

SANITARY SEWER CALCULATIONS

South Pond Village
Midwestern Consulting
7/19/2019
Sanitary Sewer Basis of Design

Based on flow data in the City's "Table A" of the Sewage Flow Offset Mitigation Program
Used to determine sewer pipe sizing and mitigation credit required.

Flow Rate per House 300 gpd
Peaking Factor 4
Recovery Factor for Mitigation 1.1

Minimum pipe slope 0.50%
Maximum pipe slope 8.00%
Pipe Manning's n 0.013
Pipe to be designed half-full
2-10 ft/s velocity limit (City Standard)

	Proposed Development	
Number of Houses	73	
Sewer Design Flow	87,600 gpd	
	60.8 gpm	
	0.136 cfs	

Pipe Size	8"	Dia. / 2
Radius	0.33 ft	PI x radius*2 / 2
A Area (1/2 full)	0.349 ft ²	PI x radius
P Wetted Perimeter (1/2 full)	2.09 ft	A/P
R Hydraulic Radius	0.167 ft	1.49/n * R^(2/3) x sqrt(slope)
v Velocity (1/2 full)	2.454 ft/sec	1.49/n * R^(2/3) x sqrt(slope)
v Velocity (1/2 full, max. slope)	9.82 ft/sec	v * A
Q Flow Capacity (1/2 full)	0.857 cfs	

The flow from the proposed development is less than the capacity of an 8" pipe flowing half/full, so an 8" pipe will be used for all pipes.

All 73 houses, with 0.167 cfs peak flow, can drain into the 8" sanitary sewer pipe (0.857 cfs capacity), so 8" pipe will be used throughout the site.
All sanitary sewer pipes will be between 0.5% and 8.0% slope, to maintain velocities between 2 ft/sec and 10 ft/sec
Uppermost runs of sanitary sewer will have a 0.6% minimum slope.

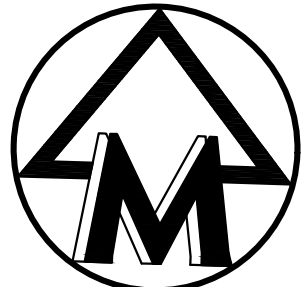
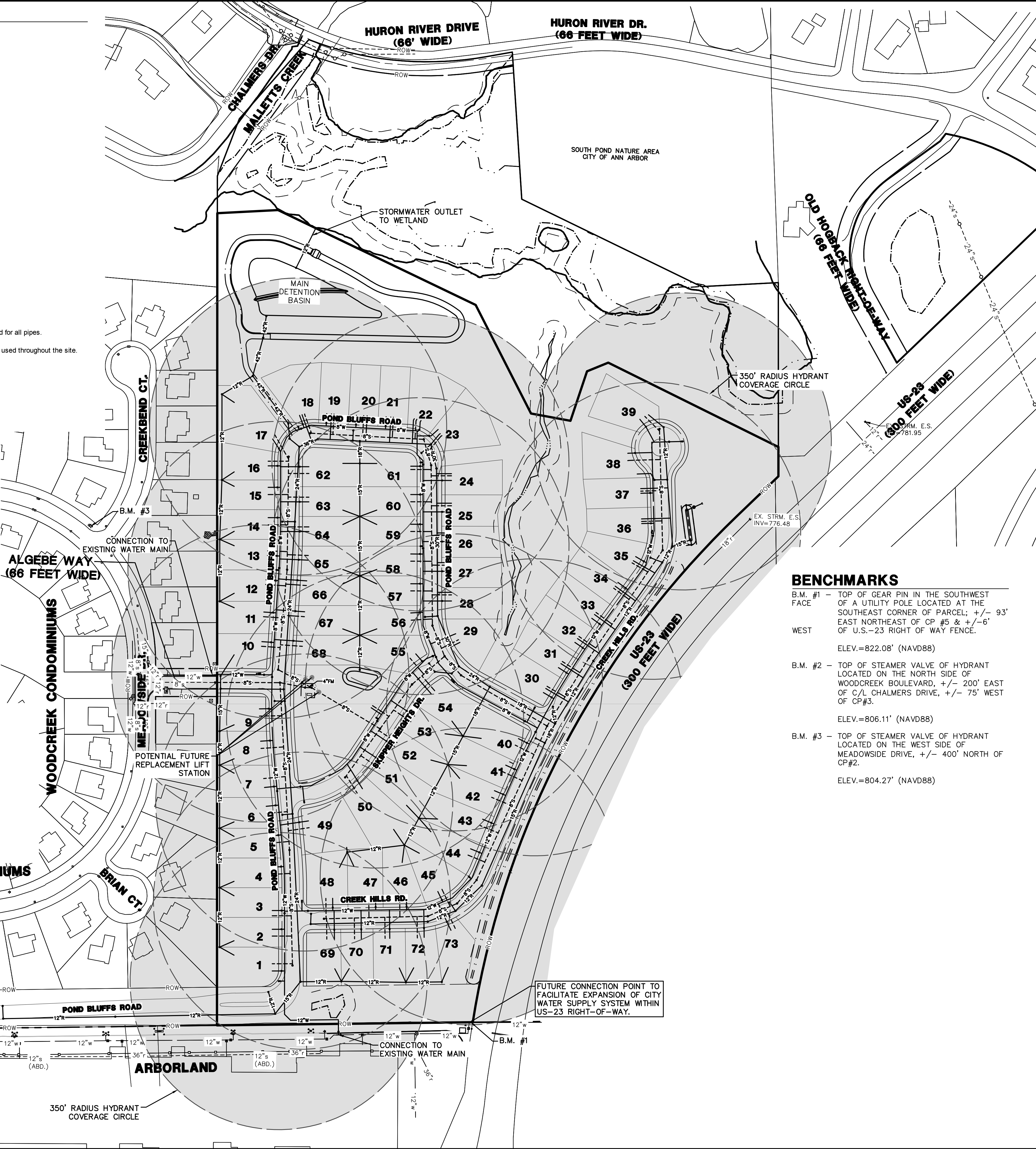
South Pond Village
Midwestern Consulting
7/19/2019
Sanitary Sewer Mitigation Calculations

Based on flow data in the City's "Table A" of the Sewage Flow Offset Mitigation Program
Used to determine sewer pipe sizing

Flow Rate per House 300 gpd
Peaking Factor 4
Recovery Factor for Mitigation 1.1

	Proposed Development	
Number of Houses	73	
Sewer Design Flow	87,600 gpd	
	60.8 gpm	
Mitigation Design Flow (with Recovery Factor)	96,360 gpd	
	66.9 gpm	

67 gpm of sanitary sewer flow mitigation will be required for the project.



SCALE: 1" = 120'
0 120 240 360

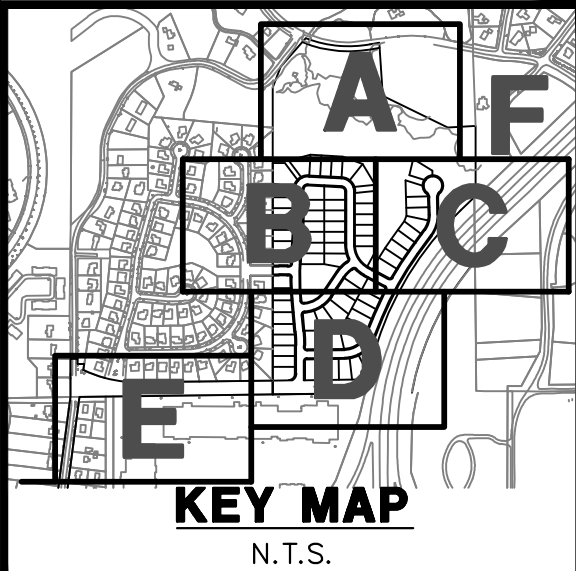


- LEGEND**
- w — EXIST. WATER MAIN
 - W — PROP. WATER MAIN
 - H — EXIST. HYDRANT
 - H — PROP. HYDRANT
 - G — EXIST. GATE VALVE IN BOX
 - G — PROP. GATE VALVE IN BOX
 - G — EXIST. GATE VALVE IN WELL
 - G — PROP. GATE VALVE IN WELL
 - G — EXIST. CURB STOP & BOX
 - G — PROP. CURB STOP & BOX
 - X — PROP. BLOW-OFF
 - R — EXIST. STORM SEWER
 - R — PROP. STORM SEWER
 - C — EXIST. CATCH BASIN OR INLET
 - C — PROP. CATCH BASIN OR INLET
 - E — END SECTION
 - H — HEAD WALL
 - C — CULVERT
 - E — EDGE DRAIN
 - S — EXIST. SANITARY SEWER
 - S — PROP. SANITARY SEWER

