITH PRESSURE REG
Water MH
Inv. 30" Steel
33' R/W LINE
6" pilaster
(36"UM)
Traf. Sign SIGNAL POST NE
Manhole SIGNAL
St MH
San MH
Sq. CB
Valve
Volve
N01°25'12"E 652.00' (R)
N02°48'00"W 651.91' (M)
S86°48'00"W (C) N88°58'48"W (R) 287.70' (C&R)
S02°14'30"E (C) S01°58'42"W (R) 203.96' (C&R)
L=119.37' (C&R) R=356.47' (C&R) D=19°11'09" (C&R) CH=S14°01'00"W (C) S18°14'12"W (R) 118.81' (C&R)
L=127.93' (C&R) R=1060.72' (C&R) D=06°54'37" (C&R) CH=S19°26'43"W (C) S23°39'55"W (R) 127.85' (C&R)
S23°36'34"W (C) S27°49'46"W (R) 242.55' (C&R)
N86°48'00"E (C) S88°58'48"E (R) 480.35' (M&R)
N86°48'00"E (C) S88°58'48"E (R) 1032.50' (C&R)
S02°48'00"E (C) S01°25'12"W (R) 70.00' (C&R)
Approximate location of 6" S-MP Gas Main as shown on sketch obtained from Consumers Energy website: www.consumersenergy.com/sims
CAUTION GAS MAIN
SAN MH TO BE RAISED TO MEET PROPOSED ELEV.
975.19 Sq. CB
975.25 Sq. CB
975.29 St MH
975.84 San MH
975.77 San MH
979.65 St MH
980.44 St MH
979.86 Manhole SIGNAL
978.79 Sq. CB
978.54 Sq. CB
955.37 San MH
966.31 San MH
968.16 Volve
951.51 Water MH
950.75 Valve
946.94 Inv. 30" CMP
948.45 Inv. 30" Steel
953.78 Inv. 12" CMP
952.63 Inv. 12" CMP
948.07 Inv. 30" CMP
948.61 Inv. 30" Steel
951.37 Water MH
127.4'
14.1'
33.9'
10.1'
1.1'
1.2'
1.3'
1.4'
1.5'
1.6'
1.7'
1.8'
1.9'
2.0'
2.1'
2.2'
2.3'
2.4'
2.5'
2.6'
2.7'
2.8'
2.9'
3.0'
3.1'
3.2'
3.3'
3.4'
3.5'
3.6'
3.7'
3.8'
3.9'
4.0'
4.1'
4.2'
4.3'
4.4'
4.5'
4.6'
4.7'
4.8'
4.9'
5.0'



SEE SHEET 2 FOR GENERAL NOTES AND LEGEND

N

SCALE: 1 INCH = 40 FEET

LEGEND

PROPOSED (PR)	EXISTING (EX)	
900 T/C XXX.XX	~900~ + 922.08	CONTOUR / SPOT ELEVATION
FF	FF	FINISHED FLOOR ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END-SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
SL	SL	SANITARY LEAD
FM	FM	FORCE MAIN
PS	PS	PRESSURE SEWER
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
FO	FO	FIBER OPTIC
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
X	X	FENCE
		SILT FENCE
		WETLAND BOUNDARY
		LIMITS OF GRADING/CLEARING
		MANHOLE
		INLET / CATCHBASIN
		FLARED END-SECTION
		GATE VALVE
		HYDRANT
		UTILITY POLE
		SIGN
TBR	NFV	NOT FIELD VERIFIED TO BE REMOVED
		CONCRETE
		ASPHALT
		PARKING LOT LANDSCAPING

PARKING LOT LANDSCAPE AREA:

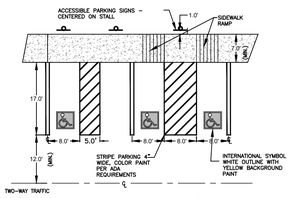
SECTION 5.19.G 20 SFT PER PARKING SPACE X 61 SPACES = 1,220 SFT
REQUIRED PARKING LOT LANDSCAPING

LEGEND
PARKING LOT LANDSCAPE AREA
LABEL

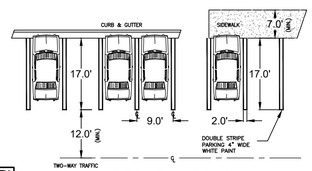
LANDSCAPE AREAS
1. 206 SFT
2. 64 SFT
3. 194 SFT
4. 176 SFT
5. 80 SFT
6. 110 SFT
7. 325 SFT
8. 1,823 SFT
9. 2,042 SFT
10. 101 SFT

White Lake Township Fire Department

Overall Length	40.600ft
Overall Width	9.665ft
Overall Body Height	12.582ft
Min Body Ground Clearance	1.626ft
Track Width	9.665ft
Lock-to-lock time	6.00s
Max Wheel Angle	45.00°



ACCESSIBLE PARKING WITH INTEGRAL SIDEWALK
(NOT TO SCALE)



TYPICAL PARKING SPACE
(NOT TO SCALE)

BUILDING DIMENSIONS TO BE VERIFIED WITH STAMPED ARCHITECTURAL DRAWINGS

SITE DATA:

WHITE LAKE TOWNSHIP
COMBINED PARCELS # 4712-20-402-003 AND # 4712-20-426-003
HIGHLAND ROAD
WHITE LAKE, MI 48383
5.36 AC +/-

ZONING: GENERAL BUSINESS

USE: RETAIL BUILDING SQUARE FOOTAGE (FOOTPRINT): RETAIL WITH DRIVE-THROUGH 8,620 GSF

SINGLE OWNER LEASABLE BUILDING WITH ADDITIONAL DEVELOPABLE SPACE ON THE WEST SIDE OF THE PARCEL. PARCEL TO REMAIN UNDER SINGLE OWNER AT THIS TIME.

MIN. LOT AREA REQUIRED FOR ZONING: 1 ACRE
MIN. LOT WIDTH: 200 FT
TOTAL EX. LOT WIDTH: 485.39
MAX. LOT COVERAGE: 40% BLDG, 85% IMPERVIOUS

MIN. SETBACKS REQUIRED:	PROPOSED SETBACKS
FRONT: 50-FT	FRONT (NORTH): 88.1 FT
	FRONT (EAST): 50.0 FT
REAR: 20-FT	REAR (SOUTH: 487.6 FT
SIDE: 15-FT	SIDE (WEST): 245.2 FT

REQUIRED PARKING:
TENANT #1: (COFFEE SHOP W/ DRIVE-THROUGH)
= 1.0 SPACE PER 75 GROSS FLOOR AREA
2,603 / 75 = 34.70 SPACES ~ 35 SPACES PLUS 8 STACKING SPACES

TENANT #2: (GENERAL RETAIL)
= 1.0 SPACE PER 200 GFA
1,697 GFA / 200 = 8.48 SPACES ~ 8 SPACES

TENANT #3: (GENERAL RETAIL)
= 1.0 SPACE PER 200 GFA
1,745 GFA / 200 = 8.73 SPACES ~ 9 SPACES

TENANT #4: (RESTAURANT)
= 1.0 SPACE PER 100 GFA
2,545 GFA / 100 = 25.45 SPACES ~ 25 SPACES

SPACES REQUIRED: 35 + 8 + 9 + 25 = 77 SPACES AND 8 STACKING SPACES
PROVIDED: 59 SPACES INCLUDING 3 ADA SPACES, PLUS 16 STACKING SPACES

SITE PLAN NOTES

1. VARIANCES TO BE REQUESTED:

   A. VARIANCE FOR PARKING DEFICIENCY – 77 SPACES AND 8 STACKING SPACES REQUIRED. PROPOSED 59 SPACES WITH 16 STACKING SPACES.

   B. VARIANCE FROM ACCESS MANAGEMENT STANDARDS – DISTANCE BETWEEN HIGHLAND ROAD ENTRANCE AND INTERSECTION WITH BOGIE LAKE ROAD CANNOT BE LESS THAN 455 FEET. CURRENT PROPOSED DISTANCE IS 386 FEET.

   C. (SPECIAL USE) DRIVE-THRU REQUIRES A 60-FOOT FRONT YARD SETBACK FROM BOGIE LAKE ROAD R.O.W. THE DRIVE-THRU WINDOW IS MORE THAN 60' FROM THE R.O.W. BUT THE CLOSEST CORNER OF THE BUILDING IS 50 FEET. REQUEST ZONING BOARD OF APPEALS MAKES AN INTERPRETATION ALLOWING THE SETBACK AS PROPOSED BEING CONFORMING TO THE 60-FOOT FRONT YARD SETBACK TO THE DRIVE THRU WINDOW.

   D. (SPECIAL USE) VARIANCE FOR HIGHLAND ROAD DRIVEWAY LOCATED LESS THAN 200 FEET FROM THE RESIDENTIAL ZONING DISTRICT TO THE WEST.

2. ACCESS DRIVE SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF FIRE APPARATUS AND SHALL BE SURFACED SO AS TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES.

3. THE OUTDOOR DINING MAY OPERATE ONLY DURING THE FOLLOWING HOURS:
   M-TH: 8:00AM TO 12:00AM (MIDNIGHT),
   FRIDAY: 8:00 AM TO 2:00 AM,
   SATURDAY: 10:00 AM TO 2:00 AM
   SUNDAY: 10:00 AM TO 10:00 PM

4. PARKING SPACES AT THE SOUTH END OF THE SITE SHALL BE DESIGNATED/MARKED AS EMPLOYEE PARKING.

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS IS NOT GUARANTEED TO BE COMPLETE OR ACCURATE. THEREFORE, THE CONTRACTOR SHALL DETERMINE FOR HIMSELF THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES BEFORE BEGINNING ANY CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE PLANS AND THE LOCATION OR DEPTH OF UTILITIES.

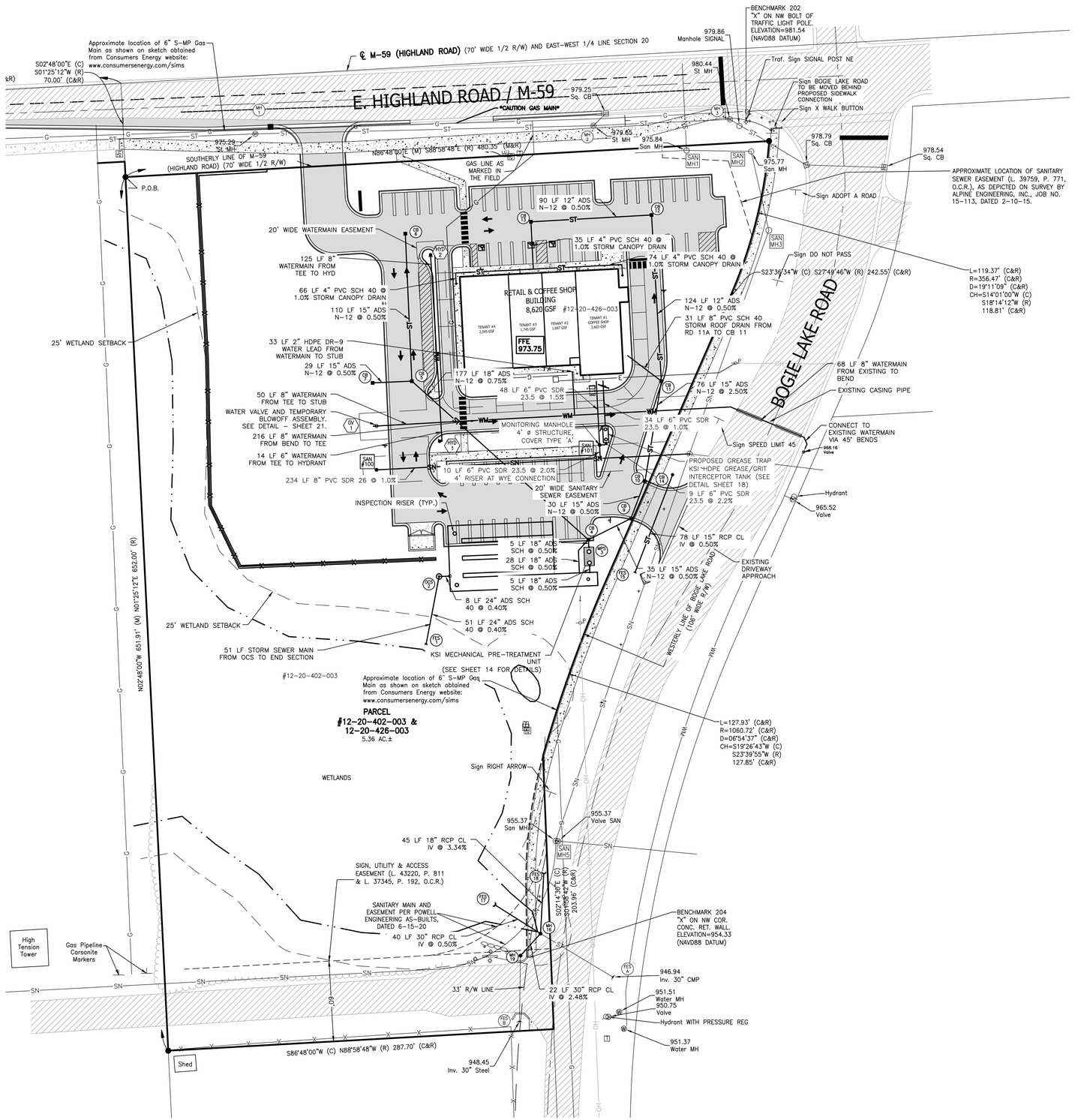
3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
(IT'S THE LAW) (IT'S A GOOD IDEA) FOR NON-MEMBERS OF MISSDIG NOTIFY

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING
PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000
TITLE: SITE PLAN

NO	BY	REVISION PER	DATE
1	MJD	MDOT COMMENTS	7/9/24
2	MJD	TOWNSHIP COMMENTS	8/6/24

DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY: BL
SCALE: 1" = 40'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 4



SEE SHEET 2 FOR GENERAL NOTES AND LEGEND

LEGEND

PROPOSED (PR)	EXISTING (EX)	
900 T/C	~900~	CONTOUR
XXX.XX	+ 922.08	SPOT ELEVATION
FF	FF	FINISHED FLOOR ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END-SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
SL	SL	SANITARY LEAD
FM	FM	FORCE MAIN
PS	PS	PRESSURE SEWER
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
FO	FO	FIBER OPTIC
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
X	X	FENCE
		SILT FENCE
		WETLAND BOUNDARY
		LIMITS OF GRADING/CLEARING
		MANHOLE
		INLET / CATCHBASIN
		FLARED END-SECTION
		GATE VALVE
		HYDRANT
		UTILITY POLE
TBR	NFV	SIGN
		NOT FIELD VERIFIED TO BE REMOVED
SAN #1		SANITARY SEWER LABEL
STR 01		STORM SEWER LABEL
GV 12		WATER MAIN LABEL
547		SOIL EROSION CONTROL MEASURE (P=PERMANENT, T=TEMPORARY)
		CONCRETE
		ASPHALT
		MODIFIED CURB

N

SCALE: 1 INCH = 40 FEET

SITE BENCHMARKS (NAVD88 DATUM):

–BM #200 = SET NAIL WITH TAG N/S POWER POLE. ELEV.=970.67

–BM #201 = SET NAIL WITH TAG W/S POWER POLE. ELEV.=973.22

–BM #202 = "X" ON NW BOLT OF TRAFFIC LIGHT POLE. ELEV.=981.54

–BM #204 = "X" ON NW CORNER CONCRETE RETAINING WALL. ELEV.=954.33

SANITARY SEWER FLOW CALCS

PROJECT **JOB:** 22-029

By: MJD **Date:** 7/29/2024

SANITARY SEWER BASIS OF DESIGN:	NUMBER OF UNITS	TOTAL REU
COFFEE SHOP (2.6 REU)	1	2.6
RESTURANT (2.4 REU PER 1000 SF)	2545	6.11
RETAIL (0.2 REU PER 1000 SF)	3442	0.69
FURTURE DRIVETHROUGH (7.5 REU)	1	7.50
	TOTAL	9

Average Flow

$Q_{avg.}$ = 260 Gal. Per REU per day (assumed)

$Q_{avg.}$ = **2,264** GPD

$Q_{avg.}$ = 1day / 86,400 sec **0.0262** gps x 1 ft³ / 7.48 gal = **0.0035** cfs

$Q_{avg.}$ = x 60 min / sec **1.57** gpm x 1 ft³ / 7.48 gal = **0.21** cfm

Peak Flow

Peaking Factor = $\frac{18 + \sqrt{(population/1000)}}{4 + \sqrt{(population/1000)}}$

In order to determine the population to use in this equation
Convert the Avg. Daily Flow of 2,264 GPD to equivalent population

Assume: 100 GPCD

Equivalent Population = 2,264 GPD/100 GPCD = 22.6408 persons

Peaking Factor = $\frac{18 + \sqrt{(POP./1000)}}{4 + \sqrt{(POP./1000)}}$ = **4.37**

$Q_{peak.} = Q_{avg.}$ x Peaking Factor

$Q_{peak.}$ = **6.88** gpm which is equivalent to **0.02** cfs

CAPACITY OF 8" SANITARY SEWER @ 1.00% SLOPE

USE MANNING'S EQUATION

$Q = 1.49/n \times A \times R_h^{2/3} \times S^{1/2}$

$Q = (1.49/0.013) \times (0.349) \times (0.167)^{2/3} \times (0.01)^{1/2}$

Q = 1.212 CFS

CONCLUSION:

SINCE CAPACITY OF THE 8-INCH SEWER AT A SLOPE OF 1.00% IS GREATER THAN PEAK FLOW, A 8-INCH SEWER IS SUFFICIENT

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS ARE APPROXIMATE AND NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT OCCUR BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY UTILITIES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND BETWEEN THE PLANS AND THE LOCATION OR DEPTH OF ANY UTILITY. DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 IT'S THE LAW!!! (P.A. 53 OF 1974, as amended) MEMBER NUMBER

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING

PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

TITLE: UTILITY PLAN

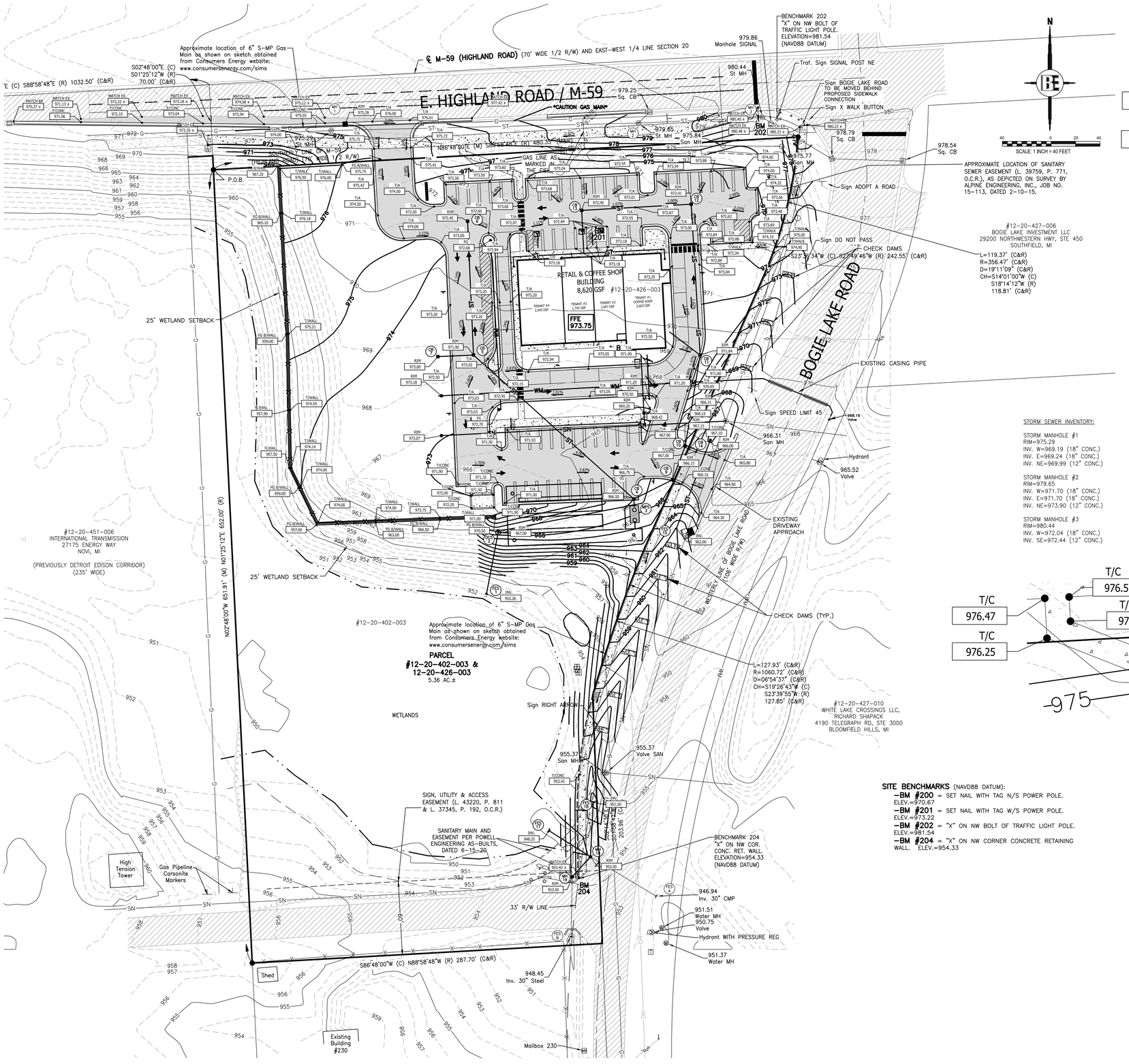
NO	BY	REVISION PER	DATE
1	MJD	MDOT COMMENTS	7/9/24
2	MJD	TOWNSHIP COMMENTS	8/6/24

DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: 1" = 40'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 5

BOSS Engineering

G:\22-029\DWG\CP\22-029-1 SHEETS CP.dwg, 8/6/2024 11:59:49 AM, marcusd, AutoCAD PDF (General Documentation).pc3

SEE SHEET 2 FOR GENERAL NOTES AND LEGEND



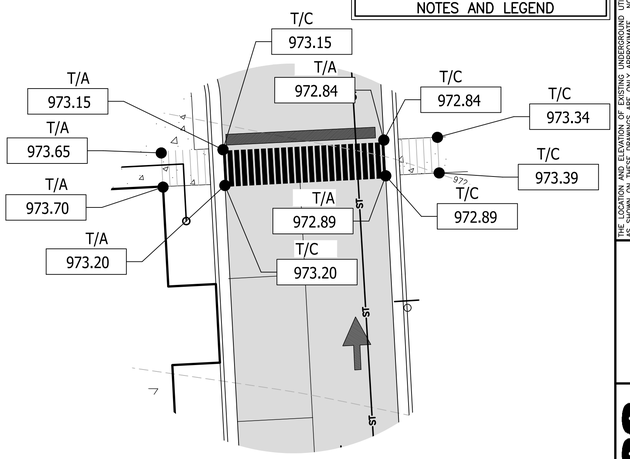
STORM SEWER INVENTORY:

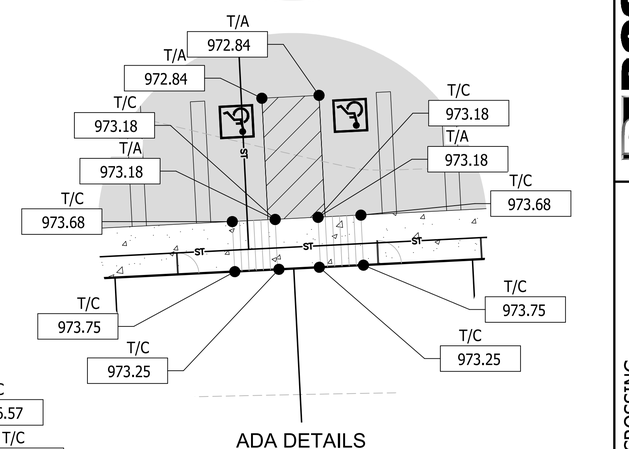
STORM MANHOLE #1
RIM=975.29
INV. W=969.19 (18" CONC.)
INV. E=969.24 (18" CONC.)
INV. NE=969.99 (12" CONC.)

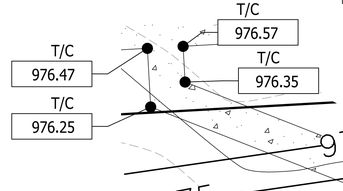
STORM MANHOLE #2
RIM=979.65
INV. W=971.70 (18" CONC.)
INV. E=971.70 (18" CONC.)
INV. NE=973.90 (12" CONC.)

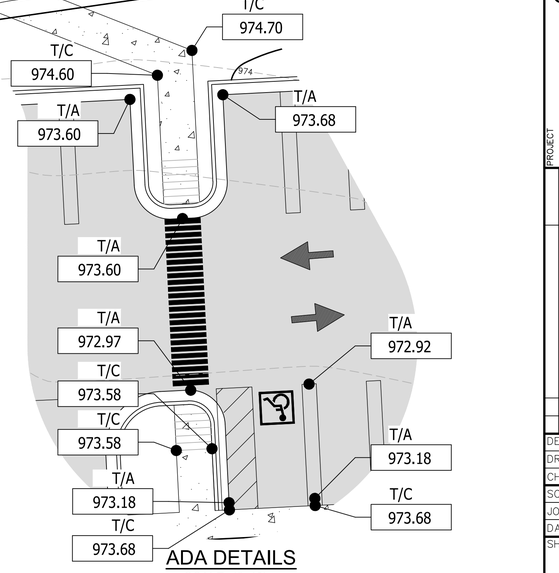
STORM MANHOLE #3
RIM=980.44
INV. W=972.04 (18" CONC.)
INV. SE=972.44 (12" CONC.)

