PITTSFIELD GLEN CONDOMINIUM

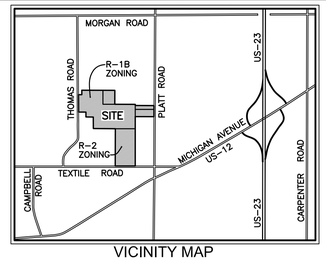
SINGLE-FAMILY RESIDENTIAL SITE CONDOMINIUM
FINAL SITE PLAN
PITTSFIELD TOWNSHIP, MICHIGAN

OWNER / DEVELOPER

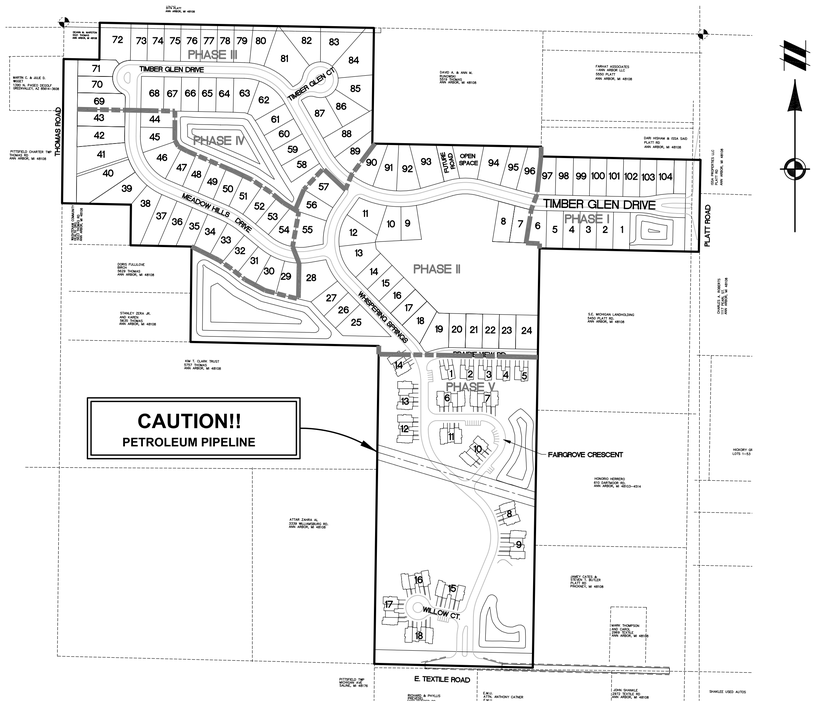
PITTSFIELD GENERAL DEVELOPMENT L.L.C.
31300 ORCHARD LAKE ROAD, SUITE 200
FARMINGTON HILLS, MICHIGAN 48334
(248) 626-9099
ATTN: MR. STUART SHERR

ENGINEER / SURVEYOR

ATWELL, LLC
TWO TOWNE SQUARE, SUITE 700
SOUTHFIELD, MICHIGAN 48076
(248) 447-2000
ATTN: MR. JOHN ACKERMAN, RLA



VICINITY MAP



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Sanitary Sewer Specifications
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Site Data

	Required / Allowed	Proposed
Site Zoning	R-1B & R-2	R-1B & R-2
Site Use	Single Family Suburban Residential Low Density Multi-Family Residential	
Site Area: (Total Site)	N/A	
Gross		73.06 acres
Thomas RD ROW		0.83 acres
Textile RD ROW		0.92 acres
Platt RD ROW		0.53 acres
Prop. ROW/Road Access Easement		11.68 acres
Wetlands		4.34 acres
Gas Easement		0.95 acres
Net Area		53.81 acres
Site Area: (Single Family)	N/A	
Gross		52.67 acres
Thomas RD ROW		0.83 acres
Platt RD ROW		0.53 acres
Prop. ROW/Access Easement		8.54 acres
Wetlands		0.68 acres
Net Area		42.09 acres
Site Area: (Multi Family)	N/A	
Gross		20.39 acres
Textile RD ROW		0.92 acres
Prop. Road Access Easement	(49' Wide)	3.14 acres
Wetlands		3.66 acres
Gas Easement		0.95 acres
Net Area		11.72 acres
Setbacks (Single Family)		
Front	35 ft. min.	35 ft. min.
Rear	35 ft. min.	35 ft. min.
Side	5 ft. Min / 15 ft. min. total	5 ft. Min / 15 ft. min. total
Setbacks (Multi-Family)		
Front (to lot)	10 ft. min.	20 ft. min. back of curb (or sidewalk)
Rear (to lot)	15 ft. min.	40 ft. min.
Side (to lot)	10 ft. min	10 ft. min.
Side to Side (bldg.)	20 ft. min.	20 ft. min.
Rear to Rear (bldg.)	40 ft. min.	40 ft. min.
Side to Rear (bldg.)	30 ft. min.	30 ft. min.
Residential Units		
Single Family Lots		104
Multi-Family Units		59
Total		163
Multi-Family Density	1 unit / 7,300 sq. ft.	1 unit / 13,673 sq. ft. (3.18 D.U./Ac.)
Single Family		
Max. lot coverage (Gross)	30%	
Impervious Surface Ratio (Net)	40%	
Building Height (Feet)	35	18' - 22'-3"
Building Height (Stories)	2.5	2.5
Multi-Family		
Max. lot coverage (Gross)	50%	11.66%
Impervious Surface Ratio (Net)	60%	

SANITARY SEWER BASIS OF DESIGN

Purpose: Sanitary Sewer Basis of Design — Project Name: Pittsfield Glen
Project No: 12000967 — By: — Ck: — Date: 10/17/2014 — Sheet No. 1

Total No. of Units:		163
No. of Users per Lot:		3.4
Total Expected Population Served:		555
Average Daily Flow (per capita)		100 G.P.D.
Peaking Factor:	$\frac{18+\sqrt{(POP/1000)}}{4+\sqrt{(POP/1000)}}$ =	3.95
Average Flow:	POP * 100 =	55500 G.P.D.
	=	38.54 G.P.M.
	=	0.086 C.F.S.
Peak Flow:	0.086 * 3.95 =	0.339 C.F.S.
Pipe Capacity:	10 in. diameter	A= 0.545 sf
	0.28% slope	R= 0.208 ft
	0.013 Manning's 'n'	
	Manning's Capacity =	1.162 C.F.S. (> 0.339)
	Velocity Fow ing Full =	2.13 F.P.S.

ESTIMATED SANITARY SEWER QUANTITIES

12" PVC SDR-26	789 LF
10" PVC SDR-26	7,261 LF
6" PVC LEAD	8,650 LF
4' MH STRUCTURES	46 EA.

ESTIMATED WATERMAIN QUANTITIES

16" DUCTILE IRON CL. 54	1,218 LF
12" DUCTILE IRON CL. 54	4,225 LF
8" DUCTILE IRON CL. 54	3,875 LF
6" DUCTILE IRON CL. 54	140 LF
12" X 16" TAPPING SLEEVE, VALVE & WELL	1 EA.
16" GATE VALVE AND WELL	2 EA.
12" GATE VALVE AND WELL	19 EA.
8" GATE VALVE AND WELL	11 EA.
STANDARD HYDRANT ASSEMBLY	20 EA.
1" TYPE K COPPER DOMESTIC LEAD	7,250 LF
2" TYPE K COPPER DOMESTIC LEAD	1,445 LF
6" TYPE K COPPER FIRE SERVICE LEAD	1,445 LF

STATE OF MICHIGAN — MICHAEL JARRETT McAVOY — ENGINEER — NO. 53261 — LICENSED PROFESSIONAL ENGINEER

PITTSFIELD GLEN
CSPA 13-06

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SOUTHFIELD, MI 48076
248.447.2000

CLIENT: PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

COVER SHEET

SECTION 22 — TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

DATE: MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 50 100
1" = 100 FEET

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P.M. J. ACKERMAN
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FILE CODE: --
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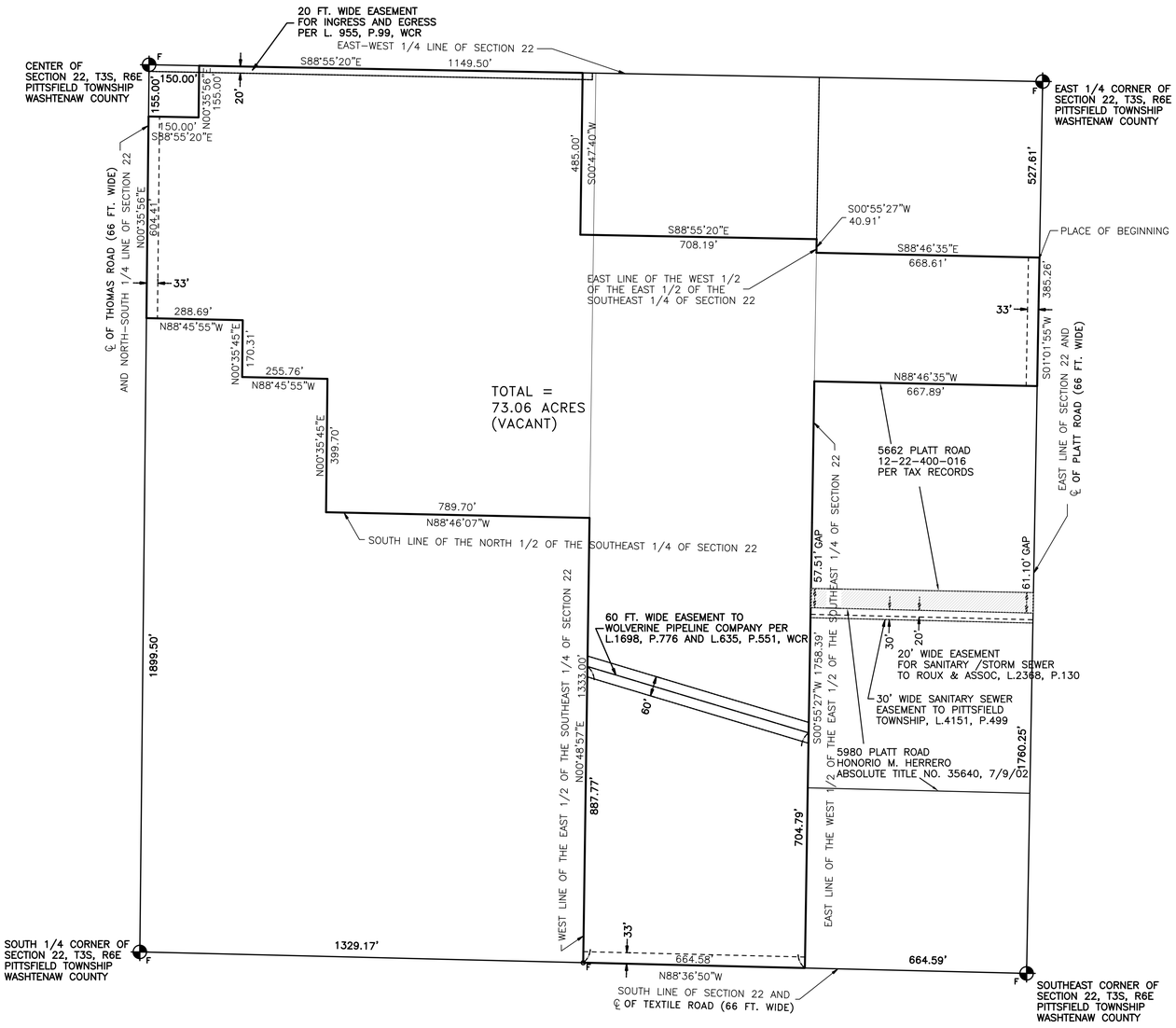

LEGEND

℄	CENTERLINE
	SECTION CORNER
○ F	FOUND IRON PIPE
○ S	SET IRON PIPE
◎ F	FOUND CONCRETE MONUMENT
◎ S	SET CONCRETE MONUMENT
○ F–RR	FOUND REROD

OVERALL LEGAL DESCRIPTION:

Commencing at the East ¼ corner of Section 22, T3S, R6E, Pittsfield Township, Washtenaw County, Michigan; thence S01°01'55"W 527.61 feet along the East line of said Section 22 and the centerline of Platt Road (66 feet wide) for a PLACE OF BEGINNING; thence continuing S01°01'55"W 385.26 feet; thence N88°46'35"W 667.89 feet; thence S00°55'27"W 1758.39 feet along the East line of the West ½ of the East ½ of the Southeast ¼ of Section 22; thence N88°36'50"W 664.58 feet along the South line of said Section 22 and the centerline of Textile Road (66 feet wide); thence N00°48'57"E 1333.00 feet along the West line of the East ½ of the Southeast ¼ of said Section 22; thence N88°46'07"W 789.70 feet along the South line of the North ½ of the Southeast ¼ of said Section 22; thence N00°35'45"E 399.70 feet; thence N88°45'55"W 255.76 feet; thence N00°35'45"E 170.31 feet; thence N88°45'55"W 288.69 feet; thence N00°35'56"E 604.41 feet along the North–South ¼ line of said Section 22 and the centerline of Thomas Road (66 feet wide); thence S88°55'20"E 150.00 feet; thence N00°35'56"E 155.00 feet; thence S88°55'20"E 1149.50 feet along the East–West ¼ line of said Section 22; thence S00°47'40"W 485.00 feet; thence S88°55'20"E 708.19 feet; thence S00°55'27"W 40.91 feet along the East line of the West ½ of the East ½ of the Southeast ¼ of Section 22; thence S88°46'35"E 668.61 feet to the Place of Beginning, being part of the Southeast ¼ of said Section 22, containing 73.06 acres of land, more or less, being subject to the rights of the public over the Easterly 33 feet thereof as occupied by said Platt Road, the Southerly 33 feet thereof as occupied by said Textile Road and the Westerly 33 feet thereof as occupied by said Thomas Road, and being subject to any other easements and restrictions of record, if any.

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SECTION 22 | TOWN 3 SOUTH, RANGE 6 EAST | PITTSFIELD TOWNSHIP | WASHTENAW COUNTY, MICHIGAN

PITTSFIELD GLEN

BOUNDARY SURVEY

DATE
MAY 5, 2014

05–20–2014 SUBMITTED TO TWP
06–03–2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07–03–2014 REVISED PSP PER TOWNSHIP COMMENTS
11–07–2014 REVISED PSP PER TOWNSHIP & WCMRC COMMENTS

REVISIONS

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SCALE 0 100 200
1" = 200 FEET

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FILE CODE: ––
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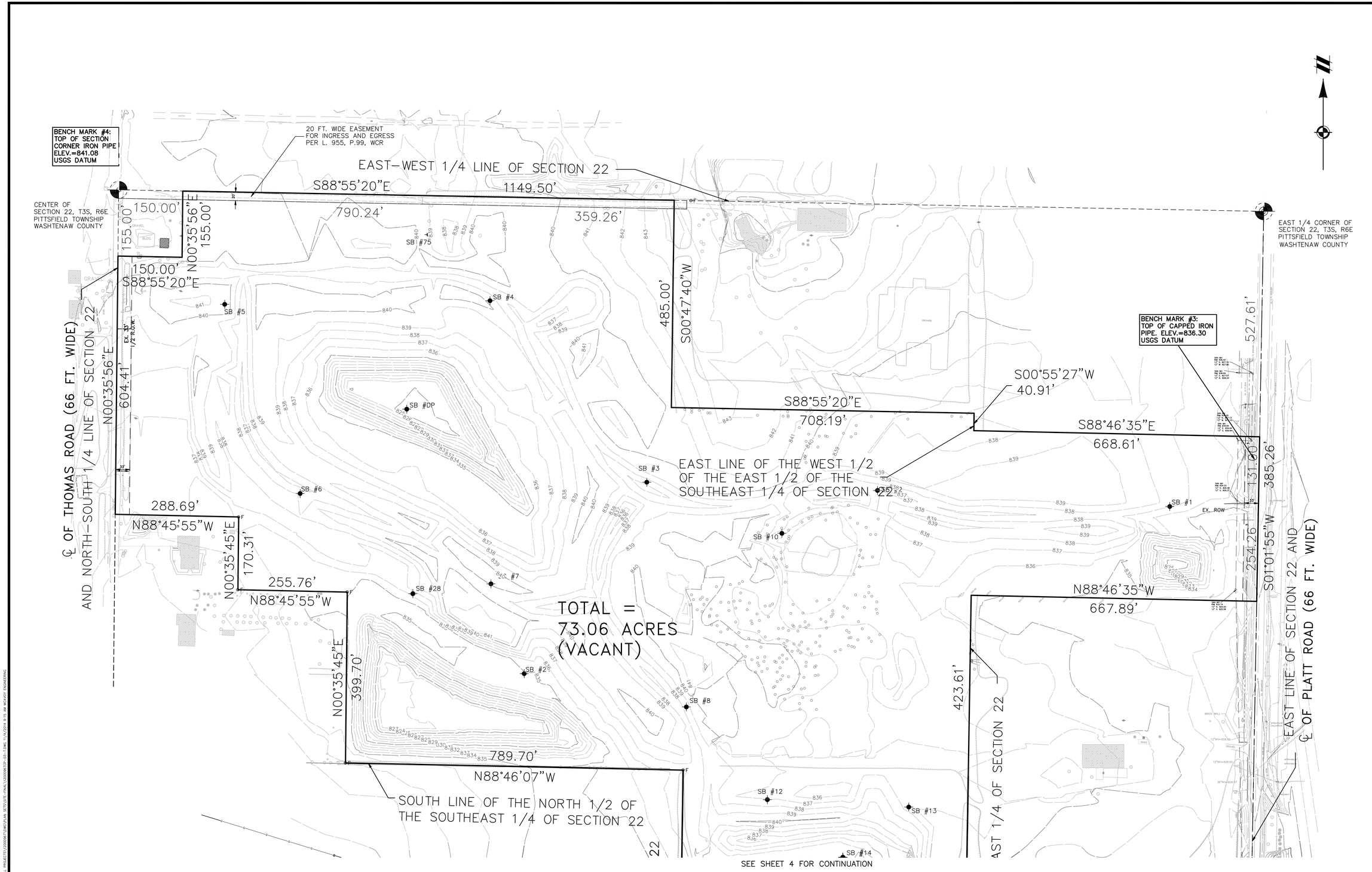

SEE SHEET 4 FOR CONTINUATION

NOTE:
1. TO OBTAIN NAVD DATUM ADD 0.29 FEET TO USGS DATUM
2. THESE PLANS HAVE BEEN PREPARED USING USGS DATUM

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SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC
PITTSFIELD GLEN
TOPOGRAPHIC SURVEY
NORTH

DATE
MAY 5, 2014

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07–03–2014 REVISED PSP PER TOWNSHIP COMMENTS
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1" = 100 FEET

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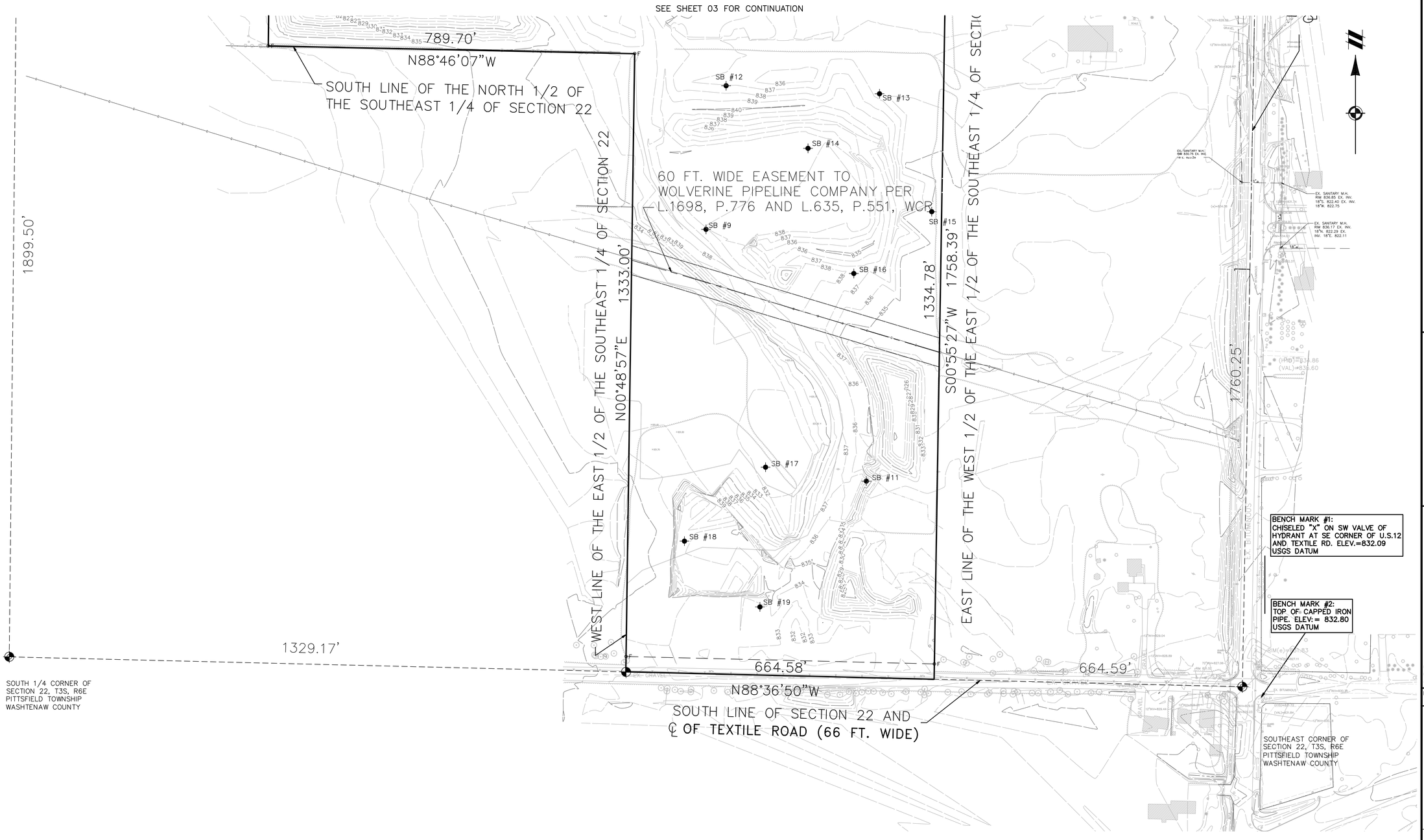

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WASHTENAW COUNTY, MICHIGAN

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PITTSFIELD GLEN
TOPOGRAPHIC SURVEY
SOUTH

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
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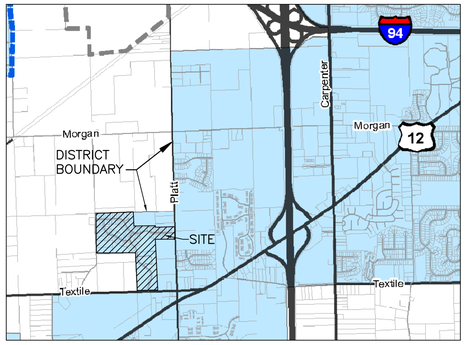

PROPOSED SANITARY SEWER AND WATER DISTRICT MAP

LEGEND

- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- PROPOSED SANITARY SEWER
- PROPOSED WATER MAIN
- PROPOSED STORM SEWER

DENNIS M. MARSTON
5521 THOMAS
ANN ARBOR, MI 48108
UNPLATTED
ZONED R-1B

MATTHEW & JAMIE L
FRETCH
5174 PLATT
ANN ARBOR, MI 48108
UNPLATTED
ZONED AG

CENTER OF
SECTION 22, T3S, R6E
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY

UNPLATTED
ZONED AG

MARTIN C. & JULIE D.
WIGGET
1390 N. PASEO DEGOLF
GREENVALLEY, AZ 85614-3608

DAVID A. & ANN M.
RUNOWSKI
5519 THOMAS
ANN ARBOR, MI 48108
UNPLATTED
ZONED AG

FARHAT ASSOCIATES
-ANN ARBOR LLC
5550 PLATT
ANN ARBOR, MI 48108
UNPLATTED
ZONED AG

MARVIN & FLORENCE
COHEN TRUST
PLATT RD
ANN ARBOR, MI 48108
UNPLATTED
ZONED AG

EAST 1/4 CORNER OF
SECTION 22, T3S, R6E
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY

PROPOSED SILK VALLEY

16" w

10" EX SANITARY

UNPLATTED
ZONED AG

DARI HISHAM & ISSA SAID
PLATT RD
ANN ARBOR, MI 48108

UNPLATTED
ZONED AG

PITTSFIELD CHARTER TWP
THOMAS RD
ANN ARBOR, MI 48108

Thomas Rd

UNPLATTED
ZONED R-1B

ISSA PROPERTIES LLC
PLATT RD
ANN ARBOR, MI 48108

UNPLATTED
ZONED AG

DORIS FULILOVE
BIRCHH
5629 THOMAS
ANN ARBOR, MI 48108

UNPLATTED
ZONED AG

STANLEY ZERA JR.
AND KAREN
5635 THOMAS
ANN ARBOR, MI 48108

WASHTENAW COMMUNITY
HEALTH ORG.
5623 THOMAS RD
ANN ARBOR, MI 48108

CHARLES A. ROBERTS
1117 PEARL ST.
ANN ARBOR, MI 48108
UNPLATTED
ZONED AG

SE MICHIGAN LAND
HOLDING LLC
5450 PLATT RD.
ANN ARBOR, MI 48108
(PROPOSED MONARCH ESTATES)

KIM T. CLARK TRUST
5757 THOMAS
ANN ARBOR, MI 48108

UNPLATTED
ZONED AG

Platt Rd

8" w
8" s
8" w
POTOMAC CT.
8" s
HICKORY GROVE ESTATES SUBDIVISION
12"
18" s
12" w
GLEN CT.
18" s

HONORIO HERRERO
610 DARTMOOR RD.
ANN ARBOR, MI 48103-4514
UNPLATTED
ZONED AG

WETLAND
MITIGATION
CONSERVATION
EASEMENTS

ATTAR ZAHRA AL
3339 WILLIAMSBURG RD.
ANN ARBOR, MI 48108

UNPLATTED
ZONED AG

JAMEY CATES &
STEVEN T. BUTLER
PLATT RD
PINCKNEY, MI 48108
UNPLATTED
ZONED AG

MARK THOMPSON
AND CAROL
2989 TEXTILE
ANN ARBOR, MI 48108
UNPLATTED
ZONED AG

ULTIMATE STORM
SEWER OUTLET:
KOCH-WARNER
DRAIN

12" w

36" s

Textile Rd

Michiga

PITTSFIELD TWP
MICHIGAN AVE
SALINE, MI 48176

RICHARD & PHYLLIS
PREVEDEL
8192 MUNGER RD
YPSILANTI, MI 48197

E.M.U.
ATTN. ANTHONY CATNER
E.M.U.
YPSILANTI, MI 48197

JOHN SHANKLE
2972 TEXTILE RD
ANN ARBOR, MI 48108

SHAKLEE USED AUTOS
SOUTHEAST CORNER OF
SECTION 22, T3S, R6E

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SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

OVERALL UTILITY
& VICINITY PLAN

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 100 200
1" = 200 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-04-OV.DWG
JOB --
FILE CODE: --
SHEET NO. 05

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NOTES

FIRE PROTECTION AND PREVENTION

12.01 Access:

A. In addition to the standards in Section 10.04 the following shall apply:

1. All roads, lanes or drives required for emergency access shall be posted as required by NFPA 1141, Sections 3-1.8 & 3-2.3 with the following exceptions:

   (a) Entryways and main drives shall be posted with signs reading "No Standing – Fire Lane".

   (b) Main drives adjacent and parallel to structures shall be posted with signs reading "No Standing – Fire Lane" or "No Parking – Fire Lane" on the side adjacent to the building and the opposite side shall be posted with signs reading "No Stopping – Standing – Parking – Fire Lane". Parking shall be prohibited on one side of all main driveways.

   (c) Paved areas on the sides and rear of buildings which are less than thirty (30) feet wide shall be posted "No Parking – Fire Lane".

   (d) Signs shall be installed with their faces perpendicular to the roadway, six feet, eight inches (6' 8") high, facing the direction of travel, and shall be located so that at least one sign is clearly readable from any location on the posted road, lane or drive. Signs shall be two sided, where applicable.

12.09 Signage:

A. Location of "Fire Lane-No Parking", "Fire Lane No Standing", "Emergency Access Only", "Authorized Parking Only", type signs shall be designated by the Fire Marshal or his designee. They shall be spaced 75 feet apart.

B. Fire Department road/parking type signage shall be 12" by 18" and meet the adopted International Fire Code and National Fire Protection Association Life Safety Codes.

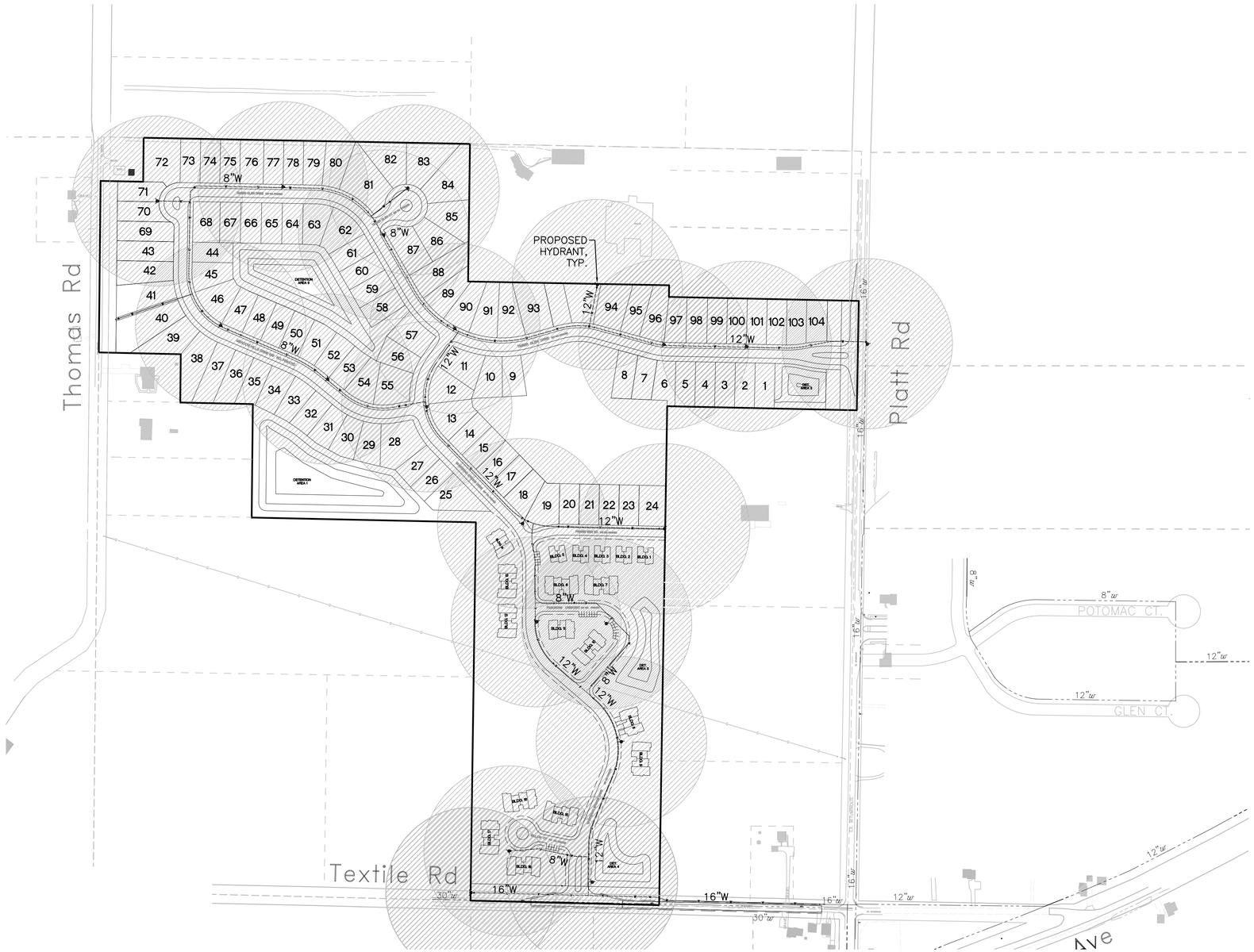
C. Curb, asphalt or cement painting may be required in fire lanes or authorized parking areas. (red or yellow paint)

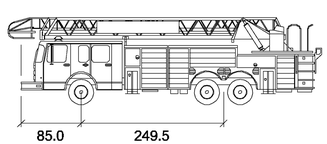
D. Fire Department Connections shall be marked with signage approved by the Fire Marshal or his designee.

E. Red signs with white lettering shall be placed on fire suppression access doors. (3/4" minimum letters)

F. Signage shall be provided to mechanical, electrical, elevator, and HVAC rooms.

G. Exit routing signs shall be placed throughout the building and approved by the Fire Marshal and Building Official in accordance with applicable codes NFPA 101.

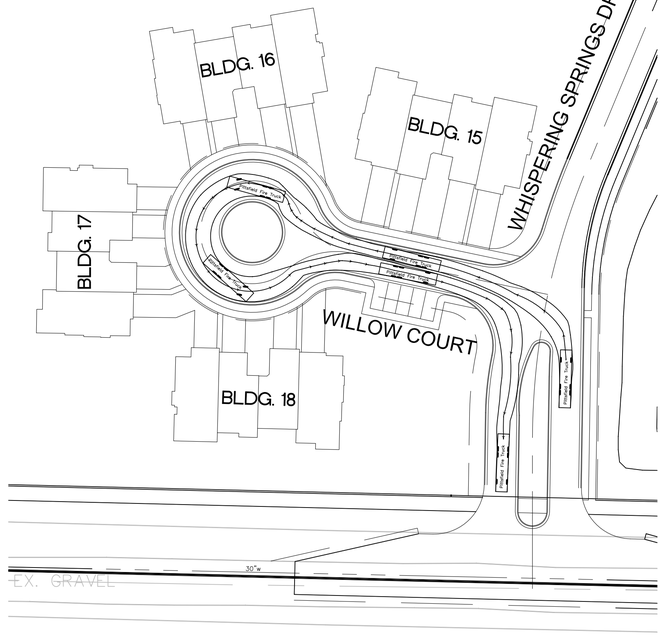




inches

Track	: 82.9
Lock to Lock Time	: 6.0
Steering Angle	: 45.0

FIRE TRUCK TEMPLATE
NO SCALE



FIRE TRUCK ROUTE
SCALE: 1" = 50'

LEGEND

- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- WETLAND
- 25' WETLAND BUFFER LINE
- 300' RADIUS HYDRANT COVERAGE (TYP.)

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TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

FIRE PROTECTION PLAN

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
09-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
09-23-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-13-2014 REVISED PSP PER TOWNSHIP & WCREC COMMENTS

REVISIONS

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1" = 200 FEET

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DESCRIPTION OF ON-SITE NATURAL FEATURES

WETLAND C: BUTTONBUSH SWAMP SURROUNDED BY RED MAPLE, AMERICAN ELM AND GRAY DOGWOOD. –NOT REGULATED BY MDEQ–

WETLAND D: WOODED WETLAND DOMINATED BY RED MAPLE, AMERICAN ELM AND POPLAR. –REGULATED BY MDEQ–

HEDGEROWS: MOST OF THE ON–SITE HEDGEROWS ARE DOMINATED BY SHRUBS; GRAY DOGWOOD, HAWTHORN, GLOSSY BUCKTHORN AND RASPBERRY. THE TREES ARE A MIX OF AMERICAN ELM, RED OAK, WALNUT, BLACK CHERRY AND HICKORY. TREES ARE PRE– DOMINANTLY 8"–10" DBH. THE HEDGEROW ALONG THE WEST PROPERTY SOUTH OF THE ON–SITE WOODS CONTAINS LARGER TREES (10"–12" DBH).

WOODLAND: THE DOMINANT SPECIES IN THE ON–SITE WOODLAND ARE WALNUT, SHAGBARK AND PIGNUT HICKORY, AND RED OAK. THE AVERAGE SIZE OF TREES IS 8"–10" DBH. THERE ARE SIGNS OF PAST LOGGING WITH OCCASIONAL LARGE DECAYING STUMPS. LARGER TREES INCLUDE 32" WHITE OAK, 27" RED OAK, 24" WALNUT, 22" WALNUT, 19" BASSWOOD. NONNATIVE INVASIVE SPECIES ARE ESTABLISHED IN THE UNDER– STORY, DOMINATED BY GLOSSY BUCKTHORN WITH SOME BARBERRY AND HONEYSUCKLE. IT IS A MEDIUM DENSITY, MID SUCCESSIONAL WOODLANDS.

SOILS LEGEND

MoB – MORLEY LOAM, 2 TO 6 PERCENT SLOPES

BbB – BLOUNT LOAM, 2 TO 6 PERCENT SLOPLES

Pe – PEWAMO CLAY LOAM

Nab – NAPPANEE SILTY CLAY LOAM, 2 TO 6 PERCENT

Hn – HOUGHTON MUCK

WETLAND FILL AND MITIGATION HAS BEEN COMPLETED UNDER MDEQ PERMIT NUMBER 00-81-0107-P

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PITTSFIELD GLEN

NATURAL FEATURES PROTECTION PLAN

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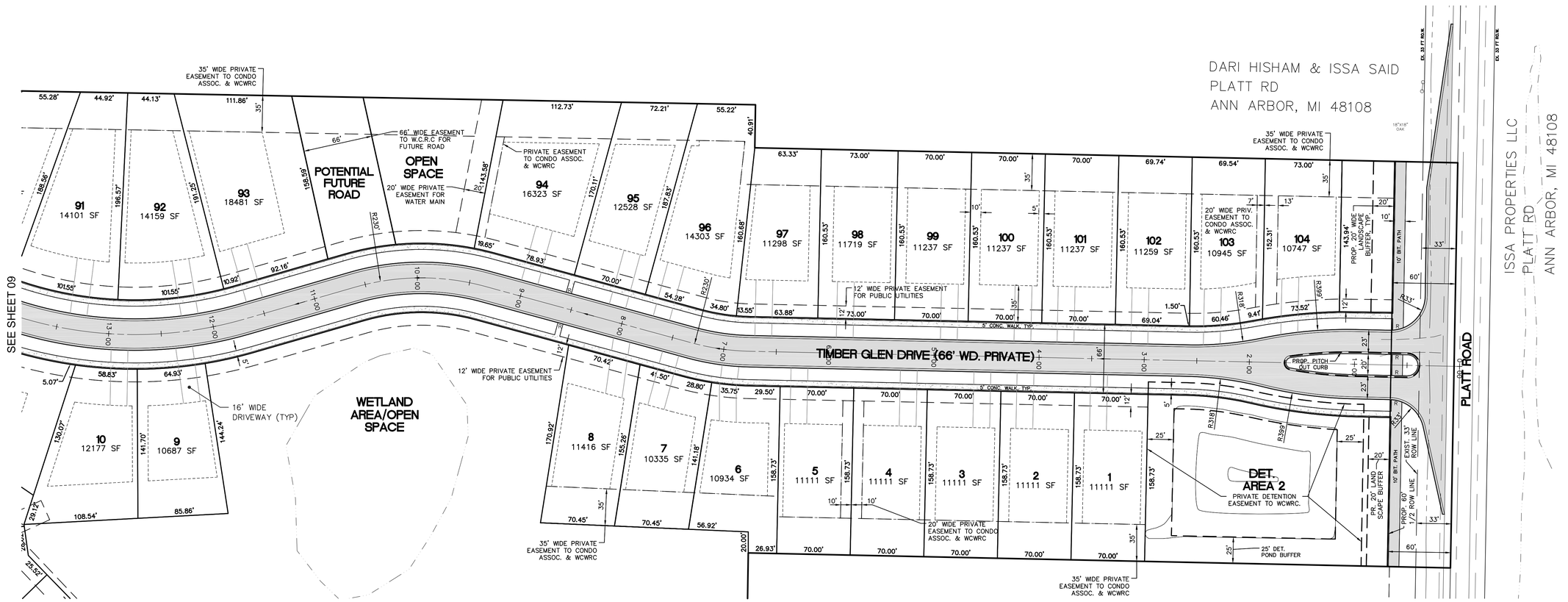
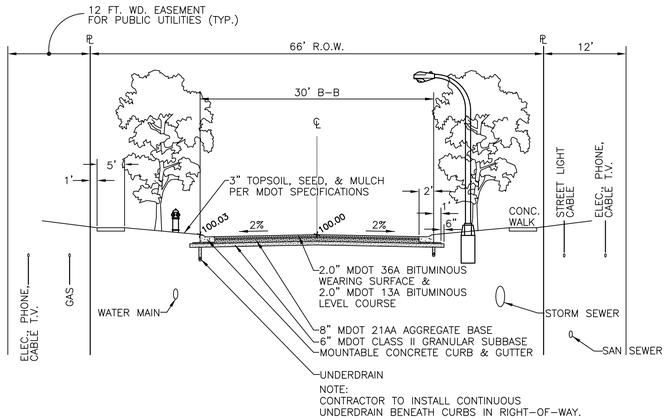
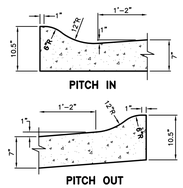
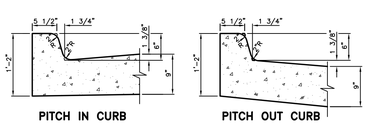




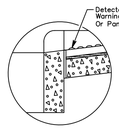
TYPICAL 30' B-B CONCRETE ROAD CROSS SECTION
NO SCALE



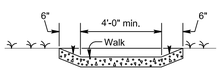
MOUNTABLE CURB AND GUTTER
NO SCALE



CURB DETAIL (FOR CURB ISLANDS)
NO SCALE



DETAIL A
Detectable Warnings (truncated domes) are to be installed in the location shown. Dimensions of the domes are 24" [610] from the back of the curb by the width of the ramp.

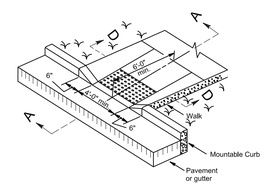


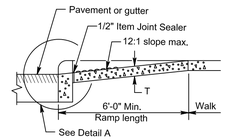
SECTION D-D

TRUNCATED DOMES: Install detectable warnings (truncated domes) for a distance of 24" from the back of the curb for the entire width of the ramp opening. Domes to be of contrasting color to the pavement (reddish tone).

Pavers will meet ASTM C 902 Class SX, Type 1, or C 936, or C 1272 Type R. Panels will be laid on top of a 4" non reinforced concrete base. Setting bed and joints to be mortared in accordance with manufacturer's instruction, or with a maximum 3/4"thick bed of latex modified cement mortar.

Panels shall be laid such that joints are level with adjoining joints so as to provide a smooth transition from panel to panel and from panel to concrete surface. The surface of any two adjacent units should not differ by more than 1/8" in height.

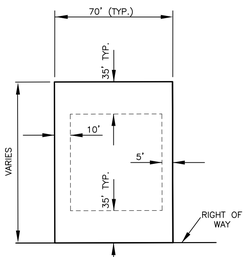




SECTION A-A

NOTE: SEE SHEET 18 FOR SIDEWALK DETAIL

CURB RAMP DETAIL
NO SCALE



TYPICAL BUILDING SETBACKS
NO SCALE

NOTES:
1. DIMENSIONS AND RADII ARE SHOWN FROM BACK OF CURB.
2. R DENOTES SIDEWALK RAMP LOCATION.

LEGEND
- PROP. ASPHALT
- PROP. CONCRETE
- PITCH OUT CURB

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CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

LAYOUT PLAN
SINGLE FAMILY
EAST

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

DATE
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05-20-2014 SUBMITTED TO TWP
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REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
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CAD FILE: 12000967CP-07-L.DWG
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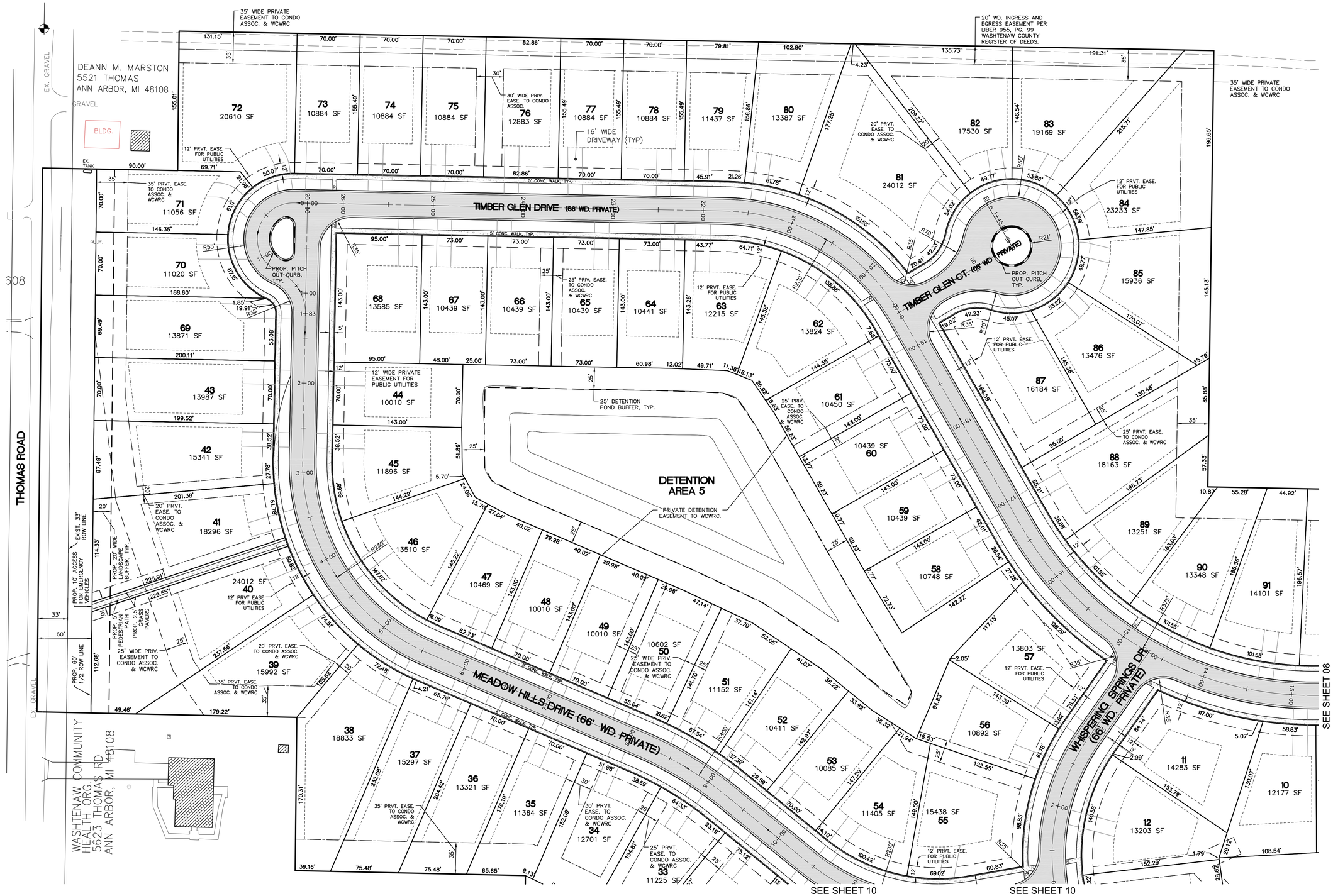
FILE CODE: --
SHEET NO. 08

D:\DEPOT\WORK\P ENGINEERING\DOCUMENTS_MI\PROJECTS\12000967\DWG\PLAN SETS\SITE PLAN\12000967CP-07-L.DWG, 11/4/2014 1:08 PM, MARKP, ENGINEERING



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LEGEND
- PROP. ASPHALT
- PROP. CONCRETE
- PITCH OUT CURB

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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

LAYOUT PLAN
SINGLE FAMILY
WEST

DATE
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SEE SHEET 09

SEE SHEET 09

SEE SHEET 08

MEADOW HILLS DRIVE (66' WD. PRIVATE)

TIMBER GLEN DRIVE (66' WD. PRIVATE)

WHISPERING SPRINGS DRIVE (66' WD. PRIVATE)

PRAIRIE VIEW RD (49' WD. PRIVATE)

WETLAND AREA/OPEN SPACE

12' WIDE PRIVATE EASEMENT FOR PUBLIC UTILITIES

35' WIDE PRIVATE EASEMENT TO CONDO ASSOC. & WCWRC

DETENTION AREA 1

PRIVATE DETENTION EASEMENT TO WCWRC.

25' DETENTION POND BUFFER, TYP.

35' PRVT. EASE. TO CONDO ASSOC. & WCWRC

20' PRVT. EASE. TO CONDO ASSOC. & WCWRC

5' CONC. WALK, TYP.

16' WIDE DRIVEWAY (TYP)

VAR. WIDTH PRVT. EASE. FOR PUBLIC UTILITIES

VARIABLE WIDTH PRVT. EASE. FOR PUBLIC UTILITIES

20' WIDE PRIVATE EASEMENT TO CONDO ASSOC. & WCWRC.

49' PRVT. EASE. FOR ROAD

12' PRVT. EASE. FOR PUBLIC UTILITIES

36	13321 SF	
35	11364 SF	
34	12701 SF	
33	11225 SF	
32	10963 SF	
31	10887 SF	
30	11161 SF	
29	11396 SF	
28	19982 SF	
27	10433 SF	
26	10010 SF	
25	16586 SF	
24	13455 SF	
23	10010 SF	
22	10010 SF	
21	10031 SF	
20	10012 SF	
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57	13803 SF	
56	10892 SF	
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54	11405 SF	
53	10085 SF	
52	10411 SF	
51	11152 SF	
50	10602 SF	
49	10010 SF	

BLDG. 1
BLDG. 2
BLDG. 3
BLDG. 4
BLDG. 5
BLDG. 4

SEE SHEET 11

KIM T. CLARK TRUST
5757 THOMAS
ANN ARBOR, MI 48108

NOTES:
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2. R DENOTES SIDEWALK RAMP LOCATION.

LEGEND

PROP. ASPHALT

PROP. CONCRETE

PITCH OUT CURB

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248.447.2000

SECTION 22
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WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

LAYOUT PLAN
SINGLE FAMILY
SOUTH

DATE
MAY 5, 2014

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SHEET NO. 10	

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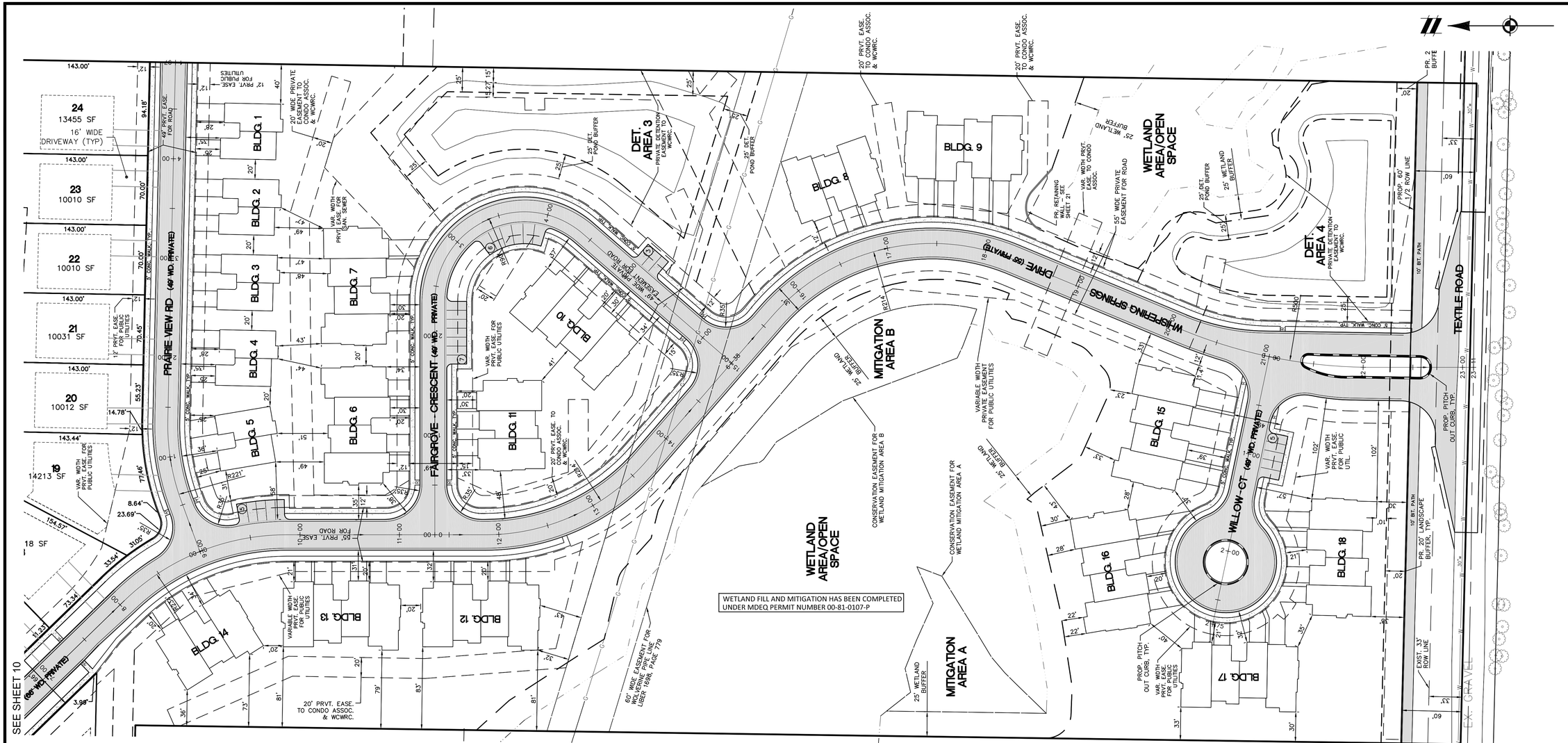
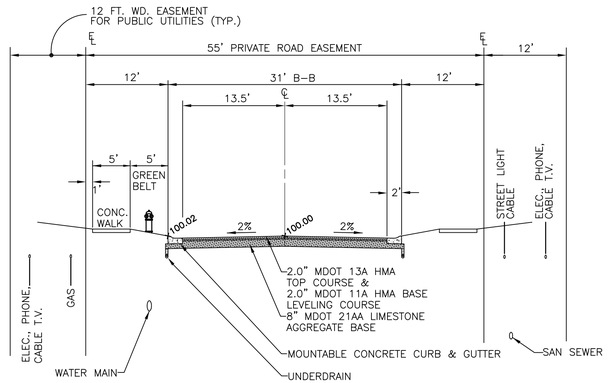
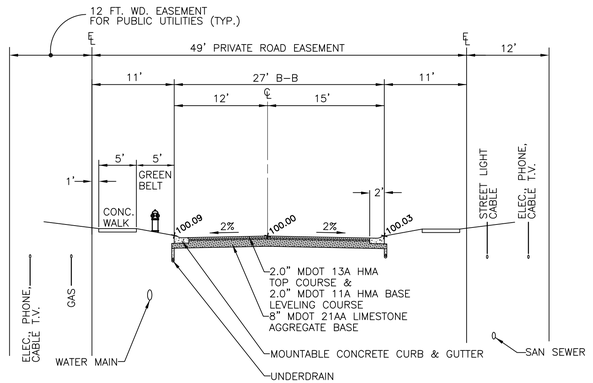


WETLAND FILL AND MITIGATION HAS BEEN COMPLETED UNDER MDEQ PERMIT NUMBER 00-81-0107-P



NOTE:
CONTRACTOR TO INSTALL CONTINUOUS UNDERDRAIN BENEATH CURBS IN PRIVATE ROAD EASEMENT.

TYPICAL 31' B-B CONCRETE ROAD CROSS SECTION
NO SCALE



NOTE:
CONTRACTOR TO INSTALL CONTINUOUS UNDERDRAIN BENEATH CURBS IN PRIVATE ROAD EASEMENT.

TYPICAL 27' B-B CONCRETE ROAD CROSS SECTION
NO SCALE

PITTSFIELD TWP
MICHIGAN AVE
SALINE, MI 48176

NOTES:
1. DIMENSIONS AND RADII ARE SHOWN FROM BACK OF CURB.
2. R DENOTES SIDEWALK RAMP LOCATION.

LEGEND
- PROP. ASPHALT
- PROP. CONCRETE
- PITCH OUT CURB

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CLIENT: PITTSFIELD GENERAL DEVELOPMENT, LLC

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

PITTSFIELD GLEN
LAYOUT PLAN
MULTI FAMILY

DATE: MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-07-L.DWG
JOB --
FILE CODE: --
SHEET NO. 11

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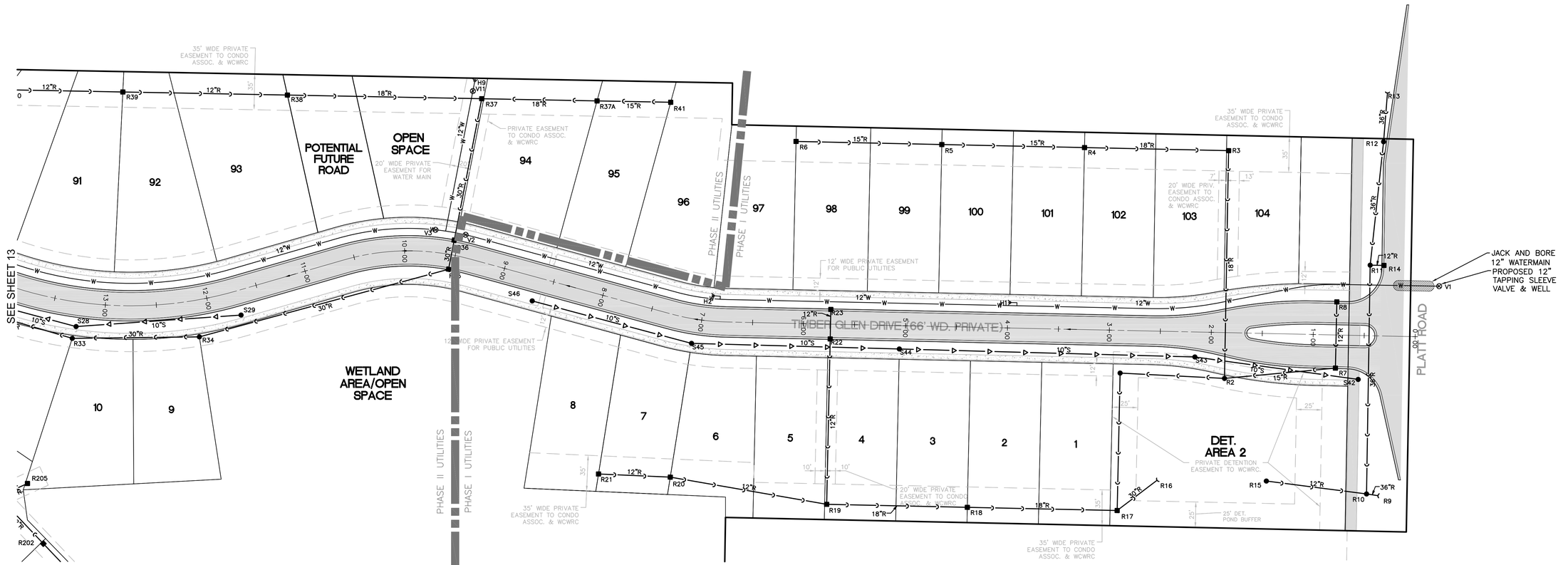

LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
- PROPOSED MANHOLE / CATCH BASIN / END SECTION
- EXISTING UNDERGROUND ELECTRIC
- EXISTING TELEPHONE SERVICE
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- PROPOSED WATER SERVICE
- EXISTING HYDRANT
- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
- EXISTING WATER MAIN MANHOLE
- PROPOSED REDUCER
- PROPOSED SANITARY SEWER MAIN
- PROPOSED SANITARY SEWER LEAD
- PROPOSED SANITARY SEWER MANHOLE
- EXISTING SANITARY
- EXISTING UNDERGROUND CABLE SERVICE
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- EXISTING GUY WIRE
- EXISTING UTILITY POLE
- EXISTING CATV BOX
- EXISTING TELEPHONE BOX
- EXISTING ELECTRICAL BOX
- EXISTING SIGN
- EXISTING TREE
- PROPOSED RIP-RAP
- PHASE LINE

NOTE:
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SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC
PITTSFIELD GLEN

UTILITY PLAN
SINGLE FAMILY
EAST

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
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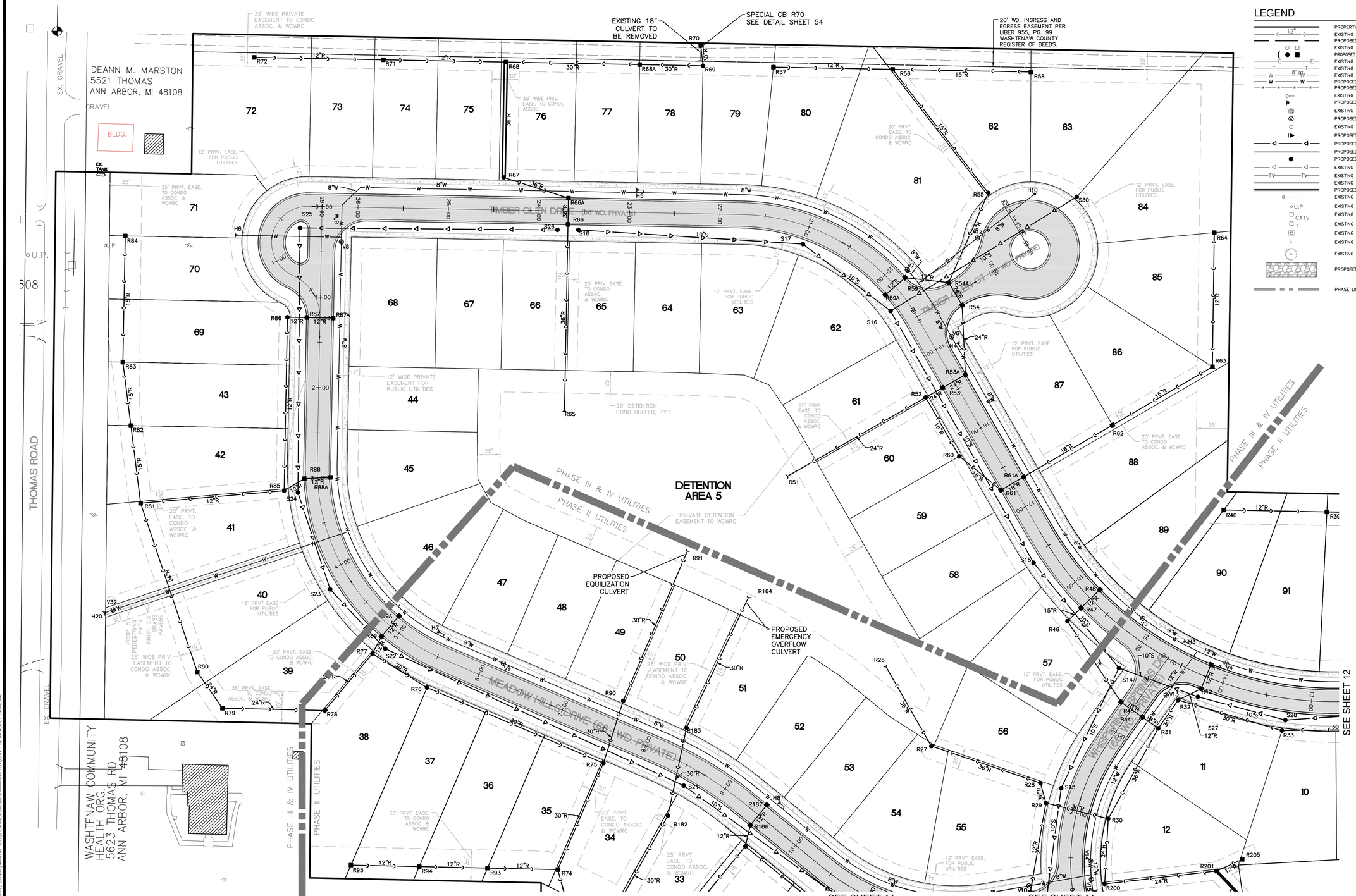
JOB --
FILE CODE: --
SHEET NO. 12



LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
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- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
- EXISTING WATER MAIN MANHOLE
- PROPOSED REDUCER
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- PROPOSED SANITARY SEWER LEAD
- PROPOSED SANITARY SEWER MANHOLE
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PITTSFIELD GLEN

UTILITY PLAN
SINGLE FAMILY
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1" = 50 FEET

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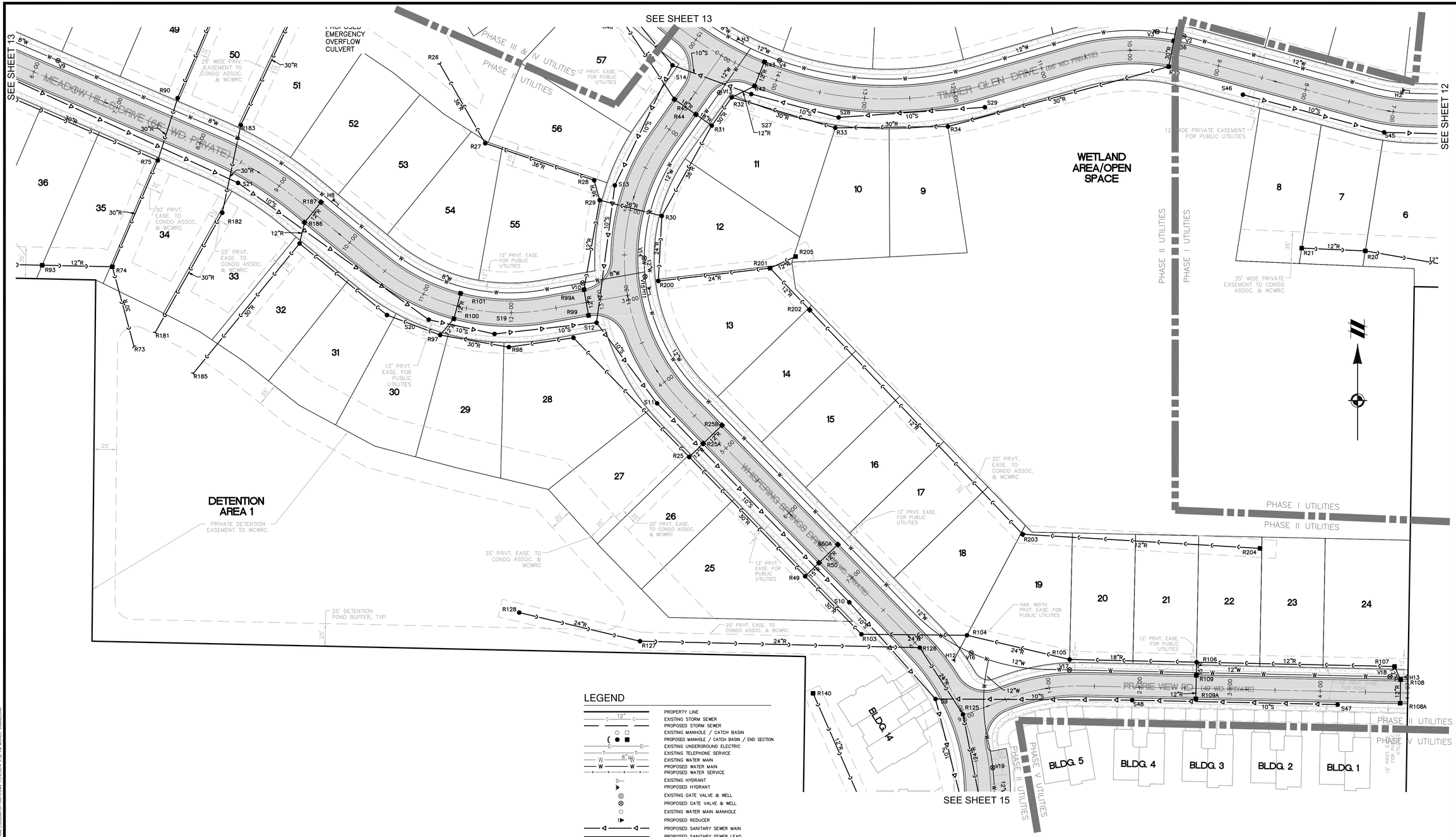

LEGEND

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- EXISTING STORM SEWER
- PROPOSED STORM SEWER
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- PROPOSED MANHOLE / CATCH BASIN / END SECTION
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- PROPOSED GATE VALVE & WELL
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SINGLE FAMILY
SOUTH

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

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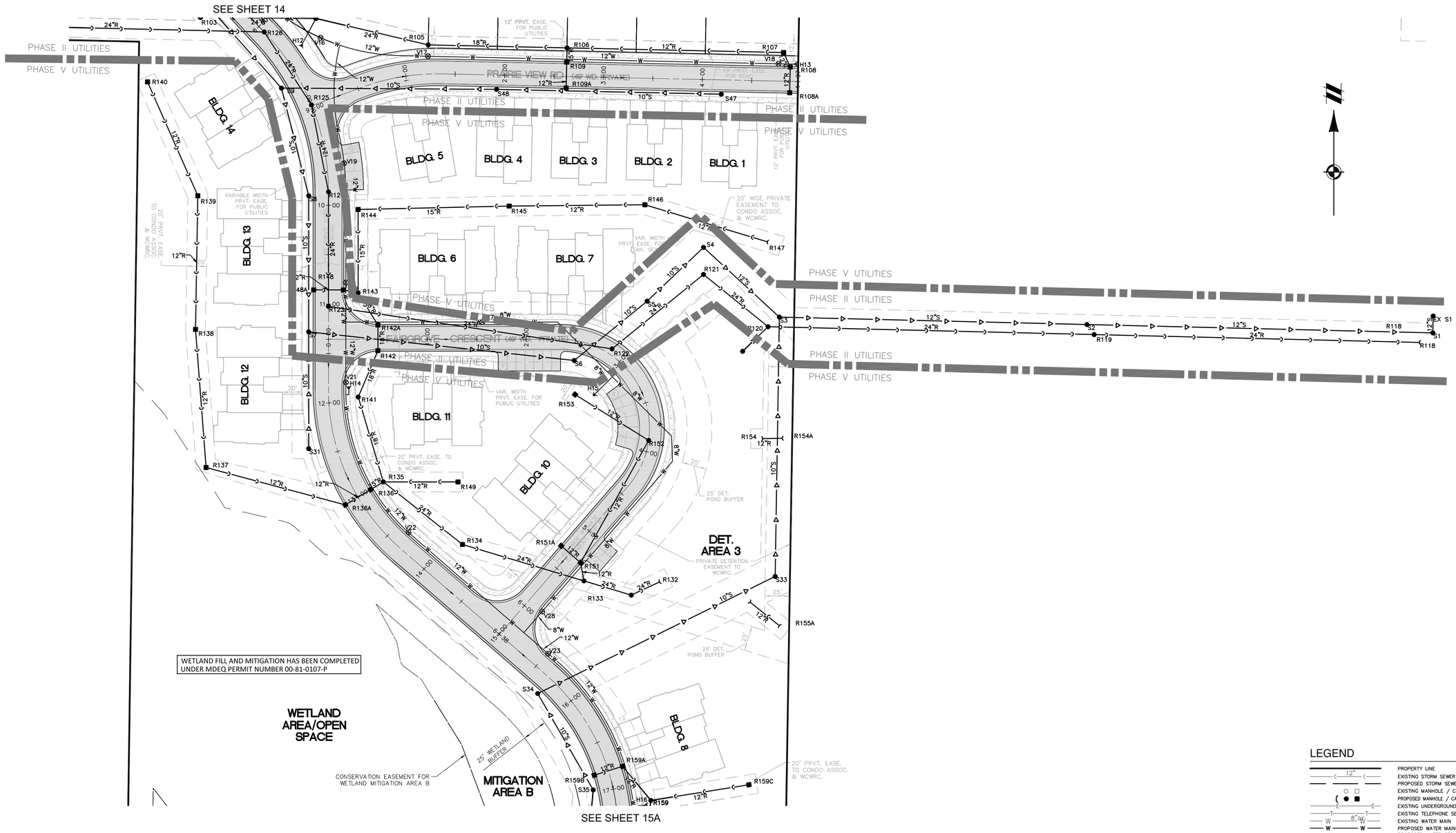
CAD FILE: 12000967CP-08-U.DWG
JOB --
FILE CODE: --

SHEET NO. 14

S:\DEPARTMENT DRIVE\PROJECTS\ATWELL PROJECTS\12000967\DRAWINGS\PLAN SETS\PSP_FINAL\12000967CP-08-U.DWG 11/4/2014 8:32 AM MICKEY FISHERING



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1" = 50 FEET

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FILE CODE: --

SHEET NO. 15

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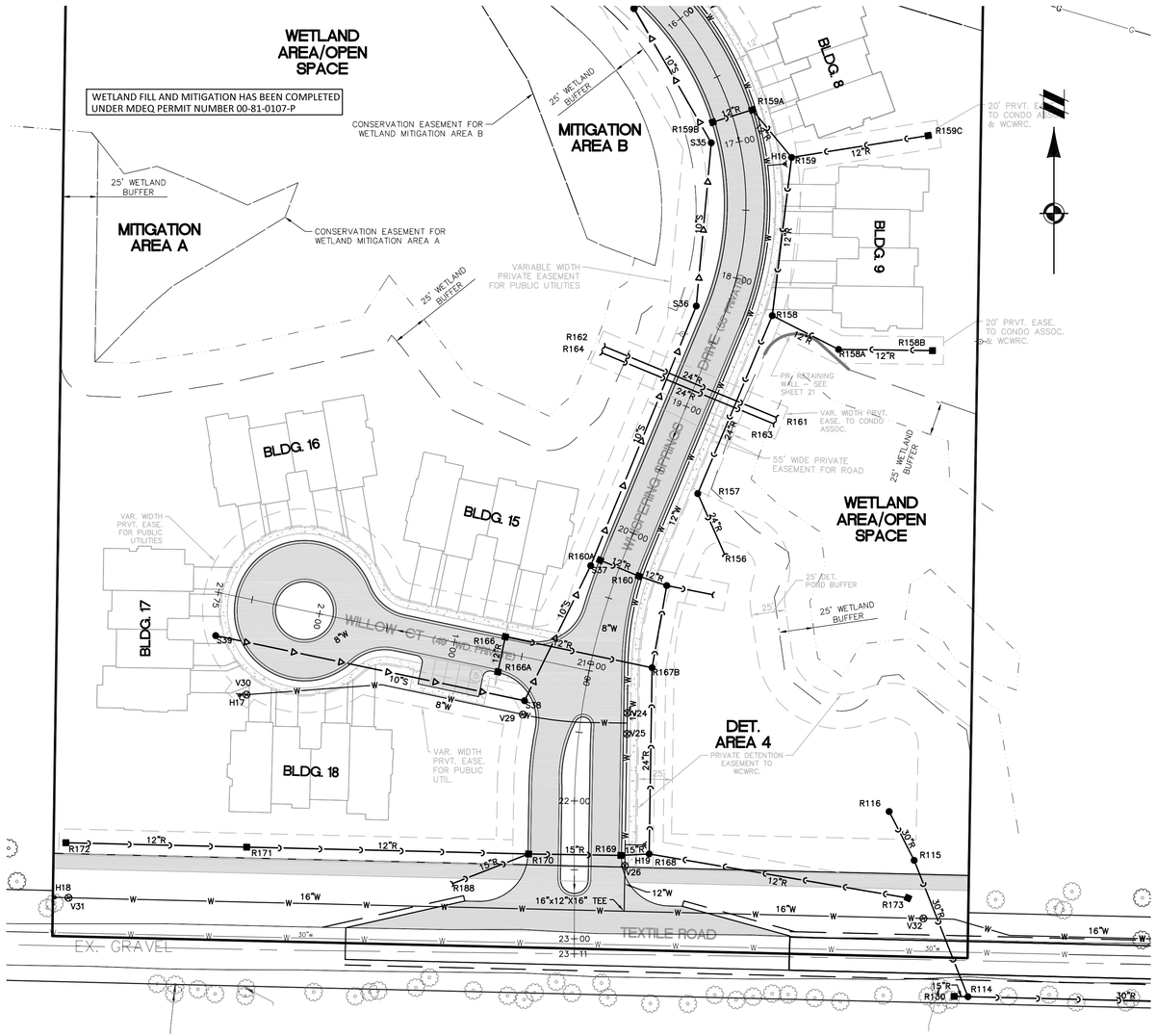

LEGEND

- PROPERTY LINE
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- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
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MULTI FAMILY

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WASHTENAW COUNTY, MICHIGAN

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FILE CODE: --
SHEET NO. 16

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SEE SHEET 18

SEE SHEET 55

WETLAND 'C'
(NOT STATE REGULATED)

TREE PROTECTION FENCE, TYP.
SILT FENCE, TYP.