- UTILITY NOTES**
1. SINGLE FAMILY HOMES WILL NOT CONTAIN FIRE SUPPRESSION.
 2. ALL SUMP DRAINAGE MUST BE DIRECTED INTO THE STORM SYSTEM.
 3. THE CONSTRUCTION COVERED BY THESE PLANS SHALL CONFORM TO THE CITY OF ANN ARBOR PUBLIC SERVICES STANDARD SPECIFICATIONS.
 4. ANY EXISTING WATER MAIN THAT IS EXPOSED AS PART OF A NEW CONNECTION TO THE MAIN MAY REQUIRE ANODES TO BE INSTALLED PRIOR TO BACKFILLING. ENGINEERING WILL DETERMINE IF ANODES WILL BE REQUIRED AFTER EXISTING WATER MAIN(S) ARE EXPOSED. THE COST OF THE ANODES AND INSTALLATION IS THE RESPONSIBILITY OF THE DEVELOPER/CONTRACTOR.
 5. PLANS HAVE BEEN PREPARED USING THE MICHIGAN STATE PLANE COORDINATE SYSTEM. ALL PVC SANITARY SEWER PIPE SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321.
 6. IN CASES WHERE BACKFILL OF NATIVE MATERIAL IS APPROVED BY THE PUBLIC SERVICES AREA ADMINISTRATOR, THERE SHALL BE NO DEBRIS, ORGANIC SOILS, FROZEN MATERIAL, OR OTHER DELETERIOUS MATERIAL WITHIN 2 FEET OF THE PIPE
 7. UNDERCUTTING OF THE PIPE TRENCH WILL BE REQUIRED WHEN UNSUITABLE MATERIAL, E.G. ORGANIC SOILS, FROZEN MATERIAL, DEBRIS, HIGHLY COMPRESSIBLE SOILS, OR OTHER DELETERIOUS MATERIAL WHICH WOULD CAUSE DIFFERENTIAL SETTLEMENT OF THE PIPE TRENCH, ARE ENCOUNTERED AT THE BOTTOM OF THE TRENCH.
 8. ALLOWABLE LEAKAGE FOR SANITARY SEWER INFILTRATION TESTING IS 100 GALLONS PER INCH DIAMETER OF PIPE PER MILE OF SEWER PER DAY.
 9. AIR TESTING FOR PVC PIPE SHALL CONFORM WITH ASTM F1417.

BENCHMARKS

- B.M. #1 — TOP OF GEAR PIN IN THE SOUTHWEST FACE OF A UTILITY POLE LOCATED AT THE SOUTHEAST CORNER OF PARCEL: +/- 93' EAST NORTHEAST OF CP #5 & +/- 6' OF U.S.-23 RIGHT OF WAY FENCE.
ELEV.=822.08' (NAVD88)
- B.M. #2 — TOP OF STEAMER VALVE OF HYDRANT LOCATED ON THE NORTH SIDE OF WOODCREEK BOULEVARD, +/- 200' EAST OF C/L CHALMERS DRIVE, +/- 75' WEST OF CP#3.
ELEV.=806.11' (NAVD88)
- B.M. #3 — TOP OF STEAMER VALVE OF HYDRANT LOCATED ON THE WEST SIDE OF MEADOWSIDE DRIVE, +/- 400' NORTH OF CP#2.
ELEV.=804.27' (NAVD88)



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THE SAVANNA AT SOUTH POND
2024 DETAILED ENGINEERING
OVERALL UTILITY AND FIRE PLAN

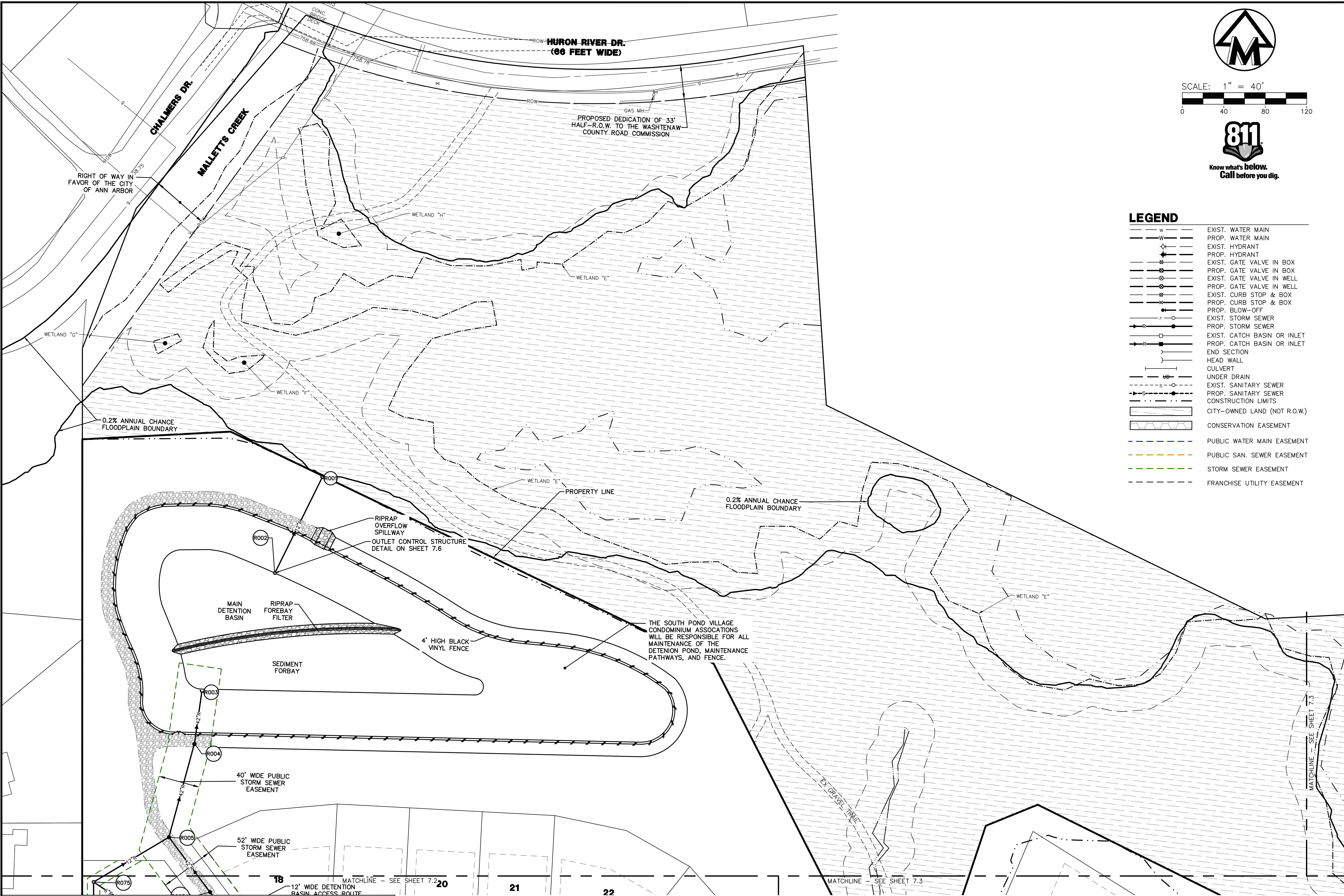
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PER MUNICIPAL REVIEW 10/31/25
PER MUNICIPAL REVIEW 01/15/26
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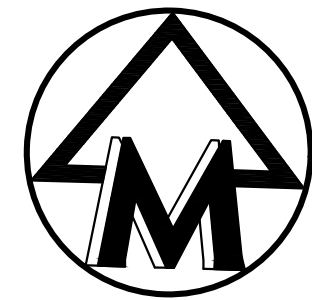
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SHEET 44 OF 86
REV. DATE 06/20/25
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Approved
Issued On: 12/03/2024
Expires On: 12/03/2024

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The underground utilities shown have been located from field survey information and existing records. The surveyor makes no guarantees that the underground utilities shown comprise all such utilities in the area, either in-service or abandoned. The surveyor further does not warrant that the underground utilities shown are in the exact location indicated. Although the surveyor does certify that they are located as accurately as possible from the information available.