SITE BENCHMARKS (NAVD88 DATUM):
- **BM #200** = SET NAIL WITH TAG N/S POWER POLE. ELEV.=970.67
- **BM #201** = SET NAIL WITH TAG W/S POWER POLE. ELEV.=973.22
- **BM #202** = "X" ON NW BOLT OF TRAFFIC LIGHT POLE. ELEV.=981.54
- **BM #204** = "X" ON NW CORNER CONCRETE RETAINING WALL. ELEV.=954.33









THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS IS APPROXIMATE AND NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL LOCATE AND ELEVATE ALL UTILITIES AND PROPOSED CONSTRUCTION AND SHALL DETERMINE IF ANY CONFLICTS EXIST. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FROM THE PLANS. IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
IT'S THE LAW!!! (P.A. 53 OF 1974, as amended)
MEMBER NOTIFICATION NUMBER

BE BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT
GATEWAY CROSSING

PREPARED FOR
GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

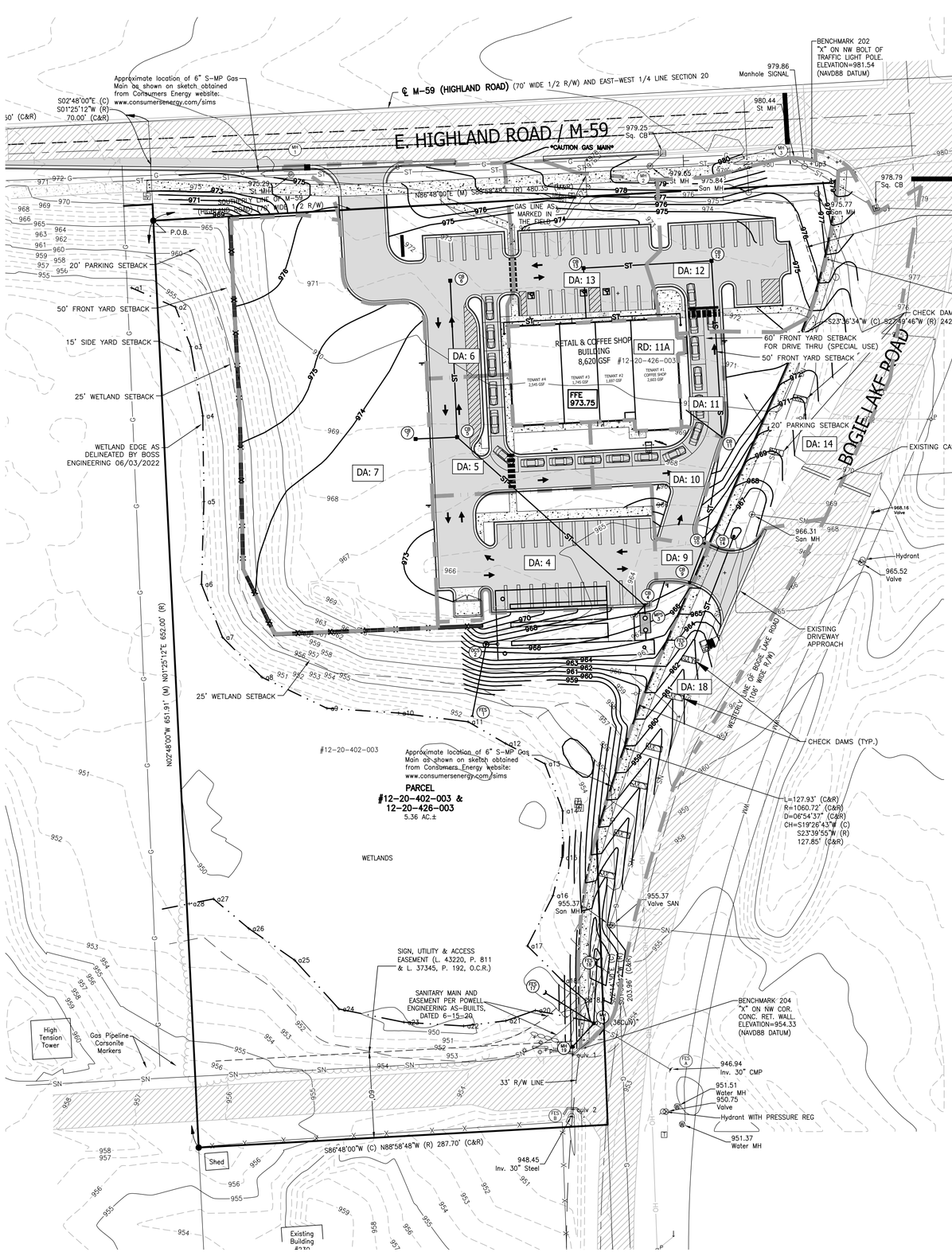
TITLE
GRADING PLAN

NO	BY	REVISION PER	DATE
2	MJD	TOWNSHIP COMMENTS	8/6/24
1	MJD	MDOT COMMENTS	7/9/24

DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: 1" = 40'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 6

BOSS Engineering

G:\22-029\DWG\CP\22-029-1 SHEETS CP.dwg, 8/6/2024 11:59:53 AM, marcusd, AutoCAD PDF (General Documentation).pc3



SEE SHEET 2 FOR GENERAL NOTES AND LEGEND

STORMWATER NARRATIVE

EXISTING: THE EXISTING SITE IS A HEAVILY SLOPED SITE WITH A WETLAND IN THE SOUTHWEST. THE SITE DRAINS TO THE SOUTH EITHER TO THE WETLAND OR TO A SERIES OF CULVERTS IN THE SOUTH WITH AN ULTIMATE OUTLET TO THE SOUTHEAST THROUGH A 30" CMP PIPE.

PROPOSED: THE PROPOSED SITE WILL UTILIZE A SERIES OF STORM STRUCTURES IN ORDER TO BRING ALL RUNOFF TO THE PROPOSED BASIN IN THE SOUTH. THE STORM SYSTEM WILL UTILIZE A MECHANICAL PRETREATMENT STRUCTURE IN REPLACEMENT OF A FOREBAY AND DRAIN INTO THE BASIN WHERE IT WILL EVENTUALLY OUTLET TO THE WETLAND TO THE SOUTH. THE SYSTEM IS SET TO HANDLE THE RUNOFF EXPECTED FROM DEVELOPMENT OF THE WEST SIDE OF THE SITE AS WELL AS THE ENTIRE SITE PROPOSED. ONCE AGAIN, THE WETLAND WILL ULTIMATELY OUTLET VIA A 30" RCP PIPE TO THE SOUTHEAST.

LEGEND

PROPOSED (PR)	EXISTING (EX)	
900	900	CONTOUR
T/C XXX.XX	922.08	SPOT ELEVATION
FF	FF	FINISHED FLOOR ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END-SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
SL	SL	SANITARY LEAD
FM	FM	FORCE MAIN
PS	PS	PRESSURE SEWER
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
FO	FO	FIBER OPTIC
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
X	X	FENCE
		SILT FENCE
		WETLAND BOUNDARY
		LIMITS OF GRADING/CLEARING
		MANHOLE
		INLET / CATCHBASIN
		FLARED END-SECTION
		GATE VALVE
		HYDRANT
		UTILITY POLE
		SIGN
TBR	NFV	NOT FIELD VERIFIED TO BE REMOVED
SAN P1		SANITARY SEWER LABEL
STR 01		STORM SEWER LABEL
GV 12		WATER MAIN LABEL
547		SOIL EROSION CONTROL MEASURE (P=PERMANENT, T=TEMPORARY)
		CONCRETE
		ASPHALT
		MODIFIED CURB

DRAINAGE AREA TABLE

DRAINAGE AREA TABLE (TRIBUTARY TO BASIN)				
DRAINAGE AREA	TOTAL AREA (AC)	IMP. AREA (AC)	C VALUE	A*C
4	0.30	0.25	0.83	0.25
5	0.17	0.15	0.85	0.14
6	0.35	0.28	0.81	0.28
7	0.81	0.76	0.91	0.73
9	0.02	0.02	0.95	0.02
10	0.11	0.09	0.79	0.09
11	0.05	0.04	0.85	0.04
11A	0.20	0.20	0.95	0.19
12	0.31	0.14	0.55	0.17
13	0.24	0.16	0.69	0.17
13B	0.00	0.00	0.95	0.00
13C	0.00	0.00	0.95	0.00
TOTAL	**2.56**	**2.10**	**0.81**	**2.08**
DRAINAGE AREA TABLE (NOT-TRIBUTARY TO BASIN)				
14	0.47	0.19	0.50	0.24
18	0.40	0.17	0.53	0.21

FUTURE DRAINAGE AREA REPRESENTS ESTIMATED AREA TO BE CONSTRUCTED ON THE WEST SIDE OF THE SITE FLOWING THROUGH CB 7

SEE SHEET 13 FOR BASIN DETAIL & STORM DRAINAGE CALCULATIONS

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS ARE APPROXIMATE AND NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL UTILITIES BEFORE COMMENCING WORK AND SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES FROM THE PLANS. IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS, NOTIFY THE ENGINEER IF ANY CONFLICTS ARE ANTICIPATED.

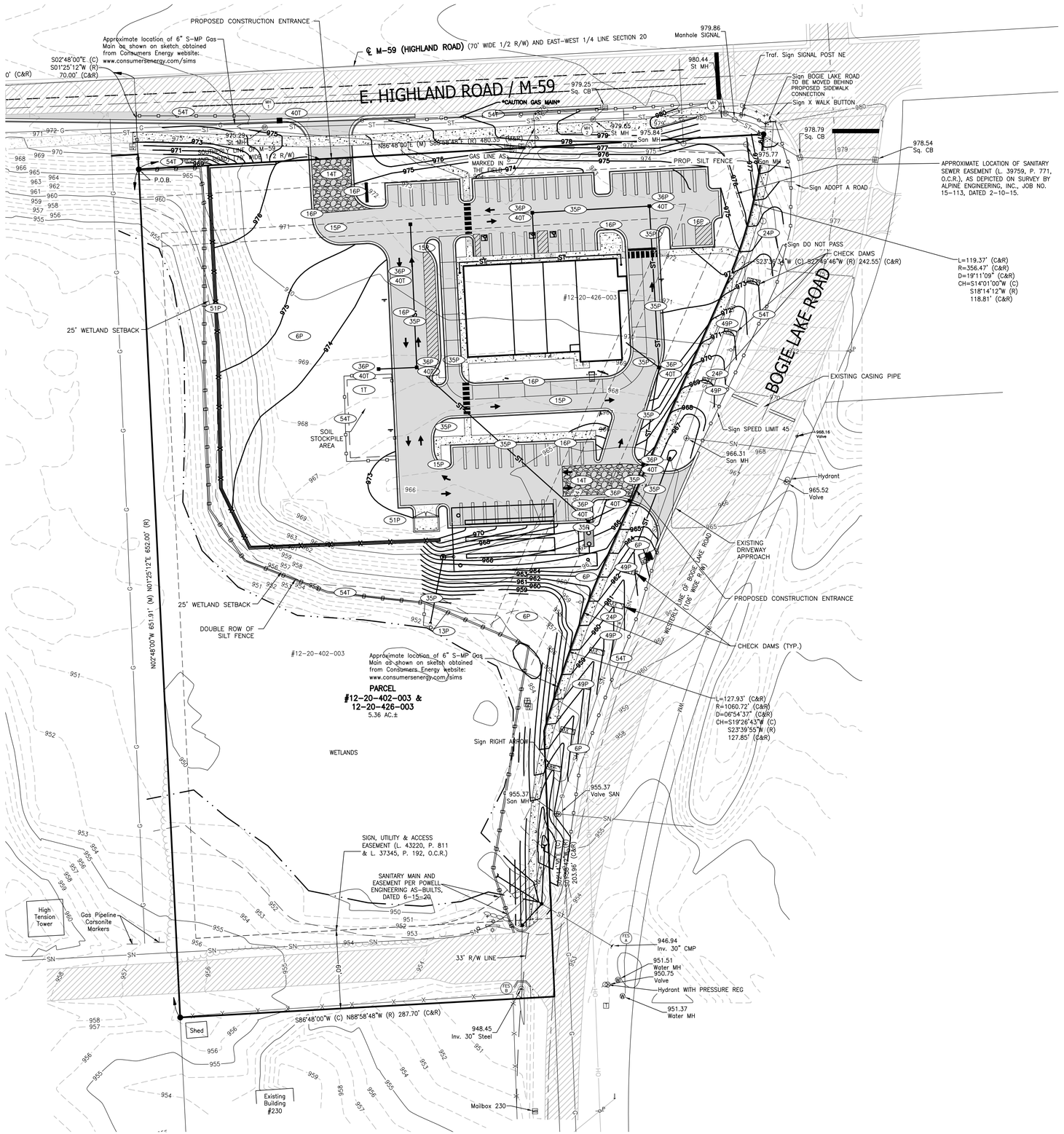
3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
IT'S THE LAW!!! (MICHIGAN PUBLIC ACT 53 OF 1974, AS AMENDED) FOR THE LOCATION OF UNDERGROUND FACILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING
PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000
TITLE: DRAINAGE PLAN

NO	BY	DATE	REVISION PER
2	MJD	8/6/24	TOWNSHIP COMMENTS
1	MJD	7/9/24	MDOT COMMENTS

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE: 1" = 40'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 7



SEE SHEET 2 FOR GENERAL NOTES AND LEGEND

N

SCALE: 1 INCH = 40 FEET

NRCS EXISTING SOILS DATA:

B	FOX SANDY LOAM, 2-6% SLOPES
BtD	SEBEWA LOAM, 0-2% SLOPES
AtD	HOUGHTON & ADRIAN MUCK
B	FOX-RIDDLES SANDY LOAM, 6-12% SLOPES
A	UDIPSAMMENTS, UNDULATING

LEGEND

PROPOSED (PR)	EXISTING (EX)	
900 T/C XXX.XX	900 922.08	CONTOUR / SPOT ELEVATION
FF	FF	FINISHED FLOOR ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END-SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
SL	SL	SANITARY LEAD
FM	FM	FORCE MAIN
PS	PS	PRESSURE SEWER
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
FO	FO	FIBER OPTIC
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
X	X	FENCE
		SILT FENCE
		WETLAND BOUNDARY
		LIMITS OF GRADING/CLEARING
		MANHOLE
		INLET / CATCHBASIN
		FLARED END-SECTION
		GATE VALVE
		HYDRANT
		UTILITY POLE
		SIGN
TBR	NFV	NOT FIELD VERIFIED / TO BE REMOVED
SN 1"		SANITARY SEWER LABEL
SR 81		STORM SEWER LABEL
GV 12		WATER MAIN LABEL
54T		SOIL EROSION CONTROL MEASURE (P=PERMANENT, T=TEMPORARY)
		CONCRETE
		ASPHALT
		MODIFIED CURB

1	STRIPPING & STOCKPILING TOPSOIL	TOPSOIL MAY BE STOCKPILED ABOVE BORROW AREAS TO ACT AS A DIVERSION STOCKPILE SHOULD BE TEMPORARILY SEEDED
6	SEEDING WITH MULCH AND/OR MATTING	FACILITATES ESTABLISHMENT OF VEGETATIVE COVER EFFECTIVE FOR DRAINAGEWAYS WITH LOW VELOCITY EASILY PLACED IN SMALL QUANTITIES BY INEXPERIENCED PERSONNEL SHOULD INCLUDE PREPARED TOPSOIL BED
13	RIP-RAP, RUBBLE, GABIONS	USED WHERE VEGETATION IS NOT EASILY ESTABLISHED EFFECTIVE FOR HIGH VELOCITIES OR HIGH CONCENTRATIONS PERMITS RUNOFF TO INFILTRATE SOIL DISSIPATES ENERGY FLOW AT SYSTEM OUTLETS
14	AGGREGATE COVER	STABILIZES SOIL SURFACE, THUS MINIMIZING EROSION PERMITS CONSTRUCTION TRAFFIC IN ADVERSE WEATHER MAY BE USED AS PART OF PERMANENT BASE CONSTRUCTION OF PAVED AREAS
15	PAVING	PROTECTS AREAS WHICH CANNOT OTHERWISE BE PROTECTED, BUT INCREASES RUNOFF VELOCITY IRREGULAR SURFACE WILL HELP SLOW VELOCITY
16	CURB & GUTTER	KEEPS HIGH VELOCITY RUNOFF ON PAVED AREAS FROM LEAVING PAVED SURFACE COLLECTS AND CONDUCTS RUNOFF TO ENCLOSED DRAINAGE SYSTEM OR PREPARED DRAINAGEWAY
24	GRASSED WATERWAY	MUCH MORE STABLE FORM OF DRAINAGEWAY THAN BARE CHANNEL GRASS TENDS TO SLOW RUNOFF AND FILTER OUT SEDIMENT USED WHERE BARE CHANNEL WOULD BE ERODED
35	STORM SEWER (CB, CB)	SYSTEM REMOVES COLLECTED RUNOFF FROM SITE, PARTICULARLY FROM PAVED AREAS CAN ACCEPT LARGE CONCENTRATIONS OF RUNOFF CONDUCTS RUNOFF TO MUNICIPAL SEWER SYSTEM OR STABILIZED OUTFALL LOCATION USE CATCH BASINS TO COLLECT SEDIMENT
36	CATCH BASIN, DRAIN INLET	COLLECTS HIGH VELOCITY CONCENTRATED RUNOFF MAY USE FILTER CLOTH OVER INLET
40	INLET SEDIMENT FILTER	EASY TO SHAPE COLLECTS SEDIMENT MAY BE CLEANED AND EXPANDED AS NEEDED
49	CHECK DAMS	REDUCES FLOW VELOCITY CATCHES SEDIMENT CAN BE CONSTRUCTED OF LOGS, STRAW, HAY, ROCK, LUMBER, MASONRY OR SAND BAGS
51	RETAINING WALL	REDUCES GRADIENT WHERE SLOPES ARE EXTREMELY STEEP PERMITS RETENTION OF EXISTING VEGETATION, KEEPING SOIL STABLE IN CRITICAL AREAS MINIMUM MAINTENANCE
54	SILT FENCE	USES GEOTEXTILE FABRIC AND POST OR POLES. EASY TO CONSTRUCT AND LOCATE AS NECESSARY. (SEE DETAIL THIS SHEET)

P = PERMANENT T = TEMPORARY

AREA OF DISTURBANCE = 159,061 SF (3.66 ACRES)

SOIL EROSION CONTROL NOTES:

1. A SOIL EROSION CONTROL PERMIT SHALL BE OBTAINED FROM THE OCWRC PRIOR TO CONSTRUCTION.
2. SEE CONSTRUCTION AND EROSION CONTROL DETAILS ON SHEET 22 FOR ADDITIONAL OAKLAND COUNTY TEMPORARY CONTROLS REQUIREMENTS.
3. APPROPRIATE SOIL EROSION CONTROL MEASURES SHALL BE ESTABLISHED PRIOR TO CONSTRUCTION AND CONTINUOUSLY MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION HAS BEEN RE-ESTABLISHED.
4. ANY MUD OR DEBRIS TRACKED ONTO ANY STREET ADJACENT TO THE PROJECT SHALL BE REMOVED IMMEDIATELY. IF A TOWNSHIP AGENT REQUESTS IN WRITING THAT THE ROAD BE CLEANED, THE PROPRIETOR WILL HAVE 12 HOURS TO CLEAN IT. IF IT IS NOT CLEANED WITHIN 12 HOURS, THE TOWNSHIP WILL HIRE IT TO BE COMPLETED AND INVOICE THE PROPRIETOR BEFORE THE PERFORMANCE BOND IS RELEASED.
5. CATCH BASIN INLET PROTECTION SHALL BE INSTALLED ON ALL NEW INLETS AS THEY ARE CONSTRUCTED.

PROPOSED CONST. SCHEDULE FOR THE YEAR 2024–2025

ACTIVITY	OCT	NOV	DEC	APRIL	MAY	JUNE	JULY	AUG
SESC ITEMS, CLEAR, GRUB								
ROUGH GRADING								
UNDERGROUND UTILITY								
BUILDING DEMO/CONST.								
PAVING								
LANDSCAPING								
SEED & MULCH								
SESC CLOSEOUT								

CONTROLS & MEASURES POST CONSTRUCTION SEQUENCE

ACTIVITY	WEEKLY	MONTHLY	AS REQUIRED
MAINTAIN LANDSCAPING, REPLACE MULCH	X	X	X
CLEAN INLETS		X	X
COLLECT LITTER	X		X
SWEEP PARKING LOT		X	X

CONTROLS & MEASURES NARRATIVE

ACTIVITY	DESCRIPTION
MAINTAIN LANDSCAPING, REPLACE MULCH	COLLECT GRASS, TREE, AND SHRUB CLIPPINGS. DISPOSE IN APPROVED CONTAINER. REPLACE DEAD SOD, TREES AND SHRUBS.
CLEAN INLETS	REMOVE LITTER, SEDIMENT, AND DEBRIS. DISPOSE OF IN APPROVED LANDFILL.
COLLECT LITTER	DISPOSE OF WITH INLET DEBRIS.
SWEEP PARKING LOT	REMOVE MUD, DIRT, GREASE AND OIL WITH PERIODIC SWEEPING
DUST CONTROL	SPRINKLE WATER AS NEEDED

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS IS BELIEVED TO BE APPROXIMATE AND IS NOT GUARANTEED TO BE EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL DETERMINE FOR HIMSELF THE EXACT LOCATION OF ALL UTILITIES AND PROPOSED LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES AS SHOWN ON THESE PLANS BEFORE BEGINNING ANY WORK. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE PLANS AND THE LOCATION OR DEPTH OF UTILITIES FROM THE PLANS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE PLANS AND THE LOCATION OR DEPTH OF UTILITIES FROM THE PLANS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE PLANS AND THE LOCATION OR DEPTH OF UTILITIES FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 OR 811

BE BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING

PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

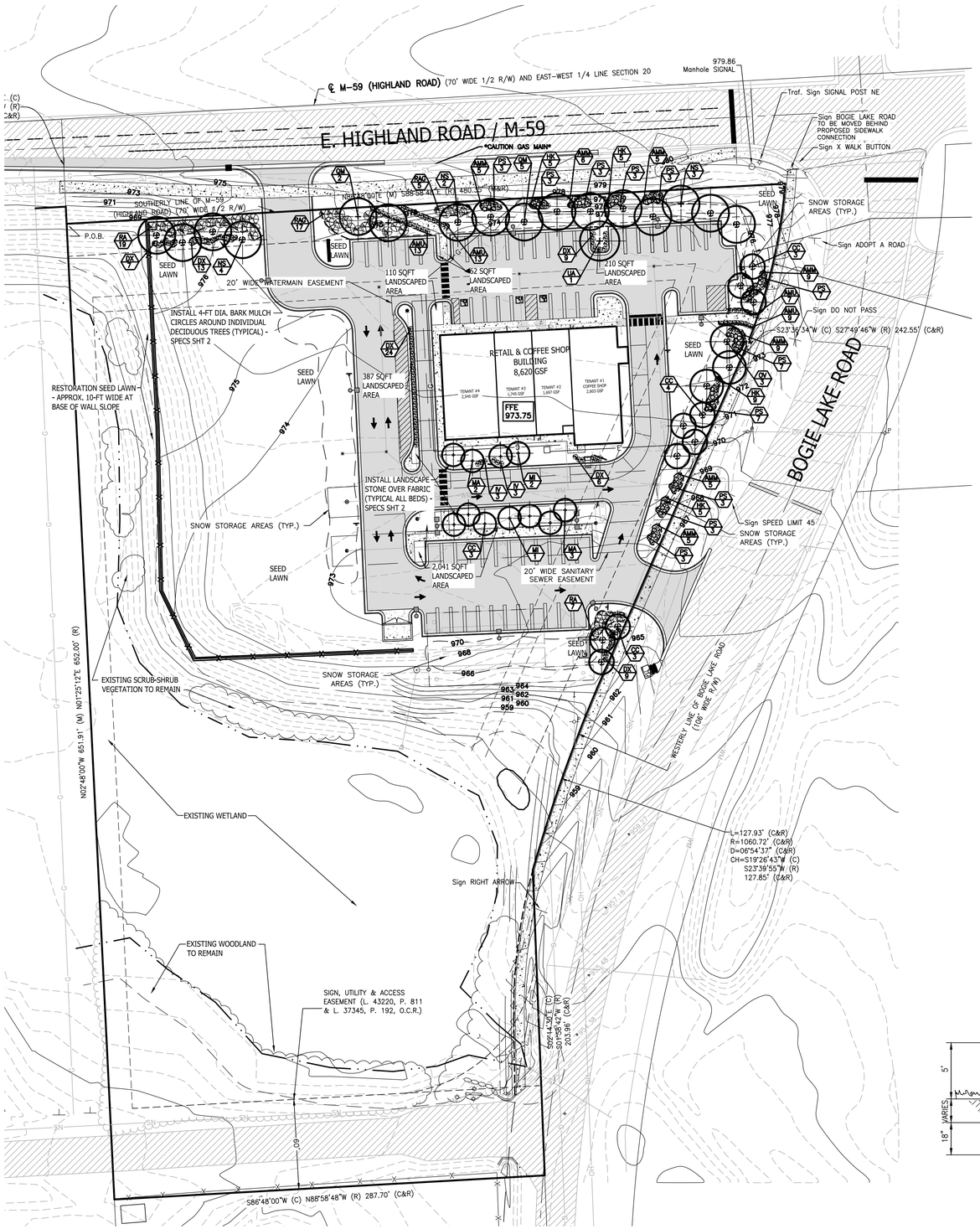
TITLE: SOIL EROSION & SEDIMENTATION PLAN

NO	BY	REVISION PER	DATE
1	MJD	MDOT COMMENTS	7/9/24
2	MJD	TOWNSHIP COMMENTS	8/6/24

DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: 1" = 40'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 8

BOSS Engineering

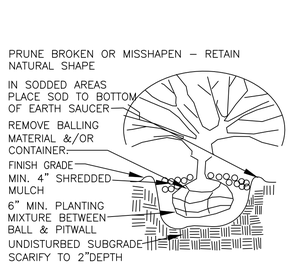
SEE SHEET 2 FOR GENERAL NOTES AND LEGEND



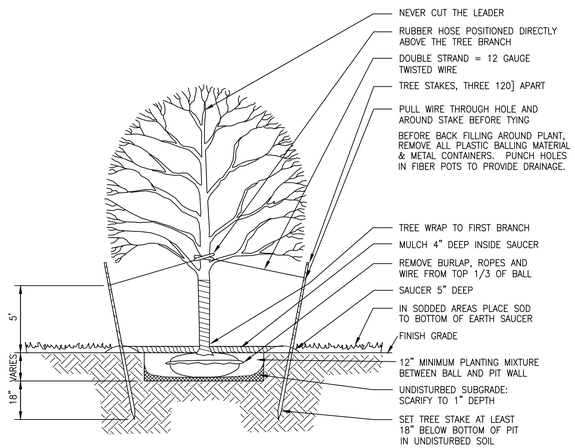
SUPPLEMENTAL LANDSCAPE NOTES

1. REFER TO GENERAL NOTES SHEET 2 FOR PROJECT LANDSCAPE NOTES INCLUDING LANDSCAPE IRRIGATION REQUIREMENTS AND PLANT WARRANTIES
2. ANY SUBSTITUTIONS OF PLANT MATERIAL FROM THE APPROVED SITE PLAN WILL BE APPROVED BY THE PLANNING DEPARTMENT PRIOR TO INSTALLATION.
3. NO TREES SHALL BE PLANTED CLOSER THAN 4-FT TO ANY PROPERTY LINE.

KEY	QUAN.	BOTANICAL NAME	COMMON NAME	SIZE	REMARK
DECIDUOUS TREES					
CC	13	Carpinus caroliniana 'Uxbridge'	Rising Fire American Hornbeam	2–1/2"	cal. B–B
NS	9	Nyssa Sylvatica	Blackgum	2–1/2"	cal. B–B
OV	3	Ostrya virginiana 'JFS–KW5'	Autumn Treasure Hophornbeam	2–1/2"	cal. B–B
MA	5	Malus 'Adirondack'	Adirondack Flowering Crab	2–1/2"	cal. B–B
MI	1	Malus ioensis 'Prairie Rose'	Prairie Rose Flowering Crab	2–1/2"	cal. B–B
QM	7	Quercus macrocarpa 'JFS–KW3' PP 22815	Urban Pinnacle Oak	2–1/2"	cal. B–B
UA	1	Ulmus americana 'Princeton'	Princeton Elm	2–1/2"	cal. B–B
DECIDUOUS SHRUBS					
AMM	43	Aronia melanocarpa 'Autumn Magic'	Autumn Magic Black Chokeberry	30" ht./#5	Cont.
AMU	41	Aronia melonocarpa 'UCONNAM165'	Low Scape Mound Black Chokeberry	30" ht./#5	Cont.
DX	68	Diervilla 'G2X88544'	Kodiak Orange Diervilla	30" ht./#5	Cont.
HK	21	Hypericum kalmianum 'Ames'	Ames St. John's Wort	30" ht./#5	Cont.
IV	7	Itea virginica 'Spirch'	Little Henry Sweetspire	30" ht./#5	Cont.
RAG	22	Rhus aromatica 'Gro–Low'	Gro–Low Fragrant Sumac	30" ht./#5	Cont.
RA	42	Rhus aromatica 'Fine Textured Compact Select A'	Lacette Fragrant Sumac	30" ht./#5	Cont.
CONIFER SHRUBS					
PS	45	Pinus strobus 'Niagara Falls'	Niagara Falls Eastern White Pine	36" ht./#5	Cont.