SILT FENCE, TYP.
TREE PROTECTION FENCE, TYP.

TIMBER GLEN DRIVE (66' WD. PRIVATE)

PLATT ROAD

20' x 100' MUD TRACKING MAT

DET. AREA 2

POND 2 FOREBAY GABION SEE SHEET 55

PERM POOL = 829.90

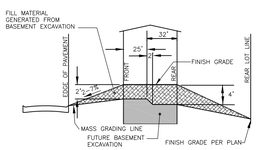
100 YR = 834.05

DET 2 SPILLWAY SEE SHEET 55

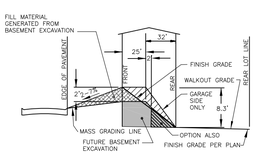
ORCHARD

CATV

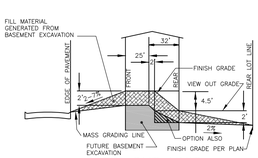
FILL MATERIAL GENERATED FROM BASEMENT EXCAVATION



STANDARD UNIT

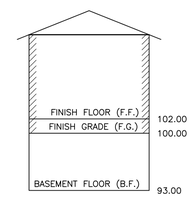


WALKOUT UNIT



VIEW OUT UNIT

MASS GRADING DETAILS
NO SCALE



TYPICAL UNIT ELEVATION
NO SCALE

SOIL EROSION LEGEND

- TRACKING MAT
- SILT FENCE
- TREE PROTECTION FENCE
- INLET FILTER

NOTE: REFER TO STANDARD PITTSFIELD TOWNSHIP SOIL EROSION AND SEDIMENTATION CONTROL DETAILS AND NOTES.

GRADING LEGEND

- 751.80 W.O. / 760.00 F.G. — FINISH GRADE OF WALK-OUT / FINISH GRADE
- 754.20 V.O. / 760.00 FG — FINISH GRADE OF VIEW-OUT / FINISH GRADE
- DBL = DROP BRICK LEDGE
- DRAINAGE ARROW

GRADING NOTES

1. SPOT GRADES ALONG THE ROAD ARE SHOWN AS THE TOP OF BACK OF CURB UNLESS NOTED OTHERWISE.
2. THE SIDEWALK CROSS SLOPE SHALL BE 2%, TYP.

LEGEND

- EXIST. SANITARY SEWER
- PROP. SANITARY SEWER
- EXIST. CLEANOUT
- PROP. CLEANOUT
- EXIST. WATER MAIN
- PROP. WATER MAIN
- EXIST. HYDRANT
- PROP. HYDRANT
- PROP. VALVE STEM
- EXIST. STORM SEWER
- PROP. STORM SEWER
- EXIST. MANHOLE
- PROP. MANHOLE
- EXIST. CATCH BASIN/INLET
- PROP. CATCH BASIN/INLET
- END SECTION
- CULVERT
- RIP-RAP

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SECTION 22
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WASHTENAW COUNTY, MICHIGAN

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PITTSFIELD GLEN
GRADING AND EROSION CONTROL PLAN
SINGLE FAMILY
EAST

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CAD FILE: 12000967CP-09-G.DWG
JOB --
FILE CODE: --
SHEET NO. 17

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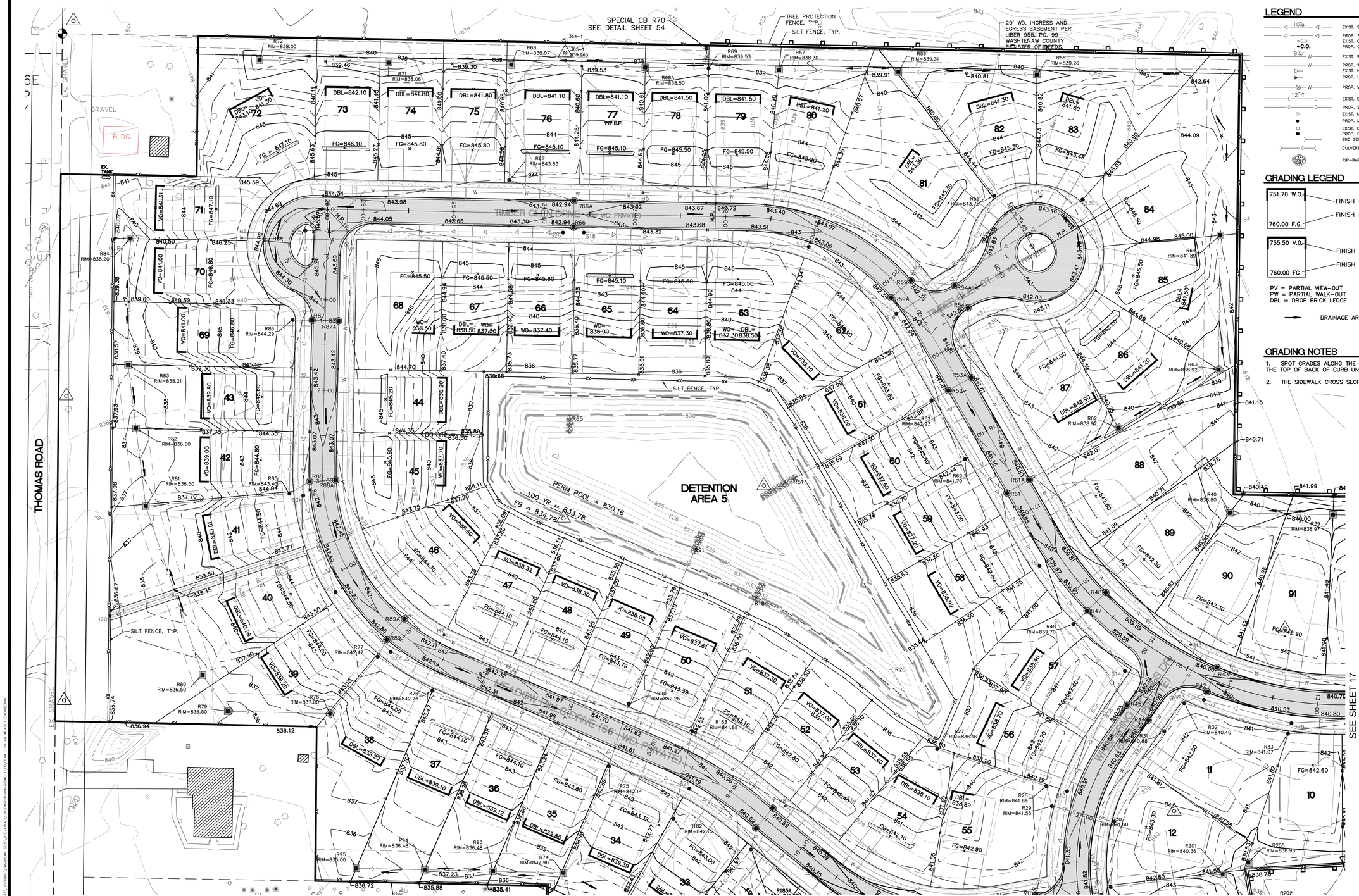

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GRADING LEGEND

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DRAINAGE ARROW

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SOIL EROSION LEGEND

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- INLET FILTER

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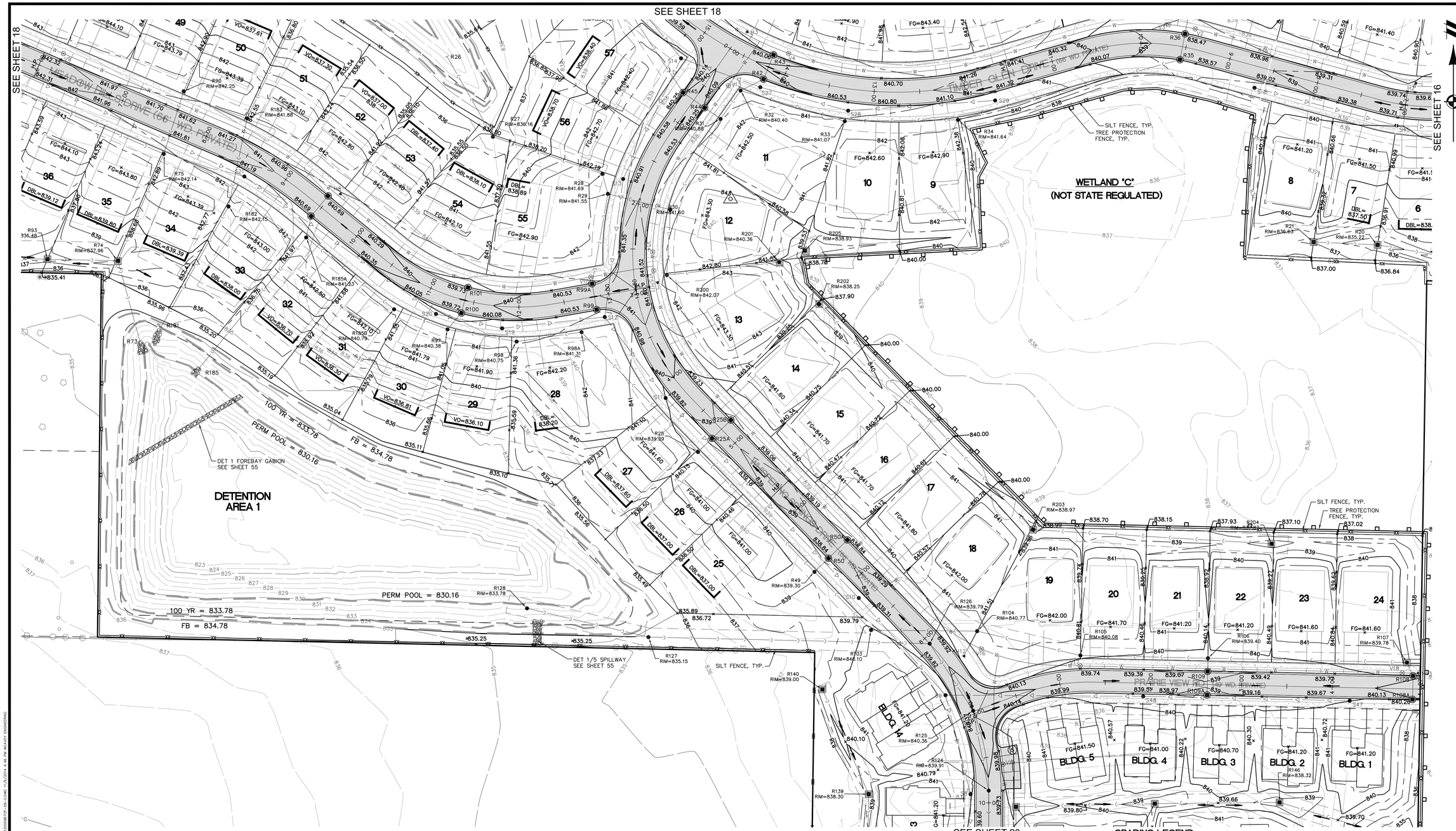

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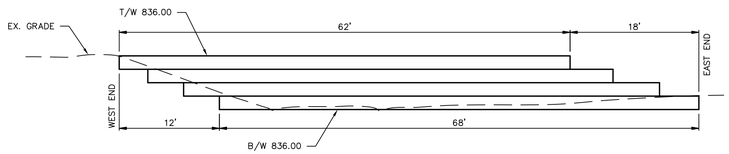
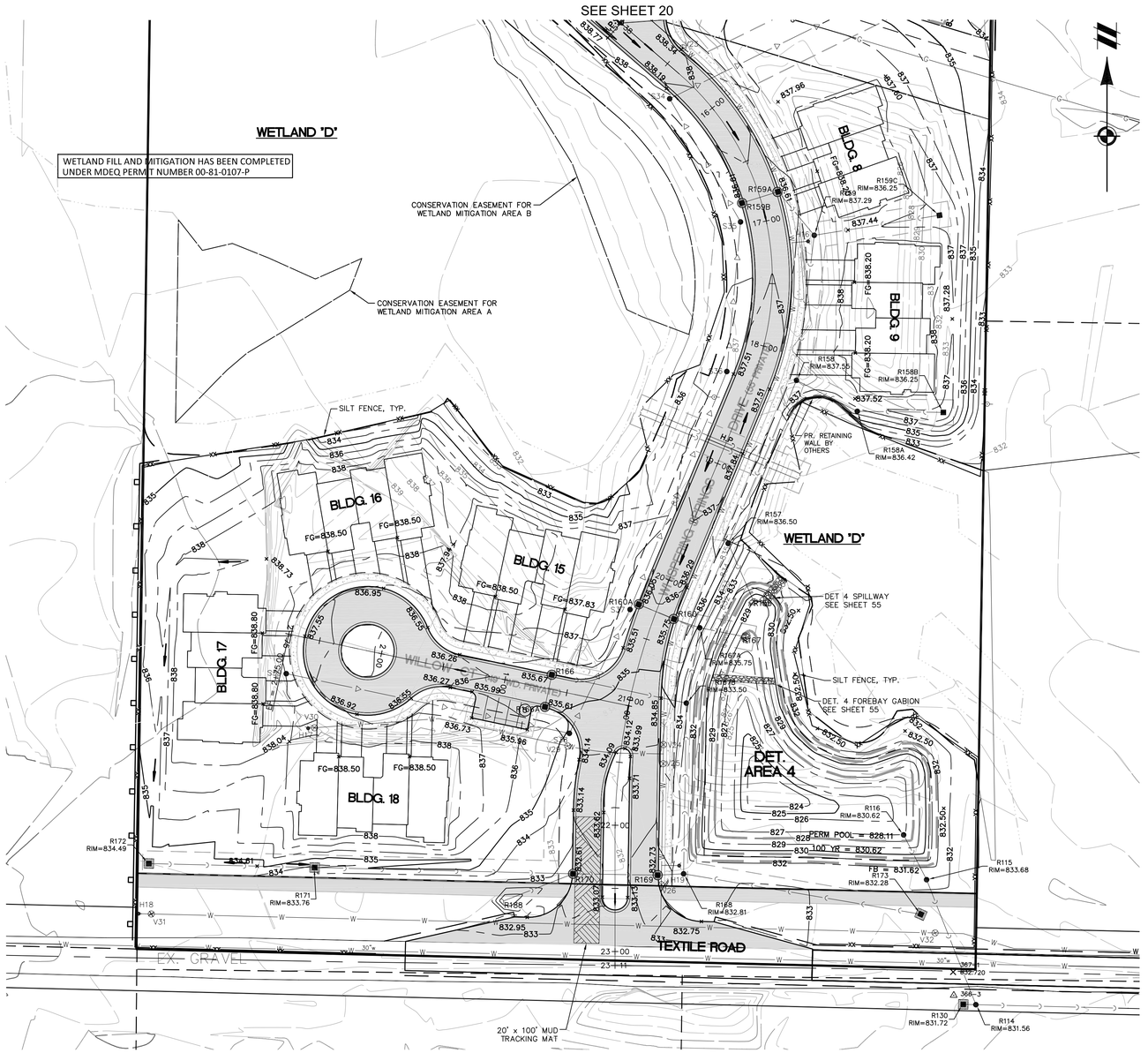


PR. BLOCK RETAINING WALL BY OTHERS - BLDG 9

NOT TO SCALE

GENERAL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF A MODULAR BLOCK RETAINING WALL TO THE DIMENSIONS AND ELEVATIONS SHOWN ABOVE. THE WALL WILL BE DESIGNED AND INSTALLED BY A QUALIFIED MANUFACTURER, ACCOUNTING FOR LOCAL SOIL AND GROUNDWATER CONDITIONS AS NECESSARY. ATWELL HAS NOT VERIFIED SITE CONDITIONS AND MAKES NO CLAIM AS TO THE EXISTING NATURE OF THE PROPOSED WALL LOCATION.
2. THE CONTRACTOR AND DESIGNATED BLOCK WALL REPRESENTATIVE SHALL EVALUATE THE EXISTING SOIL AND WATER CONDITIONS AT THE LOCATION OF PROPOSED BLOCK WALL. SOIL PARAMETERS SHALL BE EVALUATED BY A QUALIFIED PROFESSIONAL FOR THE PURPOSES OF THE WALL DESIGN, INCLUDING BACKFILL AND FOOTER BASE MATERIAL. IN GENERAL, GRANULAR SOILS ARE RECOMMENDED AS INFILL SOIL. FINE GRAINED COHESIVE SOILS WITH LOW PLASTICITY MAY BE USED IN WALL CONSTRUCTION, BUT ADDITIONAL BACKFILLING AND COMPACTION EFFORTS SHALL BE REQUIRED REQUIRED PER MANUFACTURERS RECOMMENDATIONS. REQUIRED SOIL PARAMETERS SHALL BE CONFIRMED BY THE WALL MANUFACTURER, SITE GEOTECHNICAL ENGINEER, OR OTHERS PRIOR TO WALL CONSTRUCTION.
3. UNSUITABLE SOILS UNDERNEATH THE PROPOSED WALL LOCATION SHALL BE EXCAVATED AND REMOVED BY THE CONTRACTOR AND REPLACED WITH SUITABLE BACKFILL MATERIAL. GRANULAR BACKFILL MATERIAL SHALL BE PLACED IN LIFTS NOT TO EXCEED 6-INCHES AND COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR, OR PER THE RECOMMENDATION OF THE ON-SITE WALL MANUFACTURER'S REPRESENTATIVE.
4. SUFFICIENT DRAINAGE MUST BE PROVIDED SUCH THAT HYDROSTATIC LOADING (PORE PRESSURE) DOES NOT DEVELOP IN THE REINFORCED ZONE OF THE BLOCK WALL.
5. RETAINING WALL UNITS AND INSTALLATION SHALL CONFORM TO THE MANUFACTURER'S MODULAR RETAINING WALL SPECIFICATION GUIDELINES, GEOGRID REINFORCEMENT SYSTEM SPECIFICATION GUIDELINES, AND WATER MANAGEMENT SPECIFICATION GUIDELINES. SUFFICIENT DRAINAGE MUST BE PROVIDED SUCH THAT HYDROSTATIC LOADING (PORE PRESSURE) DOES NOT DEVELOP IN THE REINFORCED ZONE OF THE BLOCK WALL.
6. RETAINING WALLS MUST BE INSTALLED AND CONSTRUCTED ACCORDING TO APPROVED DRAWINGS FROM THE BLOCK WALL MANUFACTURER. THE RETAINING WALL PLAN VIEW ABOVE IS FOR WALL IDENTIFICATION ONLY.
7. GEOGRID SPACING SHALL BE DETERMINED BY STRUCTURAL CROSS-SECTION DESIGN REQUIREMENTS PER THE BLOCK WALL MANUFACTURER. TO INSURE PROPER GEOGRID PLACEMENT, CONTRACTOR MUST REVIEW BOTH ELEVATION VIEW AND CROSS SECTIONS PRIOR TO WALL CONSTRUCTION.
8. A QUALIFIED ENGINEER OR MANUFACTURER'S TECHNICIAN SHALL SUPERVISE THE WALL CONSTRUCTION TO VERIFY FIELD AND SITE SOIL CONDITIONS. IN THE EVENT THAT THE SITE GEOTECHNICAL ENGINEER DOES NOT PERFORM THIS WORK, THE CONTRACTOR SHALL OBTAIN AND CONSULT A QUALIFIED GEOTECHNICAL ENGINEER/TECHNICIAN TO ASSURE THE BLOCK WALL IS CONSTRUCTED WITH PROPER SOIL PARAMETERS.
9. A TOE DRAIN SHOULD BE LOCATED AT THE BACK OF THE ROCK DRAIN FIELD BEHIND THE WALL AS CLOSE TO THE BOTTOM OF THE WALL AS ALLOWED WHILE STILL MAINTAINING A POSITIVE GRADIENT FOR DRAINAGE TO DAYLIGHT TOWARDS THE ADJACENT WETLAND.
10. A HEEL DRAIN MAY BE REQUIRED AT BACK OF THE CUT TO ROUTE WATER AWAY FROM THE REINFORCED SOIL MASS DURING THE CONSTRUCTION PROCESS.
11. GROUND WATER CAN BE PRESENT WITHIN THE SOIL DUE TO SURFACE INFILTRATION OR WATER TABLE FLUCTUATION. IF GROUND WATER IS ENCOUNTERED DURING CONSTRUCTION, AN ADEQUATE DRAINAGE SYSTEM MUST BE INSTALLED OR THE WALL DESIGN MUST CONSIDER THE PRESENCE OF WATER WITHIN THE SOIL MASS.
12. RETAINING WALLS IN CONDITIONS THAT ALLOW STANDING WATER TO OVERLAP THE WALL FACE ARE CONSIDERED WATER APPLICATIONS. THESE WALLS REQUIRE SPECIFIC DESIGN AND CONSTRUCTION STEPS TO ENSURE PERFORMANCE. THE CONTRACTOR SHALL VERIFY WITH THE BLOCK WALL MANUFACTURER THAT THE WALL DESIGNED ACCORDINGLY FOR SUCH CONDITIONS.
13. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ANY DEFICIENCIES WITH THE BLOCK WALL SYSTEM AS WELL AS REPAIRS OR REPLACEMENT OF THE SYSTEM FOR A PERIOD OF NO LESS THAN ONE-YEAR AFTER THE WALL'S CONSTRUCTION.



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DRAINAGE ARROW
OVERLAND FLOW ROUTE

SOIL EROSION LEGEND

TRACKING MAT
SILT FENCE
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INLET FILTER

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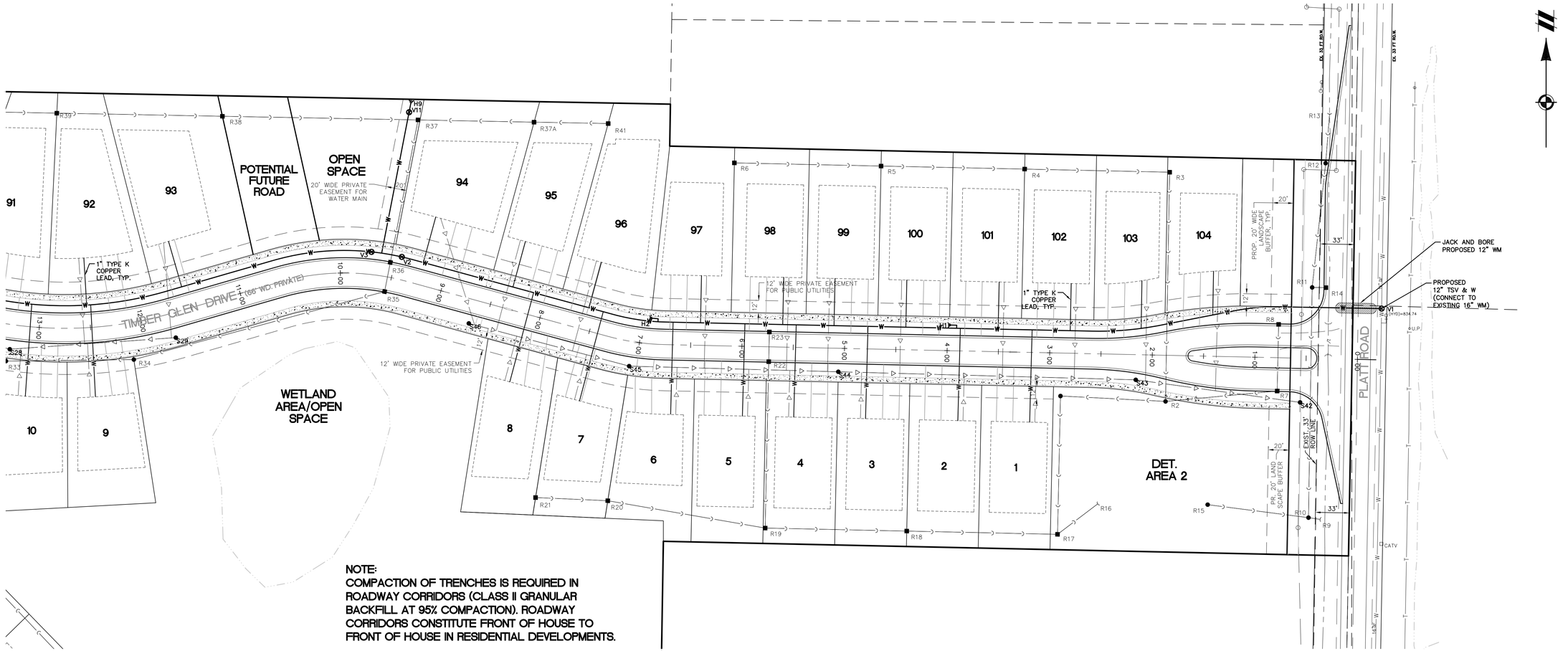
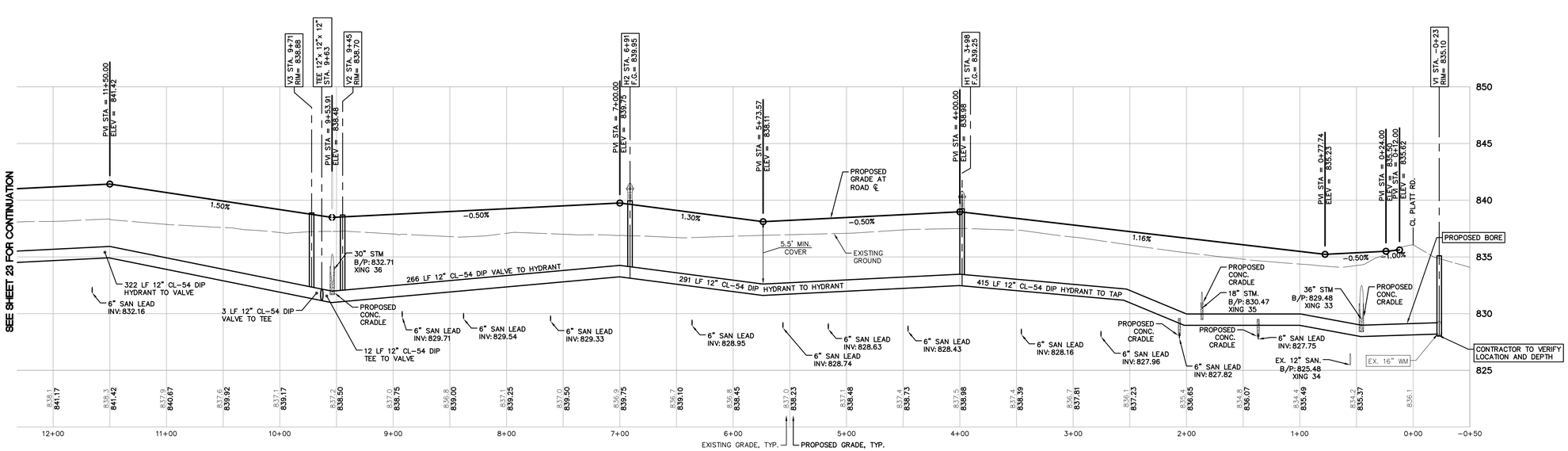


NOTE:
COMPACTION OF TRENCHES IS REQUIRED IN ROADWAY CORRIDORS (CLASS II GRANULAR BACKFILL AT 95% COMPACTION). ROADWAY CORRIDORS CONSTITUTE FRONT OF HOUSE TO FRONT OF HOUSE IN RESIDENTIAL DEVELOPMENTS.



TIMBER GLEN DRIVE
VERT: 1"=5'
HORIZ: 1"=50'

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PITTSFIELD GLEN

ROAD AND WATERMAIN PLAN & PROFILE TIMBER GLEN DRIVE STA. 0+00 TO 12+00

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

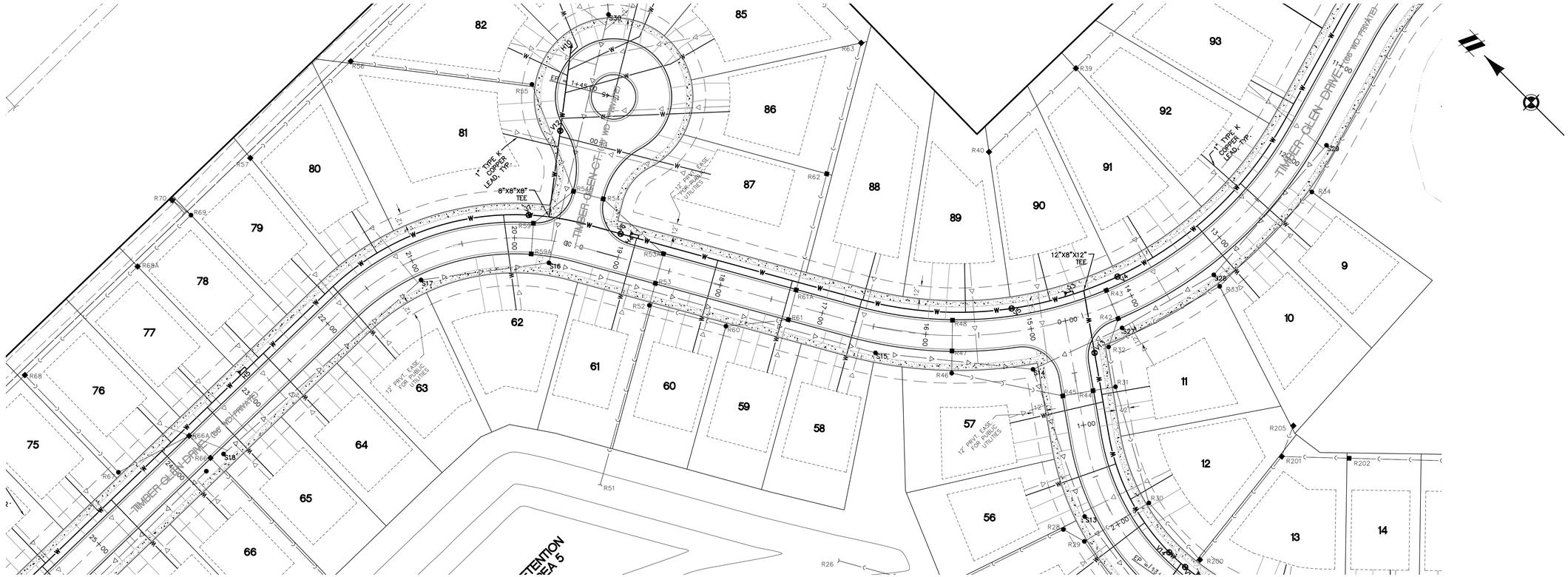
REVISIONS

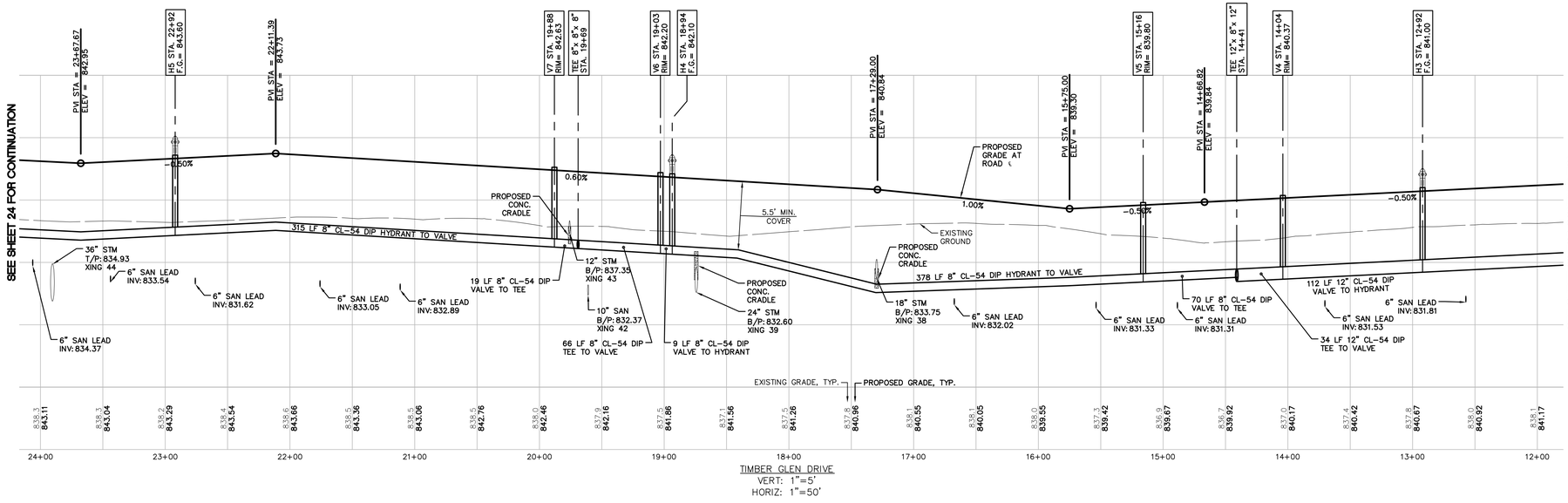
ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-11-PRD.DWG
JOB --
FILE CODE: --
SHEET NO. 22

C:\USERS\MCAVOY.ENGINEERING\DOCUMENTS_MCAVOY\PROJECTS\ATWELL PROJECTS\12000967\DWG\PLAN SETS\SITE-FINAL\12000967CP-11-PRD.DWG 11/7/2014 7:59 AM MCAVOY.ENGINEERING





TIMBER GLEN DRIVE
VERT: 1"=5'
HORIZ: 1"=50'

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WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN
ROAD AND WATERMAIN
PLAN & PROFILE
TIMBER GLEN DRIVE
STA. 12+00 TO 24+00

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-11-PRD.DWG
JOB --
FILE CODE: --
SHEET NO. 23

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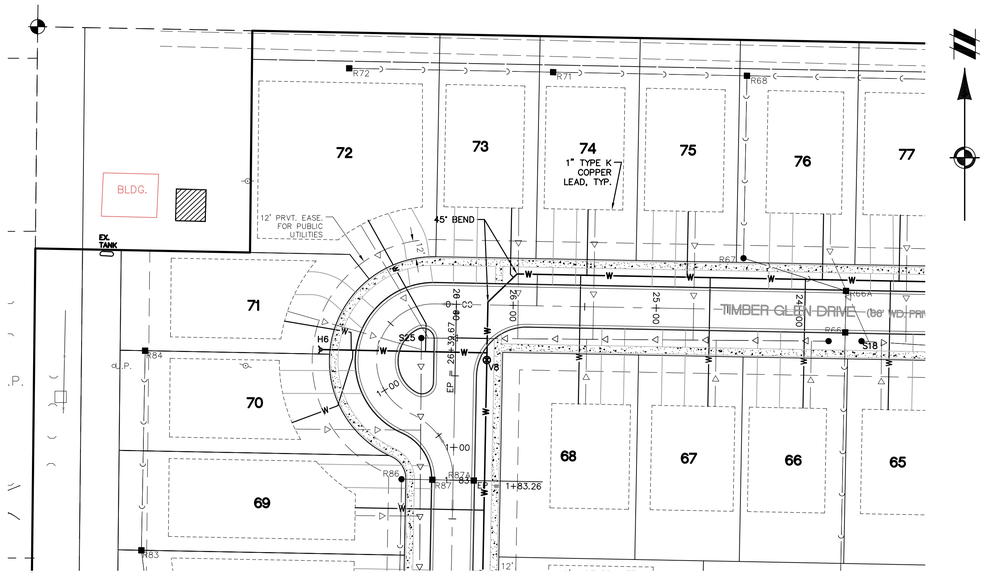
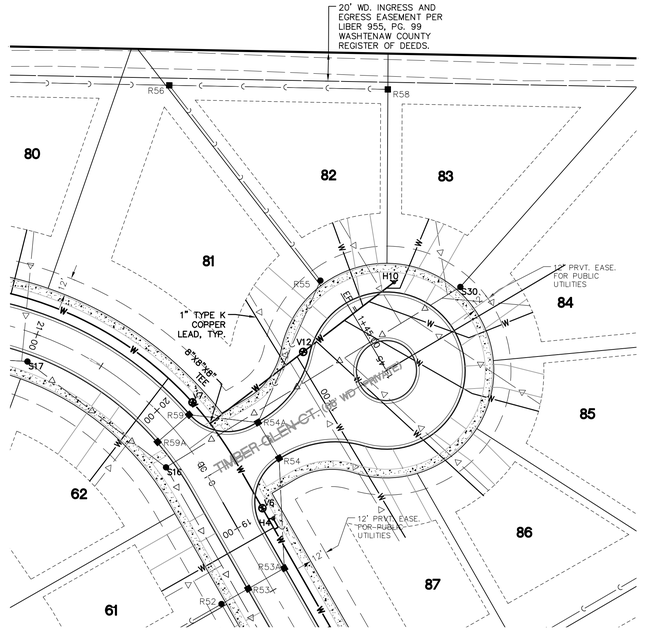
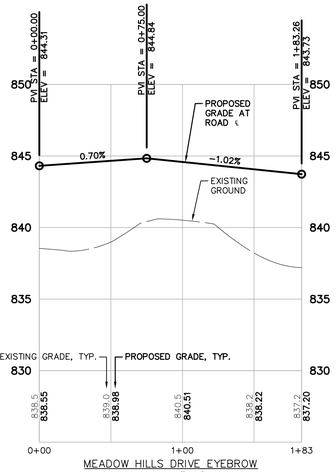
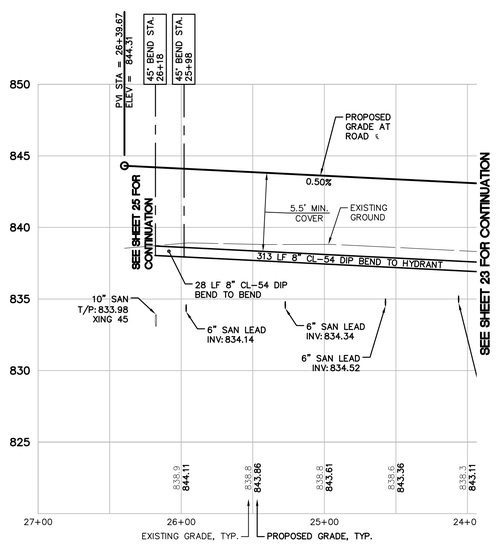


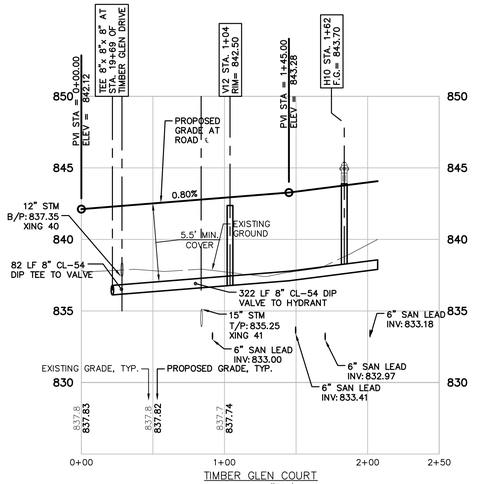




MEADOW HILLS DRIVE EYEBROW
VERT: 1"=5'
HORZ: 1"=50'



TIMBER GLEN DRIVE
VERT: 1"=5'
HORIZ: 1"=50'



TIMBER GLEN COURT
VERT: 1"=5'
HORIZ: 1"=50'

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PITTSFIELD GLEN
ROAD AND WATERMAIN PLAN & PROFILE
MEADOW HILLS DRIVE EYEBROW
STA. 0+00 TO 1+83.26
TIMBER GLEN DR. STA. 24+00 TO 26+39.37
TIMBER GLEN COURT

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
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11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

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SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-11-PRD.DWG
JOB --
FILE CODE: --
SHEET NO. 24

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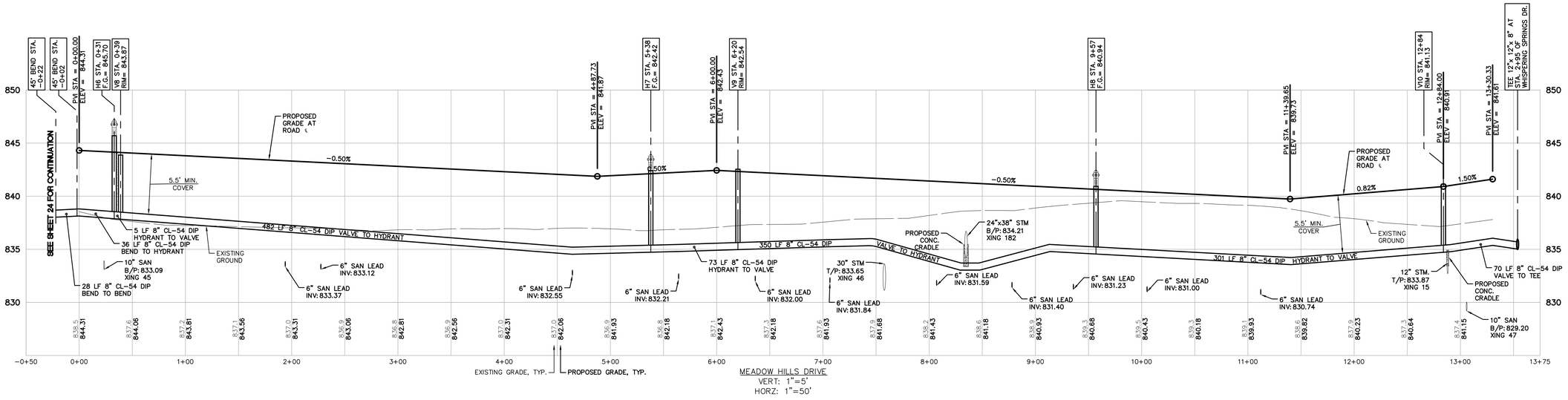

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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

PITTSFIELD GLEN
ROAD AND WATERMAIN
PLAN & PROFILE
MEADOW HILLS DRIVE
STA. 0+00 TO 13+30

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
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11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
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CAD FILE: 12000967CP-11-PRD.DWG
JOB --
FILE CODE: --
SHEET NO. 25

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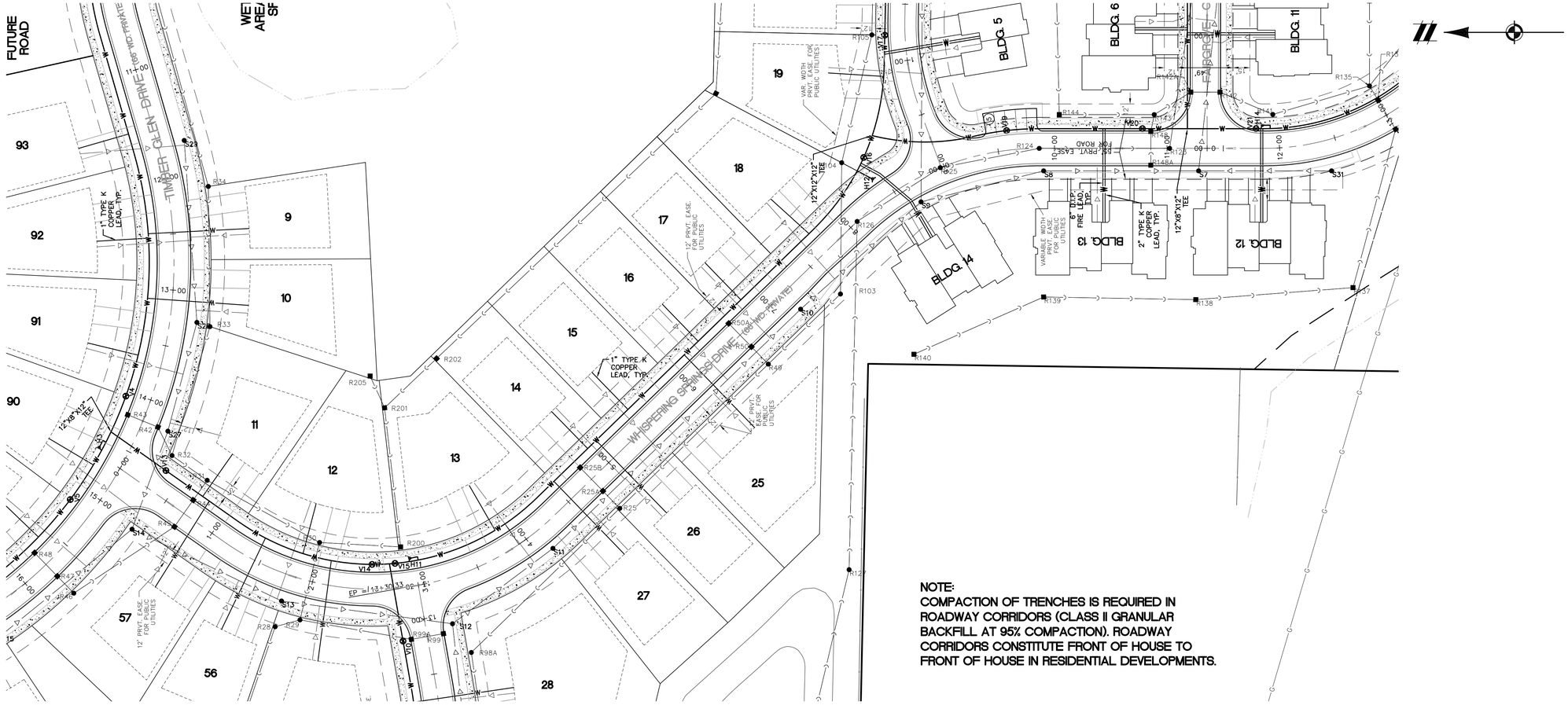

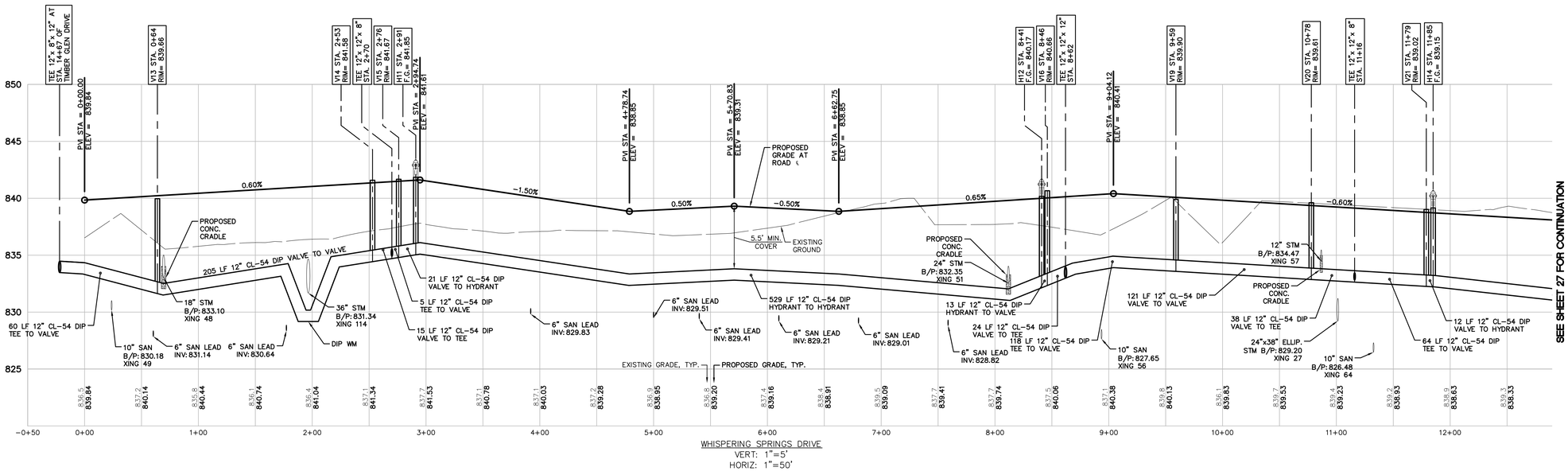

SEE SHEET 27 FOR CONTINUATION

WHISPERING SPRINGS DRIVE
VERT: 1"=5'
HORIZ: 1"=50'

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CLIENT: PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

ROAD AND WATERMAIN PLAN & PROFILE
WHISPERING SPRINGS DRIVE
STA. 0+00 TO 12+00

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

DATE: MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

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P.M. J. ACKERMAN
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CAD FILE: 12000967CP-11-PRD.DWG
JOB --
FILE CODE: --

SHEET NO. 26

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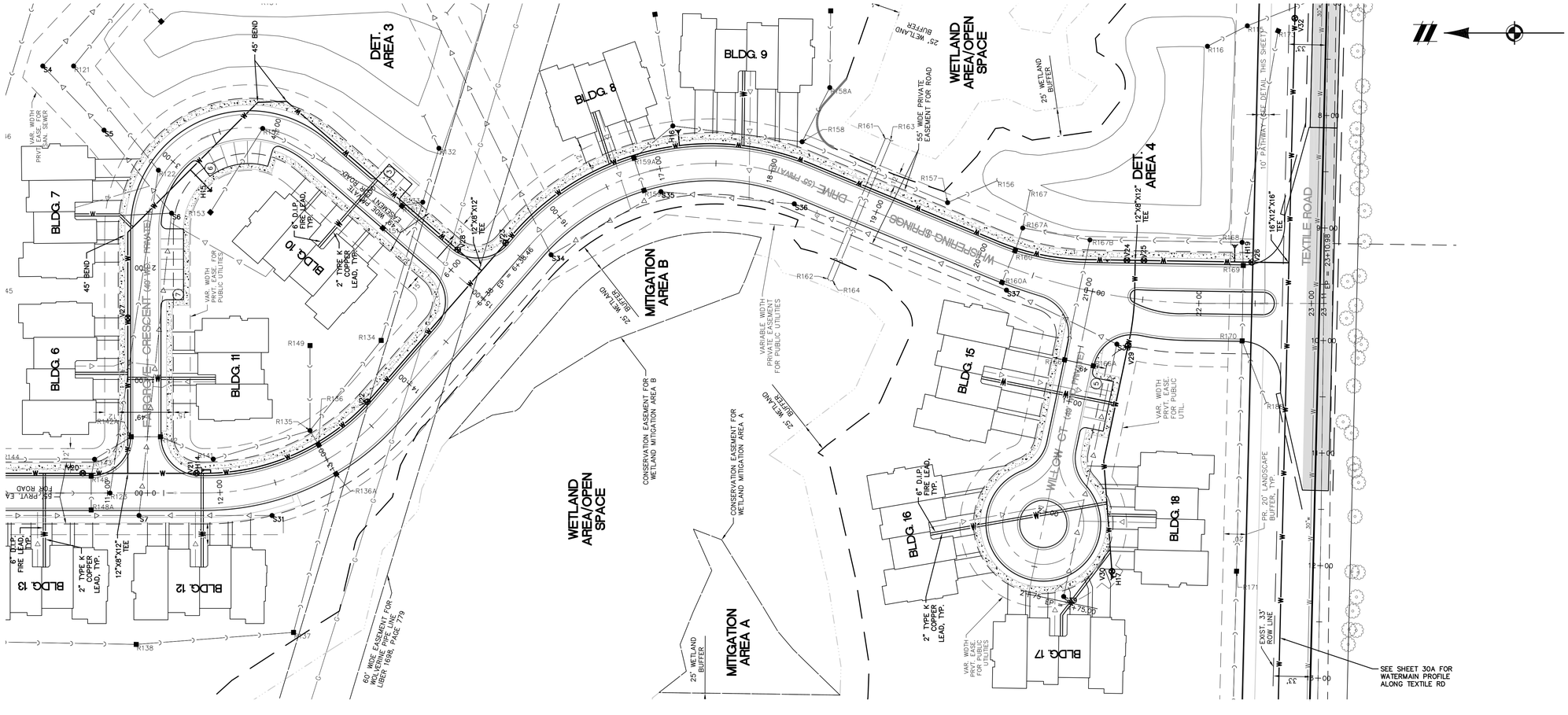

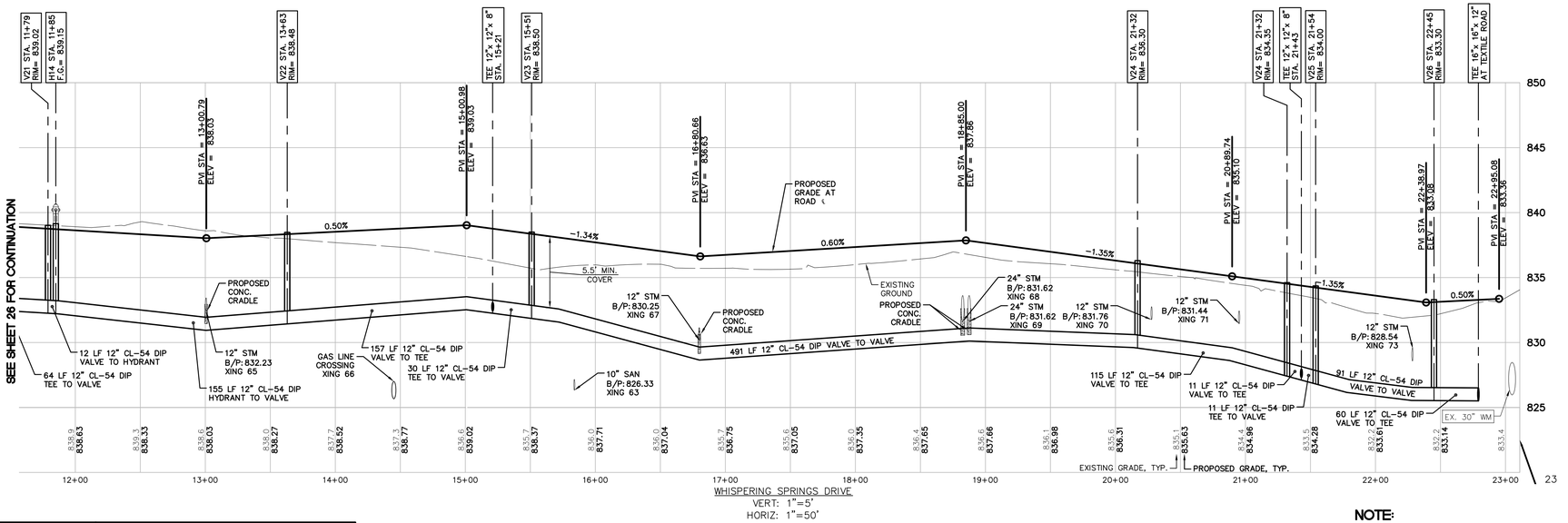

WHISPERING SPRINGS DRIVE
VERT: 1"=5'
HORIZ: 1"=50'

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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

ROAD AND WATERMAIN PLAN & PROFILE
WHISPERING SPRINGS DRIVE
STA. 12+00 TO 23+11

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-11-PRD.DWG
JOB --
FILE CODE: --
SHEET NO. 27

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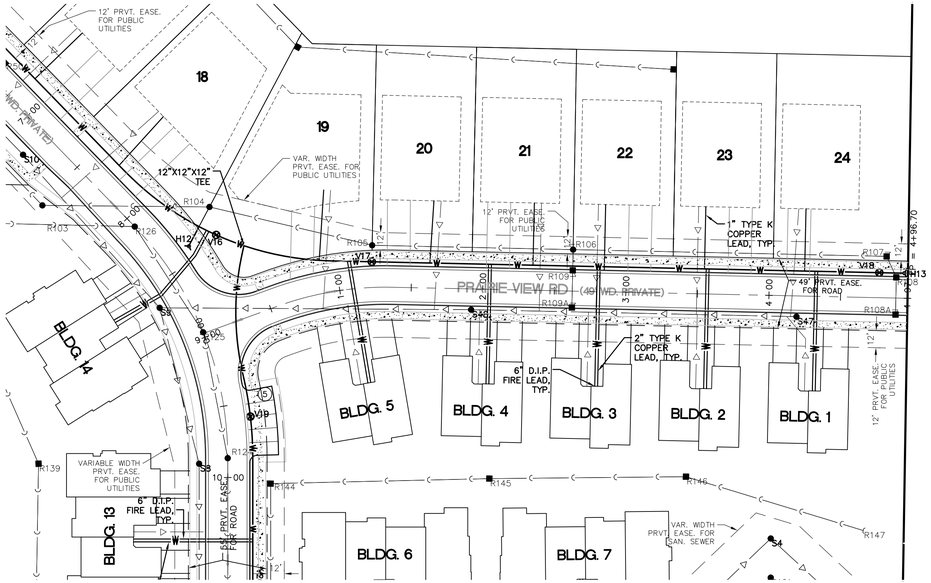

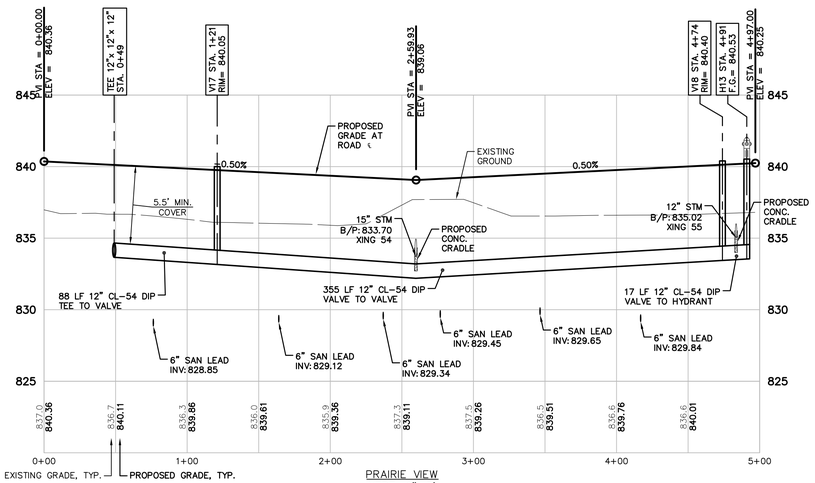

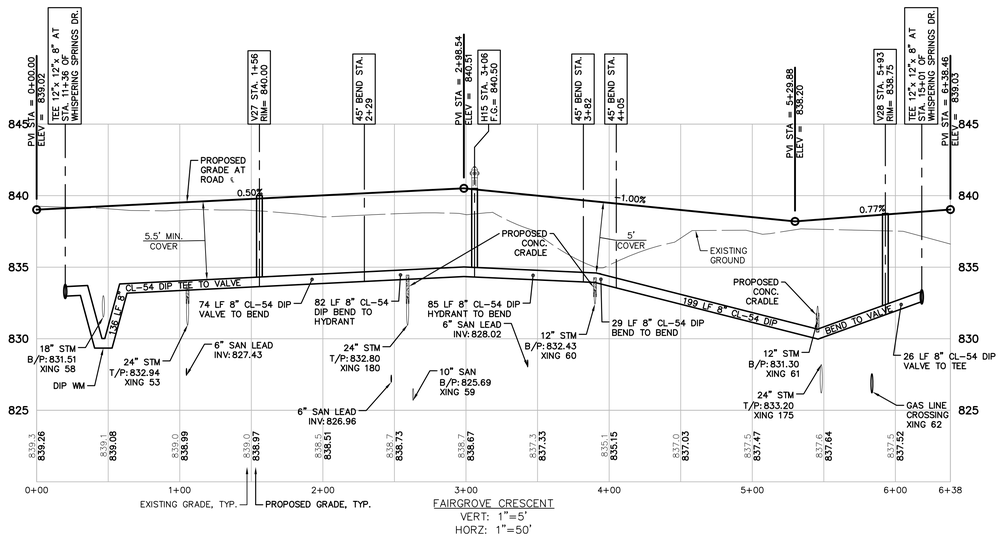

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PRAIRIE VIEW ROAD AND FAIRGROVE CRESCENT

DATE
MAY 5, 2014

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07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

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SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-11-PRD.DWG
JOB --
FILE CODE: --
SHEET NO. 28

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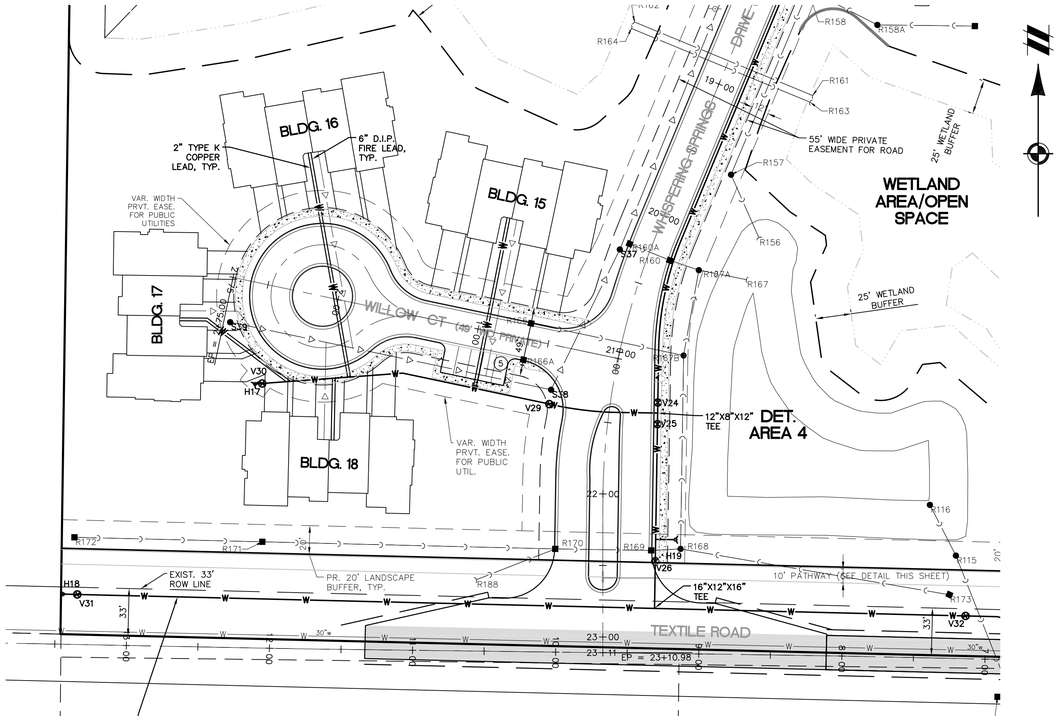

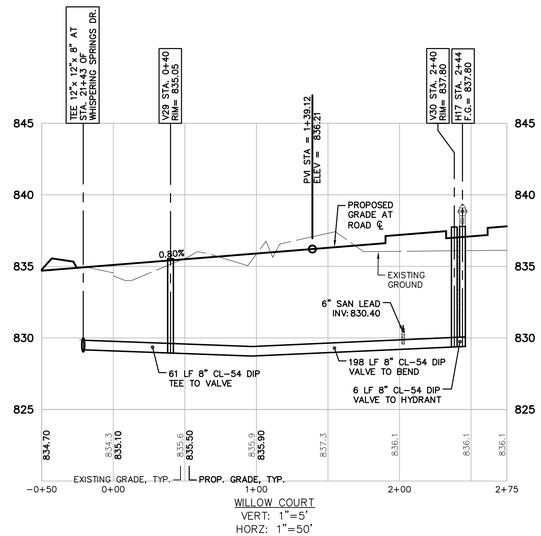

WILLOW COURT
VERT: 1"=5'
HORZ: 1"=50'

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SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN
ROAD AND WATERMAIN PLAN & PROFILE
WILLOW COURT &
WATER MAIN STRUCTURE SCHEDULE

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-11-PRD.DWG
JOB --
FILE CODE: --
SHEET NO. 29

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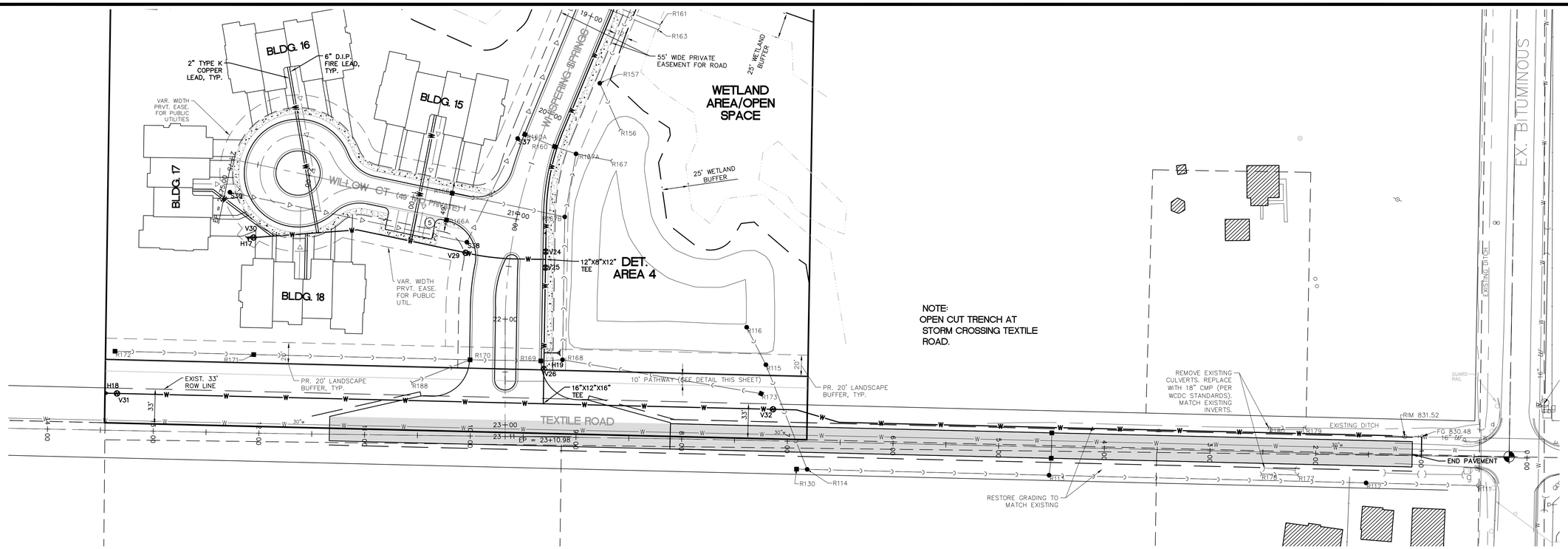

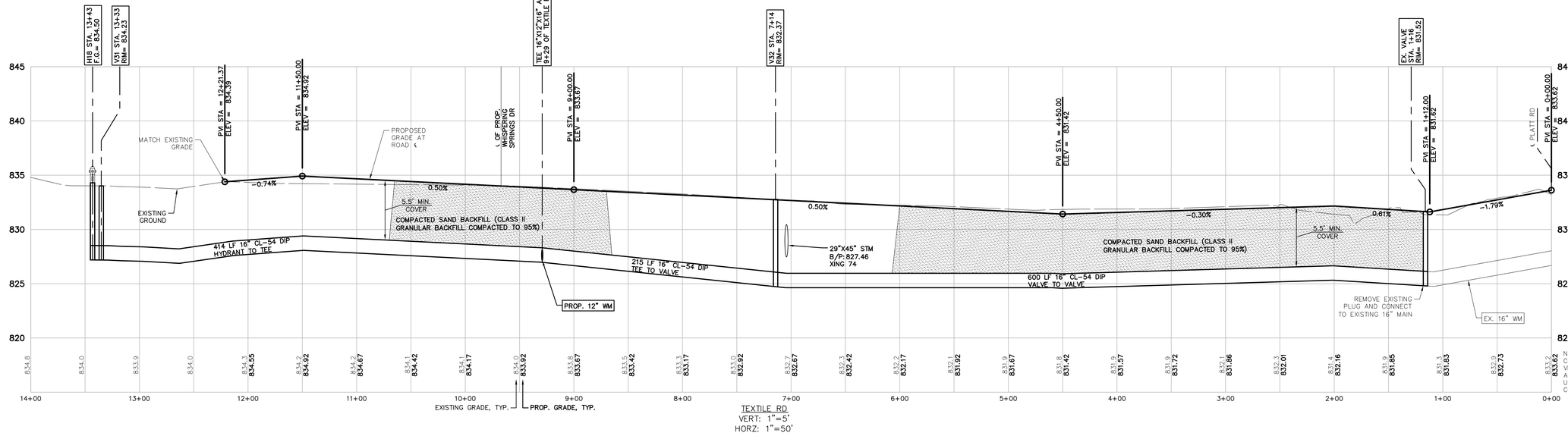

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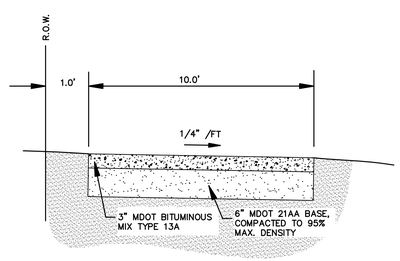
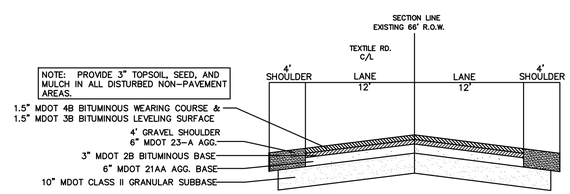


TYPICAL PATHWAY DETAIL
(N.T.S.)