SCALE: 1" = 40'



LEGEND

- EXIST. WATER MAIN
- PROP. WATER MAIN
- EXIST. HYDRANT
- PROP. HYDRANT
- EXIST. GATE VALVE IN BOX
- PROP. GATE VALVE IN BOX
- EXIST. GATE VALVE IN WELL
- PROP. GATE VALVE IN WELL
- EXIST. CURB STOP & BOX
- PROP. CURB STOP & BOX
- PROP. BLOW-OFF
- EXIST. STORM SEWER
- PROP. STORM SEWER
- EXIST. CATCH BASIN OR INLET
- PROP. CATCH BASIN OR INLET
- HEAD WALL
- CULVERT
- UNDER DRAIN
- EXIST. SANITARY SEWER
- PROP. SANITARY SEWER
- CONSTRUCTION LIMITS
- CITY-OWNED LAND (NOT R.O.W.)
- CONSERVATION EASEMENT
- PUBLIC WATER MAIN EASEMENT
- PUBLIC SAN. SEWER EASEMENT
- STORM SEWER EASEMENT
- FRANCHISE UTILITY EASEMENT



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THE SAVANNA AT SOUTH POND
2024 DETAILED ENGINEERING
SITE UTILITY PLAN - AREA A

7.1

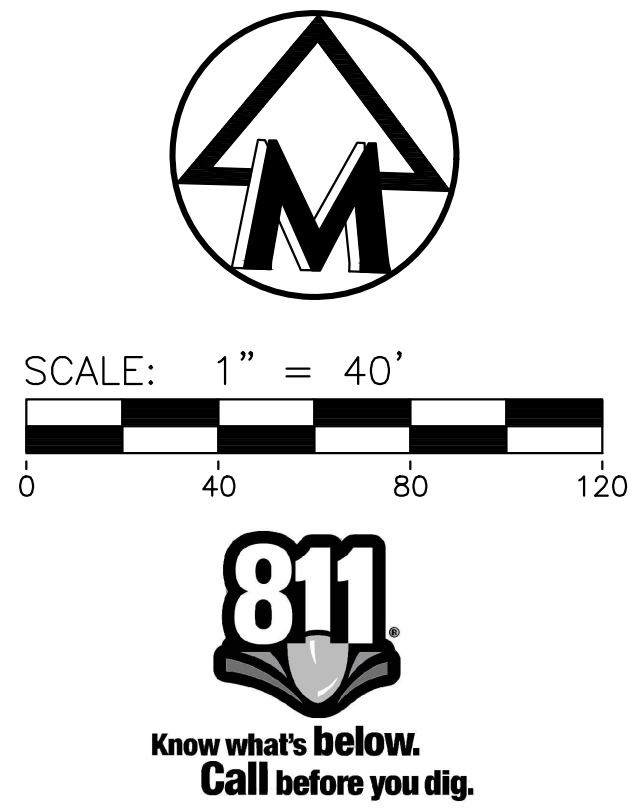
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- | | |
|--|------------------------------|
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| | CULVERT |
| | UNDER DRAIN |
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| | PUBLIC SAN. SEWER EASEMENT |
| | STORM SEWER EASEMENT |
| | FRANCHISE UTILITY EASEMENT |

UTILITY NOTES

1. DTE ELECTRIC (E), DTE GAS (G), COMCAST (C), AND AT&T (T) WILL INSTALL UTILITY SYSTEMS AFTER ROADWAY IS PAVED, AND BEFORE SIDEWALK IS INSTALLED.
2. EARTHWORK CONTRACTOR IS RESPONSIBLE FOR RESTORING FRANCHISE UTILITY EXCAVATION AREAS, PRIOR TO INSTALLING SIDEWALKS.



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OB No. **24014**

THE SAVANNA AT SOUTH POND

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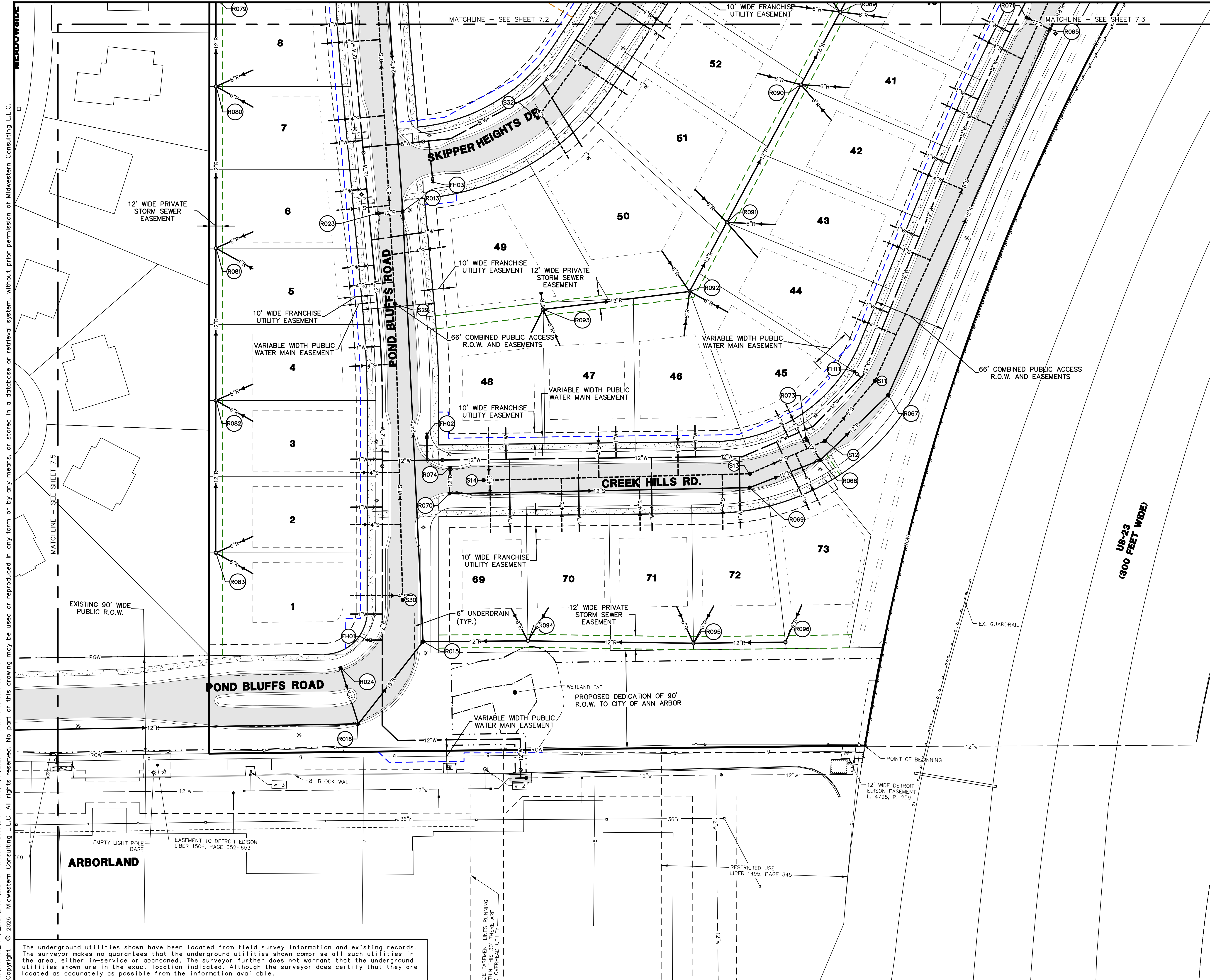
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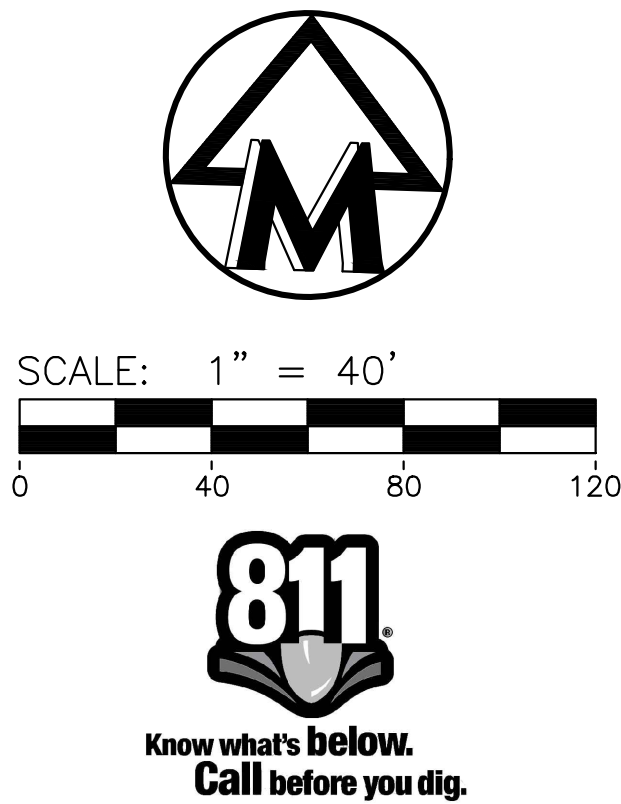
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Approved
Issued On:12/03/202
Expires On:12/03/20