SHRUB PLANTING DETAIL
(NO SCALE)



DECIDUOUS TREE PLANTING DETAIL
(NO SCALE)

ZONED: GENERAL BUSINESS (GB)

ADJACENT ZONING:
NORTH: M-59 ROW - (E) GREENBELT REQUIRED
EAST: BOGIE LAKE RD ROW - (E) GREENBELT REQUIRED
SOUTH: SUBURBAN FARMING (SF) - (A-2 OR B&D OR C REQUIRED)
WEST: SUBURBAN FARMING (SF) - (A-2 OR B&D OR C REQUIRED)

LANDSCAPE ORDINANCE REQUIREMENTS (SECTION 5.19):

(C) SCREENING - GREENBELT: MIN. 20 FT. WIDTH; 1 LARGE DECIDUOUS OR EVERGREEN TREE + 8 SHRUBS / 30 LFT. GREEN BELTS MAY BE SUBSTITUTED IN PART WITH A 2.5-FT HGT MASONRY SCREEN WALL + 5-FT WIDTH GREENBELT - AT THE DISCRETION OF THE PLANNING COMMISSION.

(E) INTERIOR LANDSCAPING REQUIREMENTS:
MIN. 15% OF THE TOTAL LOT AREA. AREAS SHALL BE GROUPED NEAR ALL BUILDING ENTRANCES, BUILDING FOUNDATIONS, PEDESTRIAN WALKWAYS, SERVICE AREAS, ADJACENT TO FENCES, WALLS, OR RIGHTS OF WAY.
1 LARGE DECIDUOUS, SMALL ORNAMENTAL DECIDUOUS, OR EVERGREEN TREE + 5 SHRUBS / 300 SQFT OF AREA.

(G) PARKING LOT LANDSCAPING (LOTS OVER 10 SPACES):
COMMERCIAL/OFFICE USES - 20 SQFT OF LANDSCAPE AREA / SPACE +
1 LARGE DECIDUOUS TREE OR SMALL DECIDUOUS ORNAMENTAL TREE + 3 SHRUBS / 100 SQFT OF LANDSCAPE AREA.
PLANTING ISLANDS CONTAINING TREES SHALL BE CURBED, MIN 5-FT WIDE & MIN 50 SQFT

LANDSCAPE CALCULATIONS:

HIGHLAND ROAD GREENBELT REQUIREMENT:
480 LFT / 30 = 16 LARGE DECIDUOUS OR EVERGREEN TREES + (16 x 8) 128 SHRUBS

BOGIE LAKE ROAD GREENBELT REQUIREMENT:
630 LFT / 30 = 21 LARGE DECIDUOUS OR EVERGREEN TREES + (21 x 8) 168 SHRUBS

INTERIOR LANDSCAPING REQUIREMENTS:
LOT AREA = 216,187 NET (NOT INCL ENTRANCE DRIVE R.O.W. EASEMENT)
216,187 X 0.15 = 32,428 SQFT REQUIRED LANDSCAPE AREA
32,428 / 300)= 108 LARGE DECIDUOUS, SMALL ORNAMENTAL, OR EVERGREEN TREES + (108 x 5) 540 SHRUBS

PARKING LOT LANDSCAPING:
59 TOTAL PARKING SPACES PROPOSED AT 20 SQFT/SPACE
20 X 59 = 1,180 SQFT OF LANDSCAPING +
1,180 / 100 = 12 LARGE DECIDUOUS TREES OR SMALL ORNAMENTAL TREES + (12 x 3) = 36 SHRUBS

PROVIDED:

HIGHLAND ROAD GREENBELT: 16 DECIDUOUS TREES PROVIDED + 128 SHRUBS

BOGIE LAKE ROAD GREENBELT: DUE TO LIMITATIONS OF SEVERAL UTILITY EASEMENTS, WETLAND & SIDEWALK ENCROACHMENTS INTO POTENTIAL PLANTING AREAS, PROPOSE LANDSCAPING OF DEVELOPED PORTION ONLY.
= 400 LFT = 400 / 30 = 13 DECIDUOUS TREES + (13 x 3) 104 SHRUBS

INTERIOR LANDSCAPING - REQUEST WAIVER FROM REQUIREMENT: A LARGE WETLAND AND WOODED AREA ARE TO REMAIN. THIS CONSTITUTES APPROXIMATELY 100,300 SQFT OF OPEN SPACE OR 46.4% OF THE OVERALL SITE AND INCLUDES APPROXIMATELY 40-55 MATURE EXISTING TREES. REQUEST WAIVER AS ALLOWED UNDER SECTIONS 5.19 (B) vi AND (C) v.

PARKING LOT LANDSCAPING: 12 DECIDUOUS TREES, 36 SHRUBS AND 2,810 SQFT OF LANDSCAPE AREAS

SCREENING TO WEST & SOUTH - REQUEST WAIVER FROM REQUIREMENTS:
TO THE SOUTH - A LARGE WETLAND WILL REMAIN ON THE PROPERTY ALONG WITH A HEAVILY WOOD BORDER BEFORE THE ENTRANCE TO THE ADJACENT DEVELOPMENT. THE WETLAND EXTENDS APPROX. 275-FT SOUTH OF THE DEVELOPED PORTION OF THE SITE AND THE WOODLAND IS ANOTHER 25-FT TO 125-FT IN WIDTH TO THE DRIVE. THIS IS PROPOSED TO PROVIDE AN EQUIVALENT BUFFER IN WIDTH AND DENSITY TO REQUIREMENTS.

TO THE WEST - SIMILARLY A LARGE WETLAND WILL REMAIN ON THE PROPERTY AND THIS WETLAND EXTENDS BEYOND PROPERTY ANOTHER APPROX. 900-FT ALONG M-59. A HIGH-VOLTAGE UTILITY CORRIDOR IS ALSO INCLUDED IN THIS AREA THAT PRECLUDES DEVELOPMENT ANY CLOSER THAN THE EXISTING 400-FT FROM THE PROPOSED DEVELOPED AREA. THIS IS PROPOSED TO PROVIDE AN EQUIVALENT BUFFER TO REQUIREMENTS.

REQUEST A WAIVER / REDUCTION OF REQUIRED LANDSCAPING TO THE SCREENING TO THE WEST AND SOUTH AS ALLOWED UNDER SECTIONS 5.19 (B) vi. AND (C) v.

N

SCALE: 1 INCH = 40 FEET

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN HEREON IS APPROXIMATE AND IS NOT TO BE RELIED UPON AS GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. IT IS THE CONTRACTOR SHALL DETERMINE THE LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES AND SHALL ASSUME FULL RESPONSIBILITY FOR ANY AND ALL DAMAGES WHICH MAY OCCUR DUE TO THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE PROPOSED IMPROVEMENTS AND EXISTING UTILITIES OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
IT'S THE LAW!! (P.A. 53 AS AMENDED BY MISS DIG SYSTEM, INC.)

STATE OF MICHIGAN
PATRICK L. CLEARY
LANDSCAPE ARCHITECT
No. 3901001619
LICENSED LANDSCAPE ARCHITECT

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

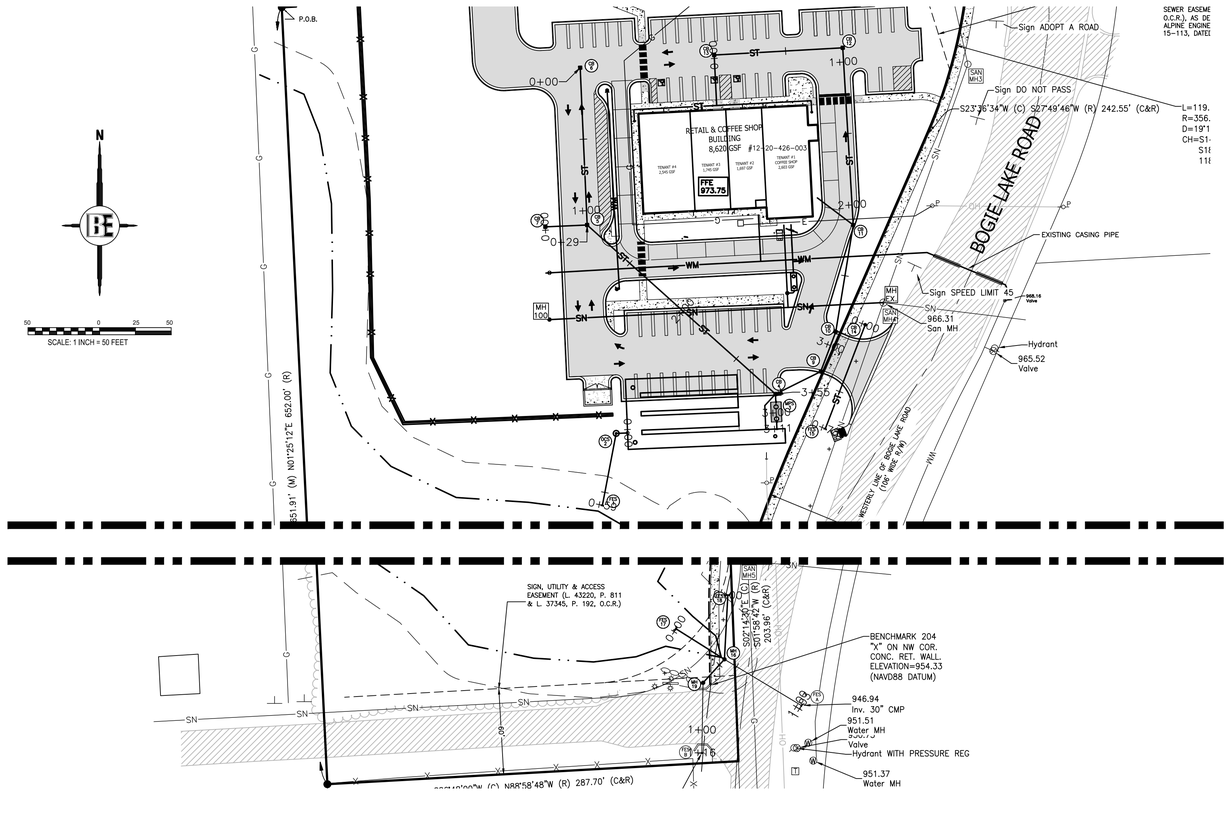
PROJECT
GATEWAY CROSSING

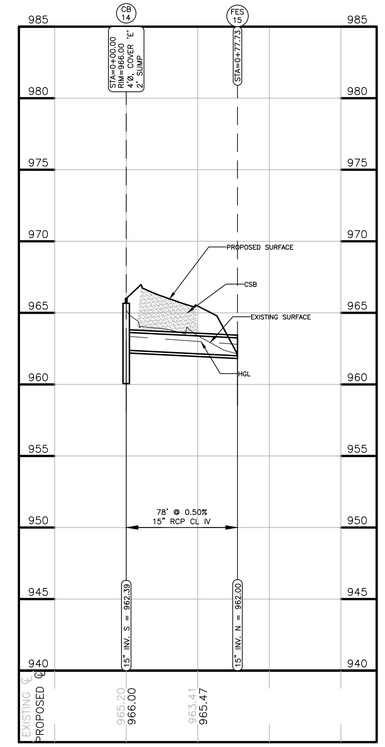
PREPARED FOR
GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

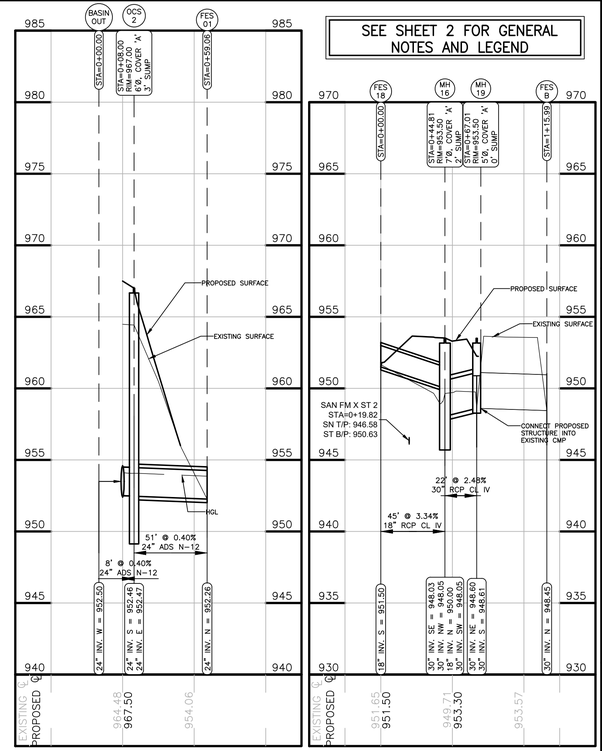
TITLE
LANDSCAPE PLAN

NO	BY	REVISION PER	DATE
1	PLC	TOWNSHIP REVIEW COMMENTS	8/XX/24
1	MJD	MDOT COMMENTS	7/9/24

DESIGNED BY: TC
DRAWN BY: PC
CHECKED BY:
SCALE: 1" = 40'
JOB NO: 22–029
DATE: 6/17/24
SHEET NO. 9

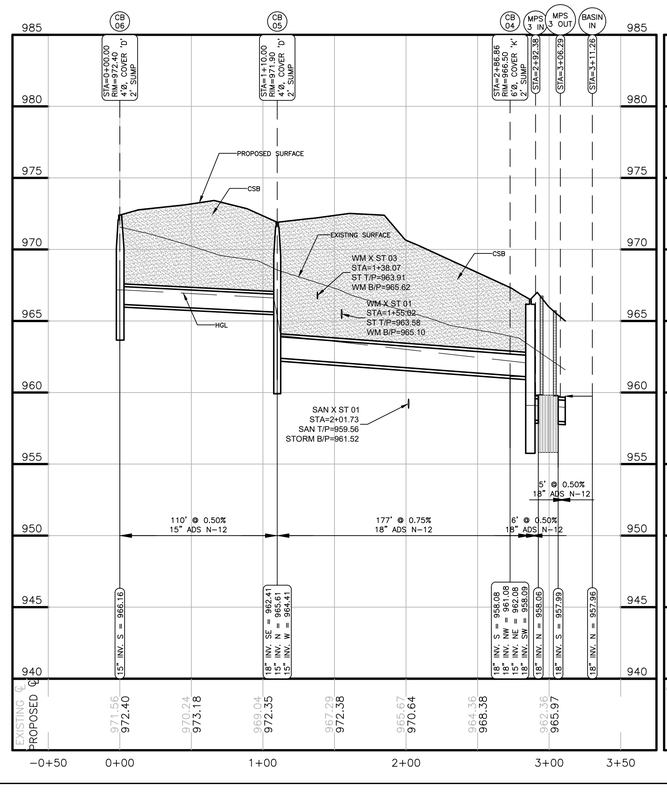


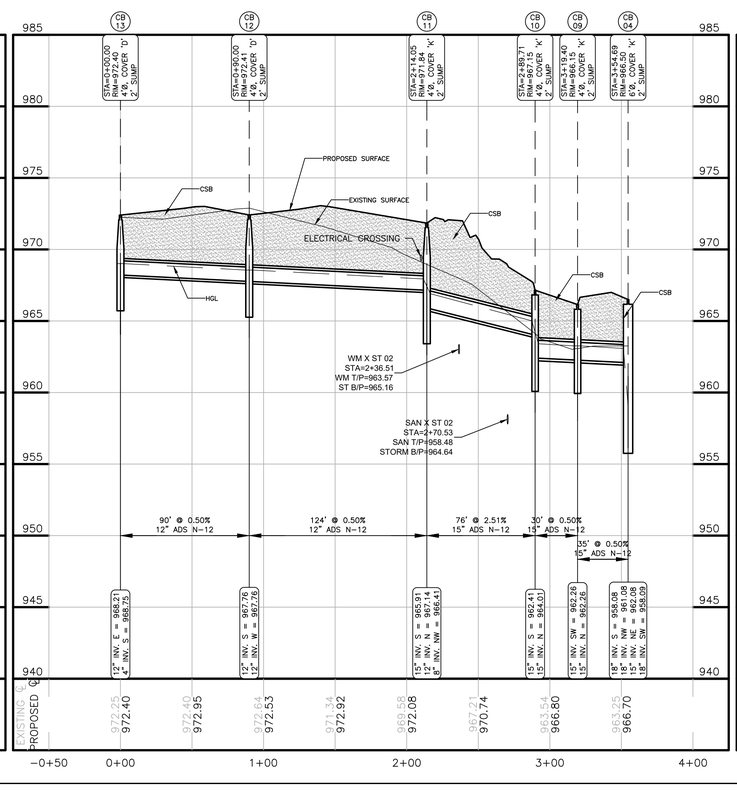


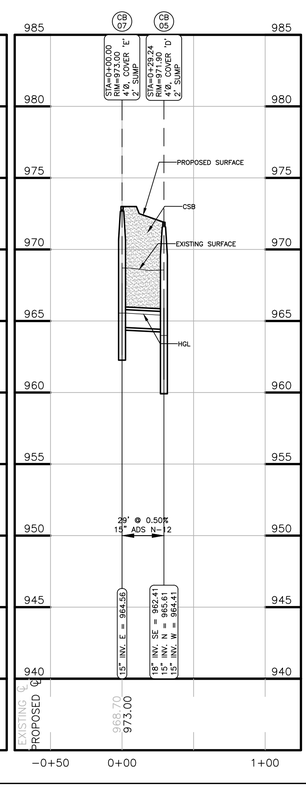


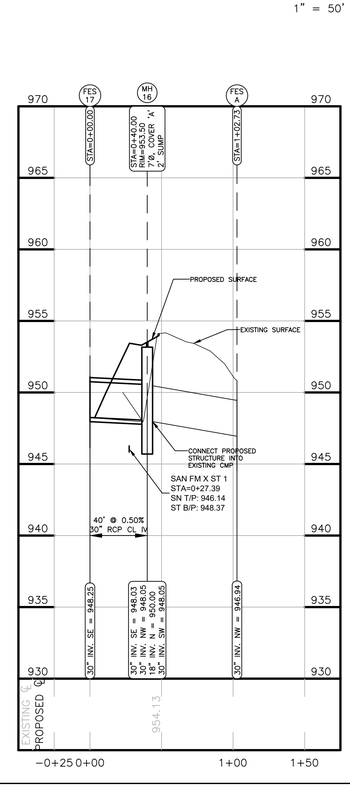
SEE SHEET 2 FOR GENERAL NOTES AND LEGEND

SCALE: 1" = 5' (VERT)
1" = 50' (HORIZ)









THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS ARE APPROXIMATE AND NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL LOCATE AND VERIFY THE DEPTH AND LOCATION OF ALL UTILITIES AND PROPOSED LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES CROSSINGS AND NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST. IF THE CONTRACTOR DEVIATES FROM THE PLANS OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS, NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG
1-800-482-7171
IT'S THE LAW!!! (MICHIGAN PUBLIC ACT 53 OF 1974, AS AMENDED)
IT'S ALSO GOOD PRACTICE!!!

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT
GATEWAY CROSSING

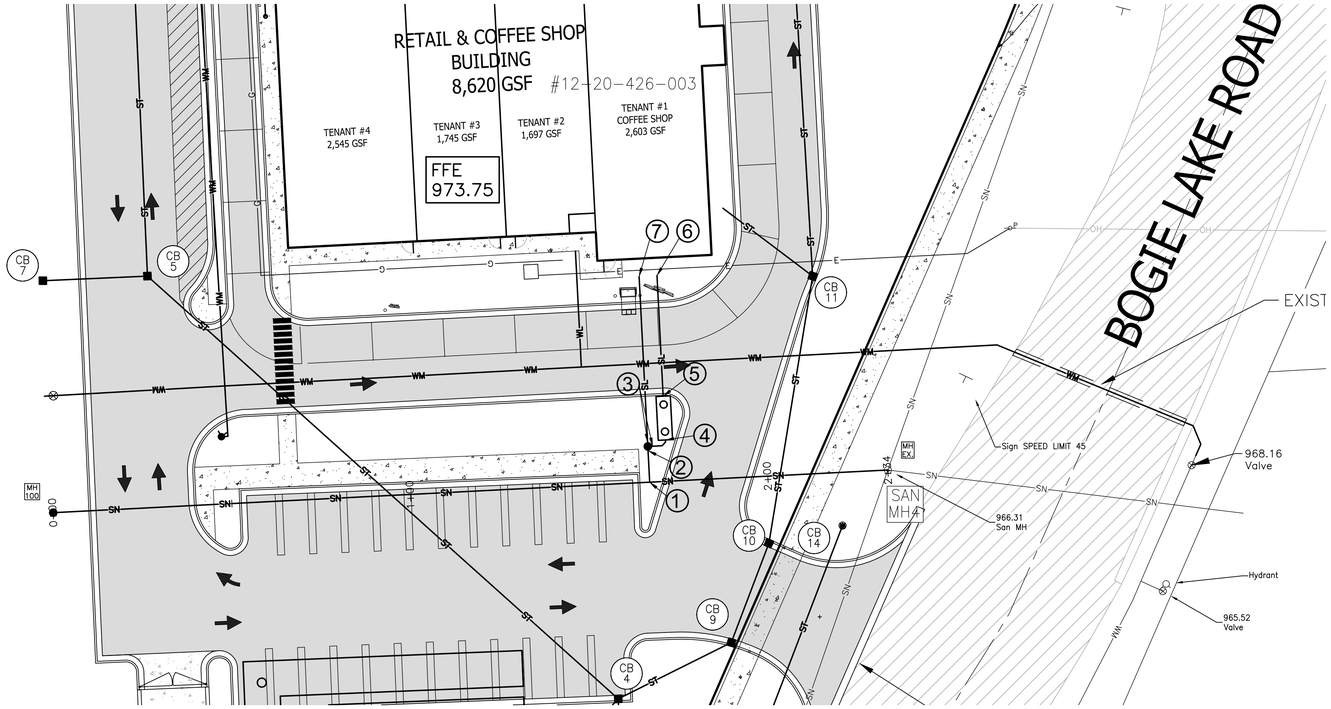
PREPARED FOR
GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

TITLE
STORM PROFILES

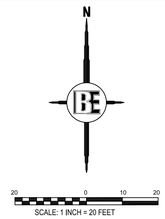
NO	BY	REVISION PER	DATE
1	MJD	MDOT COMMENTS	7/9/24
2	MJD	TOWNSHIP COMMENTS	8/6/24

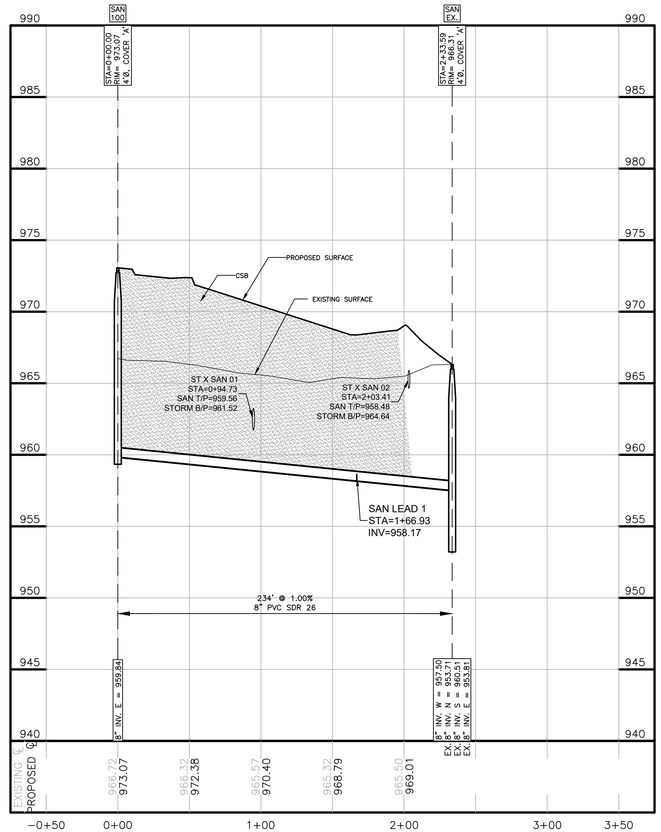
DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: 1" = 50'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 10

BOSS Engineering



SEE SHEET 2 FOR GENERAL NOTES AND LEGEND





SCALE: 1" = 5' (VERT)
1" = 50' (HORIZ)

SANITARY LEAD ELEVATIONS TABLE		
LOCATION/DESCRIPTION		ELEVATION
1	SANITARY WYE	958.17
	SANITARY RISER	966.35
2	SANITARY LEAD MONITORING MANHOLE OUT	966.55
3	SANITARY LEAD MONITORING MANHOLE IN	967.27
4	GREASE TRAP OUT	967.41
5	GREASE TRAP IN	967.66
6	GREASE TRAP STUB LOCATION	968.00
7	DOMESTIC STUB LOCATION	968.00

*CONTRACTOR TO VERIFY DEPTH AND LOCATION OF EXISTING UNDERGROUND UTILITIES BEFORE CONSTRUCTION

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 (TOLL FREE) FOR THE LOCATION OF UNDERGROUND UTILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING

PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

TITLE: SANITARY PROFILES

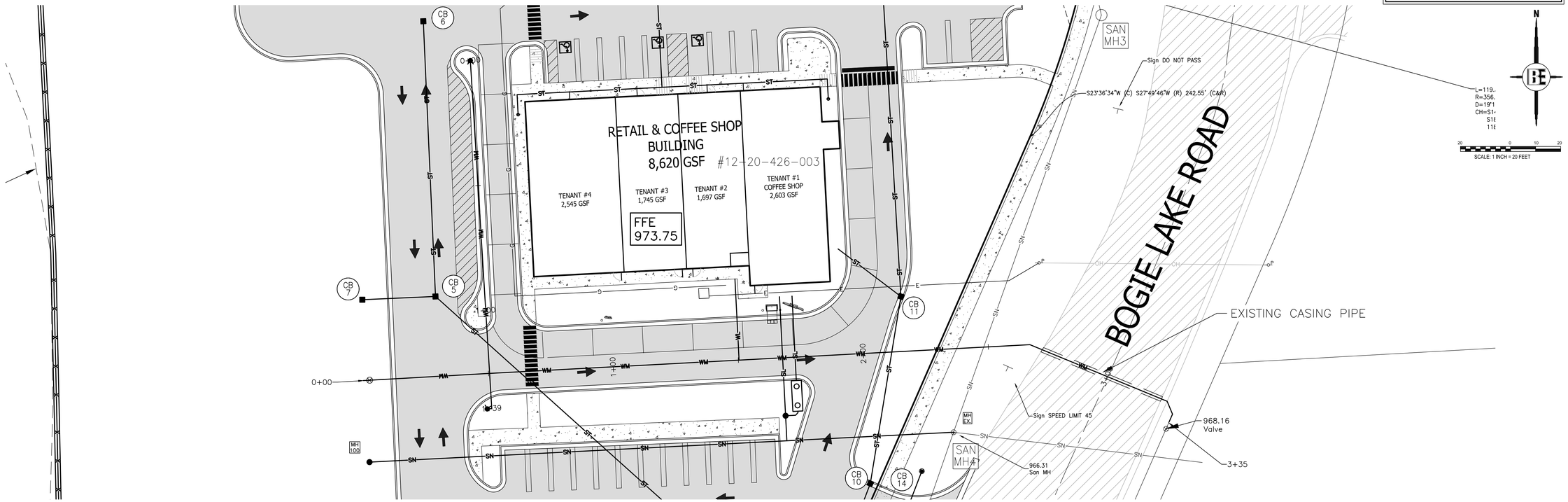
NO	BY	REVISION PER	DATE
2	MJD	TOWNSHIP COMMENTS	8/6/24
1	MJD	MDOT COMMENTS	7/9/24