NOTE:

1. TEXTILE ROAD PAVEMENT IS CENTERED IN THE EXISTING ROAD RIGHT-OF-WAY.
2. PITTSFIELD GLEN SHALL COORDINATE THE PAVING OF TEXTILE ROAD WITH BOTH THE TOWNSHIP AND THE WCRC.



TEXTILE RD. TWO LANE ASPHALT PAVEMENT SECTION
(N.T.S.)

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SECTION 22 TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

ROAD AND WATERMAIN PLAN & PROFILE TEXTILE ROAD

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-11-PRD.DWG
JOB --
FILE CODE: --
SHEET NO. 30

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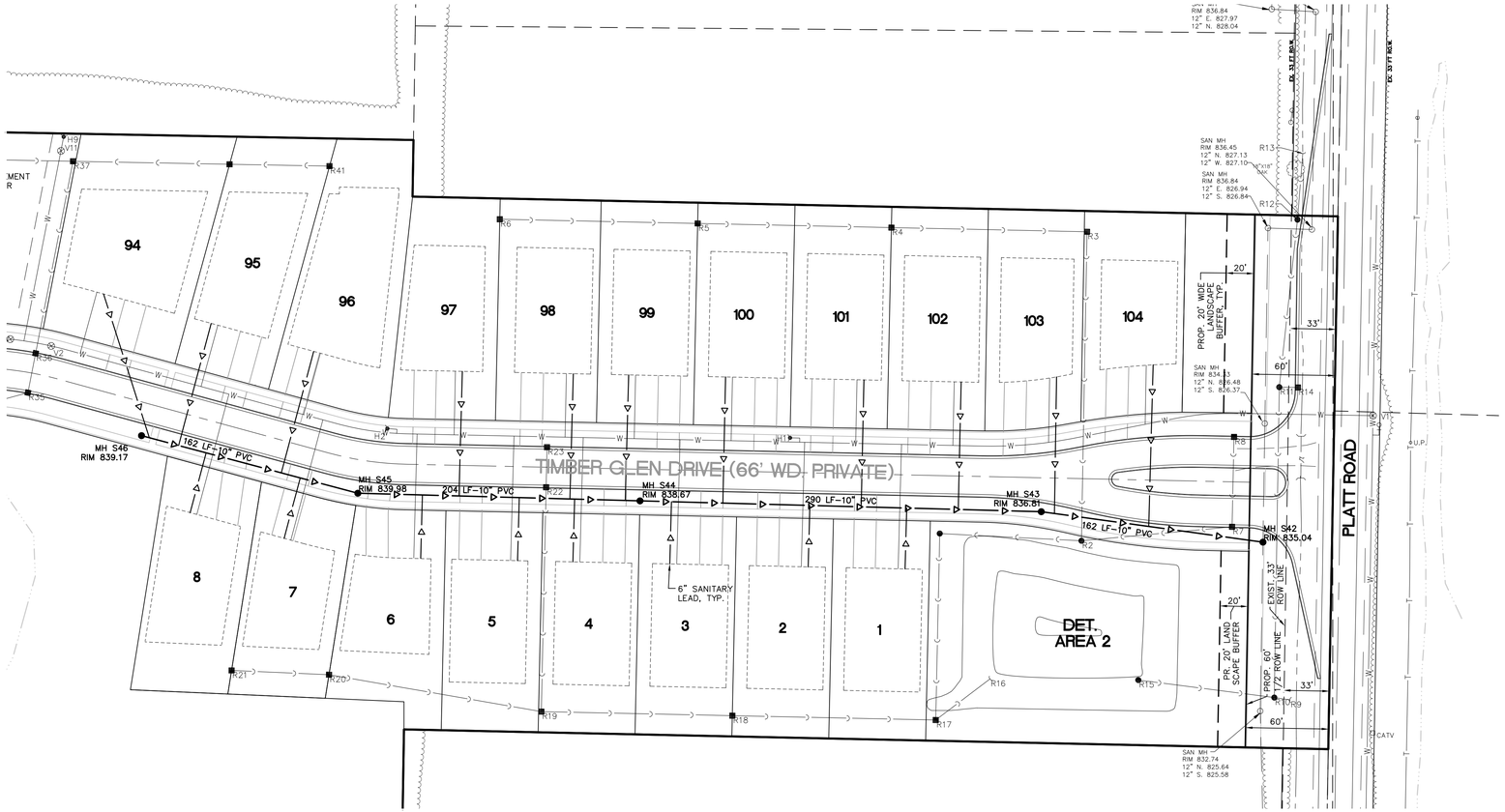

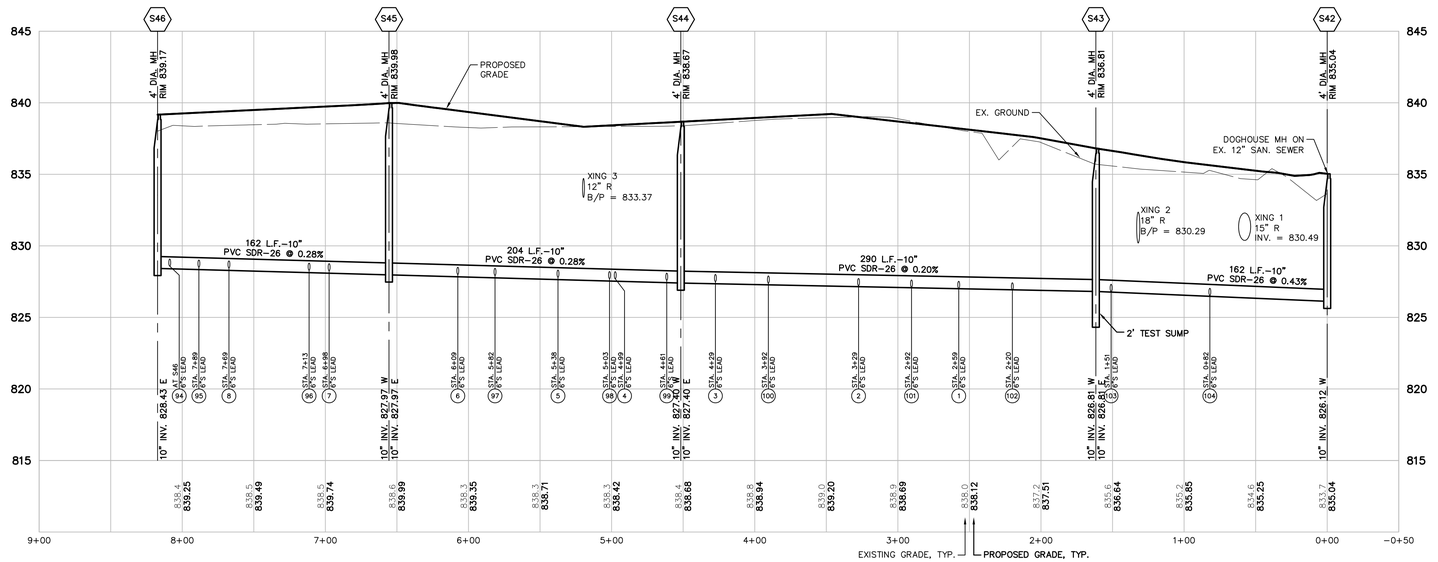

TIMBER GLEN DR – S46 TO S42
VERT: 1"=5'
HORZ: 1"=50'

NOTE:
1. FOR LEAD DEPTHS AND HOUSE FG'S SEE SHEET 41.

NOTE:
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LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
- PROPOSED MANHOLE / CATCH BASIN / END SECTION
- EXISTING UNDERGROUND ELECTRIC
- EXISTING TELEPHONE SERVICE
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- PROPOSED WATER SERVICE
- EXISTING HYDRANT
- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
- EXISTING WATER MAIN MANHOLE
- PROPOSED REDUCER
- PROPOSED SANITARY SEWER MAIN
- PROPOSED SANITARY SEWER LEAD
- PROPOSED SANITARY SEWER MAN HOLE
- EXISTING UNDERGROUND CABLE SERVICE
- PROPOSED 24" PITCH-OUT STRAIGHT BACK CURB
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- EXISTING GUY WIRE
- EXISTING UTILITY POLE
- EXISTING CATV BOX
- EXISTING TELEPHONE BOX
- EXISTING ELECTRICAL BOX
- EXISTING SIGN
- EXISTING TREE
- PROPOSED RIP-RAP
- PHASE LINE

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SECTION 22
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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

PITTSFIELD GLEN
SANITARY SEWER
PLAN & PROFILE
TIMBER GLEN DRIVE
S46 TO S42

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET
DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 120009670P-12-PS.DWG
JOB --
FILE CODE: --
SHEET NO. 31

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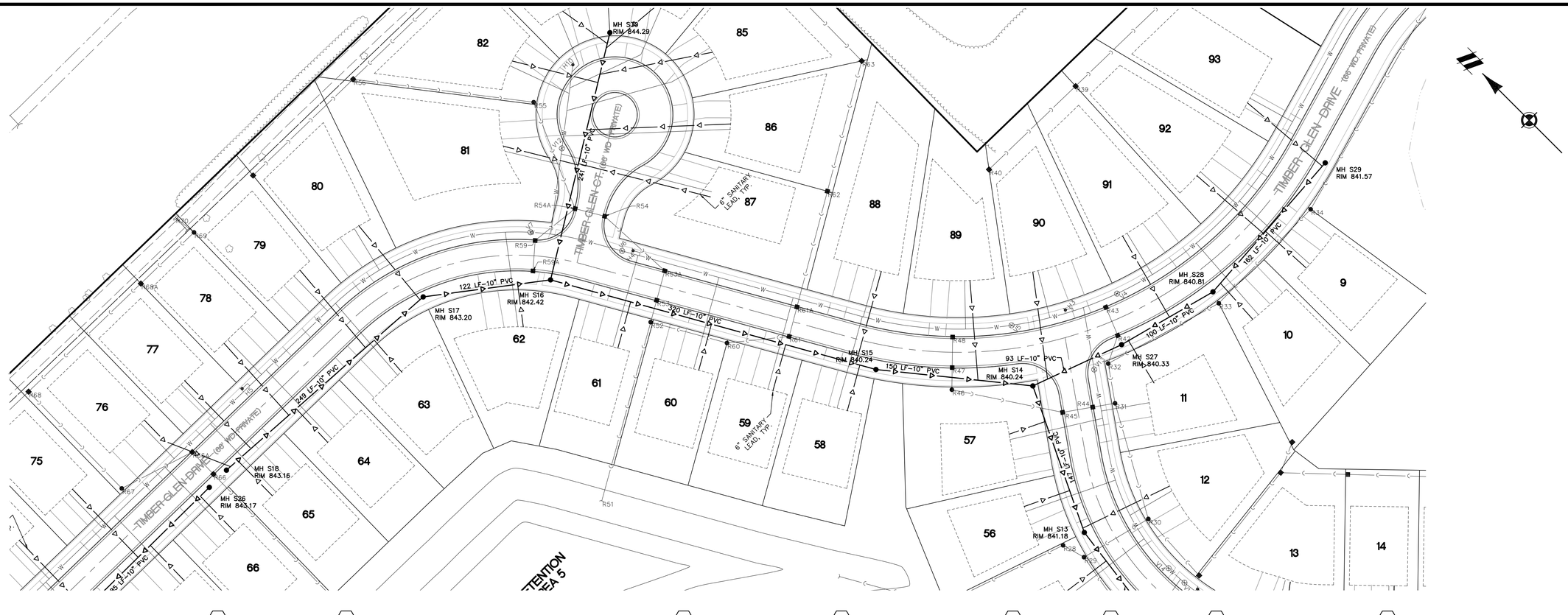

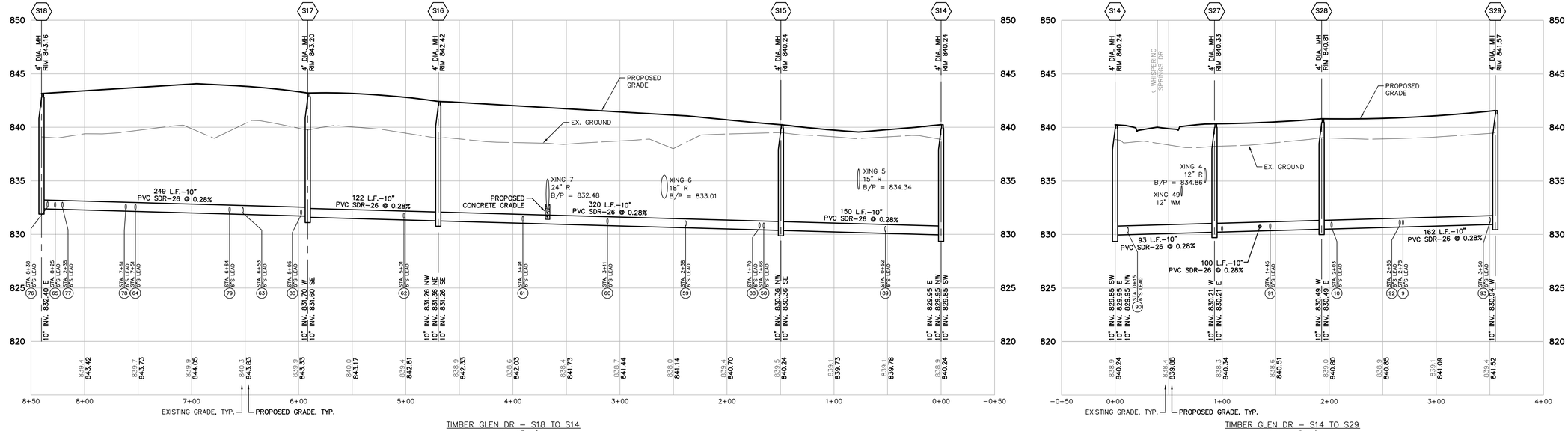

TIMBER GLEN DR – S18 TO S14
VERT: 1"=5'
HORZ: 1"=50'

TIMBER GLEN DR – S14 TO S29
VERT: 1"=5'
HORZ: 1"=50'

LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
- PROPOSED MANHOLE / CATCH BASIN / END
- EXISTING UNDERGROUND ELECTRIC
- EXISTING TELEPHONE SERVICE
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- PROPOSED WATER SERVICE
- EXISTING HYDRANT
- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
- EXISTING WATER MAIN MANHOLE
- PROPOSED REDUCER
- PROPOSED SANITARY SEWER MAIN
- PROPOSED SANITARY SEWER LEAD
- PROPOSED SANITARY SEWER MAN HOLE
- EXISTING UNDERGROUND CABLE SERVICE
- PROPOSED 24" PITCH-OUT STRAIGHT BACK CURB
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- EXISTING GUY WIRE
- EXISTING UTILITY POLE
- EXISTING CATV BOX
- EXISTING TELEPHONE BOX
- EXISTING ELECTRICAL BOX
- EXISTING SIGN
- EXISTING TREE
- PROPOSED RIP-RAP
- PHASE LINE

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SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN
SANITARY SEWER
PLAN & PROFILE
TIMBER GLEN DRIVE
S18 TO S14 & S29 TO S14

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED TSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN	CH. MSC
P.M. J. ACKERMAN	
BOOK --	
CAD FILE: 12000967CP-12-PS.DWG	
JOB --	
FILE CODE: --	
SHEET NO. 32	

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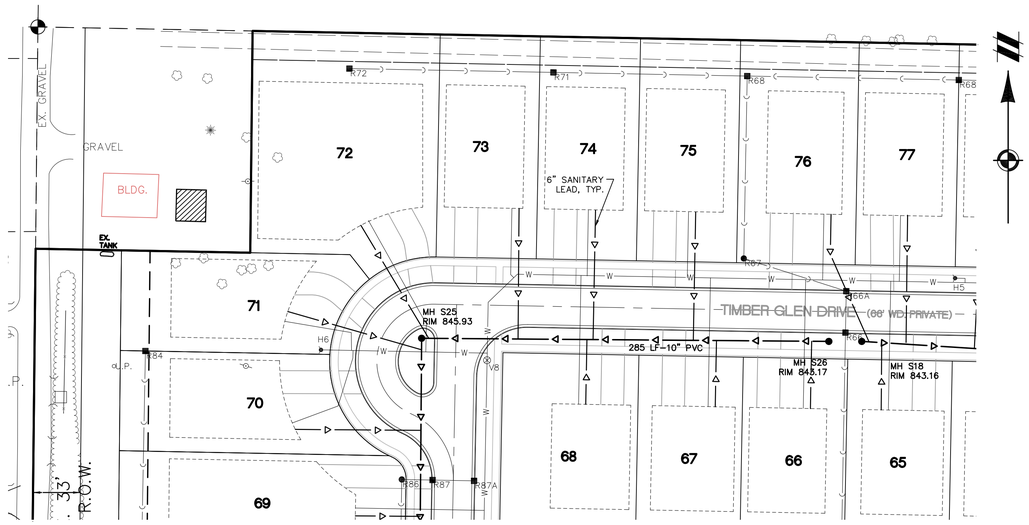
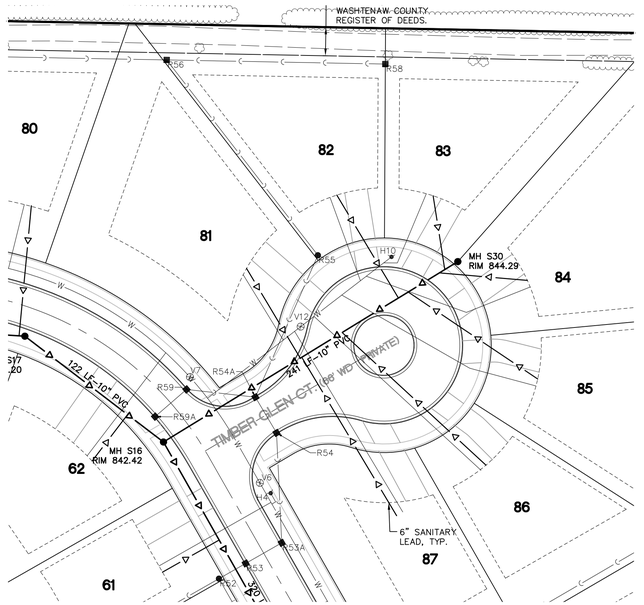
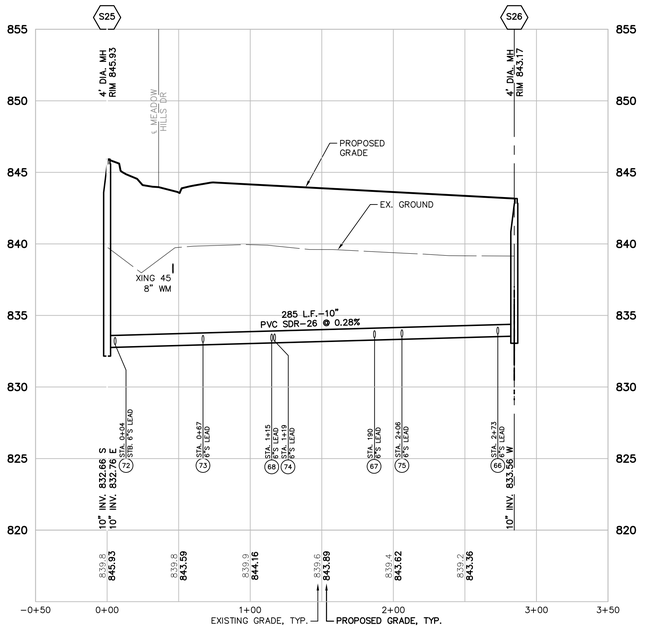
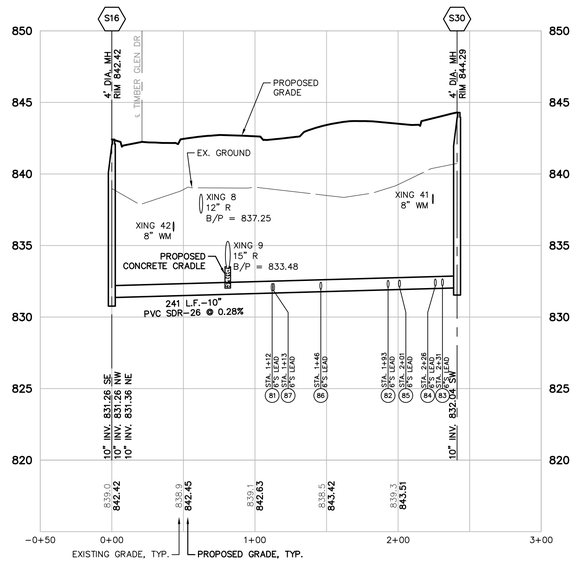






TIMBER GLEN DR – S25 TO S26
VERT: 1"=5'
HORZ: 1"=50'



TIMBER GLEN COURT – S16 TO S30
VERT: 1"=5'
HORZ: 1"=50'

LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
- PROPOSED MANHOLE / CATCH BASIN / END SECTION
- EXISTING UNDERGROUND ELECTRIC
- EXISTING TELEPHONE SERVICE
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- PROPOSED WATER SERVICE
- EXISTING HYDRANT
- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
- EXISTING WATER MAIN MANHOLE
- PROPOSED REDUCER
- PROPOSED SANITARY SEWER MAIN
- PROPOSED SANITARY SEWER LEAD
- PROPOSED SANITARY SEWER MAN HOLE
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- PROPOSED 24" PITCH-OUT STRAIGHT BACK CURB
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- EXISTING GUY WIRE
- EXISTING UTILITY POLE
- EXISTING CATV BOX
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- EXISTING SIGN
- EXISTING TREE
- PROPOSED RIP-RAP
- PHASE LINE

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SECTION 22
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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN
SANITARY SEWER
PLAN & PROFILE
TIMBER GLEN DR. & TIMBER GLEN COURT
S25 TO S26 & S30 TO S16

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
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CAD FILE: 12000967CP-12-PS.DWG
JOB --
FILE CODE: --
SHEET NO. 33

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MEADOW HILLS DR – S25 TO S12
VERT: 1"=5'
HORZ: 1"=50'

LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
- PROPOSED MANHOLE / CATCH BASIN / END
- EXISTING UNDERGROUND ELECTRIC
- EXISTING TELEPHONE SERVICE
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- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
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WASHTENAW COUNTY, MICHIGAN

CLIENT: PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN
SANITARY SEWER
PLAN & PROFILE
MEADOW HILLS DRIVE
S25 TO S12

DATE: MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
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07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
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P.M. J. ACKERMAN
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CAD FILE: 120009967CP-12-PS.DWG
JOB --
FILE CODE: --
SHEET NO. 34

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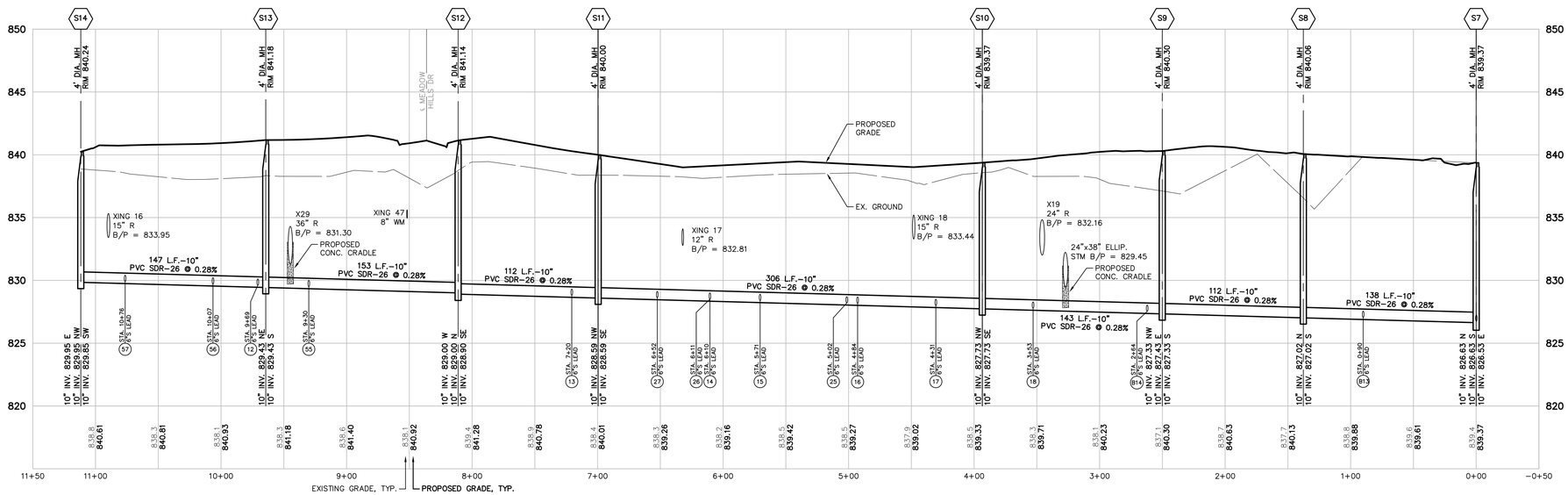

WHISPERING SPRINGS DR – S14 TO S7
VERT: 1"=5'
HORZ: 1"=50'

NOTE:
COMPACTION OF TRENCHES IS REQUIRED IN ROADWAY CORRIDORS (CLASS II GRANULAR BACKFILL AT 95% COMPACTION). ROADWAY CORRIDORS CONSTITUTE FRONT OF HOUSE TO FRONT OF HOUSE IN RESIDENTIAL DEVELOPMENTS.

LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
- PROPOSED MANHOLE / CATCH BASIN / END
- EXISTING UNDERGROUND ELECTRIC
- EXISTING TELEPHONE SERVICE
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- PROPOSED WATER SERVICE
- EXISTING HYDRANT
- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
- EXISTING WATER MAIN MANHOLE
- PROPOSED REDUCER
- PROPOSED SANITARY SEWER MAIN
- PROPOSED SANITARY SEWER LEAD
- PROPOSED SANITARY SEWER MAN HOLE
- EXISTING UNDERGROUND CABLE SERVICE
- PROPOSED 24" PITCH–OUT STRAIGHT BACK CURB
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- EXISTING GUY WIRE
- EXISTING UTILITY POLE
- EXISTING CATV BOX
- EXISTING TELEPHONE BOX
- EXISTING ELECTRICAL BOX
- EXISTING SIGN
- EXISTING TREE
- PROPOSED RIP–RAP
- PHASE LINE

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PITTSFIELD GLEN

SANITARY SEWER
PLAN & PROFILE
WHISPERING SPRINGS DRIVE
S14 TO S7

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

DATE
MAY 5, 2014

05–20–2014 SUBMITTED TO TWP
06–03–2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07–03–2014 REVISED PSP PER TOWNSHIP COMMENTS
11–07–2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK ––
CAD FILE: 12000967CP–12–PS.DWG
JOB ––
FILE CODE: ––
SHEET NO. 35

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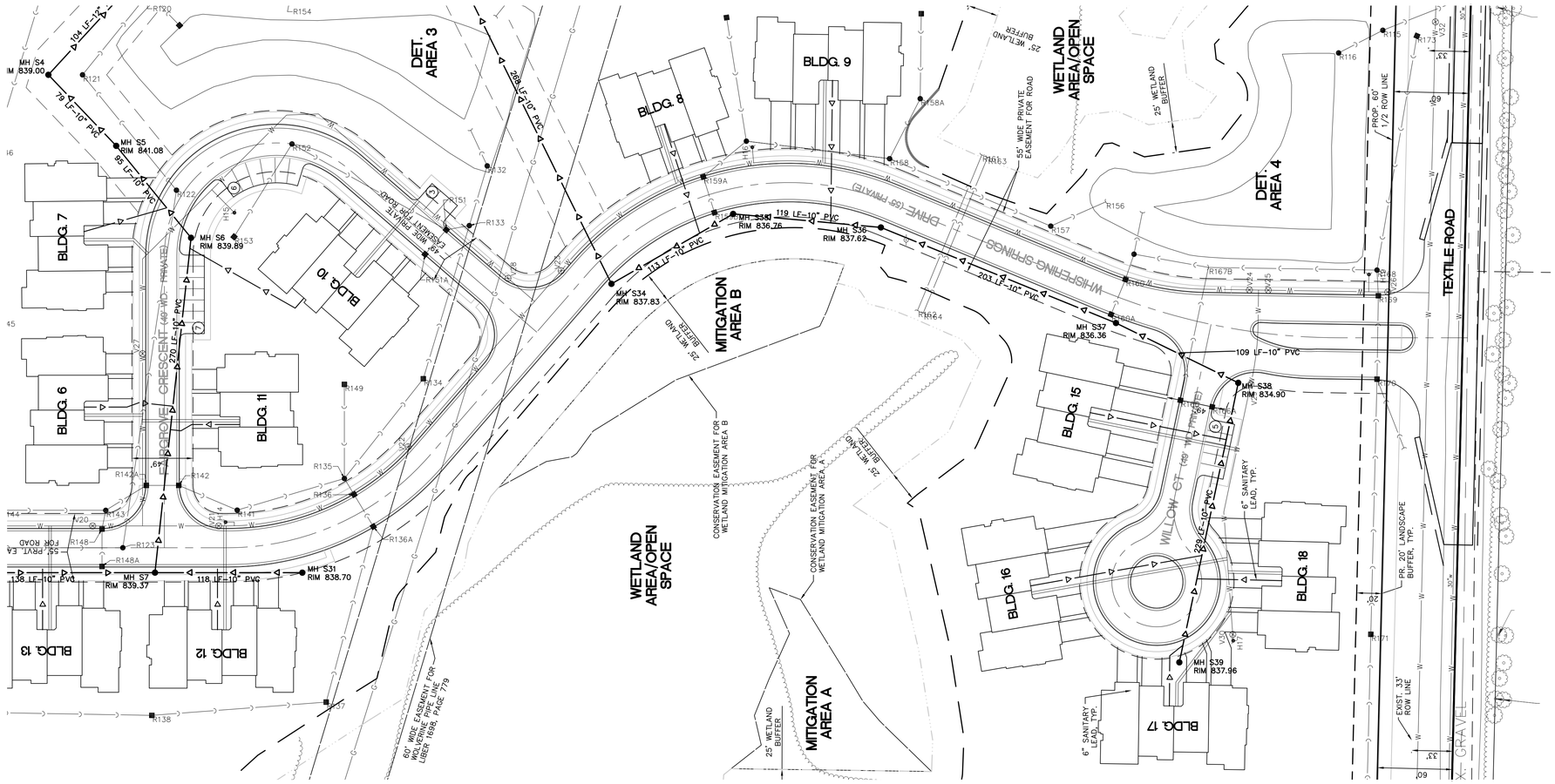
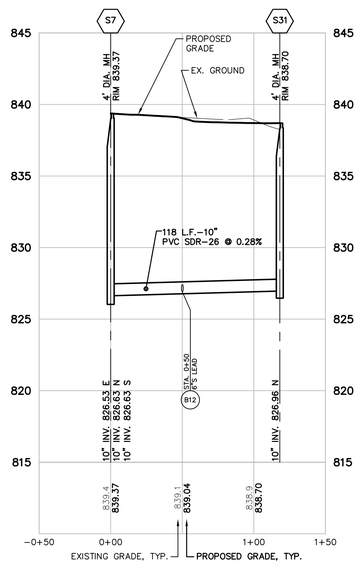
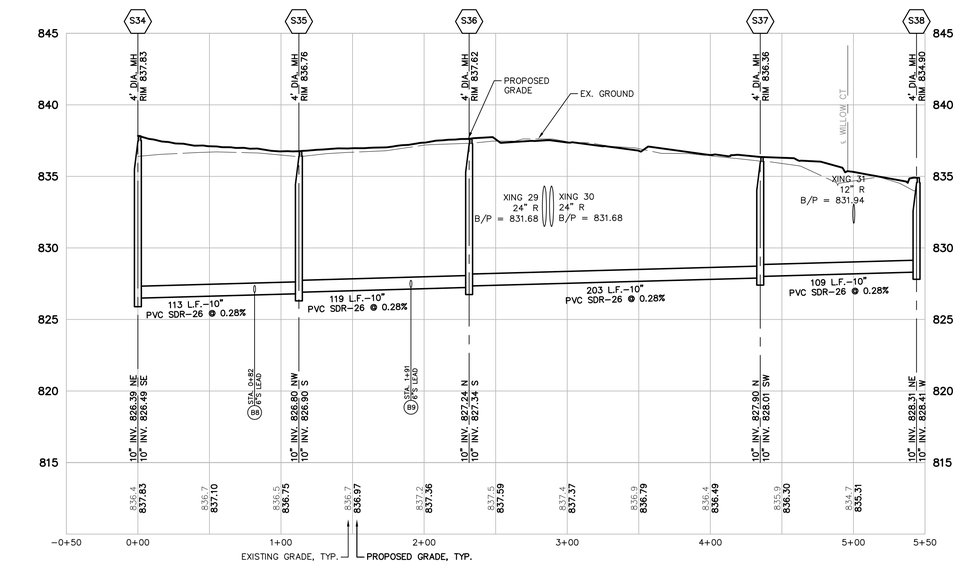
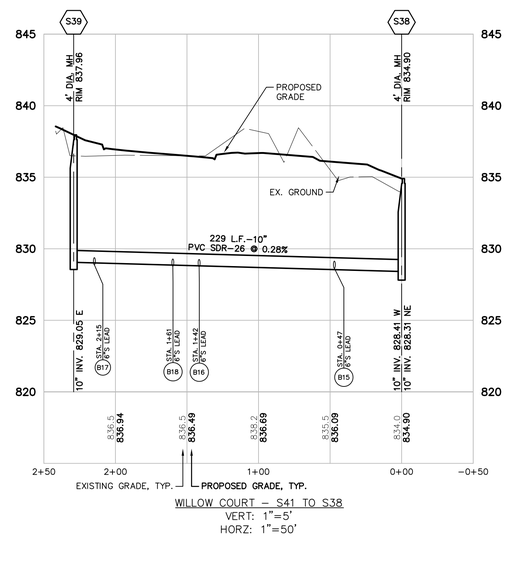




WHISPERING SPRINGS DR – S7 TO S31
VERT: 1"=5'
HORZ: 1"=50'



WHISPERING SPRINGS DR – S34 TO S38
VERT: 1"=5'
HORZ: 1"=50'



WILLOW COURT – S41 TO S38
VERT: 1"=5'
HORZ: 1"=50'

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LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
- PROPOSED MANHOLE / CATCH BASIN / END
- EXISTING UNDERGROUND ELECTRIC
- EXISTING TELEPHONE SERVICE
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- PROPOSED WATER SERVICE
- EXISTING HYDRANT
- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
- EXISTING WATER MAIN MANHOLE
- PROPOSED REDUCER
- PROPOSED SANITARY SEWER MAIN
- PROPOSED SANITARY SEWER LEAD
- PROPOSED SANITARY SEWER MAN HOLE
- EXISTING UNDERGROUND CABLE SERVICE
- PROPOSED 24" PITCH-OUT STRAIGHT BACK CURB
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- EXISTING GUY WIRE
- EXISTING UTILITY POLE
- EXISTING CATV BOX
- EXISTING TELEPHONE BOX
- EXISTING ELECTRICAL BOX
- EXISTING SIGN
- EXISTING TREE
- PROPOSED RIP-RAP
- PHASE LINE

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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

PITTSFIELD GLEN
SANITARY SEWER
PLAN & PROFILE
WHISPERING SPRINGS DRIVE
S31 TO S7 & S38 TO S34

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-12-PS.DWG
JOB --
FILE CODE: --
SHEET NO. 36

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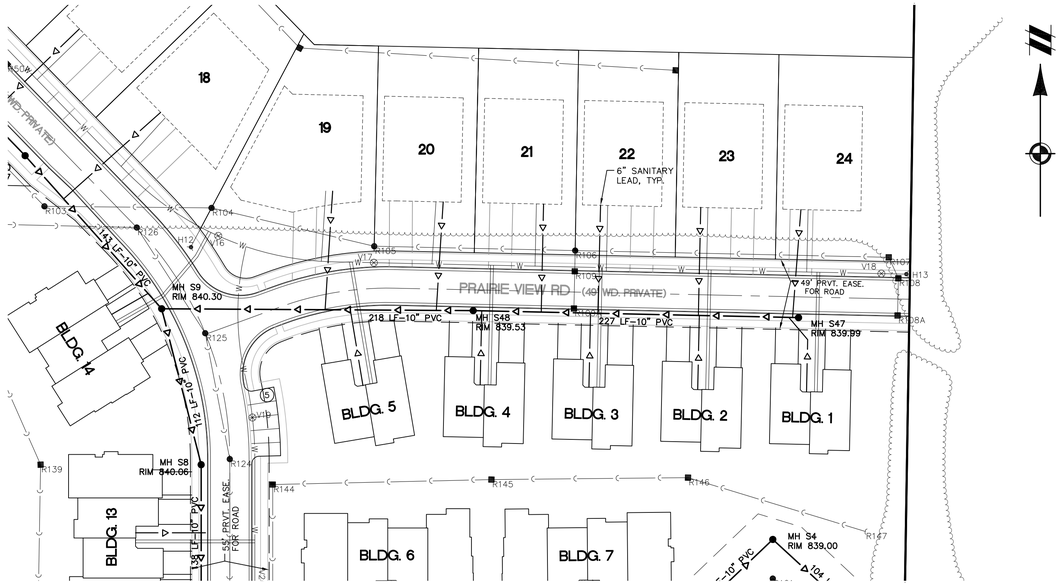

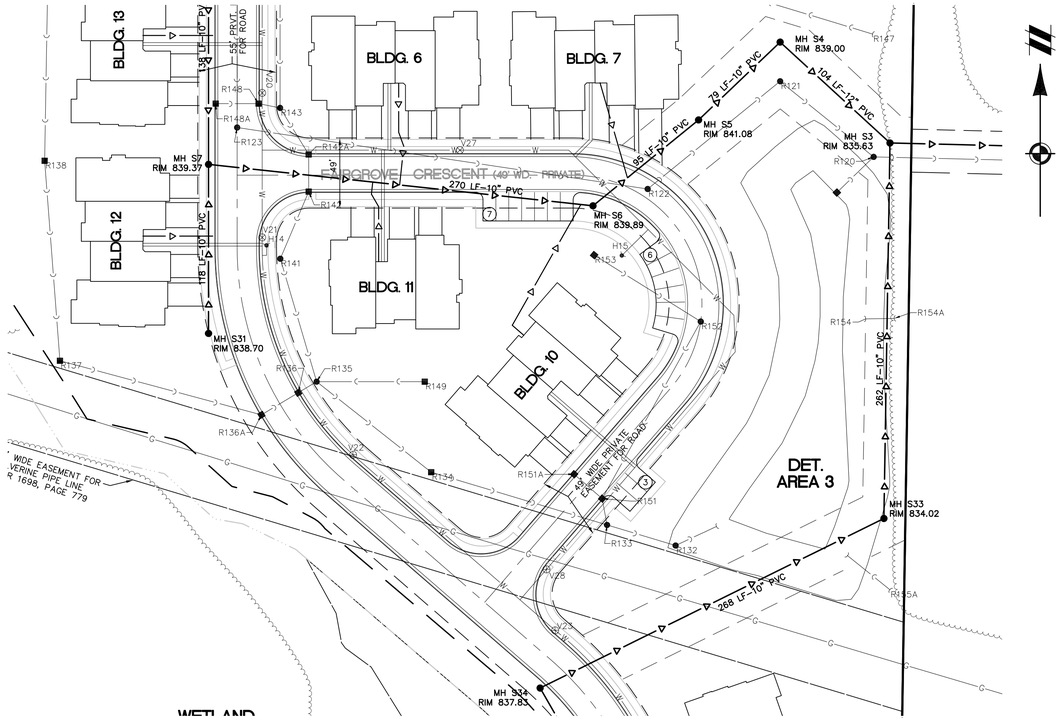

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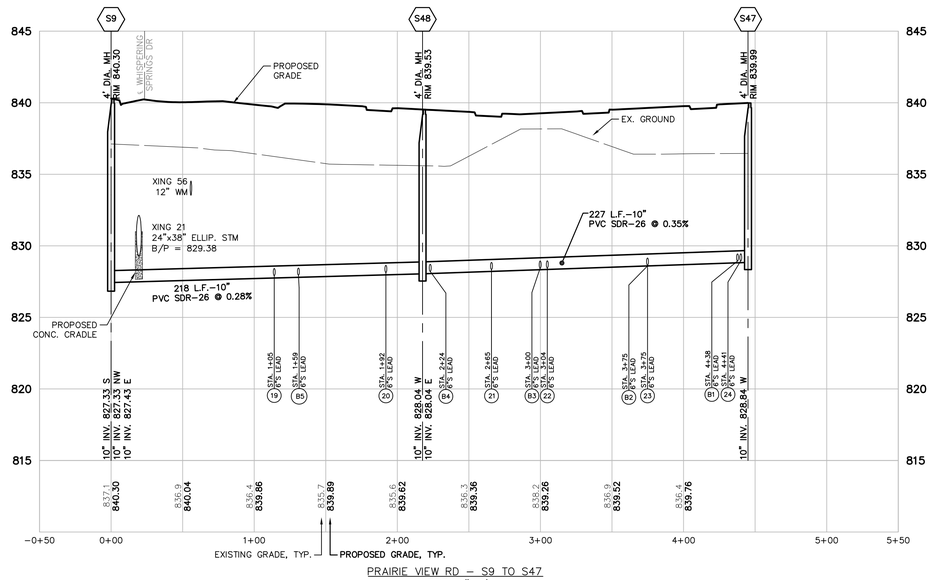
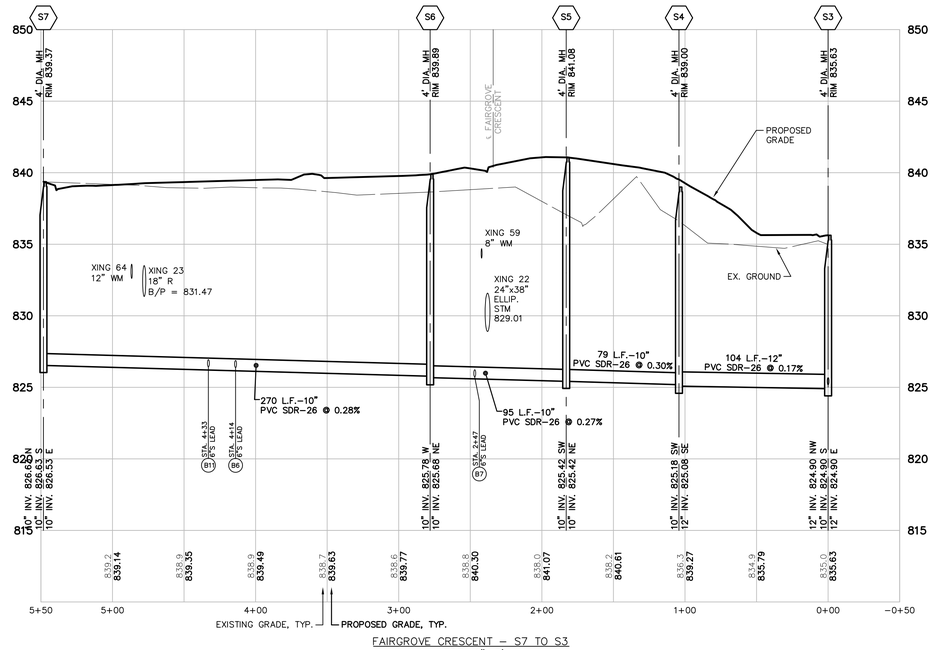


PRAIRIE VIEW RD – S9 TO S47
VERT: 1"=5'
HORZ: 1"=50'



FAIRGROVE CRESCENT – S7 TO S3
VERT: 1"=5'
HORZ: 1"=50'

LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
- PROPOSED MANHOLE / CATCH BASIN / END
- EXISTING UNDERGROUND ELECTRIC
- EXISTING TELEPHONE SERVICE
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- PROPOSED WATER SERVICE
- EXISTING HYDRANT
- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
- EXISTING WATER MAIN MANHOLE
- PROPOSED REDUCER
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- EXISTING ELECTRICAL BOX
- EXISTING SIGN
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- PROPOSED RIP-RAP
- PHASE LINE

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WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN
SANITARY SEWER
PLAN & PROFILE
PRAIRIE VIEW RD AND FAIRGROVE CRESCENT
S47 TO S9, S7 TO S3

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

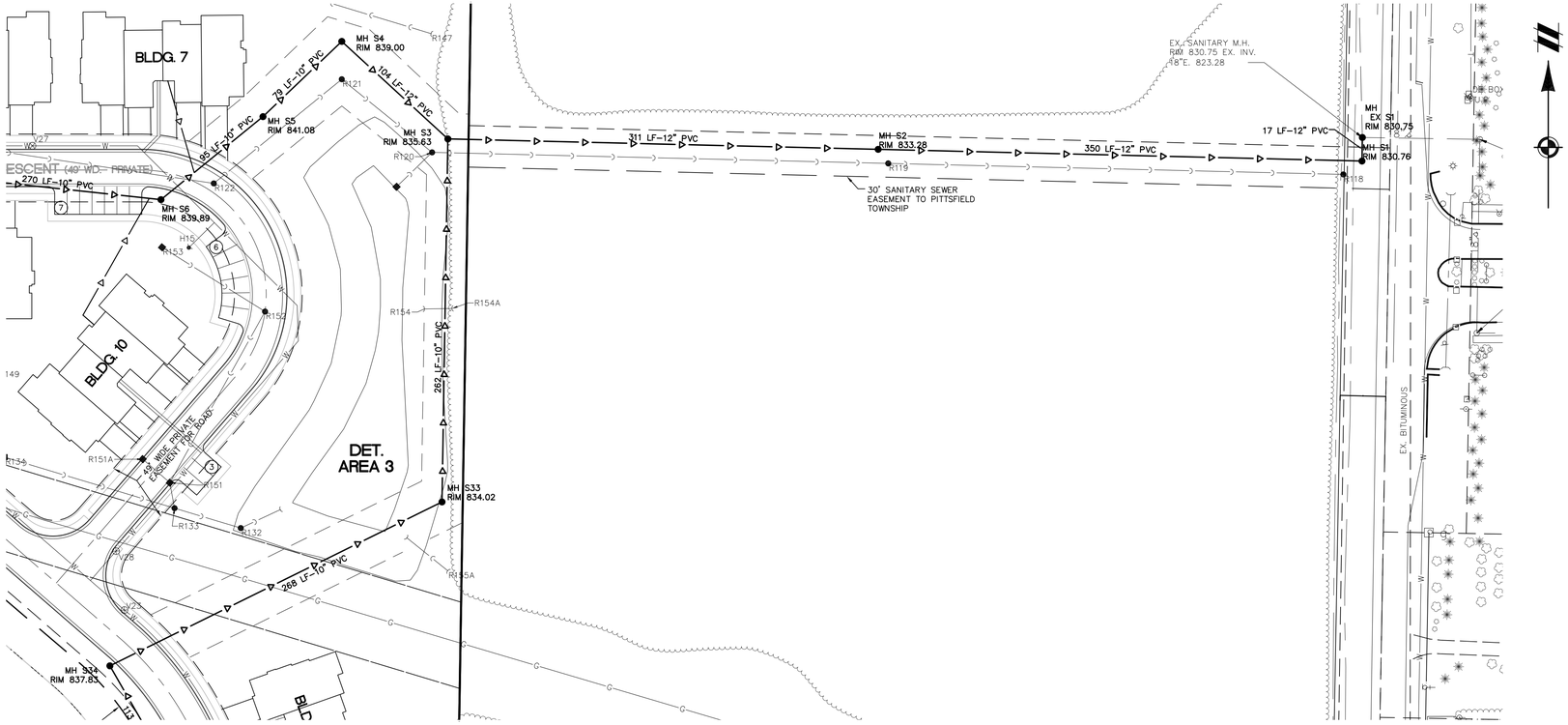
REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-12-PS.DWG
JOB --
FILE CODE: --
SHEET NO. 37

C:\USERS\MKAY\DOCUMENTS\DESIGN\DOCUMENTS_MK\PROJECTS\ATWELL PROJECTS\12000967\DWG\12000967CP-12-PS.DWG, 11/7/2014 8:24 AM, MKAY, ENGINEERING



S34 TO EXISTING SANITARY
VERT: 1"=5'
HORZ: 1"=50'

LEGEND

- PROPERTY LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING MANHOLE / CATCH BASIN
- PROPOSED MANHOLE / CATCH BASIN / END
- EXISTING UNDERGROUND ELECTRIC
- EXISTING TELEPHONE SERVICE
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- PROPOSED WATER SERVICE
- EXISTING HYDRANT
- PROPOSED HYDRANT
- EXISTING GATE VALVE & WELL
- PROPOSED GATE VALVE & WELL
- EXISTING WATER MAIN MANHOLE
- PROPOSED REDUCER
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- PROPOSED SANITARY SEWER LEAD
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SECTION 22
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PITTSFIELD GLEN
OFF-SITE SANITARY SEWER PLAN & PROFILE S34 TO EX S1

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET
DR. MN | CH. MSC
P.M. J. ACKERMAN
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CAD FILE: 12000967CP-12-PS.DWG
JOB --
FILE CODE: --
SHEET NO. 38

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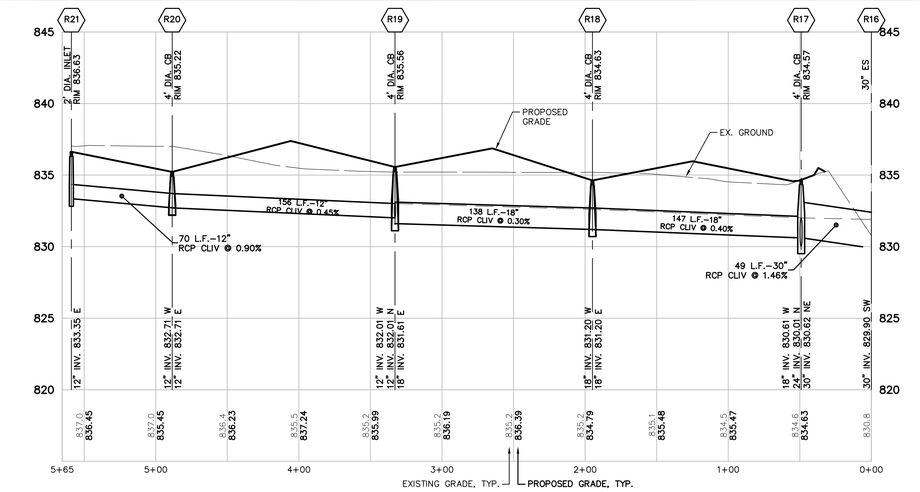
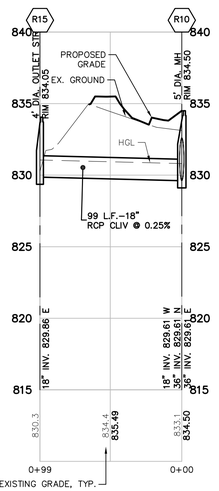
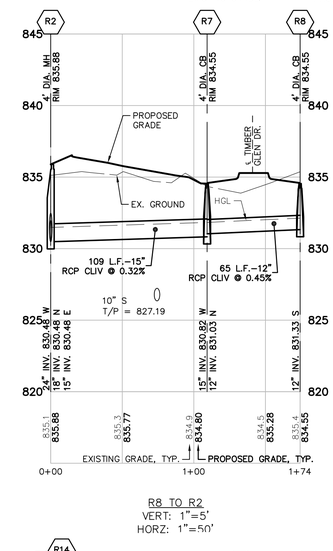


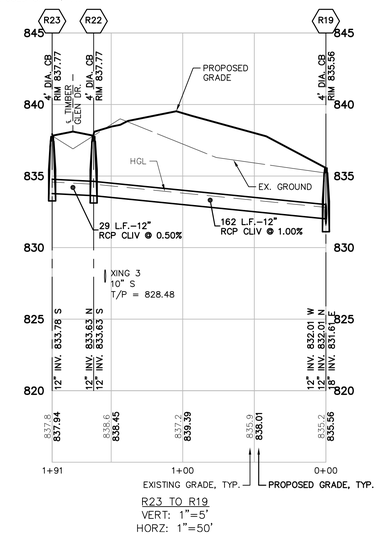
R21 TO R16
VERT: 1"=5'
HORIZ: 1"=50'



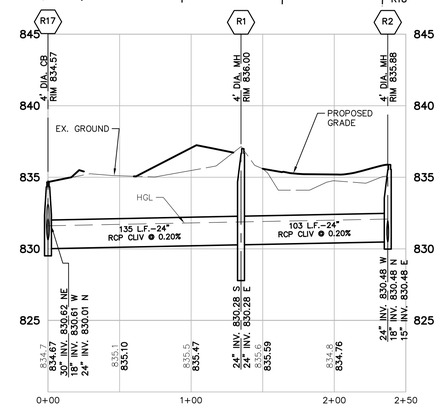
R15 TO R10
VERT: 1"=5'
HORZ: 1"=50'



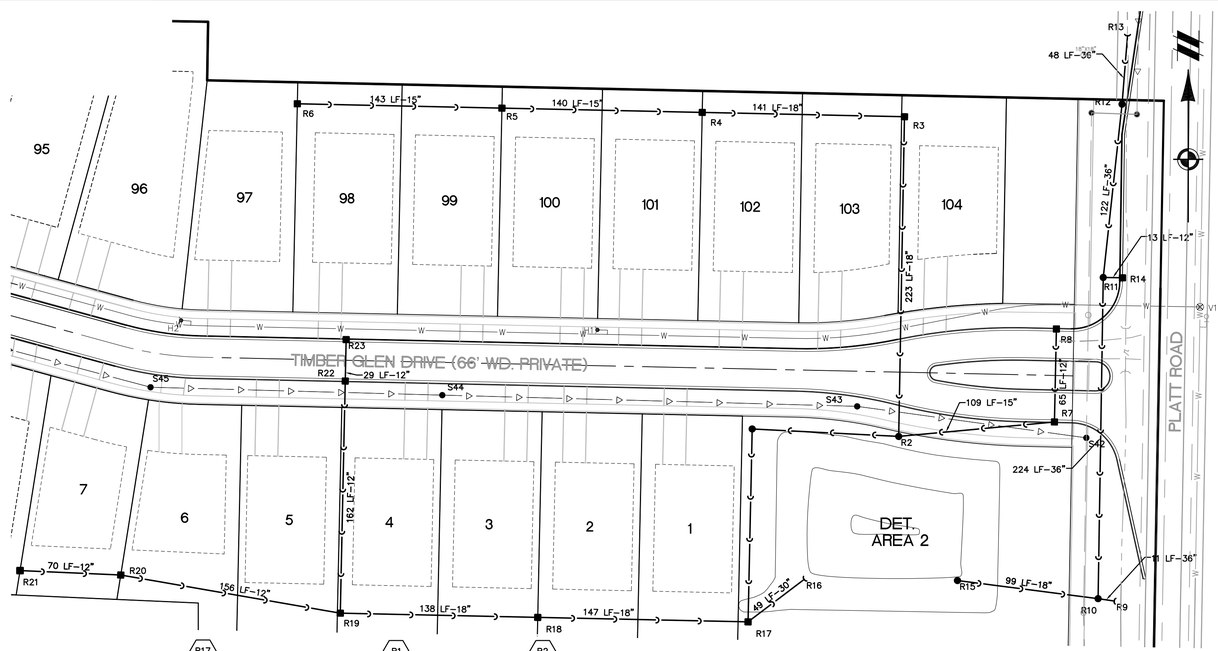
R8 TO R2
VERT: 1"=5'
HORZ: 1"=50'

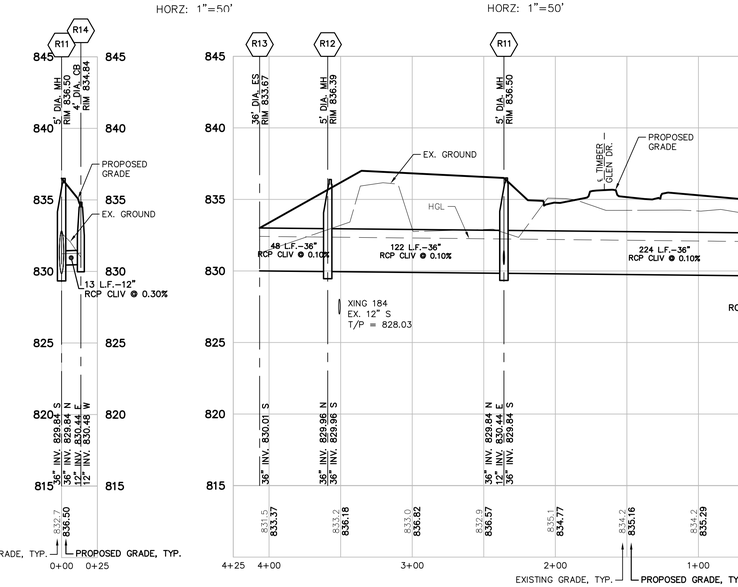


R23 TO R19
VERT: 1"=5'
HORZ: 1"=50'



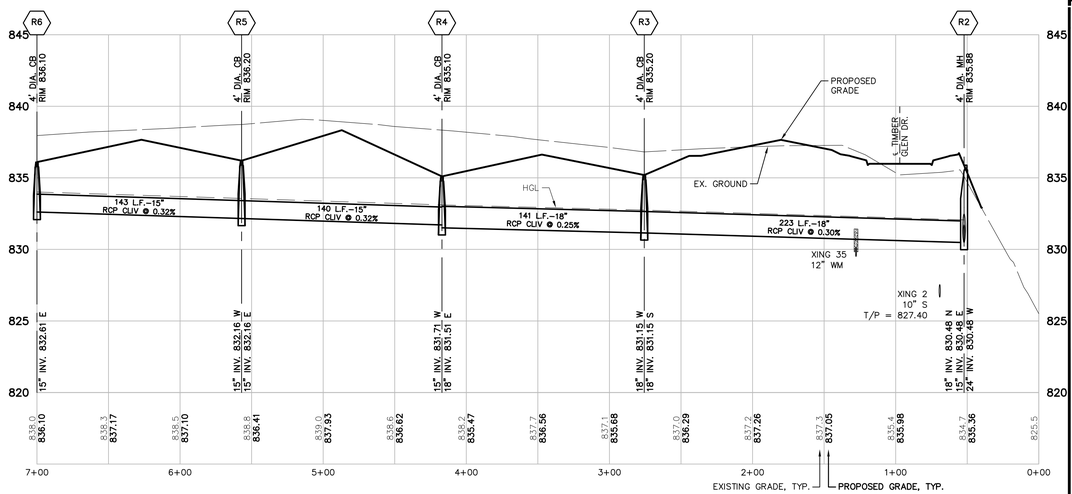
R17 TO R2
VERT: 1"=5'
HORZ: 1"=50'





R14 TO R11
VERT: 1"=5'
HORZ: 1"=50'

R13 TO R9
VERT: 1"=5'
HORZ: 1"=50'



R6 TO R1
VERT: 1"=5'
HORZ: 1"=50'

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LEGEND

- PROPOSED STORM SEWER
- PROPOSED STORM SEWER WITH COMPACTED SAND BACKFILL
- PROPOSED MANHOLE / CATCH BASIN / END SECTION

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WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

STORM SEWER
PLAN & PROFILE
TIMBER GLEN DRIVE

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
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11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

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1" = 50 FEET

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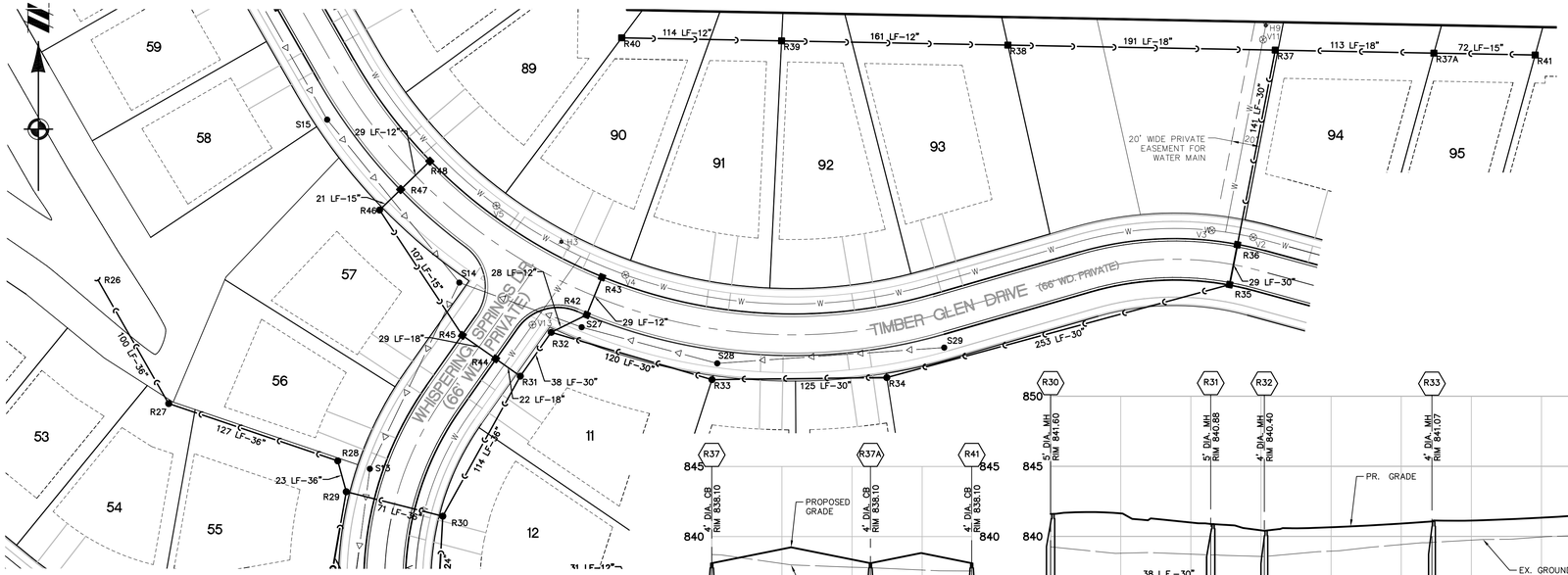
FILE CODE: --
SHEET NO. 39