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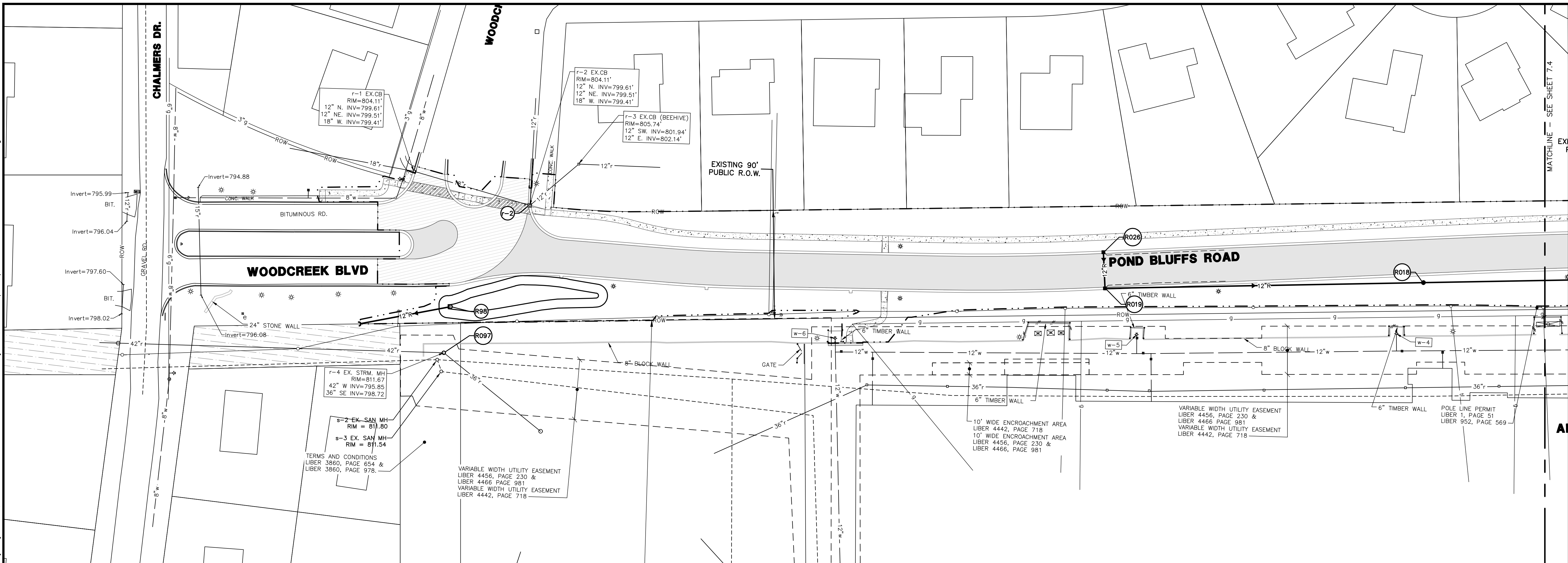
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THE SAVANNA AT SOUTH POND
2024 DETAILED ENGINEERING
SITE UTILITY PLAN - AREA D

7.4

JOB No.	24014	REV. DATE	DATE: 09/05/24
REVISIONS:			SHEET 48 OF 66
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3	PER MUNICIPAL REVIEW	01/15/26	PM: TJC
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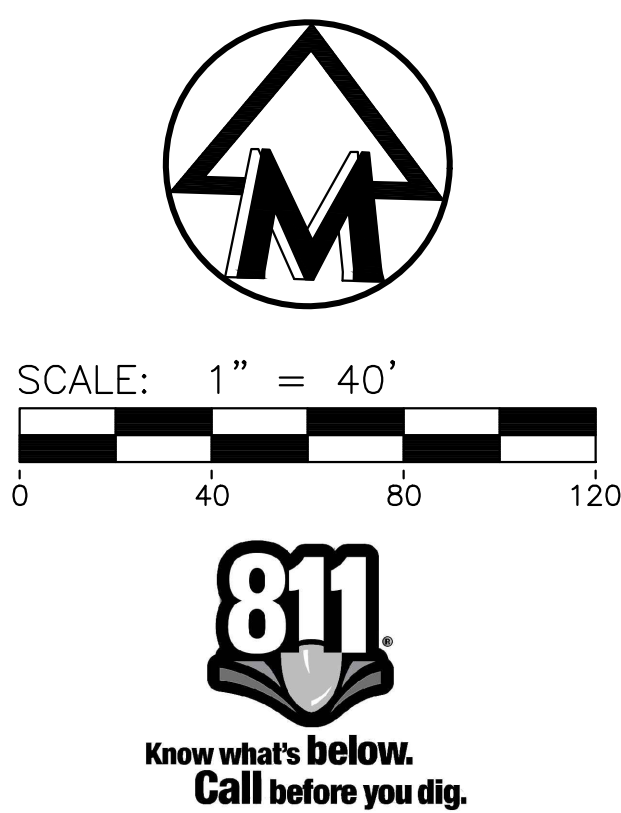