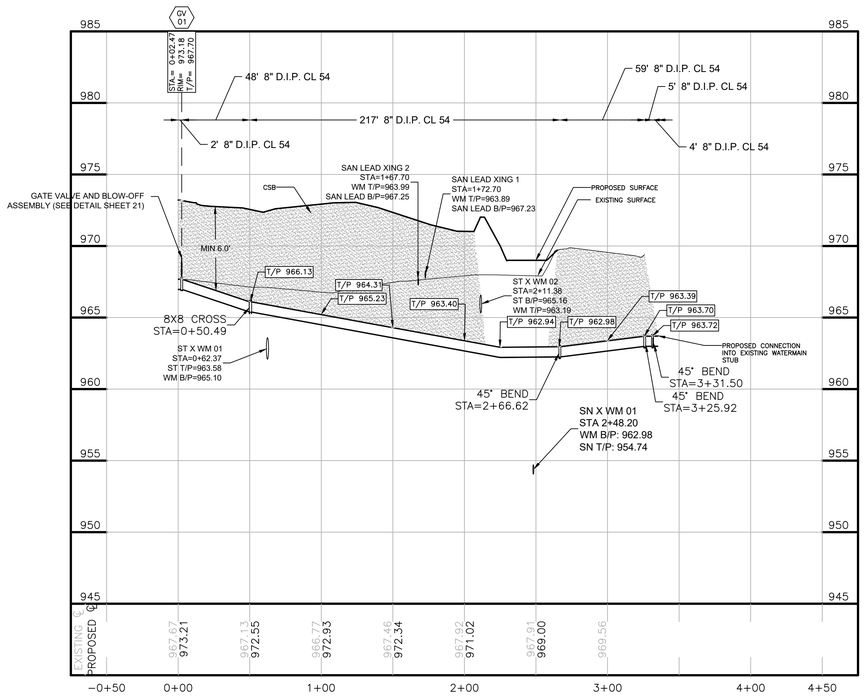
DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: 1" = 20'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 11

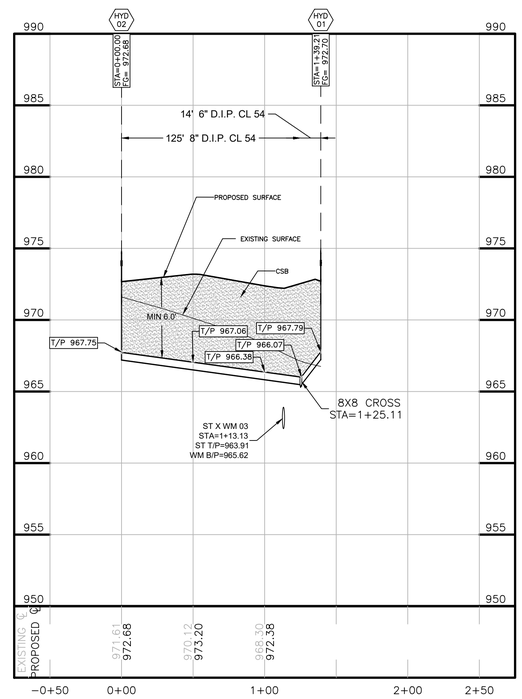
BOSS Engineering

G:\22-029\DWG\CP\22-029-1 PROFILES CP.dwg, 8/6/2024 12:00:35 PM, marcusd, AutoCAD PDF (General Documentation).pc3

SEE SHEET 2 FOR GENERAL NOTES AND LEGEND







SCALE: 1" = 5' (VERT)
1" = 50' (HORIZ)

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 (TOLL FREE) FOR THE LOCATION OF UNDERGROUND UTILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING

PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

TITLE: WATERMAIN PROFILES

NO	BY	REVISION PER	DATE
2	MJD	TOWNSHIP COMMENTS	8/6/24
1	MJD	MDOT COMMENTS	7/9/24

DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: 1" = 20'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 12

BOSS Engineering

G:\22-029\DWG\CP\22-029-1 PROFILES CP.dwg, 8/6/2024 12:00:39 PM, marcusd, AutoCAD PDF (General Documentation).pc3

OAKLAND COUNTY DETENTION BASIN CALCULATIONS

AREA (ACRES)	IMPERVIOUS FACTOR	ACRE IMPERVIOUS
2.11	0.95	2.00
0.00	0.7	0.00
0.46	0.2	0.09

COMPOUND C: 0.82

TOTAL DRAINAGE AREA: 2.56 ACRES

WATER QUALITY VOLUME V_{WQ}

V_{WQ}= 3.630(C)(A) = 7620 FT^3

V_T= 0.15(V_{WQ}) = 1143 FT^3

WATER QUALITY RATE FOR MECHANICAL STRUCTURE

T_C = MAX TIME OF CONCENTRATION = 16.42 MIN

Q_{WQ}= (C)(A)30.2/(T_C+9.17)$^{.51}$ = 4.59 CFS

CHANNEL PROTECTION VOLUME CONTROL - REQUIRED

V_{CP-R} = 4.719(C)(A) = 9906 FT^3

CHANNEL PROTECTION VOLUME CONTROL - PROVIDED

In-Situ Infiltration rate = 0 IN/HR

Are upstream infiltration BMP's provided? NO

Basin Footprint Infiltration Area Required =NO INFILTRATIO FT^2

V_{CP-P} = 0 FT^3

CHANNEL PROTECTION RATE CONTROL (EXTENDED DETENTION VOLUME)

V_{ED} = 6.897(C)(A) = 14478 FT^3

EXTENDED DETENTION OUTLET RATE

Q_{ED} = V_{ED}/(48hr) = 0.084 CFS

H_{ED} = V_{ED}/4.666 $(H)^{1/2}$ = 1.0 1" HOLES

H = 8.00 FT

$ELEV_{ED}$ = 957.69

100-YEAR ALLOWABLE OUTLET RATE

Q_{DRAIN} = Restricted Drain Rate = 0.2 CFS/ACRE

Q_{VRR} = 1.1055 - 0.206LN(A) = 0.912 CFS/ACRE

Q_{100P} = (LESSER OF Q_{DRAIN} & Q_{VRR})*A = 0.512 CFS

VARIABLE RELEASE RATE	
1 CFS/ACRE	< 2 ACRES
0.15 CFS/ACRE	> 100 ACRES

100-YEAR DETENTION VOLUME

V_{100R} = 18985 (C)(A) = 39853 FT^3

Q_{100N} = (C)(A)83.3/(T_C+9.17)$^{0.81}$ = 12.65 CFS

R = 0.206-.15(ln(Q_{100P}/Q_{100N}) = 0.6871

V_{1000} = V_{100R}-V_{CP-P} = 27382 FT^3

Is $V_{1000} \geq V_{ED}$? YES

V_{1000} = 27,382 FT^3

BASIN STORAGE PROVIDED

LINEAL FOOTAGE OF PIPE IN SYSTEM: 352 LFT

ELEVATION	INCREMENTAL VOLUME / LFT	VOLUME (FT^3)	TOTAL VOLUME (FT^3)	
962.5	4.0875	1,439	27,646	DHWL
961.5	7.0949	2,497	26,207	
960.5	8.6345	3,039	23,710	
959.5	9.5201	3,351	20,670	
958.5	9.9329	3,496	17,319	
957.5	9.9329	3,496	13,823	
956.5	9.5201	3,351	10,327	
955.5	8.6345	3,039	6,976	
954.5	7.0949	2,497	3,936	
953.5	4.0875	1,439	1,439	
952.5	0.0000			BOTTOM OF STORAGE

PROVIDED FOOTPRINT OF BASIN BOTTOM AREA 4108 FT^2

OUTLET CONTROL STRUCTURE

Q_{ED} ACTUAL

H_{ED} = 1 (1" HOLES)

A_{ED} = 0.0055 FT^2

$Q_{ED-ACTUAL}$ = (A_{ED})0.62 x (2 x 32.2 x $h)^{0.5}$) = 0.077 CFS

Q_{100ALT} OUTLET

$Q_{100-ACTUAL}$ = Q_{100P} - $Q_{ED-ACTUAL}$ = 0.435 CFS

A_{100} = $Q_{100-ACTUAL}$ / (0.62 * (2 *32.2 * ($ELEV_{DHWL}$ - $ELEV_{ED}$)$^{0.5}$) = 0.052 FT^2

AREA OF 2 INCH DIAMETER ORIFICE = 0.022 FT^2

ORIFICES = A100 / 0.005 = 2.0 ORIFICES

OVERFLOW SPILLWAY DESIGN

Design Flow Rate: Q_{100N} = 12.65 CFS

Depth of Spillway: H_{WEIR} = 9 INCHES

Width of Spillway: L_{WEIR} = Q_{100N}/3.33$H_{WEIR}^{3/2}$ = 5.8 FT

BASIN DESIGN SUMMARY	
BASIN SIZE REQUIRED =	27,382 FT^3
BASIN SIZE PROVIDED =	27,646 FT^3

ORIFICE DESIGN SUMMARY		
ELEVATION	# OF HOLES	DIAMETER OF HOLES
952.50	1.0	1 -INCH
957.69	2.0	2 -INCH
OVERFLOW SPILLWAY SUMMARY		
WIDTH OF OVERFLOW SPILLWAY =		6 FT

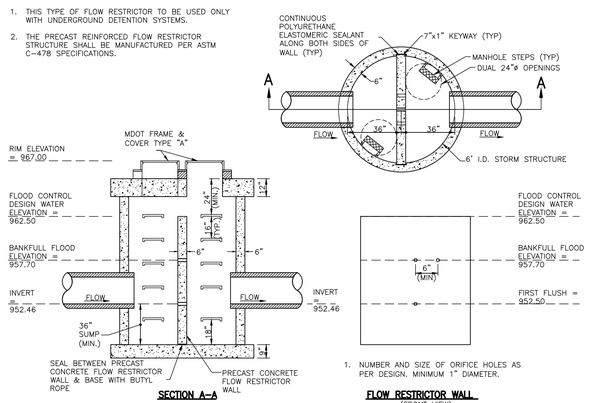
SEE SHEET 2 FOR GENERAL NOTES AND LEGEND

FROM	TO	DRAIN AREA	ACRES A	RUNOFF COEFF C	EQUIV. AREA A * C	INTEN-SITY I	TIME OF CONC. T_C	ADD'L RUNOFF Q	RUNOFF (CFS) Q	PIPE LENGTH (LF)	PIPE DIA. (IN)	VELOCITY FLOWING FULL (FPS)	HYDRAULIC GRADIENT SLOPE %	ACTUAL SLOPE USED	MANNING COEFFICIENT	MANNING FLOW CAPACITY	MANNING'S VELOCITY (FT/SEC)	TIME (MIN)	HG ELEV UPPER END	HG ELEV LOWER END	RIM ELEV UPPER END	RIM ELEV LOWER END	INVERT UPPER END	INVERT LOWER END	DROP DISTANCE (FT)
6	5	6	0.35	0.81	0.28	4.38	15.00		1.23	110	15	2.61	0.24%	0.50%	0.013	4.58	3.73	0.49	967.16	966.61	972.40	971.90	966.16	965.61	3.20
5	4	5	0.17	0.85	0.14	4.32	15.49	3.21	5.06	177	15	5.49	1.08%	0.75%	0.013	5.61	4.57	0.65	963.99	962.08	971.90	966.50	962.41	961.08	3.00
7	5	7	0.81	0.91	0.73	4.38	15.00		3.21	29	15	3.55	0.45%	0.50%	0.013	4.58	3.73	0.13	965.55	965.41	973.00	971.90	964.55	964.41	2.00
13C	13A	13C	0.00	0.95	0.00	4.38	15.00		0.02	35	4	1.20	0.30%	1.00%	0.013	0.19	2.19	0.27	969.71	969.36	-	-	969.45	969.10	
13B	13A	13B	0.00	0.95	0.00	4.38	15.00		0.02	34	4	1.20	0.30%	1.00%	0.013	0.19	2.19	0.26	969.70	969.36	-	-	969.44	969.10	
13A	13	-	-	-	-	-	15.26	0.02	0.04	35	4	1.46	0.44%	1.00%	0.013	0.19	2.19	0.27	969.36	969.01	-	972.40	969.10	968.75	
13	12	13	0.24	0.69	0.17	4.38	15.00	0.04	0.77	90	12	2.41	0.28%	0.50%	0.013	2.53	3.22	0.47	969.01	968.56	972.40	972.41	968.21	967.76	
12	11	12	0.31	0.55	0.17	4.32	15.47		1.51	124	12	2.93	0.41%	0.50%	0.013	2.53	3.22	0.64	968.56	967.94	972.41	971.84	967.76	967.14	1.03
11	10	11	0.05	0.85	0.04	4.26	16.11	0.82	2.50	76	15	5.85	1.23%	2.51%	0.013	10.26	8.36	0.15	966.91	965.01	971.84	967.15	965.91	964.01	1.60
10	9	10	0.11	0.79	0.09	4.24	16.26		2.88	30	15	3.45	0.43%	0.50%	0.013	4.58	3.73	0.13	963.41	963.26	967.15	966.15	962.41	962.26	-
9	4	9	0.02	0.95	0.02	4.23	16.39		2.97	35	15	3.45	0.43%	0.50%	0.013	4.58	3.73	0.16	963.26	963.08	966.15	966.50	962.26	962.08	4.00
4	3	4	0.30	0.83	0.25	4.21	16.55	5.06	9.08	5	15	4.85	0.84%	0.50%	0.013	4.58	3.73	0.02	959.10	959.06	966.50	968.15	958.08	958.06	0.07
3	BASIN	-	-	-	-	-	16.57		9.08	5	15	4.85	0.84%	0.50%	0.013	4.58	3.73	0.02	959.00	958.96	968.15	-	957.99	957.96	5.46
4	BASIN	-	-	-	-	-	16.51	9.08	9.08	28	18	5.48	0.84%	0.50%	0.013	7.45	4.21	0.11	959.39	959.15	966.50	-	958.09	957.95	5.45
11A	11	11A	0.20	0.95	0.19	4.38	15.00		0.82	31	8	3.30	0.90%	1.00%	0.013	1.21	3.47	0.15	970.22	969.91	-	971.84	969.69	969.38	3.00
14	15	14	0.47	0.50	0.24	4.38	15.00		1.03	77	15	2.61	0.24%	0.50%	0.013	4.58	3.73	0.34	963.39	963.00	966.00	-	962.39	962.00	1.92
BASIN	2	ALL	-	-	-	-	15.00	9.08	9.08	8	24	4.22	0.34%	0.40%	0.013	14.35	4.57	0.03	954.10	954.07	-	967.00	952.50	952.47	0.01
2	1	-	-	-	-	-	15.03		9.08	51	24	4.22	0.34%	0.40%	0.013	14.35	4.57	0.19	954.06	953.86	967.00	-	952.46	952.26	
18	16	18	0.40	0.53	0.21	4.38	15.00	1.03	1.95	45	18	5.99	1.01%	3.34%	0.013	19.25	10.89	0.07	952.70	951.20	-	953.50	951.50	950.00	

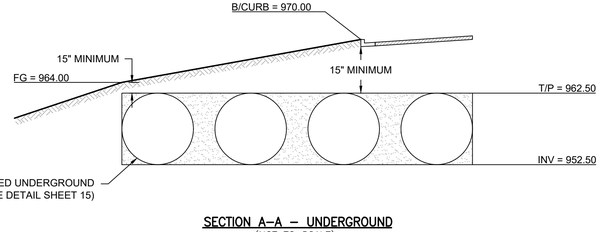
100-YEAR PIPE FLOW CALCULATION FOR OCS

BASIN	2	ALL	2.56	0.81	2.08	6.00	16.57		12.50	8	24	5.02	0.48%	0.40%	0.013	14.35	4.57	0.03	954.15	954.11	-	967.00	952.50	952.47	0.01
2	1	-	-	-	-	-	16.60		12.50	51	24	5.02	0.48%	0.40%	0.013	14.35	4.57	0.19	954.11	953.86	967.00	-	952.46	952.26	

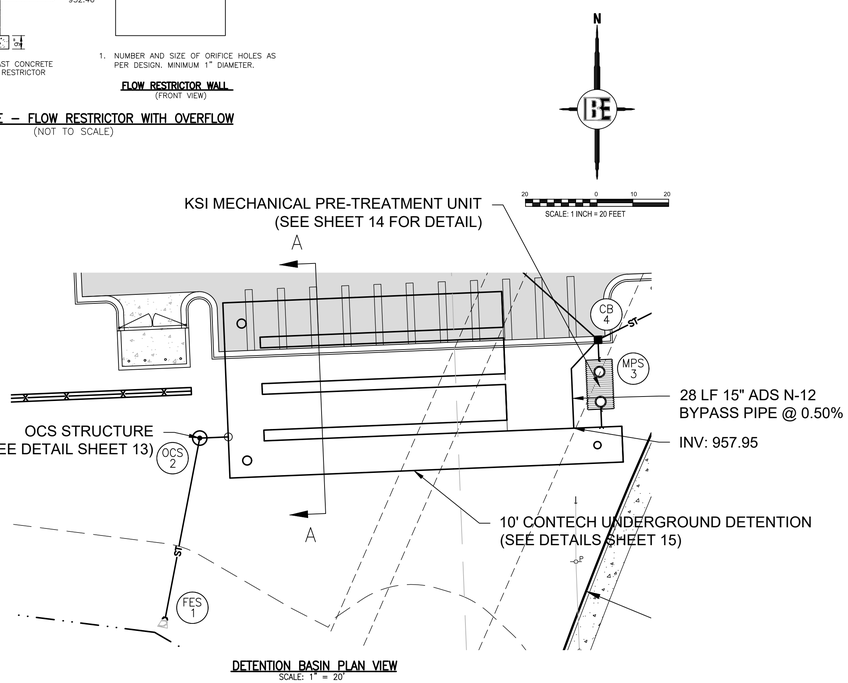
1. THIS TYPE OF FLOW RESTRICTOR TO BE USED ONLY WITH UNDERGROUND DETENTION SYSTEMS.
2. THE PRECAST REINFORCED FLOW RESTRICTOR STRUCTURE SHALL BE MANUFACTURED PER ASTM C-478 SPECIFICATIONS.



OCS STRUCTURE – FLOW RESTRICTOR WITH OVERFLOW
(NOT TO SCALE)



SECTION A–A – UNDERGROUND
(NOT TO SCALE)



DETENTION BASIN PLAN VIEW
SCALE: 1" = 20'

STRUCTURE TABLE	
STRUCTURE NAME	STRUCTURE DETAILS
BASIN IN	18" INV N = 957.96
BASIN OUT	24" INV W = 952.50
CB 04 DIA. 72", COVER TYPE 'K' SUMP = 2'	RIM = 966.50 18" INV S = 958.08 18" INV NW = 961.08 15" INV NE = 962.08 18" INV SW = 958.09
CB 05 DIA. 48", COVER TYPE 'D' SUMP = 2'	RIM = 971.90 18" INV SE = 962.41 15" INV N = 965.61 15" INV W = 964.41
CB 06 DIA. 48", COVER TYPE 'D' SUMP = 2'	RIM = 972.40 15" INV S = 966.16
CB 07 DIA. 48", COVER TYPE 'E' SUMP = 2'	RIM = 973.00 15" INV E = 964.56
CB 09 DIA. 48", COVER TYPE 'K' SUMP = 2'	RIM = 966.15 15" INV SW = 962.26 15" INV N = 962.26
CB 10 DIA. 48", COVER TYPE 'K' SUMP = 2'	RIM = 967.15 15" INV S = 962.41 15" INV N = 964.01
CB 11 DIA. 48", COVER TYPE 'K' SUMP = 2'	RIM = 971.84 15" INV S = 965.91 12" INV N = 967.14 8" INV NW = 966.41
CB 12 DIA. 48", COVER TYPE 'D' SUMP = 2'	RIM = 972.41 12" INV S = 967.76 12" INV W = 967.76
CB 13 DIA. 48", COVER TYPE 'D' SUMP = 2'	RIM = 972.40 12" INV E = 968.21 4" INV S = 968.75
CB 14 DIA. 48", COVER TYPE 'E' SUMP = 2'	RIM = 966.00 15" INV S = 962.39
FES 01	24" INV N = 952.26
FES 15	15" INV N = 962.00
FES 17	30" INV SE = 948.25
FES 18	18" INV S = 951.50

STRUCTURE TABLE	
STRUCTURE NAME	STRUCTURE DETAILS
FES A	30" INV NW = 946.94
FES B	30" INV N = 948.45
MH 16 DIA. 84", COVER TYPE 'A' SUMP = 2'	RIM = 953.50 30" INV NW = 948.05 18" INV N = 950.00 30" INV SW = 948.05 30" INV SE = 948.03
MH 19 DIA. 60", COVER TYPE 'A' SUMP = 0'	RIM = 953.50 30" INV S = 948.61 30" INV NE = 948.60
MPS 3 IN	18" INV N = 958.06
MPS 3 OUT	18" INV S = 957.99
OCS 2 DIA. 72", COVER TYPE 'A' SUMP = 3'	RIM = 967.00 24" INV E = 952.47 24" INV S = 952.46

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AND SURFACE FEATURES AS SHOWN ON THESE PLANS ARE NOT GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES AND SURFACE FEATURES PRIOR TO CONSTRUCTION. IF NECESSARY, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FROM THE PLANS. IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
IT'S THE LAW!!
(MI ACT 53 OF 1974, AS AMENDED)
PA ACT 287 OF 1974, AS AMENDED

BE BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING

PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI. 48009
248-433-7000

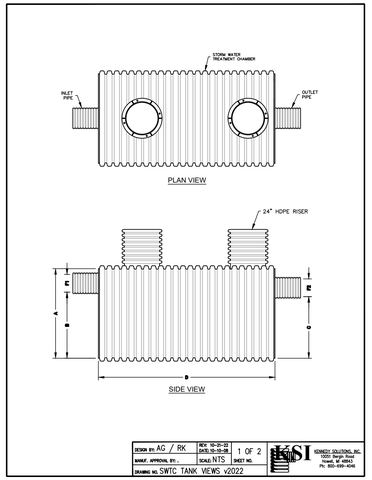
TITLE: DETENTION BASIN DETAILS

NO	BY	REVISION PER	DATE
2	MJD	TOWNSHIP COMMENTS	8/6/24
1	MJD	MDOT COMMENTS	7/9/24

DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: 1" = 20'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 13

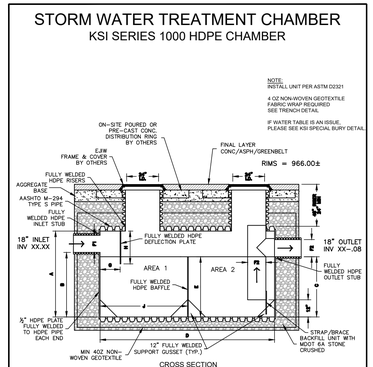
BOSS Engineering

SEE SHEET 2 FOR GENERAL NOTES AND LEGEND



DESIGN BY: AG / RK | REV: 10-20-22 DATE: 10-10-18 | 1 OF 2
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. SWTC TANK VIEWS v2022

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046



STORM WATER TREATMENT CHAMBER DIMENSIONS AND CAPACITIES

MODEL NO.	A	B	C	D	E	F1	F2	G	H	J	AREA 1	AREA 2
1000--48--18	48"	27"	26"	167"	26"	18"	18"	18"	27"	84"	48 CF	97 CF

DESIGN BY: AG / RK | REV: 10-20-22 DATE: 10-10-18 | 2 OF 2
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. SERIES 1000 SWTC v2022

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046

STORM WATER TREATMENT CHAMBER
INSTALLATION AND MAINTENANCE GUIDELINES

INSTALLATION GUIDELINES

1. EXCAVATE AREA FOR KSI SWTC AND PREPARE TRENCH BOTTOM PER ASTM D2321, SECTIONS 6 & 7.

2. THE KSI SWTC SHALL BE INSTALLED ON A BED OF NO LESS THAN 12" MDOT 6A CRUSHED STONE MATERIALS COMPACTED TO 95% PROCTOR DENSITY. COMPACTED TO 95% (90% MIN. FOR MDOT 6A CRUSHED STONE MATERIAL) OF THE BACKFILL MATERIAL'S MAXIMUM WEIGHT AT A MOISTURE CONTENT NOT GREATER THAN THE OPTIMUM.

3. INSTALL KSI SWTC UNIT, HIGH FLOW BYPASS LINE (IF APPLICABLE), DIVERSION STRUCTURE AND EXITING STRUCTURE AT ELEVATIONS INDICATED ON SITE PLAN. COUPLE INLET AND OUTLET HDPE SPLIT COUPLERS TO CONVEYANCE PIPE.

4. BACKFILL UNIT WITH MDOT 6A CRUSHED STONE MATERIALS PER ASTM D2321. BACKFILL SHALL BE COMPACTED TO 95% PROCTOR DENSITY.

5. THE HDPE ACCESS RISERS SHALL BE FIELD CUT TO FINISH GRADE BY THE CONTRACTOR. SEE RISER INSTALLATION OPTIONS PAGE.

6. KSI RECOMMENDS FILLING THE UNIT WITH WATER UPON COMPLETION OF INSTALLATION UP TO THE BAFFLE HEIGHT.

7. ONCE THE UNIT IS INSTALLED, PLACE A ORANGE SAFETY FENCE 4-5 FT HIGH WITH TEE POST, AROUND THE SYSTEM. PLACE FENCE 5 FT BEYOND GRID FOOTPRINT. ANY DAMAGE TO THE SYSTEM AS A RESULT OF NOT FOLLOWING THESE INSTRUCTIONS AND THE BLUEPRINT DETAILS, SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR THE SYSTEM TO KSI'S SATISFACTION. IF GIVEN IN WRITING, A 3-4 DAY LEAD TIME, KSI WILL HAVE A REPRESENTATIVE AVAILABLE ON SITE DURING THE INSTALLATION.

MAINTENANCE GUIDELINES

1. ALL STORM WATER TREATMENT CHAMBERS WILL REQUIRE PERIODIC MAINTENANCE DEPENDING ON SPECIFIC SITE CONDITIONS.

2. KSI RECOMMENDS CLEANING THE SWTC QUARTERLY AND AFTER HEAVY RAIN STORMS. SEDIMENT IS EASIER TO REMOVE WHEN IT IS REMOVED ON A REGULAR BASIS.

3. DISPOSAL OF MATERIAL FROM THE KSI SWTC ARE SIMILAR TO THAT OF ANY OTHER BEST MANAGEMENT PRACTICES (BMP). LOCAL GUIDELINES SHOULD BE CONSULTED PRIOR TO DISPOSAL OF THE SWTC CONTENTS. PETROLEUM WASTE PRODUCTS SHOULD BE REMOVED BY A LICENSED WASTE MANAGEMENT COMPANY.

4. IF A HYDROCARBON REMOVAL SYSTEM WAS INSTALLED - REPLACE IT WHEN IT TURNS BLACK. UNIT CAN BE DISPOSED OF VIA NORMAL REFUSE REMOVAL. SPENT UNIT DOES NOT LEACH CAPTURED CONTAMINATES.

WHITE = NEW
GRAY = WORKING
BLACK = SPENT - NEEDS REPLACEMENT - CONTACT KSI FOR REPLACEMENT PARTS

5. AFTER CLEANING THE UNIT - KSI RECOMMENDS REFILLING THE UNIT WITH WATER.

DESIGN BY: AG / RK | REV: 6-9-23 DATE: 10-10-18 | 1 OF 1
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. SWTC INSTALL & MAINT.

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046

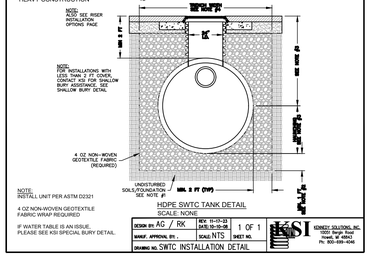
STORM WATER TREATMENT CHAMBER TRENCH DETAIL

NOTES:
1. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH A FOUNDATION OF MDOT 6A CRUSHED STONE AS DEFINED IN ASTM D2321, LATEST EDITION; AS AN ALTERNATIVE TRENCH BOTTOM MAY BE STABILIZED USING A WOVEN GEOTEXTILE FABRIC AND OR A GEOGRID.
2. BEDDING: SUITABLE MATERIAL SHALL BE MDOT 6A CRUSHED STONE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION, UNLESS OTHERWISE SPECIFIED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 12" FOR 36"-120"Ø SWTC.
3. HAUNCHING AND INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE MDOT 6A CRUSHED STONE AND INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION, MAXIMUM TEN INCH (10") LIFTS.
4. UNLESS OTHERWISE SPECIFIED BY THE ENGINEER, MIN. TRENCH WIDTHS ARE AS FOLLOWS.