I:\SURVEY\SURVEY PROPERTY\DOCUMENTS_SK\PROJECTS\ATWELL PROJECTS\12000967\DWG\PLAN SETS\SITE PLAN\12000967CP-13-PR.DWG 11/7/2014 8:17 AM MICKEY HONAKER



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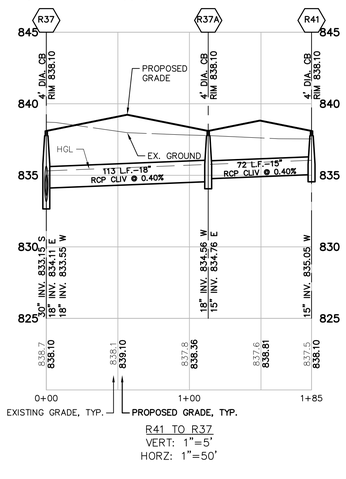
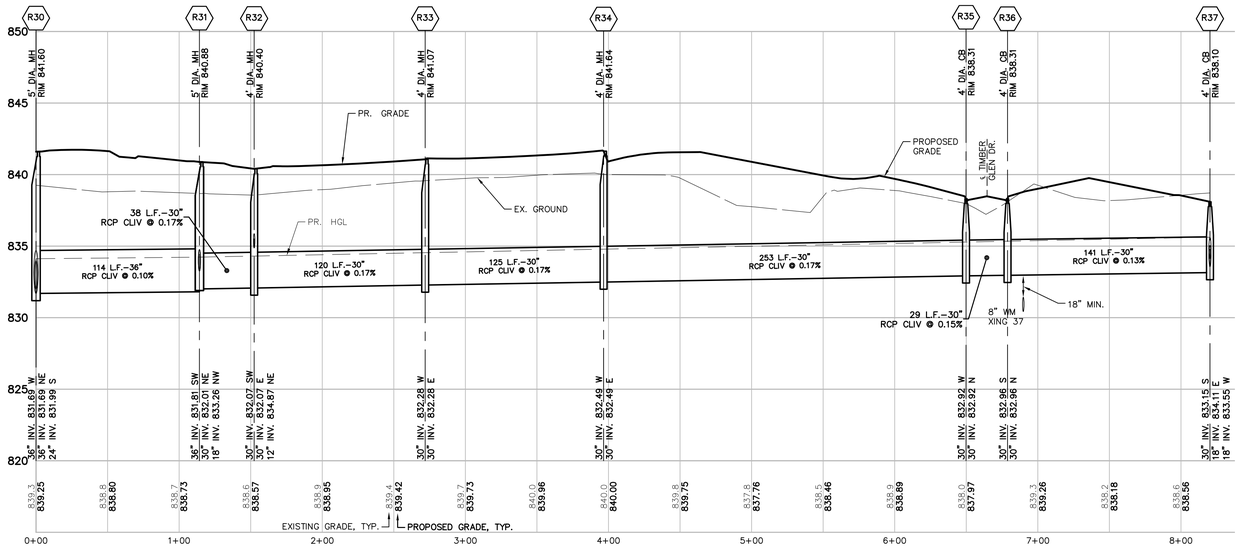
LEGEND

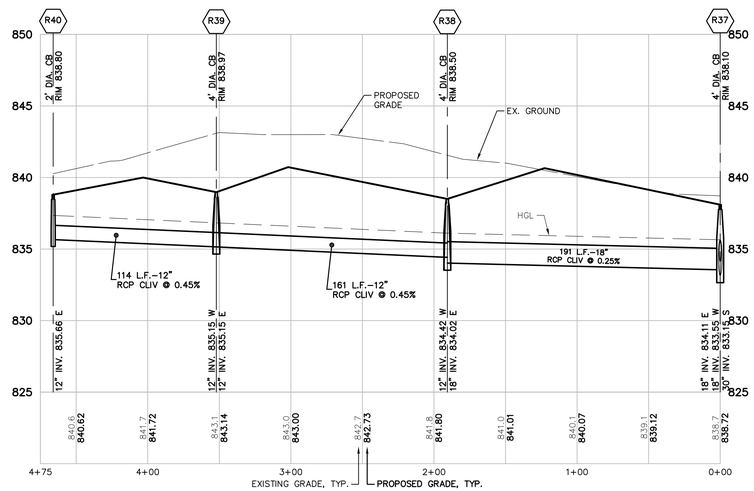
- PROPOSED STORM SEWER
- PROPOSED STORM SEWER WITH COMPACTED SAND BACKFILL
- PROPOSED MANHOLE / CATCH BASIN / END SECTION



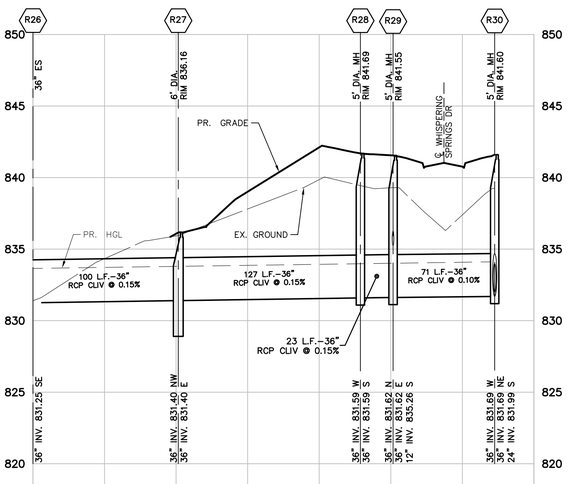
R41 TO R37
VERT: 1"=5'
HORZ: 1"=50'



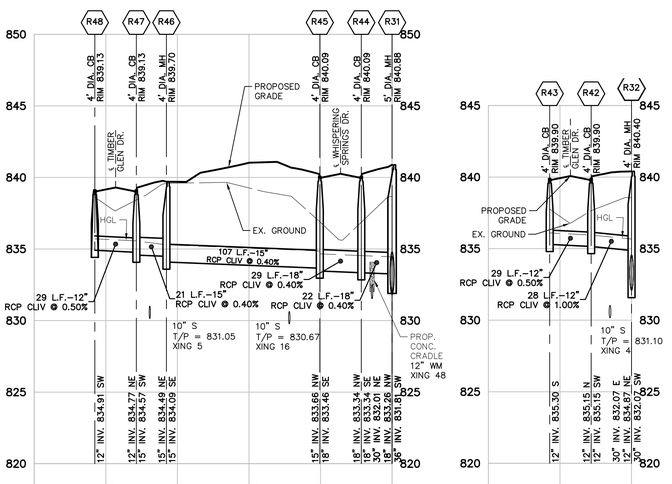
R30 TO R37
VERT: 1"=5'
HORZ: 1"=50'



R37 TO R40
VERT: 1"=5'
HORZ: 1"=50'



R26 TO R30
VERT: 1"=5'
HORZ: 1"=50'



R48 TO R31
VERT: 1"=5'
HORZ: 1"=50'

R43 TO R32
VERT: 1"=5'
HORZ: 1"=50'

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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC
PITTSFIELD GLEN

STORM SEWER
PLAN & PROFILE
WHISPERING SPRINGS DRIVE

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

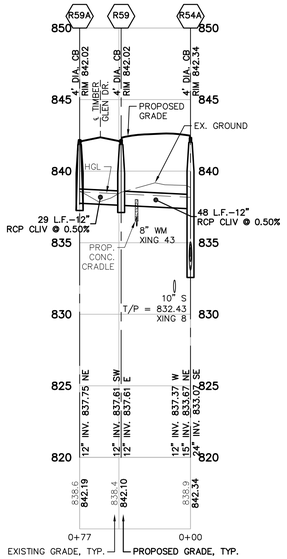
REVISIONS

ATWELL

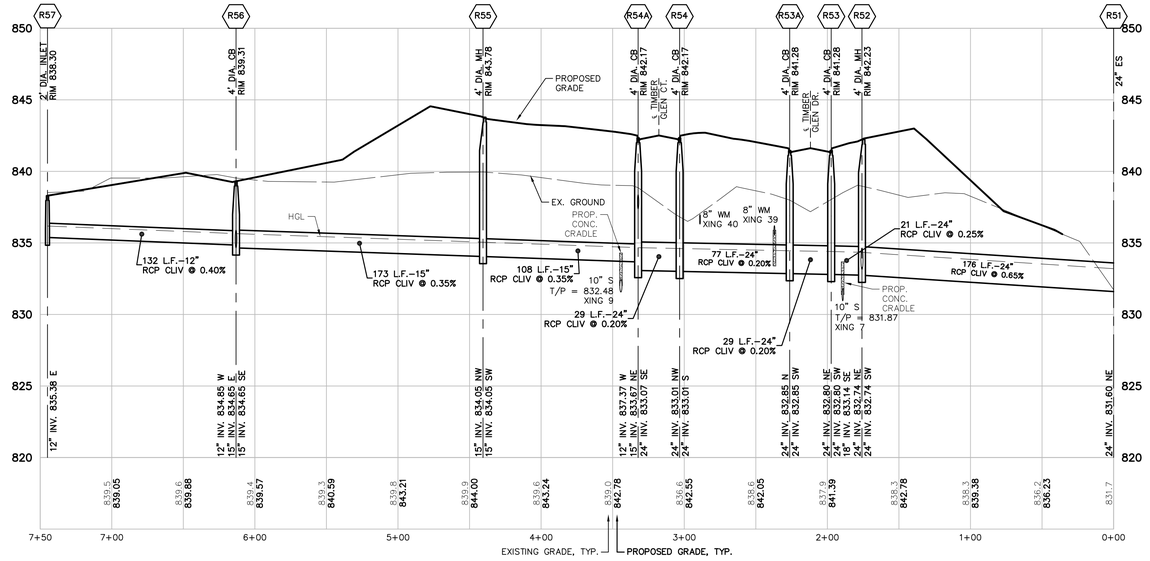
SCALE 0 25 50
1" = 50 FEET

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-13-PR.DWG
JOB --
FILE CODE: --
SHEET NO. 40

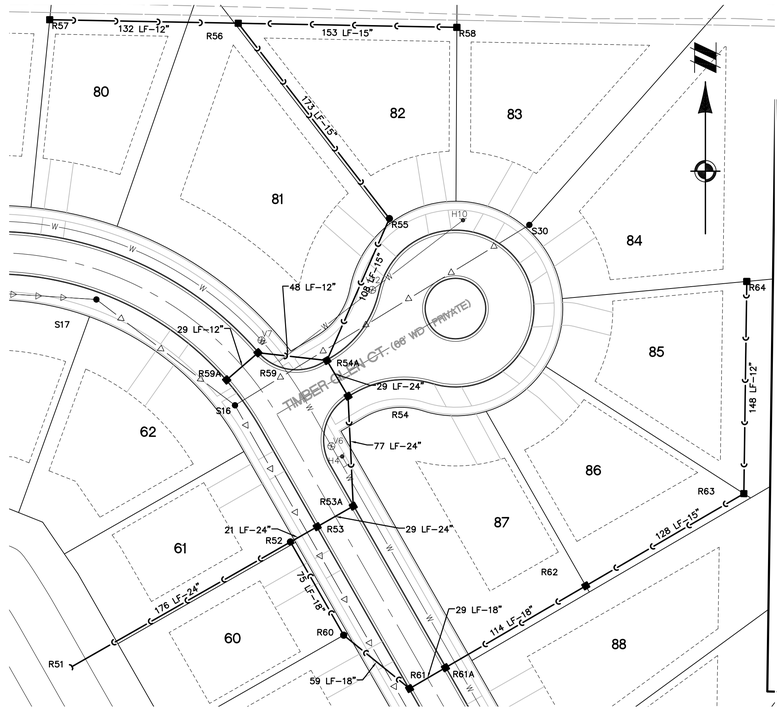
C:\DESKTOP\WORKING\12000967CP-13-PR.DWG, 11/7/2014 8:17:44 AM, MICHAEL SCHOENTHAL



R59A TO R54A
VERT: 1"=5'
HORZ: 1"=50'



R57 TO R51
VERT: 1"=5'
HORZ: 1"=50'



R64 TO R52
VERT: 1"=5'
HORZ: 1"=50'

R58 TO R56
VERT: 1"=5'
HORZ: 1"=50'

R201 TO R205
VERT: 1"=5'
HORZ: 1"=50'

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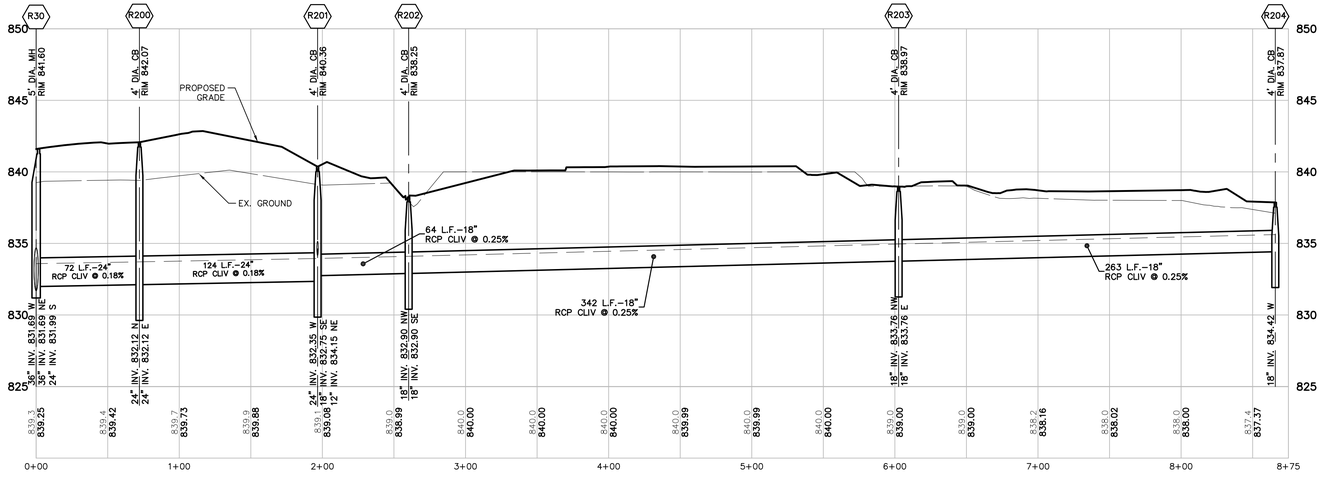
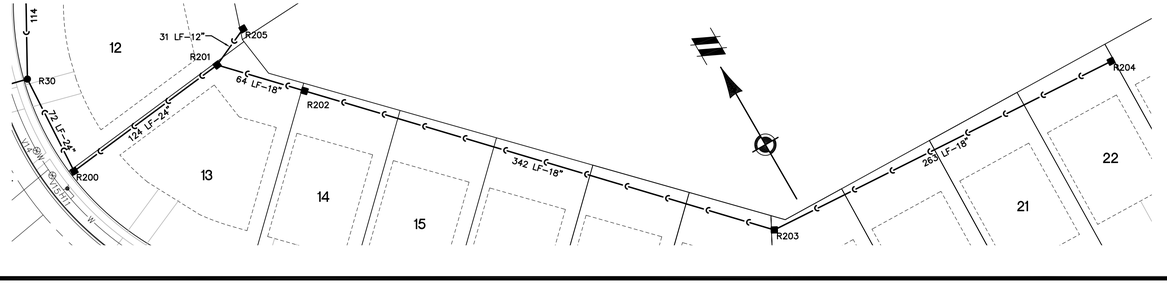
LEGEND

- PROPOSED STORM SEWER
- PROPOSED STORM SEWER WITH COMPACTED SAND BACKFILL
- PROPOSED MANHOLE / CATCH BASIN / END SECTION



R30 TO R204
VERT: 1"=5'
HORZ: 1"=50'



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G:\WORKSPACE\ENGINEERING DOCUMENTS_JOB PROJECTS\PITTSFIELD TOWNSHIP\DWG\PLAN SETS\SITE-FINAL\12000967CP-13-PR.DWG, 11/7/2014 9:14 AM, MICHAEL ENGELBERG

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CLIENT
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PITTSFIELD GLEN
STORM SEWER
PLAN & PROFILE
TIMBER GLEN COURT

DATE
MAY 5, 2014

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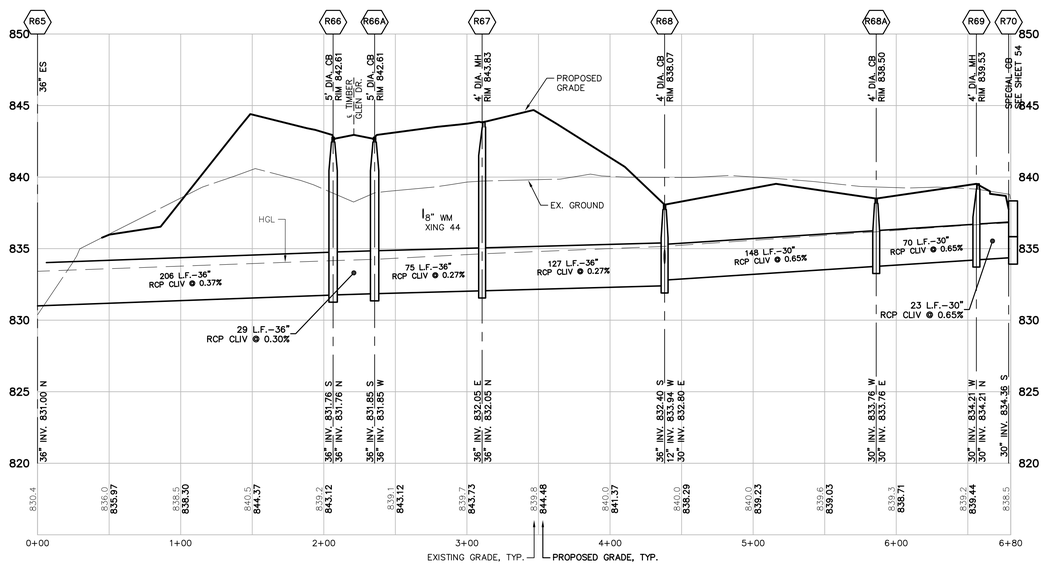
REVISIONS

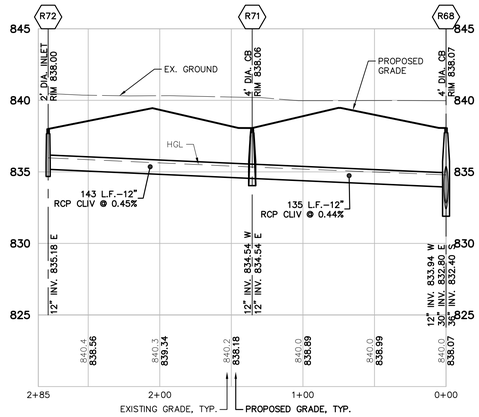
ATWELL

SCALE 0 25 50
1" = 50 FEET

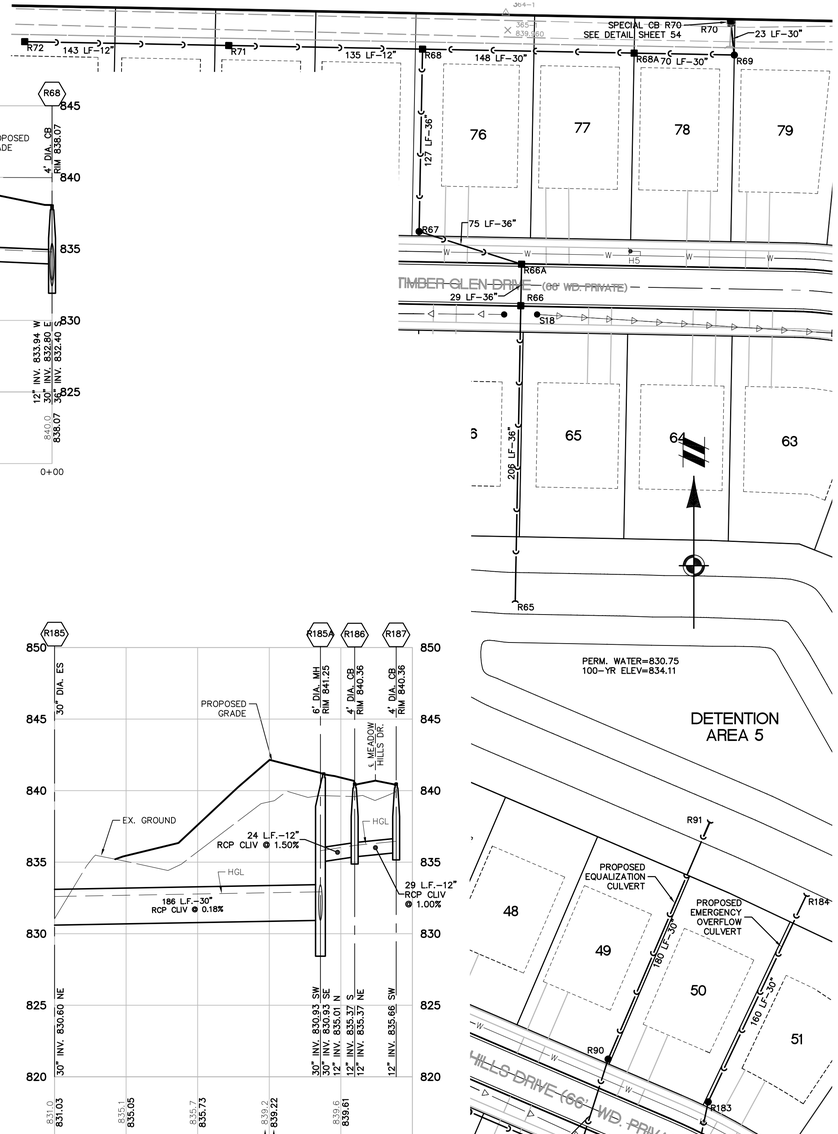
DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-13-PR.DWG
JOB --
FILE CODE: --
SHEET NO. 41

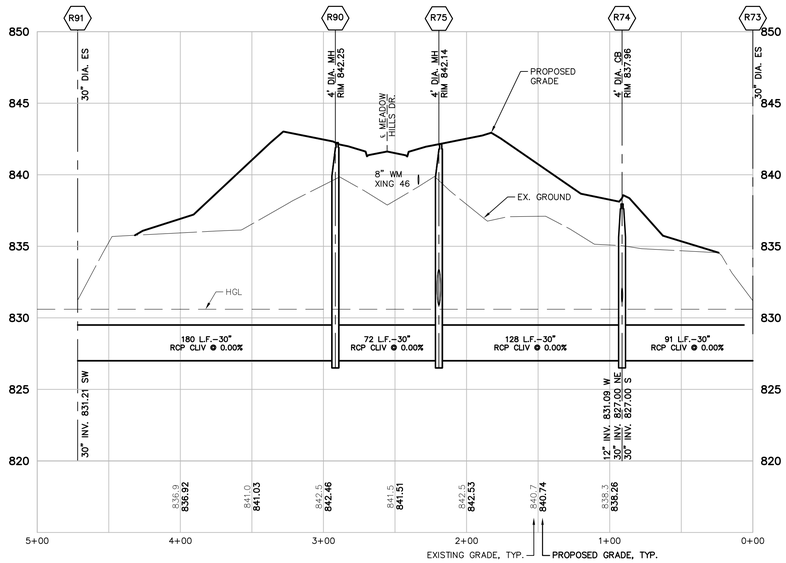


R70 TO R65
VERT: 1"=5'
HORZ: 1"=50'

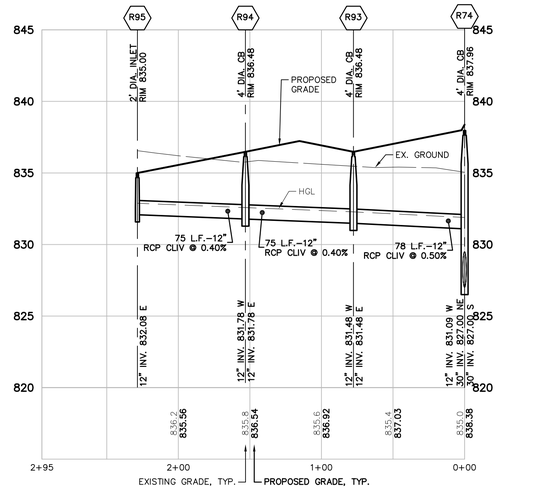


R72 TO R68
VERT: 1"=5'
HORZ: 1"=50'



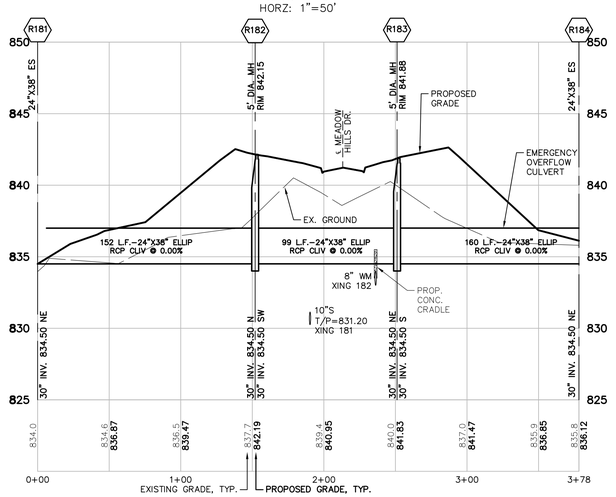


R73 TO R91
VERT: 1"=5'
HORZ: 1"=50'



R95 TO R74
VERT: 1"=5'
HORZ: 1"=50'

R185 TO R187
VERT: 1"=5'
HORZ: 1"=50'



R95 TO R74
VERT: 1"=5'
HORZ: 1"=50'

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LEGEND

- PROPOSED STORM SEWER
- PROPOSED STORM SEWER WITH COMPACTED SAND BACKFILL
- PROPOSED MANHOLE / CATCH BASIN / END SECTION

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PITTSFIELD GLEN
STORM SEWER
PLAN & PROFILE
TIMBER GLEN DRIVE &
MEADOW HILLS DRIVE

DATE
MAY 5, 2014

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06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

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ATWELL
SCALE 0 25 50
1" = 50 FEET

DR.	MN
CH.	MSC
P.M.	J. ACKERMAN
BOOK	--
CAD FILE:	12000967CP-13-PR.DWG
JOB	--
FILE CODE:	--
SHEET NO.	42

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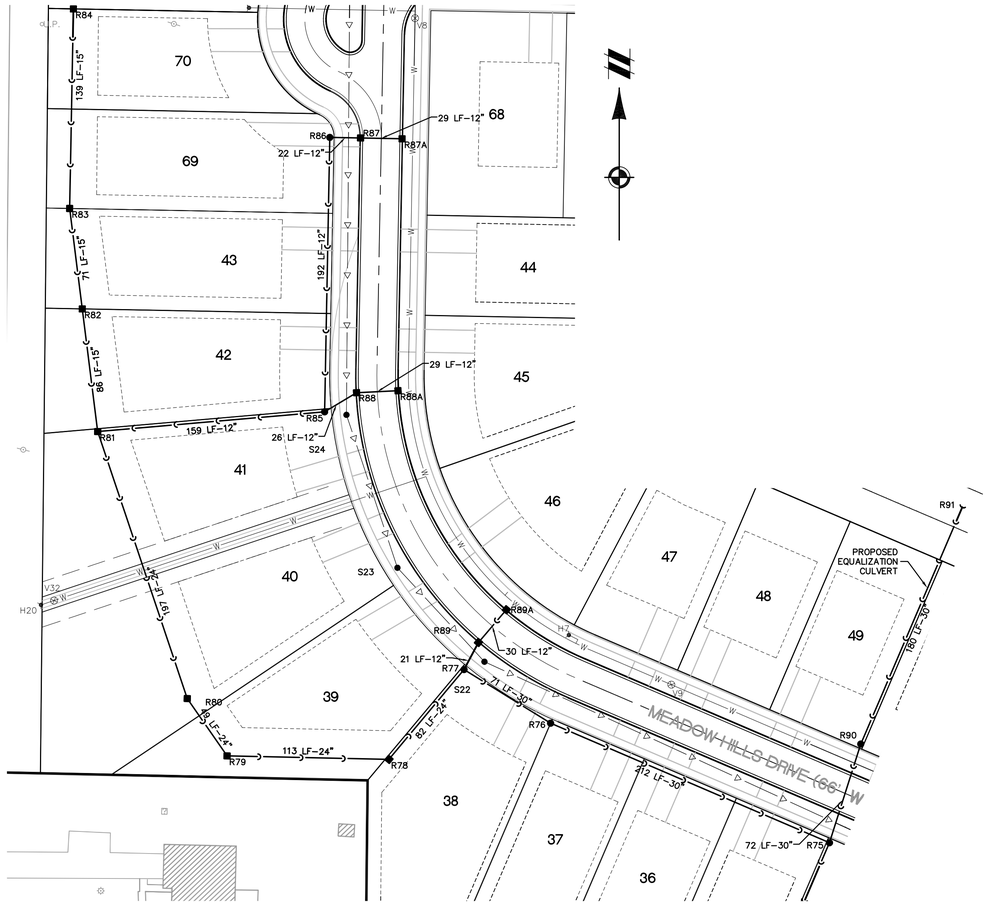

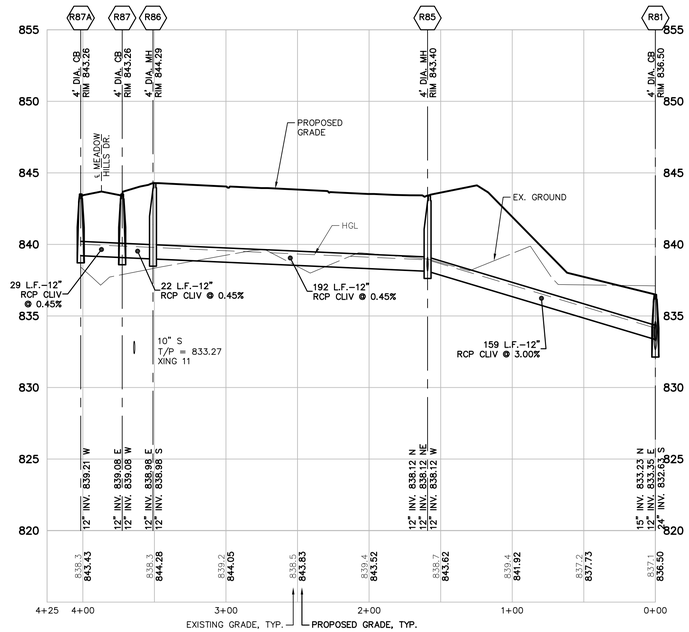

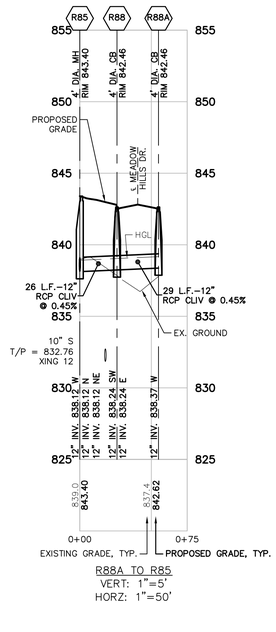

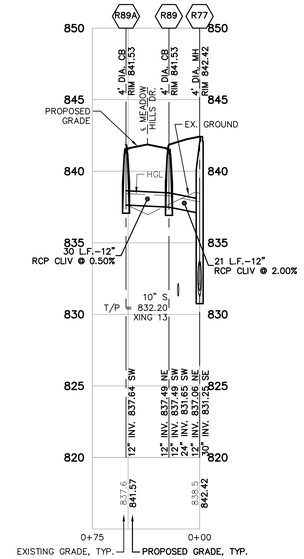

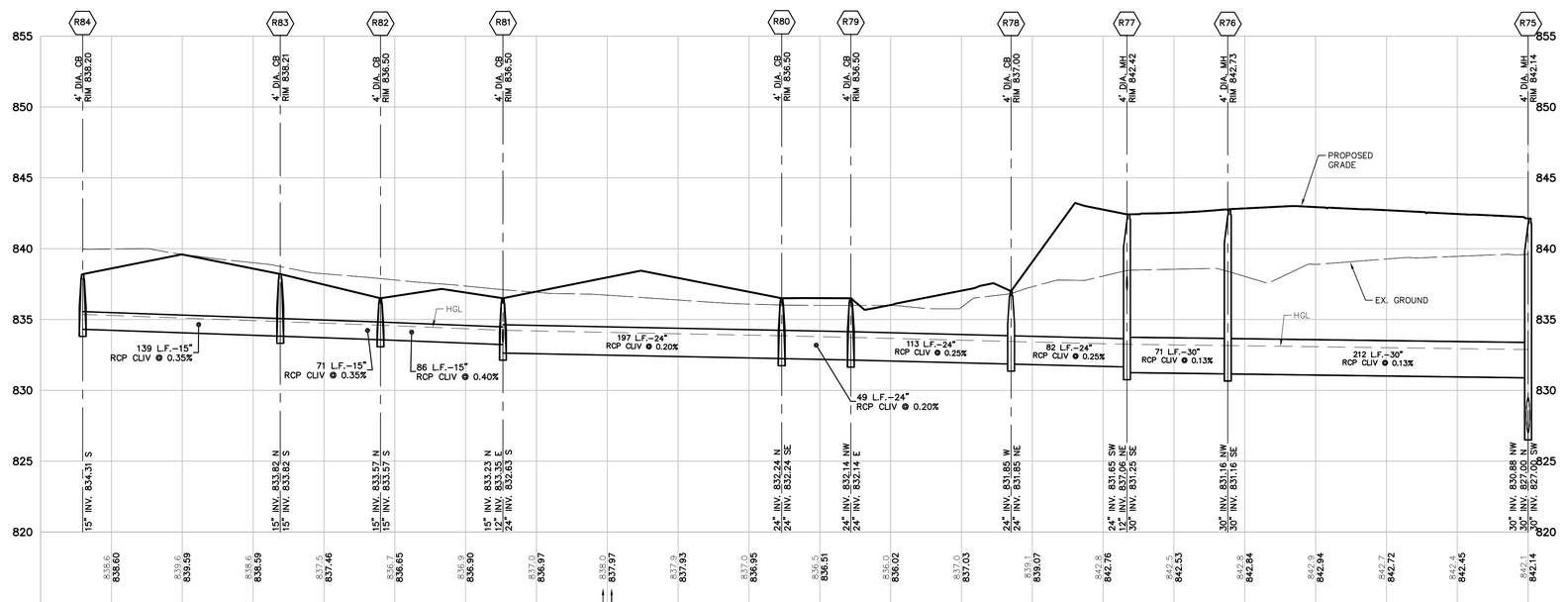

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LEGEND

- PROPOSED STORM SEWER
- PROPOSED STORM SEWER WITH COMPACTED SAND BACKFILL
- PROPOSED MANHOLE / CATCH BASIN / END SECTION

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REVISIONS

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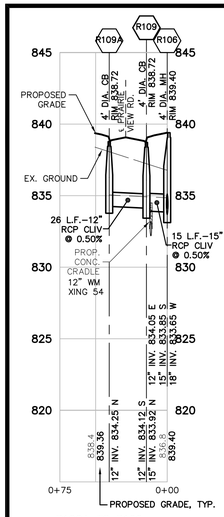
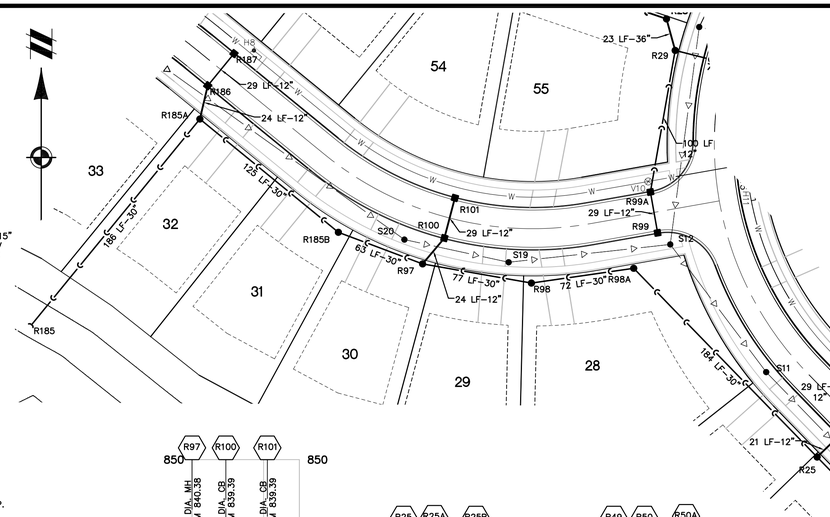
1" = 50 FEET

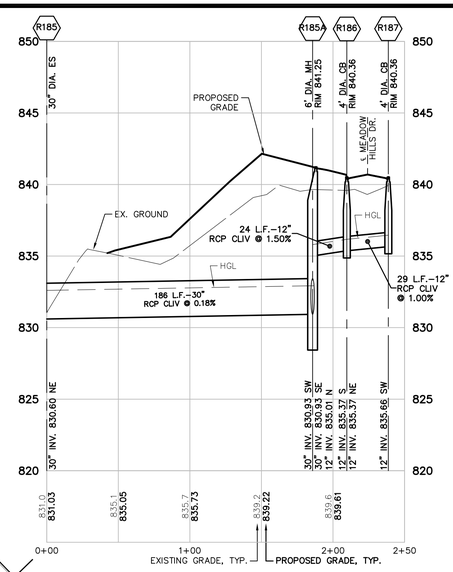
DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-13-PR.DWG
JOB --
FILE CODE: --
SHEET NO. 43

G:\DEPARTMENT PROJECTS\DOCUMENTS_ACTIVE\PITTSFIELD_PROJECTS\12000967\DWG\PLAN SETS\SITE PLAN\12000967CP-13-PR.dwg 11/7/2014 9:14:44 AM EASTERN STANDARD

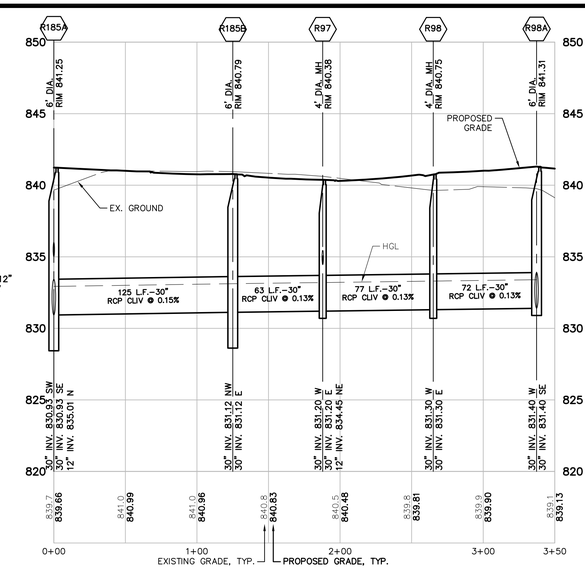


R109A TO R106
VERT: 1"=5'
HORZ: 1"=50'

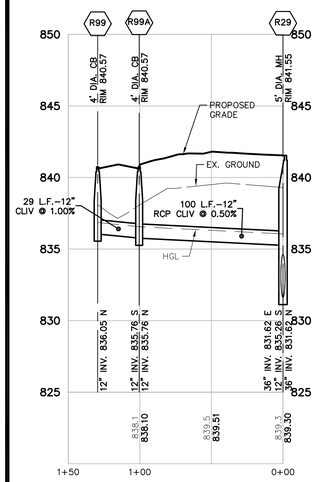




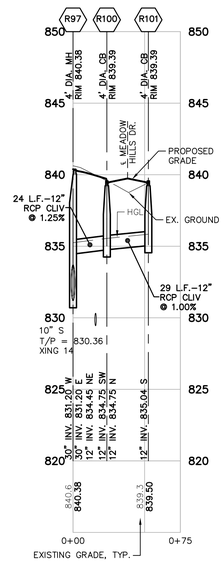
R185 TO R187
VERT: 1"=5'
HORZ: 1"=50'



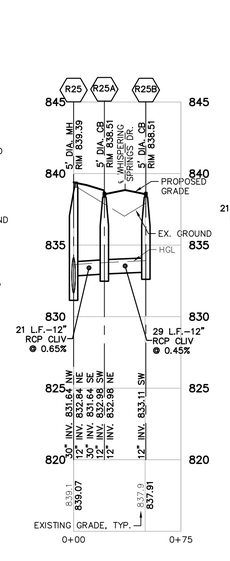
R185A TO R99A
VERT: 1"=5'
HORZ: 1"=50'



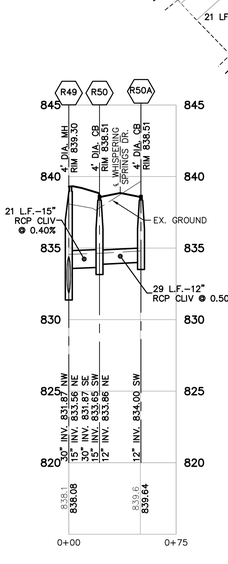
R26 TO R99
VERT: 1"=5'
HORZ: 1"=50'



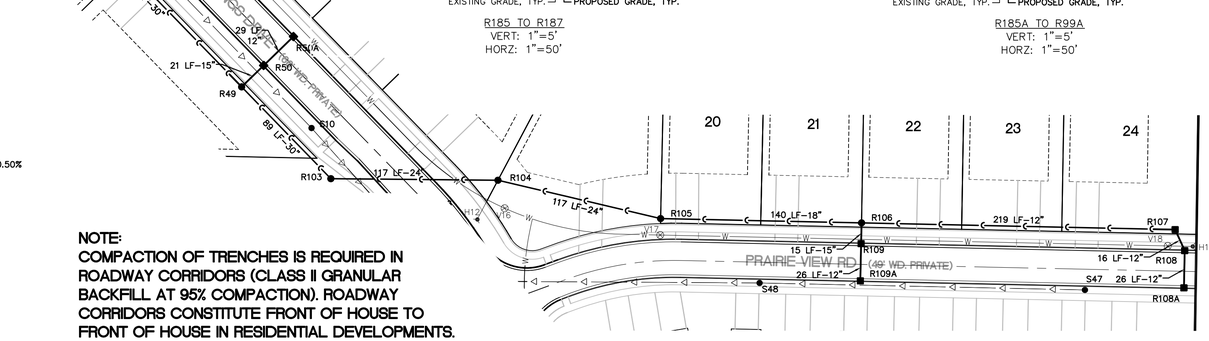
R101 TO R97
VERT: 1"=5'
HORZ: 1"=50'



R25 TO R 25B
VERT: 1"=5'
HORZ: 1"=50'



R49 TO R50A
VERT: 1"=5'
HORZ: 1"=50'



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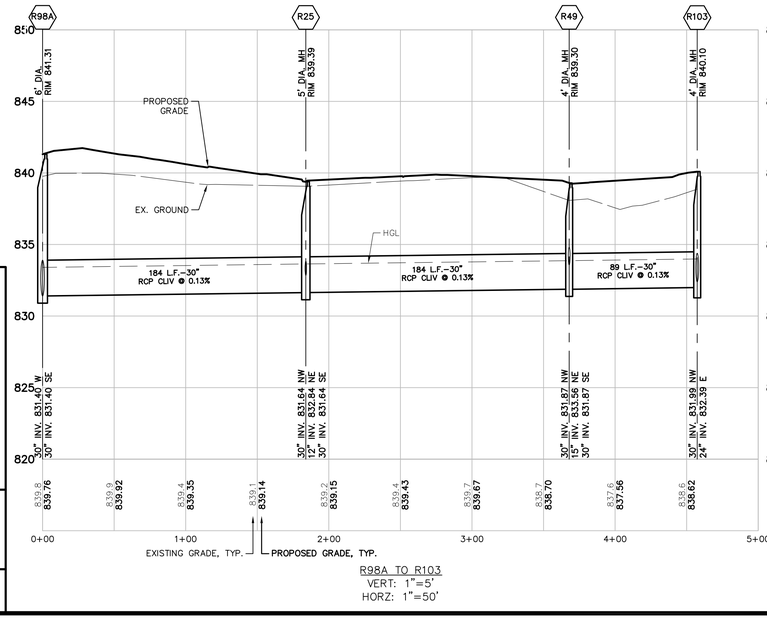
LEGEND

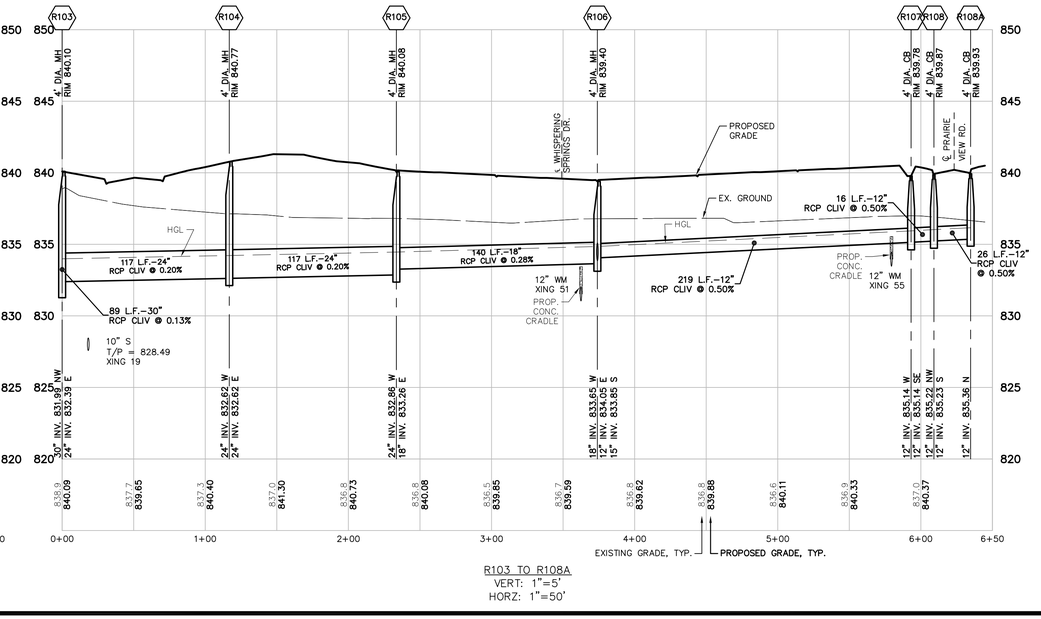
PROPOSED STORM SEWER

PROPOSED STORM SEWER WITH COMPACTED SAND BACKFILL

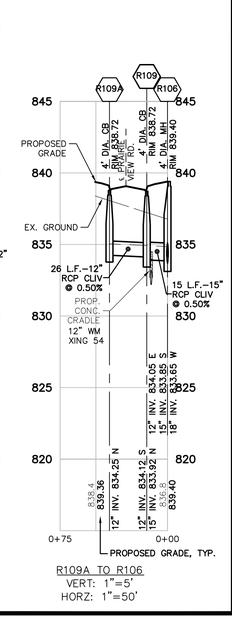
PROPOSED MANHOLE / CATCH BASIN / END SECTION



R98A TO R103
VERT: 1"=5'
HORZ: 1"=50'



R103 TO R108A
VERT: 1"=5'
HORZ: 1"=50'



R109A TO R106
VERT: 1"=5'
HORZ: 1"=50'

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© SURVEYDATA\ ENGINEERING\DRAWINGS\ LAND PROJECTS\ATWELL PROJECTS\12000967 PRAIRIE VIEW\SHEETS - FINAL\12000967CP-13-PR.DWG 11/7/2014 8:19 AM MICHAEL ROSENBERG

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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

STORM SEWER
PLAN & PROFILE
WHISPERING SPRINGS DRIVE
& MEADOW HILLS DRIVE
& PRAIRIE VIEW RD

DATE MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

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SCALE 0 25 50
1" = 50 FEET

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P.M. J. ACKERMAN
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CAD FILE: 12000967CP-13-PR.DWG
JOB --
FILE CODE: --
SHEET NO. 44

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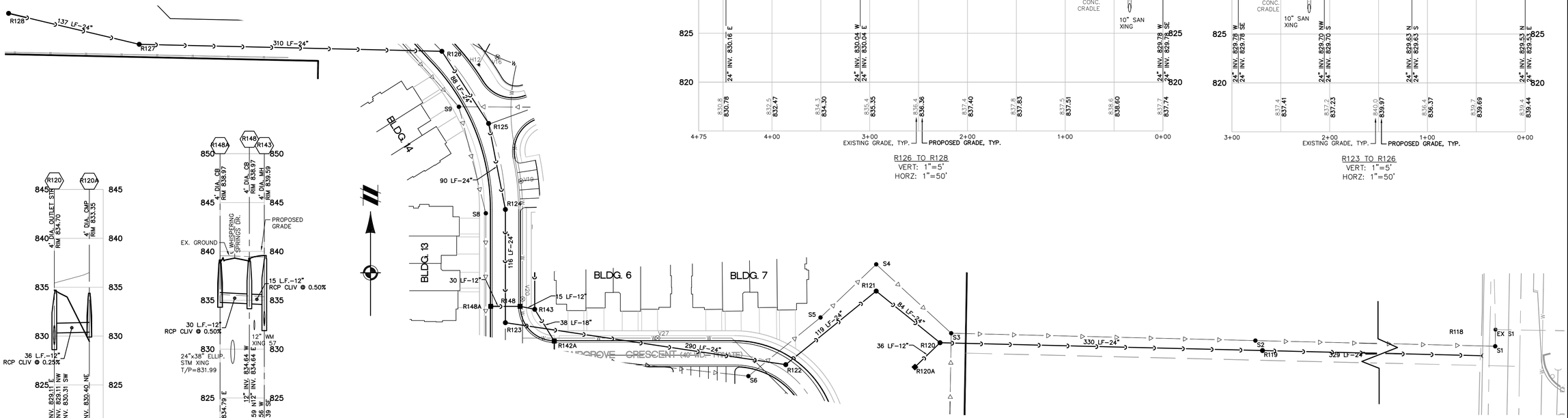
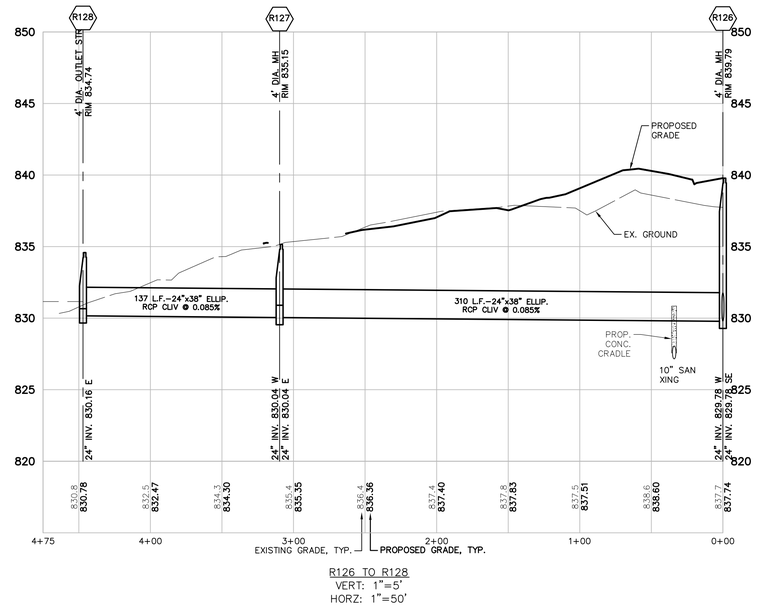
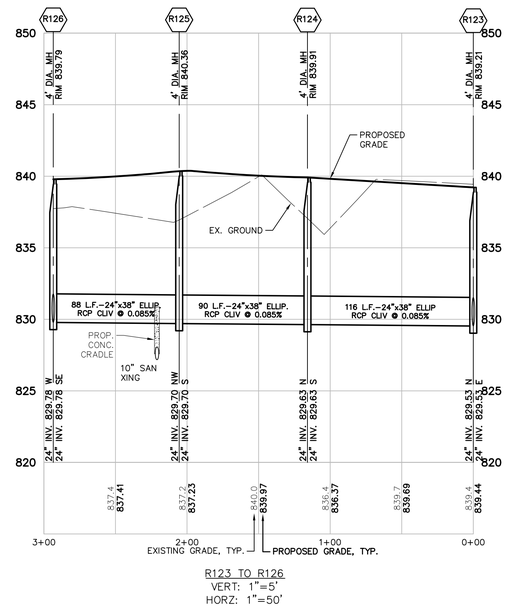
LEGEND

- PROPOSED STORM SEWER
- PROPOSED STORM SEWER WITH COMPACTED SAND BACKFILL
- PROPOSED MANHOLE / CATCH BASIN / END SECTION

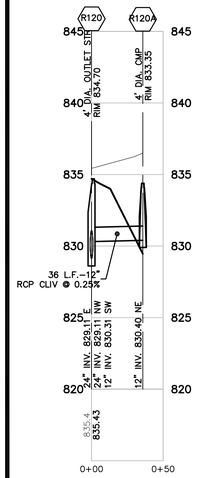




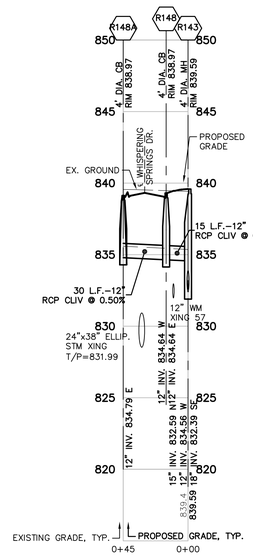
R126 TO R128
VERT: 1"=5'
HORZ: 1"=50'



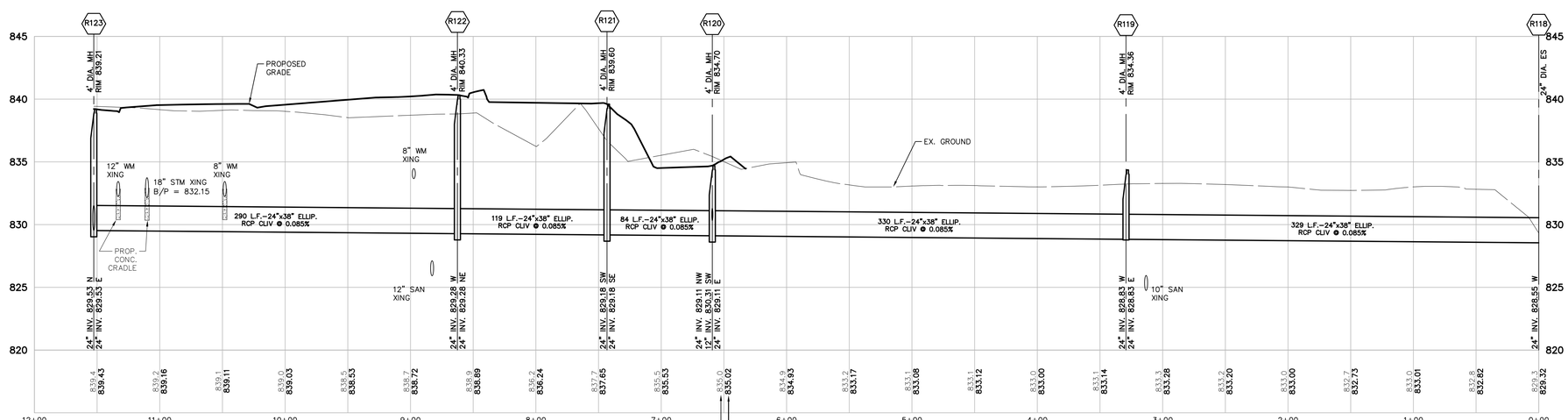
R123 TO R126
VERT: 1"=5'
HORZ: 1"=50'



R120 TO R120A
VERT: 1"=5'
HORZ: 1"=50'



R148A TO R143
VERT: 1"=5'
HORZ: 1"=50'



R118 TO R1123
VERT: 1"=5'
HORZ: 1"=50'

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STORM SEWER
PLAN & PROFILE
WHISPERING SPRINGS DRIVE

DATE
MAY 5, 2014
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07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

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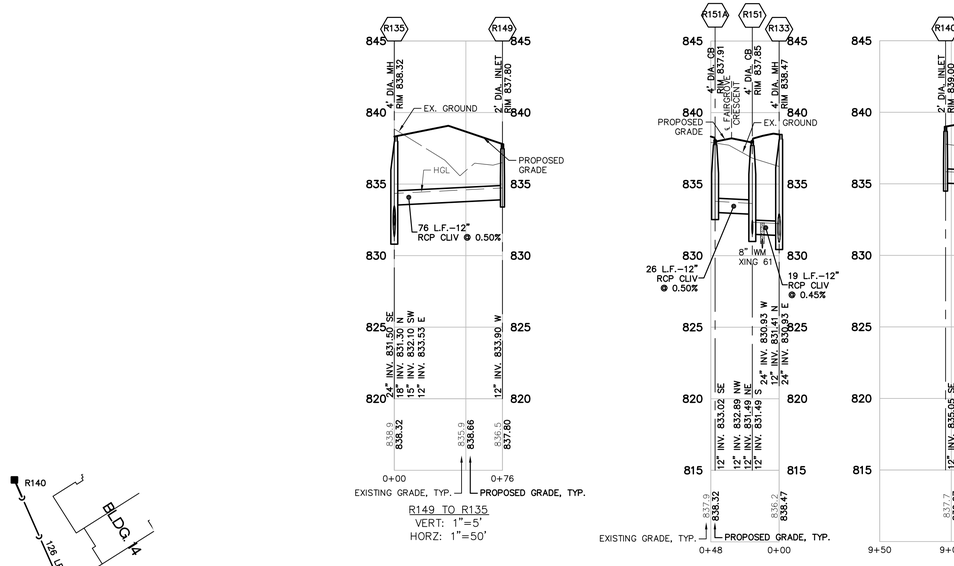
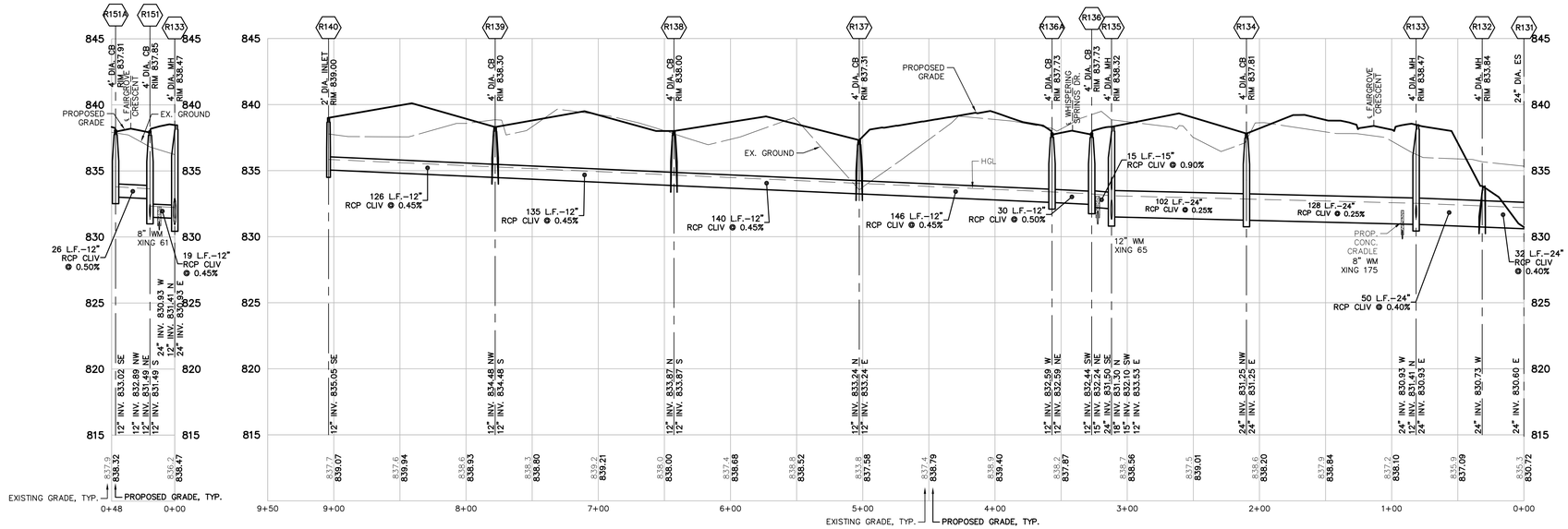
CAD FILE: 12000967CP-13-PR.DWG
JOB --
FILE CODE: --
SHEET NO. 45

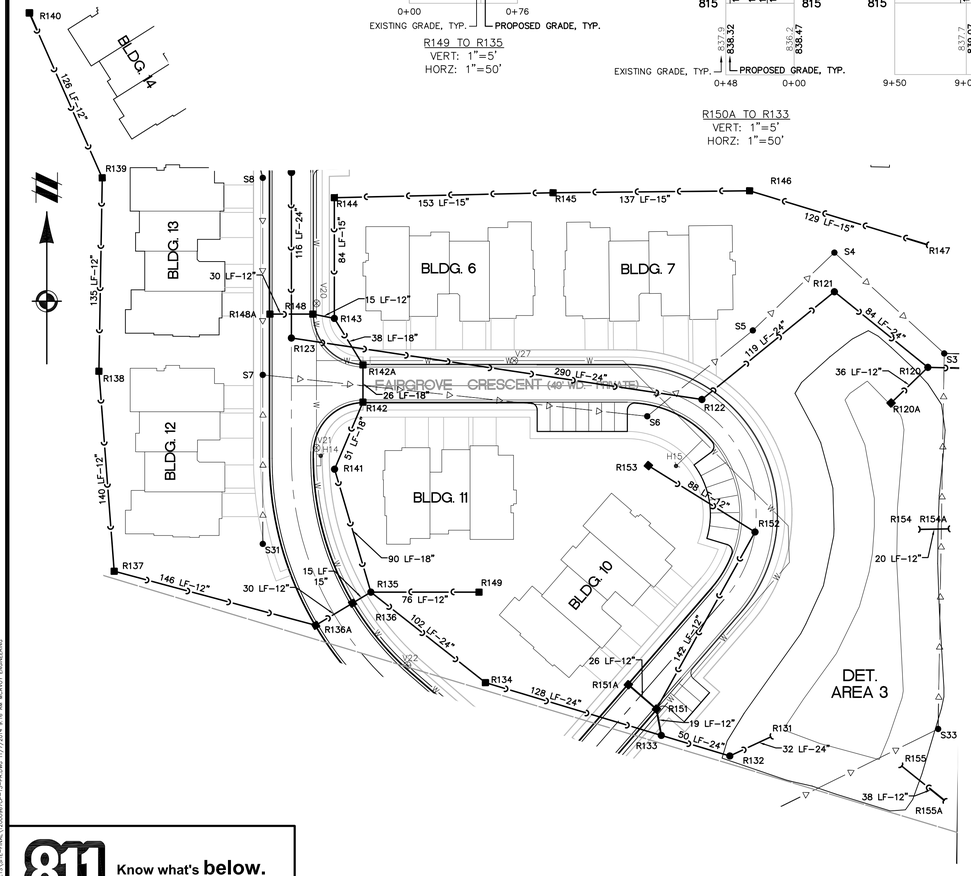
G:\DRAWINGS\PLANNING DOCUMENTS - SITE PROJECTS\PITTSFIELD TOWNSHIP\12000967\CP\12000967CP-13-PR.DWG, 11/7/2014 8:15 AM, MICHAEL SCHOENFELD

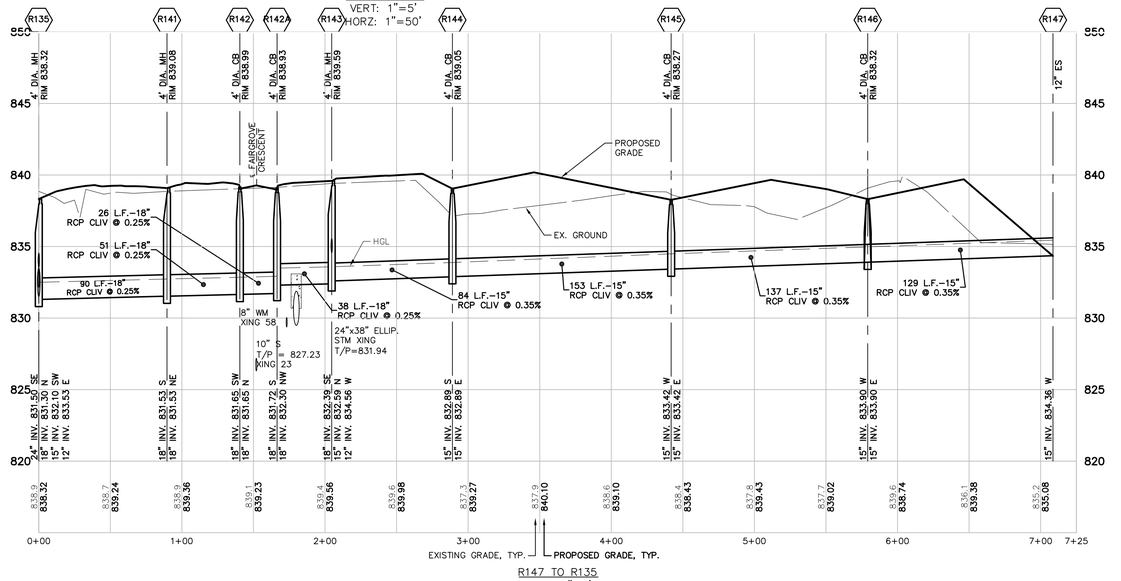


R149 TO R135
VERT: 1"=5'
HORZ: 1"=50'

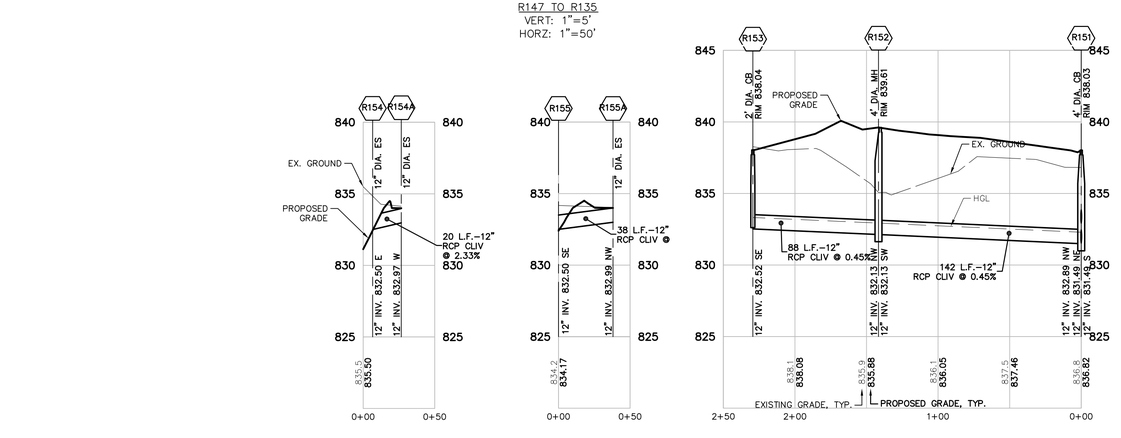


R150A TO R133
VERT: 1"=5'
HORZ: 1"=50'





R140 TO R131
VERT: 1"=5'
HORZ: 1"=50'



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- PROPOSED STORM SEWER WITH COMPACTED SAND BACKFILL
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PITTSFIELD GLEN

STORM SEWER
PLAN & PROFILE
FAIRGROVE CRESCENT

DATE
MAY 5, 2014

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07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