UTILITY NOTES

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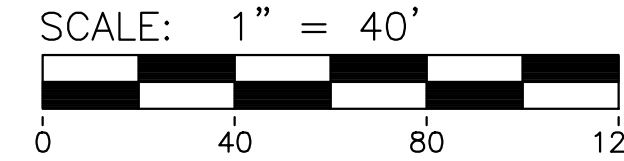
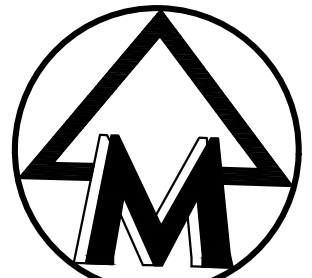
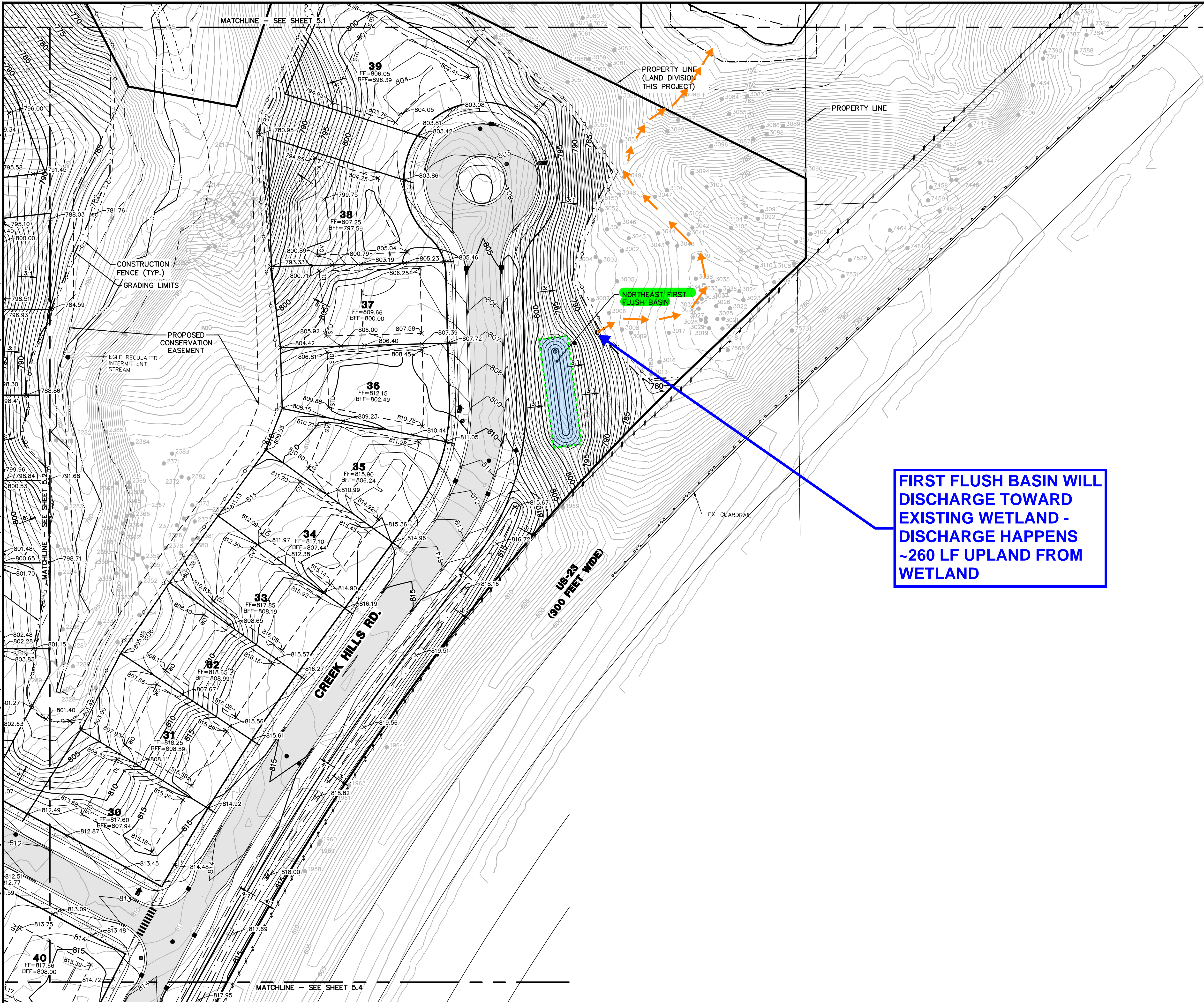
LEGEND

	EXIST. WATER MAIN
	PROP. WATER MAIN
	EXIST. HYDRANT
	PROP. HYDRANT
	EXIST. GATE VALVE IN BOX
	PROP. GATE VALVE IN BOX
	EXIST. GATE VALVE IN WELL
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	EXIST. CURB STOP & BOX
	PROP. CURB STOP & BOX
	PROP. BLOW-OFF
	EXIST. STORM SEWER
	PROP. STORM SEWER
	EXIST. CATCH BASIN OR INLET
	PROP. CATCH BASIN OR INLET
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	HEAD WALL
	CULVERT
	UNDER DRAIN
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	PROP. SANITARY SEWER
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	CITY-OWNED LAND (NOT R.O.W.)
	CONSERVATION EASEMENT
	PUBLIC WATER MAIN EASEMENT
	PUBLIC SAN. SEWER EASEMENT
	STORM SEWER EASEMENT
	FRANCHISE UTILITY EASEMENT



REVISIONS:	REV. DATE	SHEET 49 OF 80
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LEGEND

- 838 EXIST. CONTOUR
- 838 PROP. CONTOUR
- x836.2 EXIST. SPOT ELEVATION
- 36.60 PROP. SPOT ELEVATION
- DRAINAGE DIRECTION
- ⬮ EXIST. HYDRANT
- ⬮ PROP. HYDRANT
- ⬮ EXIST. GATE VALVE IN BOX
- ⬮ PROP. GATE VALVE IN BOX
- ⬮ EXIST. GATE VALVE IN WELL
- ⬮ PROP. GATE VALVE IN WELL
- ⬮ EXIST. CURB STOP & BOX
- ⬮ PROP. CURB STOP & BOX
- ⬮ EXIST. CATCH BASIN OR INLET
- ⬮ PROP. CATCH BASIN OR INLET
- ⬮ END SECTION
- ⬮ HEAD WALL
- ⬮ CULVERT
- ⬮ EXIST. MANHOLE
- ⬮ PROP. MANHOLE
- ⬮ SINGLE TREE
- FENCE
- - - CONSTRUCTION FENCE
- . - GRADING LIMITS

**FIRST FLUSH BASIN WILL
DISCHARGE TOWARD
EXISTING WETLAND -
DISCHARGE HAPPENS
~260 LF UPLAND FROM
WETLAND**



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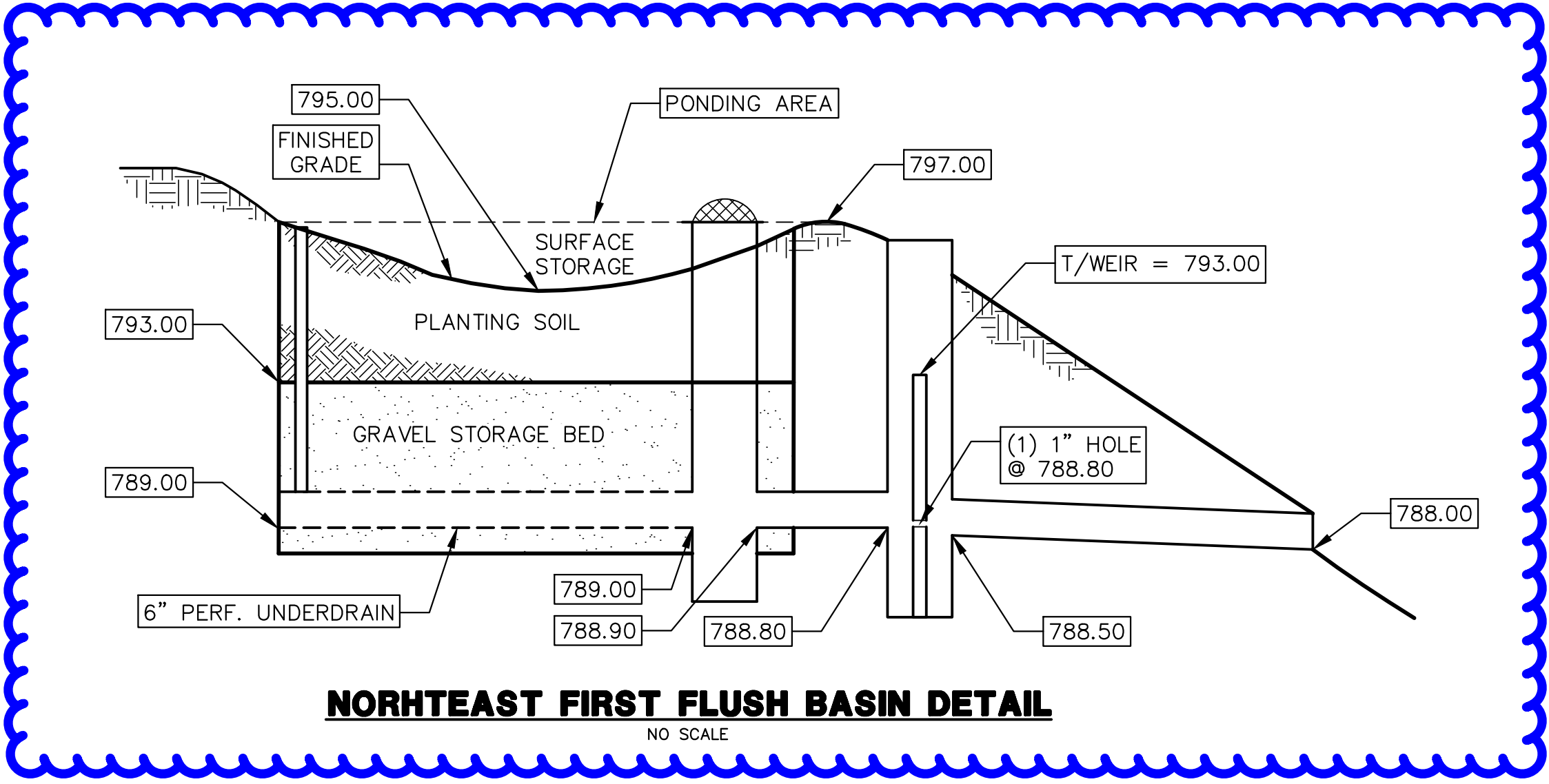