NOMINAL I.D.	NOMINAL O.D.	MINIMUM RECOMM. TRENCH WIDTH
36"	42"	90"
48"	54"	102"
60"	66"	114"
72"	80.5"	120"
96"	105.9"	154"
120"	131.3"	190"

5. MINIMUM COVER: MINIMUM RECOMMENDED COVER FOR VARIOUS LIVE LOADING CONDITIONS ARE AS SUMMARIZED IN THE FOLLOWING TABLE. UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE TAKEN FROM THE TOP OF THE SWTC TANK TO THE GROUND SURFACE.

SURFACE LIVE LOAD	MINIMUM REQUIRED COVER FOR WAYNE COUNTY (ALL SIZES)
HS-25/H25 (FLEXIBLE PAVEMENT)	MIN. 24" AS MEASURED FROM THE BOTTOM OF THE FLEXIBLE PAVEMENT
HS-25/H25 (RIGID PAVEMENT)	MIN. 24" AS MEASURED FROM THE TOP OF THE RIGID PAVEMENT
E80 RAILWAY	24"
HEAVY CONSTRUCTION	48"

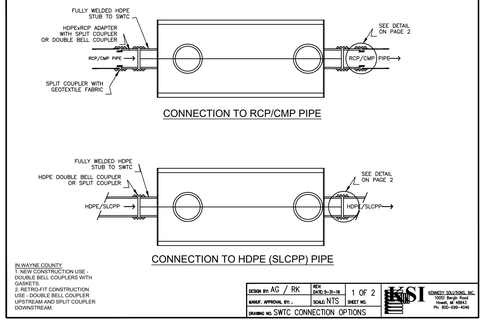


HDPE SWTC TANK DETAIL
SCALE: NONE

DESIGN BY: AG / RK | REV: 11-17-23 DATE: 10-10-18 | 1 OF 1
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. SWTC INSTALLATION DETAIL

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046

STORM WATER TREATMENT CHAMBER
CONNECTION OPTIONS

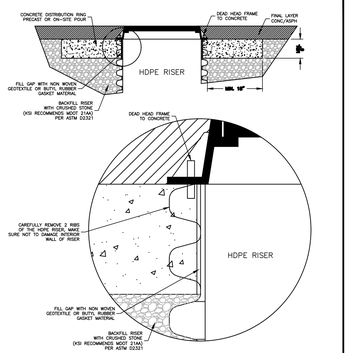


IN WAYNE COUNTY
1. NEW CONSTRUCTION USE - DOUBLE BELL COUPLERS WITH GASKETS.
2. RETRO-FIT CONSTRUCTION USE - DOUBLE BELL COUPLER UPSTREAM AND SPLIT COUPLER DOWNSTREAM.

DESIGN BY: AG / RK | REV: DATE: 5-31-18 | 1 OF 2
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. SWTC CONNECTION OPTIONS

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046

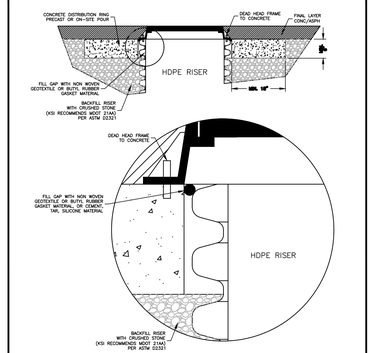
OPTION 2 SCHEMATIC
EJIW / RISER INSTALLATION



DESIGN BY: AG / RK | REV: 6-9-23 DATE: 5-31-18 | 1 OF 1
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. EJIW--RISER CONC INSTALL

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046

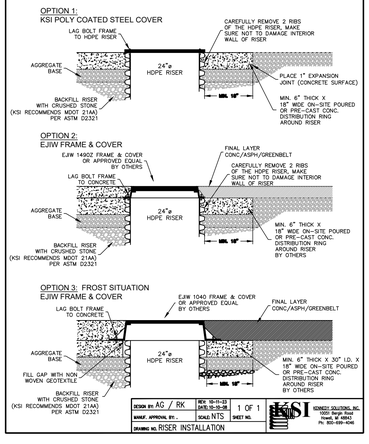
OPTION 3 SCHEMATIC
EJIW / RISER INSTALLATION



DESIGN BY: AG / RK | REV: 6-9-23 DATE: 5-31-18 | 1 OF 1
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. EJIW--RISER CONC INSTALL

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046

KSI RISER INSTALLATION OPTIONS
FOR PAVED SURFACE APPLICATIONS

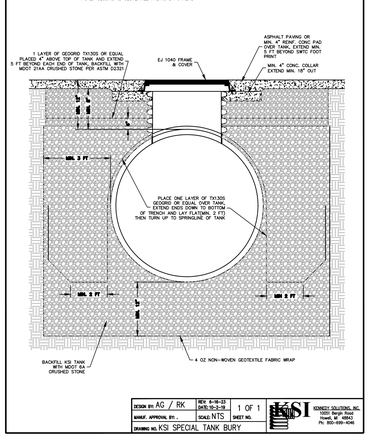


DESIGN BY: AG / RK | REV: 10-11-23 DATE: 10-10-18 | 1 OF 1
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. RISER INSTALLATION

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046

KSI SPECIAL TANK BURY DETAIL

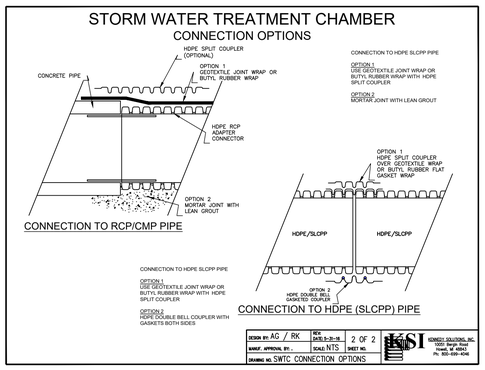
NOTE: GEOGRID & GEOTEXTILE FABRIC BY OTHERS



DESIGN BY: AG / RK | REV: 6-9-23 DATE: 5-31-18 | 1 OF 1
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. KSI SPECIAL TANK BURY

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046

STORM WATER TREATMENT CHAMBER
CONNECTION OPTIONS



DESIGN BY: AG / RK | REV: DATE: 5-31-18 | 2 OF 2
MANUF. APPROVAL BY: - | SCALE: NTS | SHEET NO.
DRAWING NO. SWTC CONNECTION OPTIONS

KSI KENNEDY SOLUTIONS, INC. 1000 Bergin Road Howell, MI 48843 Ph: 800-699-4046

KSI Storm Water Treatment Chamber (SWTC) Sizing Chart

(80% annual TSS removal based on particle size)

August 2019

KSI MODEL	FLOW RATES: WAYNE CO. 75 MICRON	75 MICRON	110 MICRON
~~350~~	~~1.8 CFS~~	~~2.2 CFS~~	~~2.3 CFS~~
~~500~~	~~2.3 CFS~~	~~2.9 CFS~~	~~3.0 CFS~~
~~750~~	~~3.3 CFS~~	~~4.1 CFS~~	~~4.2 CFS~~
1000	4.1 CFS	5.1 CFS	5.3 CFS
~~1250~~	~~5.0 CFS~~	~~6.3 CFS~~	~~6.5 CFS~~
~~1500~~	~~6.2 CFS~~	~~7.8 CFS~~	~~8.1 CFS~~
~~1750~~	~~7.4 CFS~~	~~9.2 CFS~~	~~9.5 CFS~~
~~2000~~	~~8.3 CFS~~	~~10.4 CFS~~	~~10.7 CFS~~
~~2500~~	~~9.8 CFS~~	~~12.3 CFS~~	~~12.6 CFS~~
~~3000~~	~~11.3 CFS~~	~~14.1 CFS~~	~~14.5 CFS~~
~~3500~~	~~13.8 CFS~~	~~17.2 CFS~~	~~17.7 CFS~~
~~3750~~	~~16.3 CFS~~	~~20.4 CFS~~	~~21.0 CFS~~
~~4000~~	~~18.8 CFS~~	~~23.5 CFS~~	~~24.3 CFS~~
~~4500~~	~~20.0 CFS~~	~~25.2 CFS~~	~~25.8 CFS~~
~~5000~~	~~22.0 CFS~~	~~27.6 CFS~~	~~28.4 CFS~~
~~5500~~	~~24.0 CFS~~	~~30.0 CFS~~	~~31.0 CFS~~
~~6000~~	~~30.5 CFS~~	~~38.1 CFS~~	~~39.3 CFS~~

All KSI models will require some form of customization to meet site specific conditions.

Please call KSI at 800-699-4046 for design assistance. Details and specifications are available.

The peak flow rate of an off-line system treats approximately on quarter to one third of the peak storm event.

These flow rates typically represent 90% to 95% of the total annual runoff volume.

These models will remove greater than 90% of the free floating oils at the above design flow rates.

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AND STRUCTURES SHOWN ON THESE PLANS ARE NOT GUARANTEED TO BE EXACT OR COMPLETE. NO REPRESENTATION IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES AND STRUCTURES SHOWN ON THESE PLANS PRIOR TO BIDDING. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE PLANS AND THE LOCATION OR DEPTH OF UTILITIES FROM THE PLANS. THE ENGINEER SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE PLANS AND THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
IT'S THE LAW!!! (P.A. 53 OF 1974, AS AMENDED)
MEMBER NO. 0000
FOR NE LICENSE OF UNDERGROUND FACILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING
PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

TITLE: MECHANICAL PRETREATMENT DETAILS

NO	BY	REVISION PER	DATE
2	MJD	TOWNSHIP COMMENTS	8/6/24
1	MJD	MDOT COMMENTS	7/9/24

DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: NO SCALE
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 14

BOSS Engineering

G:\22-029\DWG\CP\22-029-1 SHEETS CP.dwg, 8/6/2024 12:00:49 PM, marcusd, AutoCAD PDF (General Documentation).pc3

SEE SHEET 2 FOR GENERAL NOTES AND LEGEND

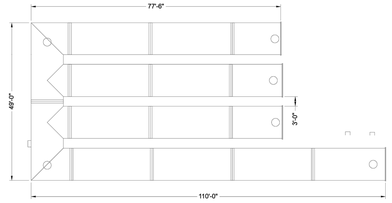
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 352 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 27,334 CF
- PIPE STORAGE VOLUME = 27,607 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 27,607 CF

PIPE DETAILS
- DIAMETER = 120"
- CORRUGATION = 5x1
- GAGE = 14
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



ASSEMBLY
SCALE: 1" = 20'

NOTES
- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN. QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither the design nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk. Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

DATE	REVISION DESCRIPTION	BY

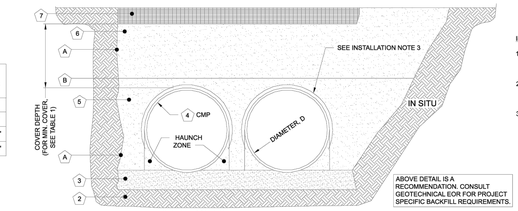
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO42257 Gateway Commons, LLC
Underground Detention
White Lake, MI
DETENTION SYSTEM

PROJECT No.: 28985	SEQ. No.: 42257
DATE: 7/30/2024	
DESIGNED: DYO	DRAWN: DYO
CHECKED: DYO	APPROVED: DYO
SHEET NO.:	1

C:\DEPOT\TEMPLATES\ENGINEERING\DWG_IA.DWG 10/18/2019 3:02:02 AM



MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT.

INSTALLATION NOTES
1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. AN HDPE MEMBRANE LINER WILL BE PLACED ON THE CROWN OF EACH PIPE TO PROVIDE AN IMPERMEABLE BARRIER AGAINST ENVIRONMENTAL CHANGES THAT MAY ADVERSELY AFFECT THE SYSTEM OVER TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL TECHNICAL DETAILS.

TABLE 2: PERFORATED STANDARD

CMP RETENTION STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** - PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57**	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE OPEN GRADED GRANULAR BEDDING CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4		CORRUGATED METAL PIPE		
5	BACKFILL	FREE-DRAINING, ANGULAR, WASHED-STONE PER **AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** OR APPROVED EQUAL *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING, WHERE CONVENTIONAL COMPACTION TESTING IS NOT PRACTICAL, THE MATERIAL SHALL BE MECHANICALLY COMPACTED UNTIL NO FURTHER YIELDING OF MATERIAL IS OBSERVED UNDER THE COMPACTOR. ***IN AREAS WITH HIGH WATER TABLE FLUCTUATIONS THAT INTERACT WITH THE PIPE ZONE, CONSIDER INSTALLING A GEOTEXTILE SEPARATION LAYER TO PREVENT SOIL MIGRATION.	
6	COVER MATERIAL	UP TO MIN. COVER - **AASHTO M 145: A-1, A-2, A-3** ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROADBASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.
- APPROVED REGIONAL EQUIVALENTS FOR SECTION 5 INCLUDE CA-7, MIDOT 6AA, 6A, OR 5G, PROVIDED THEY MEET THE PARTICLE SIZES INDICATED.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither the design nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk. Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

DATE	REVISION DESCRIPTION	BY

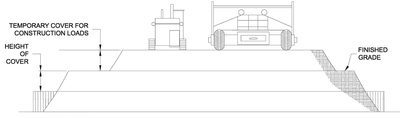
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO42257 Gateway Commons, LLC
Underground Detention
White Lake, MI
DETENTION SYSTEM

PROJECT No.: 28985	SEQ. No.: 42257
DATE: 7/30/2024	
DESIGNED: DYO	DRAWN: DYO
CHECKED: DYO	APPROVED: DYO
SHEET NO.:	1

C:\DEPOT\TEMPLATES\ENGINEERING\DWG_IA.DWG 10/18/2019 3:02:02 AM



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

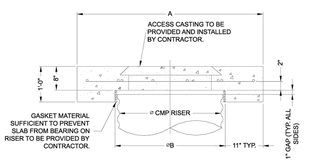
POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSPS (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

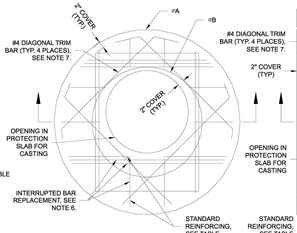


SECTION VIEW

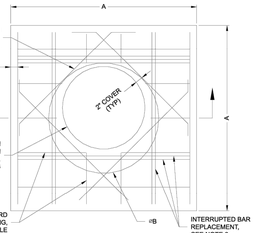
REINFORCING TABLE

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 8" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:
1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither the design nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk. Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO42257 Gateway Commons, LLC
Underground Detention
White Lake, MI
DETENTION SYSTEM

PROJECT No.: 28985	SEQ. No.: 42257
DATE: 1/18/2024	
DESIGNED: DYO	DRAWN: DYO
CHECKED: DYO	APPROVED: DYO
SHEET NO.:	1

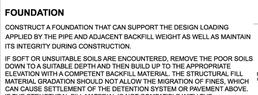
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

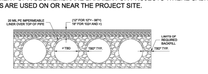


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

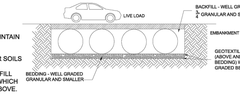
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

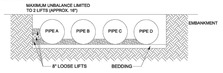
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



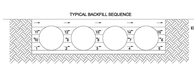
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

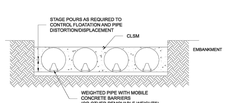


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

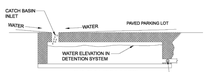


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

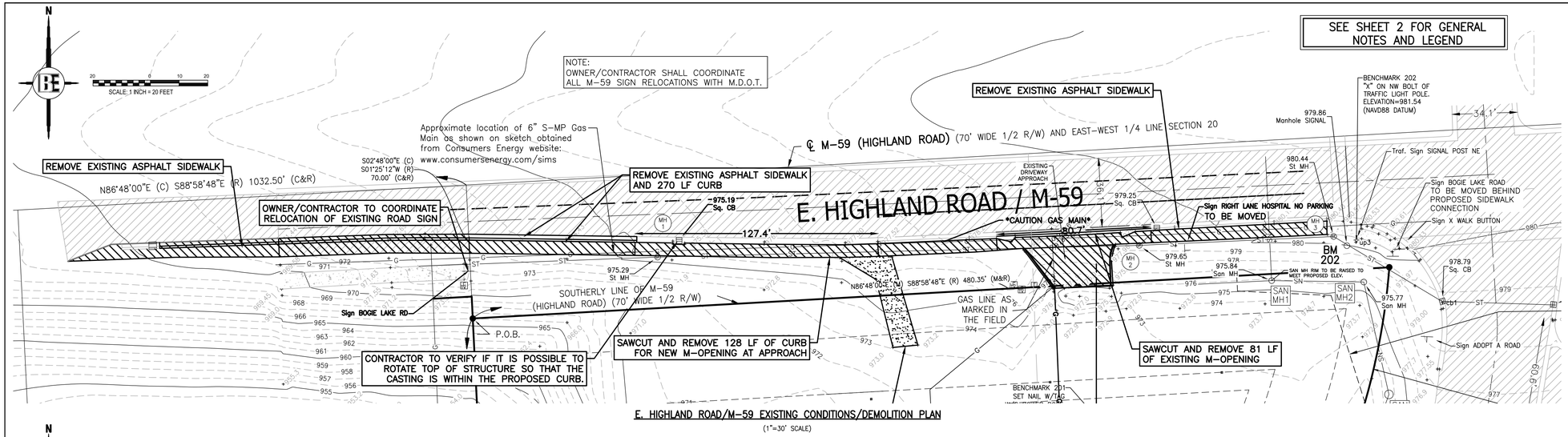
INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM.

MAINTENANCE

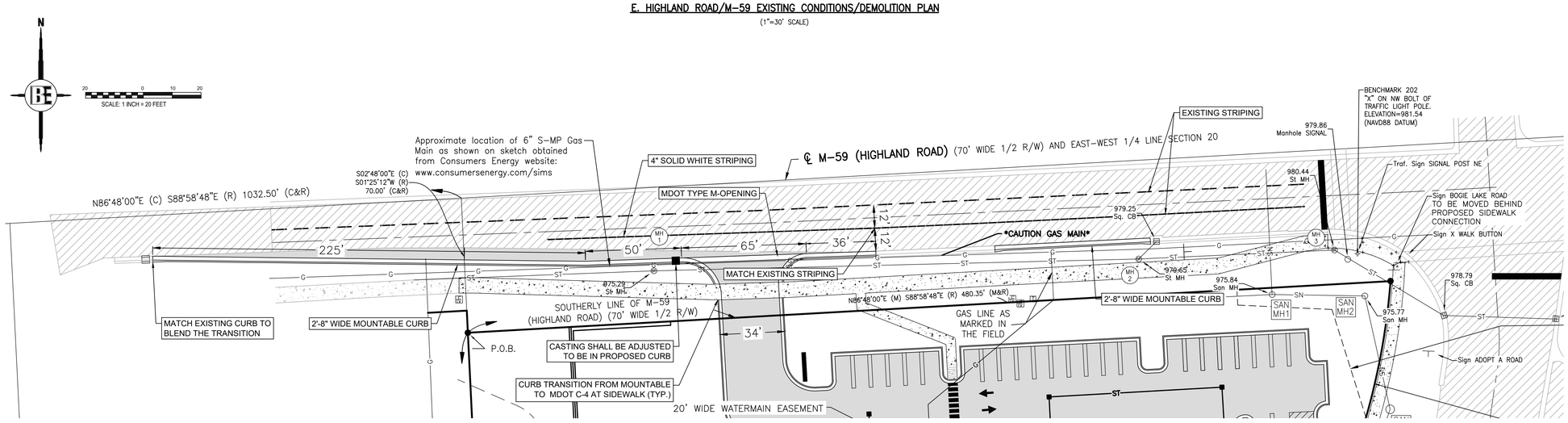
CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION



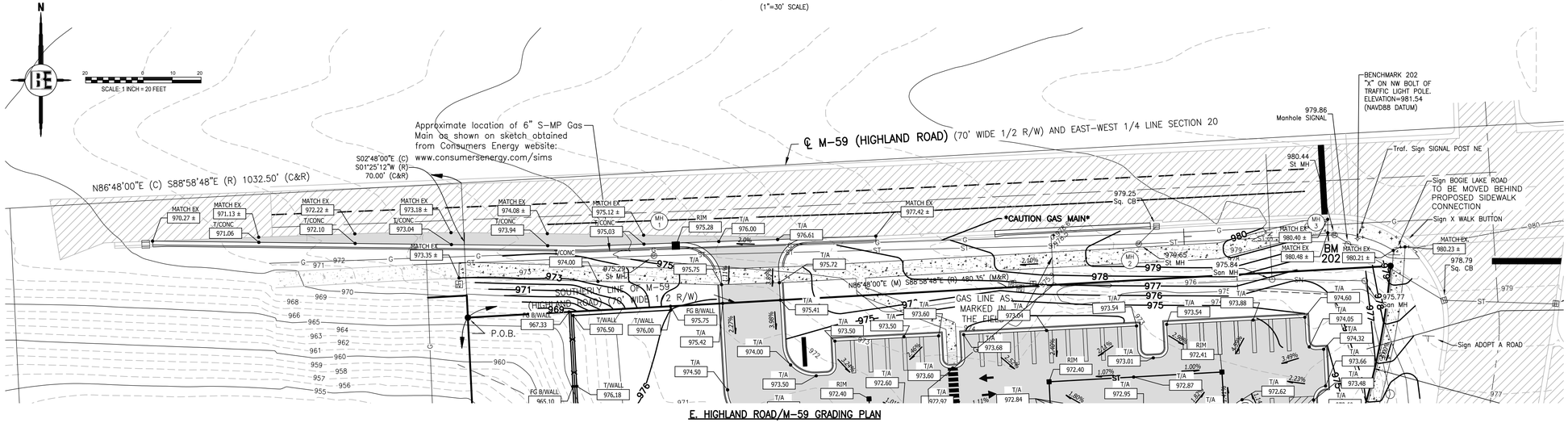
E. HIGHLAND ROAD/M-59 EXISTING CONDITIONS/DEMOLITION PLAN

(1"=30' SCALE)



E. HIGHLAND ROAD/M-59 STRIPING, EXPANSION, & UTILITY PLAN

(1"=30' SCALE)



E. HIGHLAND ROAD/M-59 GRADING PLAN

(1"=30' SCALE)

LEGEND

PROPOSED (PR)	EXISTING (EX)	
900 T/C XXX.XX	900 + 922.08	CONTOUR / SPOT ELEVATION
FF	FF	FINISHED FLOOR ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END-SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
SL	SL	SANITARY LEAD
FM	FM	FORCE MAIN
PS	PS	PRESSURE SEWER
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
FO	FO	FIBER OPTIC
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
X	X	FENCE
SF	SF	SILT FENCE
		WETLAND BOUNDARY
		LIMITS OF GRADING/CLEARING
		MANHOLE
		INLET / CATCHBASIN
		FLARED END-SECTION
		GATE VALVE
		HYDRANT
		UTILITY POLE
		SIGN
TBR	NFV	NOT FIELD VERIFIED / TO BE REMOVED
SN#		SANITARY SEWER LABEL
ST#		STORM SEWER LABEL
GV 12		WATER MAIN LABEL
541		SOIL EROSION CONTROL MEASURE (P=PERMANENT, T=TEMPORARY)
		CONCRETE
		ASPHALT
		MODIFIED CURB

SITE BENCHMARKS (NAVD88 DATUM):

- **BM #200** = SET NAIL WITH TAG N/S POWER POLE. ELEV.=970.67
- **BM #201** = SET NAIL WITH TAG W/S POWER POLE. ELEV.=973.22
- **BM #202** = "X" ON NW BOLT OF TRAFFIC LIGHT POLE. ELEV.=981.54
- **BM #204** = "X" ON NW CORNER CONCRETE RETAINING WALL. ELEV.=954.33

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN HEREON IS APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL UTILITIES BEFORE THE COMMENCEMENT OF ANY WORK AND SHALL AGREE TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT OCCUR. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE PROPOSED IMPROVEMENTS AND ANY EXISTING FACILITIES OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171

BE BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING

PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

TITLE: M-59 ENTRANCE DETAILS

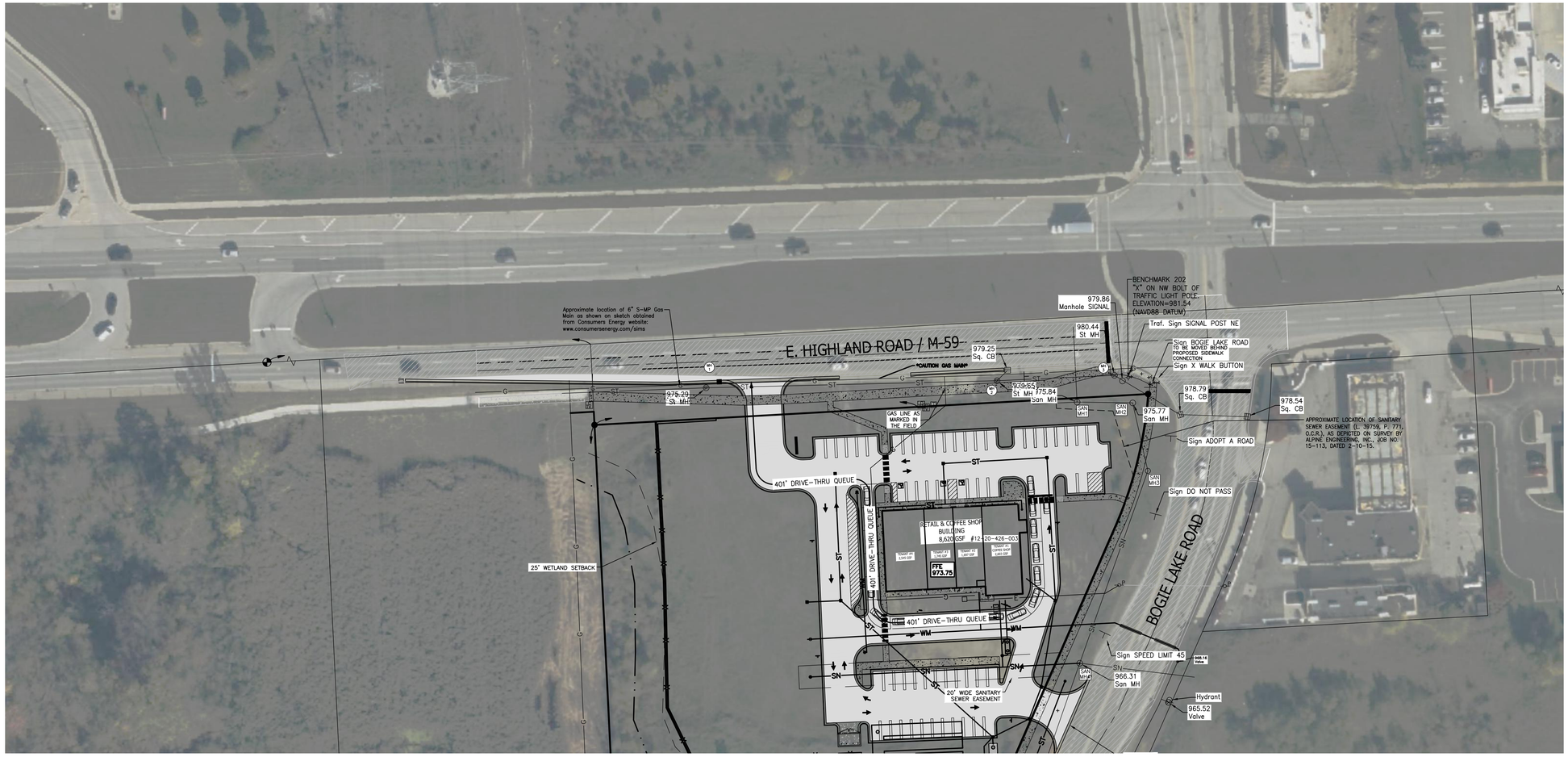
BY	REVISION PER	DATE
NO	TOWNSHIP COMMENTS	8/6/24
MJD	MDOT COMMENTS	7/9/24
MJD		

DESIGNED BY: ST
DRAWN BY: NL
CHECKED BY:
SCALE: 1" = 20'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 16

N

SCALE: 1 INCH = 20 FEET

SEE SHEET 2 FOR GENERAL NOTES AND LEGEND



E. HIGHLAND ROAD/M-59 MDOT PLAN

(1"=50' SCALE)

LEGEND

PROPOSED (PR)	EXISTING (EX)	
900 T/C XXX.XX	900 + 922.08	CONTOUR / SPOT ELEVATION
FF	FF	FINISHED FLOOR ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END-SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
SL	SL	SANITARY LEAD
FM	FM	FORCE MAIN
PS	PS	PRESSURE SEWER
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
FO	FO	FIBER OPTIC
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
X	X	FENCE
SF	SF	SILT FENCE
WETLAND BOUNDARY	WETLAND BOUNDARY	
LIMITS OF GRADING/CLEARING		
MANHOLE		
INLET / CATCHBASIN		
FLARED END-SECTION		
GATE VALVE		
HYDRANT		
UTILITY POLE		
SIGN		
TBR	NFV	NOT FIELD VERIFIED / TO BE REMOVED
SN 24		SANITARY SEWER LABEL
ST 18		STORM SEWER LABEL
GV 12		WATER MAIN LABEL
541		SOIL EROSION CONTROL MEASURE (P=PERMANENT, T=TEMPORARY)
		CONCRETE
		ASPHALT
		MODIFIED CURB

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS ARE APPROXIMATE AND NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL DETERMINE FOR HIMSELF THE EXACT LOCATION OF ALL UTILITIES BEFORE COMMENCING WORK AND SHALL ASSUME FULL RESPONSIBILITY FOR THE PROTECTION OF UTILITIES AS SHOWN OR NOT SHOWN ON THESE PLANS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE PROPOSED CONSTRUCTION AND ANY EXISTING FACILITIES SHOWN ON THE PLANS OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THAT INDICATED.