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FILE CODE: --
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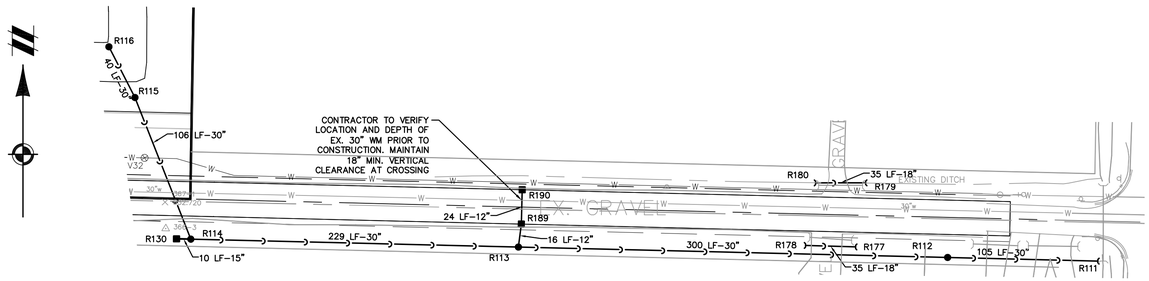
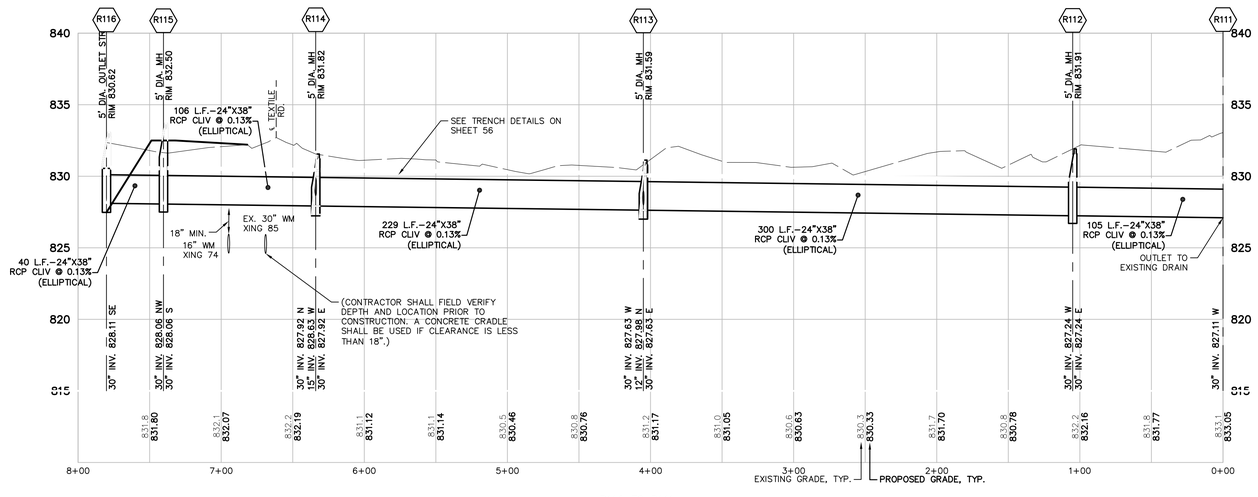
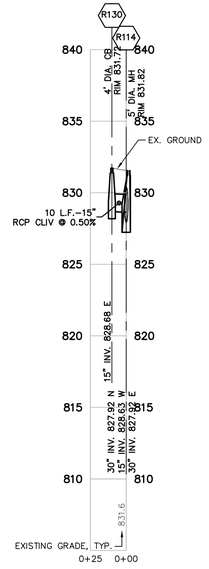
G:\DEPARTMENT\ENGINEERING\DOCUMENTS_DEVELOPMENTS\PITTSFIELD GLEN\CIVIL\PLANS\13 STORM SEWER\PITTSFIELD GLEN-STORM SEWER-PLAN PROFILE-13-PR.DWG, 11/7/2014 8:11 AM, MCAVOY, ENGINEERING

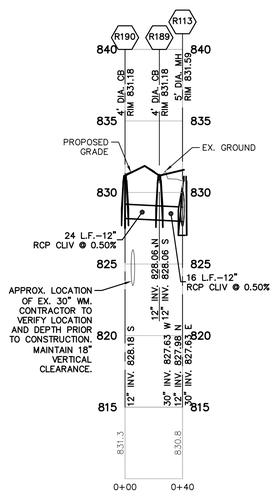




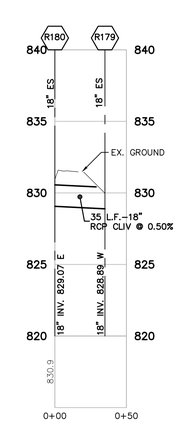
R116 TO R111
VERT: 1"=5'
HORZ: 1"=50'



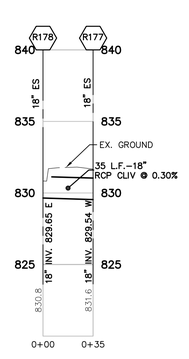
R130 TO R114
VERT: 1"=5'
HORZ: 1"=50'



R190 TO R113
VERT: 1"=5'
HORZ: 1"=50'



R180 TO R179
VERT: 1"=5'
HORZ: 1"=50'



R178 TO R177
VERT: 1"=5'
HORZ: 1"=50'

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1" = 50 FEET
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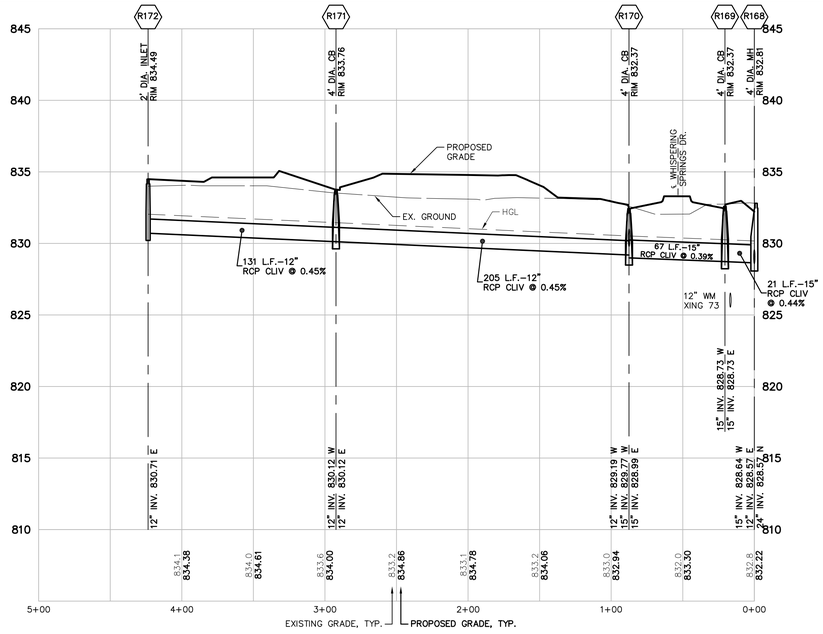
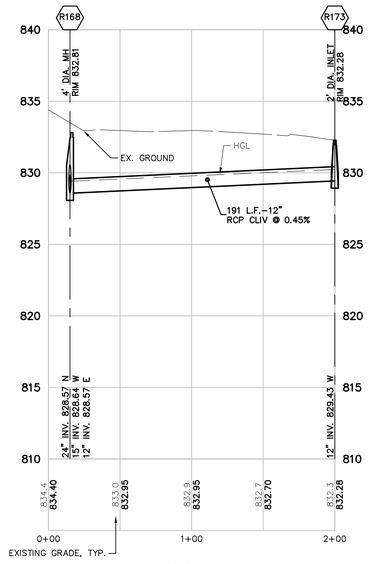
FILE CODE: --
SHEET NO. 47

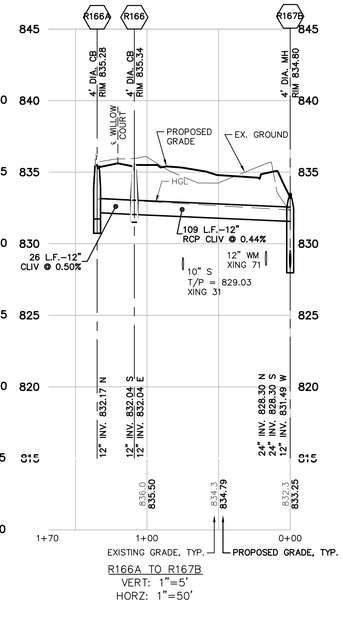
G:\SUBDIVISION ENGINEERING\DRAWINGS_WORKING\PITTSFIELD GLEN\PROJECTS\12000967CP\PLAN SETS\SITE-FINAL\12000967CP-13-PR.DWG, 1/7/2014 8:16 AM, KEVIN THOMPSON



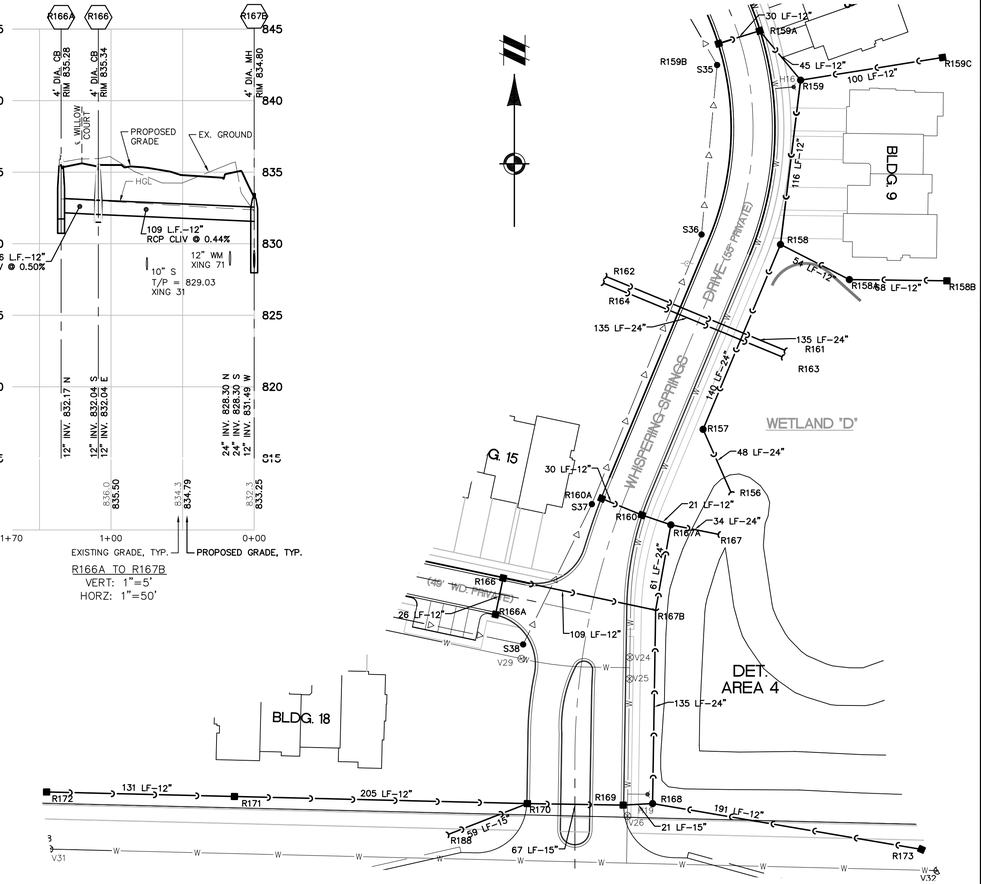
R172 TO R168
VERT: 1"=5'
HORZ: 1"=50'

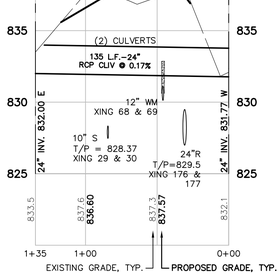


R173 TO R168
VERT: 1"=5'
HORZ: 1"=50'

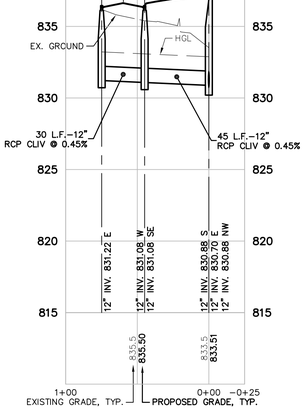


R166A TO R167B
VERT: 1"=5'
HORZ: 1"=50'

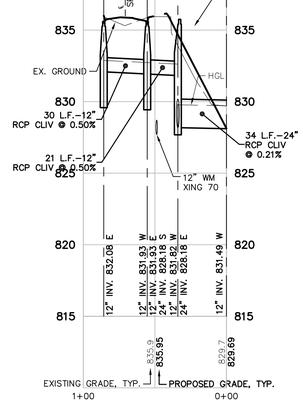




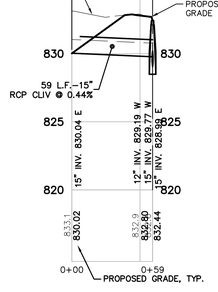
R162 TO R161 (R164 TO R163)
VERT: 1"=5'
HORZ: 1"=50'



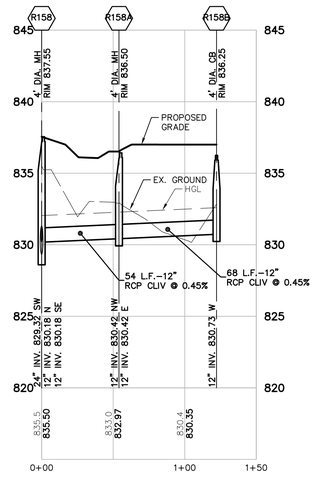
R159 TO R159B
VERT: 1"=5'
HORZ: 1"=50'



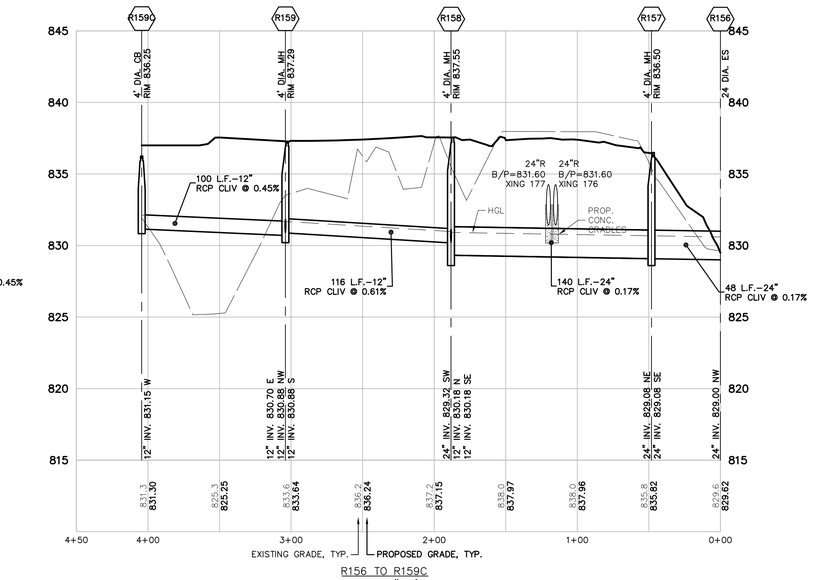
R167 TO R160A
VERT: 1"=5'
HORZ: 1"=50'



R188 TO R170
VERT: 1"=5'
HORZ: 1"=50'



R158 TO R158B (2)
VERT: 1"=5'
HORZ: 1"=50'



R156 TO R159C
VERT: 1"=5'
HORZ: 1"=50'

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COMPACTION OF TRENCHES IS REQUIRED IN ROADWAY CORRIDORS (CLASS II GRANULAR BACKFILL AT 95% COMPACTION). ROADWAY CORRIDORS CONSTITUTE FRONT OF HOUSE TO FRONT OF HOUSE IN RESIDENTIAL DEVELOPMENTS.

LEGEND

- PROPOSED STORM SEWER
- PROPOSED STORM SEWER WITH COMPACTED SAND BACKFILL
- PROPOSED MANHOLE / CATCH BASIN / END SECTION

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CLIENT
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PITTSFIELD GLEN

STORM SEWER
PLAN & PROFILE
WILLOW COURT

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-13-PR.DWG
JOB --
FILE CODE: --
SHEET NO. 48

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WOLVERINE PIPE LINE COMPANY EASEMENT

THE FOLLOWING IS A LIST OF RESTRICTIONS WHEN WORKING WITHIN ANY WOLVERINE PIPE LINE COMPANY EASEMENTS:

1. NO ABOVE OF BELOW GROUND STRUCTURES SHALL BE CONSTRUCTED SUCH AS MANHOLES, SEPTIC FIELDS, SWIMMING POOLS, GARAGES, BUILDINGS, FOUNDATIONS, IRRIGATION SYSTEMS, GREENHOUSES, TREES, ETC. ANY LANDSCAPING VEGETATION SHALL HAVE A MATURE HEIGHT OF LESS THEN THREE (3) FEET TALL.

2. A MINIMUM CLEARANCE OF 24 INCHES BETWEEN THE PIPELINE AND ANY PROPOSED UTILITY CROSSINGS. THE UTILITY SHOULD CROSS BELOW THE PIPELINE UNLESS OTHERWISE AGREED TO. ELECTRIC LINES AND PLASTIC GAS LINES MUST BE INSIDE A STEEL OR SCHEDULE 80 PVC CASING AT THE POINT OF CROSSING AND FOR TEN (10) FEET BOTH SIDES OF THE CROSSING TO PREVENT DAMAGE TO THE UTILITY AND INJURY TO OUR EMPLOYEES DURING FUTURE PIPELINE LOCATES USING A PROBE ROD.

3. NO EXISTING GROUND COVER SHALL BE ADDED TO OR REMOVED WITHOUT PRIOR WRITTEN APPROVAL FROM WOLVERINE FOR ANY CONSTRUCTION PURPOSES. A WOLVERINE INSPECTOR WILL BE REQUIRED TO BE AT THE SITE DURING ANY EXCAVATION.

4. NO STORM WATER RETENTION FACILITY WILL BE CONSTRUCTED ON THE EASEMENT.

5. AT PROPOSED ROAD CROSSINGS AND PARKING AREAS A MINIMUM OF 3 FEET OF GROUND COVER IS REQUIRED. WOLVERINE PIPE LINE COMPANY RESERVES THE RIGHT TO REMOVE ANY ASPHALT OR CONCRETE PAVING MATERIAL FOR MAINTENANCE PURPOSES, IF REQUIRED, AT NO COST TO THE OWNER. REPLACEMENT OF SUCH MATERIAL WILL BE AT THE EXPENSE OF THE OWNER AND AT NO COST TO WOLVERINE PIPE LINE COMPANY.

6. PLEASE NOTE THAT OUR PERSONNEL ARE REQUIRED TO ENTER THIRD-PARTY TRENCHES THAT CROSS OUR PIPELINE TO EXAMINE THE CONDITION OF OUR LINE IF EXPOSED, AND/OR TO TAKE MEASUREMENTS. THEREFORE A REQUIREMENT FOR PERMISSION TO CROSS OUR LINE IS THAT ANY TRENCH CROSSING OUR PIPELINE MUST BE IN COMPLIANCE WITH THE LATEST OSHA STANDARDS FOR TRENCHING AND CONFINED SPACE ENTRY.

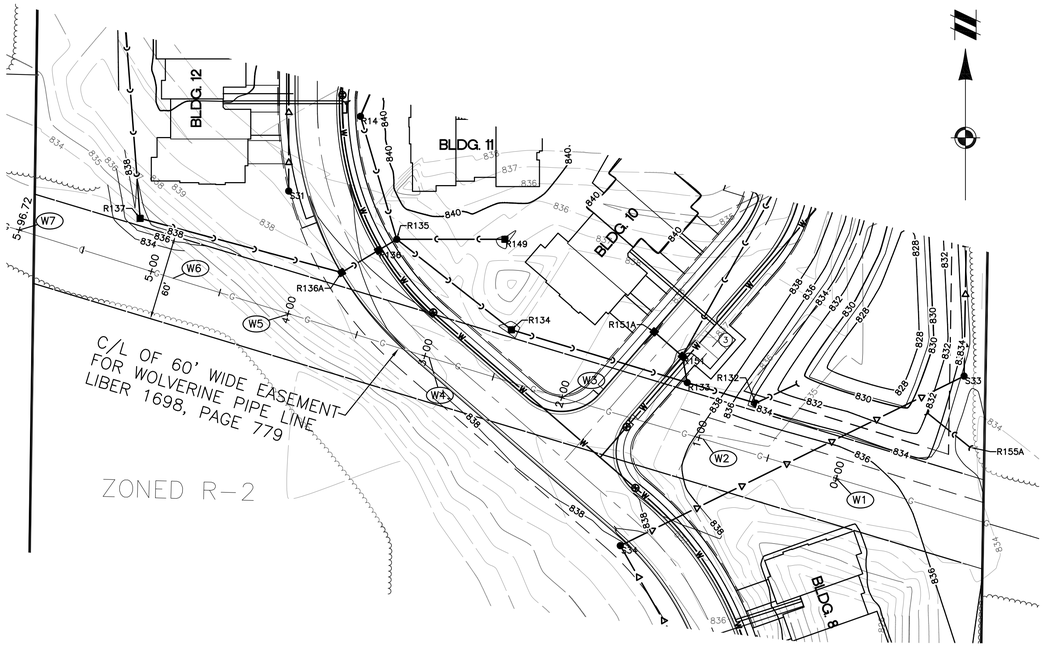
7. AT LEAST 2 DAYS BEFORE WORKING WITHIN THE EASEMENT AREA, PLEASE CONTACT MR. ROD KELLEY AT 734-428-8386. MR. KELLEY WILL ACCURATELY LOCATE OUR FACILITIES AND PROVIDE AN INSPECTOR DURING ANY EXCAVATION WITHIN THE EASEMENT.

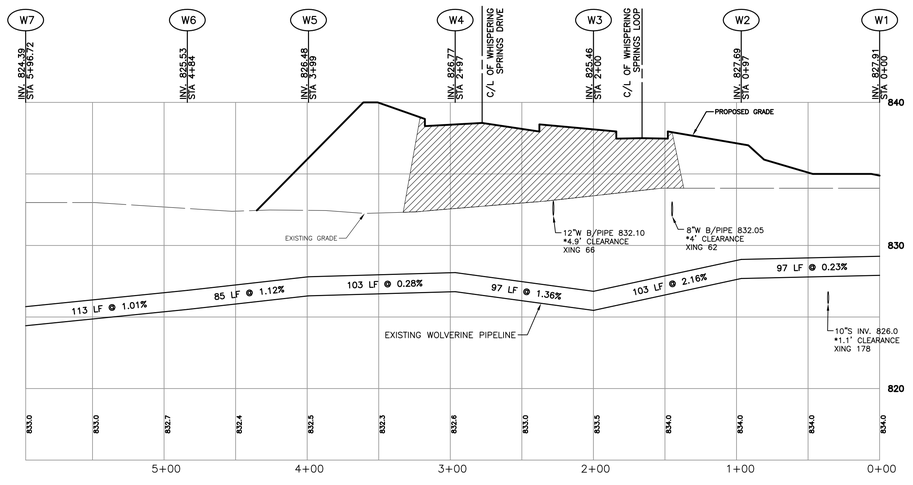
MDOT CLII GRANULAR BACKFILL COMPACTED TO 95% MAX. DENSITY

NOTES:

1. GAS LINE DEPTHS W1-W7 WERE OBTAINED BY WOLVERINE PIPELINE WITH A PROBE.
2. GAS LINE ELEVATION TO BE FIELD VERIFIED AT CROSSING LOCATIONS.
3. ABSOLUTE MINIMUM CLEARANCE AT CROSSINGS OF WOLVERINE PIPELINE TO BE 12 INCHES PER LETTER FROM WOLVERINE PIPELINE COMPANY TO ATWELL-HICKS, INC., DATED JUNE 7, 2001.

* ALL PIPE CLEARANCES TO BE FIELD VERIFIED.





WOLVERINE PIPELINE

1" = 5' VERT.
1" = 50' HORZ.

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

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. 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 BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NOTICE:
CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR; NEITHER THE OWNER NOR THE ENGINEER SHALL BE EXPECTED TO ASSUME ANY RESPONSIBILITY FOR SAFETY OF THE WORK, OF PERSONS ENGAGED IN THE WORK, OF ANY NEARBY STRUCTURES, OR OF ANY OTHER PERSONS.

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PITTSFIELD GLEN

PETROLEUM PIPELINE
PLAN & PROFILE

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

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REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

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P.M. J. ACKERMAN
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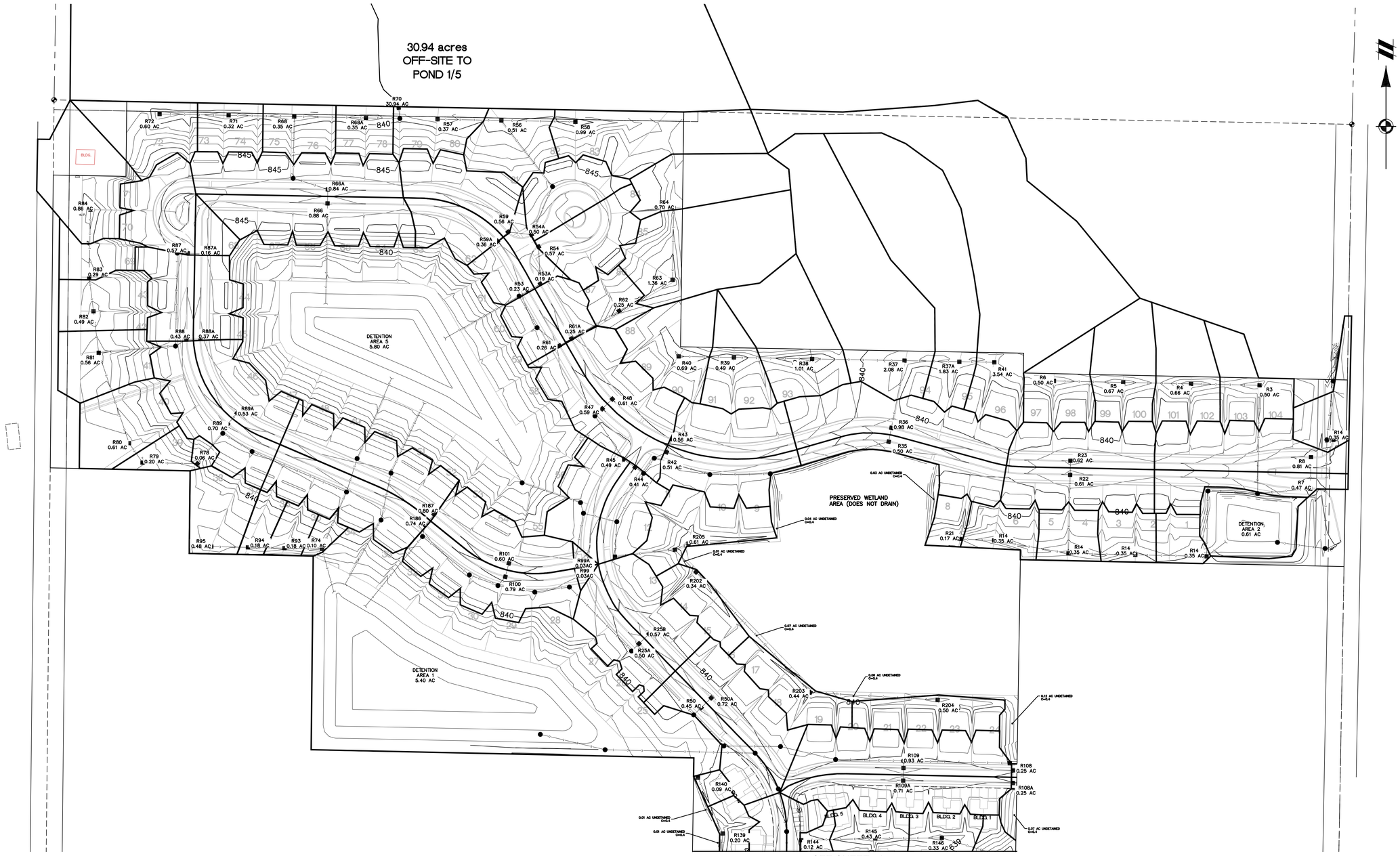

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PITTSFIELD GENERAL DEVELOPMENT, LLC
PITTSFIELD GLEN

DRAINAGE AREA PLAN
NORTH

DATE
MAY 5, 2014

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1" = 100 FEET

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SEE SHEET 50

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POND 1

FROM STR	TO STR	INCRE-MENT DRAINAGE AREA (A)	C RUNOFF COEF.	EQUIV. AREA (CxA) ACRES IMPERVIOUS	SUM OF EQUIVALENT AREAS SUM CxA	I RAINFALL INTENSITY (in/hr)	TIME OF CONC. T (min)	Q=CIA C.F.S. FLOW	LENGTH OF LINE (ft)	DIA. OF PIPE (IN.)	PIPE ROUGH COEF (n)	MIN HG BASED ON "Q" (%)	DESIGN SLOPE OF PIPE (%)	VELOCITY IN PIPE FLOWING FULL (fps)	TIME OF FLOW (min)	CAPAC-ITY OF SEWER (cfs)	HYDRAULIC GRADE UP STREAM	HYDRAULIC GRADE DOWN STREAM	GROUND ELEV UPPER END	GROUND ELEV LOWER END	INVERT ELEVATION UPPER END	INVERT ELEVATION LOWER END
R109A	**R109**	0.71 ac	0.60	0.43 ac-imp	0.43 ac-imp	4.38 in/hr	20.00 min	1.87 cfs	**26 ft**	**12 in**	0.013	0.27%	0.50%	3.2 ft/s	0.14 min	2.52 cfs	835.05	834.92	838.72	838.72	834.25	834.12
R109	**R106**	0.93 ac	0.60	0.56 ac-imp	0.98 ac-imp	4.36 in/hr	20.14 min	4.29 cfs	**15 ft**	**15 in**	0.013	0.44%	0.50%	3.7 ft/s	0.06 min	4.57 cfs	834.92	834.85	838.72	839.40	833.92	833.85
										18 in											833.65	
R50A	**R50**	0.72 ac	0.60	0.43 ac-imp	0.43 ac-imp	4.38 in/hr	20.00 min	1.88 cfs	**29 ft**	**12 in**	0.013	0.28%	0.50%	3.2 ft/s	0.15 min	2.51 cfs	834.80	834.66	838.51	838.51	834.00	833.86
R50	**R49**	0.45 ac	0.60	0.27 ac-imp	0.70 ac-imp	4.36 in/hr	20.15 min	3.05 cfs	**21 ft**	**15 in**	0.013	0.22%	0.40%	3.3 ft/s	0.11 min	4.09 cfs	834.65	834.56	838.51	839.30	833.65	833.56
										30 in											831.87	
R25B	**R25A**	0.57 ac	0.60	0.34 ac-imp	0.34 ac-imp	4.38 in/hr	20.00 min	1.51 cfs	**29 ft**	**12 in**	0.013	0.18%	0.45%	3.0 ft/s	0.16 min	2.39 cfs	833.91	833.78	838.51	838.51	833.11	832.98
R25A	**R25**	0.50 ac	0.60	0.30 ac-imp	0.64 ac-imp	4.36 in/hr	20.16 min	2.81 cfs	**21 ft**	**12 in**	0.013	0.62%	0.65%	3.7 ft/s	0.10 min	2.88 cfs	833.78	833.64	838.51	839.39	832.98	832.84
										30 in											831.64	
R101	**R100**	0.60 ac	0.60	0.36 ac-imp	0.36 ac-imp	4.38 in/hr	20.00 min	1.58 cfs	**29 ft**	**12 in**	0.013	0.20%	1.00%	4.5 ft/s	0.11 min	3.56 cfs	835.84	835.55	839.39	839.39	835.04	834.75
R100	**R97**	0.79 ac	0.60	0.47 ac-imp	0.84 ac-imp	4.36 in/hr	20.11 min	3.65 cfs	**24 ft**	**12 in**	0.013	1.04%	1.25%	5.1 ft/s	0.08 min	3.98 cfs	835.55	835.25	839.39	840.38	834.75	834.45
										30 in											831.20	
R187	**R186**	0.80 ac	0.60	0.48 ac-imp	0.48 ac-imp	4.38 in/hr	20.00 min	2.11 cfs	**29**	**12 in**	0.013	0.35%	1.00%	4.5 ft/s	0.11 min	3.56 cfs	836.46	836.17	840.36	840.36	835.66	835.37
R186	**R185A**	0.74 ac	0.60	0.45 ac-imp	0.93 ac-imp	4.36 in/hr	20.11 min	4.05 cfs	**24**	**12 in**	0.013	1.29%	1.50%	5.6 ft/s	0.07 min	4.36 cfs	836.17	835.81	840.36	841.25	835.37	835.01
										30 in											830.93	
R108A	**R108**	0.25 ac	0.60	0.15 ac-imp	0.15 ac-imp	4.38 in/hr	20.00 min	0.66 cfs	**26 ft**	**12 in**	0.013	0.03%	0.50%	3.2 ft/s	0.14 min	2.52 cfs	836.16	836.03	839.93	839.87	835.36	835.23
R108	**R107**	0.25 ac	0.60	0.15 ac-imp	0.30 ac-imp	4.36 in/hr	20.14 min	1.31 cfs	**16 ft**	**12 in**	0.013	0.13%	0.50%	3.2 ft/s	0.08 min	2.52 cfs	836.03	835.94	839.87	839.78	835.23	835.14
R107	**R106**	0.00 ac	0.60	0.00 ac-imp	0.30 ac-imp	4.35 in/hr	20.22 min	1.31 cfs	**219 ft**	**12 in**	0.013	0.13%	0.50%	3.2 ft/s	1.14 min	2.52 cfs	835.94	834.85	839.78	839.40	835.14	834.05
R106	**R105**	0.00 ac	0.60	0.00 ac-imp	1.28 ac-imp	4.23 in/hr	21.36 min	5.43 cfs	**140 ft**	**18 in**	0.013	0.27%	0.28%	3.1 ft/s	0.74 min	5.56 cfs	834.85	834.46	839.40	840.08	833.65	833.26
R105	**R104**	0.00 ac	0.60	0.00 ac-imp	1.28 ac-imp	4.16 in/hr	22.10 min	5.33 cfs	**117 ft**	**24 in**	0.013	0.06%	0.20%	3.2 ft/s	0.60 min	10.12 cfs	834.46	834.22	840.08	840.77	832.86	832.62
R104	**R103**	0.00 ac	0.60	0.00 ac-imp	1.28 ac-imp	4.10 in/hr	22.70 min	5.26 cfs	**116 ft**	**24 in**	0.013	0.05%	0.20%	3.2 ft/s	0.60 min	10.12 cfs	834.22	833.99	840.77	840.10	832.62	832.39
R103	**R49**	0.00 ac	0.60	0.00 ac-imp	1.28 ac-imp	4.04 in/hr	23.30 min	5.18 cfs	**89 ft**	**30 in**	0.013	0.02%	0.13%	3.0 ft/s	0.49 min	14.79 cfs	833.99	833.87	840.10	839.30	831.99	831.87
R49	**R25**	0.00 ac	0.60	0.00 ac-imp	1.98 ac-imp	4.00 in/hr	23.80 min	7.92 cfs	**184 ft**	**30 in**	0.013	0.04%	0.13%	3.0 ft/s	1.02 min	14.79 cfs	833.87	833.64	839.30	839.39	831.87	831.64
R25	**R98A**	0.00 ac	0.60	0.00 ac-imp	2.63 ac-imp	3.90 in/hr	24.81 min	10.26 cfs	**184 ft**	**30 in**	0.013	0.06%	0.13%	3.0 ft/s	1.02 min	14.79 cfs	833.64	833.40	839.39	841.31	831.64	831.40
R98A	**R98**	0.00 ac	0.60	0.00 ac-imp	2.63 ac-imp	3.82 in/hr	25.83 min	10.03 cfs	**72 ft**	**30 in**	0.013	0.06%	0.13%	3.0 ft/s	0.40 min	14.79 cfs	833.40	833.30	841.31	840.75	831.40	831.30
R98	**R97**	0.00 ac	0.60	0.00 ac-imp	2.63 ac-imp	3.79 in/hr	26.23 min	9.94 cfs	**77 ft**	**30 in**	0.013	0.06%	0.13%	3.0 ft/s	0.43 min	14.79 cfs	833.30	833.20	840.75	840.38	831.30	831.20
R97	**R185B**	0.00 ac	0.60	0.00 ac-imp	3.46 ac-imp	3.75 in/hr	26.66 min	12.99 cfs	**62 ft**	**30 in**	0.013	0.10%	0.13%	3.0 ft/s	0.34 min	14.79 cfs	833.20	833.12	840.38	840.79	831.20	831.12
R185B	**R185A**	0.00 ac	0.60	0.00 ac-imp	3.46 ac-imp	3.72 in/hr	27.00 min	12.90 cfs	**125 ft**	**30 in**	0.013	0.10%	0.15%	3.2 ft/s	0.64 min	15.89 cfs	833.12	832.93	840.79	841.25	831.12	830.93
R185A	**R185**	0.00 ac	0.60	0.00 ac-imp	4.39 ac-imp	3.67 in/hr	27.64 min	16.14 cfs	**186 ft**	**30 in**	0.013	0.15%	0.18%	3.5 ft/s	0.87 min	17.40 cfs	832.93	832.60	841.25	831.85	830.93	830.60
R184	**R183**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**160 ft**	**30 in**	0.013	0.00%	0.00%	0.3 ft/s	10.06 min	1.30 cfs	836.50	836.50	838.08	841.88	834.50	834.50
R183	**R182**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**99 ft**	**30 in**	0.013	0.00%	0.00%	0.3 ft/s	6.24 min	1.30 cfs	836.50	836.50	841.88	842.15	834.50	834.50
R182	**R181**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**152 ft**	**30 in**	0.013	0.00%	0.00%	0.3 ft/s	9.58 min	1.30 cfs	836.50	836.50	842.15	838.08	834.50	834.50
R95	**R94**	0.48 ac	0.60	0.29 ac-imp	0.29 ac-imp	4.38 in/hr	20.00 min	1.26 cfs	**75 ft**	**12 in**	0.013	0.12%	0.40%	2.9 ft/s	0.44 min	2.25 cfs	832.88	832.58	835.00	836.48	832.08	831.78
R94	**R93**	0.18 ac	0.60	0.11 ac-imp	0.40 ac-imp	4.33 in/hr	20.44 min	1.71 cfs	**75 ft**	**12 in**	0.013	0.23%	0.40%	2.9 ft/s	0.44 min	2.25 cfs	832.58	832.28	836.48	836.48	831.78	831.48
R93	**R74**	0.18 ac	0.60	0.11 ac-imp	0.50 ac-imp	4.28 in/hr	20.88 min	2.16 cfs	**78 ft**	**12 in**	0.013	0.37%	0.50%	3.2 ft/s	0.40 min	2.52 cfs	832.28	831.89	836.48	837.96	831.48	831.09
										30 in											827.00	
R91	**R90**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**180 ft**	**30 in**	0.013	0.00%	0.00%	0.3 ft/s	11.35 min	1.30 cfs	829.00	829.00	831.09	842.25	827.00	827.00
R90	**R75**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	3.41 in/hr	31.35 min	0.00 cfs	**72 ft**	**30 in**	0.013	0.00%	0.00%	0.3 ft/s	4.54 min	1.30 cfs	829.00	829.00	842.25	842.14	827.00	827.00
										30 in											827.00	
R89A	**R89**	0.53 ac	0.60	0.32 ac-imp	0.32 ac-imp	4.38 in/hr	20.00 min	1.40 cfs	**30 ft**	**12 in**	0.013	0.15%	0.50%	3.2 ft/s	0.16 min	2.52 cfs	838.44	838.29	841.53	841.53	837.64	837.49
R89	**R77**	0.70 ac	0.60	0.42 ac-imp	0.74 ac-imp	4.36 in/hr	20.16 min	3.23 cfs	**21 ft**	**12 in**	0.013	0.82%	2.00%	6.4 ft/s	0.06 min	5.04 cfs	838.29	837.86	841.53	842.42	837.49	837.06
										30 in											831.25	
R88A	**R88**	0.37 ac	0.60	0.22 ac-imp	0.22 ac-imp	4.38 in/hr	20.00 min	0.96 cfs	**29 ft**	**12 in**	0.013	0.07%	0.45%	3.0 ft/s	0.16 min	2.39 cfs	839.17	839.04	842.46	842.46	838.37	838.24
R88	**R85**	0.43 ac	0.60	0.26 ac-imp	0.48 ac-imp	4.36 in/hr	20.16 min	2.07 cfs	**26 ft**	**12 in**	0.013	0.34%	0.45%	3.0 ft/s	0.14 min	2.39 cfs	839.04	838.92	842.46	843.40	838.24	838.12
										12 in											838.12	
R87A	**R87**	0.16 ac	0.60	0.10 ac-imp	0.10 ac-imp	4.38 in/hr	20.00 min	0.42 cfs	**29 ft**	**12 in**	0.013	0.01%	0.45%	3.0 ft/s	0.16 min	2.39 cfs	840.01	839.88	843.26	843.26	839.21	839.08
R87	**R86**	0.57 ac	0.60	0.34 ac-imp	0.44 ac-imp	4.36 in/hr	20.16 min	1.91 cfs	**22 ft**	**12 in**	0.013	0.29%	0.45%	3.0 ft/s	0.12 min	2.39 cfs	839.88	839.79	843.26	844.29	839.08	838.99
R86	**R85**	0.00 ac	0.60	0.00 ac-imp	0.44 ac-imp	4.34 in/hr	20.28 min	1.91 cfs	**192 ft**	**12 in**	0.013	0.29%	0.45%	3.0 ft/s	1.05 min	2.39 cfs	839.79	838.92	844.29	843.40	838.99	838.12
R85	**R81**	0.00 ac	0.60	0.00 ac-imp	0.91 ac-imp	4.23 in/hr	21.33 min	3.87 cfs	**159 ft**	**12 in**	0.013	1.17%	3.00%	7.9 ft/s	0.34 min	6.17 cfs	838.92	834.15	843.40	836.50	838.12	833.35
										24 in											832.63	
R84	**R83**	0.86 ac	0.60	0.51 ac-imp	0.51 ac-imp	4.38 in/hr	20.00 min	2.25 cfs	**139 ft**	**15 in**	0.013	0.12%	0.35%	3.1 ft/s	0.75 min	3.82 cfs	835.33	834.85	838.20	838.21	834.31	833.82
R83	**R82**	0.29 ac	0.60	0.17 ac-imp	0.69 ac-imp	4.29 in/hr	20.75 min	2.95 cfs	**71 ft**	**15 in**	0.013	0.21%	0.35%	3.1 ft/s	0.38 min	3.82 cfs	834.85	834.60	838.21	836.50	833.82	833.57
R82	**R81**	0.49 ac	0.60	0.29 ac-imp	0.98 ac-imp	4.26 in/hr	21.12 min	4.17 cfs	**86 ft**	**15 in**	0.013	0.41%	0.40%	3.3 ft/s	0.43 min	4.09 cfs	834.60	834.24	836.50	836.50	833.57	833.23
R81	**R80**	0.56 ac	0.60	0.33 ac-imp	2.23 ac-imp	4.21 in/hr	21.56 min	9.39 cfs	**197 ft**	**24 in**	0.013	0.17%	0.20%	3.2 ft/s	1.02 min	10.12 cfs	834.24	833.85	836.50	836.50	832.63	832.24
R80	**R79**	0.61 ac	0.60	0.37 ac-imp	2.60 ac-imp	4.11 in/hr	22.57 min	10.68 cfs	**49 ft**	**24 in**	0.013	0.22%	0.20%	3.2 ft/s	0.25 min	10.12 cfs	833.85	833.74	836.50	836.50	832.24	832.14
R79	**R78**	0.20 ac	0.60	0.12 ac-imp	2.72 ac-imp	4.09 in/hr	22.83 min	11.10 cfs	**113 ft**	**24 in**	0.013	0.24%	0.25%	3.6 ft/s	0.52 min	11.31 cfs	833.74	833.45	836.50	837.00	832.14	831.85
R78	**R77**	0.06 ac	0.60	0.04 ac-imp	2.75 ac-imp	4.04 in/hr	23.35 min	11.11 cfs	**82 ft**	**24 in**	0.013	0.24%	0.25%	3.6 ft/s	0.38 min	11.31 cfs	833.45	833.25	837.00	842.42	831.85	831.65
R77	**R76**	0.00 ac	0.60	0.00 ac-imp	3.49 ac-imp	4.00 in/hr	23.73 min	13.97 cfs	**71 ft**	**30 in**	0.013	0.12%	0.13%	3.0 ft/s	0.39 min	14.79 cfs	833.25	833.16	842.42	842.73	831.25	831.16
R76	**R75**	0.00 ac	0.60	0.00 ac-imp	3.49 ac-imp	3.97 in/hr	24.12 min	13.85 cfs	**212 ft**	**30 in**	0.013	0.11%	0.13%	3.0 ft/s	1.17 min	14.79 cfs	833.16	832.88	842.73	842.14	831.16	830.88
R75	**R74**	0.00 ac	0.60	0.00 ac-imp	3.49 ac-imp	3.86 in/hr	25.29 min	13.49 cfs	**127 ft**	**30 in**	0.013	0.11%	0.00%	0.3 ft/s	8.01 min	1.30 cfs	829.23	829.10	842.14	837.96	827.00	827.00
R74	**R73**	0.10 ac	0.60	0.06 ac-imp	4.06 ac-imp	3.28 in/hr	33.30 min	13.32 cfs	**91 ft**	**30 in**	0.013	0.10%	0.00%	0.3 ft/s	5.76 min	1.30 cfs	829.10	829.00	837.96	828.86	827.00	827.00
R128	**R127**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**137 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	0.94 min	11.96 cfs	832.16	832.04	834.74	835.15	830.16	830.04
R127	**R126**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.27 in/hr	20.94 min	0.00 cfs	**310 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	2.12 min	11.96 cfs	832.04	831.78	835.15	839.79	830.04	829.78
R126	**R125**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.06 in/hr	23.06 min	0.00 cfs	**88 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	0.60 min	11.96 cfs	831.78	831.70	839.79	840.36	829.78	829.70
R125	**R124**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.01 in/hr	23.66 min	0.00 cfs	**90 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	0.61 min	11.96 cfs	831.70	831.63	840.36	839.91	829.70	829.63
R124	**R123**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	3.95 in/hr	24.27 min	0.00 cfs	**116 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	0.79 min	11.96 cfs	831.63	831.53	839.91	839.21	829.63	829.53
R123	**R122**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	3.88 in/hr	25.06 min	0.00 cfs	**290 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	1.98 min	11.96 cfs	831.53	831.28	839.21	840.33	829.53	829.28
R122	**R121**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	3.72 in/hr	27.05 min	0.00 cfs	**119 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	0.81 min	11.96 cfs	831.28	831.18	840.33	840.60	829.28	829.18
R121	**R120**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	3.66 in/hr	27.86 min	0.00 cfs	**84 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	0.57 min	11.96 cfs	831.18	831.11	840.60	834.70	829.18	829.11
R120	**R119**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	3.61 in/hr	28.44 min	0.00 cfs	**330 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	2.26 min	11.96 cfs	831.11	830.83	834.70	829.80	829.11	828.83
R119	**R118**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	3.45 in/hr	30.69 min	0.00 cfs	**329 ft**	**30 in**	0.013	0.00%	0.085%	2.4 ft/s	2.25 min	11.96 cfs	830.83	830.55	829.80	829.80	828.83	828.55

POND 2

FROM STR	TO STR	INCRE-MENT DRAINAGE AREA (A)	C RUNOFF COEF.	EQUIV. AREA (CxA) ACRES IMPERVIOUS	SUM OF EQUIVALENT AREAS SUM CxA	I RAINFALL INTENSITY (in/hr)	TIME OF CONC. T (min)	Q=CIA C.F.S. FLOW	LENGTH OF LINE (ft)	DIA. OF PIPE (IN.)	PIPE ROUGH COEF (n)	MIN HG BASED ON "Q" (%)	DESIGN SLOPE OF PIPE (%)	VELOCITY IN PIPE FLOWING FULL (fps)	TIME OF FLOW (min)	CAPAC-ITY OF SEWER (cfs)	HYDRAULIC GRADE UP STREAM	HYDRAULIC GRADE DOWN STREAM	GROUND ELEV UPPER END	GROUND ELEV LOWER END	INVERT ELEVATION UPPER END	INVERT ELEVATION LOWER END
R14	**R11**	0.35 ac	0.60	0.21 ac-imp	0.21 ac-imp	4.38 in/hr	20.00 min	0.93 cfs	**13 ft**	**12 in**	0.013	0.07%	0.30%	2.5 ft/s	0.09 min	1.95 cfs	831.28	831.24	834.84	836.50	830.48	830.44
										36 in											829.84	
R15	**R10**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**99 ft**	**18 in**	0.013	0.00%	0.25%	3.0 ft/s	0.56 min	5.25 cfs	831.06	830.81	834.05	834.50	829.86	829.61
										36 in											829.61	
R13	**R12**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**48 ft**	**36 in**	0.013	0.00%	0.10%	3.0 ft/s	0.27 min	21.09 cfs	832.41	832.36	833.67	836.39	830.01	829.96
R12	**R11**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.35 in/hr	20.27 min	0.00 cfs	**122 ft**	**36 in**	0.013	0.00%	0.10%	3.0 ft/s	0.68 min	21.09 cfs	832.36	832.24	836.39	836.50	829.96	829.84
R11	**R10**	0.00 ac	0.60	0.00 ac-imp	0.21 ac-imp	4.27 in/hr	20.95 min	0.91 cfs	**224 ft**	**36 in**	0.013	0.00%	0.10%	3.0 ft/s	1.25 min	21.09 cfs	832.24	832.01	836.50	834.50	829.84	829.61
R10	**R9**	0.00 ac	0.60	0.00 ac-imp	0.21 ac-imp	4.15 in/hr	22.20 min	0.88 cfs	**11 ft**	**36 in**	0.013	0.00%	0.10%	3.0 ft/s	0.06 min	21.09 cfs	832.01	832.00	834.50	833.27	829.61	829.60
R23	**R22**	0.62 ac	0.60	0.37 ac-imp	0.37 ac-imp	4.38 in/hr	20.00 min	1.64 cfs	**29 ft**	**12 in**	0.013	0.21%	0.50%	3.2 ft/s	0.15 min	2.52 cfs	834.58	834.43	837.77	837.77	833.78	833.63
R22	**R19**	0.61 ac	0.60	0.37 ac-imp	0.74 ac-imp	4.36 in/hr	20.15 min	3.23 cfs	**162 ft**	**12 in**	0.013	0.82%	1.00%	4.5 ft/s	0.60 min	3.56 cfs	834.43	832.81	837.77	835.56	833.63	832.01
										18 in											831.61	
R8	**R7**	0.81 ac	0.60	0.48 ac-imp	0.48 ac-imp	4.38 in/hr	20.00 min	2.12 cfs	**65 ft**	**12 in**	0.013	0.35%	0.45%	3.0 ft/s	0.36 min	2.39 cfs	832.13	831.83	834.55	834.55	831.33	831.03
R7	**R2**	0.47 ac	0.60	0.28 ac-imp	0.77 ac-imp	4.34 in/hr	20.36 min	3.33 cfs	**109 ft**	**15 in**	0.013	0.26%	0.32%	3.0 ft/s	0.61 min	3.65 cfs	831.83	831.48	834.55	835.88	830.82	830.48
										24 in											830.48	
R6	**R5**	0.50 ac	0.60	0.30 ac-imp	0.30 ac-imp	4.38 in/hr	20.00 min	1.30 cfs	**143 ft**	**15 in**	0.013	0.04%	0.32%	3.0 ft/s	0.80 min	3.65 cfs	834.01	833.56	836.10	836.20	832.61	832.16
R5	**R4**	0.67 ac	0.60	0.40 ac-imp	0.70 ac-imp	4.29 in/hr	20.80 min	3.00 cfs	**140 ft**	**15 in**	0.013	0.21%	0.32%	3.0 ft/s	0.78 min	3.65 cfs	833.56	833.11	836.20	835.10	832.16	831.71
R4	**R3**	0.66 ac	0.60	0.39 ac-imp	1.09 ac-imp	4.21 in/hr	21.58 min	4.60 cfs	**141 ft**	**18 in**	0.013	0.19%	0.25%	3.0 ft/s	0.79 min	5.25 cfs	833.11	832.75	835.10	835.20	831.51	831.15
R3	**R2**	0.50 ac	0.60	0.30 ac-imp	1.39 ac-imp	4.13 in/hr	22.38 min	5.75 cfs	**223 ft**	**18 in**	0.013	0.30%	0.30%	3.3 ft/s	1.14 min	5.75 cfs	832.75	832.08	835.20	835.88	831.15	830.48
R2	**R1**	0.00 ac	0.60	0.00 ac-imp	2.16 ac-imp	4.02 in/hr	23.52 min	8.68 cfs	**103 ft**	**24 in**	0.013	0.15%	0.20%	3.2 ft/s	0.53 min	10.12 cfs	832.08	831.88	835.88	836.00	830.48	830.28
R1	**R17**	0.00 ac	0.60	0.00 ac-imp	2.16 ac-imp	3.97 in/hr	24.05 min	8.58 cfs	**135 ft**	**24 in**	0.013	0.14%	0.20%	3.2 ft/s	0.70 min	10.12 cfs	831.88	831.61	836.00	834.57	830.28	830.01
										30 in											830.01	
R21	**R20**	0.17 ac	0.60	0.10 ac-imp	0.10 ac-imp	4.38 in/hr	20.00 min	0.44 cfs	**70 ft**	**12 in**	0.013	0.02%	0.90%	4.3 ft/s	0.27 min	3.38 cfs	834.34	833.70	836.63	835.22	833.35	832.71
R20	**R19**	0.32 ac	0.60	0.19 ac-imp	0.29 ac-imp	4.35 in/hr	20.27 min	1.28 cfs	**156 ft**	**12 in**	0.013	0.13%	0.45%	3.0 ft/s	0.85 min	2.39 cfs	833.70	833.00	835.22	835.56	832.71	832.01
R19	**R18**	0.30 ac	0.60	0.18 ac-imp	1.22 ac-imp	4.26 in/hr	21.13 min	5.18 cfs	**138 ft**	**18 in**	0.013	0.24%	0.30%	3.3 ft/s	0.71 min	5.75 cfs	833.00	832.59	835.56	834.63	831.61	831.20
R18	**R17**	0.29 ac	0.60	0.17 ac-imp	1.39 ac-imp	4.18 in/hr	21.83 min	5.82 cfs	**147 ft**	**18 in**	0.013	0.31%	0.40%	3.8 ft/s	0.65 min	6.64 cfs	832.59	832.00	834.63	834.57	831.20	830.61
R17	**R16**	0.23 ac	0.60	0.14 ac-imp	3.69 ac-imp	4.12 in/hr	22.48 min	15.20 cfs	**49 ft**	**30 in**	0.013	0.14%	0.20%	3.8 ft/s	0.22 min	18.57 cfs	832.00	831.90	834.57	830.92	830.01	829.90

POND 3

FROM STR	TO STR	INCRE-MENT DRAINAGE AREA (A)	C RUNOFF COEF.	EQUIV. AREA (CxA) ACRES IMPERVIOUS	SUM OF EQUIVALENT AREAS SUM CxA	I RAINFALL INTENSITY (in/hr)	TIME OF CONC. T (min)	Q=CIA C.F.S. FLOW	LENGTH OF LINE (ft)	DIA. OF PIPE (IN.)	PIPE ROUGH COEF (n)	MIN HG BASED ON "Q" (%)	DESIGN SLOPE OF PIPE (%)	VELOCITY IN PIPE FLOWING FULL (fps)	TIME OF FLOW (min)	CAPAC-ITY OF SEWER (cfs)	HYDRAULIC GRADE UP STREAM	HYDRAULIC GRADE DOWN STREAM	GROUND ELEV UPPER END	GROUND ELEV LOWER END	INVERT ELEVATION UPPER END	INVERT ELEVATION LOWER END
R155A	**R155**	0.28 ac	0.40	0.11 ac-imp	0.11 ac-imp	4.38 in/hr	20.00 min	0.49 cfs	**38 ft**	**12 in**	0.013	0.02%	1.30%	5.2 ft/s	0.12 min	4.06 cfs	833.79	833.30	833.49	833.00	832.99	832.50
R154A	**R154**	0.26 ac	0.40	0.10 ac-imp	0.10 ac-imp	4.38 in/hr	20.00 min	0.46 cfs	**20 ft**	**12 in**	0.013	0.02%	2.33%	6.9 ft/s	0.05 min	5.44 cfs	833.77	833.30	833.47	833.00	832.97	832.50
R148A	**R148**	0.29 ac	0.60	0.18 ac-imp	0.18 ac-imp	4.38 in/hr	20.00 min	0.77 cfs	**30 ft**	**12 in**	0.013	0.05%	0.50%	3.2 ft/s	0.16 min	2.52 cfs	836.17	836.02	838.97	838.97	835.37	835.22
R148	**R143**	0.23 ac	0.60	0.14 ac-imp	0.31 ac-imp	4.36 in/hr	20.16 min	1.37 cfs	**15 ft**	**12 in**	0.013	0.15%	0.50%	3.2 ft/s	0.08 min	2.52 cfs	836.02	835.94	838.97	838.59	835.22	835.14
										18 in											832.39	
R149	**R135**	0.30 ac	0.60	0.18 ac-imp	0.18 ac-imp	4.38 in/hr	20.00 min	0.79 cfs	**76 ft**	**12 in**	0.013	0.05%	0.50%	3.2 ft/s	0.39 min	2.52 cfs	834.70	834.33	837.80	838.32	833.90	833.53
										18 in											831.53	
R147	**R146**	0.52 ac	0.60	0.31 ac-imp	0.31 ac-imp	4.38 in/hr	20.00 min	1.35 cfs	**129 ft**	**15 in**	0.013	0.04%	0.35%	3.1 ft/s	0.69 min	3.82 cfs	835.36	834.90	839.00	838.32	834.36	833.90
R146	**R145**	0.33 ac	0.60	0.20 ac-imp	0.51 ac-imp	4.30 in/hr	20.69 min	2.18 cfs	**137 ft**	**15 in**	0.013	0.11%	0.35%	3.1 ft/s	0.73 min	3.82 cfs	834.90	834.42	838.32	838.27	833.90	833.42
R145	**R144**	0.43 ac	0.60	0.26 ac-imp	0.77 ac-imp	4.22 in/hr	21.43 min	3.24 cfs	**153 ft**	**15 in**	0.013	0.25%	0.35%	3.1 ft/s	0.82 min	3.82 cfs	834.42	833.89	838.27	839.05	833.42	832.89
R144	**R143**	0.12 ac	0.60	0.07 ac-imp	0.84 ac-imp	4.14 in/hr	22.24 min	3.47 cfs	**84 ft**	**15 in**	0.013	0.29%	0.35%	3.1 ft/s	0.45 min	3.82 cfs	833.89	833.59	839.05	838.59	832.89	832.59
R143	**R142A**	0.00 ac	0.60	0.00 ac-imp	0.31 ac-imp	4.10 in/hr	22.70 min	1.29 cfs	**38 ft**	**18 in**	0.013	0.01%	0.25%	3.0 ft/s	0.21 min	5.25 cfs	833.59	833.50	838.59	838.93	832.39	832.30
R142A	**R142**	0.44 ac	0.60	0.26 ac-imp	0.58 ac-imp	4.08 in/hr	22.91 min	2.35 cfs	**26 ft**	**18 in**	0.013	0.05%	0.25%	3.0 ft/s	0.15 min	5.25 cfs	832.92	832.85	838.93	838.99	831.72	831.65
R142	**R141**	0.27 ac	0.60	0.16 ac-imp	0.74 ac-imp	4.06 in/hr	23.06 min	3.00 cfs	**51 ft**	**18 in**	0.013	0.08%	0.25%	3.0 ft/s	0.29 min	5.25 cfs	832.85	832.73	838.99	839.08	831.65	831.53
R141	**R135**	0.00 ac	0.60	0.00 ac-imp	0.74 ac-imp	4.04 in/hr	23.34 min	2.98 cfs	**90 ft**	**18 in**	0.013	0.08%	0.25%	3.0 ft/s	0.50 min	5.25 cfs	832.73	832.50	839.08	838.32	831.53	831.30
										24 in											831.50	
R151A	**R151**	0.30 ac	0.60	0.18 ac-imp	0.18 ac-imp	4.38 in/hr	20.00 min	0.78 cfs	**26 ft**	**12 in**	0.013	0.05%	0.50%	3.2 ft/s	0.14 min	2.52 cfs	833.82	833.69	837.91	837.85	833.02	832.89
										12 in											830.93	
R153	**R152**	0.19 ac	0.60	0.11 ac-imp	0.11 ac-imp	4.38 in/hr	20.00 min	0.50 cfs	**88 ft**	**12 in**	0.013	0.02%	0.45%	3.0 ft/s	0.48 min	2.39 cfs	833.32	832.93	838.04	839.61	832.52	832.13
R152	**R151**	0.00 ac	0.60	0.00 ac-imp	0.11 ac-imp	4.32 in/hr	20.48 min	0.49 cfs	**142 ft**	**12 in**	0.013	0.02%	0.45%	3.0 ft/s	0.78 min	2.39 cfs	832.93	832.29	839.61	837.85	832.13	831.49
R151	**R133**	0.22 ac	0.60	0.13 ac-imp	0.42 ac-imp	4.24 in/hr	21.26 min	1.79 cfs	**19 ft**	**12 in**	0.013	0.25%	0.45%	3.0 ft/s	0.10 min	2.39 cfs	832.29	832.21	837.85	838.47	831.49	831.41
										24 in											830.93	
R140	**R139**	0.09 ac	0.60	0.05 ac-imp	0.05 ac-imp	4.38 in/hr	20.00 min	0.23 cfs	**126 ft**	**12 in**	0.013	0.00%	0.45%	3.0 ft/s	0.69 min	2.39 cfs	835.85	835.28	839.00	838.30	835.05	834.48
R139	**R138**	0.20 ac	0.60	0.12 ac-imp	0.18 ac-imp	4.30 in/hr	20.69 min	0.75 cfs	**135 ft**	**12 in**	0.013	0.04%	0.45%	3.0 ft/s	0.74 min	2.39 cfs	835.28	834.67	838.30	838.00	834.48	833.87
R138	**R137**	0.22 ac	0.60	0.13 ac-imp	0.31 ac-imp	4.22 in/hr	21.43 min	1.31 cfs	**140 ft**	**12 in**	0.013	0.13%	0.45%	3.0 ft/s	0.77 min	2.39 cfs	834.67	834.04	838.00	837.31	833.87	833.24
R137	**R136A**	0.09 ac	0.60	0.05 ac-imp	0.36 ac-imp	4.15 in/hr	22.20 min	1.50 cfs	**146 ft**	**12 in**	0.013	0.18%	0.45%	3.0 ft/s	0.80 min	2.39 cfs	834.04	833.39	837.31	837.73	833.24	832.59
R136A	**R136**	0.40 ac	0.60	0.24 ac-imp	0.60 ac-imp	4.07 in/hr	23.00 min	2.44 cfs	**30 ft**	**12 in**	0.013	0.47%	0.50%	3.2 ft/s	0.16 min	2.52 cfs	833.39	833.24	837.73	837.73	832.59	832.44
R136	**R135**	0.39 ac	0.60	0.24 ac-imp	0.84 ac-imp	4.06 in/hr	23.15 min	3.39 cfs	**15 ft**	**15 in**	0.013	0.27%	0.90%	5.0 ft/s	0.05 min	6.13 cfs	833.24	833.10	837.73	838.32	832.24	832.10
R135	**R134**	0.00 ac	0.60	0.00 ac-imp	1.75 ac-imp	4.05 in/hr	23.20 min	7.10 cfs	**102 ft**	**24 in**	0.013	0.10%	0.25%	3.6 ft/s	0.47 min	11.31 cfs	833.10	832.85	838.32	837.81	831.50	831.25
R134	**R133**	0.15 ac	0.60	0.09 ac-imp	1.84 ac-imp	4.01 in/hr	23.67 min	7.39 cfs	**128 ft**	**24 in**	0.013	0.11%	0.25%	3.6 ft/s	0.59 min	11.31 cfs	832.85	832.53	837.81	838.47	831.25	830.93
R133	**R132**	0.00 ac	0.60	0.00 ac-imp	2.26 ac-imp	3.95 in/hr	24.27 min	8.95 cfs	**50 ft**	**24 in**	0.013	0.16%	0.40%	4.6 ft/s	0.18 min	14.31 cfs	832.53	832.33	838.47	833.84	830.93	830.73
R132	**R131**	0.00 ac	0.60	0.00 ac-imp	2.26 ac-imp	3.94 in/hr	24.45 min	8.92 cfs	**32 ft**	**24 in**	0.013	0.15%	0.40%	4.6 ft/s	0.12 min	14.31 cfs	832.33	832.20	833.84	831.60	830.73	830.60

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PITTSFIELD GLEN
STORM SEWER CALCULATIONS

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0

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POND 4

FROM STR	TO STR	INCREMENT DRAINAGE AREA (A)	C RUNOFF COEF.	EQUIV. AREA (CxA) ACRES IMPERVIOUS	SUM OF EQUIVALENT AREAS SUM CxA	I RAINFALL INTENSITY (in/hr)	TIME OF CONC. T (min)	Q=CIA C.F.S. FLOW	LENGTH OF LINE (ft)	DIA. OF PIPE (IN.)	PIPE ROUGH COEF (n)	MIN HG BASED ON "Q" (%)	DESIGN SLOPE OF PIPE (%)	VELOCITY IN PIPE FLOWING FULL (fps)	TIME OF FLOW (min)	CAPACITY OF SEWER (cfs)	HYDRAULIC GRADE UP STREAM	HYDRAULIC GRADE DOWN STREAM	GROUND ELEV UPPER END	GROUND ELEV LOWER END	INVERT ELEVATION UPPER END	INVERT ELEVATION LOWER END
R188	**R170**	0.12 ac	0.60	0.07 ac-imp	0.07 ac-imp	4.38 in/hr	20.00 min	0.31 cfs	**59 ft**	**15 in**	0.013	0.00%	0.45%	3.5 ft/s	0.28 min	4.33 cfs	831.04	830.77	830.42	832.37	830.04	829.77
										15 in											828.99	
R173	**R168**	0.23 ac	0.60	0.14 ac-imp	0.14 ac-imp	4.38 in/hr	20.00 min	0.60 cfs	**191 ft**	**12 in**	0.013	0.03%	0.45%	3.0 ft/s	1.04 min	2.39 cfs	830.23	829.37	832.28	832.81	829.43	828.57
										24 in											828.57	
R166A	**R166**	0.49 ac	0.60	0.29 ac-imp	0.29 ac-imp	4.38 in/hr	20.00 min	1.28 cfs	**26 ft**	**12 in**	0.013	0.13%	0.50%	3.2 ft/s	0.14 min	2.52 cfs	833.07	832.94	835.28	835.34	832.16	832.03
R166	**R167B**	0.57 ac	0.60	0.34 ac-imp	0.63 ac-imp	4.36 in/hr	20.14 min	2.76 cfs	**109 ft**	**12 in**	0.013	0.60%	0.50%	3.2 ft/s	0.57 min	**2.52 cfs**	832.94	832.29	835.34	834.80	832.03	831.49
										24 in											828.30	
R160A	**R160**	0.08 ac	0.60	0.05 ac-imp	0.05 ac-imp	4.38 in/hr	20.00 min	0.22 cfs	**30 ft**	**12 in**	0.013	0.00%	0.50%	3.2 ft/s	0.16 min	2.52 cfs	832.88	832.73	835.60	835.60	832.08	831.93
R160	**R167A**	0.09 ac	0.60	0.05 ac-imp	0.10 ac-imp	4.36 in/hr	20.16 min	0.45 cfs	**21 ft**	**12 in**	0.013	0.02%	0.50%	3.2 ft/s	0.11 min	2.52 cfs	832.73	832.62	835.60	835.75	831.93	831.82
										24 in											828.18	
R172	**R171**	0.45 ac	0.60	0.27 ac-imp	0.27 ac-imp	4.38 in/hr	20.00 min	1.17 cfs	**131 ft**	**12 in**	0.013	0.11%	0.45%	3.0 ft/s	0.72 min	2.39 cfs	832.04	831.45	834.49	833.76	830.71	830.12
R171	**R170**	0.29 ac	0.60	0.17 ac-imp	0.44 ac-imp	4.30 in/hr	20.72 min	1.90 cfs	**205 ft**	**12 in**	0.013	0.28%	0.45%	3.1 ft/s	1.12 min	2.40 cfs	831.45	830.52	833.76	832.37	830.12	829.19
R170	**R169**	0.46 ac	0.60	0.28 ac-imp	0.79 ac-imp	4.18 in/hr	21.83 min	3.31 cfs	**67 ft**	**15 in**	0.013	0.26%	0.40%	3.3 ft/s	0.34 min	4.09 cfs	830.52	830.26	832.37	832.37	828.99	828.73
R169	**R168**	0.23 ac	0.60	0.14 ac-imp	0.93 ac-imp	4.15 in/hr	22.17 min	3.85 cfs	**21 ft**	**15 in**	0.013	0.35%	0.40%	3.4 ft/s	0.11 min	4.11 cfs	830.26	830.17	832.37	832.81	828.73	828.64
R168	**R167B**	0.00 ac	0.60	0.00 ac-imp	1.07 ac-imp	4.14 in/hr	22.28 min	4.41 cfs	**135 ft**	**24 in**	0.013	0.04%	0.20%	3.2 ft/s	0.70 min	10.12 cfs	830.17	829.90	832.81	834.80	828.57	828.30
R167B	**R167A**	0.00 ac	0.60	0.00 ac-imp	1.70 ac-imp	4.07 in/hr	22.98 min	6.92 cfs	**60 ft**	**24 in**	0.013	0.09%	0.20%	3.2 ft/s	0.31 min	10.12 cfs	829.90	829.78	834.80	835.75	828.30	828.18
R167A	**R167**	0.00 ac	0.60	0.00 ac-imp	1.80 ac-imp	4.04 in/hr	23.29 min	7.30 cfs	**34 ft**	**24 in**	0.013	0.10%	0.20%	3.2 ft/s	0.18 min	10.12 cfs	829.78	829.71	835.75	829.11	828.18	828.11
R162	**R161**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**135 ft**	**24 in**	0.013	0.00%	0.17%	3.0 ft/s	0.76 min	9.33 cfs	833.60	833.37	834.75	833.35	832.00	831.77
R164	**R163**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**135 ft**	**24 in**	0.013	0.00%	0.17%	3.0 ft/s	0.76 min	9.33 cfs	833.60	833.37	834.75	832.95	832.00	831.77
R159B	**R159A**	0.07 ac	0.60	0.04 ac-imp	0.04 ac-imp	4.38 in/hr	20.00 min	0.19 cfs	**30 ft**	**12 in**	0.013	0.00%	0.45%	3.0 ft/s	0.16 min	2.39 cfs	833.21	833.08	836.28	836.28	831.22	831.08
R159A	**R159**	0.21 ac	0.60	0.12 ac-imp	0.17 ac-imp	4.36 in/hr	20.16 min	0.73 cfs	**45 ft**	**12 in**	0.013	0.04%	0.45%	3.0 ft/s	0.25 min	2.39 cfs	833.08	832.88	836.28	837.29	831.08	830.88
										12 in											830.70	
R158B	**R158A**	0.12 ac	0.60	0.07 ac-imp	0.07 ac-imp	4.38 in/hr	20.00 min	0.31 cfs	**68 ft**	**12 in**	0.013	0.01%	0.45%	3.0 ft/s	0.37 min	2.39 cfs	832.59	832.29	836.25	836.50	830.73	830.42
R158A	**R158**	0.00 ac	0.60	0.00 ac-imp	0.07 ac-imp	4.33 in/hr	20.37 min	0.31 cfs	**54 ft**	**12 in**	0.013	0.01%	0.45%	3.0 ft/s	0.30 min	2.39 cfs	832.29	832.04	836.50	837.55	830.42	830.18
										24 in											829.32	
R159C	**R159**	0.28 ac	0.60	0.17 ac-imp	0.30 ac-imp	4.38 in/hr	20.00 min	1.33 cfs	**100 ft**	**12 in**	0.013	0.14%	0.45%	3.0 ft/s	0.55 min	2.39 cfs	831.95	831.50	836.25	837.29	831.15	830.70
R159	**R158**	0.00 ac	0.60	0.00 ac-imp	0.47 ac-imp	4.32 in/hr	20.55 min	2.04 cfs	**116 ft**	**12 in**	0.013	0.33%	0.45%	3.0 ft/s	0.64 min	2.39 cfs	831.50	830.98	837.29	835.72	830.70	830.18
R158	**R157**	0.00 ac	0.60	0.00 ac-imp	0.54 ac-imp	4.25 in/hr	21.18 min	2.31 cfs	**140 ft**	**24 in**	0.013	0.01%	0.17%	3.0 ft/s	0.79 min	9.33 cfs	830.92	830.68	837.55	836.50	829.32	829.08
R157	**R156**	0.00 ac	0.60	0.00 ac-imp	0.54 ac-imp	4.17 in/hr	21.97 min	2.27 cfs	**48 ft**	**24 in**	0.013	0.01%	0.17%	3.0 ft/s	0.27 min	9.33 cfs	830.68	830.60	836.50	830.00	829.08	829.00
R130	**R114**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**10 ft**	**15 in**	0.013	0.00%	0.50%	3.7 ft/s	0.04 min	4.57 cfs	829.68	829.63	831.72	831.82	828.68	828.63
										30 in											827.92	
R190	**R189**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.38 in/hr	20.00 min	0.00 cfs	**24 ft**	**12 in**	0.013	0.00%	0.50%	3.2 ft/s	0.12 min	2.52 cfs	828.98	828.86	831.18	831.18	828.18	828.06
R189	**R113**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	4.36 in/hr	20.12 min	0.00 cfs	**16 ft**	**12 in**	0.013	0.00%	0.50%	3.2 ft/s	0.08 min	2.52 cfs	828.86	828.78	831.18	831.59	828.06	827.98
										30 in											827.63	
R116	**R115**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	8.75 in/hr	0.00 min	0.00 cfs	**40 ft**	**30 in**	0.013	0.00%	0.13%	3.0 ft/s	0.22 min	14.79 cfs	830.11	830.06	830.62	832.50	828.11	828.06
R115	**R114**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	8.65 in/hr	0.22 min	0.00 cfs	**106 ft**	**30 in**	0.013	0.00%	0.13%	3.0 ft/s	0.59 min	14.79 cfs	830.06	829.92	832.50	831.82	828.06	827.92
R114	**R113**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	8.41 in/hr	0.81 min	0.00 cfs	**229 ft**	**30 in**	0.013	0.00%	0.13%	3.0 ft/s	1.27 min	14.79 cfs	829.92	829.63	831.82	831.59	827.92	827.63
R113	**R112**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	7.93 in/hr	2.07 min	0.00 cfs	**300 ft**	**30 in**	0.013	0.00%	0.13%	3.0 ft/s	1.66 min	14.79 cfs	829.63	829.24	831.59	831.91	827.63	827.24
R112	**R111**	0.00 ac	0.60	0.00 ac-imp	0.00 ac-imp	7.37 in/hr	3.73 min	0.00 cfs	**105 ft**	**30 in**	0.013	0.00%	0.13%	3.0 ft/s	0.58 min	14.79 cfs	829.24	829.10	831.91	818.29	827.24	827.10