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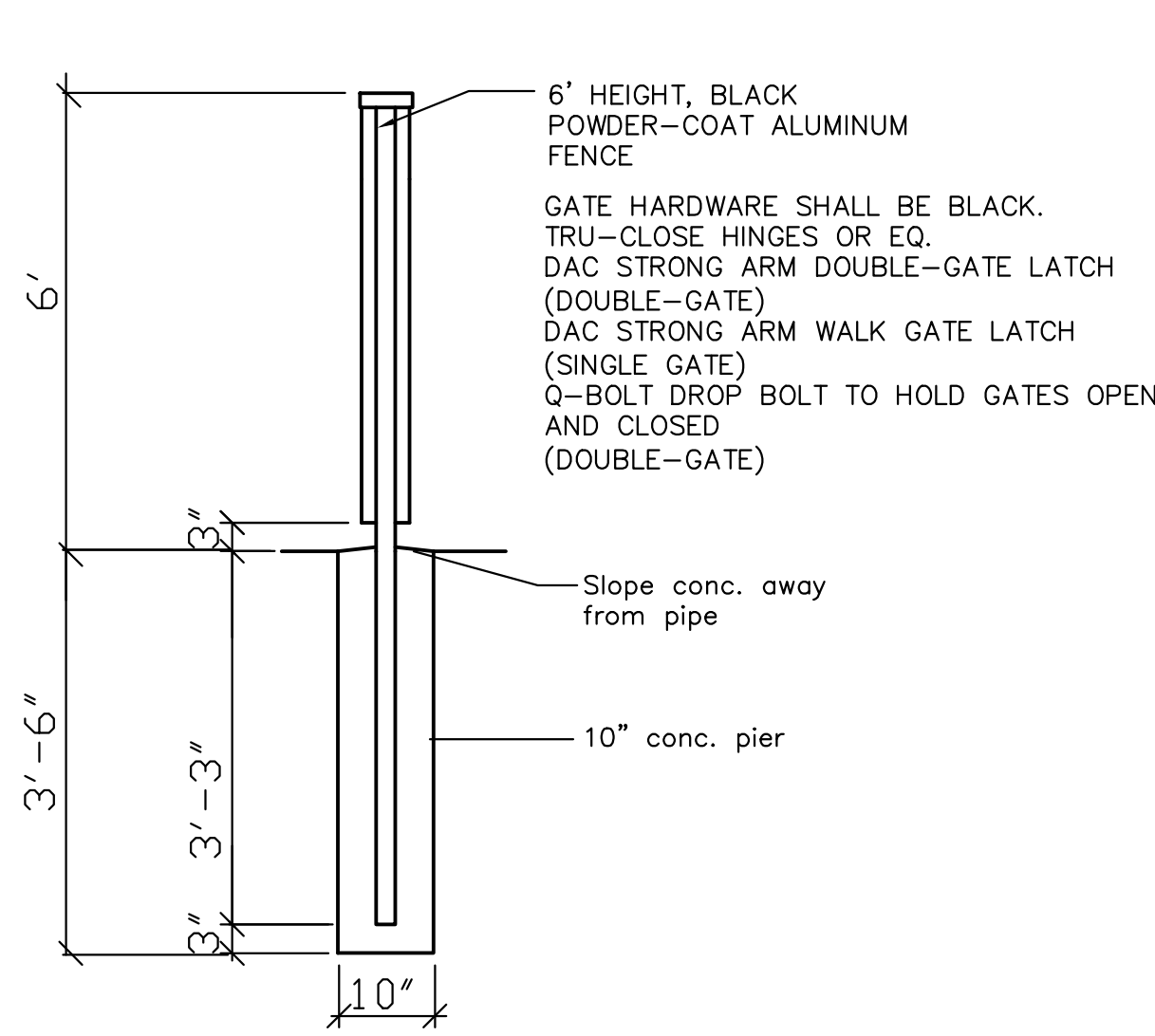
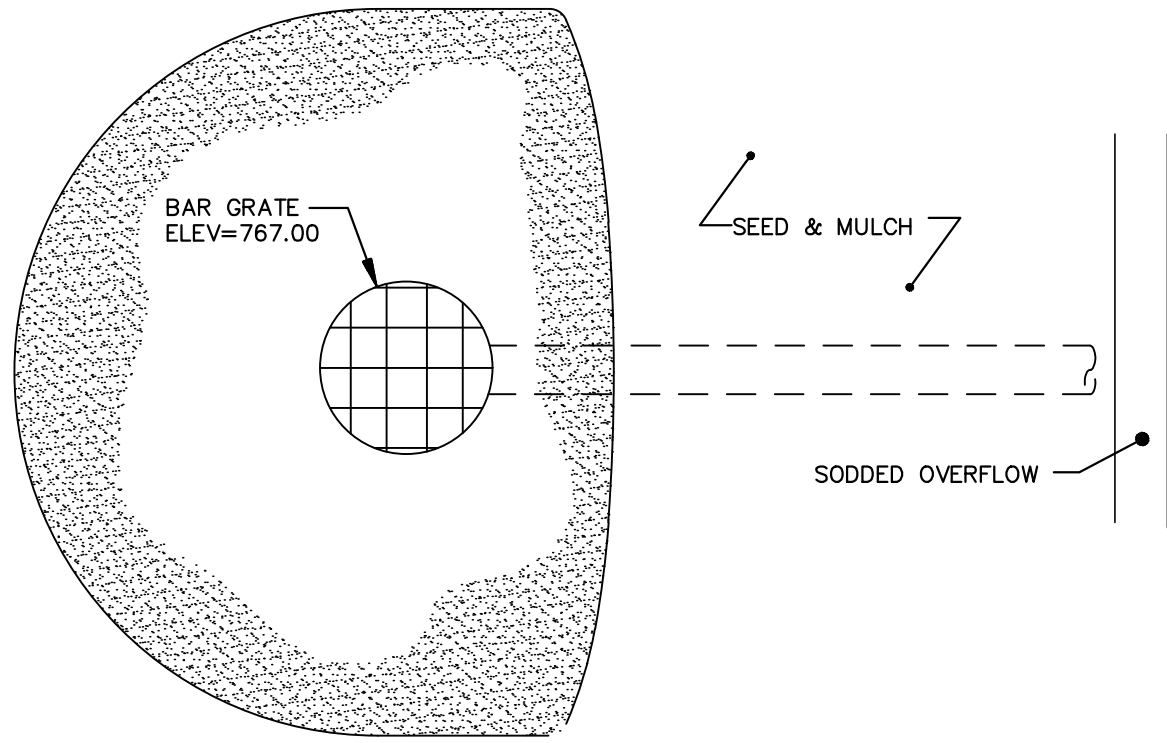
THE SAVANNA AT SOUTH POND
2024 DETAILED ENGINEERING
SITE GRADING PLAN - AREA C