3 WORKING DAYS BEFORE YOU DIG DIAL MISS DIG 1-800-482-7171 IT'S THE LAW!!! IT'S FREE!!! IT'S A GOOD IDEA!!! IT'S A MEMBER SERVICE

BE BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

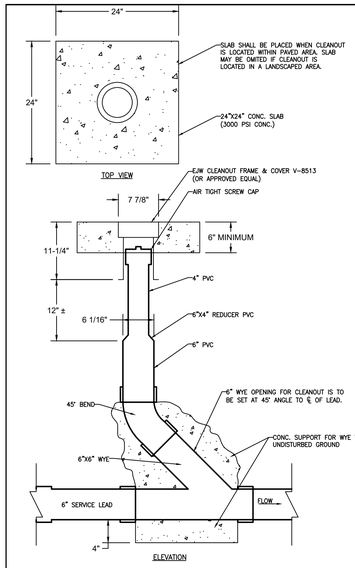
PROJECT: GATEWAY CROSSING

PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

TITLE: M-59 MDOT LAYOUT PLAN

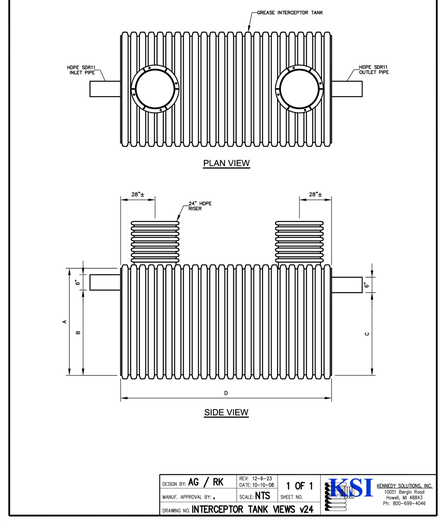
NO	BY	DATE	REVISION PER
1	MJD	7/9/24	MDOT COMMENTS
2	MJD	8/6/24	TOWNSHIP COMMENTS

DESIGNED BY: ST
DRAWN BY: NL
CHECKED BY:
SCALE: 1" = 20'
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 17



DETAIL OF SANITARY SEWER CLEANOUT

(NO SCALE)

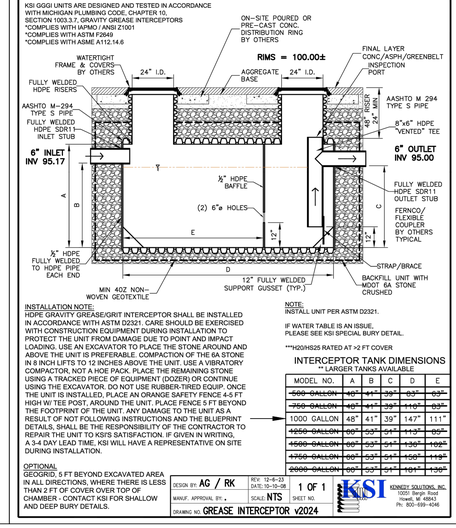


DESIGN BY: AG / RK	REV: 12-6-23 DATE: 10-15-08	1 OF 1	KSI KENNEDY SOLUTIONS, INC. 10331 Bergin Road Howell, MI 48843 Ph: 800-699-4046
MANUF. APPROVAL BY: -	SCALE: NTS	SHEET NO.	
DRAWING NO. INTERCEPTOR TANK VIEWS v24			

KSI HDPE GRAVITY GREASE/GRIT INTERCEPTOR TANK (500-2000 GALLON)

2 COMPARTMENT SYSTEM WITH 2 RISERS

KSI GGIII UNITS ARE DESIGNED AND TESTED IN ACCORDANCE WITH MICHIGAN PLUMBING CODE, CHAPTER 10, SECTION 1003.3.7, GRAVITY GREASE INTERCEPTORS
*COMPLIES WITH IAPMO / ANSI Z1001
*COMPLIES WITH ASTM F2649
*COMPLIES WITH ASME A112.14.6



INSTALLATION NOTE:
HDPE GRAVITY GREASE/GRIT INTERCEPTOR SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321. CARE SHOULD BE EXERCISED WITH CONSTRUCTION EQUIPMENT DURING INSTALLATION TO PROTECT THE UNIT FROM DAMAGE DUE TO POINT AND IMPACT LOADING. USE AN EXCAVATOR TO PLACE THE STONE AROUND AND ABOVE THE UNIT IS PREFERABLE. COMPACTION OF THE 6A STONE IN 8 INCH LIFTS TO 12 INCHES ABOVE THE UNIT. USE A VIBRATORY COMPACTOR, NOT A HOE PACK. PLACE THE REMAINING STONE USING A TRACKED PIECE OF EQUIPMENT (DOZER) OR CONTINUE USING THE EXCAVATOR. DO NOT USE RUBBER-TIRED EQUIP. ONCE THE UNIT IS INSTALLED, PLACE AN ORANGE SAFETY FENCE 4-5 FT HIGH W/ TEE POST, AROUND THE UNIT. PLACE FENCE 5 FT BEYOND THE FOOTPRINT OF THE UNIT. ANY DAMAGE TO THE UNIT AS A RESULT OF NOT FOLLOWING INSTRUCTIONS AND THE BLUEPRINT DETAILS, SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR THE UNIT TO KSI'S SATISFACTION. IF GIVEN IN WRITING, A 3-4 DAY LEAD TIME, KSI WILL HAVE A REPRESENTATIVE ON SITE DURING INSTALLATION.

OPTIONAL
GEOGRID, 5 FT BEYOND EXCAVATED AREA IN ALL DIRECTIONS, WHERE THERE IS LESS THAN 2 FT OF COVER OVER TOP OF CHAMBER - CONTACT KSI FOR SHALLOW AND DEEP BURY DETAILS.

NOTE:
INSTALL UNIT PER ASTM D2321.

IF WATER TABLE IS AN ISSUE, PLEASE SEE KSI SPECIAL BURY DETAIL.

***H20/HS25 RATED AT >2 FT COVER

INTERCEPTOR TANK DIMENSIONS
** LARGER TANKS AVAILABLE

MODEL NO.	A	B	C	D	E
~~500 GALLON~~	~~40"~~	~~41"~~	~~39"~~	~~93"~~	~~93"~~
~~750 GALLON~~	~~40"~~	~~41"~~	~~39"~~	~~116"~~	~~93"~~
1000 GALLON	48"	41"	39"	147"	111"
~~1250 GALLON~~	~~60"~~	~~53"~~	~~51"~~	~~113"~~	~~99"~~
~~1500 GALLON~~	~~60"~~	~~53"~~	~~51"~~	~~135"~~	~~105"~~
~~1750 GALLON~~	~~60"~~	~~53"~~	~~51"~~	~~150"~~	~~111"~~
~~2000 GALLON~~	~~60"~~	~~53"~~	~~51"~~	~~161"~~	~~136"~~

DESIGN BY: AG / RK	REV: 12-6-23 DATE: 10-15-08	1 OF 1	KSI KENNEDY SOLUTIONS, INC. 10331 Bergin Road Howell, MI 48843 Ph: 800-699-4046
MANUF. APPROVAL BY: -	SCALE: NTS	SHEET NO.	
DRAWING NO. GREASE INTERCEPTOR v2024			

KSI HDPE GRAVITY GREASE/GRIT INTERCEPTOR (GGGI)

INSTALLATION AND MAINTENANCE GUIDELINES

INSTALLATION GUIDELINES

1. EXCAVATE AREA FOR KSI HDPE GGGI AND PREPARE TANK/TRENCH BOTTOM PER ASTM D2321, SECTIONS 6 & 7.

2. THE KSI HDPE GGGI TANK SHALL BE INSTALLED ON A BED OF NO LESS THAN 12" MDOT 6A CRUSHED STONE BEDDING MATERIAL COMPACTED TO 95% PROCTOR DENSITY.

3. BACKFILL GGGI UNIT WITH MDOT 6A CRUSHED STONE PER ASTM D 2321. CLASS I MATERIAL IS RECOMMENDED. BACKFILL SHALL BE COMPACTED TO 95% PROCTOR DENSITY.

4. THE HDPE ACCESS RISERS SHALL BE FIELD CUT TO FINISH GRADE BY THE CONTRACTOR. SEE RISER INSTALLATION OPTIONS PAGE.

5. KSI RECOMMENDS FILLING THE GGGI UNIT WITH WATER UPON COMPLETION OF INSTALLATION UP TO THE OUTLET HEIGHT.

MAINTENANCE GUIDELINES

1. ALL GREASE INTERCEPTOR TANKS WILL REQUIRE PERIODIC MAINTENANCE DEPENDING ON SPECIFIC SITE CONDITIONS.

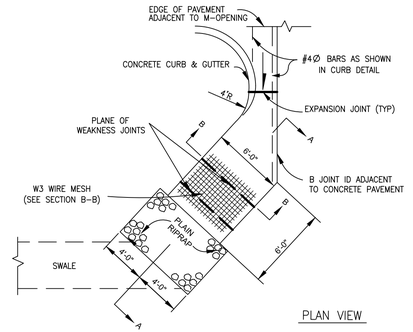
2. KSI RECOMMENDS FREQUENT CLEANING THE GREASE INTERCEPTOR. WEEKLY, MONTHLY, QUARTERLY, ETC, AS DICTATED BY THE ESTABLISHMENTS NEEDS. THIS WILL BE BASED ON THE BUILDING WASTE EFFLUENT DISCHARGE CAPACITY AND CONCENTRATION. MATERIAL IS EASIER TO REMOVE WHEN IT IS REMOVED ON A REGULAR BASIS.

3. DISPOSAL OF MATERIAL FROM THE KSI GREASE INTERCEPTOR ARE SIMILAR TO THAT OF ANY OTHER BEST MANAGEMENT PRACTICES (BMP). LOCAL GUIDELINES SHOULD BE CONSULTED PRIOR TO DISPOSAL OF THE GREASE INTERCEPTOR CONTENTS. WASTE PRODUCTS SHOULD BE REMOVED BY A LICENSED WASTE MANAGEMENT COMPANY.

4. AFTER CLEANING THE UNIT - KSI RECOMMENDS REFILLING THE GGGI UNIT WITH WATER.

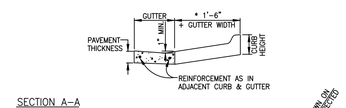
DESIGN BY: AG / RK	REV: 3-20-23 DATE: 9-24-09	1 OF 1	KSI KENNEDY SOLUTIONS, INC. 10331 Bergin Road Howell, MI 48843 Ph: 800-699-4046
MANUF. APPROVAL BY: -	SCALE: NTS	SHEET NO.	
DRAWING NO. GGGI INSTALL & MAINT.			

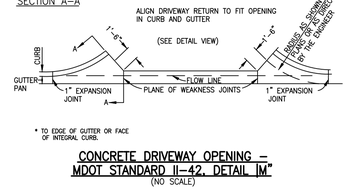
SEE SHEET 2 FOR GENERAL NOTES AND LEGEND



ANGLED CONCRETE SPILLWAY

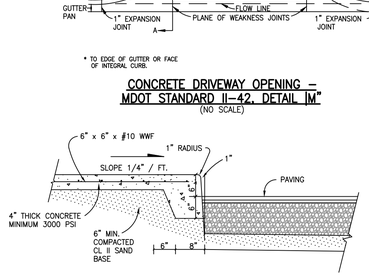
FOR USE AT END OF CURB
(ANGLED)





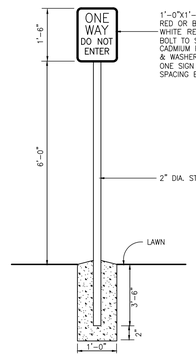
CONCRETE DRIVEWAY OPENING – MDOT STANDARD II-42, DETAIL 'M"

(NO SCALE)



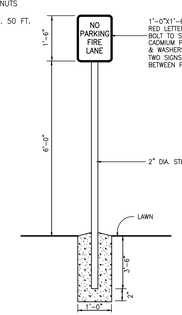
INTEGRAL CONCRETE WALK / CURB DETAIL

(NO SCALE)



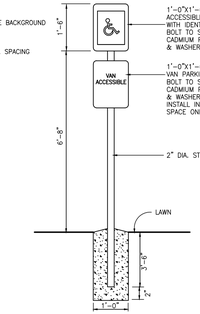
NO PARKING SIGN DETAIL

(NO SCALE)



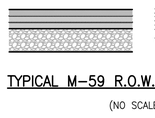
NO PARKING SIGN DETAIL

(NO SCALE)



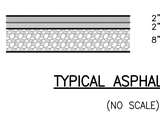
HANDICAP PARKING SIGN DETAIL

(NO SCALE)



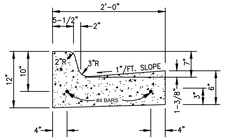
TYPICAL M-59 R.O.W. ASPHALT DETAIL

(NO SCALE)



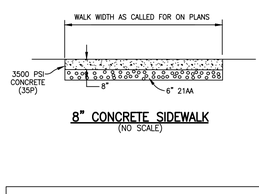
TYPICAL ASPHALT DETAIL

(NO SCALE)



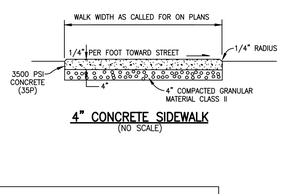
REDUCED SECTION CONCRETE CONCRETE CURB & GUTTER TYPE C4

(TO BE USED AT OPPOSITE VALLEY TYPE" CURB AT BOULEVARDS)
(NO SCALE)



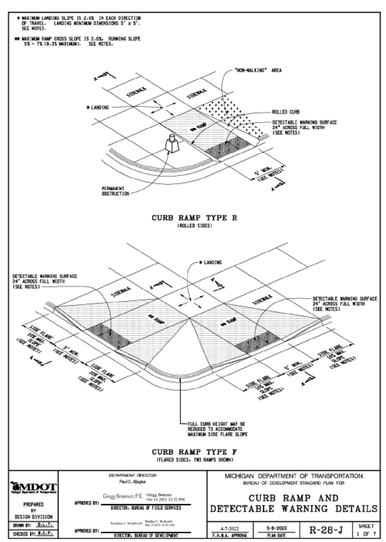
8" CONCRETE SIDEWALK

(NO SCALE)

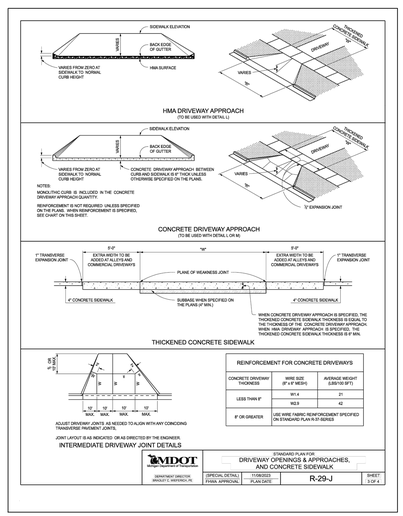


4" CONCRETE SIDEWALK

(NO SCALE)

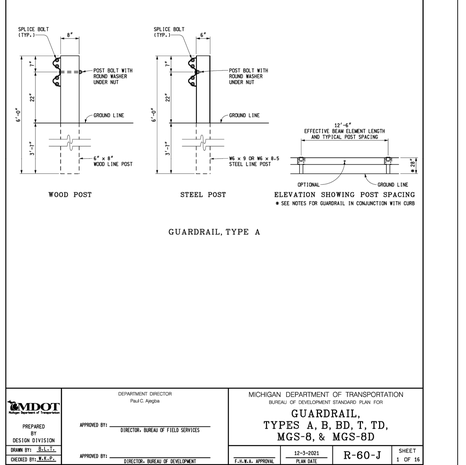


MDOT PREPARED BY DESIGN DIVISION	DEPARTMENT DIRECTOR Paul C. Ajegba	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR
DRAWN BY: B.L.T.	APPROVED BY: Gregg Brannon, P.E. Gregg Brannon (Apr 19, 2021 15:15 PM EDT) DIRECTOR, BUREAU OF FIELD SERVICES	CURB RAMP AND DETECTABLE WARNING DETAILS
CHECKED BY: R.K.F.	APPROVED BY: Wendlee L. Wiedrick Wendlee L. Wiedrick (Apr 19, 2021 15:15 PM EDT) DIRECTOR, BUREAU OF DEVELOPMENT	T.A.S.M.A. APPROVAL: 4-7-2021 / PLAN DATE: 5-6-2020 / R-28-J / SHEET: 1 OF 7



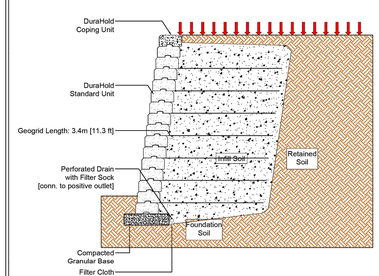
REINFORCEMENT FOR CONCRETE DRIVEWAYS		
CONCRETE DRIVEWAY THICKNESS	WIRE SIZE (6" x 6" MESH)	AVERAGE WEIGHT (LBS/100 SFT)
LESS THAN 8"	W1.4	21
	W2.9	42
8" OR GREATER	USE WIRE FABRIC REINFORCEMENT SPECIFIED ON STANDARD PLAN R-57-SERIES	

MDOT PREPARED BY DESIGN DIVISION	DEPARTMENT DIRECTOR Paul C. Ajegba	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR
DRAWN BY: B.L.T.	APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES	DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK
CHECKED BY: R.K.F.	APPROVED BY: DIRECTOR, BUREAU OF DEVELOPMENT	T.A.S.M.A. APPROVAL: 11/30/2023 / PLAN DATE: - / R-29-J / SHEET: 3 OF 4



MDOT PREPARED BY DESIGN DIVISION	DEPARTMENT DIRECTOR Paul C. Ajegba	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR
DRAWN BY: B.L.T.	APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES	GUARDRAIL, TYPES A, B, BD, T, TD, MGS-6, & MGS-8D
CHECKED BY: R.K.F.	APPROVED BY: DIRECTOR, BUREAU OF DEVELOPMENT	T.A.S.M.A. APPROVAL: - / PLAN DATE: 12-3-2021 / R-60-J / SHEET: 1 OF 16

TYPICAL SECTION - NOT FOR CONSTRUCTION



Design Specific Geometric Information

Retaining Wall System	DuraHold w/ Geogrid	Geogrid Type and Manufacturer	See Notes
Maximum Height mm (in)	4880 (192)	Minimum Geogrid LTDS kN/m (lb/ft)	See Notes
Maximum Slope Above Wall	Horizontal	Maximum Slope Below Wall	None
Max. Surcharge Above Wall kPa (lb/sq.ft)	Traffic Surcharge 12 kPa (250 lb/sq.ft)	Depth of Embedment mm (in)	488 (19)
Batter of Wall	7.12 °	Compacted Base Dimension mm (in)	1228 x 305 (48 x 12)

Design Specific Soil Information

	Soil Region				
	Infill	Retained	Foundation	Base	Drainage
Description (by USCS)	GW Well graded, free draining Granular	CL Inorganic Clays Low Plasticity	CL Inorganic Clays Low Plasticity	GW Well graded, free draining Granular	see infill
Effective Internal Friction Angle	35 °	28 °	28 °	39 °	NR
Moist Unit Weight kN/cu.m (lb/cu.ft)	22 (140)	20 (127)	20 (127)	22 (140)	NR
Effective Cohesion kPa (lb/sq.ft)	NR	NR	NR	NR	NR
Soil Notes	Placed in 150mm (6") lifts and compacted to 95 % SPD.	Undisturbed dense soil or well compacted Eng. fill.	Allowable bearing cap.must exceed 150kPa (3125 psf).	Crushed Gravel (free draining) compacted to 98 % SPD.	Gravel infill must be well graded, angular, free drain w/max. 8% fines.

NR - Not Required
Notes:
1. This design meets or exceeds the minimum factors of safety required by Risi Stone Systems based on the design parameters listed above. The analysis was performed as outlined in the National Concrete Masonry Association Design Manual for Segmental Retaining Walls, Third Edition. This is a typical, non site-specific Design.
2. No analysis of global stability, total or differential settlement, or seismic effects has been performed.
3. This design is only provided to illustrate the general arrangement of the SRW structure for preliminary costing and feasibility purposes only. This drawing is not for construction. A qualified Engineer must be retained to provide the Final Design prior to construction.
4. Structures such as handrails, guardrails, fences, terraces, and site conditions such as water applications, drainage and soil conditions, additional live and dead loads, etc., have significant effects on the wall design and have not been taken into account in this typical section. When accounted for in the Final Design, other conditions and elements may result in additional design measures (geogrid, drainage, etc) and cost.
5. For geogrid reinforced structures, a minimum Long Term Allowable Design Strength of 14 kN/m was assumed. Contact your manufacturer or Risi Stone Systems for a list of approved geogrid reinforcements.

Risi Stone retaining wall systems
www.risistone.com
1-800-626-8255

DuraHold®
Retaining Wall Geogrid Section
4880mm (16.00ft)
Site: Surcharge - Clays
Infill: Granular
DH1RBQAI488

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS IS APPROXIMATE AND NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES CONSTRUCTED BY OTHERS PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FROM THE PLANS IN THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
IT'S THE LAW!!! IT'S FREE!!!
(FOR NON-MEMBERS OF UNDERGROUND FACILITIES)

BE BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: GATEWAY CROSSING
PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000
TITLE: CONSTRUCTION DETAILS

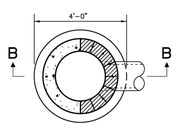
NO	BY	DATE
		8/6/24
2	MJD	7/9/24
1	MJD	REVISION PER
		TOWNSHIP COMMENTS
		MDOT COMMENTS

DESIGNED BY: ST
DRAWN BY: DH
CHECKED BY:
SCALE: NO SCALE
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 18

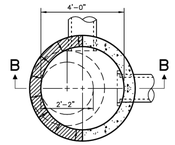
BOSS Engineering

G:\22-029\DWG\CP\22-029-1 SHEETS CP.dwg, 8/6/2024 12:01:09 PM, marcusd, AutoCAD PDF (General Documentation).pc3

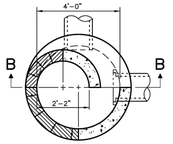
SEE SHEET 2 FOR GENERAL NOTES AND LEGEND



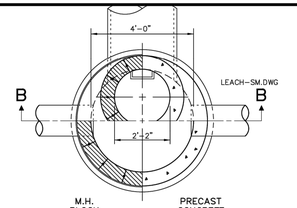
SECTION A–A



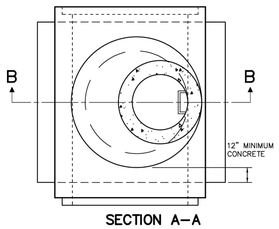
SECTION A–A



SECTION A–A

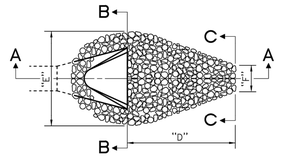


SECTION A–A

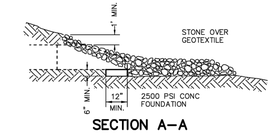


SECTION A–A

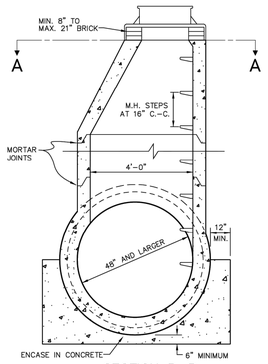
PIPE DIA.	"D"	"E"	"F"	S.Y.
12"	5'-0"	6'-6"	3'-0"	4
15"	5'-0"	7'-0"	3'-0"	4
18"	5'-0"	7'-6"	3'-6"	4
21"	5'-6"	8'-0"	4'-0"	5
24"	6'-0"	8'-6"	4'-6"	6
27"	6'-6"	9'-0"	5'-0"	7
30"	7'-0"	9'-9"	5'-6"	8
33"	7'-6"	10'-3"	5'-6"	9
36"	8'-0"	10'-9"	6'-0"	10
42"	9'-0"	11'-9"	6'-6"	12
48"	10'-0"	13'-0"	7'-0"	14



PLAN VIEW

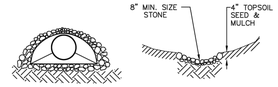


SECTION A–A



SECTION B–B

STANDARD PRECAST CONCRETE MANHOLE TEE



SECTION B–B SECTION C–C

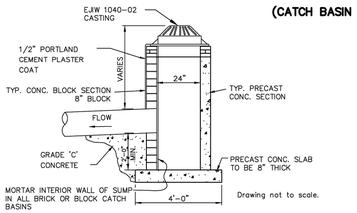
PLAIN STONE RIP–RAP

STORM SEWER NOTES

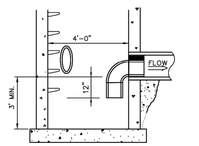
1. PRECAST CONC. RISERS SHALL MEET A.S.T.M. C478
2. DIAMETER OF CONC. BASE: I.D. + 2(WALL) + 8"
3. MANHOLE STEP SPACING SHALL MEET MIOSHA REQUIREMENTS. NO MORE THAN 21" FROM RIM TO FIRST STEP. MAX. 16" O.C. STEPS SHALL BE CAST POLYPROPYLENE REINFORCED WITH A 1/2" STEEL ROD.
4. WALL THICKNESS OF BLOCK STRUCTURES SHALL BE:

DEPTH	THICKNESS
0–8'	6"
8–15'	8"
OVER 15'	12"

5. MINIMUM I.D. OF STRUCTURE FOR: 36"to 42" = 5'–0" 48"to 54" = 6'–0" LARGER DIAMETER STRUCTURES MAY BE REQUIRED DEPENDING ON PIPING CONFIGURATION.
6. ALL LIFTING HOLES AND VOIDS IN INTERIOR JOINTS SHALL BE FILLED BY MORTAR.
7. THE FINGER DRAIN DETAIL SHALL BE USED AT ALL LOW POINT CATCH BASINS IN PAVEMENT AREAS. THE DETAIL MAY BE OMITTED WITH THE APPROVAL OF THE TOWNSHIP ENGINEER IN AREAS WITH VERY POROUS SOILS AND NO GROUNDWATER PROBLEMS.
8. PRECAST ONE PIECE BASES AND RISERS ARE ACCEPTABLE FOR INLETS, CATCH BASINS AND MANHOLES
9. FRAMES & COVERS WITH INLET CAPACITY (1.0 CFS/90 SQ IN)
   –TRAFFIC AND PARKING AREAS: MDOT "D" (EJIW 5105) 1.9 CFS*
   –REAR YARD AND DITCH INLETS: (EJIW 1040–02) 2.1 CFS*
   –MANHOLES: MDOT "A" (EJIW 1060)
   –CURB AND GUTTER INLETS: MDOT "K" (EJIW 7045) 1.8 CFS*
   –MOUNTABLE CURB & GUTTER: (EJIW 7065) 2.2 CFS*
   –*MAY VARY DUE TO MANUFACTURER CHANGES
10. CONTACT THE TOWNSHIP ENGINEER 48 HOURS PRIOR TO CONSTRUCTION TO SCHEDULE INSPECTION. FULL TIME INSPECTION WILL BE REQUIRED FOR ALL UNDERGROUND STORM SEWER CONSTRUCTION. PHONE (248) 334–9901
11. THE CONTRACTOR SHALL CONTACT MISS DIG 72 HOURS BEFORE CONSTRUCTION AT (800) 482–7171 TO LOCATE EXISTING UNDERGROUND UTILITIES.
12. PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL HAVE IN HIS POSSESSION A CURRENT SOIL EROSION CONTROL PERMIT AS ISSUED BY WHITE LAKE TOWNSHIP.
13. A 2' DEEP SUMP SHALL BE USED IN ANY STRUCTURE SUBJECT TO A WATER DROP GREATER THAN 2.0' FROM AN INLET PIPE.
14. ALLOWABLE STORM SEWER PIPE TYPES:
   –12" AND UP: RCP ASTM C–76 MIN. CLASS 3, MIN CLASS 4 UNDER TRAFFIC AREAS, RUBBER JOINT
   –6" TO 15": SCH 40 PVC OR SDR 23.5 PVC WITH RUBBER OR GLUE JOINT
   –6" TO 48": SMOOTH BORE CORRUGATED HIGH DENSITY POLYETHYLENE WITH NEOPRENE LINED JOINTS OR BETTER
15. THE MINIMUM PIPE SIZE IN PUBLIC RIGHT–OF–WAY OR EASEMENTS AND FOR PIPES CARRYING OFF–SITE STORM WATER SHALL BE 12"
16. ALL PIPE ENDS NOT WITHIN A STRUCTURE SHALL HAVE A CONCRETE OR METAL FLARE END SECTION (FES) WITH A BAR SCREEN ON PIPES 18" AND LARGER EXCEPT THOSE WITHIN A SECURE FENCED AREA NEED NO BAR SCREEN.
17. ALL DRAINAGE STRUCTURES WITHIN THE ROAD SHALL BE SEALED WITH WRAPPED GEOTEXTILE PER RCOC STANDARDS



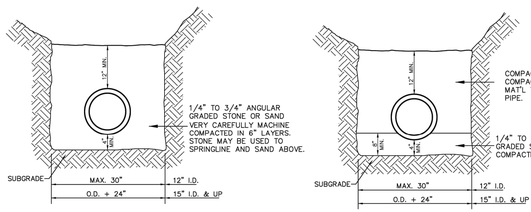
STANDARD REAR YARD CATCH BASIN



TRAP SHALL BE BULKHEADED IN OUTLET PIPE AND SHALL BE A SCH 40 PVC ASSY WITH A PIPE AREA NO LESS THAN 50% OF THE OUTLET PIPE.