POND 5

FROM STR	TO STR	INCREMENT DRAINAGE AREA (A)	C RUNOFF COEF.	EQUIV. AREA (CxA) ACRES IMPERVIOUS	SUM OF EQUIVALENT AREAS SUM CxA	I RAINFALL INTENSITY (in/hr)	TIME OF CONC. T (min)	Q=CIA C.F.S. FLOW	LENGTH OF LINE (ft)	DIA. OF PIPE (IN.)	PIPE ROUGH COEF (n)	MIN HG BASED ON "Q" (%)	DESIGN SLOPE OF PIPE (%)	VELOCITY IN PIPE FLOWING FULL (fps)	TIME OF FLOW (min)	CAPACITY OF SEWER (cfs)	HYDRAULIC GRADE UP STREAM	HYDRAULIC GRADE DOWN STREAM	GROUND ELEV UPPER END	GROUND ELEV LOWER END	INVERT ELEVATION UPPER END	INVERT ELEVATION LOWER END
R99	**R99A**	0.03 ac	0.60	0.02 ac-imp	0.02 ac-imp	4.38 in/hr	20.00 min	0.08 cfs	**29 ft**	**12 in**	0.013	0.00%	1.00%	4.5 ft/s	0.11 min	3.56 cfs	836.85	836.56	840.57	840.57	836.05	835.76
R99A	**R29**	0.03 ac	0.60	0.02 ac-imp	0.04 ac-imp	4.36 in/hr	20.11 min	0.17 cfs	**100 ft**	**12 in**	0.013	0.00%	0.50%	3.2 ft/s	0.52 min	2.52 cfs	836.56	836.06	840.57	841.55	835.76	835.26
										36 in											831.62	
R72	**R71**	0.60 ac	0.60	0.36 ac-imp	0.36 ac-imp	4.38 in/hr	20.00 min	1.57 cfs	**143 ft**	**12 in**	0.013	0.19%	0.45%	3.0 ft/s	0.78 min	2.39 cfs	835.98	835.34	838.00	838.06	835.18	834.54
R71	**R68**	0.32 ac	0.60	0.19 ac-imp	0.55 ac-imp	4.29 in/hr	20.78 min	2.36 cfs	**135 ft**	**12 in**	0.013	0.44%	0.45%	3.0 ft/s	0.74 min	2.39 cfs	835.34	834.74	838.06	838.07	834.54	833.94
										36 in											832.40	
R70	**R69**	30.94 ac	0.35	10.83 ac-imp	10.83 ac-imp	2.92 in/hr	40.00 min	31.58 cfs	**23 ft**	**30 in**	0.013	0.59%	0.65%	6.7 ft/s	0.06 min	33.07 cfs	836.36	836.21	838.34	839.53	834.36	834.21
R69	**R68A**	0.00 ac	0.60	0.00 ac-imp	10.83 ac-imp	2.91 in/hr	40.06 min	31.55 cfs	**70 ft**	**30 in**	0.013	0.59%	0.65%	6.7 ft/s	0.17 min	33.07 cfs	836.21	835.76	839.53	838.50	834.21	833.76
R68A	**R68**	0.27 ac	0.60	0.16 ac-imp	10.99 ac-imp	2.91 in/hr	40.23 min	31.94 cfs	**148 ft**	**30 in**	0.013	0.60%	0.65%	6.7 ft/s	0.37 min	33.07 cfs	835.76	834.80	838.50	838.11	833.76	832.80
R68	**R67**	0.35 ac	0.60	0.21 ac-imp	11.20 ac-imp	2.89 in/hr	40.60 min	32.36 cfs	**127 ft**	**36 in**	0.013	0.23%	0.27%	4.9 ft/s	0.43 min	34.66 cfs	834.80	834.45	838.07	843.87	832.40	832.05
R67	**R66A**	0.00 ac	0.60	0.00 ac-imp	11.20 ac-imp	2.87 in/hr	41.03 min	32.13 cfs	**75 ft**	**36 in**	0.013	0.23%	0.27%	4.9 ft/s	0.25 min	34.66 cfs	834.45	834.25	843.83	842.78	832.05	831.85
R66A	**R66**	0.84 ac	0.60	0.51 ac-imp	11.71 ac-imp	2.86 in/hr	41.28 min	33.44 cfs	**29 ft**	**36 in**	0.013	0.25%	0.30%	5.2 ft/s	0.09 min	36.53 cfs	834.25	834.16	842.61	842.78	831.85	831.76
R66	**R65**	0.88 ac	0.60	0.53 ac-imp	12.24 ac-imp	2.85 in/hr	41.38 min	34.89 cfs	**206 ft**	**36 in**	0.013	0.27%	0.37%	5.7 ft/s	0.60 min	40.57 cfs	834.16	833.40	842.61	835.77	831.76	831.00
R64	**R63**	0.70 ac	0.40	0.28 ac-imp	0.28 ac-imp	4.38 in/hr	20.00 min	1.22 cfs	**148 ft**	**12 in**	0.013	0.12%	1.00%	4.5 ft/s	0.54 min	3.56 cfs	838.04	836.56	841.89	838.92	837.24	835.76
R63	**R62**	1.36 ac	0.40	0.55 ac-imp	0.82 ac-imp	4.32 in/hr	20.54 min	3.56 cfs	**128 ft**	**15 in**	0.013	0.30%	0.65%	4.2 ft/s	0.50 min	5.21 cfs	836.56	835.73	838.92	838.92	835.56	834.73
R62	**R61A**	0.25 ac	0.60	0.15 ac-imp	0.98 ac-imp	4.26 in/hr	21.05 min	4.16 cfs	**114 ft**	**18 in**	0.013	0.16%	0.50%	4.2 ft/s	0.45 min	7.43 cfs	835.73	835.16	838.92	840.50	834.53	833.96
R61A	**R61**	0.23 ac	0.60	0.14 ac-imp	1.11 ac-imp	4.22 in/hr	21.50 min	4.69 cfs	**29 ft**	**18 in**	0.013	0.20%	0.50%	4.2 ft/s	0.11 min	7.43 cfs	835.16	835.01	840.50	840.50	833.96	833.81
R61	**R60**	0.26 ac	0.60	0.16 ac-imp	1.27 ac-imp	4.21 in/hr	21.61 min	5.33 cfs	**59 ft**	**18 in**	0.013	0.26%	0.50%	4.2 ft/s	0.24 min	7.43 cfs	835.01	834.72	840.50	841.70	833.81	833.52
R60	**R52**	0.00 ac	0.60	0.00 ac-imp	1.27 ac-imp	4.18 in/hr	21.85 min	5.30 cfs	**75 ft**	**18 in**	0.013	0.25%	0.50%	4.2 ft/s	0.30 min	7.43 cfs	834.72	834.34	841.70	842.23	833.52	833.14
										24 in											832.74	
R59A	**R59**	0.36 ac	0.60	0.22 ac-imp	0.22 ac-imp	4.38 in/hr	20.00 min	0.95 cfs	**29 ft**	**12 in**	0.013	0.07%	0.50%	3.2 ft/s	0.15 min	2.52 cfs	838.55	838.41	842.02	842.02	837.75	837.61
R59	**R54A**	0.56 ac	0.60	0.34 ac-imp	0.55 ac-imp	4.36 in/hr	20.15 min	2.42 cfs	**48 ft**	**12 in**	0.013	0.46%	0.50%	3.2 ft/s	0.25 min	2.52 cfs	838.41	838.17	842.02	842.34	837.61	837.37
										24 in											833.07	
R58	**R56**	0.99 ac	0.40	0.40 ac-imp	0.40 ac-imp	4.38 in/hr	20.00 min	1.73 cfs	**153 ft**	**15 in**	0.013	0.07%	0.40%	3.3 ft/s	0.76 min	4.09 cfs	836.26	835.65	839.26	839.31	835.26	834.65
										15 in											834.65	
R57	**R56**	0.37 ac	0.60	0.22 ac-imp	0.22 ac-imp	4.38 in/hr	20.00 min	0.96 cfs	**132 ft**	**12 in**	0.013	0.07%	0.40%	2.9 ft/s	0.76 min	2.25 cfs	836.18	835.65	838.30	839.31	835.38	834.85
R56	**R55**	0.51 ac	0.60	0.31 ac-imp	0.53 ac-imp	4.29 in/hr	20.76 min	2.27 cfs	**173 ft**	**15 in**	0.013	0.12%	0.35%	3.1 ft/s	0.92 min	3.82 cfs	835.65	835.05	839.31	843.78	834.65	834.05
R55	**R54A**	0.00 ac	0.60	0.00 ac-imp	0.53 ac-imp	4.20 in/hr	21.69 min	2.22 cfs	**108 ft**	**15 in**	0.013	0.12%	0.35%	3.1 ft/s	0.58 min	3.82 cfs	835.05	834.67	843.78	842.17	834.05	833.67
R54A	**R54**	0.50 ac	0.60	0.30 ac-imp	0.83 ac-imp	4.14 in/hr	22.27 min	3.44 cfs	**29 ft**	**24 in**	0.013	0.02%	0.20%	3.2 ft/s	0.15 min	10.12 cfs	834.67	834.61	842.17	842.17	833.07	833.01
R54	**R53A**	0.57 ac	0.60	0.34 ac-imp	1.17 ac-imp	4.13 in/hr	22.42 min	4.84 cfs	**77 ft**	**24 in**	0.013	0.05%	0.20%	3.2 ft/s	0.40 min	10.12 cfs	834.61	834.45	842.17	841.28	833.01	832.85
R53A	**R53**	0.19 ac	0.60	0.11 ac-imp	1.29 ac-imp	4.09 in/hr	22.82 min	5.25 cfs	**29 ft**	**24 in**	0.013	0.05%	0.20%	3.2 ft/s	0.15 min	10.12 cfs	834.45	834.40	841.28	841.28	832.85	832.80
R53	**R52**	0.23 ac	0.60	0.14 ac-imp	1.43 ac-imp	4.07 in/hr	22.97 min	5.81 cfs	**21 ft**	**24 in**	0.013	0.07%	0.25%	3.6 ft/s	0.10 min	11.31 cfs	834.40	834.34	841.28	842.23	832.80	832.74
R52	**R51**	0.00 ac	0.60	0.00 ac-imp	1.43 ac-imp	4.06 in/hr	23.07 min	5.79 cfs	**176 ft**	**24 in**	0.013	0.07%	0.65%	5.8 ft/s	0.50 min	18.24 cfs	834.34	833.20	842.23	831.99	832.74	831.60
R205	**R201**	0.61 ac	0.60	0.37 ac-imp	0.37 ac-imp	4.38 in/hr	20.00 min	1.60 cfs	**31 ft**	**12 in**	0.013	0.20%	0.45%	3.0 ft/s	0.17 min	2.39 cfs	835.09	834.95	838.93	840.36	834.29	834.15
										24 in											832.35	
R204	**R203**	0.50 ac	0.60	0.30 ac-imp	0.30 ac-imp	4.38 in/hr	20.00 min	1.31 cfs	**263 ft**	**18 in**	0.013	0.02%	0.25%	3.0 ft/s	1.47 min	5.25 cfs	835.62	834.96	837.87	838.97	834.42	833.76
R203	**R202**	0.44 ac	0.60	0.26 ac-imp	0.56 ac-imp	4.22 in/hr	21.47 min	2.38 cfs	**342 ft**	**18 in**	0.013	0.05%	0.25%	3.0 ft/s	1.92 min	5.25 cfs	834.96	834.10	838.97	838.25	833.76	832.90
R202	**R201**	0.34 ac	0.60	0.20 ac-imp	0.77 ac-imp	4.03 in/hr	23.39 min	3.10 cfs	**63 ft**	**18 in**	0.013	0.09%	0.25%	3.0 ft/s	0.35 min	5.25 cfs	834.10	833.95	838.25	840.36	832.90	832.75
R201	**R200**	0.00 ac	0.60	0.00 ac-imp	1.13 ac-imp	4.00 in/hr	23.74 min	4.54 cfs	**124 ft**	**24 in**	0.013	0.04%	0.18%	3.1 ft/s	0.68 min	9.60 cfs	833.95	833.72	840.36	842.07	832.35	832.12
R200	**R30**	0.00 ac	0.60	0.00 ac-imp	1.13 ac-imp	3.94 in/hr	24.42 min	4.47 cfs	**72 ft**	**24 in**	0.013	0.04%	0.18%	3.1 ft/s	0.39 min	9.60 cfs	833.72	833.59	842.07	841.60	832.12	831.99
										36 in											831.69	
R48	**R47**	0.61 ac	0.60	0.36 ac-imp	0.36 ac-imp	4.38 in/hr	20.00 min	1.59 cfs	**29 ft**	**12 in**	0.013	0.20%	0.50%	3.2 ft/s	0.15 min	2.52 cfs	835.71	835.57	839.13	839.13	834.91	834.77
R47	**R46**	0.59 ac	0.60	0.35 ac-imp	0.72 ac-imp	4.36 in/hr	20.15 min	3.12 cfs	**21 ft**	**15 in**	0.013	0.23%	0.40%	3.3 ft/s	0.11 min	4.09 cfs	835.57	835.49	839.13	839.70	834.57	834.49
R46	**R45**	0.00 ac	0.60	0.00 ac-imp	0.72 ac-imp	4.35 in/hr	20.26 min	3.11 cfs	**107 ft**	**15 in**	0.013	0.23%	0.40%	3.3 ft/s	0.54 min	4.09 cfs	835.29	834.86	839.70	840.09	834.09	833.66
R45	**R44**	0.49 ac	0.60	0.29 ac-imp	1.01 ac-imp	4.29 in/hr	20.79 min	4.33 cfs	**29 ft**	**18 in**	0.013	0.17%	0.40%	3.8 ft/s	0.13 min	6.64 cfs	834.66	834.54	840.09	840.09	833.46	833.34
R44	**R31**	0.41 ac	0.60	0.25 ac-imp	1.25 ac-imp	4.28 in/hr	20.92 min	5.36 cfs	**21 ft**	**18 in**	0.013	0.26%	0.40%	3.8 ft/s	0.09 min	6.64 cfs	834.54	834.46	840.09	840.88	833.34	833.26
										36 in											831.81	
R41	**R37A**	3.54 ac	0.40	1.42 ac-imp	1.42 ac-imp	2.92 in/hr	40.00 min	4.13 cfs	**72 ft**	**15 in**	0.013	0.41%	0.40%	3.3 ft/s	0.36 min	**4.09 cfs**	836.05	835.76	838.10	838.10	835.05	834.76
R37A	**R37**	1.83 ac	0.40	0.73 ac-imp	2.15 ac-imp	2.90 in/hr	40.36 min	6.22 cfs	**113 ft**	**18 in**	0.013	0.35%	0.40%	3.8 ft/s	0.50 min	6.64 cfs	835.76	835.31	838.10	838.10	834.56	834.11
										30 in											833.15	
R43	**R42**	0.56 ac	0.60	0.34 ac-imp	0.34 ac-imp	4.38 in/hr	20.00 min	1.48 cfs	**29 ft**	**12 in**	0.013	0.17%	0.50%	3.2 ft/s	0.15 min	2.52 cfs	836.10	835.95	839.90	839.90	835.30	835.15
R42	**R32**	0.51 ac	0.60	0.31 ac-imp	0.65 ac-imp	4.36 in/hr	20.15 min	2.81 cfs	**28 ft**	**12 in**	0.013	0.62%	1.00%	4.5 ft/s	0.10 min	3.56 cfs	835.95	835.67	839.90	840.40	835.15	834.87
										30 in											832.07	
R40	**R39**	0.69 ac	0.40	0.28 ac-imp	0.28 ac-imp	4.38 in/hr	20.00 min	1.21 cfs	**114 ft**	**12 in**	0.013	0.12%	0.45%	3.0 ft/s	0.62 min	2.39 cfs	837.35	836.83	838.80	838.97	835.66	835.15
R39	**R38**	0.49 ac	0.40	0.20 ac-imp	0.47 ac-imp	4.31 in/hr	20.62 min	2.04 cfs	**161 ft**	**12 in**	0.013	0.33%	0.45%	3.0 ft/s	0.88 min	2.39 cfs	836.83	836.11	838.97	838.50	835.15	834.42
R38	**R37**	1.01 ac	0.40	0.41 ac-imp	0.88 ac-imp	4.22 in/hr	21.51 min	3.71 cfs	**191 ft**	**18 in**	0.013	0.12%	0.25%	3.0 ft/s	1.07 min	5.25 cfs	836.11	835.63	838.50	838.10	834.02	833.55
R37	**R36**	2.08 ac	0.40	0.83 ac-imp	3.86 ac-imp	4.11 in/hr	22.58 min	15.86 cfs	**141 ft**	**30 in**	0.013	0.15%	0.13%	3.0 ft/s	0.78 min	**14.79 cfs**	835.63	835.42	838.10	838.31	833.15	832.96
R36	**R35**	0.98 ac	0.60	0.59 ac-imp	4.45 ac-imp	4.04 in/hr	23.36 min	17.94 cfs	**29 ft**	**30 in**	0.013	0.19%	0.15%	3.2 ft/s	0.15 min	**15.89 cfs**	835.42	835.36	838.31	838.31	832.96	832.92
R35	**R34**	0.50 ac	0.60	0.30 ac-imp	4.75 ac-imp	4.02 in/hr	23.51 min	19.09 cfs	**253 ft**	**30 in**	0.013	0.22%	0.17%	3.4 ft/s	1.22 min	**16.91 cfs**	835.36	834.82	838.31	841.64	832.92	832.49
R34	**R33**	0.00 ac	0.60	0.00 ac-imp	4.75 ac-imp	3.91 in/hr	24.73 min	18.57 cfs	**125 ft**	**30 in**	0.013	0.20%	0.17%	3.4 ft/s	0.60 min	**16.91 cfs**	834.82	834.56	841.64	841.07	832.49	832.28
R33	**R32**	0.00 ac	0.60	0.00 ac-imp	4.75 ac-imp	3.86 in/hr	25.33 min	18.32 cfs	**120 ft**	**30 in**	0.013	0.20%	0.17%	3.4 ft/s	0.58 min	**16.91 cfs**	834.56	834.33	841.07	840.40	832.28	832.07
R32	**R31**	0.00 ac	0.60	0.00 ac-imp	5.39 ac-imp	3.81 in/hr	25.91 min	20.55 cfs	**38 ft**	**30 in**	0.013	0.25%	0.17%	3.4 ft/s	0.18 min	**16.91 cfs**	834.33	834.23	840.40	840.88	832.07	832.01
R31	**R30**	0.00 ac	0.60	0.00 ac-imp	5.39 ac-imp	3.80 in/hr	26.10 min	20.47 cfs	**114 ft**	**36 in**	0.013	0.09%	0.10%	3.0 ft/s	0.64 min	21.09 cfs	834.23	834.12	840.88	841.60	831.81	831.69
R30	**R29**	0.00 ac	0.60	0.00 ac-imp	6.53 ac-imp	3.74 in/hr	26.73 min	24.44 cfs	**71 ft**	**36 in**	0.013	0.13%	0.10%	3.0 ft/s	0.40 min	**21.09 cfs**	834.12	834.02	841.60	841.55	831.69	831.62
R29	**R28**	0.00 ac	0.60	0.00 ac-imp	6.56 ac-imp	3.71 in/hr	27.13 min	24.37 cfs	**22 ft**	**36 in**	0.013	0.13%	0.15%	3.7 ft/s	0.10 min	25.83 cfs	834.02	833.99	841.55	841.69	831.62	831.59
R28	**R27**	0.00 ac	0.60	0.00 ac-imp	6.56 ac-imp	3.71 in/hr	27.23 min	24.32 cfs	**127 ft**	**36 in**	0.013	0.13%	0.15%	3.7 ft/s	0.58 min	25.83 cfs	833.99	833.80	841.69	836.16	831.59	831.40
R27	**R26**	0.00 ac	0.60	0.00 ac-imp	6.56 ac-imp	3.66 in/hr	27.81 min	24.02 cfs	**100 ft**	**36 in**	0.013	0.13%	0.15%	3.7 ft/s	0.45 min	25.83 cfs	833.80	833.65	836.16	832.75	831.40	831.25

Land Development & Real Estate
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SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC
PITTSFIELD GLEN

STORM SEWER CALCULATIONS

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

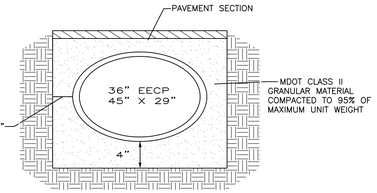
REVISIONS

ATWELL

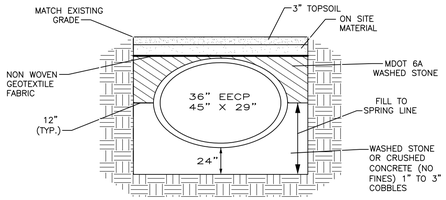
SCALE 0

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK ––
CAD FILE: 12000967CP-15A-CALCS.DWG
JOB ––
FILE CODE: ––
SHEET NO.
53

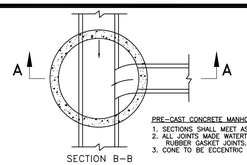
C:\USERS\MCAVOY ENGINEERING\DOCUMENTS_ME\PROJECTS\ATWELL PROJECTS\12000967\DWG\PLAN SETS\SITE-FINAL\12000967CP-15A-CALCS.DWG 11/11/2014 6:57 AM MCAVOY ENGINEERING



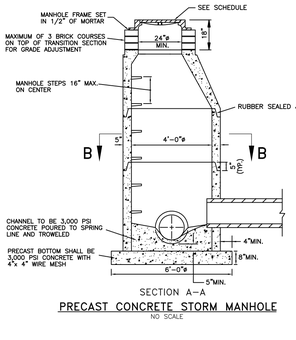
OPEN CUT TRENCH DETAIL FOR STORM SEWER CROSSING TEXTILE ROAD



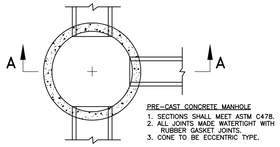
FROST FREE TRENCH DETAIL



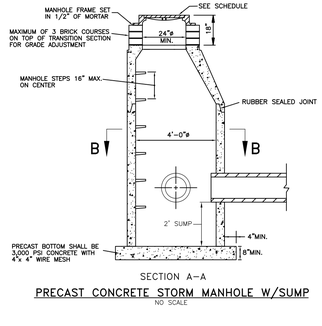
PRE-CAST CONCRETE MANHOLE
1. SECTIONS SHALL MEET ASTM C478.
2. ALL JOINTS MADE WATERTIGHT WITH RUBBER GASKET JOINTS.
3. CONE TO BE ECCENTRIC TYPE.



PRECAST CONCRETE STORM MANHOLE
NO SCALE

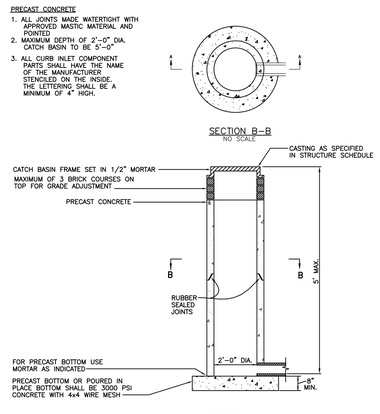


PRE-CAST CONCRETE MANHOLE
1. SECTIONS SHALL MEET ASTM C478.
2. ALL JOINTS MADE WATERTIGHT WITH RUBBER GASKET JOINTS.
3. CONE TO BE ECCENTRIC TYPE.



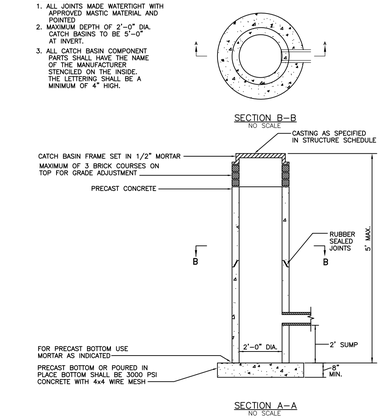
PRECAST CONCRETE STORM MANHOLE W/SUMP
NO SCALE

PRECAST CONCRETE
1. ALL JOINTS MADE WATERTIGHT WITH APPROVED MASTIC MATERIAL AND POINTED
2. MAXIMUM DEPTH OF 2'-0" DIA. CATCH BASIN TO BE 5'-0"
3. ALL CURB INLET COMPONENT PARTS SHALL HAVE THE NAME OF THE MANUFACTURER STENCILED ON THE INSIDE. THE LETTERING SHALL BE A MINIMUM OF 4" HIGH.

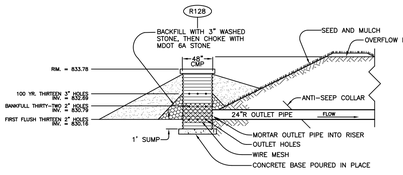


2' DIAMETER CATCH BASIN
NO SCALE

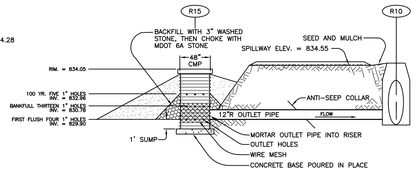
PRECAST CONCRETE
1. ALL JOINTS MADE WATERTIGHT WITH APPROVED MASTIC MATERIAL AND POINTED
2. MAXIMUM DEPTH OF 2'-0" DIA. CATCH BASINS TO BE 5'-0"
3. ALL CATCH BASIN COMPONENT PARTS SHALL HAVE THE NAME OF THE MANUFACTURER STENCILED ON THE INSIDE. THE LETTERING SHALL BE A MINIMUM OF 4" HIGH.



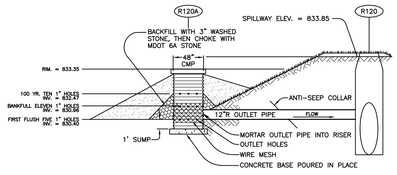
2' DIAMETER CATCH BASIN WITH SUMP
NO SCALE



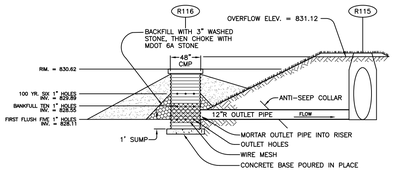
PERFORATED RISER - R128 POND 1/5
NO SCALE



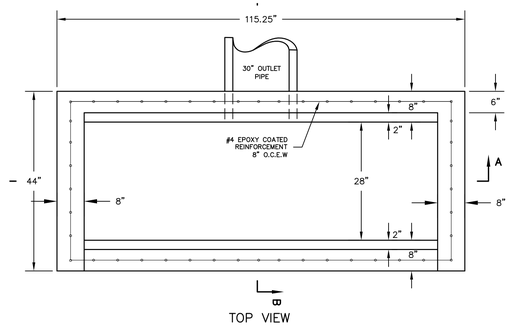
PERFORATED RISER - R15 POND 2
NO SCALE



PERFORATED RISER - R120A POND 3
NO SCALE



PERFORATED RISER - R116 POND 4
NO SCALE



NOTES
1. THE TWO GRATES SHALL BE EJIW V5669 (49.5"x31.75"), OR EQUIVALENT. EQUIVALENT GRATES SHALL HAVE A MINIMUM OPEN AREA OF 724 SQUARE INCHES EACH AND HAVE A GRATE THICKNESS OF 1.5" TO 2".

2. THE ON-SITE ENGINEER SHALL REJECT THE FINISHED CATCH BASIN THE TWO GRATES ARE UNABLE TO FIT OR LAY LEVEL ON THE 2"x2" ANGLE IRONS. REPLACEMENT OF THE CATCH BASIN SHALL BE AT THE CONTRACTOR'S EXPENSE.

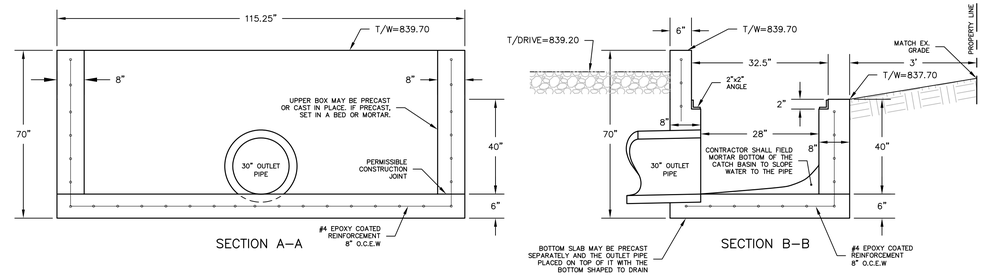
3. THE CATCH BASIN SHALL REST ON AT LEAST 6-INCHES OF COMPACTED GRANULAR MATERIAL. UNDERCUTTING OF POOR SOILS, IF NECESSARY, SHALL BE PER THE DISCRETION OF THE ON-SITE ENGINEER.

4. ALL REINFORCEMENT SHALL BE EPOXY COATED.

5. THE CATCH BASIN MAY BE CAST IN PLACE OR PRECAST. THE ON-SITE ENGINEER MAY REFUSE DELIVERY OF A PRECAST VAULT IF EXTERIOR OR INTERIOR DIMENSIONS VARY MORE THAN ½" FROM PLAN. REPLACEMENT OF A REJECTED CATCH BASIN SHALL BE AT THE CONTRACTORS EXPENSE.

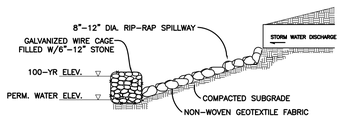
6. THE CONTRACTOR SHALL VERIFY THE EXTERIOR DIMENSIONS OF THE CONCRETE OUTLET PIPE PRIOR TO CASTING THE CATCH BASIN.

7. ALL CATCH BASIN WALL EDGES SHALL BE CHAMFERED WITH A ¾" RADIUS.

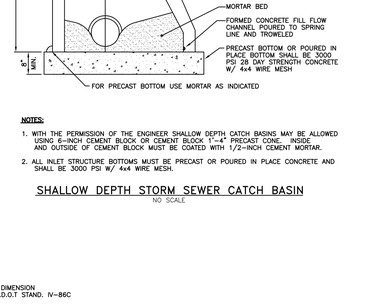


CATCH BASIN R70 DETAIL
NO SCALE

TYPICAL GABION DIMENSIONS
LENGTH = 9'
WIDTH = 3'
HEIGHT = 3'

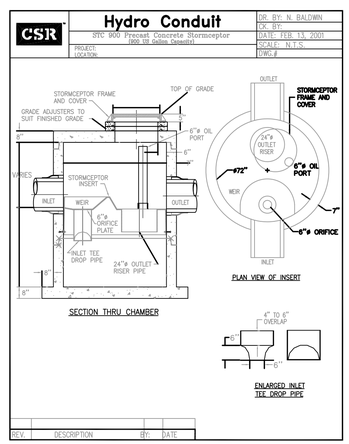


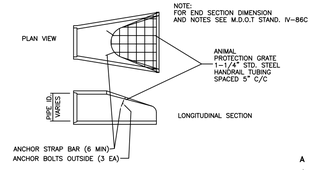
TYPICAL GABION SECTION
NOT TO SCALE



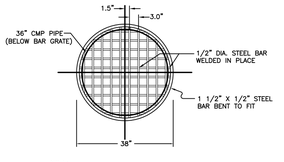
NOTES:
1. WITH THE PERMISSION OF THE ENGINEER SHALLOW DEPTH CATCH BASINS MAY BE ALLOWED USING 6-INCH CEMENT BLOCK OR CEMENT BLOCK 1'-4" PRECAST CONC. INSIDE AND OUTSIDE OF CEMENT BLOCK MUST BE COATED WITH 1/2-INCH CEMENT MORTAR.
2. ALL INLET STRUCTURE BOTTOMS MUST BE PRECAST OR POURED IN PLACE CONCRETE AND SHALL BE 3000 PSI W/ 4x4 WIRE MESH.

SHALLOW DEPTH STORM SEWER CATCH BASIN
NO SCALE



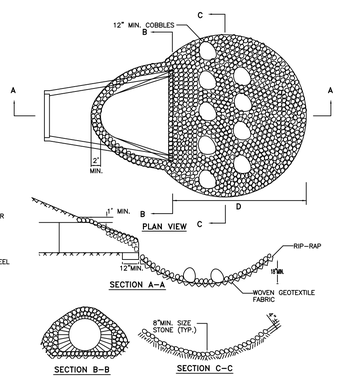


PRECAST CONCRETE END SECTION WITH ANIMAL PROTECTION GRATE
NO SCALE



NOTE:
1. BAR GRATE IS TO BE REMOVABLE.
2. APPROXIMATE WEIGHT OF GRATE IS 70 LBS.

BAR GRATE DETAIL
NO SCALE



RIP-RAP SPLASH POOL
NO SCALE

Know what's below. Call before you dig.

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. 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 BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NOTICE:
CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR; NEITHER THE OWNER NOR THE ENGINEER SHALL BE EXPECTED TO ASSUME ANY RESPONSIBILITY FOR SAFETY OF THE WORK, OF PERSONS ENGAGED IN THE WORK, OF ANY NEARBY STRUCTURES, OR OF ANY OTHER PERSONS.

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SOUTHFIELD, MI 48076
248.447.2000

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC
PITTSFIELD GLEN

STORM SEWER / DETENTION POND DETAILS

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCMRC COMMENTS

REVISIONS

ATWELL

SCALE 0

DR. MN | CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-15B-DET.DWG
JOB --
FILE CODE: --
SHEET NO. 54

G:\JOBS\MASTER ENGINEERING\DOCUMENTS_MCP\PROJECTS\ATWELL PROJECTS\12000967\DWG\PLAN SET\SITE-FINAL\12000967CP-15B-DET.DWG 11/7/2014 8:57 AM MCKAY ENGINEERING

DETENTION BASIN CALCULATIONS:
(BASED ON THE RULES OF THE WASHTENAW COUNTY DRAIN COMMISSIONER)

Basin 1/5

Basin 1/5		3,607,688 sf	82.82	acres
C1, Impervious Areas		571,894 sf	13.13	C1 = 0.95
C2, Water Surface (in Basin)		122,717 sf	2.82	C2 = 1.00
C3, Lawn Areas, Open Space		2,913,077 sf	66.88	C3 = 0.40
Cumulative (C x A) =	(13.13 x C1) + (2.82 x C2) +	(66.88 x C3) =	42.04	
Compound Run-off Coefficient, C	42.04 / 82.82 Ac.	C =	**0.51**	
Allowable Outflow Rate, Qa	0.15 cfs/acre x 82.82 Ac.	=	12.42 cfs	
Calculate Qo = Qa / (a * c) (max. outflow per acre impervious)		=	0.29	cfs/acre imperv.
Max. Storage Time, T = -25+sqrt(10312.5/Qo)		=	163.57	minutes
Max. Storage Required, Vs = ((16500*T) / (T+25)) - 40QoT		=	12,415	cf / acre imperv.
Total Storage Required, Vt = Vs * a * c			524,397	c.f.

Volume Summary

Zero Outflow Volume for 100-yr Storm Event = 16,500 x A x C =	Vo =	696,940	CF
Detention Volume Required for 100-yr Storm Event =	V100 =	524,397	CF
Bank Full Storage Volume, V(bf) = 8,170 x A x C =	Vbf =	345,091	CF
First Flush Storage Volume, V(ff) = 1,815 x A x C =	Vff =	76,663	CF
Sediment Forebay Capacity = 5% of 100-yr volume =		26,220	CF

Basin Geometry / Contour Interpolation Calcs.

	Elevation	Pond 1 Surf Area (SF)	Pond 5 Surf Area (SF)	Pond 1&5 Vol at Elev (CF)	Total Volume (CF)	100-Year X100	Bank Full Xbf	First Flush Xff	Zero Outflow
Xo (Pnd1)	830.16	74,549				524,397	345,091	76,663	696,940
Xo (Pnd5)	830.16		40,848						
	831	81,874	46,867	102,538	102,538	-	-	830.79	-
	832	90,594	54,032	136,684	239,222	-	-	-	-
	833	99,658	61,671	152,978	392,199	-	832.69	-	-
	834	109,528	69,878	170,368	562,567	833.78	-	-	-
	835	135,256	79,639	197,151	759,717	-	-	-	834.68
						-	-	-	-

Storage Volume Provided = 759,717 CF

OUTLET CONTROL STRUCTURE CALCULATIONS:

First Flush Orifice Calculations

Qff = Vff / 24 hrs / 3600 sec		Qff=	0.887	cfs	
h = 2/3 x (Xff - Xo)		h =	0.420	ft	
A = Qff / .62 x sqrt(2*32.2*h)		A=	0.275	sf	
Selected orifice size =	2.000"	Orifice area =	0.0218	sf	
		therefore, use	**13**	**2.0" holes at**	**Elev. 830.16**

Bank Full Orifice Calculations

Bankfull should discharge within 36 to 48 hours					
Release from first flush holes only					
Q=a x .62 x sqrt(2x32.2x2/3h) =		Q=	1.778	cfs	
Tbf with first flush holes only=			54	hrs	
Add holes at to decrease storage time					
The first flush volume will discharge in			24.0	hrs	
The volume between the Bankfull elevation and the First Flush Elevation					
Vbf-Vff=			268,427	cf	
should discharge (target 48 hour discharge time) in			24.0	hrs	
Qbf=			3.11	cfs	
A=area of bankfull holes			0.303	sf	
Selected orifice size =	2.000"	Orifice area =	0.0218	sf	
		therefore, use	**32**	**2.0" holes at**	**Elev. 830.79**
bankfull storage time check=			37	hrs	

100-Year Orifice Calculations

Q100=Qa		Q100=	12.423	cfs	
Release from above holes					
hff = (X100-Xo)		hff =	3.62	ft	
hbf = (X100-Xff)		hbf =	2.990	ft	
Release from above holes					
Q=a x.62 x sqrt(2x32.2xhff)+a x .62 x sqrt(2x32.2xhbf)=		Q=	8.606	cfs	
Remaining flow		Q100-Q=	3.817	cfs	
A = Q100 /(.62 x sqrt(2*32.2*h))		A =	0.735	sf	
Selected orifice size =	3.000"	Orifice area =	0.0491	sf	
		therefore, use	**13**	**3.0" holes at**	**Elev. 832.69**
Q100 = A*(.62 x sqrt(2*32.2*h))			3.32	cfs	
Design Peak Outlet Rate (Qff+Qbf+Q100 at 100 year elev.) =			**11.92**	**cfs**	

DETENTION BASIN CALCULATIONS:
(BASED ON THE RULES OF THE WASHTENAW COUNTY DRAIN COMMISSIONER)

Basin 2

Basin 2		294,890 sf	6.77	acres
C1, Impervious Areas		95,203 sf	2.19	C1 = 0.95
C2, Water Surface (in Basin)		7,170 sf	0.16	C2 = 1.00
C3, Lawn Areas, Open Space		192,517 sf	4.42	C3 = 0.40
Cumulative (C x A) =	(2.19 x C1) + (0.16 x C2) +	(4.42 x C3) =	4.01	
Compound Run-off Coefficient, C	4.01 / 6.77 Ac.	C =	**0.59**	
Allowable Outflow Rate, Qa	0.150 cfs/acre x 6.77 Ac.	=	1.02 cfs	
Calculate Qo = Qa / (a * c) (max. outflow per acre impervious)		=	0.25	cfs/acre imperv.
Max. Storage Time, T = -25+sqrt(10312.5/Qo)		=	178.10	minutes
Max. Storage Required, Vs = ((16500*T) / (T+25)) - 40QoT		=	12,688	cf / acre imperv.
Total Storage Required, Vt = Vs * a * c			50,678	c.f.

Volume Summary

Zero Outflow Volume for 100-yr Storm Event = 16,500 x A x C =	Vo =	65,903	CF
Detention Volume Required for 100-yr Storm Event =	V100 =	50,678	CF
Bank Full Storage Volume, V(bf) = 8,170 x A x C =	Vbf =	32,632	CF
First Flush Storage Volume, V(ff) = 1,815 x A x C =	Vff =	7,249	CF
Sediment Forebay Capacity = 5% of 100-yr volume =		2,534	CF

Basin Geometry / Contour Interpolation Calcs.

	Elevation	Surface Area (SF)	Volume (CF)	Total Volume (CF)	100-Year X100	Bank Full Xbf	First Flush Xff	Zero Outflow
Xo	829.9	7,170			50,678	32,632	7,249	65,903
	830	7,369	727	727	-	-	-	-
	831	9,395	8,382	9,109	-	-	830.78	-
	832	11,925	10,660	19,769	-	-	-	-
	833	14,881	13,403	33,172	-	832.96	-	-
	834	18,202	16,542	49,713	-	-	-	-
	835	21,783	19,993	69,706	834.05	-	-	834.81
					-	-	-	-

Storage Volume Provided = 69,706 CF

OUTLET CONTROL STRUCTURE CALCULATIONS:

First Flush Orifice Calculations

Qff = Vff / 24 hrs / 3600 sec		Qff=	0.084	cfs	
h = 2/3 x (Xff - Xo)		h =	0.587	ft	
A = Qff / .62 x sqrt(2*32.2*h)		A=	0.0220	sf	
Selected orifice size =	1.000"	Orifice area =	0.0055	sf	
		therefore, use	**4**	**1.0" holes at**	**Elev. 829.90**

Bank Full Orifice Calculations

Bankfull should discharge within 36 to 48 hours					
Release from first flush holes only					
Q=a x .62 x sqrt(2x32.2x2/3h) =		Q=	0.156	cfs	
Tbf with first flush holes only=			58	hrs	
Add holes at to decrease storage time					
The first flush volume will discharge in			24.0	hrs	
The volume between the Bankfull elevation and the First Flush Elevation					
Vbf-Vff=			25,383	cf	
should discharge (target 42 hour discharge time) in			18.0	hrs	
Qbf=			0.39	cfs	
A=area of bankfull holes			0.041	sf	
Selected orifice size =	1.000"	Orifice area =	0.0055	sf	
		therefore, use	**13**	**1.0" holes at**	**Elev. 830.78**
bankfull storage time check=			36	hrs	

100-Year Orifice Calculations

Q100=Qa		Q100=	1.015	cfs	
Release from above holes					
hff = (X100-Xo)		hff =	4.15	ft	
hbf = (X100-Xff)		hbf =	3.270	ft	
Release from above holes					
Q=a x.62 x sqrt(2x32.2xhff)+a x .62 x sqrt(2x32.2xhbf)=		Q=	0.866	cfs	
Remaining flow		Q100-Q=	0.149	cfs	
A = Q100 /(.62 x sqrt(2*32.2*h))		A =	0.029	sf	
Selected orifice size =	1.000"	Orifice area =	0.0055	sf	
		therefore, use	**5**	**1.0" holes at**	**Elev. 832.96**
Q100 = A*(.62 x sqrt(2*32.2*h))			0.14	cfs	
Design Peak Outlet Rate (Qff+Qbf+Q100 at 100 year elev.) =			**1.01**	**cfs**	

DETENTION BASIN CALCULATIONS:
(BASED ON THE RULES OF THE WASHTENAW COUNTY DRAIN COMMISSIONER)

Basin 3

Basin 3		282,882 sf	6.49	acres
C1, Impervious Areas		105,105 sf	2.41	C1 = 0.95
C2, Water Surface (in Basin)		12,530 sf	0.29	C2 = 1.00
C3, Lawn Areas, Open Space		165,247 sf	3.79	C3 = 0.40
Cumulative (C x A) =	(2.41 x C1) + (0.29 x C2) +	(3.79 x C3) =	4.10	
Compound Run-off Coefficient, C	4.10 / 6.49 Ac.	C =	**0.63**	
Allowable Outflow Rate, Qa	0.150 cfs/acre x 6.49 Ac.	=	0.97 cfs	
Calculate Qo = Qa / (a * c) (max. outflow per acre impervious)		=	0.24	cfs/acre imperv.
Max. Storage Time, T = -25+sqrt(10312.5/Qo)		=	182.29	minutes
Max. Storage Required, Vs = ((16500*T) / (T+25)) - 40QoT		=	12,760	cf / acre imperv.
Total Storage Required, Vt = Vs * a * c			52,205	c.f.

Volume Summary

Zero Outflow Volume for 100-yr Storm Event = 16,500 x A x C =	Vo =	67,506	CF
Detention Volume Required for 100-yr Storm Event =	V100 =	52,205	CF
Bank Full Storage Volume, V(bf) = 8,170 x A x C =	Vbf =	33,426	CF
First Flush Storage Volume, V(ff) = 1,815 x A x C =	Vff =	7,426	CF
Sediment Forebay Capacity = 5% of 100-yr volume =		2,610	CF

Basin Geometry / Contour Interpolation Calcs.

	Elevation	Surface Area (SF)	Volume (CF)	Total Volume (CF)	100-Year X100	Bank Full Xbf	First Flush Xff	Zero Outflow
Xo	830.4	12,182			52,205	33,426	7,426	67,506
	831	14,337	7,956	7,956	-	-	830.96	-
	832	17,921	16,129	24,085	-	-	-	-
	833	21,711	19,816	43,901	-	832.47	-	-
	834	26,347	24,029	67,930	833.35	-	-	833.98
	834.5	29,914	14,065	81,995	-	-	-	-
		.			-	-	-	-
					-	-	-	-

Storage Volume Provided = 81,995 CF

OUTLET CONTROL STRUCTURE CALCULATIONS:

First Flush Orifice Calculations

Qff = Vff / 24 hrs / 3600 sec		Qff=	0.086	cfs	
h = 2/3 x (Xff - Xo)		h =	0.373	ft	
A = Qff / .62 x sqrt(2*32.2*h)		A=	0.028	sf	
Selected orifice size =	1.000"	Orifice area =	0.0055	sf	
		therefore, use	**5**	**1.0" holes at**	**Elev. 830.40**

Bank Full Orifice Calculations

Bankfull should discharge within 36 to 48 hours					
Release from first flush holes only					
Q=a x .62 x sqrt(2x32.2x2/3h) =		Q=	0.165	cfs	
Tbf with first flush holes only=			56	hrs	
Add holes at to decrease storage time					
The first flush volume will discharge in			24.0	hrs	
The volume between the Bankfull elevation and the First Flush Elevation					
Vbf-Vff=			26,000	cf	
should discharge (target 42 hour discharge time) in			18.0	hrs	
Qbf=			0.40	cfs	
A=area of bankfull holes			0.056	sf	
Selected orifice size =	1.000"	Orifice area =	0.0055	sf	
		therefore, use	**11**	**1.0" holes at**	**Elev. 830.96**
bankfull storage time check=			39	hrs	

100-Year Orifice Calculations

Q100=Qa		Q100=	0.750	cfs	
Release from above holes					
hff = (X100-Xo)		hff =	2.95	ft	
hbf = (X100-Xff)		hbf =	2.390	ft	
Release from above holes					
Q=a x.62 x sqrt(2x32.2xhff)+a x .62 x sqrt(2x32.2xhbf)=		Q=	0.707	cfs	
Remaining flow		Q100-Q=	0.043	cfs	
A = Q100 /(.62 x sqrt(2*32.2*h))		A =	0.009	sf	
Selected orifice size =	1.000"	Orifice area =	0.0055	sf	
		therefore, use	**10**	**1.0" holes at**	**Elev. 832.47**
Q100 = A*(.62 x sqrt(2*32.2*h))			0.26	cfs	
Design Peak Outlet Rate (Qff+Qbf+Q100 at 100 year elev.) =			**0.96**	**cfs**	

DETENTION BASIN CALCULATIONS:
(BASED ON THE RULES OF THE WASHTENAW COUNTY DRAIN COMMISSIONER)

Basin 4

Basin 4		217,695 sf	5.00	acres
C1, Impervious Areas		98,020 sf	2.25	C1 = 0.95
C2, Water Surface (in Basin)		12,210 sf	0.28	C2 = 1.00
C3, Lawn Areas, Open Space		107,465 sf	2.47	C3 = 0.40
Cumulative (C x A) =	(2.25 x C1) + (0.28 x C2) +	(2.47 x C3) =	3.40	
Compound Run-off Coefficient, C	3.40 / 5.00 Ac.	C =	**0.68**	
Allowable Outflow Rate, Qa	0.150 cfs/acre x 5.00 Ac.	=	0.75 cfs	
Calculate Qo = Qa / (a * c) (max. outflow per acre impervious)		=	0.22	cfs/acre imperv.
Max. Storage Time, T = -25+sqrt(10312.5/Qo)		=	191.51	minutes
Max. Storage Required, Vs = ((16500*T) / (T+25)) - 40QoT		=	12,909	cf / acre imperv.
Total Storage Required, Vt = Vs * a * c			43,871	c.f.

Volume Summary

Zero Outflow Volume for 100-yr Storm Event = 16,500 x A x C =	Vo =	56,073	CF
Detention Volume Required for 100-yr Storm Event =	V100 =	43,871	CF
Bank Full Storage Volume, V(bf) = 8,170 x A x C =	Vbf =	27,765	CF
First Flush Storage Volume, V(ff) = 1,815 x A x C =	Vff =	6,168	CF
Sediment Forebay Capacity = 5% of 100-yr volume =		2,194	CF

Basin Geometry / Contour Interpolation Calcs.

	Elevation	Surface Area (SF)	Volume (CF)	Total Volume (CF)	100-Year X100	Bank Full Xbf	First Flush Xff	Zero Outflow
Xo	828.11	12,210			43,871	27,765	6,168	56,073
	829	15,553	12,355	12,355	-	-	828.55	-
	830	18,957	17,255	29,610	-	829.89	-	-
	831	22,523	23,121	52,731	830.62	-	-	-
	832	27,154	24,839	77,569	-	-	-	831.13

Storage Volume Provided = 77,569 CF

OUTLET CONTROL STRUCTURE CALCULATIONS:

First Flush Orifice Calculations

Qff = Vff / 24 hrs / 3600 sec		Qff=	0.071	cfs	
h = 2/3 x (Xff - Xo)		h =	0.293	t	
A = Qff / .62 x sqrt(2*32.2*h)		A=	0.026	sf	
Selected orifice size =	1.000"	Orifice area =	0.0055	sf	
		therefore, use	**5**	**1.0" holes at**	**Elev. 828.11**

Bank Full Orifice Calculations

Bankfull should discharge within 36 to 48 hours					
Release fom first flush holes only					
Q=a x .62 x sqrt(2x32.2x2/3h) =		Q=	0.143	cfs	
Tbf with first fush holes only=			54	hrs	
Add holes at to decrease storage time					
The first flush volume will discharge in			24.0	hrs	
The volume between the Bankfull elevation and the First Flush Elevation					
Vbf-Vff=			21,597	cf	
should discharge (target 42 hour discharge time) in			18.0	hrs	
Qbf=			0.33	cfs	
A=area of bankfull holes			0.051	sf	
Selected orifice size =	1.000"	Orifice area =	0.0055	sf	
		therefore, use	**10**	**1.0" holes at**	**Elev. 828.55**
bankfull storage time check=			39	hrs	

100-Year Orifice Calculations

Q100=Qa		Q100=	0.750	cfs	
Release fom above holes					
hff = (X100-Xo)		hff =	2.51	t	
hbf = (X100-Xff)		hbf =	2.070	t	
Release fom above holes					
Q=a x.62 x sqrt(2x32.2xhff)+a x .62 x sqrt(2x32.2xhbf)=		Q=	0.602	cfs	
Remaining fow		Q100-Q=	0.147	cfs	
A = Q100 /(.62 x sqrt(2*32.2*h))		A =	0.035	sf	
Selected orifice size =	1.000"	Orifice area =	0.0055	sf	
		therefore, use	**6**	**1.0" holes at**	**Elev. 829.89**
Q100 = A*(.62 x sqrt(2*32.2*h))			0.14	cfs	
Design Peak Outlet Rate (Qff+Qbf+Q100 at 100 year elev.) =			**0.74**	**cfs**	

BASIN	ELEV. A	ELEV. B	ELEV. C	D	E	F	G	H
1	832.00	831.00	822.00	146'	24'	61'	48'	56'
2	832.00	831.00	826.00	98'	8'	45'	37'	24'
3	832.00	831.00	828.00	88'	8'	40'	24'	40'
4	830.00	829.00	826.00	56'	8'	24'	12'	32'

NOTE: GABION DESIGN BY OTHERS.

DETENTION BASIN FOREBAY GABION DIMENSIONS
NO SCALE

BASIN	ELEV. A	ELEV. B	C	D
1	835.25	834.28	35'	41'
2	835.50	834.55	5'	11'
3	834.50	833.85	5'	10'
4	832.50	831.12	5'	14'

DETENTION BASIN SPILLWAY DIMENSIONS
NO SCALE

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SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC
PITTSFIELD GLEN
DETENTION POND CALCULATIONS

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

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SCALE 0

DR. MN CH. MSC
P.M. J. ACKERMAN
BOOK --
CAD FILE: 12000967CP-15B-DET.DWG
JOB --
FILE CODE: --
SHEET NO.
55

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NOTES

FIRE PROTECTION AND PREVENTION

12.01 Access:

A. In addition to the standards in Section 10.04 the following shall apply:

1. All roads, lanes or drives required for emergency access shall be posted as required by NFPA 1141, Sections 3-1.8 & 3-2.3 with the following exceptions:

   (a) Entryways and main drives shall be posted with signs reading "No Standing – Fire Lane".

   (b) Main drives adjacent and parallel to structures shall be posted with signs reading "No Standing – Fire Lane" or "No Parking – Fire Lane" on the side adjacent to the building and the opposite side shall be posted with signs reading "No Stopping – Standing – Parking – Fire Lane". Parking shall be prohibited on one side of all main driveways.

   (c) Paved areas on the sides and rear of buildings which are less than thirty (30) feet wide shall be posted "No Parking – Fire Lane".

   (d) Signs shall be installed with their faces perpendicular to the roadway, six feet, eight inches (6' 8") high, facing the direction of travel, and shall be located so that at least one sign is clearly readable from any location on the posted road, lane or drive. Signs shall be two sided, where applicable.

12.09 Signage:

A. Location of "Fire Lane-No Parking", "Fire Lane No Standing", "Emergency Access Only", "Authorized Parking Only", type signs shall be designated by the Fire Marshal or his designee. They shall be spaced 75 feet apart.

B. Fire Department road/parking type signage shall be 12" by 18" and meet the adopted International Fire Code and National Fire Protection Association Life Safety Codes.

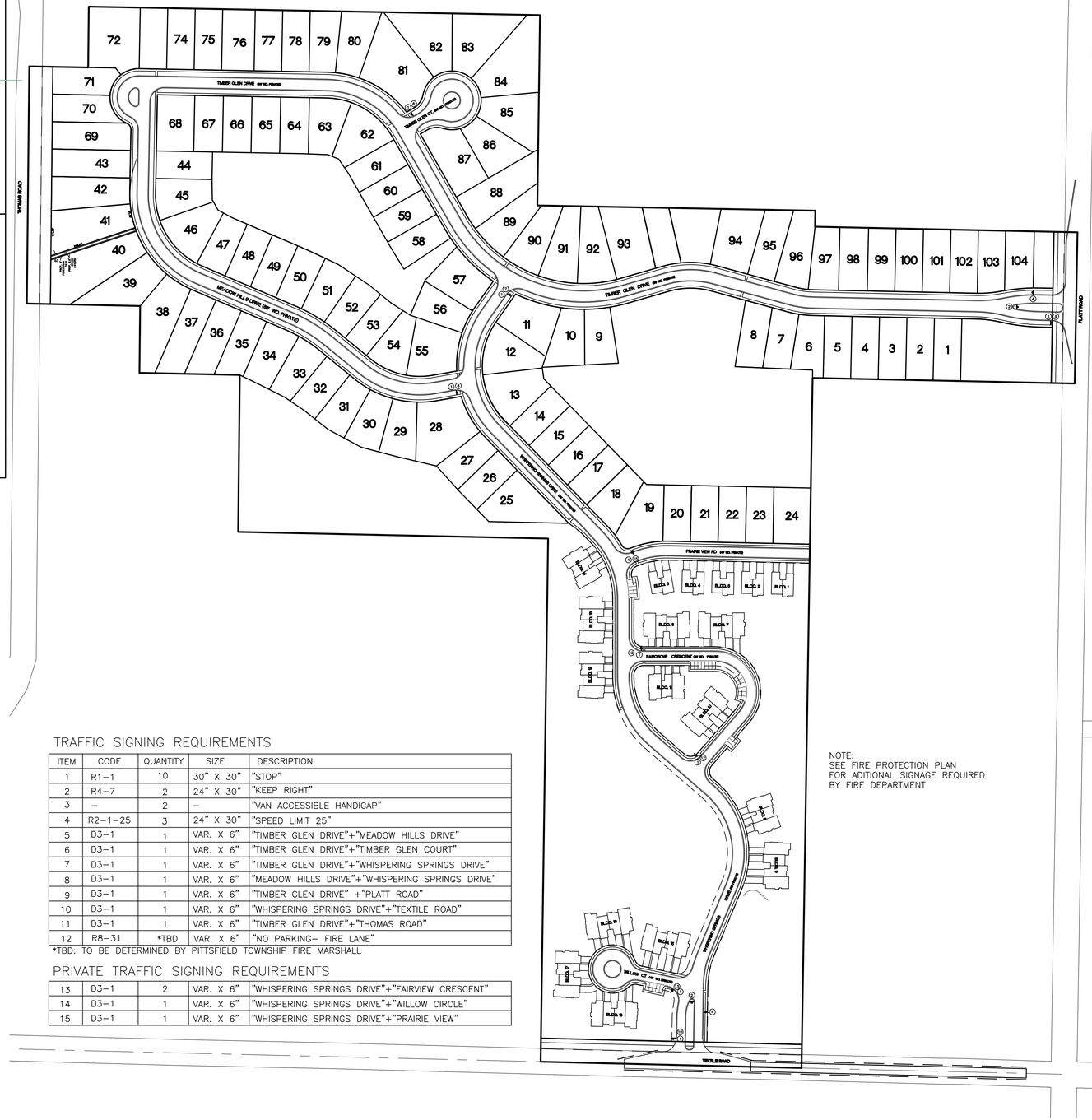
C. Curb, asphalt or cement painting may be required in fire lanes or authorized parking areas. (red or yellow paint)

D. Fire Department Connections shall be marked with signage approved by the Fire Marshal or his designee.

E. Red signs with white lettering shall be placed on fire suppression access doors. (3/4" minimum letters)

F. Signage shall be provided to mechanical, electrical, elevator, and HVAC rooms.

G. Exit routing signs shall be placed throughout the building and approved by the Fire Marshal and Building Official in accordance with applicable codes NFPA 101.



NOTE:
SEE FIRE PROTECTION PLAN FOR ADITIONAL SIGNAGE REQUIRED BY FIRE DEPARTMENT

TRAFFIC SIGNING REQUIREMENTS

ITEM	CODE	QUANTITY	SIZE	DESCRIPTION
1	R1-1	10	30" X 30"	"STOP"
2	R4-7	2	24" X 30"	"KEEP RIGHT"
3	–	2	–	"VAN ACCESSIBLE HANDICAP"
4	R2-1-25	3	24" X 30"	"SPEED LIMIT 25"
5	D3-1	1	VAR. X 6"	"TIMBER GLEN DRIVE"+"MEADOW HILLS DRIVE"
6	D3-1	1	VAR. X 6"	"TIMBER GLEN DRIVE"+"TIMBER GLEN COURT"
7	D3-1	1	VAR. X 6"	"TIMBER GLEN DRIVE"+"WHISPERING SPRINGS DRIVE"
8	D3-1	1	VAR. X 6"	"MEADOW HILLS DRIVE"+"WHISPERING SPRINGS DRIVE"
9	D3-1	1	VAR. X 6"	"TIMBER GLEN DRIVE" +"PLATT ROAD"
10	D3-1	1	VAR. X 6"	"WHISPERING SPRINGS DRIVE"+"TEXTILE ROAD"
11	D3-1	1	VAR. X 6"	"TIMBER GLEN DRIVE"+"THOMAS ROAD"
12	R8-31	*TBD	VAR. X 6"	"NO PARKING– FIRE LANE"

*TBD: TO BE DETERMINED BY PITTSFIELD TOWNSHIP FIRE MARSHALL

PRIVATE TRAFFIC SIGNING REQUIREMENTS

13	D3-1	2	VAR. X 6"	"WHISPERING SPRINGS DRIVE"+"FAIRVIEW CRESCENT"
14	D3-1	1	VAR. X 6"	"WHISPERING SPRINGS DRIVE"+"WILLOW CIRCLE"
15	D3-1	1	VAR. X 6"	"WHISPERING SPRINGS DRIVE"+"PRAIRIE VIEW"

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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN
SITE SIGNAGE PLAN

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
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07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

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SCALE 0 100 200
1" = 200 FEET
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FILE CODE: --
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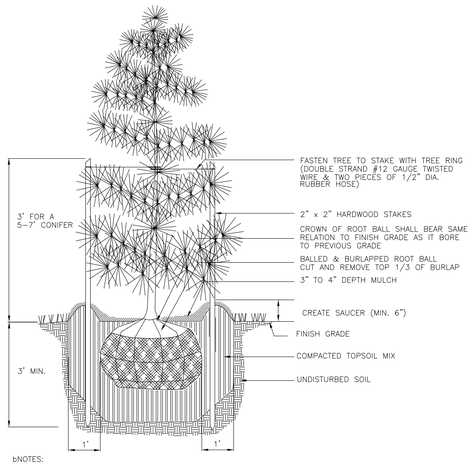
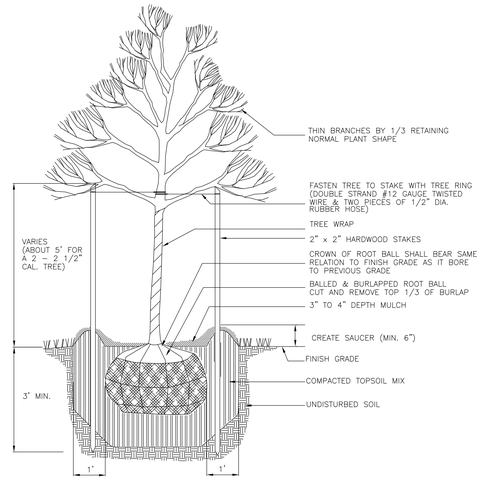


bNOTES:

1. DO NOT ALLOW AIR POCKETS TO FORM WHEN BACKFILLING
2. DO NOT DAMAGE MAIN ROOTS OR DESTROY ROOT BALL WHEN INSTALLING TREE STAKE
3. REMOVE TREE RINGS AND STAKES TWO YEARS AFTER INSTALLATION
4. WATER TREE THOROUGHLY SUBSEQUENT TO INSTALLATION

CONIFEROUS TREE PLANTING DETAIL
BALLED AND BURLAPPED
NO SCALE



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1. DO NOT ALLOW AIR POCKETS TO FORM WHEN BACKFILLING
2. DO NOT DAMAGE MAIN ROOTS OR DESTROY ROOT BALL WHEN INSTALLING TREE STAKE
3. REMOVE TREE RINGS, TREE WRAP AND STAKES TWO YEARS AFTER INSTALLATION
4. WATER TREE THOROUGHLY SUBSEQUENT TO INSTALLATION

DECIDUOUS TREE PLANTING DETAIL
BALLED AND BURLAPPED
NO SCALE

LANDSCAPE NOTES

All landscaping shall be installed and maintained in accordance with Pittsfield Township standards and in accordance with current industry standards in a neat, healthy and weed free condition. Any dead, diseased or damaged plant material is to be replaced within one year before the end of the growing season.

Any discrepancy with the plan and plant list the number of symbols on the plan shall take president.

All disturbed unpaved areas are to be spread with a minimum 4 inches of topsoil and seeded, hydro-seeded or sodded with MDOT class A seed or sod except areas of individual trees and landscape beds which are to be mulched with a minimum of 4 inches shredded hardwood bark.

The landscape contractor shall be responsible for verification of all underground and overhead utilities. Plant material is to be located such that it will not interfere with any underground or overhead utilities.

All landscape areas shall be provided with a readily available water supply.

Any plant substitutions shall have prior Township approval.

Trees and landscaping shall be located a minimum of 4' behind the back of curb to allow adequate site distance for vehicles, signs and traffic control devices.

Seed wetland buffer strip as outlined below. Prior to seeding seed, packaging and invoice shall be made available to designer for review and approval. Any substitution of seed species or source must have prior approval.

Seeding of wetland mitigation area should not be done during dry periods. Soils may be saturated but not inundated.

Prior to seeding de-compact the soil through disking, rototilling to a depth of 4 inches. Seed with wildflower mix A at manufacturers recommended rate. Seed should be mixed with clean fine sand, at a rate of three pounds of sand per pound of seed. A slow release fertilizer (osmocote or equal) should be broadcast at a rate of 300 pounds per acre. The seed and fertilizer should be pressed into the soil and then covered with a thin layer of silt or mud (1/8 inch deep). Area is to be watered as necessary to establish germination and maintain growth.