JOB No.	24014		DATE: 09/05/24	
	SHEET 29 OF 81			
REVISIONS:	REV. DATE	REV. DATE	REV. DATE	REV. DATE
	05/10/25	05/10/25	05/10/25	05/10/25
PER MUNICIPAL REVIEW	DESIGNED	CHECKED	ENGINEER	IN CHARGE
	10/28/25	10/28/25	10/28/25	10/28/25
PER MUNICIPAL REVIEW	DATE	DATE	DATE	DATE
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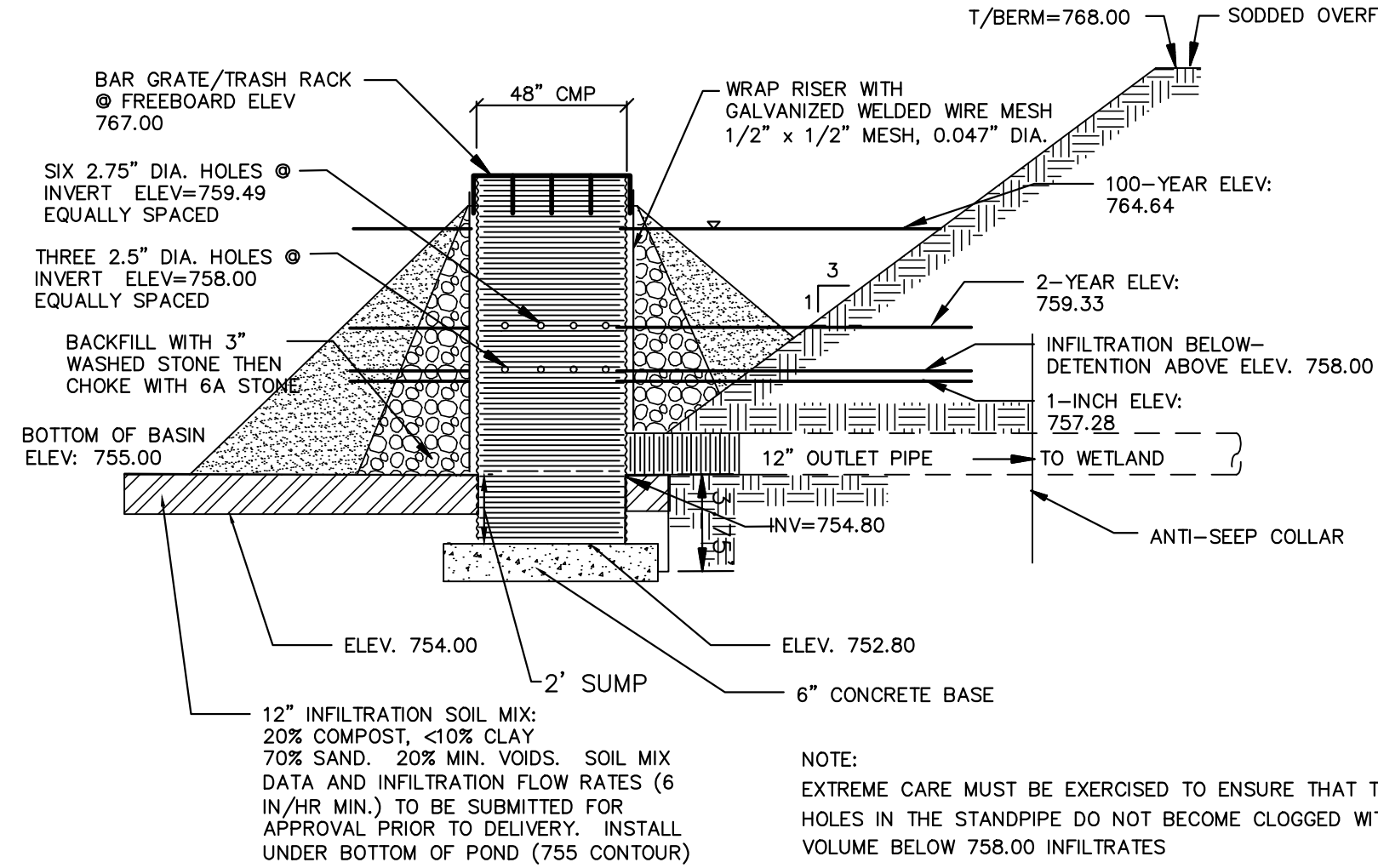
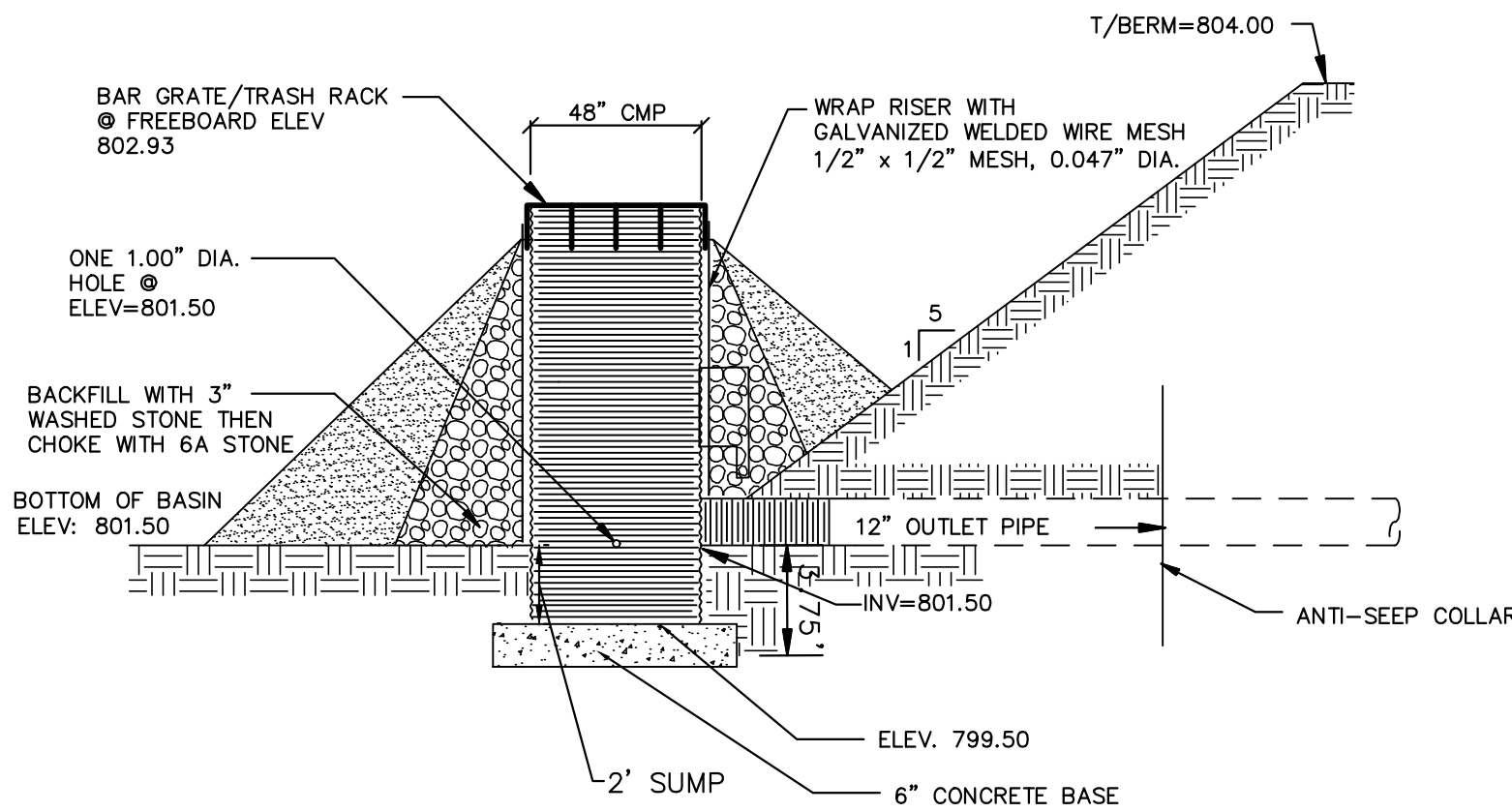
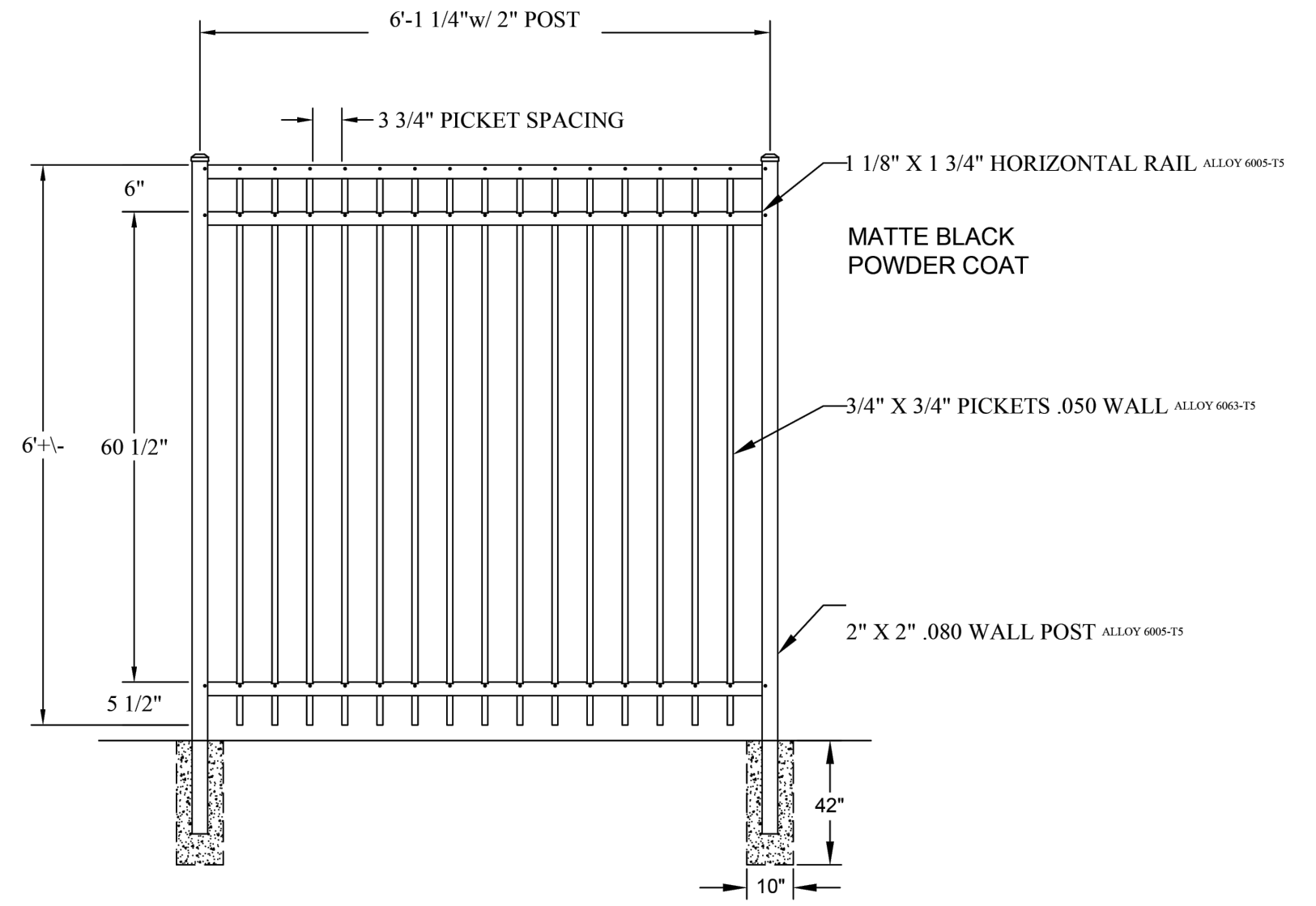
BAR SCREEN COVER:
WELD #4 REBARS AT 4" ON CENTER AND BEND BARS 4" OVER THE OUTER EDGE OF THE MANHOLE TO SECURE IT TO THE STRUCTURE.