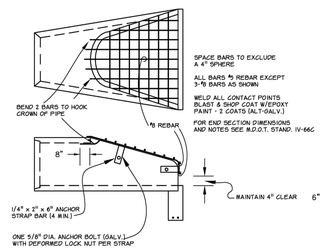
ALTERNATE: USE "THE SNOUT" BASIN TRAP SYSTEM

TRAPPED CATCH BASIN

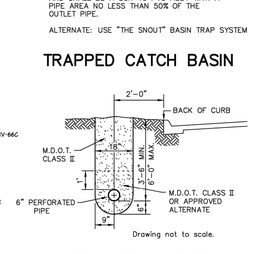


PIPE BEDDING FOR PLASTIC PIPE

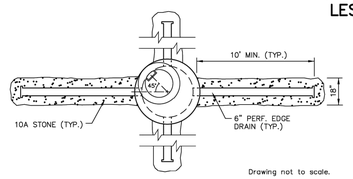
CLASS "B" BEDDING FOR SEWER PIPE LESS THAN 48"



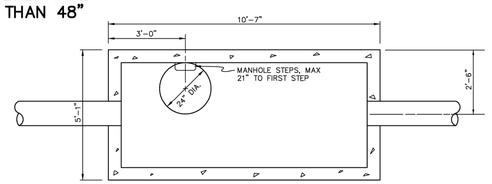
BAR SCREEN DETAIL

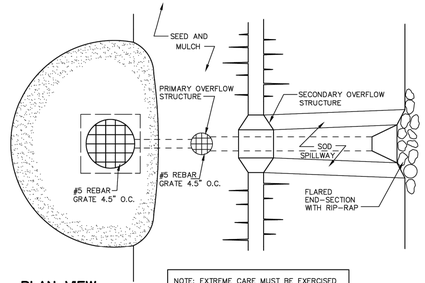


EDGE DRAIN DETAIL



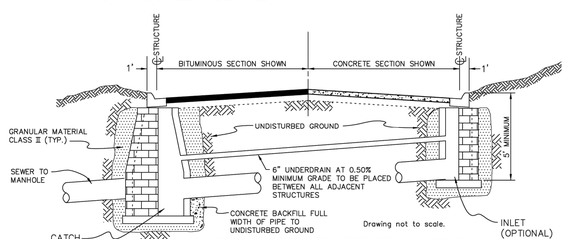
PLAN



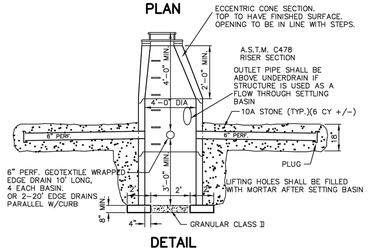


PLAN VIEW

NOTE: EXTREME CARE MUST BE EXERCISED TO INSURE THAT THE OUTLET HOLES IN THE STANDPIPE, DO NOT BECOME CLOGGED WITH SEDIMENT.

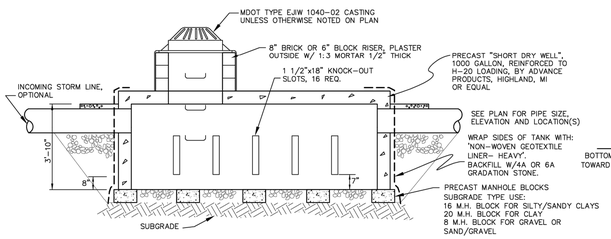


DRAINAGE STRUCTURE LAYOUT

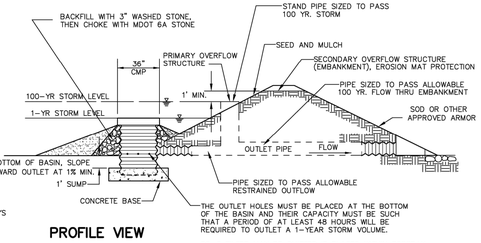


DETAIL

STANDARD LEACHING BASIN



1000 GALLON LEACHING/SETTLING BASIN



PROFILE VIEW

SO–2 FILTER MAY BE OMITTED IF PLACED WITHIN FOREBAY

SO–2 DETENTION BASIN OUTLET FILTER (CMP)

(SEE OCDC STANDARD DETAILS FOR SEDIMENT BASIN OR FOREBAY OUTLET STRUCTURE)

DRAWN: CAD
DESIGN: OA
CHECKED: –

SCALE: VERT. –
HORZ. AS NOTED

REVISIONS	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE
		FIRST ISSUE	08/16/95		REVISE	10–03–02		REVISE	06–01–07
		ADD SO–1	06–17–96		REVISE	12–17–03		UPDATED TITLE BLOCK	04/30/13
		NEW BAR GRATE	11–03–97		SEC REFERENCE	05–17–05			

Johnson&Anderson
4494 Elizabeth Lake Road, Waterford, Michigan 48328, tel (248) 681-7800 fax (248) 681-2660
1060 W. Norton Avenue, Suite 7, Muskegon, Michigan 49441, tel (231) 780-3100 fax (231) 780-3115
3910 Lapeer Road, Port Huron, Michigan 48060, tel (810) 987-7820 fax (810) 987-7895

White Lake Township
7525 Highland Road (M-59)
White Lake, Michigan 48383
248-698-3300

STORM SEWER STANDARD DETAILS

JOB NO.
DATE ISSUED 08/16/95
SHEET NO.

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AND/OR STRUCTURES SHOWN ON THESE PLANS ARE NOT GUARANTEED TO BE EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES CROSSINGS PRIOR TO CONSTRUCTION. IN ADDITION, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST FROM THE PLANS. THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1–800–482–7171 IT'S THE LAW!!! (P.A. 53 AS AMENDED BY PUBLIC ACT 174 OF 2013)

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT
GATEWAY CROSSING

PREPARED FOR
GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

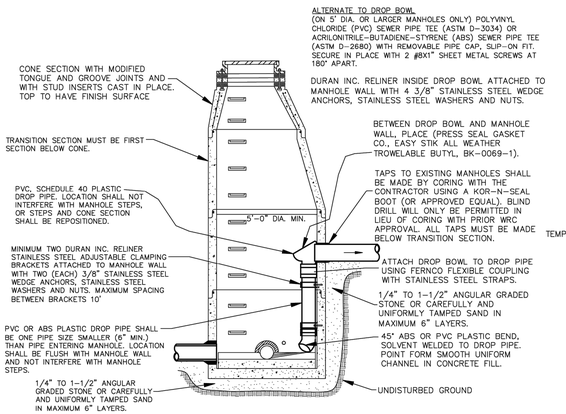
TITLE
TOWNSHIP STORM DETAILS

NO	BY	REVISION PER	DATE
1	MJD	MDOT COMMENTS	7/9/24
2	MJD	TOWNSHIP COMMENTS	8/6/24

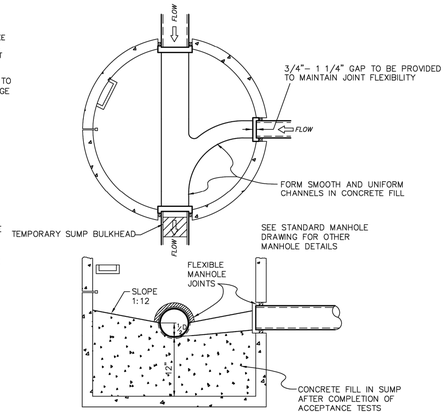
DESIGNED BY:
DRAWN BY:
CHECKED BY:
SCALE: NO SCALE
JOB NO: 22–029–1
DATE: 05/30/24
SHEET NO. 19

BOSS Engineering

SEE SHEET 2 FOR GENERAL NOTES AND LEGEND

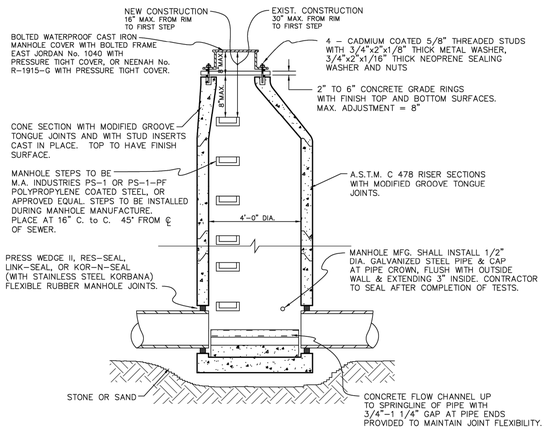


INTERIOR DROP CONNECTION



Drawing not to scale.

SUMP MANHOLE FOR TESTING, CLEANING, AND DEWATERING



Drawing not to scale.

STANDARD MANHOLE ON 8" THROUGH 24" DIAMETER SEWERS

SANITARY SEWER CONSTRUCTION NOTES

1. All construction shall conform to the current standards and specifications of the local unit of government and the Oakland County Water Resources Commissioner (OCWRC). All sanitary sewer construction shall have full time inspection supervised by a professional engineer provided by or caused to be provided by the local unit of government.

2. At all connections to Oakland County Water Resources Commissioner's sewers or extensions, and before start of construction, the Contractor must obtain a Sewer Inspection Permit issued by the OCWRC. Gravity sewer permit charges are $250.00 for each connection plus $25.00 for each manhole constructed. Pressure sewer permit charges are $250.00 per 2460 L.F. of force main with a minimum permit fee of $250.00. Failure to pass any test segment will result in an additional charge to the Contractor for each retest, in accordance with the above price schedule. The Contractor shall also have posted with the OCWRC a $5,000.00 surety bond and $500.00 cash deposit. The Contractor shall notify the local unit of government and the OCWRC (248-858-1110) 24 hours prior to the beginning of any construction. Final acceptance tests must be witnessed by County personnel and must be scheduled by Municipality or It's consultant in advance with 24 hour notice at 248-858-1110.

3. No sewer installation shall have an infiltration or exfiltration exceeding 100 gallons per inch diameter per mile of pipe in a 24 hour period, and no single run of sewer between manholes shall exceed 100 gallons per inch diameter per mile. Air tests in lieu of infiltration tests shall be as specified in the OCWRC "Acceptance Tests", dated September, 1972. Only pipe and pipe joints approved by the Oakland County Water Resources Commissioner may be used for sanitary sewer construction.

4. Located in the first manhole upstream from the point of all connections to an existing OCWRC sewer, or extension thereto, a temporary 12-inch deep sump shall be provided in the first manhole above the connection which will be filled in after such successful completion of any acceptance test up to the standard fillet provided for the flow channel. A watertight bulkhead shall be provided on the downstream of the sump manhole.

5. All building leads and risers shall be 6-inch S.D.R. 23.5 ABS OR PVC pipe with chemically fused joints, or an approved equal pipe and joint. Sewer pipe wye shall contain factory installed premium joint material of an approved type compatible with that of the building lead pipe used. Building leads to be furnished with removable air tight and water-tight stoppers.

6. All rigid sewer pipe shall be installed in Class "B" bedding or better. All flexible, semi-flexible or composite sewer pipe shall be installed in conformance to the Oakland County Water Resources Commissioner specifications.

7. All new manholes shall have Oakland County Water Resources Commissioner approved flexible, water-tight seals where pipes pass through walls. Manholes shall be of precast sections with modified groove tongue and rubber gasket type joints. Precast manhole cone sections shall be Oakland County Water Resources Commissioner approved modified eccentric cone type. All manholes shall be provided with bolted, water-tight covers.

8. At all connections to manholes on Oakland County Water Resources Commissioner's sewers or extensions thereto drop connections will be required when the difference in invert elevations exceeds 18-inches. Outside drop connections only will be approved.

9. Taps to existing manholes shall be made by coring. The Contractor shall place a KOR-N-SEAL boot (or OCWRC approved equal) after coring is completed. Blind drilling will not be permitted in lieu of coring.

10. New manholes constructed directly on Oakland County Water Resources Commissioner's sewers shall be provided with covers reading "Oakland County – Sanitary" in raised letters. New manholes built over an existing sanitary sewer shall have monolithic poured bottoms.

11. No ground water, storm water, construction water, downspout drainage or weep tile drainage shall be allowed to enter any sanitary sewer installation.

12. Prior to excavation, the Contractor shall telephone MISS DIG (647-7344) for the location of underground pipeline and cable facilities, and shall also notify representatives of other utilities located in the vicinity of the work.

13. 18" minimum vertical separation and 10' minimum horizontal separation must be maintained between sanitary sewer and water main.

14. Manhole frame and cover shall be as follows: East Jordan heavy manhole cover, base flange type #1040 or Neenah Foundry heavy duty #R-1642 manhole frame. Solid lid cover shall be non-rocking and marked "WHITE LAKE TOWNSHIP SEWER DEPARTMENT."

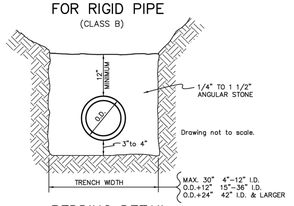
Drawing not to scale.

HOUSE/BUILDING LEAD DETAIL

Drawing not to scale.

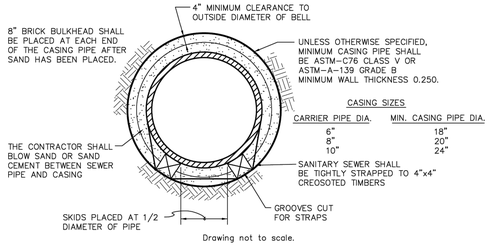
NOTE: APPROVAL MAY BE GIVEN TO ALTERNATE MATERIALS AND METHODS TO ACHIEVE CLASS B BEDDING

BEDDING DETAIL FOR RIGID PIPE



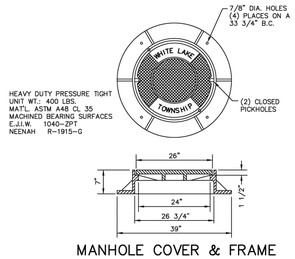
Drawing not to scale.

BEDDING DETAIL FOR FLEXIBLE PIPE

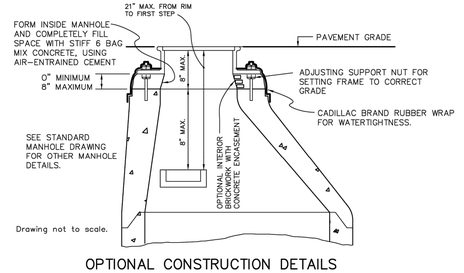


Drawing not to scale.

PIPE BARREL SUPPORT FOR SEWER



MANHOLE COVER & FRAME



Drawing not to scale.

OPTIONAL CONSTRUCTION DETAILS

DRAWN: CAD
DESIGN: OA
CHECKED: –

SCALE: VERT. –
HORZ. AS NOTED

REVISIONS	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE
		FIRST ISSUE	09/11/97		OCWRC COMMENTS	11/06/15			
		UPDATED TITLE BLOCK	04/30/13						
		UPDATED NOTES	02/17/15						

Johnson&Anderson
4494 Elizabeth Lake Road, Waterford, Michigan 48328, tel (248) 681-7800 fax (248) 681-2660
1060 W. Norton Avenue, Suite 7, Muskegon, Michigan 49441, tel (231) 780-3100 fax (231) 780-3115
2291 Water Street, Suite 6, Port Huron, Michigan 48060, tel (810) 987-7820 fax (810) 987-7895
White Lake Township
7525 Highland Road (M-59)
White Lake, Michigan 48383
248-698-3300

SANITARY SEWER STANDARD DETAILS

JOB NO.
DATE ISSUED 09/11/97
SHEET NO.

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS IS NOT GUARANTEED TO BE ACCURATE OR COMPLETE AND NO REPRESENTATION AS TO THE LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES AS SHOWN ON THESE PLANS IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT LOCATION AND ELEVATION OF ALL EXISTING UTILITIES AND PROPOSED UTILITIES AS SHOWN ON THESE PLANS BEFORE COMMENCING WORK. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE LOCATION OR DEPTH OF UTILITIES AS SHOWN ON THE PLANS AND THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
IT'S THE LAW!!! (P.A. 53 OF 1974, AS AMENDED)
MEMBERS OF MISS DIG SYSTEM

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT
GATEWAY CROSSING

PREPARED FOR
GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI. 48009
248-433-7000

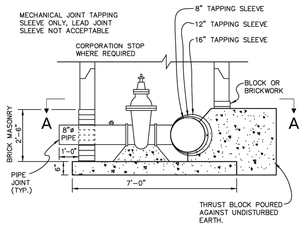
TITLE
TOWNSHIP SANITARY DETAILS

NO.	BY	REVISION PER	DATE
2	MJD	TOWNSHIP COMMENTS	8/6/24
1	MJD	MDOT COMMENTS	7/9/24

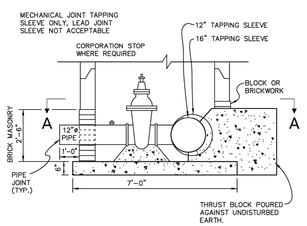
DESIGNED BY:
DRAWN BY:
CHECKED BY:
SCALE: NO SCALE
JOB NO: 22–029–1
DATE: 05/30/24
SHEET NO. 20

BOSS Engineering

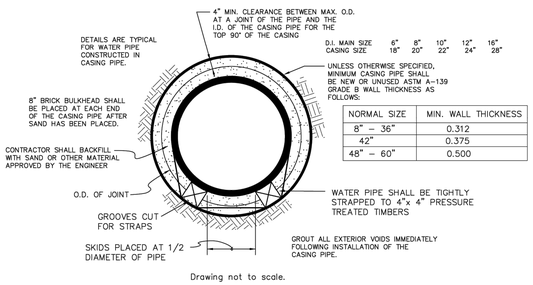
SEE SHEET 2 FOR GENERAL NOTES AND LEGEND



16" X 8", 12" X 8", 8" X 8"
TAPPING SLEEVE, VALVE & WELL
(B–B)

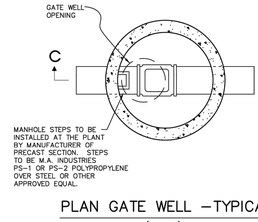


16" X 12", 12" X 12"
TAPPING SLEEVE, VALVE & WELL
(B–B)

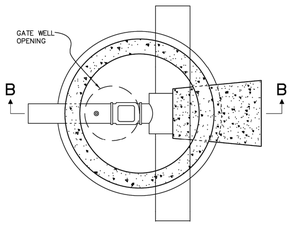


Drawing not to scale.

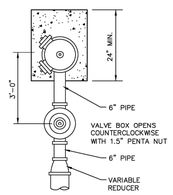
PIPE BARREL SUPPORT FOR WATER MAIN
CONSTRUCTED IN CASING

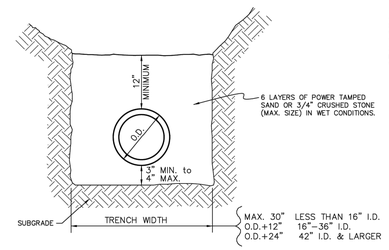


PLAN GATE WELL –TYPICAL
(D–D)



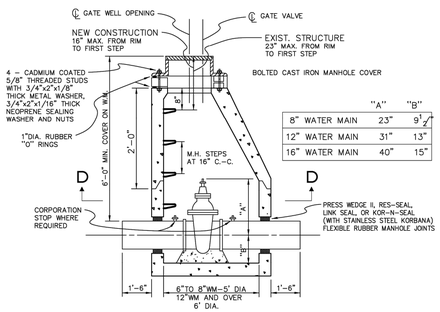
PLAN TAPPING SLEEVE, VALVE & WELL –TYPICAL
(A–A)





Drawing not to scale.

STANDARD BEDDING
FOR WATER PIPE



GATE WELL
(C–C)

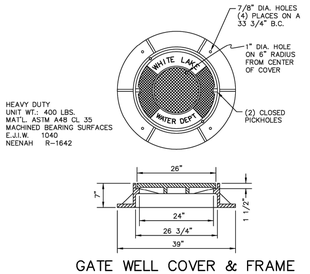
WATER MAIN NOTES

1. All construction procedures and materials used on this project shall conform to White Lake Township current standards and specifications.
2. All hydrants shall be East Jordan Iron Works 5BR–250 traffic model. Self–draining hydrants shall not be used. Valve shall have 1–1/2" pentagon nut and shall open counter–clockwise. Provide two 4.5" pumper outlets with 5" Storz quick connect nozzles (Harrington Integral Hydrant Storz, Model HIHS) as manufactured by Harrington, Inc. of Erie, PA.
3. All hydrants shall be field painted with a heavy coat of bright safety red polyurethane or alkyd gloss enamel, except for the Storz fittings and caps, which shall be left unpainted.
4. Johnson and Anderson, Inc. field personnel will affix to the fixed collar of each Storz connection 1" wide 3M Scotch reflective tape, color coded per NFPA 291 guidelines flow capacity.
5. All water mains shall be ductile iron pipe Class 54, cement lined with push on joints. Mechanical joints allowed only for tapping sleeves, hydrants & hydrant valves. Only Cor–Blue bolts shall be used for assembling mechanical joints. All bends, tees, valves and hydrant tees shall have a poured concrete thrust block as detailed on this sheet. Joints which have thrust blocks bearing on soil of questionable stability shall be fully restrained utilizing Tyler swivel ells and adapters or a system approved by the Township Engineer. HDPE pipe for directional boring, if approved by the Township Engineer, shall meet all of the requirements of the MDEQ and shall be DR9 (200 psi), and shall have two #8 tracer wires, terminated in the nearest gate well at the highest step.
6. Tapping sleeve shall be mechanical joint or approved equal. Ductile Iron or Stainless steel are allowed.
7. Specifications shall include direction of operation of all valves. All valves shall be counter clockwise open.
8. All necessary easements shall be provided in the name of White Lake Township before acceptance of the water distribution system.
9. The design engineer shall furnish White Lake Township with one reproducible sets of "As–Built" water main plans or an AutoCAD file upon completion of the job.
10. All required cross–connection devices shall be installed as required by the local plumbing inspector and in accordance with the standards of the Michigan Department of Public Health.
11. Gate well frame and cover shall be as follows: East Jordan heavy manhole cover, base flange type #1040 or Neenah Foundry heavy duty #R–1642 Manhole frame, solid lid cover shall be non–rocking and marked "White Lake Water Department"
12. Gate valves shall be AWWA approved and of a double disc or resilient wedge design with push on joints, 16" gate valves may be mechanical joint provided Cor–Blue bolts are used. All gate valves with operating nuts greater than 5' below ground surface shall be provided with an extension stem. The length of the extension shall be such that it will be within 5' of the ground surface when an extension is used it shall be held in place by an extension stem guide suitably fastened to the wall of the gate well.
13. 1" corporation stops are to placed on the main at each side of each main line gate valve and at such other locations as may be required by the engineer.
14. All pipe and fittings shall be subjected to a hydro–static pressure test of 150 PSI for a 2 hour duration; Township Engineer must be present. Maximum segment 2000 feet except that longer segments may be tested with allowable leakage based on 2000 feet.
15. 2 consecutive safe bacteria samples shall be taken from the water system approx. 24 hours apart at points established by the Township Engineer. Samples shall be taken by the Township Engineer.
16. Filling, flushing and sampling of water main can only be performed with a "Jumper" Line, the jumper shall be equipped with an approved RPZ type of backflow preventer.
17. Adjustments on gate wells shall be limited to 23" maximum from top of rim to first step in accordance with MIOSHA Rule 341.
18. All new water service lines shall have a minimum nominal size of 1". Services from 1" to 2" may be type K copper tubing or plastic DR–9 (200 PSI rated) meeting ASTM D2737–03 (Standard Specification for Polyethylene (PE) plastic tubing). ASTM Designation and pressure rating shall be stamped on the pipe by the manufacturer. Plastic pipe shall also meet AWWA C–901 Specifications. All sizes shall relate to the copper tubing outside diameter standard size (CTS). Copper pipe joints shall be flared. Fittings shall adapt to the plastic pipe with compression to iron pipe thread adapter. Plastic pipes shall be either compression style with a steel insert or may be fusion welded in the larger sizes.

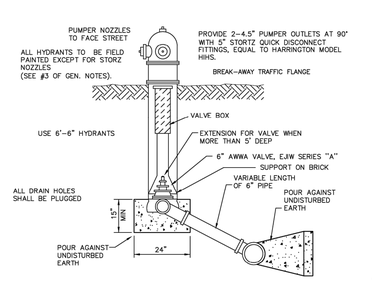
    Plastic water service pipes shall be traced with two #10 copper tracer wires or two #12 copper coated steel or stainless steel wires insulated with a minimum of 30 mils of polyethylene insulation. The tracer wires shall be terminated to supply line so as to be locatable at the building and the curb box without digging.