Wildflower Mix A

Midwestern Wetland Edge Mix (Heartland Restoration Services, Inc. (219)489-8511) or equal with prior approval from designer. 40 lbs/acre

Carex vulpinoidea
Echenochloa crusgalli
Eleocharis obtusa
Juncus effusus
Leersia oryzoides
Scirpus atrovirens
Scirpus cyperinus
Scirpus fluviatilis

LANDSCAPE DATA

REQUIRED	PROVIDED
1 TREE PER 50' LINEAR FEET OF INTERNAL STREETS	
15,299 LF OF ROAD/50 = 305.98	
306 TREES REQUIRED	306 TREES PROVIDED

Quercus rubra Red Oak

Acer rubrum 'October Glory' October Glory Red Maple

Gleditisia triacanthos inermis 'Shademaster' Shademaster Honey Locust

Tilia cordata 'Greenspire' Greenspire Linden

Picea pungens 'Glauca' Blue Spruce

Abies concolor Concolor Fir

Deciduous trees to be 2.5"Cal B & B
Evergreen trees to be 6'-7' HT. B & B

NOTES:
1. TREES SHALL NOT BE PLACED IN SIGHT DISTANCE TRIANGLES.
2. A PERMANENT BUFFER STRIP, VEGETATED WITH NATURAL PLANT SPECIES, WILL BE MAINTAINED OR RESTORED WITHIN A SETBACK OF 25 FEET FROM A DESIGNATED EDGE OR BOUNDARY OF A WETLAND AREA.

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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

LANDSCAPE PLAN
SINGLE FAMILY
EAST

DATE
MAY 5, 2014
05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

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SCALE 0 25 50
1" = 50 FEET

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JOB --	
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LANDSCAPE DATA

REQUIRED	PROVIDED
1 TREE PER 50' LINEAR FEET OF INTERNAL STREETS	
15,299 LF OF ROAD/50 = 305.98 306 TREES REQUIRED	306 TREES PROVIDED

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Deciduous trees to be 2.5"Cal B & B
Evergreen trees to be 6'–7' HT. B & B

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PITTSFIELD GLEN

LANDSCAPE PLAN
SINGLE FAMILY
WEST

DATE
MAY 5, 2014
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SCALE 0 25 50
1" = 50 FEET

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JOB --
FILE CODE: --
SHEET NO. 58

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SEE SHEET 58

SEE SHEET 59

SEE SHEET 58

LANDSCAPE DATA

REQUIRED	PROVIDED
1 TREE PER 50' LINEAR FEET OF INTERNAL STREETS	
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SEE SHEET 60

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PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC

PITTSFIELD GLEN

LANDSCAPE PLAN
SINGLE FAMILY SOUTH

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED PSP PER TOWNSHIP & WCWRC COMMENTS

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SCALE 0 25 50
1" = 50 FEET

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P.M. J. ACKERMAN
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CAD FILE: 12000967CP-17-LS.DWG
JOB --
FILE CODE: --
SHEET NO. 59

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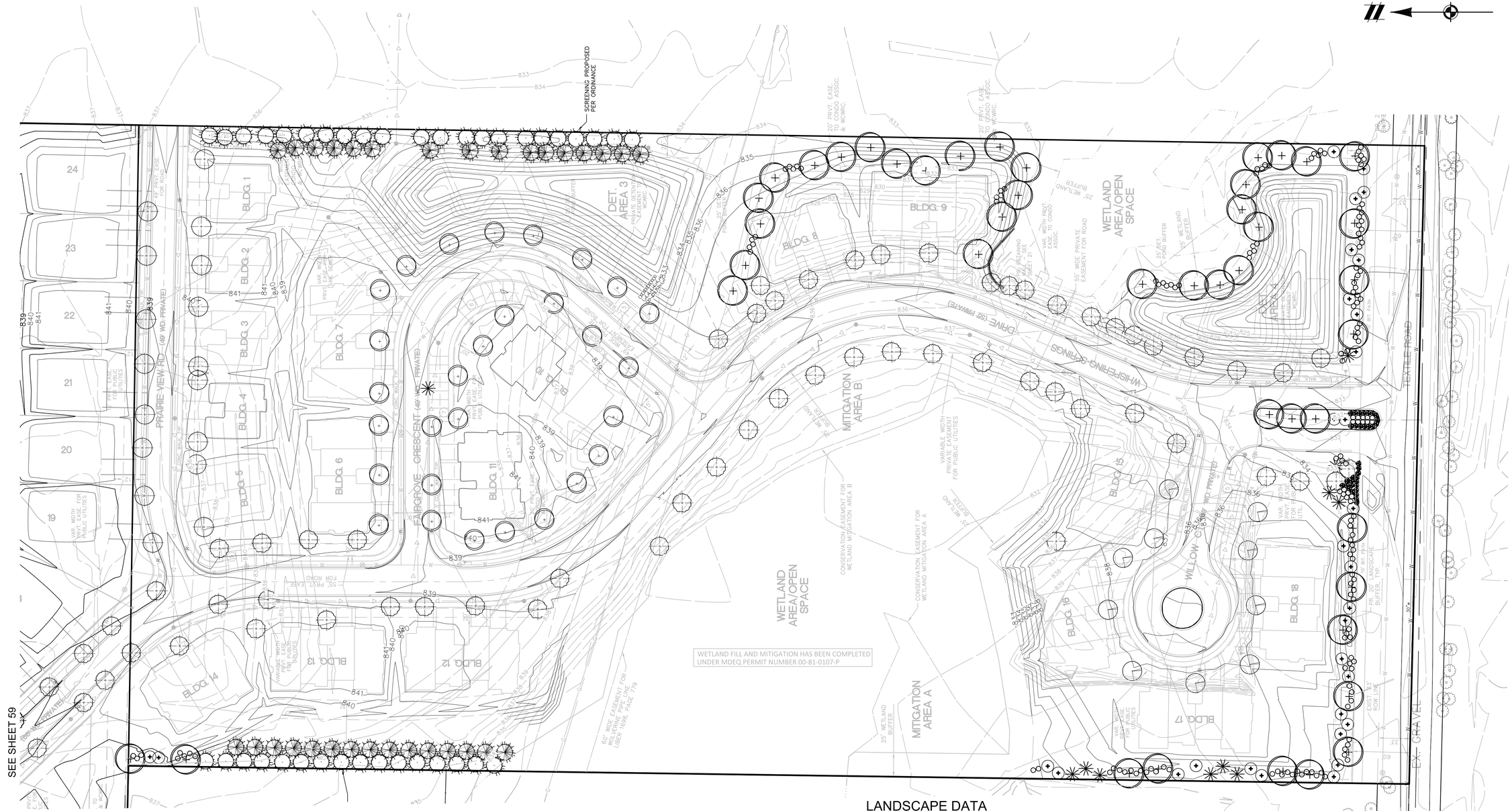

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TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC
PITTSFIELD GLEN

LANDSCAPE PLAN
MULTI FAMILY

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

REVISIONS

ATWELL

SCALE 0 25 50
1" = 50 FEET

DR. MN	CH. MSC
P.M. J. ACKERMAN	
BOOK --	
CAD FILE: 12000967CP-17-LS.DWG	
JOB --	
FILE CODE: --	
SHEET NO. 60	

* DETECTABLE WARNINGS SHALL CONSIST OF RAISED TRUNCATED DOMES WITH A DIAMETER OF NOMINAL 0.9 IN (23 MM), A HEIGHT OF NOMINAL 0.2 IN (5MM) AND A CENTER TO CENTER SPACING OF NOMINAL 2.35 IN (60MM) AND SHALL CONTRAST VISUALLY WITH ADJOINING SURFACES, EITHER LIGHT-ON-DARK, OR DARK-ON-LIGHT.

THE MATERIAL USED TO PROVIDE CONTRAST SHALL BE AN INTEGRAL PART OF THE WALKING SURFACE.

Curb Ramp And Typical Sidewalk Detail

NO SCALE

Concrete Sidewalk Detail

NO SCALE

Subdivision Benchmark Detail

NO SCALE

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

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. 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 BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NOTICE:
CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR; NEITHER THE OWNER NOR THE ENGINEER SHALL BE EXPECTED TO ASSUME ANY RESPONSIBILITY FOR SAFETY OF THE WORK, OF PERSONS ENGAGED IN THE WORK, OF ANY NEARBY STRUCTURES, OR OF ANY OTHER PERSONS.

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ATWELL
866.850.4200 | www.atwell-group.com
TWO TOWNE SQUARE, SUITE 700
SOUTHFIELD, MI 48076
248.447.2000

SECTION 22
TOWN 3 SOUTH, RANGE 6 EAST
PITTSFIELD TOWNSHIP
WASHTENAW COUNTY, MICHIGAN

CLIENT
PITTSFIELD GENERAL DEVELOPMENT, LLC
PITTSFIELD GLEN
DETAIL SHEET

DATE
MAY 5, 2014

05-20-2014 SUBMITTED TO TWP
06-03-2014 SUBMITTED UPDATED PSP TO TOWNSHIP
07-03-2014 REVISED PSP PER TOWNSHIP COMMENTS
11-07-2014 REVISED FSP PER TOWNSHIP & WCWRC COMMENTS

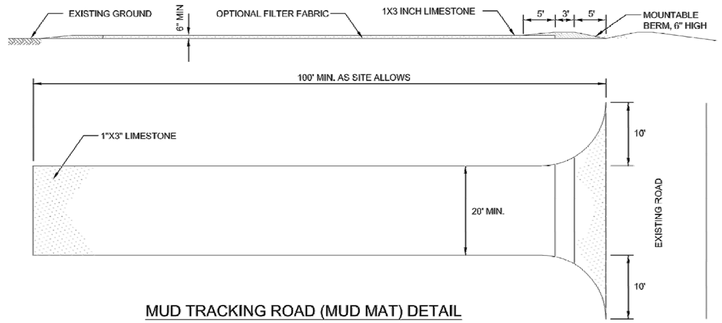
REVISIONS

ATWELL

SCALE 0

DR. MN	CH. MSC
P.M. J. ACKERMAN	
BOOK --	
CAD FILE: 12000967CP-18-DT.DWG	
JOB --	
FILE CODE: --	
SHEET NO. 61	

C:\USERS\MCAVOY ENGINEERING\DOCUMENTS_ME\PROJECTS\ATWELL PROJECTS\12000967\DWG\PLAN SETS\SITE-FINAL\12000967CP-18-DT.DWG 11/7/2014 9:51 AM MCAVOY ENGINEERING



MUD TRACKING ROAD (MUD MAT) DETAIL

PITTSFIELD CHARTER TOWNSHIP
SOIL EROSION AND SEDIMENTATION CONTROL NOTES

GENERAL

1. The contractor shall implement and maintain the soil erosion control measures as shown on the plans at all times during construction on this project. Any modifications or additions to the soil erosion control measures due to construction or changed conditions, shall be complied with as required or directed by the owner, project engineer or Pittsfield Township.
2. All soil erosion and sedimentation control work shall conform to the permit requirements of Pittsfield Township and the laws of the State of Michigan.
3. A NPDES construction activity permit is required for all sites greater than 5 acres.
4. Daily inspections shall be made by the contractor. Periodic inspections may be made by the owner/project engineer/Township to determine the effectiveness of erosion and sedimentation control measures. Any necessary corrections shall be made without delay.
5. Erosion and sedimentation from work on the site shall be contained on the site and not be allowed to collect on any off-site areas or in waterways.
6. All mud/dirt tracked onto roads from the site due to construction, shall be promptly removed by the contractor.
7. Restoration of all disturbed areas, including placement of topsoil, seed, fertilizer and mulch and/or sod shall be done within 5 days of the completion of final grade.
8. Construction operations shall be scheduled and performed so that preventative soil erosion control measures are in place prior to excavation in critical areas and temporary stabilization measures are in place immediately following backfilling operations.
9. Special precautions will be taken in the use of construction equipment to prevent situations that promote erosion.
10. Proper dust control shall be maintained during construction by use of water trucks and/or chloride as required.
11. The contractor shall be responsible for maintaining all temporary soil erosion control measures and removal of some upon authorized completion of project. Completion of project will not be authorized until all site work, home building, road work and utility construction is complete and all soils are stabilized.
12. The contractor shall not grade in existing wetland or conservation areas to be protected. Silt fence shall be installed and maintained adjacent to existing wetland and conservation areas to prevent grading, erosion and sedimentation into them.
13. Tree protection fencing must remain intact until restoration of the site is complete.

SEQUENCE OF CONSTRUCTION

1. Install sediment fence and tree protection fencing prior to any grading operation.
2. Install mud-tracking pad.
3. Construct temporary sediment/detention basin.
4. Place topsoil, fertilizer, seed and mulch over the entire detention basin area.
5. Rough grade site, stockpile topsoil and begin building construction.
6. Install storm drainage system including riprap and parking lot inlet filters and detention basin standpipe.
7. Maintain erosion and sedimentation control measures, as required.
8. Install sanitary sewer and water systems.
9. Bring pavement areas to sub-base grade, place sub-base and bituminous pavement.
10. Install franchised utilities.
11. Finish grade, redistribute topsoil, seed and mulch all disturbed areas.
12. Remove any accumulated sediment within the detention basin and replace clean washed stone around standpipe.
13. Complete construction of site.
14. Insure all soil is stabilized. Remove all temporary soil erosion control measures.

SEEDING/SOD

1. Seed or sod in accordance with project specifications.
2. All areas of disturbed earth that are not to be paved or sodded shall have 4 inches of topsoil, seed, fertilizer and mulch.
3. Immediately after seeding, mulch all seeded areas with unweathered small grain straw (preferably wheat) or hay spread. Spread uniformly at the rate of 1 ½ to 2 tons or 100 pounds (2 to 3 bales) per 1,000 square foot. This mulch should be anchored with a disc-type mulch-anchoring tool.
4. Any disturbed area not paved, seeded or mulched, sodded or built upon by November 15, is to be mulched in the manner as specified above, in order to provide soil erosion protection during the winter and early spring.
5. All erosion and sedimentation control prevention procedures and structures are to comply with the Standards and Specifications for soil erosion and sediment control of the Washtenaw County Soil Conservation District.
6. Drainage ditches and slopes steeper than 1:4 (25%) shall be stabilized with erosion control blankets.
7. Steep slopes that do not take upon initial seeding must be re-seeded and stabilized with erosion control blankets.
8. Where excavation has been through lawn areas, the CONTRACTOR shall restore the disturbed area by placing topsoil and seeding or sodding over the final backfill material.

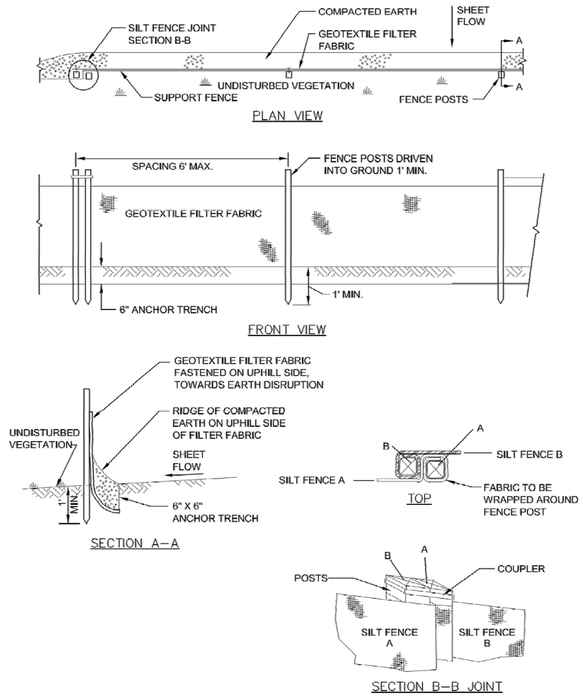
CATCH BASIN/MANHOLE PROTECTION

1. Protect storm sewer catch basins with Siltsack. or approved equivalent as follows:

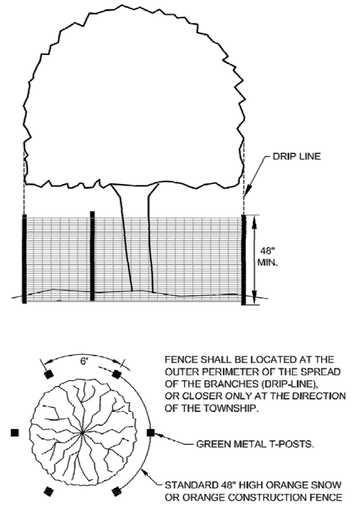
ROADS

1. During construction, all roads shall be protected from unvegetated areas washing onto road surfaces by placement of silt fence behind curb or a 10 foot wide straw mulch bank behind the curb or other approved method and/or as shown on the plans.
2. During construction of any portion of the project, roads shall be maintained free of dirt, silt and construction debris.

Pittsfield SEC 9/22/2009

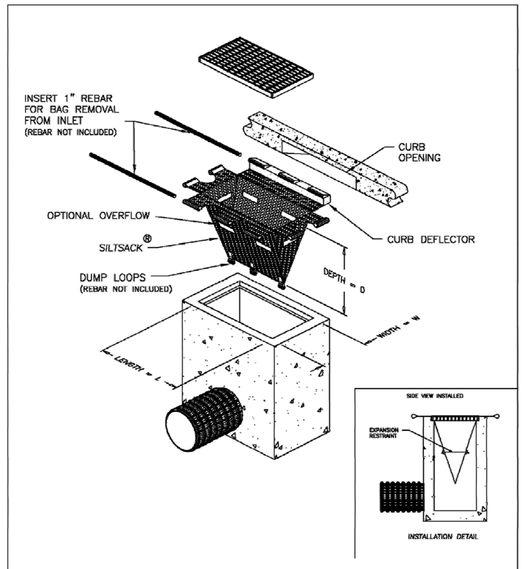


SILT FENCE
NOT TO SCALE



NOTES:
1. ALL TREES TO BE REMOVED WILL BE IDENTIFIED BY RED FLAGGING.
2. TREE PROTECTION FENCING IS TO BE ERECTED PRIOR TO ANY EARTHWORK OR CONSTRUCTION AND IS TO REMAIN IN PLACE UNTIL CONSTRUCTION AND GRADING IS COMPLETE.
3. ALL DEBRIS, FILL, EQUIPMENT OR MATERIAL IS TO BE KEPT CLEAR OF AREA WITHIN PROTECTIVE FENCE. NO CLEANING OF EQUIPMENT OR MATERIAL OR STORAGE OR DISPOSAL OF ANY MATERIAL WITHIN THE DRIP LINE OF ANY TREES TO BE SAVED.

TREE PROTECTION FENCE DETAIL
NOT TO SCALE



DETAIL OF INLET SEDIMENT CONTROL DEVICE
TYPE B – WITH CURB DEFLECTOR

ACF Environmental
Your Complete Source for Geosynthetic Solutions

ACF Environmental, Inc.
2831 Cardwell Rd.
Richmond, Virginia 23234
(800) 448-3636

SILTSACK®
SPECIFICATIONS

NOTE: THE SILTSACK® WILL BE MANUFACTURED FROM A WOVEN POLYPROPYLENE FABRIC THAT MEETS OR EXCEEDS THE FOLLOWING SPECIFICATIONS.

REGULAR FLOW SILTSACK®
(FOR AREAS OF LOW TO MODERATE PRECIPITATION AND RUN-OFF)

PROPERTIES	TEST METHOD	UNITS	
GRAB TENSILE STRENGTH	ASTM D-4632		300 LBS
GRAB TENSILE ELONGATION	ASTM D-4632		20 %
PUNCTURE	ASTM D-4833		120 LBS
MULLEN BURST	ASTM D-3786		800 PSI
TRAPEZOID TEAR	ASTM D-4533		120 LBS
UV RESISTANCE	ASTM D-4355		90 %
APPARENT OPENING SIZE	ASTM D-4751		40 US SIEVE
FLOW RATE	ASTM D-4491		40 GAL/MIN/SQ FT
PERMITTIVITY	ASTM D-4491		0.55 SEC -1

* HI-FLOW SILTSACK®
(FOR AREAS OF MODERATE TO HEAVY PRECIPITATION AND RUN-OFF)

PROPERTIES	TEST METHOD	UNITS	
GRAB TENSILE STRENGTH	ASTM D-4632		265 LBS
GRAB TENSILE ELONGATION	ASTM D-4632		20 %
PUNCTURE	ASTM D-4833		135 LBS
MULLEN BURST	ASTM D-3786		420 PSI
TRAPEZOID TEAR	ASTM D-4533		45 LBS
UV RESISTANCE	ASTM D-4355		90 %
APPARENT OPENING SIZE	ASTM D-4751		20 US SIEVE
FLOW RATE	ASTM D-4491		200 GAL/MIN/SQ FT
PERMITTIVITY	ASTM D-4491		1.5 SEC -1

OIL-ABSORBANT SILTSACK®
(FOR AREAS WHERE THERE IS A CONCERN FOR OIL RUN-OFF OR SPILLS)

DEPENDING ON YOUR PARTICULAR APPLICATION, THE SILTSACK CAN BE MADE FROM EITHER ONE OF THE ABOVE FABRICS WITH AN OIL-ABSORBANT PILLOW INSERT OR, MADE COMPLETELY FROM AN OIL-ABSORBANT SILTSACK WITH A WOVEN PILLOW INSERT.

SILTSACK DISTRIBUTORS:
PRICE & COMPANY
(www.priceandcompany.com)

METRO GRAND RAPIDS, MI
425 36TH STREET SW
WYOMING, MI 49548-2108
1-800-248-8230

METRO DETROIT, MI
29165 WALL STREET
WIXOM, MI 48393-3525
1-888-960-4300

(* HI-FLOW SILT SACK SHALL BE USED FOR ALL APPLICATIONS WITHIN PITTSFIELD TOWNSHIP)

SILTSACK
NOT TO SCALE

Pittsfield Charter Township
6201 W. Michigan Ave.
Ann Arbor, MI 48108-9721
48108-9721
Tel. 734.822.3101
www.pittsfield-mi.gov

SILTSACK	EWA	DRW	12.01.03
TWP REV	EWA	DRW	11.04.27
UPDATES	TTN	DRW	10.01.20
Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name: SE-01	TTN	DRW	DRW	07.10.01
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
PITTSFIELD TOWNSHIP

Pittsfield Township, Michigan

Title
SOIL EROSION DETAILS AND NOTES

Project No.
2075001300

Scale
NOT TO SCALE

Revision
1

STORM SEWER AND DRAINAGE STRUCTURES

1.00 GENERAL

1.01 DESCRIPTION

A. Furnish all labor, tools, equipment and materials to construct all storm sewers, and drainage structures as herein specified. No sewers shall be accepted until the sewer system has passed the system acceptance tests.

1.02 TESTING

A. General

1. The CONTRACTOR shall furnish all equipment and personnel to conduct system acceptance tests as specified herein on all completed sewers. All tests shall be conducted under the supervision of the ENGINEER. No acceptance tests shall be conducted until the entire sewer system is constructed or just prior to placing the line in service providing the sewer pipe has been installed for not less than 30 days.

B. Test for Alignment

1. All sewers shall be laid accurately to the line and grade designed by the ENGINEER. The sewers will be tested for alignment by shining a light through the pipe at a manhole and viewing the light from an adjacent manhole. Any section of sewer in which a light cannot be seen from one manhole to the next shall be corrected to the satisfaction of the ENGINEER to pass this test.

C. Material Tests

1. The CONTRACTOR shall have tests of pipe strength made by an independent testing laboratory. Tests of up to 4 lengths of sewer pipe per hundred lengths may be required to show compliance with the Specifications. All pipe delivered to the job site shall be accompanied with a manufacturer's certificate of compliance to the Specifications.

D. Submittals

1. The CONTRACTOR shall submit shop drawings, or data sheets for all castings, steps and manholes.

2. The CONTRACTOR shall submit certification letters for all pipes. All letters must contain the following; Contractors name, project name, township name, current date, certification of pipe provided and letterhead of the certifying company.

2.00 PRODUCTS

2.01 PIPE

A. Reinforced concrete pipe and manhole tees shall be no less than the latest revision of ASTM C76, with the class designation as shown on the Plans or in the Proposal.

B. Concrete pipe shall have tongue and groove gasketed premium joints.

C. Corrugated steel pipe shall meet the requirements of AASHO M-190 for coated pipe latest revision. Minimum gage thickness shall be as shown on the Plans.

2.02 REINFORCED CONCRETE MANHOLES

A. Manholes shall conform to the current ASTM Specifications for precast reinforced concrete Manhole Sections, serial designation C478. Manhole section joints shall conform to ASTM Designation C990. All cones shall be eccentric with an offset step configuration. Concrete adjustment rings or riser rings shall not be used for adjusting the height of the structure.

B. All manhole component parts shall have the name of the manufacturer stenciled on the inside. The lettering or logo shall be a minimum of 4 inches high.

2.03 MORTAR FOR MANHOLES

A. Mortar for plastering manholes and drainage structures shall be made of one part Portland cement and two parts fine aggregate.

2.04 BRICK AND BLOCK

A. Brick for brick and mortar structures shall conform to the current ASTM Specification C32. Block for block and mortar structures shall conform to the current ASTM Specification C135.

B. The concrete block masonry used to construct manhole and catch basin walls shall be solid curved blocks with the inside and outside surfaces curved to the required radii. The blocks shall have tongue and groove or other approved type of joint at the ends so that the units interlock to form a strong, rigid structure. Curved blocks shall have the inside and outside surfaces parallel.

C. The block shall not exceed 18 inches in length or 8 inches in depth (height). No block shall be less than 8 inches in width (thickness). All blocks in one structure shall be of the same height dimension. The blocks shall be designed for length so that only full-length or half-length blocks are required to lay the circular wall of any one course.

D. Blocks intended for use in the cones or tops of manholes and catch basins shall have such shape as may be required to form the structure as shown on the Plans with inside and outside joint not to exceed 1/4-inch in thickness.

2.05 STRUCTURE FRAMES AND COVERS

A. Structures frames and covers shall weigh not less than 350 lbs. Each frame and cover shall have machined bearing surfaces and shall be suitably notched for convenient removal of the cover. Each solid manhole cover shall be marked Storm Sewer with letters integrally cast into the cover.

B. Frames and Covers shall be as follows:

1. For use on manholes: East Jordan 1040Z, with Type B cover lettered "STORM SEWER", or equal. Structures 24-inches in diameter shall have the 1045 Z frame.
2. For use on drainage structures in paved areas: East Jordan 1040Z, with Type M1 cover, with "DUMP NO WASTE" lettering and trout logo.
3. For use on drainage structures in curbed areas: East Jordan 7045 or 7065, with "DUMP NO WASTE" lettering and trout logo.
4. For use on drainage structures in landscaped areas: East Jordan 1040Z, with 1040 N 7", with "DUMP NO WASTE" lettering and trout logo.

C. All frames and covers shall be coated by the manufacturer with coal tar pitch varnish or other asphaltum coating reviewed by the ENGINEER.

D. All covers for drainage structures shall have storm drain markers affixed to the nearest available flat surface. The storm drain markers shall be manufactured by Das Manufacturing and shall be #SDR "No Dumping, Drains to River." The storm drain markers shall be installed per the manufacturer's recommendations.

2.06 MANHOLE STEPS

A. Steps shall be plastic coated steel. They shall be M.A. Industries PS1-PF for precast manholes, PS1-B for block manholes, or equal.

2.07 DRAINAGE STRUCTURES

A. All manholes and catch basins shall be precast unless otherwise specified.

B. Manhole and catch basin bottoms shall be concrete and top of slab shall have a troweled finish.

C. Upon approval by the ENGINEER, the manhole and catch basin walls may be constructed of concrete block masonry or concrete manhole pipe conforming to the requirements of the specifications previously listed. Construction shall be in accordance with the details for Catch Basin and Storm Sewer Manhole shown on the Plans.

D. A plaster coat of mortar 1/2-inch in thickness shall be applied to the inside and outside surface of all manholes and catch basins constructed with concrete block masonry or sewer brick. The inside coat of mortar shall be applied in a smooth, neat workmanlike manner.

E. Final adjustment of the top of manholes and catch basins, so that the manhole or catch basin cover is at finished elevations as shown on the Plans or meets the finished surface, may be accomplished with sewer brick conforming to the previously listed Specifications. The total height of brick for this purpose shall not exceed 9 inches. The total chimney height shall not exceed 18 inches.

F. All block and brick masonry units shall be laid in a full bed of mortar. The inside joints of the block masonry construction shall be tooled in a neat and workmanlike manner.

3.00 EXECUTION

3.01 EXCAVATION AND BACKFILL

A. All excavation and backfill 12 inches above the crown of pipe shall conform to Section 2.04, Earthwork of these specifications.

B. The trench shall be backfilled closely behind the pipe laying. Unless otherwise directed or permitted by the ENGINEER, the backfilling shall follow and be completed to the top of the trench within four pipe lengths behind pipe laying.

3.02 BEDDING

A. Concrete pipe shall be laid on a compacted granular material placed on the bottom of the trench to a depth of not less than 4 inches. Where indicated on the Plans or required by the ENGINEER, concrete encasement or cradle shall be used.

B. For all pipes, compacted aggregate material shall be placed at the sides of the pipe in 12-inch lifts and cover not less than 12 inches above the crown of the pipe.

C. "Granular Material" shall be MDOT class II, placed in not more than 6-inch layers and compacted to not less than 90% standard density.

3.03 PIPE INSTALLATION

A. All pipe shall be laid true to the required lines and grades. All trenches when pipe laying is in progress, shall be kept dry, and all pipes and fittings shall be uniformly supported on a properly trimmed bedding with holes at each joint to receive bells. All pipe shall be laid with bells uphill.

B. The grade as shown on the profiles is that of the pipe invert and that to which the work must conform. The grade shall be kept by laser or other tools which shall be furnished by the CONTRACTOR at his expense. Each pipe shall be laid accurately to the line and grade as shown on the Plans and in such manner as to form a close concentric joint with the adjoining pipe and prevent sudden offsets of the invert. The interior of sewers shall, as the work progresses, be cleaned of all dirt, cement, debris and other superfluous materials of every description. Bulkheads shall be used to keep foreign materials out of the open end of the sewer when work is not in progress.

C. The location of the piping as shown on the Plans has been determined to avoid, insofar as possible, interference with trees or structures or fixtures above ground and other underground mains, services, utilities or structures. Any change in location or alignment of piping, which may be found more feasible or practicable as the work progresses, shall be made by the CONTRACTOR, as the ENGINEER may direct.

D. All pipe shall be carefully lowered and moved into position in trench or vault in a controlled manner such as will prevent damage to the pipe and any coatings or lining. An excessive amount of scratching on the surface of the concrete pipe will be considered cause for rejection.

E. All cutting of the pipe shall be done in a neat workmanlike manner with the least amount of waste and without damage to existing or new lines. A fine toothsaw, tubing cutter or similar tool may be used to cut concrete pipe. Cuts must be square. Ragged edges shall be removed with a cutting tool or file.

F. Breaks in pipe or joints shall be repaired to the satisfaction of the ENGINEER and at the expense of the CONTRACTOR.

3.04 CONNECTIONS TO EXISTING MANHOLES

A. When a sewer is connected to an existing manhole, a hole adequate to receive the new pipe shall be cored into the manhole.

B. If the existing manhole is of brick construction, a single rowlock of brick shall be turned over the new pipe and the existing manhole brick work shall be cleaned, pointed and given a 1/2-inch mortar coat on the outside surface.

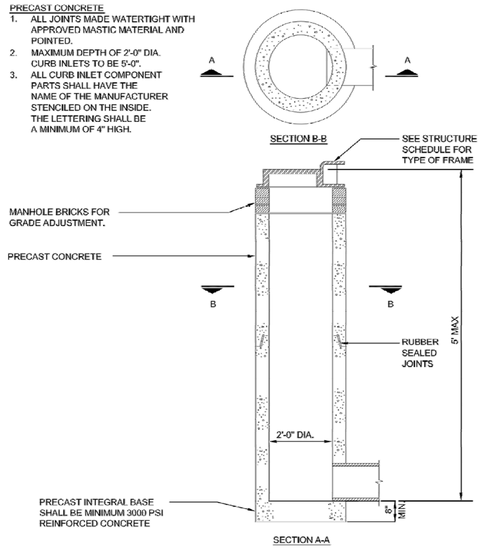
C. For connections to existing precast reinforced concrete manholes, a hole shall be cored into the concrete manhole wall to receive the pipe. Reinforcing steel shall not be cut out shall be bent and replaced in the area that is to be patched. A form shall be constructed over the area of pipe penetration. The formed area shall then be filled with concrete.

D. Closure of the manhole wall shall be made watertight using concrete.

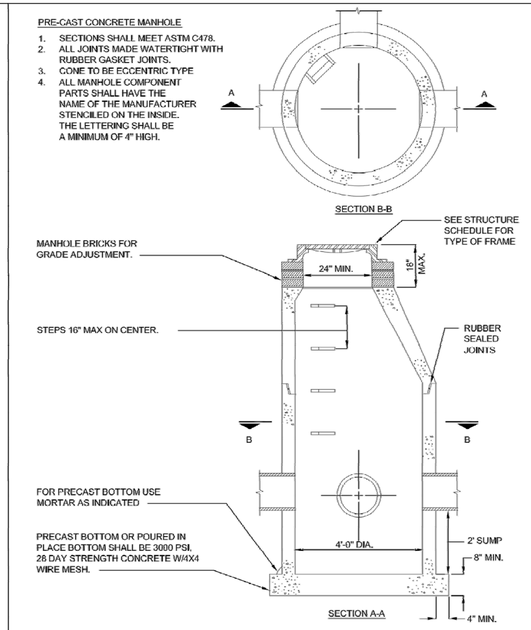
3.05 ANIMAL GRATES

A. Animal grates shall be required on all endsections greater than 12-inch diameter.

PCT February 2008



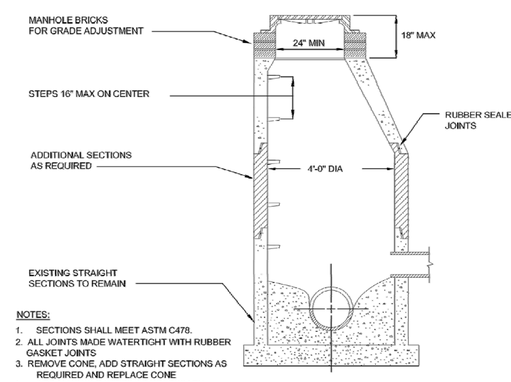
2' DIAMETER INLET



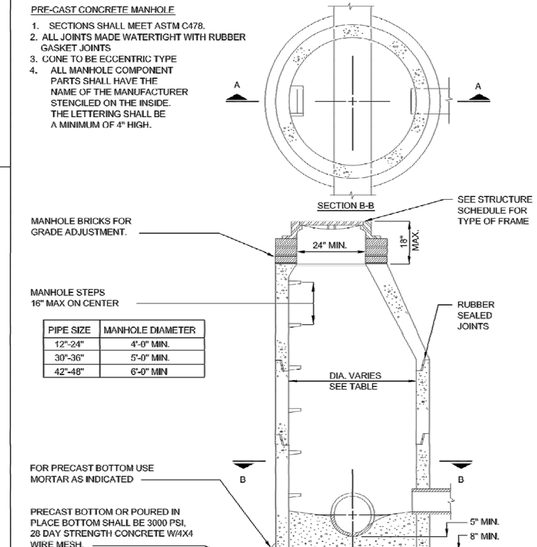
4' DIAMETER CATCH BASIN

AFFIX TO SURFACE ON OR NEAR ALL DRAINAGE COVERS.

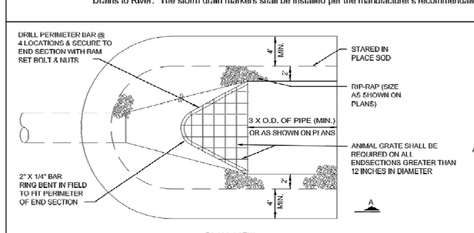
STORM DRAIN MARKER

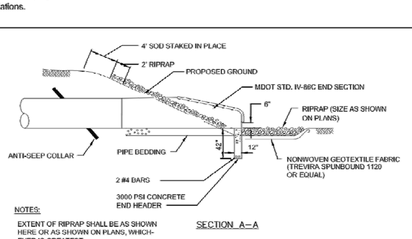


MANHOLE & CATCH BASIN RECONSTRUCTION DETAIL

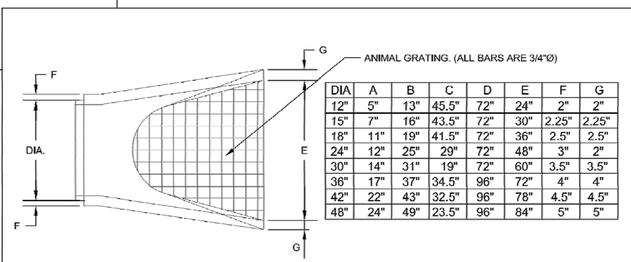


STORM SEWER MANHOLE

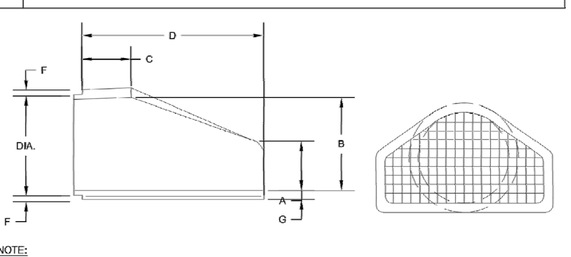




END SECTION AND RIPRAP DETAIL



DIA	A	B	C	D	E	F	G
12"	5"	13"	45.5"	72"	24"	2"	2"
15"	7"	16"	43.5"	72"	30"	2.25"	2.25"
18"	11"	19"	41.5"	72"	36"	2.5"	2.5"
24"	12"	25"	29"	72"	48"	3"	2"
30"	14"	31"	19"	72"	60"	3.5"	3.5"
36"	17"	37"	34.5"	96"	72"	4"	4"
42"	22"	43"	32.5"	96"	78"	4.5"	4.5"
48"	24"	49"	23.5"	96"	84"	5"	5"



NOTE:
FLARED END SECTIONS SHALL BE MANUFACTURED TO THE CLASS SPECIFICATIONS AS THE PIPE ITSELF.

STANDARD END SECTIONS FOR PRECAST CONCRETE

Pittsfield Charter Township
6201 W. Michigan Ave.
Ann Arbor, MI 48108-9721
48108-9721
Tel. 734.822.3101
www.pittsfield-mi.gov

UPDATES	MRH	DRW	14.01.24
TWP REV	DWA	DRW	12.08.09
TWP REV	DWA	DRW	11.04.27
UPDATES	BWA	DRW	10.10.25
UPDATES	TTN	DRW	10.01.20
Revision	By	Appd.	YY.MM.DD
Issued	By	Appd.	YY.MM.DD
File Name: ST-01	TTN	DRW	DRW	07.10.01
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
PITTSFIELD TOWNSHIP

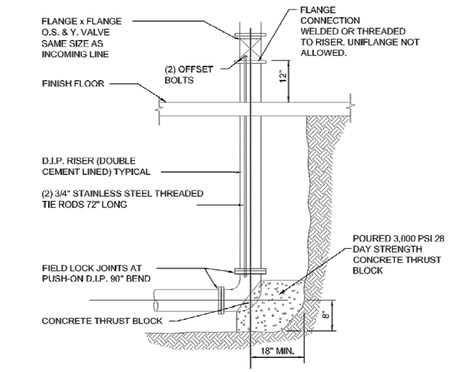
Pittsfield Township, Michigan

Title
STORM SEWER DETAILS AND SPECIFICATIONS

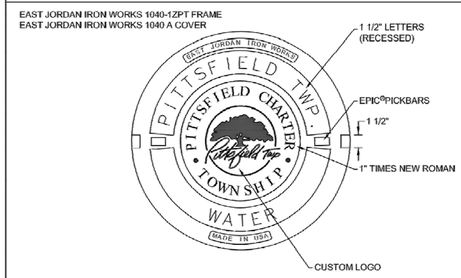
Project No.
2075001300

Scale
NOT TO SCALE

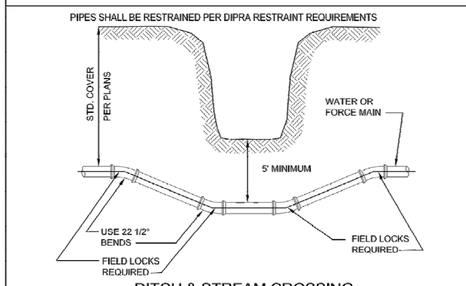
Revision



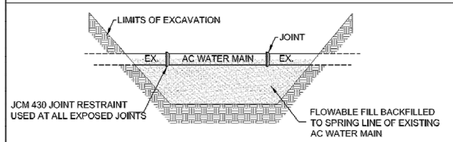
FIRE PROTECTION RISER DETAIL



COVER DETAIL

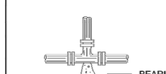


DITCH & STREAM CROSSING



ASBESTOS CEMENT (AC) WATER MAIN

ELBOWS					
PIPE DIA. INCHES		BEARING AREA SQUARE FEET 90°	45°	22 1/2°	11 1/4°
4		2.1	1.1	0.6	0.3
6		4.1	2.2	1.1	0.6
8		6.8	3.7	1.9	0.9
10		10.1	5.5	2.8	1.4
12		14.1	7.6	3.9	2.0
16		24.2	13.0	6.7	3.3
18		30.0	16.3	8.3	4.2
20		36.8	19.9	10.1	5.1



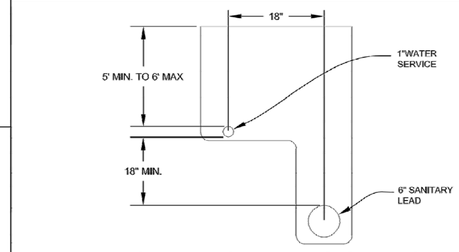
TEES, CROSSES & HYDRANTS		
PIPE DIA. INCHES		BEARING AREA SQUARE FEET
4		1.5
6		2.9
8		4.8
10		7.1
12		10.0
16		17.1
18		21.0
20		26.0

NOTES:
1. CONCRETE FOR ALL THRUST BLOCKS SHALL BE 3000 PSI, 28 DAY STRENGTH MIN.
2. ALL THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED EARTH
3. BOLTS, FITTINGS & JOINTS SHALL BE KEPT CLEAR OF CONCRETE
4. A BEARING CAPACITY OF 2000# PER FOOT WAS USED IN DETERMINING THE MINIMUM "BEARING AREAS" IN THE ABOVE TABLE
5. THE CROSS SECTION OF THE THRUST BLOCKS SHALL BE SQUARE
6. IN ADDITION TO THRUST BLOCKS, ALL PIPE JOINTS SHALL BE RESTRAINED WITH LOCKING GASKETS PER DIPRA'S STANDARDS.

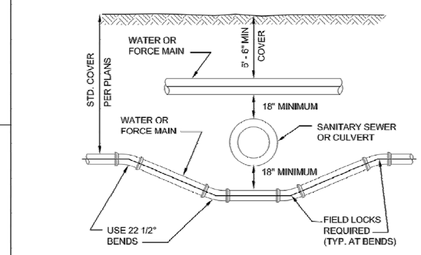
SOIL CHARACTERISTICS	FACTOR
(A) LOOSE COARSE OR MEDIUM SAND; COMPACT FINE SAND; COMPACT SAND-CLAY SOILS; STIFF CLAY	0.33
(B) FIRM FINE SAND; COMPACT INORGANIC SILT; FIRM SAND-CLAY SOILS; MEDIUM CLAY	0.50
(C) LOOSE FINE SAND; FIRM INORGANIC SILT	0.67
(D) LOOSE SAND-CLAY SOILS; LOOSE INORGANIC SILT SOFT CLAY	1.00

"BEARING AREA" x FACTOR = ACTUAL BEARING AREA
2.1 x .5 = 1.05 SQ. FT.
BASED UPON 150# TEST PRESSURE

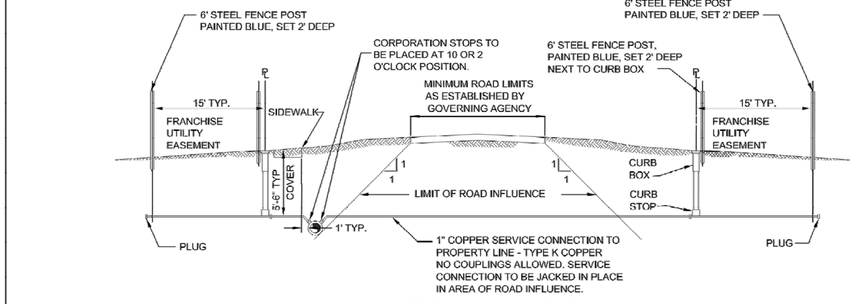
THRUST BLOCK



TYPICAL L TRENCH DETAIL HOUSE LEADS

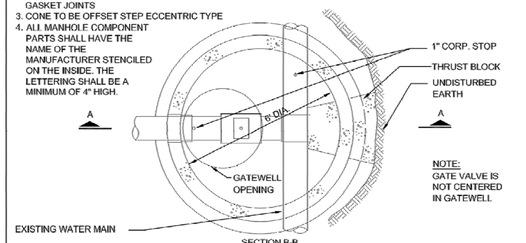


SEWER OR CULVERT CROSSING

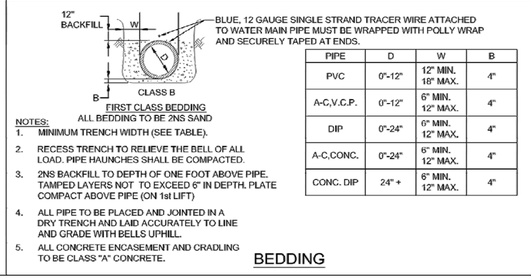


WATER MAIN CONNECTION

PRE-CAST CONCRETE MANHOLE
1. SECTIONS SHALL MEET ASTM C478.
2. ALL JOINTS MADE WATERTIGHT WITH RUBBER GASKET JOINTS
3. CONE TO BE OFFSET STEP ECCENTRIC TYPE
4. ALL MANHOLE COMPONENT PARTS SHALL HAVE THE NAME OF THE MANUFACTURER STENCILED ON THE INSIDE. THE LETTERING SHALL BE A MINIMUM OF 4" HIGH.



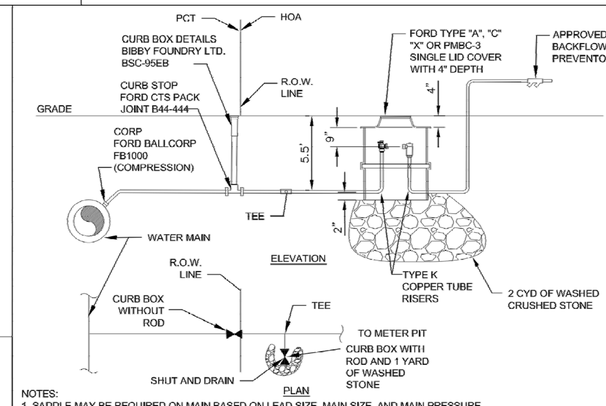
TAPPING SLEEVE & VALVE & WELL



PIPE	D	W	B
PVC	0"-12"	12" MIN. 18" MAX.	4"
A-C,V.C.P.	0"-12"	6" MIN. 12" MAX.	4"
DIP	0"-24"	6" MIN. 12" MAX.	4"
A-C,CONC.	0"-24"	6" MIN. 12" MAX.	4"
CONC. DIP	24" +	6" MIN. 12" MAX.	4"

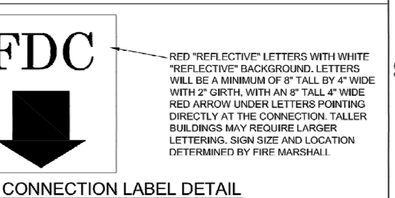
NOTES:
1. MINIMUM TRENCH WIDTH (SEE TABLE).
2. RECESS TRENCH TO RELIEVE THE BELL OF ALL LOAD. PIPE HAUNCHES SHALL BE COMPACTED.
3. 2NS BACKFILL TO DEPTH OF ONE FOOT ABOVE PIPE. TAMPED LAYERS NOT TO EXCEED 6" IN DEPTH. PLATE COMPACT ABOVE PIPE (ON 1st LIFT)
4. ALL PIPE TO BE PLACED AND JOINTED IN A DRY TRENCH AND LAID ACCURATELY TO LINE AND GRADE WITH BELLS UPHILL.
5. ALL CONCRETE ENCASEMENT AND CRADLING TO BE CLASS "A" CONCRETE.

BEDDING



NOTES:
1. SADDLE MAY BE REQUIRED ON MAIN BASED ON LEAD SIZE, MAIN SIZE, AND MAIN PRESSURE
2. ALL WATER MAIN TAPS AND COMPONENT PARTS SHALL BE APPROVED BY THE PITTSFIELD TOWNSHIP UTILITIES DEPARTMENT PRIOR TO INSTALLATION.
3. INSTALLATION SHALL BE INSPECTED AND APPROVED BY THE PITTSFIELD TOWNSHIP UTILITIES DEPARTMENT.

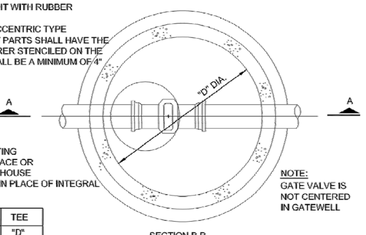
IRRIGATION METER PIT DETAIL



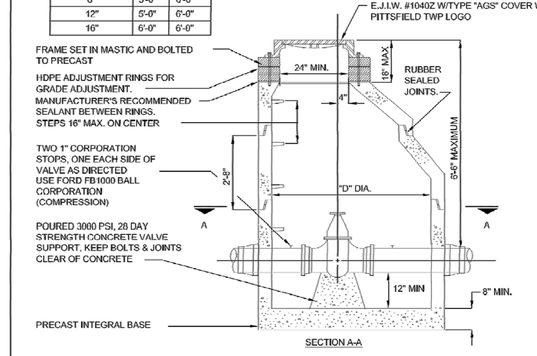
RED "REFLECTIVE" LETTERS WITH WHITE "REFLECTIVE" BACKGROUND. LETTERS WILL BE A MINIMUM OF 8" TALL BY 4" WIDE WITH 2" GIRTH, WITH AN 8" TALL 4" WIDE RED ARROW UNDER LETTERS POINTING DIRECTLY AT THE CONNECTION. TALLER BUILDINGS MAY REQUIRE LARGER LETTERING. SIGN SIZE AND LOCATION DETERMINED BY FIRE MARSHALL.

FIRE DEPARTMENT CONNECTION LABEL DETAIL

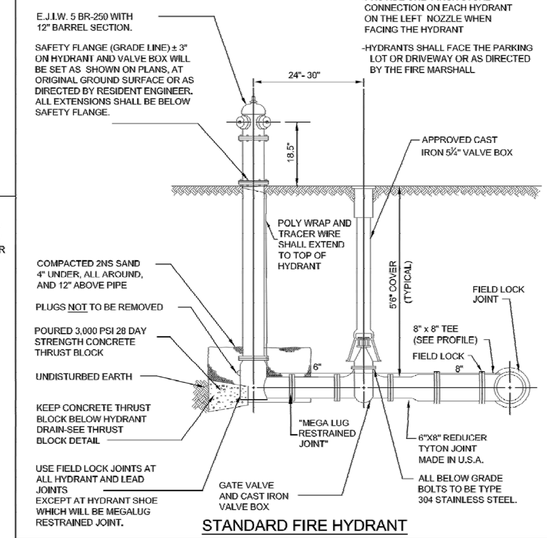
PRE-CAST CONCRETE MANHOLE
1. SECTIONS SHALL MEET ASTM C478.
2. ALL JOINTS MADE WATERTIGHT WITH RUBBER GASKET JOINTS
3. CONE TO BE OFFSET STEP ECCENTRIC TYPE
4. ALL MANHOLE COMPONENT PARTS SHALL HAVE THE NAME OF THE MANUFACTURER STENCILED ON THE INSIDE. THE LETTERING SHALL BE A MINIMUM OF 4" HIGH.
5. PROVIDE INTEGRAL BASE.
6. KOR-N-SEAL BOOTS OR APPROVED EQUAL TO BE INSTALLED AT PIPE PENETRATIONS.
7. WHERE GATE WELLS ARE CONSTRUCTED OVER EXISTING WATERMAIN, POURED IN PLACE OR PRECAST COOKIE AND DOGHOUSE STRUCTURES MY BE USED IN PLACE OF INTEGRAL BASE.



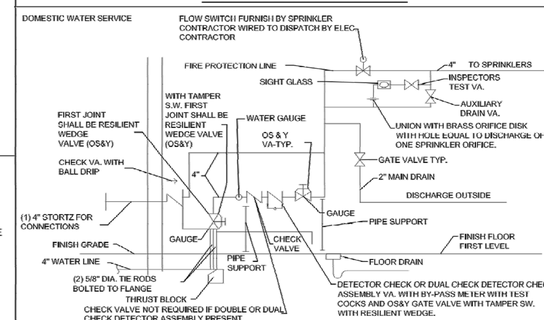
STRAIGHT THRU	TEE
VALVE SIZE	"D"	"D"
8"	5'-0"	6'-0"
12"	5'-0"	6'-0"
16"	6'-0"	6'-0"



STANDARD GATE VALVE & WELL



STANDARD FIRE HYDRANT



METER ROOM DETAIL

Pittsfield Charter Township
6201 W. Michigan Ave.
Ann Arbor, MI 48108-9721
48108-9721
Tel. 734.822.3101
www.pittsfield-mi.gov

Revision	By	Appd.	YY.MM.DD
UPDATES	MRJ	DRW	14.01.24
FDC UPDATE	BWA	DRW	11.09.13
TWP REV	BWA	DRW	11.04.27
HYDRANT, MANHOLE UPDATE	BWA	DRW	10.10.25
UPDATES	TTN	DRW	10.01.20

Issued	By	Appd.	YY.MM.DD
File Name: W-01	BWA	DRW	07.10.01
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
PITTSFIELD TOWNSHIP

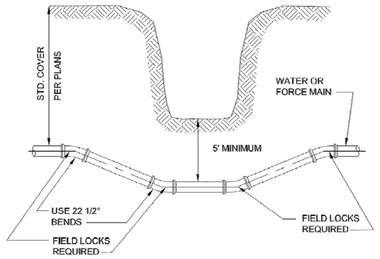
Pittsfield Township, Michigan

Title
WATER MAIN DETAILS

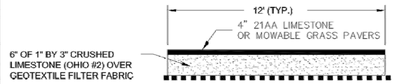
Project No.
2075001300

Scale
NOT TO SCALE

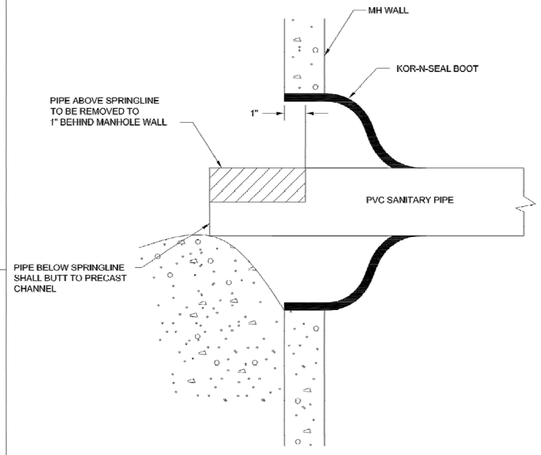
Revision



DITCH & STREAM CROSSING

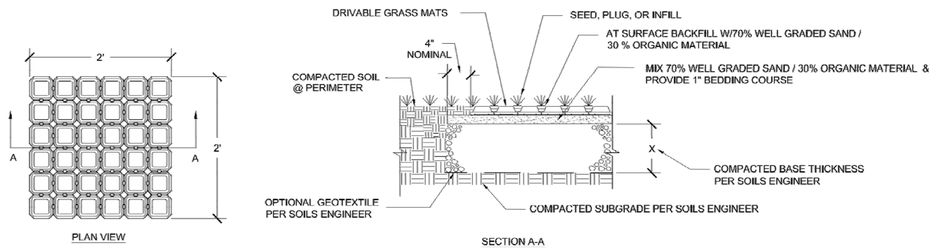


SANITARY SEWER ACCESS PATH

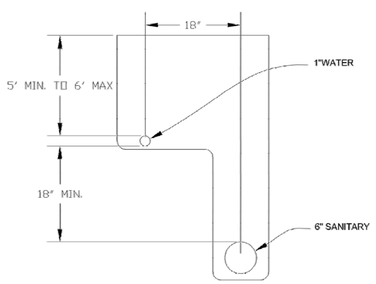


SANITARY PIPE PENETRATION

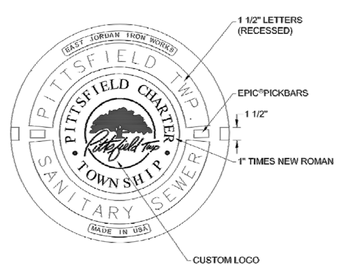
NOTE:
FOR STORMWATER MANAGEMENT APPLICATIONS INCLUDING STORAGE AND INFILTRATION, ALTERNATE INFILLS, BASE MATERIAL, AND DRAINAGE MAY BE REQUIRED



TYPICAL HEAVY TRAFFIC DRIVABLE GRASS DETAIL



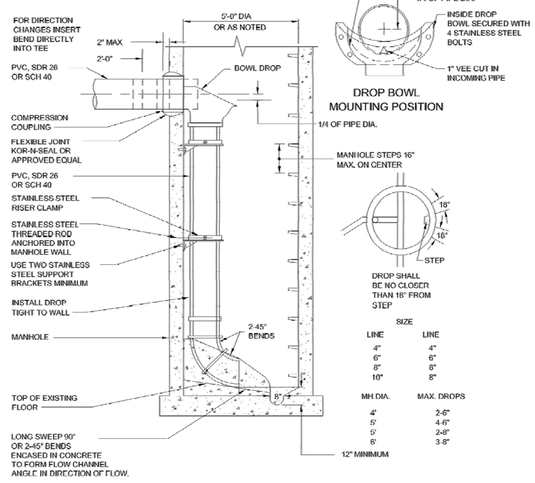
TYPICAL L TRENCH DETAIL
HOUSE LEADS



EAST JORDAN IRON WORKS 1040 Z BOLT DOWN FRAME
EAST JORDAN IRON WORKS 1040 AGS COVER

COVER DETAIL

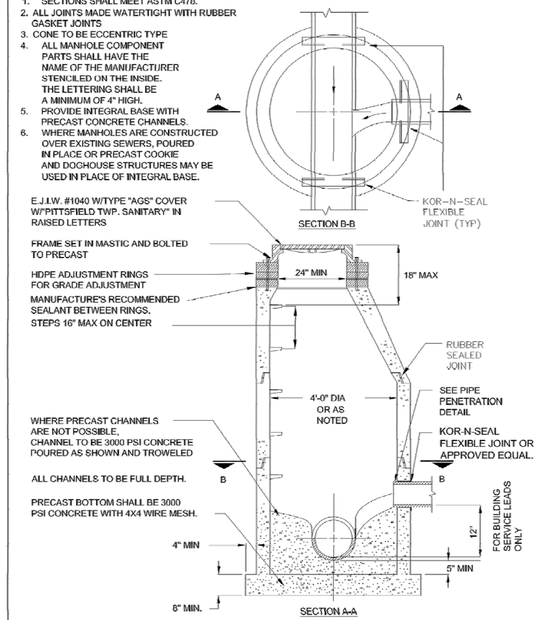
NOTES:
1. SECURE DROP PIPE TO MANHOLE WALL WITH RELINER-DURAN, INC STAINLESS STEEL ADJUSTABLE CLAMPING BRACKETS OR EQUAL.
2. ATTACH THE DROP BOWL & EACH CLAMPING BRACKET TO THE MANHOLE WALL WITH 3/8" x 3 3/4" RAMSET/RED HEAD BOLTS HELD INPLACE WITH 2 STAGE EPOXY PASTE.



NO UTILITY STRUCTURES (ie. MANHOLES, CURB BOXES etc.) SHALL BE PLACED IN ANY DRIVEWAY OR SIDEWALK

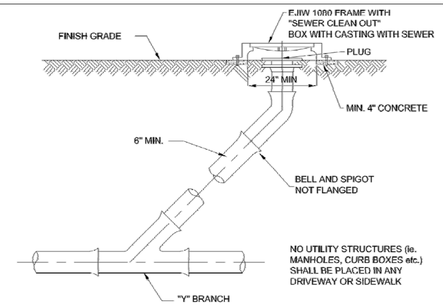
INTERIOR DROP
SANITARY MANHOLE

PRE-CAST CONCRETE MANHOLE
1. SECTIONS SHALL MEET ASTM C478.
2. ALL JOINTS MADE WATERTIGHT WITH RUBBER GASKET JOINTS
3. CONE TO BE ECCENTRIC TYPE
4. ALL MANHOLE COMPONENT PARTS SHALL HAVE THE NAME OF THE MANUFACTURER STENCILED ON THE INSIDE. THE LETTERING SHALL BE A MINIMUM OF 4" HIGH.
5. PROVIDE INTEGRAL BASE WITH PRECAST CONCRETE CHANNELS.
6. WHERE MANHOLES ARE CONSTRUCTED OVER EXISTING SEWERS, POURED IN PLACE OR PRECAST COOKIE AND DOGHOUSE STRUCTURES MAY BE USED IN PLACE OF INTEGRAL BASE.

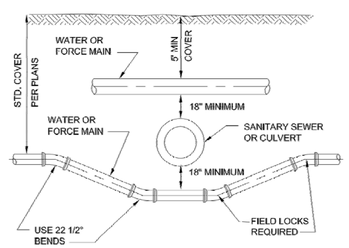


NO UTILITY STRUCTURES (ie. MANHOLES, CURB BOXES etc.) SHALL BE PLACED IN ANY DRIVEWAY OR SIDEWALK

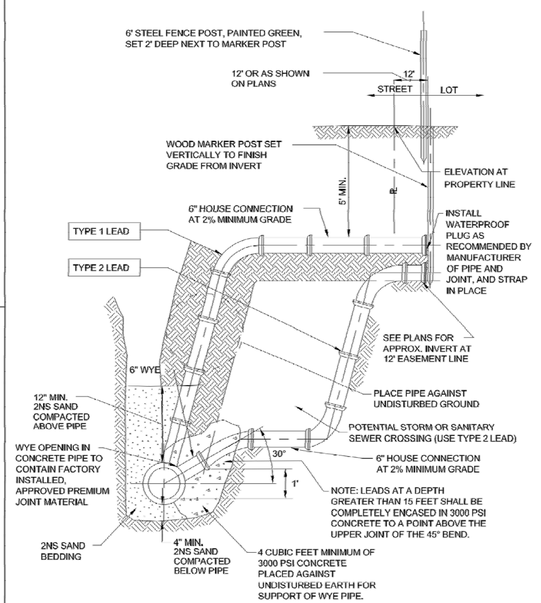
SANITARY MANHOLE



SANITARY SEWER CLEANOUT



SEWER OR CULVERT CROSSING



SANITARY SEWER SERVICE
& RISER CONNECTION DETAIL

Pittsfield Charter Township
6201 W. Michigan Ave.
Ann Arbor, MI 48108-9721
48108-9721
Tel. 734.822.3101
www.pittsfield-mi.gov

COVER DETAIL UPDATE	MPH	DRW	14.01.24
TWP REV	BWA	DRW	11.04.27
MANHOLE UPDATES	BWA	DRW	10.10.25
UPDATES	TTN	DRW	10.01.20
Revision	By	Appd.	YY.MM.DD
Issued	By	Appd.	YY.MM.DD
File Name: SS-01	BWA	DRW	07.10.01
	Dsn.	Chkd.	Dsgn. YY.MM.DD

Permit-Seal

Client/Project
PITTSFIELD TOWNSHIP

Pittsfield Township, Michigan

Title
SANITARY SEWER DETAILS

Project No.
2075001300

Scale
NOT TO SCALE

Revision

Earthwork

1.00 GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall perform all excavation and backfilling necessary to complete the work. This shall include the excavation of earth and rock, the removal and disposal of unsuitable material, dewatering, placement of suitable fill and backfill material, pipe boring and jacking, all quality assurance testing, and the restoration and final grading for all earth surfaces.

1.02 WORK WITHIN RIGHTS-OF-WAY

A. Where the governmental bodies having jurisdiction of the streets or rights-of-way have specific specifications relating to the requirements for work within their jurisdiction, such requirements must be met as a minimum requirement, and if these Specifications impose further limitation on the work, they shall also be met as the required work standard.

B. During all operations of the CONTRACTOR in the streets and roadways, the CONTRACTOR shall maintain barricades, lights, and warning signs as required by the agency having jurisdiction.

1.03 WORK WITHIN EASEMENTS

A. During construction within any easements, the CONTRACTOR shall confine himself to the limits shown on the Plans. He shall notify property owners in advance of moving equipment on easements and use of the access routes which will be designated by the OWNER. The OWNER will cooperate in working out the details of access. The topsoil over the trench shall be removed and carefully replaced upon completion of the work. The backfill of the trench in the easement may be left slightly high to provide for any slight residual settlement. Any trees, shrubs, or bushes removed shall be replaced to the satisfaction of the property owner.

1.04 SOIL BORINGS

A. Soil boring results, if taken on a site, are appended to these Specifications with locations noted. Boring logs are shown to be generally representative of the site and to assist in the design and construction of the work.

2.00 PRODUCTS

2.01 BACKFILL MATERIAL

A. For areas not requiring "granular backfill" material, backfill shall be of the excavated material, with the exception that materials such as soft clay, topsoil, muck, cinders, vegetable matter, refuse, boulders and other objectionable and non-packing earth shall be excluded from the backfill and removed from the site. Stone larger than 3 inches in any dimension shall be excluded from the backfill and removed from the site by the CONTRACTOR.

B. Where "granular material" backfill is required as specified herein, backfill material shall be defined as a material meeting granular material Class II as defined in 2003 MDOT 902.08.

C. All utilities within road right-of-way corridor (existing or proposed) shall be backfilled with MDOT CL II granular material compacted to 95% maximum unit weight.

D. All utilities shall be installed with 2 NS sand bedding or better.

2.02 ENCASING PIPE

A. Steel encasing pipe for boring and jacking shall conform to the requirements of either, ASTM A53, Type E or S, Grade B or ASTM A139, Grade B.

B. Steel encasing pipe used under channels and highways shall meet the requirements of the governmental agency having jurisdiction and the following minimum requirements:

Nominal Diameter (Inches)	Maximum Wall Thickness
Under 13	0.188 inches
13-24	0.250 inches
25-36	0.312 inches
42	0.438 inches
48	0.500 inches
54	0.563 inches

C. Steel encasing pipe used under railroads shall meet the requirements of the railroad and the following minimum requirements:

	Minimum Wall Thickness (inches)	
Nominal Diameter (Inches)	Coated or Cathodically Protected	Uncoated & Unprotected
Under 14	0.180	0.251
14-16	0.219	0.282
18	0.250	0.313
20	0.281	0.344
22	0.312	0.375
24	0.344	0.407
26	0.375	0.438
28-30	0.406	0.469
32	0.438	0.501
34-36	0.469	0.532
38-42	0.500	0.563
48	0.563	0.626

D. Casing pipe joints shall be welded to form a leak-proof continuous casing.

F. The inside diameter of casing pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe joints or couplings for carrier pipe less than 6 inches in diameter, and at least 4 inches greater than the largest outside diameter of the carrier pipe joints for carrier pipe 6 inches and over in diameter, unless otherwise shown on the Plans.

F. The steel casing pipe shall be of smooth interior and shall be placed accurately to line and grade, allowing for the encased pipe thickness and supports under each length of encased pipe.

3.00 EXECUTION

3.01 GENERAL EXCAVATION

A. Excavation shall be performed by any practicable method consistent with the integrity and protection of the work and neighboring structures, workmen, and the public. Topsoil shall be separately removed and stockpiled for reuse.

B. All excavation, except where necessary to tunnel, bore or jack under roads, railroads, tree roots and other obstructions within the limits indicated on the Plans, may be open cut from the surface. Tunneling or boring under trees shall be considered as incidental to construction and will not be considered as cause for request for additional payment.

C. Foreign material or unsuitable foundation material encountered such as wood, boulders, etc., which obstruct the excavation, shall be removed. Such materials found at the bottom of the excavation shall be removed and the foundation restored with approved materials.

D. If excess excavation is made or the material becomes disturbed so as to require removal beyond the prescribed limits, the resulting space shall be filled with selected material solidly tamped into place, in not more than 6-inch layers to the satisfaction of the ENGINEER, before the construction work proceeds. At the direction of the ENGINEER, the excess excavation may be filled with 2000 psi concrete at the CONTRACTOR's expense.

E. The excavation shall be kept dry during the work. Where water is encountered in the excavation, it shall be removed by pumping or well points. All necessary precautions shall be taken to prevent damage to existing wells and to completed or partially completed structures. The CONTRACTOR shall be responsible for all damages caused by him due to inadequate or improper protection.