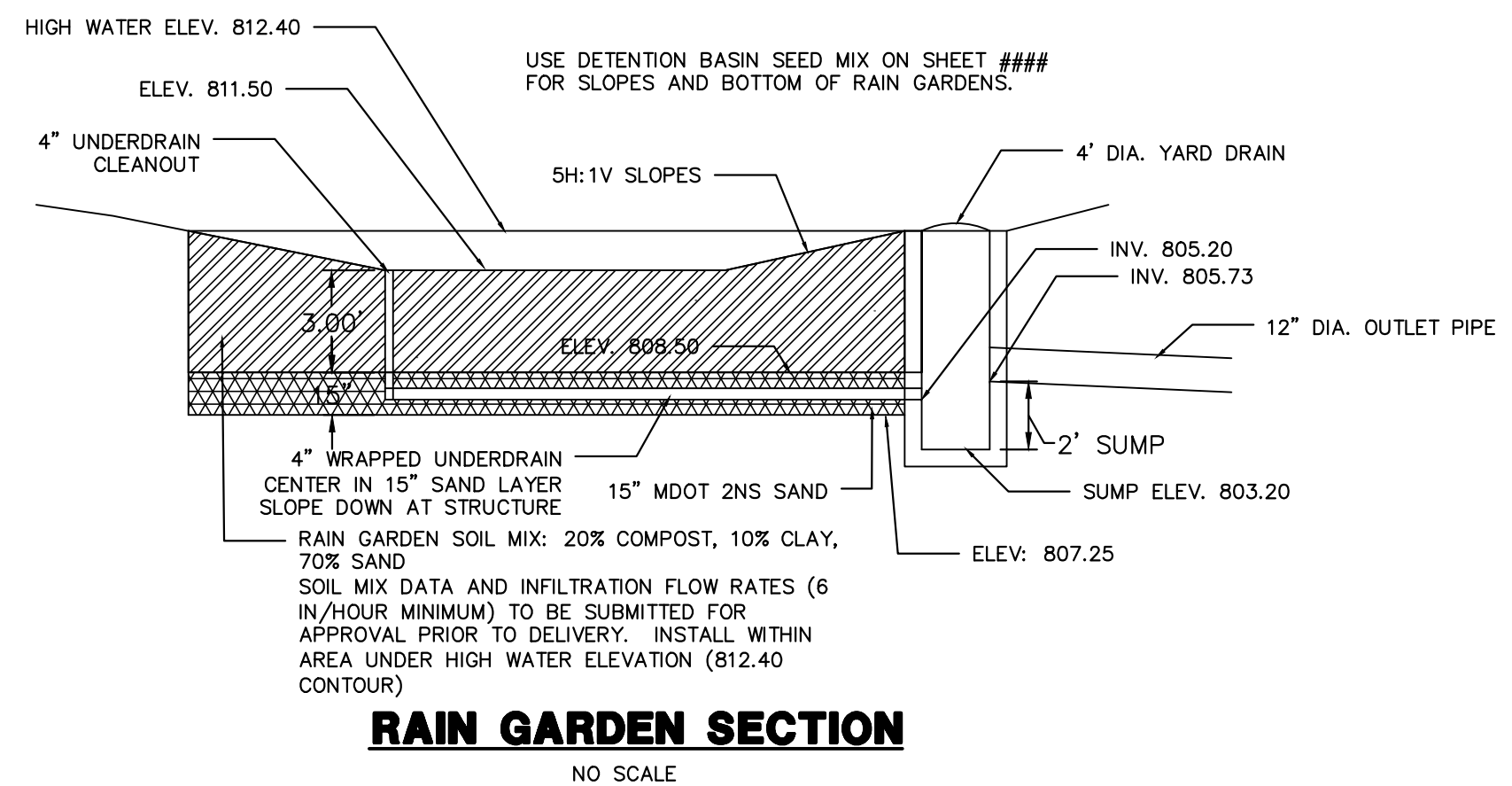
NOTES

FENCE SHALL BE FOREST GREEN 5' HEIGHT ALUMINUM COMMERCIAL-GRADE FENCE WITH TWO HORIZONTAL TOP BARS AND ONE HORIZONTAL BOTTOM BAR. SUBMIT PRODUCT DATA AND COLOR SAMPLE TO ENGINEER FOR APPROVAL PRIOR TO ORDERING COMPONENTS. ACCEPTABLE SUPPLIERS INCLUDE:

FENCE-DEPOT: 72 INCH AUBURN COMMERCIAL FENCE (BLACK)
ELITE FENCE PRODUCTS: EFF-20 6' HEIGHT (BLACK)
ALUMINUM FENCE SUPPLY: FLAT TOP, COMMERCIAL SERIES A THREE-RAIL FENCE (BLACK)



NOTE: EXCAVATE BASIN AND TEST INFILTRATION RATE PRIOR TO FABRICATING OUTLET CONTROL STRUCTURE. CALCULATIONS AND ORIFICE DESIGN WILL BE MODIFIED BY MIDWESTERN CONSULTING BASED ON THE FULL AS-EXCAVATED INFILTRATION RATE.



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THE SAVANNA AT SOUTH POND
2024 DETAILED ENGINEERING
STORM DETENTION DETAILS

7.6

JOB No.	24014
DATE	09/05/24
SHEET	50 OF 81
REV. DATE	06/10/25
PER MUNICIPAL REVIEW	ENG. JAM. TPH
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