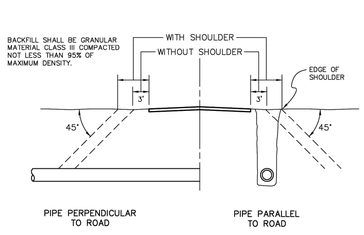
    Water services sizes 3" and greater shall be Class 54 cement lined ductile iron with push on joints or HDPE DR–9 (200 PSI rated) with fusion welded joints and fittings, DIPS (Ductile Iron Pipe Size).

    A stop box shall be installed at the property or easement line and shall be equivalent to an A.Y. McDonald Mfg. 6100 flare regular pattern ball valve. The curb box shall have a 1" riser pipe with an Erie 2–hole pattern cover equivalent to A.Y. McDonald Mfg. 5601L. Stop box shall be protected with a 2"x4" painted blue extending 4 feet above ground.
19. Standard pipe cover shall be 6'–0".
20. Air release manholes shall consist of a standard 5' diameter gate well style structure with a ValMatic Model 25C air release valve mounted on a 1" corporation stop. Air release shall be equipped with the vacuum check option. A 1/2" diameter galvanized pipe air discharge shall be extended to within 12" of the top of the structure. A gooseneck trap shall be installed at the top of the riser to prevent debris & water from entering the valve.

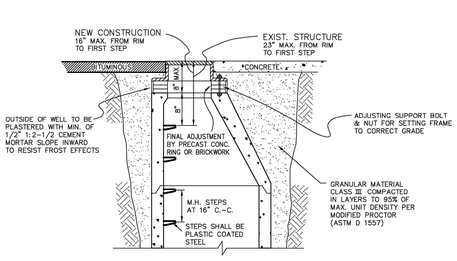


GATE WELL COVER & FRAME

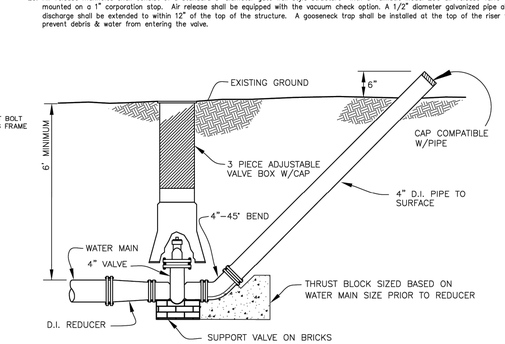




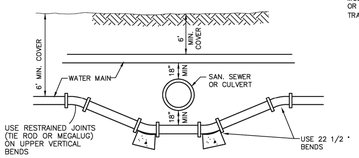
BACKFILL IN THE AREA OF STREETS,
ALLEYS, SIDEWALKS, DRIVES & PARKING AREAS



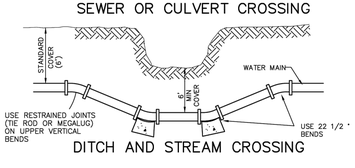
GATE WELL TOPS WITHIN PAVEMENT AREAS



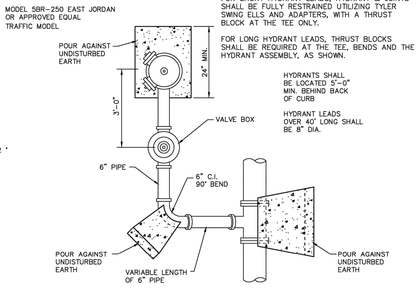
TEMPORARY BLOWOFF ASS'Y



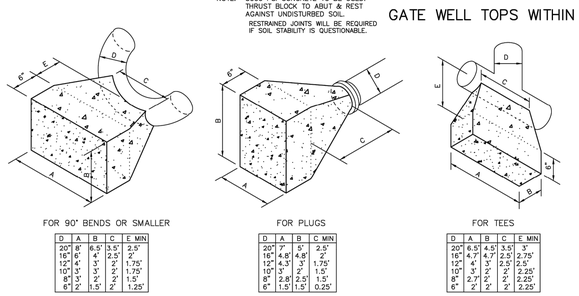
SEWER OR CULVERT CROSSING



DITCH AND STREAM CROSSING



DETAIL OF HYDRANT SETTINGS

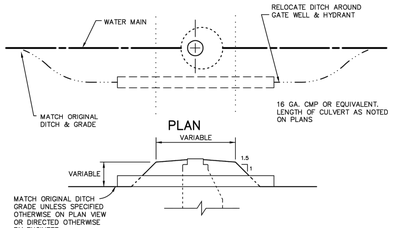


D	A	B	C	E MIN
20"	8"	6.5"	3.5"	2.5"
16"	6"	4"	2.5"	2"
12"	4"	3"	2"	1.75"
10"	3"	3"	2"	1.75"
8"	3"	3"	2"	1.5"
6"	2"	1.5"	2"	1.25"

D	A	B	C	E MIN
20"	7"	5"	2.5"	
16"	4.8"	4.8"	2"	
12"	4.3"	3"	1.75"	
10"	3"	2"	1.5"	
8"	2.8"	2.5"	1.5"	
6"	1.5"	1.5"	0.25"	

D	A	B	C	E MIN
20"	6.5"	4.5"	3.5"	3"
16"	4.7"	4.7"	2.5"	2.75"
12"	4"	3"	2.5"	2.5"
10"	3"	3"	2"	2.25"
8"	2.7"	2"	2"	2.25"
6"	2"	2"	2"	2.25"

THRUST BLOCK DETAILS



PROFILE
DITCH ENCLOSURE AT GATE WELL

DRAWN:CAD
DESIGN:OA
CHECKED: --

SCALE: VERT. --
HORZ. AS NOTED

REVISIONS	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE
		GENERAL REVISION TO CAD	12/29/95		GW & NUT SIZE	07/23/98		CLARIFY HYD. SPEC	02/07/01		REV. HYD, THRUST, AIR REL.	03/29/04
		ADD NOTE 17	11/04/97		PIPE CIVER & FLANGE TAPE	05/12/99		5–BR HYD, WS STAKE	02/27/02		HDPE, HYD, VALVES	07/18/05
		REVISE HYD. & THRUSTING	05/18/98		ADD BLOWOFF	07/06/99		ADD NOTE 19	07/23/03		UPDATED TITLE BLOCK	04/30/13

Johnson&Anderson
4494 Elizabeth Lake Road, Waterford, Michigan 48328, tel (248) 681-7800 fax (248) 681-2660
1060 W. Norton Avenue, Suite 7, Muskegon, Michigan 49441, tel (231) 780-3100 fax (231) 780-3115
2291 Water Street, Suite 6, Port Huron, Michigan 48060, tel (810) 987-7820 fax (810) 987-7895

White Lake Township
7525 Highland Road (M-59)
White Lake, Michigan 48383
248-698-3300

WATER MAIN STANDARD DETAILS

JOB NO.
DATE ISSUED
SHEET NO.

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN HEREON ARE APPROXIMATE AND NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL 1–800–482–7171 MISS DIG System, Inc.

BE BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT
GATEWAY CROSSING

PREPARED FOR
GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

TITLE
TOWNSHIP WATERMAIN DETAILS

NO	BY	DESCRIPTION	DATE
2	MJD	TOWNSHIP COMMENTS	8/6/24
1	MJD	MDOT COMMENTS	7/9/24
		REVISION PER	DATE

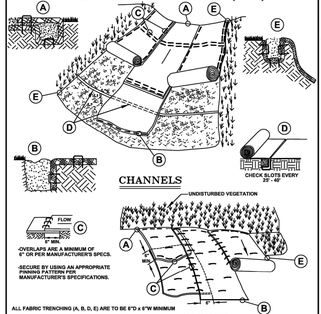
DESIGNED BY:
DRAWN BY:
CHECKED BY:
SCALE: NO SCALE
JOB NO: 22–029–1
DATE: 05/30/24
SHEET NO. 21

BOSS BE Engineering

G:\22-029\DWG\CP\22-029-1 SHEETS CP.dwg, 8/6/2024 12:01:26 PM, marcusd, AutoCAD PDF (General Documentation).pc3

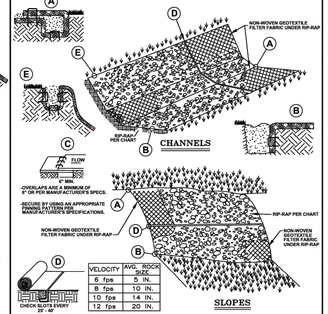
SEE SHEET 2 FOR GENERAL NOTES AND LEGEND

EROSION CONTROL BLANKETS AND TURF MAT LINING (E-9)



DEPENDING ON THE VELOCITY, SLOPE, SOILS, USE PROPER BLANKET OR TURF MAT LINING PER MANUFACTURER'S SPECIFICATIONS TO HANDLE THE SHEER STRESSES OF THE SLOPE/CHANNEL.

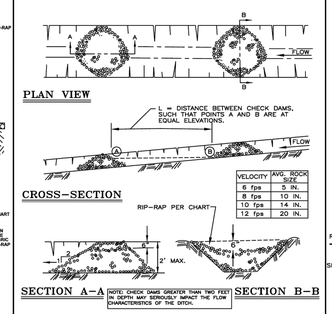
RIP-RAP: CHANNELS AND SLOPES (E-10)



VELOCITY	AVG. ROCK SIZE
6 fps	5 IN.
8 fps	10 IN.
10 fps	14 IN.
12 fps	20 IN.

DEPENDING ON THE VELOCITY, SLOPE AND SOILS, USE THE PROPER SIZED RIP-RAP AND NON-WOVEN GEOTEXTILE FABRIC TO HANDLE THE SHEER STRESS OF THE SLOPE/CHANNEL.

CHECK DAMS (E-3)



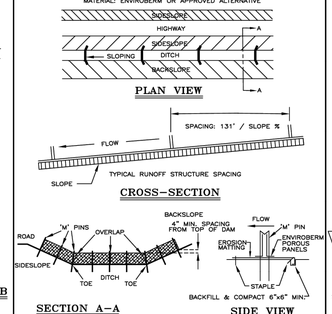
NOTE: CHECK DAMS GREATER THAN TWO FEET IN DEPTH MAY SERIOUSLY IMPACT THE FLOW CHARACTERISTICS OF THE DITCH.

VELOCITY	AVG. ROCK SIZE
6 fps	5 IN.
8 fps	10 IN.
10 fps	14 IN.
12 fps	20 IN.

-DEPENDING ON THE VELOCITY, SLOPE AND SOILS, USE THE PROPER SIZED RIP-RAP TO HANDLE THE SHEER STRESS OF THE SLOPE/CHANNEL.
-FOR SLOPE AND/OR CHANNEL PROTECTION SEE OTHER BMP'S ON THIS SHEET OR IN THE WRC SOIL EROSION MANUAL.

CHECK DAMS ALTERNATIVE "A" (E-3A)

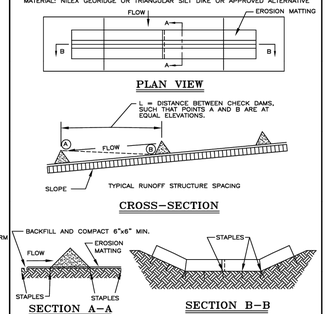
MATERIAL: ENVIROBERM OR APPROVED ALTERNATIVE



-FOR SLOPE AND/OR CHANNEL PROTECTION SEE OTHER BMP'S ON THIS SHEET OR IN THE WRC SOIL EROSION MANUAL.

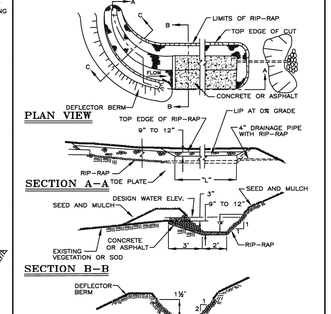
CHECK DAMS ALTERNATIVE "B" (E-3B)

MATERIAL: NILEX GEORIDGE OR TRIANGULAR SILT DIKE OR APPROVED ALTERNATIVE



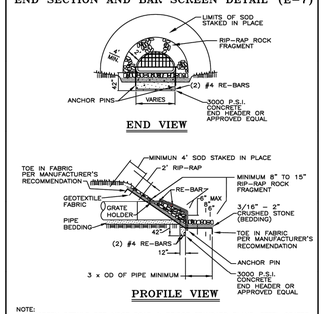
-FOR SLOPE AND/OR CHANNEL PROTECTION SEE OTHER BMP'S ON THIS SHEET OR IN THE WRC SOIL EROSION MANUAL.

LEVEL SPREADER (E-4)



-FOR SLOPE AND/OR CHANNEL PROTECTION SEE OTHER BMP'S ON THIS SHEET OR IN THE WRC SOIL EROSION MANUAL.

RIP-RAP, END SECTION AND BAR SCREEN DETAIL (E-7)

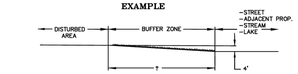


NOTE:
-BAR SCREEN DETAILS PER MDOT ROAD & BRIDGE STANDARD PLANS, STEEL GRATES FOR END SECTIONS. BARS ARE TO BE CUT OFF AT EDGE OF END SECTION.
-FOR SLOPE AND/OR CHANNEL PROTECTION SEE OTHER BMP'S ON THIS SHEET OR IN THE WRC SOIL EROSION MANUAL.

VEGETATIVE BUFFER ZONE (SP-1)

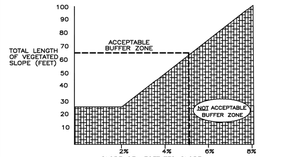
THE GRAPH SHOWN BELOW IS USED TO DETERMINE THE ADEQUACY OF AN EXISTING VEGETATIVE BUFFER ZONE FOR USE AS A SEDIMENT FILTER. THIS GRAPH IS ONLY APPLICABLE IF THE VEGETATION IS 90% DENSE AND AT LEAST 1" IN LENGTH OVER EVERY SQUARE FOOT OF DISTURBED SOIL. AN AREA COVERED WITH WEEDS, OR BUSHES AND TREES WITHOUT A GOOD GROUND COVER IS NOT ACCEPTABLE.

EXAMPLE



LENGTH OF BUFFER ZONE
% OF SLOPE OF BUFFER ZONE = 5%
WHAT IS THE ACCEPTABLE LENGTH OF THE BUFFER ZONE?

PLOT IN GRAPH BELOW
BUFFER ZONE IS ACCEPTABLE AT 65'



SILT FENCE (SP-2)

(MATERIAL: AMOCO PRO PEX 2130 OR APPROVED EQUIVALENT)

SILT FENCE ALTERNATIVE "A" (SP-2A)

(MATERIAL: SILT SHIELD OR APPROVED EQUIVALENT)

2% GRADE MAXIMUM SLOPE

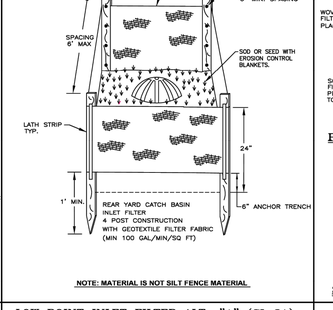
Optional Extended Sediment Filter Fence is achieved beginning with an additional 6' section of sediment filter fence at the 0° to 45° bend and overlap of 6 min. of 8" of the EXTRUDED SEDIMENT FILTER FENCE ends secured every six-of our plastic ratchet rigit push-in fasteners. Locate one at the beginning, midpoint, at least 2' from each edge of the splice.

Optional Joint Splicing
Overlap a minimum of eight inches. Melt a thin layer of EXTRUDED SILT FENCE. Press both ends together. Allow to cool. Secure splice with nylon tyraps. Tyrap is minimum top to bottom. Checking total diamination from top to bottom of material. (Do not apply heat to filter)

WINTER/FROZEN GROUND SILT FENCE (SP-2W)

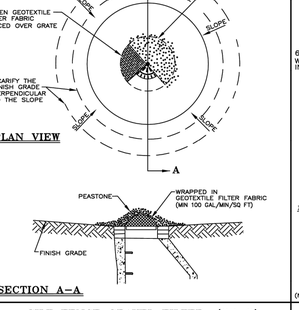
(MATERIAL: AMOCO PRO PEX 2130 OR APPROVED EQUIVALENT)

RYCB INLET FILTER (SI-3)



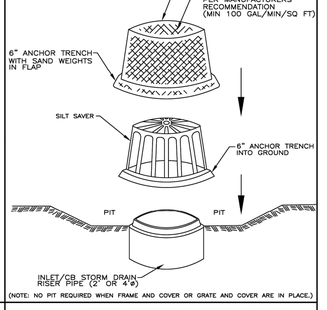
NOTE: MATERIAL IS NOT SILT FENCE MATERIAL

RYCB INLET FILTER ALTERNATIVE "A" (SI-3A)



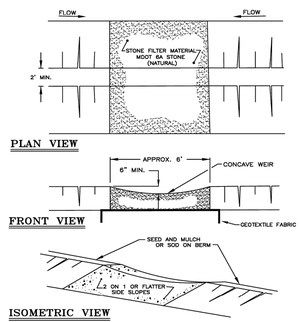
RYCB INLET FILTER ALTERNATIVE "B" (SI-3B)

MATERIAL: SILT SAVER OR APPROVED ALTERNATIVE



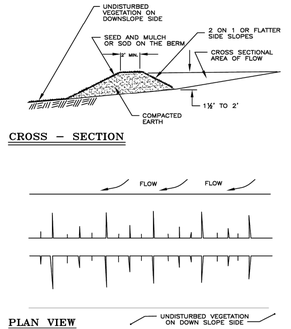
(NOTE: NO PIT REQUIRED WHEN FRAME AND COVER OR GRATE AND COVER ARE IN PLACE.)

EARTH DIVERSION BERM WITH STONE OUTLET FILTER (SP-4)

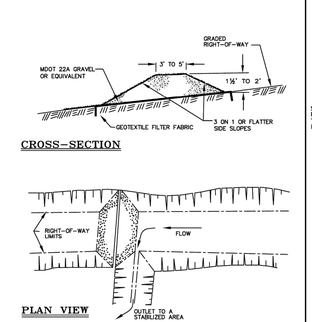


-PLACE GEOTEXTILE FABRIC UNDER STONE WITH 6 INCH MIN. OVERLAP AND TRENCHED IN 6 INCH MIN.

EARTH DIVERSION BERM (E-2)



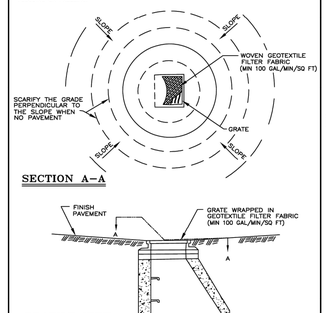
GRAVEL INTERCEPTOR DIKE (SP-6)



-PLACE GEOTEXTILE FABRIC UNDER STONE WITH 6 INCH MIN. OVERLAP AND TRENCHED IN 6 INCH MIN.
-FOR SLOPE AND/OR CHANNEL PROTECTION SEE OTHER BMP'S ON THIS SHEET OR IN THE WRC SOIL EROSION MANUAL.

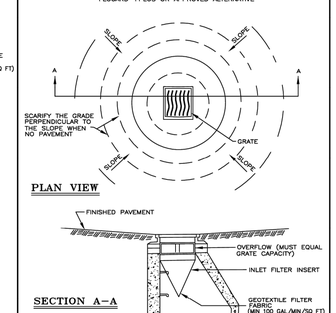
LOW POINT INLET FILTER (SI-2)

ALTERNATIVE INLET FILTER MUST BE USED IN AREAS THAT MAY BECOME A SAFETY HAZARD DUE TO FLOODING OR FREEZING.

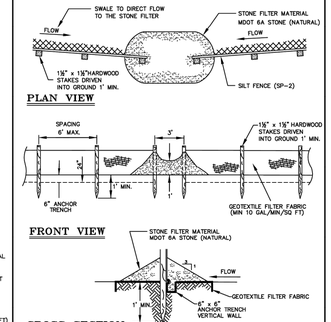


LOW POINT INLET FILTER ALT. "A" (SI-2A)

MATERIAL: CATCH-ALL, ULTRA-URBAN FILTERS, FLOGARD +PLUS OR APPROVED ALTERNATIVE

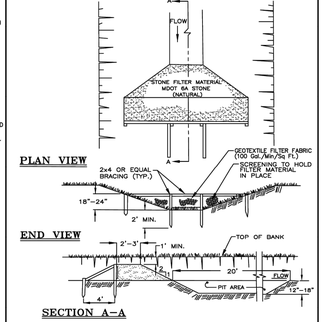


SILT FENCE GRAVEL FILTER (SP-3)



-PLACE GEOTEXTILE FABRIC UNDER STONE WITH 6 INCH MIN. OVERLAP AND TRENCHED IN 6 INCH MIN.

DITCH SEDIMENT TRAP (SO-4)

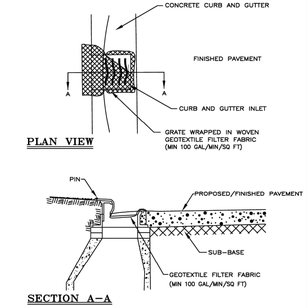


NOTE:
FOR SLOPE AND/OR CHANNEL PROTECTION SEE OTHER BMP'S ON THE SHEET OR IN THE WRC SOIL EROSION MANUAL.

CURB AND GUTTER INLET FILTER (SI-4)

(BEFORE AND AFTER PAVING)

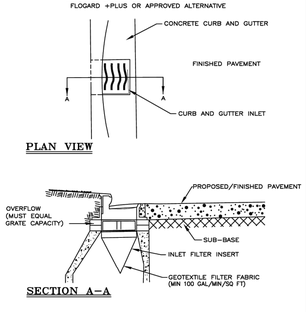
ALTERNATIVE INLET FILTER MUST BE USED IN AREAS THAT MAY BECOME A SAFETY HAZARD DUE TO FLOODING OR FREEZING.



CURB AND GUTTER INLET FILTER ALTERNATIVE "A" (SI-4A)

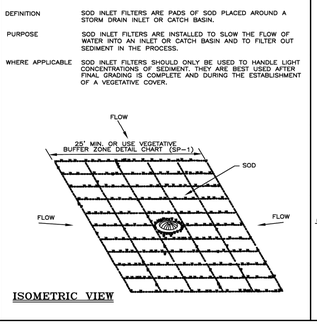
(BEFORE AND AFTER PAVING)

MATERIAL: CATCH-ALL, ULTRA-URBAN FILTERS, FLOGARD +PLUS OR APPROVED ALTERNATIVE

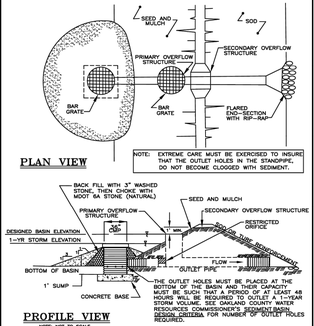


SOD INLET FILTER (SI-1)

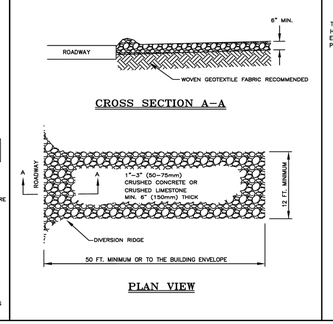
DEFINITION	SOD INLET FILTERS ARE PADS OF SOD PLACED AROUND A STORM DRAIN INLET OR CATCH BASIN.
PURPOSE	SOD INLET FILTERS ARE INSTALLED TO SLOW THE FLOW OF WATER INTO AN INLET OR CATCH BASIN AND TO FILTER OUT SEDIMENT IN THE PROCESS.
WHERE APPLICABLE	SOD INLET FILTERS SHOULD ONLY BE USED TO HANDLE LIGHT CONCENTRATIONS OF SEDIMENT. THEY ARE BEST USED AFTER FINAL GRADING IS COMPLETE AND DURING THE ESTABLISHMENT OF A VEGETATIVE COVER.



TEMPORARY DETENTION BASIN OUTLET STONE FILTER (SO-2)

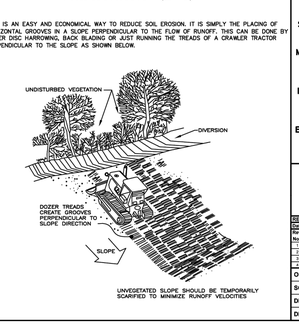


TEMPORARY STONE ACCESS DRIVE (SP-9)



SURFACE ROUGHENING AND SCARIFICATION (E-8)

THIS IS AN EASY AND ECONOMICAL WAY TO REDUCE SOIL EROSION. IT IS SIMPLY THE PLACING OF HORIZONTAL GROOVES IN A SLOPE PERPENDICULAR TO THE FLOW OF RUNOFF. THIS CAN BE DONE BY EITHER DISC HARROWING, BACK BLADING OR JUST RUNNING THE TREADS OF A CRAWLER TRACTOR PERPENDICULAR TO THE SLOPE AS SHOWN BELOW.



NOTE:

WHILE PERFORMING WORK INVOLVING GROUNDS MAINTENANCE AND/OR THE CONSTRUCTION/MAINTENANCE OF ANY INFRASTRUCTURE, INCLUDING ROADS, WATER MAINS, SANITARY SEWERS, STORM DRAINS AND STORM WATER BEST MANAGEMENT PRACTICES (BMPS), CONTRACTORS SHALL MINIMIZE POLLUTION FROM STORM WATER RUNOFF THAT CAN AFFECT WATER QUALITY RELATED TO WORK ACTIVITIES. POLLUTANTS THAT COULD IMPAIR WATER QUALITY MAY INCLUDE FUEL, GREASE AND OIL, NUTRIENTS, BACTERIA AND PATHOGENS, LITTER AND DEBRIS, AND SOIL EROSION AND SEDIMENTATION. APPLICABLE BMPS SHALL BE IMPLEMENTED BY THE CONTRACTOR TO THE MAXIMUM EXTENT PRACTICABLE TO PROTECT WATER QUALITY AND WILDLIFE HABITAT.

SOIL EROSION AND SEDIMENTATION CONTROL DETAILS

REVISION BLOCK			
Date Source / Source Date: N/A			
Rev. No.	Rev. By:	Rev. Date:	Description:
1	S	3-27-07	PROPOSED DETAIL EDITS
2	S	5-29-08	ETHICARDS COMMITTEE APPROVAL / NAME CHANGES
3	DS	5-29-11	SILT FENCE ALTERNATIVE "A" DETAIL (SP-2A) ADDED
4	KS	6-14-13	ETHICARDS COMMITTEE APPROVAL / NOTE CHANGES

ORIG. DATE:	01/01/01	WRC WATER RESOURCES COMMISSIONER Jim Nash	ONE PUBLIC WORKS DRIVE, BLDG 95 WEST WATERFORD, MICHIGAN 48328-1907
SCALE:	NONE		
DESIGNED BY:	WRC		SHEET NO.: 1 of 1
DRAWN BY:	Mapping		

BEBOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS IS APPROXIMATE AND NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES BEFORE BEGINNING ANY EXCAVATION. IT SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY TO NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE LOCATION OR DEPTH OF UTILITIES AS SHOWN ON THE PLANS AND THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 IT'S THE LAW!!! (P.A. 53 AS AMENDED BY PUBLIC ACT 174 OF 2013)

PROJECT: GATEWAY CROSSING
PREPARED FOR: GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

TITLE: OAKLAND COUNTY SESC DETAILS

NO	BY	DATE
2	MJD	8/6/24
1	MJD	7/9/24

TOWNSHIP COMMENTS
MDOT COMMENTS
REVISION PER

DESIGNED BY:
DRAWN BY:
CHECKED BY:
SCALE: NO SCALE
JOB NO: 22-029-1
DATE: 05/30/24
SHEET NO. 22

BOSS Engineering

Plotted: 8/6/2024 12:01:34 PM By: marcusd
G:\22-029\DWG\CP22-029-1 SHEETS CP.dwg, 8/6/2024 12:01:34 PM, marcusd, AutoCAD PDF (General Documentation).pc3