F. The CONTRACTOR shall take ample precautions to protect all trees and ornamental shrubbery not within the limits of the construction areas, or within the construction areas shown on the Plans to be retained from injury by workmen, equipment, or any other agencies connected with the work, including subcontractors. Such protection shall be provided during the progress of the excavation, grading, or other phases of the work as necessary. Such trees or shrubbery shall be surrounded by protective posts or fencing before construction begins, when in judgment of the ENGINEER, such precautionary measures are necessary. If, as a result of any phase of the work, trees are damaged or it is necessary to remove limbs in the way of construction, the repair of the damage and such limb removal shall be done by the CONTRACTOR as directed by the ENGINEER. All costs for the protective work shall be borne by the CONTRACTOR as incidental to the Contract work.

G. Any excavation not backfilled at the end of each day must be clearly marked and surrounded by appropriate safety fencing as directed by the ENGINEER. If directed by the ENGINEER, the CONTRACTOR shall cover the open excavation with a steel plate and light the excavated area.

3.02 EXCAVATION FOR SEWERS AND WATER MAINS

A. Trenches shall be excavated to the depth required with allowance for bedding the pipe. The trench shall be cut wider and deeper at each pipe joint location to provide for properly completing the pipe joint and to relieve the joint of all loadings.

B. The width of the trench at the top of a rigid pipe shall be sufficient to allow the pipe to be laid and jointed properly and shall provide for a minimum net clearance of 6 inches and a maximum net clearance of 12 inches on each side of the barrel of the pipe and to allow the backfill to be placed and properly compacted.

C. The width of trench at the top of a flexible pipe backfill when using concrete bedding shall be sufficient to allow the pipe to be laid and jointed properly with the minimum net clearance of 12 inches and a maximum net clearance of 18 inches on each side of the barrel of the pipe.

D. Where the conditions of the ground require or where the work is in close proximity of existing structures, the sides of excavation shall be securely held by bracing and/or sheeting which may be removed in units when the level of the backfill has reached a point where it is safe to pull the sheeting without disturbing the protected feature. No sheeting, bracing, or other timber shall be left in the excavation upon the completion of the main or other structures, except with the specific review and direction of the ENGINEER.

E. Other underground mains, sewers or structures encountered in the excavation shall be adequately supported during the CONTRACTOR's operations, and before backfilling, shall be given permanent support as directed by the ENGINEER to meet the standards or requirements of the owning utility or agency.

F. Water, sewer, gas and other utility services disturbed by the CONTRACTOR in his operations shall be repaired or replaced in a manner equal to the original condition by the CONTRACTOR at his own expense. Where these services are encountered and are undamaged, they shall be supported and/or protected by the CONTRACTOR at his expense against later settlement and/or damage after backfill. The CONTRACTOR shall consult the agency or the utility firm having jurisdiction over any duct line, gas main, etc., which may cross the excavation to determine method of supporting such duct or pipe.

G. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve manhole covers, valve boxes, curb stop boxes, fire and police call boxes, or other similar fixtures shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clean, or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed except as otherwise provided for herein on a temporary basis.

3.03 EXCAVATION FOR STRUCTURES

A. Excavation for structures shall be extended sufficiently beyond the limits of the structure to provide ample room for form construction and for practicable construction methods to be followed.

B. Requirements for excavation of sewers and water mains shall also apply to this Section.

3.04 EXCAVATION FOR PAVED SURFACES

A. In excavating around manholes and catch basins or inlets, care shall be exercised to avoid removing the casings and pushing dirt into the structures. Dirt pushed into manholes, catch basins or inlets by the CONTRACTOR's operations shall be immediately removed so that the dirt will not be carried into the sewer by the flow of sewage or storm water.

B. The CONTRACTOR shall take ample precautions to protect all trees and ornamental shrubbery not within the limits of the construction area, or within the construction areas shown on the Plans to be retained from injury by workmen, equipment, or any other agencies connected with the work, including subcontractors. Such protection shall be provided during the progress of the excavation, grading, or other phases of the work as necessary. Such trees or shrubbery shall be surrounded by protective posts or fencing before construction begins, when in the judgment of the ENGINEER, such precautionary measures are necessary. If, as a result of any phase of the work, trees are damaged or it is necessary to remove limbs in the way of construction, the repair of the damage and such limb removal shall be done by the CONTRACTOR as directed by the ENGINEER. All costs for the protective work shall be borne by the CONTRACTOR as incidental to the Contract work.

3.05 ROCK EXCAVATION

A. Rock excavation shall consist of excavating igneous, metamorphic and sedimentary rock which cannot be excavated without continuous drilling and blasting or drilling and splitting to fracture the rock. Blasting shall be permitted only after it has been shown that other methods of excavation are impractical. All rock excavation shall be carried to a minimum depth of 8 inches below the pipe or manhole bottom and to the bottom of all footings. The width of the rock excavation shall not exceed the diameter of the pipe plus 12 inches on either side or the edge of the foundation footing.

B. When the use of explosives is necessary for the progression of the work, the CONTRACTOR shall comply with all laws, ordinances and applicable safety code requirements and regulations relative to the handling, storage and use of explosives and protection of life and property. A person competent and experienced in the use of explosives shall be employed to supervise the work. The CONTRACTOR shall schedule all blasting for a definite hour of the day and shall so notify all residents and businesses in the area as to the scheduled day and hour for such blasting operations. Explosive materials shall not be stockpiled and stored in residential areas. Explosives and initiating devices shall not be carried in the same vehicle.

C. Suitable weighted plank coverings or timber mats shall be provided to confine all materials lifted by blasting within the limits of the excavation of trench. Excessive blasting or overshooting shall not be permitted. Any material outside of the authorized excavation cross section which may be shattered or loosened shall be removed at the CONTRACTOR's expense. The CONTRACTOR shall be responsible for all damage resulting from the use of explosives.

3.06 PIPE BORING AND JACKING

A. The CONTRACTOR shall obtain all necessary permits for jacking the encasing pipe under channels, highways and/or railroads and shall notify the governmental agency and/or company having jurisdiction 48 hrs before work at any crossing is started. The CONTRACTOR shall pay all costs for an inspector and/or flagmen required by a railroad or governmental agency.

B. A suitable approach trench shall be opened, adjacent to the toe of the slope of the embankment. The approach trench shall be long enough to accommodate the length of pipe units to be placed, and wide enough to provide sufficient working room. Guide timbers or rails for keeping the pipe on-line and grade shall be installed in the bottom of the trench and heavy timber backstop supports installed at the rear of the trench to take the thrust of the jacks. A timber bearing a "pushing frame" shall be built and furnished to fit or match the end of the pipe to be jacked, so that the pressure of the jacks will be evenly distributed over the end of the pipe. Two (2) hydraulic jacks of sufficient power shall be used to apply pushing or jacking pressure. For firm ground, excavation shall be carried on from inside the pipe, not to exceed twelve (12) inches ahead of the lead pipe. For unstable ground, the lead pipe shall precede the auger. Excavation at the top and sides shall be accurately cut to line and grade. Adjoining sections of steel pipe shall be welded. Pipe shall be jacked on successive shifts until completed to guard against the "freezing of the line" due to settlement and compaction of surrounding soil.

C. The sheeting of pits along any road will be required if the leading edge of all work pits will be closer to the pavement edge than the shoulder point or ten (10) ft, which ever distance is greater, or on curb and gutter sections, at least five (5) ft from back of curb.

D. Upon completion of the installation of the steel pipe encasement, the contractor shall furnish and install a bolted style casing spacer as described below on the carrier pipe. Casing spacers shall be placed a maximum of seven (7) feet apart along the length of the carrier pipe with one casing spacer within 2-1/2 feet of each side of a pipe joint and the rest evenly spaced. Wood skids are not an acceptable method of supporting the carrier pipe.

1. Casing spacers for carrier pipes from 4" - 24" shall be made of a molded, segmented high density polyethylene plastic with 304 stainless steel connecting nuts and bolts. Minimum spacer width shall be 5.2" for carrier pipes from 4" - 12" and 7.0" for carrier pipes 14" - 24". Each casing spacer shall have at least six (6) integrally molded skids extending 1" beyond the bell or mechanical joint of the carrier pipe. The casing spacers shall be equal to the PSI Ranger as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX.
2. Casing spacers for carrier pipes larger than 24" shall be a PVC fusion bonded coated (10-16 mils) steel shell (minimum 14 gauge steel) with a 90 mil PVC inner liner and 2" wide 30% glass reinforced polyester runners (minimum compressive strength = 18,000 psi) (polyethylene is not an acceptable runner material) attached by 3/8" coated steel studs welded to the steel shell. All bolts and nuts used to fasten the shell to the carrier pipe shall be cadmium plated steel. Where riser are required under the runners they shall be a minimum 10 gauge steel welded to the shell and coated as specified for the shell (epoxy is not an acceptable coating for the shell riser). The casing spacers shall be equal to the PSI Model C as manufactured by Pipeline Seal and Insulator, Inc., Houston, Texas.

E. Boring shall be performed by accepted and recognized methods which will provide adequate safety and protection at all times to workmen employed in the work and to inspectors and others involved in the construction.

F. If voids should develop around the outside of the encasing pipe, grouting or other methods approved by the ENGINEER shall be employed to fill such voids.

G. After the pipes are tested satisfactorily, the remaining space between the carrier pipe and the encasing pipe shall be pressure grouted or otherwise filled with concrete. The carrier pipe shall be adequately braced to prevent floating or movement of the pipe.

3.07 SHORING, SHEETING AND BRACING

A. Where sheet piling, shoring, sheeting, bracing, or other supports are necessary, they shall be furnished, placed, maintained, and except as shown or specified otherwise, removed by the CONTRACTOR.

B. All sheet piling, shoring, sheeting and bracing shall be designed by a professional engineer engaged by the CONTRACTOR with demonstrated competence and experience in such work. The sheeting system shall be designed to prevent bottom failure and hydrostatic uplift within the excavation. Provision shall also be made in the design for lateral pressures due to side slope and construction equipment or other surcharge loads, as applicable.

C. The CONTRACTOR shall provide to the ENGINEER for his review, design calculation and arrangement drawings of the sheeting system prior to ordering any materials for bracing, sheeting, etc., and prior to the commencement of the excavation.

D. All materials, except as otherwise specified, used for sheeting and sheet piling, lagging, braces, shores, and stringers, or waling strips shall be of approved quality and dimensions throughout.

E. Materials for sheeting systems shall be furnished and driven or set in place by the CONTRACTOR, where necessary or wherever ordered by the ENGINEER, whether the same is or is not considered necessary by the CONTRACTOR. If, in the opinion of the ENGINEER, the materials furnished by the CONTRACTOR are not of proper quality or sufficient size or not properly placed to ensure the safety of the work or of adjacent structures and property, the CONTRACTOR shall, upon notice from the ENGINEER to that effect, forthwith procure, furnish and set in place or drive other and satisfactory materials, or place the material in a satisfactory manner; and if he shall fail or neglect to do so, the ENGINEER may order all or any part of the work to be stopped until such materials so used are furnished and placed; and the CONTRACTOR shall not be entitled to claim, demand, or receive any compensation for larger size or better quality or different disposal of materials ordered by the ENGINEER, nor any compensation for allowance of any kind whatsoever for or on account of any damage or delay resulting from such stoppage of work.

F. Steel sheet piling may be either new or used. It shall be of adequate strength, straight and properly braced. Steel sheet piling shall be of the interlocking type. Friction in the interlocks shall not be assumed to contribute to the strength of the sheet piling.

G. The design, planning, installation and removal, if required, of all sheet piling, shoring, sheeting, and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.

H. Steel sheet piling for the excavation shall be driven straight and in-line. The piling shall be supported above ground, before driving, by a guide frame at least 20 ft high which will keep the piling accurately in the required position and vertical. Each piece of piling shall be driven only a few feet at a time and driving shall proceed continuously around the perimeter so that the piles shall reach their full penetration together.

I. Walers and bracing shall be supplied and installed as required to complete the sheeting system. Walers and braces shall be of adequate strength for the load imposed. Splices in walers shall develop the full strength of the member in bending, shear, and axial compression.

J. If bracing members are to be removed during construction, the timing and procedure for removal shall not induce excessive stresses in the permanent structures or in steel sheet piling and bracing members.

K. If the construction sequence of structures requires the transfer of bracing to the completed portions of any structure, the CONTRACTOR shall secure written acceptance of the ENGINEER prior to the installation of such bracing.

L. In trenching operations the use of horizontal struting below the barrel of pipe or the use of the pipe as support for trench racing will not be permitted. The use of a traveling shield for sewer construction shall require that the device be approved for use by a professional engineer. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of the pipe or additional backfill loadings which might overload the pipe.

M. The neglect, failure, or refusal of the ENGINEER to order the use of sheeting, or sheet piling or steel, or to order the same to be left in place, or the giving or failure to give of any order or directions as to the manner or methods of driving or placing sheeting, sheet piling, bracing, shores, etc., shall not in any way relieve the CONTRACTOR of any or all obligations under this Contract. Sheeting left in place shall be cut off one (1) ft below existing grade.

N. The rules of the OSHA and the State Department of Labor with respect to excavation and construction shall at all times be strictly observed.

3.08 GENERAL BACKFILLING

A. For all areas, unless otherwise noted, backfilling shall consist of placing excavated material as defined in Paragraph 2.01.A. of this Section, in 12-inch lifts to finish grade. Compaction of backfill shall be such as to obtain 90% of the maximum density.

B. Under pavements, curb, paved driveways, and sidewalks, and where pipe is within a one on one influence of pavement, compaction testing shall be performed by an independent testing laboratory. Testing shall be performed at intervals of one test per lift per 50 feet of trench or as determined necessary by the ENGINEER.

C. In residential developments, all backfill within the road corridor shall be granular material compacted in layers not to exceed 12 inches loose thickness with backfilling carried up to subgrade. Compaction of backfill shall be as such to obtain 95% of the maximum unit density as determined at the optimum moisture content. For purposes of this section, the road corridor is defined as front of house to front of house, including right-of-way and adjacent easements and setbacks.

3.09 BACKFILLING FOR SEWERS AND WATER MAINS

A. Backfilling shall consist of placement of the prescribed materials from a level 12 inches above the crown of the pipe. Placement shall be as follows:

1. Under gravel driveways, gravel roads and shoulders, the backfill shall be granular material which shall be solidly compacted by mechanical tamps in layers of not more than 12 inches loose thickness with backfilling carried up to within 12 inches of finished grade. Compaction of backfill shall be such as to obtain 95% of the maximum unit density as determined at the optimum moisture content.
2. Under pavements, curb, paved driveways, and sidewalks, the backfill shall be granular material compacted in layers not to exceed 12 inches loose thickness with backfilling carried up to subgrade. Compaction of backfill shall be such as to obtain 95% of the maximum unit density as determined at the optimum moisture content. After a period of about 60 days or less, if the backfill compaction is satisfactory to the ENGINEER, to provide for any slight settlement, the CONTRACTOR shall retrim neatly any broken edges of pavement and replace the top surface of the backfill within the pavement area with pavement surface equal to that surface which was removed. The pavement shall be replaced in accordance with the standard specifications of the agency having jurisdiction.
3. Backfill around lift stations, or buried underground structures shall be granular material compacted in 12-inch lifts. Compaction of backfill shall be such as to obtain 95% of the maximum unit density as determined at the optimum moisture content.
4. For all other areas, backfilling shall consist of placing excavated material as defined in Paragraph 2.01.A. of this Section, in 12-inch lifts to finish grade. Compaction of backfill shall be such as to obtain 90% of the maximum unit density as determined at the optimum moisture content.

3.10 FILLING AND BACKFILLING FOR STRUCTURES

A. Embankments underlying structural footings, streets and drives, sidewalks and around structures shall be granular material meeting the requirements of the Michigan Department of Transportation for granular material compacted to 95% density.

B. In all other areas, material required for embankments and backfilling shall be soil or soil-rock mixture free of organic and other deleterious matter and shall contain no more than 15% rocks or lumps larger than 2-1/2 inches in the greatest dimension, compacted to 90% density.

C. Under all interior and exterior floor slabs, an 8-inch thick granular cushion shall be placed. This material shall be clean mineral aggregate meeting the following gradation requirements:

Passing the No. 4 Sieve	100%
Passing the No. 200 Sieve	0-3%

D. Where embankment material is placed to achieve a new surface elevation, the top 4 inches shall be approved topsoil either salvaged from the site or hauled in by the CONTRACTOR.

3.11 FILLING AND BACKFILLING FOR PAVED SURFACES

A. Embankments, including sand cushions and granular fills, shall be placed in successive layers not more than 6 inches in depth the full width of the cross section, each layer to be thoroughly compacted by means of vibratory compactors or by an approved pneumatic-tired roller or combination thereof, as required by the ENGINEER. Each layer shall be compacted to not less than 95% of the maximum unit density as determined at the optimum moisture content. All parts of the embankment shall be uniformly compacted and the CONTRACTOR shall so direct all earthmoving equipment used in the work so that the same shall be attained. Embankment or fill outside the limits of the subgrade where sand or gravel is not required shall be made with suitable material which is free from perishable organic matter, rubbish, stones, broken concrete, roots, or other foreign materials, at no additional compensation. Before any embankments are begin, the base shall be made firm and cleared of topsoil, sod or other perishable material. The sides of the embankment shall be neatly and evenly dressed to the slope shown on the Plans, or such other slope as the ENGINEER may direct.

B. Upon completion of the placing of the curbs, and after the concrete has cured sufficiently, forms shall be removed and the excavated space behind the curb shall be backfilled with a good quality of surface soil, free of rubbish, stone, broken concrete, roots or other foreign material. Where adequate acceptable material for backfill behind the curb is not available, granular fill conforming to 2003 MDOT 8.02.06, Class II, shall be used. Where the area behind the curb is in cut, it shall be trimmed from the top of the curb on the slope shown on the Plans. If the area is in embankment or fill, an earth berm shall be placed immediately adjacent to the top of the curb and then the embankment of fill shall be finished to the slope shown on the Plans. All trimming and finishing shall be done in a neat, workmanlike manner. All excess concrete and debris shall be removed from the excavation behind the curb line before backfilling begins.

C. In construction of non-rigid pavements, backfilling back of curb and gutter shall be completed before placement and compaction of the base course of the roadway.

3.12 PREPARATION OF SUBGRADE FOR ROADWAY SURFACES

A. The bottom of the excavation for the pavement or top of the fill shall be known as the pavement subgrade and shall be smoothed, trimmed and compacted to the required line, grade and cross section to receive the road metal. It shall be thoroughly compacted by rolling with a roller of approved type weighing not less than 8 tons. The subgrade shall be compacted to at least 95% of the maximum density as designated by the test method AASHTO T-180. Inaccessible areas, where rolling is not practical, shall be thoroughly compacted by mechanical tampers capable of striking a blow equivalent to at least 250 foot-pounds per square foot. The subgrade thus formed shall be maintained in a smooth and compacted condition until the pavement has been placed. No base course, surfacing, curb, or curb and gutter, shall be placed until the subgrade has been reviewed by this ENGINEER. The subgrade shall be finished in an acceptable condition at least one day in advance of the pavement construction at all times. Six inches of compacted depth of granular material shall be used where uncompactable soil is encountered. The granular fill shall conform to the 2003 MDOT 9.02.08., Class II, compacted to 95% of its density.

B. Immediately prior to placing the pavement, the subgrade shall be tested for conformity with the cross section shown on the Plans by means of an approved template riding on the curb and gutter sections or on side forms. If necessary, materials shall be removed or added, as required, to bring all portions of the subgrade to the correct elevation. Corrected portions shall then be thoroughly compacted and again tested with the template. Pavement material shall not be placed at any portion of the subgrade which has not been tested for correct elevation.

C. The finished subgrade shall be maintained in a smooth and compacted condition until the pavement is placed. No storage piles of fine or coarse aggregate shall be placed directly upon the finished subgrade. Should the subgrade become rutted or disturbed in any manner, it shall be reshaped and recompacted.

3.13 GRADING

A. The CONTRACTOR shall grade the site to achieve the elevations as shown on the Plans. All disturbed areas beyond the grading limits shall be restored to prior condition.

B. Surplus excavated material not needed for embankment shall be disposed of by the CONTRACTOR. Headwalls, culverts, drains, sewers and appurtenances filled or damaged by the CONTRACTOR during the course of his operations shall be cleaned, repaired, or replaced at his expense.

C. All temporary earth changes shall be in conformance with the Soil and Erosion Control Act.

3.14 RESTORATION

A. Headwalls, culverts, and drainage systems filled or damaged by the CONTRACTOR during the course of his operations shall be cleaned, relaid or rebuilt with new materials to a condition equal to the original state, and of thickness equal to the original structure and to the original line and grade at the CONTRACTOR'S expense.

B. Where the excavation is located beside a ditch and/or where an existing ditch is filled or disturbed in the CONTRACTOR's operations, the CONTRACTOR shall clean, repair, or replace the ditch with properly pitched bottom and side slopes and of section and capacity not less than the original section.

C. Where excavation has been through lawn areas, the CONTRACTOR shall restore the disturbed area by placing topsoil and seeding or sodding over the final backfill material.

D. The CONTRACTOR shall remove excess dirt and other construction material from the site of the work and leave the site in a condition equal to its original state.

E. The final condition of the streets and roadways shall be subject to the approval of the governmental body having jurisdiction thereof, as well as review by the ENGINEER.

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Client/Project
PITTSFIELD TOWNSHIP

Pittsfield Township, Michigan

Title
EARTHWORK SPECIFICATIONS

Project No.
2075001300

Scale
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Revision
1

SANITARY SEWER AND MANHOLES

1.00 GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall furnish all labor, tools, equipment and materials to construct all sanitary sewers, manholes and necessary appurtenant work as herein specified. No sewers shall be accepted until the sewer system has passed the system acceptance tests.

1.02 TESTING

A. General

1. The CONTRACTOR shall furnish all equip\-ment and personnel to conduct system acceptance tests as specified herein on all completed sewers. All tests shall be conducted under the supervision of the ENGINEER. No acceptance tests shall be conducted until the entire sewer system is constructed and has been installed for not less than 30 days.

2. The CONTRACTOR may desire to make an air test prior to backfill for his own purposes but the line acceptance tests shall be conducted after backfilling or extensions.

3. All sewer lines shall be televised while running enough water through the line to be visible at the next downstream manhole.

4. All sewer lines shall be checked for alignment.

5. All manholes shall be tested for leakage. All PVC lines shall be tested for deflection.

6. Sewer pipe 30 inches and smaller shall be air tested. Sewer pipe larger than 30 inches shall be tested by either infiltration or exfiltration and shall be tested in lengths of 1600 feet or less.

7. Should the results of any test fail to meet the criteria established in this Specification, the CONTRACTOR shall, at his own expense, locate and repair rejected section and retest until it is within specified allowance.

B. Test for Leakage - Air Test

1. Section 33-95 (pg 30-6) 2004-Ten State Standards.

2. After a manhole-to-manhole section of line has been backfilled and cleaned, it shall be plugged at each manhole with pneumatic plugs inflated to 35 psig internal pressure. The design of the pneumatic plugs shall be such that they will hold against the line test pressure without requiring external blocking or bracing.

3. There shall be three (3) hose connections to the pneumatic plug. One hose shall be used only for inflation of the pneumatic plug. The second hose shall be used for continuously reading the air pressure rise in the sealed line. The third hose shall be used only for introducing low pressure air into the sealed line.

4. There shall be a 0-30 psig gauge for reading the internal pressure of the line being tested. Calibrations from the 1-10 psig range shall be in tenths of lbs (not ounces) and this 0-10 portion shall cover 90% of the complete dial range.

5. Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4.0 psig greater than the average back pressure of any ground water pressure that may be over the pipe. At least two (2) minutes shall be allowed for the air pressure to stabilize. After the stabilization period, the third hose shall be disconnected.

6. The portion of line being tested shall be accepted if the portion under test meets the following conditions.

a. DI, and RCP Pipes

(1) The time requirement for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time given in the following table:

Pipe	Min. Holding Time Seconds/100 ft. Pipe
4-inch	18
6-inch	42
8-inch	72
10-inch	90
12-inch	108
15-inch	126
18-inch	144
21-inch	180
24-inch	216
27-inch	252
30-inch	288

(2) In areas where ground water is known to exist, the CONTRACTOR shall install a 1/2-inch diameter capped pipe nipple, approximately 10 inches long, through the manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the line acceptance test, the ground water level shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the pipe nipple. The hose shall be held vertically and a measurement of the height in feet of water shall be taken after the water stops rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the lbs of pressure that will be added to all readings. For example, if the height of water is 11-1/2 ft, then the added pressure will be 5 psig. This makes the 3.5 psig to be 8.5 psig, and the 2.5 psig to be 7.5 psig. The 1 lb allowable drop and the timing remains the same.

a. PVC Pipe

(1) The time requirement for the pressure to decrease from 3.5 to 3.0 psig (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than that shown in the following table:

Pipe Size (inches)	Holding Time (seconds)	Minimum Holding Time (seconds)
4-inch	0.190xL	113
6-inch	0.427xL	170
8-inch	0.760xL	227
10-inch	1.187xL	283
12-inch	1.709xL	340
15-inch	2.671xL	425
18-inch	3.846xL	512

(2) If any section of the sewer fails to meet this requirement, the CONTRACTOR shall perform a television inspection of the faulty section and repair or replace at his own expense all defective materials and/or workmanship to the satisfaction of the ENGINEER. The test procedure shall be repeated until the results are acceptable.

C. Test for Infiltration

1. Sewer pipe over 18 inches shall be tested to measure the infiltration of ground water. If the measured leakage exceeds 100 gallons per inch diameter per mile of pipe per 24 hr period, the CONTRACTOR shall locate the points of excessive leakage and make the necessary repairs at his own expense.

2. In the event the line does not pass the infiltration test as stated above, the test shall be repeated after suitable repairs have been completed.

D. Test for Exfiltration

1. Where the ground water provides less than a 2 ft head on the sewer, an exfiltration test shall be conducted by filling the sewer with water to a 4 ft head or 4 ft above the ground water level, whichever is greater. The allowable water loss shall be 100 gal/in./mi/day as calculated above for infiltration.

2. After the sewer has been filled with water, 4 hrs time shall be allowed for water absorption by the pipe before exfiltration tests are initiated.

3. For the purpose of establishing the 4 ft test head, the head shall be measured from the center of the sewer pipe at the midpoint of the test section length. This procedure shall be used for both infiltration and exfiltration tests.

E. Test for Manhole Leakage

1. All manholes shall be tested for leakage by using plugs on inleting-outleting sewers, and filling the manholes with water to the top of the man\-hole. Four hours shall be allowed for water absorption by the manhole before testing is initiated. Allowable exfiltration for 48-inch diameter manholes shall be 2 gallons per foot of depth per day.

F. Test for Alignment

1. All sewers shall be laid accurately to the line and grade designed by the ENGINEER. The sewers will be tested for alignment by shining a light through the pipe at a manhole and viewing the light from an adjacent manhole. Any section of sewer in which a light cannot be seen from one manhole to the next shall be corrected to the satisfaction of the ENGINEER to pass this test.

G. Test for Deflection of PVC Pipe

1. PVC pipe sewers shall be installed in such a manner that the initial deflection of the conduit shall conform to the latest revision of ASTM D-3034.

2. Deflection of PVC pipe shall be tested by pulling a rigid pig or equivalent through the pipe. The pig shall be constructed in accordance with the following table of maximum outside diameters and shall be submitted to the ENGINEER for review before testing is initiated.

Pipe I.D.	Pig O.D.
6 inches	5.33 inches
8 inches	7.11 inches
10 inches	8.87 inches
12 inches	10.55 inches
15 inches	12.90 inches
18 inches	15.74 inches

3. The pig shall be drawn by hand through the pipe from manhole to manhole. Any portion of pipe through which the pig passes freely shall be deemed to have passed the deflection test. Sections of pipe through which the pig does not pass shall be located, uni-covered and the pipe zone bedding improved and backfilled by the CONTRACTOR at his own expense. The pipe shall then be retested before acceptance is granted.

H. Material Tests

1. The CONTRACTOR shall have tests of pipe and strength made by an independent testing laboratory. Tests of up to 4 lengths of sewer pipe per hundred lengths may be required to show compliance with the Specifications. All pipe delivered to the job site shall be accompanied with a manufacturer's certificate of compliance to the Specifications.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit shop drawings or data sheets for all pipe, manholes, manhole castings, pipe to manhole connections, and valves. The Contractor shall submit certification letter for all pipe proposed on the project. The letters shall contain the following: Contractor name, project name, township name, current date, certification of pipe provided and letterhead of the certifying company.

2.00 PRODUCTS

2.01 SEWER PIPE

A. Pipe for sewer 24-inch diameter and smaller shall be polyvinyl chloride (PVC). Pipe for 30-inch diameter and larger shall be PVC truss pipe. Ductile iron pipe and reinforced concrete pipe shall be used as specified by the ENGINEER.

B. Pipe for service leads 4 through 8 inches in diameter shall be polyvinyl chloride (PVC).

C. Reinforced concrete pipe shall be no less than the latest revision of ASTM C76, with the class designation as shown on the Plans or in the Proj-posal.

D. PVC pipe 4 inches through 15 inches in diameter shall meet or exceed all of the requirements of the current ASTM D-3034 SDR-26 polyvinyl chloride sewer pipe and fittings. 18-inch diameter PVC pipe shall meet or exceed all the requirements of the current ASTM F-794 SDR 26 polyvinyl chloride sewer pipe and fittings. Samples of pipe and physical and chemical data sheets shall be submitted to the ENGINEER for review. Approval shall be obtained before pipe is purchased.

E. If the sewer pipe is greater than 15 feet deep PVC pipe shall be SDR 21.

F. Truss pipe shall meet or exceed all of the requirements of the current ASTM D2680.

G. Ductile iron pipe shall meet or exceed all the requirements of ANSI A21.50 with a cement lining.

2.02 SEWER PIPE FITTINGS

A. Fittings shall be of the same material as the pipe, and in no case shall the walls be thinner than that of the pipe furnished.

B. Wye and tee fittings for PVC pipe shall be reviewed by the ENGINEER before purchasing.

C. The dry fit of all fittings must be snug. If the fit is such that it is loose, the pipe or fitting will be rejected as faulty and of improper size.

2.03 SEWER PIPE JOINTS

A. Concrete pipe joints shall be made of a resilient material conforming to the latest revision of ASTM Designation C443. Proper lubricant shall be furnished by the joint manufacturer.

B. Concrete pipe for use with rubber joints shall be smooth and precisely formed to provide a uniform annular space for joint materials.

C. PVC pipe shall be jointed with ring gusseted bell ends. (ASTM-D3212) Jointing materials shall be applied to the bell end of the pipe at the point of manufacture in such a manner that a tight uniform joint will be achieved and such that when the joint is made up in the field, the joint material will not roll or tear from the pipe. A proper joint lubricant shall be furnished by the pipe manufacturer.

2.04 REINFORCED CONCRETE MANHOLES

A. Manholes shall conform to the current ASTM specifications for precast reinforced concrete manhole sections, serial designation C478. Manhole section joints shall conform to ASTM C990-96. Cone sections shall be straight side type, with an offset step configuration.

B. All manhole component parts shall have the name of the manufacturer stenciled on the inside. The lettering or logo shall be a minimum of 4-inches high.

C. Manholes constructed over an existing sewer line shall have a doghouse mudded to an 8-inch thick cookie. The bottom of the existing pipe shall be the channel. All other manholes shall have precast integral base sections with pre-formed concrete channels.

D. All channels shall be constructed to the full flow depth of the pipe.

2.05 MORTAR FOR MANHOLES

A. Mortar for plastering manholes shall be made of one part Portland cement and two parts fine aggregate.

2.06 MANHOLE FRAMES AND COVERS

A. Manhole frames and covers shall weigh not less than 350 lbs. Each frame and cover shall have machined bearing surfaces and shall be suitably notched for convenient removal of the cover. Each cover shall be marked with the Pittsfield Township logo and the letters, PITTSFIELD TWP SANITARY SEWER integrally cast into the cover.

B. Covers shall be of the "self-sealing" design having a continuous gasket glued in a machined groove and a concealed pickhole. Frames and covers shall be East Jordan 1040Z, with Type AGS cover.

C. All manhole frames and covers shall be coated by the manufacturer with coal tar pitch varnish or other asphaltum coating reviewed by the ENGINEER.

2.07 MANHOLE STEPS

A. Steps shall be plastic coated steel. They shall be M.A. Industries PS1-PF or PS1-B, or approved equal.

2.08 MANHOLE CONNECTIONS

A. Sewer pipe (6-inch to 24-inch) to manhole connections shall be through: 1) a flexible rubber boot which shall be securely clamped into a core-drilled pipe port. Pipe ports shall be core-drilled at the point of manhole manufacturer and shall be accurately located within 1/2-inch of proposed sewer centerline (Kor-N-Seal); or, 2) a self-adjusting mechanical pipe to manhole seal which provides a resilient flexible and infiltration-proof joint (Res-seal); or, 3) a flexible rubber wedge firmly rammed into a rubber gasket which is cast into the manhole (Press Wedge II), or equal. All flexible pipe to manhole connections shall be installed per the manufacturers specifications.

B. Neoprene rubber for the manhole boot shall meet ASTM Specification C443 and shall have a minimum thickness of 3/8-inch. Pipe clamp bands shall be of corrosion-resistant steel.

C. Sewer pipe over 24 inches to manhole connections shall be in accordance with details shown on the Plan.

2.09 SANITARY MANHOLE ADJUSTMENTS

A. All final grade adjustment of manhole covers and frame assemblies shall be completed utilizing injection molded High Density Polyethylene (HDPE) adjustment rings as manufactured by LADTECH, INC. or approved equal. The adjustment rings shall be manufactured from polyethylene plastic as identified in ASTM Designation D 1248.

B. All adjustment for matching road grade shall be made utilizing a molded indexed slope ring.

C. Each adjustment ring shall be sealed with a 3/16 to ¼ inch bead of butyl rubber sealant per the manufacturer's instructions. Sealant shall meet ASTM specification C-990.

D. All castings and adjustment rings shall be securely fastened to the cone of the structure with four 3/8-inch threaded rods. The rods shall be galvanized or stainless steel anchored to the structure with Redhead concrete anchors or equal. Stainless steel or galvanized nuts and washers shall be used to attach the casting.

2.10 MANHOLE DROPS

A. Manhole drop connections shall be interior drops using the drop bowl as produced by Reliner-Duran Inc. or approved equal.

B. Drop bowl model A-4" shall be used for all lines up through full 6-inch inlets. Drop bowl model A-6" shall be used for all 8-inch inlets. Drop bowl model B-8" shall be used for all 10-inch inlets. Lines larger than 10 inches shall be as directed by the ENGINEER.

C. The force line hood shall be attached on models A-4" and A-6" when the incoming line is from a force main or the slope is 3 percent or greater.

D. The drop pipe shall be secured to the manhole wall with Reliner-Duran, Inc. stainless steel adjustable clamping brackets or approved equal.

E. The drop bowl and each clamping bracket shall be attached to the manhole wall with 3/8-inch x 3 3/4-inch bolts.

F. The incoming pipe shall be trimmed such that it protrudes 2 inches into the manhole.

G. A 1-inch V shaped notch shall be cut into the bottom edge of the incoming pipe.

3.00 EXECUTION

3.01 EXCAVATION AND BACKFILL

A. All excavation and backfill above a line 12 inches above the crown of the pipe shall conform to Section 2.04, Earthwork, of these Specifications.

3.02 BEDDING

A. Reference Section 33.83a of 10 State Standards.

B. Reference Section 33.83b of 10 State Standards.

C. Ductile iron, and concrete pipes shall be laid on a compacted granular material placed on the bottom of the trench to a depth of not less than 3 inches for 24-inch and smaller pipe and not less than 4 inches for pipe larger than 24-inch conforming to Class B bedding as shown on the Plans. Where shown on the Plans or required by the ENGINEER, concrete encasement or concrete cradle shall be used.

D. PVC pipe shall be laid on a compacted granular material placed on the bottom of the trench to a depth of not less than 4 inches conforming to Class B bedding as shown on the Plans. Where shown on the Plans, or where the pipe passes under a road with less than 4 ft of cover, the pipes shall be encased.

E. For all pipes, compacted granular material shall be placed at the sides of the pipe and cover not less than 12 inches above the crown of the pipe.

F. "Granular Material" shall be class 2NS sand, pea gravel or crushed stone conforming to ASTM C33 Size No. 67 placed in not more than 6-inch layers and com\-pacted to not less than 95% standard density for PVC and 90% standard density for reinforced concrete.

G. Pea gravel or crushed stone used for bedding shall be separated from the sand backfill with a non-woven geotextile fabric. The fabric shall be Amoco 4551, or approved equal.

3.03 PIPE INSTALLATION

A. Installation of PVC pipe shall be in confor\-mance with ASTM D2321-89.

B. All pipe shall be laid true to the required lines and grades. All trenches when pipe laying is in progress shall be kept dry; and all pipes and fittings shall be uniformly supported on a properly trimmed bedding with holes at each joint to receive bells. All pipe shall be laid with bells uphill.

C. All joints shall be made up in accordance with the manufacturer's instructions using materials and equipment especially prepared for the type of joint to be used.

D. The grade as shown on the profiles is that of the pipe invert and that to which the work must conform. The grade shall be kept by levels, laser or other tools which shall be furnished by the CONTRACTOR at his expense. Each pipe shall be laid accurately to the line and grade as shown on the Plans and in such manner as to form a close concentric joint with the adjoining pipe and prevent sudden offsets of the invert. The interior of sewers shall, as the work progresses, be cleaned of all dirt, cement, debris and other superfluous materials of every description. Bulkheads shall be used to keep foreign materials out of the open end of the sewer when work is not in progress.

E. The location of the piping as shown on the Plans has been determined to avoid, insofar as possible, interference with trees or structures or fixtures above ground and other underground mains, services, utilities, or structures. Any change in location or alignment of piping which may be found more feasible or practicable as the work progresses shall be made by the CONTRACTOR, as the ENGINEER may direct.

F. All pipe and fittings shall be carefully lowered and moved into position in trench or vault in a controlled manner such as will prevent damage to the pipe and any coatings or lining. An excessive amount of scratching on the surface of the PVC pipe will be considered cause for rejection.

G. The trench shall be backfilled closely behind the pipe laying. Unless otherwise directed or permitted by the ENGINEER, the backfilling shall follow and be completed to the top of the trench within two pipe lengths behind pipe laying.

H. All cutting of the pipe shall be done in a neat workmanlike manner with the least amount of waste and without damage to existing or new lines. A fine tooth saw, tubing cutter or similar tool may be used to cut PVC pipe. Cuts must be square. Ragged edges shall be removed with a cutting tool or file.

I. After cutting bell and spigot or socket pipe, a stop mark shall be made with a pencil or crayon using dimensions as shown by the manufacturer's instructions or by using another pipe in the field as a guide.

J. Breaks in pipe or joints shall be repaired to the satisfaction of the ENGINEER and at the expense of the CONTRACTOR.

3.04 CONNECTIONS TO EXISTING MANHOLES AND OTHER RIGID STRUCTURES

A. When a sewer is connected to an existing manhole, a hole adequate to receive the new pipe shall be cut into the manhole.

B. If the existing manhole is of brick construction, a single rowlock of brick shall be turned over the new pipe and the existing manhole brick work shall be cleaned, pointed and given a 1/2-inch mortar coat on the outside surface.

C. For connections to existing precast reinforced concrete manholes, a hole shall be cored into the concrete manhole wall to receive the pipe. A Kor-N-Seal boot or engineer approved equal shall be clamped into the cored hole and used to make the connection.

D. For connections to existing fiberglass manholes, a hole shall be cored into the manhole wall to receive the pipe. A Kor-N-Seal boot or engineer approved equal shall be installed using fiberglass reinforced pipe stubout for Kor-N-Seal boot sealing surface.

3.05 STREAM AND RIVER CROSSING

A. Whenever a pipe is required to cross a stream or river, all work shall be in accordance with the provisions of Act 346, the Inland Lakes and Streams Act of 1962, and the rules and regulations promulgated thereunder. Stream crossings and all restoration required shall be completed within five days of the construction.

B. The CONTRACTOR shall utilize such con\-struction methods as are feasible and practicable to divert or stop stream flow to lay the pipe in the dry. Pipe shall be ductile iron, mechanical joint, or compression gasket joint pipe with joints at transition to other types of sewer pipe encased with no less than 1 cu yd of concrete, placed at a minimum of 6 inches thickness around the pipe. After the sewer is properly laid, jointed and encased, the stream-channel shall be cleaned of dirt and debris resulting from the CONTRACTOR'S operations.

C. After the crossing is made, heavy riprap and sodding shall be placed to protect the banks from corrosion as shown on the Plans.

PCT July 2008

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Revision	By	Appd.	YY.MM.DD
TWP REV	BWA	DRW	11.04.27
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Permit-Seal

Client/Project
PITTSFIELD TOWNSHIP

Pittsfield Township, Michigan

Title
SANITARY SEWER SPECIFICATIONS

Project No. 2075001300

Scale NOT TO SCALE

Revision 1

1.00 GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall furnish all labor, materials, and equipment required to construct a water main and necessary appurtenant work as herein specified. The water main shall be installed in the locations as shown on the Plans and shall meet all acceptance tests.

1.02 NOTIFICATION

A. CONTRACTOR shall notify the ENGINEER and the Pittsfield Township Utilities Department at (734) 882-2110, 24 hours prior to flushing or chlorination of the water main.

B. CONTRACTOR shall schedule bacteriological testing with the ENGINEER 48 hours prior.

C. CONTRACTOR shall notify the ENGINEER and the Pittsfield Township Utilities Department 48 hours prior to connecting to an existing water main.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit shop drawings or data sheets for all pipe, manholes, manhole castings, pipe to manhole connections, valves, hydrants and the B-1 Poly Pig. The Contractor shall submit a certification letter for all pipe proposed on the project. The letters shall contain the following: Contractor name, project name, Township name, current date, certification of pipe provided and letterhead of the certifying company.

1.04 TESTING

A. General

1. CONTRACTOR shall furnish all equipment and personnel to conduct system acceptance tests as specified herein. All tests shall be conducted under the supervision of the ENGINEER. All water mains, branches and valves shall be subject to cleaning with a poly-pig, hydrostatic pressure testing, disinfection and bacteriological testing. No acceptance tests shall be conducted until the water main has been installed and backfilled for not less than 30 days. A copy of all test results shall be furnished to the ENGINEER.

2. Hydrostatic pressure testing must be performed in accordance with ANSI/AWWA C600. Disinfection and bacteriological testing must be performed in accordance with ANSI/AWWA C651.

3. CONTRACTOR shall furnish all material and labor to provide for an acceptable full size blow-off to flush the poly-pigs out of the main at the far end of the project not connected to the existing system.

4. Should the results of any test fail to meet the criteria established in this Specification, the CONTRACTOR shall, at his own expense, locate and repair the rejected section and retest until it is within the specified allowance.

5. Only Pittsfield Township personnel or the CONTRACTOR under direct supervision of Pittsfield Township personnel may fill or flush lines.

B. Preparation

1. After the pipe has been laid and backfilled as specified, the CONTRACTOR shall fill the line, or a valve section thereof, to be tested with water in such a manner as to expel all air from the pipe. This may be done through fire hydrants at the high points; or, if no hydrant is available at such point, the CONTRACTOR shall make the taps necessary to accomplish the expulsion of all air. At the close of the test, all taps shall be satisfactorily plugged with brass plugs.

C. Sequence

1. All water mains connected to an existing water system shall be flushed, swabbed, chlorinated and bacteriological tested prior to pressure testing. The sequence for acceptance testing shall be:

   a. Flushing with approved B-1 Poly-Pig
   b. Chlorination
   c. Flushing
   d. Bacteriological Testing
   e. Pressure Testing

2. Where mains can be totally isolated from the existing water system with airgaps, pressure testing shall precede chlorination and bacteriological testing. The sequence for acceptance testing shall be:

   a. Pressure Testing
   b. Connect to System
   c. Flushing with approved B-1 Poly Pig
   d. Chlorination
   e. Flushing
   f. Bacteriological Testing

3. If a hydrostatic pressure test fails, the chlorination and flushing process must be repeated after repairs to the system are completed.

D. Flushing

1. All flushing will be conducted by the TOWNSHIP with clean potable water until the water runs clear.

E. Chlorination

1. All new mains and pipe or any existing mains contaminated by the CONTRACTOR shall be chlorinated to a minimum residual chlorine concentration of fifty (50) parts per million with commercial liquid chlorine solution or approved equal. The chlorinated water shall be allowed to stand in the mains for 24 hours. The end of the 24-hour period the chlorinated water at all parts of the mains shall show a free available chlorine residual of not less than twenty-five (25) parts per million. If less than twenty-five (25) parts per million residual is shown at the end of the first 24 hours period, additional chlorine shall be added until a residual of not less than twenty-five (25) parts per million at all parts of the system is shown after a subsequent 24 hour period. The chlorinated water shall then be removed from the mains and the mains flushed with potable water for bacteriological testing. No flushing shall take place between the two required bacteriological testing.

F. Bacteriological Testing

1. The Pittsfield Township Utilities Department will take bacteriological samples of the water in the mains for analysis at two different times. The first samples will be taken 24 hours after the mains have been satisfactorily chlorinated, flushed and filled with potable water. The second sample will be taken 24 hours later. Each sample will be incubated for 48 hours. No flushing shall be done during or between tests, unless supervised and approved by ENGINEER. Two sets of safe consecutive bacteriological samples, collected at least 24 hours apart, must be obtained before placing the water main in service.

2. The CONTRACTOR shall provide a sufficient number of corporation cocks and copper tubing for taking samples. Samples shall not be collected from hoses or fire hydrants.

3. Bacteriological testing must begin on Mondays to allow Pittsfield Township personnel and the testing laboratory a full work week to conduct the testing.

G. Hydrostatic Pressure Testing

1. The CONTRACTOR shall pressure test sections of water main as sections of 2,000 feet or less unless otherwise authorized by the ENGINEER. When permitted to test lengths in excess of 2,000 feet, only the allowable leakage for 2,000 feet will be permitted.

2. All water mains shall be subjected to a hydrostatic pressure of 150 psi based on the elevation of the lowest point in the system. The main shall be maintained under the test pressure for a minimum continuous period of two (2) hours by pumping potable water into the line at frequent intervals. The volume of water so added shall be measured and considered to represent the leakage from the main. No pipeline installed will be accepted until the leakage measured is less than 0.092 gallons per inch diameter of the pipe per 1 hour per 1,000 feet.

3. In the event that the leakage exceeds the specified amount, the main shall be carefully inspected for leaks and repaired as necessary. Any cracked or defective pipe, fittings, valves or hydrants discovered shall be removed and replaced with sound material and the test repeated to the satisfaction of the ENGINEER.

4. If the CONTRACTOR chooses to pressure test against an existing valve he assumes the responsibility of meeting the leakage requirements. The CONTRACTOR may at his discretion provide a physical break and cutting in sleeve for pressure testing.

5. Temporary connections (jumpers) between existing water mains and the newly constructed system for testing purposes, shall include a reduced zone backflow preventer to prevent backflow and possible contamination of the public water.

H. Material Tests

1. The CONTRACTOR shall have test of pipe and strength made by an independent testing laboratory. Tests of up to 4 lengths of water main per hundred lengths may be required to show compliance with the Specifications. All pipe delivered to the job site shall be accompanied with a manufacturers certificate of compliance to the specifications.

2.00 PRODUCTS

A. All products shall be consistent with the current component part submittal sheet posted on the Township website.

2.01 PIPE AND FITTINGS

A. Ductile-iron pipe water main shall meet all the requirements of the latest revision of ANSI/AWWA C151/A21.51. Pipe shall be furnished in eighteen-foot or twenty-foot lengths, unless otherwise required. All joints, to include joints for fittings, valves and hydrants, must be of the push on joint type and compatible tyton joint gaskets. Ductile iron pipe must be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50 to meet requirements for Pressure Class 350.

B. Ductile iron pipe and fittings shall be double-cement lined with an approved bituminous seal coat in accordance with ANSI/AWWA C104/A21.4.

C. Ductile iron fittings shall meet all the requirements of the latest revision of ANSI/AWWA C110/A21.10 for full body fittings and ANSI/AWWA C153/A21.53 for compact fittings for a minimum working pressure of 250 psi and be of the push-on joint type. Plugs, where shown on the plans, shall be solid mechanical joint plug type.

D. Restrained mechanical joints of the wedge action type shall use a follower gland and shall include a restraining mechanism which, when activated, impart multiple wedging action against the pipe, increasing its resistance as the pressure increases. Twist off nuts shall be used to insure proper actuating of the restraining device. Restrained mechanical joints for ductile iron pipe shall be Megalug, Series 1100, or approved equal. Mechanical joints shall be in conformity with the requirements of the latest revision of the ANSI AWWA C111/A21.11. Bolts and nuts must be type 304 stainless steel.

E. Push-on joints shall meet all requirements of ANSI/AWWA C111/A21.11. Push-on joints shall consist of a ductile-iron bell provided with a recess to receive a circular molded rubber gasket to effect the joint seal. A rubber gasket and sufficient lubricant to assemble the joint shall be furnished with each joint. The lubricant shall have no deleterious effect upon the color, taste or odor of potable water and shall not be corrosive to either the pipe or gasket. Pipe furnished with push-on type joints shall be equal in strength and leak tightness to pipe furnished with mechanical joints as specified when installed under identical conditions, and shall meet all other requirements of these specifications. In addition to the above requirements, the gasket and lubricant shall conform to the latest revision of ANSI/AWWA C111/A21.11. Where it is necessary to utilize a locking mechanism for a push-on joint upstream or downstream of a restrained mechanical joint, field-lok gaskets or equal shall be utilized and shall be used in conformance with DIPRA Standards for restraint distance from a restrained mechanical joint fitting.

F. All pipe and fittings shall be manufactured in the United States of America.

G. The ENGINEER shall witness the delivery and unloading of all pipe and collect the appropriate manufacturer's certificate of compliance per Section 1.04 of this Specification.

2.02 VALVES

A. All valves installed under this Specification shall conform to the applicable requirements of ANSI/AWWA C500, C504 and C509 standards governing construction materials and workmanship. Each valve shall carry the name or trademark of the manufacturer. All valves shall have operating nuts that turn to the right (clockwise) to open.

B. Resilient-Seated Gate Valves

1. Resilient seated gate valves shall conform to the applicable requirements of ANSI/AWWA C515. Valves shall have a minimum working pressure of 250 psi. The gate shall be ductile iron encased in a bonded synthetic rubber to form resilient seating surfaces. Stem shall be bronze with a non-rising design and double o-ring packing. Joints shall be push-on type.

2. Resilient Seated Gate Valves shall be manufactured by American Flow Control or Clow.

C. Tapping Sleeves and Valves

1. Tapping sleeves shall be full length of heavy-duty stainless steel construction designed for use with the type of pipe to be tapped. Tapping sleeve flange and body shall be type 304 stainless steel. Bolts and nuts shall be 304 stainless steel. Gasket shall be full circumferential SBR compounded for water service. Tapping sleeve shall contain a test plug to assure seal prior to tapping. Tapping sleeve shall be JCM Industries 432; Romac Industries SST, Ford FAST, Powerseal 3490AS; Dresser 630 or equal.

2. Tapping valves shall meet the specifications for gate valves except that the valve shall have a flange compatible with the tapping sleeve.

3. The tapping sleeves and valves shall be subjected to a hydrostatic pressure of 200 psi. The sleeves and valves shall be maintained under pressure for a minimum continuous period of 5 minutes by pumping potable water into the sleeve. Upon any visual leakage observed by the ENGINEER, the tapping sleeve and valve shall be removed and replaced, and the test repeated at the CONTRACTOR'S expense to the satisfaction of the ENGINEER.

D. Corporation Stops

1. Corporation stops used for insertion into mains shall be ball valve type. All stops shall have no lead brass bodies, keys, stem washers and nuts. Inlet threads shall conform to the latest revision of AWWA C800. The outlet connection shall be of the compression type to receive copper service pipe.

E. Valve Boxes

1. Valves boxes shall be 5-1/4-inch and be of cast-iron construction. They shall be of three-piece, screw-type adjustment design. All valve boxes shall be installed flush with the top of the proposed site grade. Cover shall be designed to be removed easily to provide access to the valve. The base shall not rest upon the valve assembly. Valve boxes shall be Tyler 6860 Item DD with number 6 base, or equal.

F. Valve Extensions

1. All gate valves with operating nuts at a distance greater than 6.5 feet below ground surface shall be provided with an extension stem. The length of the extension stem shall reach within 6.5 feet of the ground surface. Details of the extension system and method of installation shall be approved by the ENGINEER prior to installation.

G. Post Indicators and Valves

1. Post indicators, when specified, shall be American Flow Control series A240 or Clow series 2945A with aluminum plates indicating OPEN and SHUT. Post indicators shall open left.

2. Post indicator valves shall be American Flow Control Model 2500 or Clow model F-6120. All valves shall open left.

3. Post indicators and their corresponding valves must be made by the same manufacturer.

4. Bollards must be placed to protect post indicators, except as specified by the ENGINEER.

5. Bollards shall be 4-inch diameter galvanized schedule 40 steel posts 36 to 48 inches high with minimum depth of 24 inches. The posts shall be set in and filled with 3000 psi concrete. Bollards protecting hydrants and PIVs shall be painted red.

2.03 GATEWELLS

A. Gatewells shall conform to the latest revision of ASTM C478 for Precast Reinforced Concrete Manhole Sections. Section joints shall be rubber gasketed and shall conform to ASTM C990. Cone sections shall be eccentric, with an offset step configuration.

B. All gatewell components shall have the name of the manufacturer stenciled on the inside. The lettering shall be a minimum of 4-inches high.

C. Gatewells constructed over an existing water main shall have a doghouse molded to an 8-inch thick cookie. All other gatewells shall have precast integral base sections.

D. Mortar for masonry or plastering outside of gatewells shall be made of one part of Portland Cement to two parts fine aggregate. Mortar materials and mixing shall correspond, in general, to those for concrete. All openings in gate wells shall be closed with brick and mortar in a manner that will make them watertight.

E. Gatewell steps shall be reinforced polypropylene coated steel. They shall be M.A. Industries models PS1-PF or PS1-B, or approved equal.

2.04 GATEWELL FRAMES AND COVERS

A. Gatewell frames and covers shall weigh not less than 350 lbs. Each frame and cover shall have machined bearing surfaces and shall be suitable notched for convenient removal of the cover.

B. Frames and covers shall be East Jordan Iron Works Model 1040Z frame with 1040 A cover. Each cover shall have the Pittsfield Township logo and the letters "PITTSFIELD TWP WATER" cast integrally into the cover.

C. All frames and covers shall be coated at the place of manufacturer with coal tar pitch varnish or other asphaltum coating approved by the ENGINEER.

2.05 GATEWELL CONNECTIONS

A. Water pipe to gate well connections shall be through a watertight flexible pipe-to-manhole connector, which shall be securely clamped into a core-drilled port. Pipe ports shall be core-drilled at the point of manufacture and shall be accurately located within 1/2-inch of the proposed water main centerline. Flexible pipe-to-manhole connectors shall meet the requirements of ASTM C923 and shall be NPC, Kor-N-Seal, or equal.

B. All non-rubber components including wedges, bands and pipe clamps shall be stainless steel.

2.06 GATEWELL ADJUSTMENTS

A. All final grade adjustment of gatewell cover and frame assemblies shall be completed utilizing injection molded High Density Polyethylene (HDPE) adjustment rings as manufactured by Ladtech, Inc., or approved equal. The adjustment rings shall be manufactured from polyethylene plastic meeting the requirements of ASTM D4976. Brick adjustments are not acceptable.

B. All adjustment for matching road grade shall be made utilizing a molded indexed slope ring.

C. Each adjustment ring shall be sealed with a 3/16 to 1/4-inch bead of butyl rubber sealant per the manufacturer's instructions. Sealant shall meet the requirements of ASTM C990.

D. All castings and adjustment rings shall be securely fastened to the cone of the structure with four 3/8-inch threaded rods. The rods shall be galvanized or stainless steel anchored to the structure with Redhead Trubolt concrete anchors, or equal. Stainless steel or galvanized nuts and washers shall be used to attach the casting.

E. When the depth of the gate well requires an adjustment greater than the maximum allowed, the CONTRACTOR shall provide additional pre-cast gate well barrel sections required to maintain acceptable chimney heights.

2.07 HYDRANTS

A. Fire hydrants shall comply with the latest revision of ANSI/AWWA C502. Hydrants shall be compression type to open with the pressure. They shall have a 5-1/4" valve opening and 6" mechanical joint inlet. Hydrants shall have two 3-1/2" (4.00" O.D.) pumper connections with National Standard 7-1/2 threads per inch. All hydrants shall have City of Ann Arbor standard thread pattern.

B. Fire hydrants shall have an inside barrel dimension of not less than 7.376" I.D. from top to bottom. The 1-1/8" pentagon operating nut shall open left (counter clockwise).

C. All nozzles shall be on a removable head with a flange so that they may be rotated by changing the position of the flange.

D. Hydrant shall be fully bronze mounted, including top of the operating stem where it passes through the double o-ring seal in the bronze packing gland. The forged operating stem in the base and the valve seat shall also be of bronze. The molded valve shall be of composition rubber and the cast iron valve clamps shall be packed with o-ring seals and held tight to the stem by a threaded bronze hex retainer ring and threaded bronze locknut, anchored with set screws.

E. Hydrant shall be designed for 150 psi working pressure and tested to 300 psi. Those portions of the hydrant above grade shall have two coats of red enamel. All unpainted surfaces shall have two coats of coal tar pitch varnish.

F. The hydrants shall be EJIW WaterMaster 5BR-250 with mechanical joint connections and break flange barrel with standard head.

G. Hydrant bolts located below grade shall be type 304 stainless steel

H. All hydrants shall have a 4" Storz Integral Hydra-Storz (HHS) adapter. The HHS shall meet the requirements of AWWA C502 regarding material and pressure testing. Storz nozzle shall have a brass metal face and hard anodized ramps and lugs. The aluminum finish shall be hardcoat anodized to Mil-A-8625f, type 3 dark gray. The adapter shall be made from forged or extruded 6061-T6 aluminum.

I. The blind cap shall have hard anodized aluminum Storz ramps and lugs, made of forged or extruded 6061-T6 aluminum. the cap shall be equipped with suction seal. The cap shall be connected to the adapter or the hydrant with 0.125 vinyl coated aircraft cable.

J. Fire hydrant extensions shall be manufactured by the hydrant manufacturer for use with the model hydrant being installed.

K. Hydrants adjacent to truck routes on commercial developments shall be protected by bollards.

2.08 SERVICE LEADS

A. Pipe for service leads 1-inch to 2-inch shall be soft annealed Type K copper. Service leads 4-inch to 8-inch shall be Pressure Class 350 Ductile Iron, Double cement lined.

B. Curb Stops

1. Curb stops used for service connections shall be ball valve type. All parts shall be no lead brass. Both the inlet and outlet connections shall be of the compression type to receive copper service pipe. Curb stops shall be consistent with the most current shop drawing checklist posted on the Township website.

C. Curb Boxes

1. Curb boxes shall be the Bibby Screw Style V010 with S169 top, V201 bottom, V223 extention, and V240 water cover . All curb boxes shall be coated inside and out with a tar base enamel. The minimum bury shall be 5'-0" (60") and the maximum 6' (72"). Curb boxes shall be consistent with the most current shop drawing checklist posted on the Township website.

D. Couplings

1. Couplings used for service connections shall be located outside the pavement and more than 10 feet from any building wherever possible. They shall have a three part union, and both connections shall be of the compression type to receive copper service pipe. All parts shall be no lead brass..

2. All service connections between two copper service pipes (two-inch or less in diameter) located under the pavement or within 10 feet of a building shall be connected using wrought copper, solder-sweat type couplings conforming to ASME B16.18 or ASME B16.22. Fittings shall bear made in USA labels. Joining of copper piping shall be a solder-sweat connection using lead free Silfos. The use of 95-5, Tin-Antimony or equivalent solders will not be allowed.

2.09 TRACER WIRE

A. Tracer wire to be used on open cut pipe shall be AWG #12 single strand copper with blue 30 mil HDPE insulation. Connections shall be made using 3M DBR-6 wire connectors, or equal.

2.10 POLYETHYLENE ENCASEMENT

A. All ductile iron pipe and fittings must be polyethylene encased. In addition, the initial 24-inches of copper service lead must be encased from the corporation stop. Polyethylene encasement must be manufactured in accordance with the requirements of the latest revision of ANSI/AWWA C105/A21.5.

B. Polyethylene Encasement shall be black linear low-density polyethylene with a minimum thickness of 8 mils.

C. The wrap shall overlap the joint by 12 inches to either side and be secured to the pipe with polyethylene adhesive tape.

3.00 EXECUTION

3.01 EXCAVATION AND BACKFILL

A. All excavation and backfill shall conform to the Earthwork specification.

3.02 PIPE INSTALLATION

A. The installation of ductile iron water main must conform to the requirements of ANSI/AWWA C600.

B. Any pipe damaged in transport or handling shall be rejected and removed from the site of the work.

C. Before lowering in the trench, and while suspended, each pipe and fitting shall be inspected for defects. Defective, damaged or unsound pipe shall immediately be removed from the construction site. The interior of each pipe shall be inspected for cleanness and cleared of all dirt and foreign matter before being lowered into the trench.

D. In handling and placing ductile iron pipe and fittings, no metal shall be used in contact with the inside of the pipe to lift or support the pipe. The pipe shall be moved only through the use of belt slings or automatic release type pipe tongs. Care shall be taken not to injure the pipe or pipe coating, and no damaged or imperfect pipe shall be used in the work except that minor damage to pipe coating may be repaired subject to the review of the ENGINEER.

E. Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying. After a length of pipe is placed in the trench, the spigot shall be centered in the bell of the adjacent pipe; the pipe shoved into position and brought to a true alignment. It will then be secured with sand backfill tamped under and on each side of the pipe, except at bell holes. No earth or other foreign matter shall be allowed to enter the joint space.

F. All excavation and backfill above the pipe shall conform to specifications under Earthwork and as shown on the Drawings.

G. A minimum of 18-inches vertical clearance shall be provided between the water main and any existing underground facility, unless otherwise approved by the ENGINEER. Whenever a main is installed under any existing utility line such as gas, buried electric power, telephone line, sewer or water, provisions shall be made to properly support or distribute any concentrated load to avoid settlement and possible failure of either main. Such provisions shall consist of concrete bedding of the main, complete concrete encasement, or some other method as shown on the plans. Water mains passing under sewers, in addition, shall be protected by providing:

1. A vertical separation of at least 18-inches between the bottom of the sewer and the top of the water main.

2. Adequate structural support for the sewer to prevent excessive deflection of joints and settlement of the sewer about the water main; i.e., a concrete saddle under the pipe with a span length extending to undisturbed earth bearing.

H. Water mains shall be installed at least 10 feet horizontally from any existing or proposed gravity sanitary or storm sewer, septic tank, or subsoil treatment system. The distance shall be measured edge to edge.

I. In assembly of push-on or shove type joints, the bell socket recess and the gasket shall be wiped clean and the gasket placed properly in position. A thin film of lubricant shall then be applied to the surface of the gasket to come into contact with the entering pipe. The plain end of the entering pipe shall be cleaned and then entered and forced home to the base of the socket.

J. Where necessary to cut pipe, cutting shall be done with approved tools and cut ends of pipe shall be square and regular. Cutting shall be done in a manner to avoid damage to lining and coating. Minor damage may be repaired subject to review of the ENGINEER.

K. To prevent trench water from entering the pipe, joints, which for any reason may not be completed as the pipe is laid, shall be thoroughly packed with approved material, in a manner to make them watertight. Open ends of fittings shall be tightly closed with approved plugs and well packed, as shall the end of the last pipe laid whenever work is not in progress.

L. Each pipe shall be laid accurately to the line and grade shown on the Plans. Wherever deflections at joints are required by changes in grade or alignment or to plumb valve stems, the deflection at any bell and spigot joint shall not exceed that which will cause the spigot end of pipe to be away from home in the bell of the adjacent pipe a distance of 1/4 inch at the point of greatest opening.

M. The deflection at any mechanical joint shall not exceed three-quarters of the maximum deflection recommended by the manufacturer or 3 degrees, whichever is more conservative of the joint used.

N. The CONTRACTOR shall not be entitled to any additional compensation because depth is more than specified at certain locations or due to clearances at manholes, or due to unforeseen obstacles, or occasioned in order to avoid undue changes in grade.

O. Pipe shall be laid at depths to provide minimum cover of 5' - 0" over the top of the pipe unless otherwise noted on the Drawings or elsewhere in these specifications.

3.03 GATE VALVES AND WELLS

A. All pre-cast section joints and lift holes shall be pointed and plugged, inside and outside, with mortar.

B. Gate valves shall be of the size and installed at the location as shown on the plans. They shall be set square with the line of the main, and unless otherwise directed by the Township ENGINEER, all gate valves shall be set with stems plumb. At each side of gate valve, the CONTRACTOR shall furnish and install a 1-inch corporation stop on the main as shown on the Standard Details.

C. All gate valves with operating nuts at a distance greater than 6.5 feet below ground surface shall be provided with an extension stem.

3.04 HYDRANTS

A. Fire hydrants shall be constructed in accordance with the details shown on the plans. Finish grade level to center of nozzle caps shall measure between 24 and 30 inches. A maximum of one hydrant barrel extension and one operating stem extension may be used to accommodate changes in grade. Under no conditions shall extended hydrant have more than one coupling in the operating stem. Pumper connections shall point toward the street.

B. Fire hydrants shall be installed with barrel vertical and properly based. Concrete thrust blocks shall be placed behind the hydrant, tee, and every bend. Care should be taken to insure the drain holes on the hydrant are not plugged by the thrust blocks. Hydrant shall be set in 1 yard of coarse gravel for drainage purposes. If ground water is encountered, the drain hole shall be plugged as directed by the manufacturer. The backfill shall be sand thoroughly tamped around the hydrant and valve box in 1 ft layers.

C. Fire hydrant and gate valve shall be set apart 24 inches. Gate valves and valve box shall be as specified under the valve paragraphs of this section.

D. Hydrant leads shall have a minimum of 5.5 feet of cover in all areas, including crossings through ditch sections.

E. Hydrants shall be carefully plumbed, braced and backfilled so they remain plumb.

F. All grade, facing, and vertical alignment adjustment of hydrants shall be completed prior to pressure testing and charging of the hydrants.

G. All hydrants shall be cleaned and painted with a rust inhibitive, oil base paint such as "rustoleum" or *approved equal to the Township's color code prior to acceptance.*

H. The lubricant reservoirs in all hydrants having such construction shall be filled with a lubricant acceptable to the Michigan Department of Environmental Quality and recommended by the hydrant manufacturer.

I. Backfilling around fire hydrants shall be carefully tamped sand in 12-inch layers from the centerline of the lead main to a height of 1-foot below finished grade.

J. CONTRACTOR shall place burlap sack or equivalent material over the hydrant nozzles after installation.

K. Fire hydrant nozzles shall be aligned as required by the Township Fire Marshal.

L. Fire hydrant extensions shall be provided as necessary so that the safety flange is located at or above surface grade.

3.05 TRACER WIRE

A. Tracer wire shall be installed along the top of all water mains. For directional drilling, the tracer wire shall be installed at the same time as the pipe. For open cut construction, the tracer wire shall be installed at a height of not more than 6 inches above the main line pipe or service leads. Wire shall be extended to all hydrants, blow-offs, dead ends, service leads and post indicator valves. Tracer wire shall be brought to grade, leaving enough excess material to avoid loss or damage to the wire during construction and subsequent activities. Wire shall be trimmed to finish grade following completion of the landscaping.

B. When tracer wire is to be run along short offsets (less than 20 feet), a loop of wire shall be utilized to loop to the end of the offset, bring the loop to grade and terminate it in an approved manner. For service leads and offsets of more than 20 feet in length, or installed by directional drilling method, a splice may be utilized to make the connection at the main. The tracer wire shall then be installed and terminated in an approved manner.

C. Tracer wire terminations shall be made by one of the following methods:

1. Tracer wire shall be terminated at hydrants by tying off the wire at the head flange, leaving excess material for future trimming following landscape activities.

2. Terminations at valve/curb boxes, post indicators, valves and blow-offs shall be made with 2 wraps of wire at grade around the box or pipe, leaving excess material for future trimming following landscaping.

3. Gatewell terminations shall be made by running the tracer wire through the pipe opening in the wall, down to and across the floor to the steps, up the wall and secure to the top step leaving the stub accessible at the casting. Wire shall be run through the gatewell such that it does not create a hazard.

4. Terminations at existing water mains without tracer wire shall be made at the nearest hydrant or gate well as outlined above. If no hydrant or gatewell is available, an upper section of valve box shall be installed with the tracer wire stubbed up inside

D. When connections are made to existing water mains which do not have tracer wire, the following method most applicable to field conditions shall be used.

1. When connection is made at/near a valve or hydrant, the connection shall be made in the same manner as the termination at said structures in Item C(2) above.

2. When connection takes place in a gatewell, the same procedure shall be used as in termination at a gatewell (see item C(3) above).

3. If no valve or hydrant is available, the upper section only of a valve box shall be set with the tracer wire stubbed up inside.

3.06 POLYETHYLENE ENCASEMENT

A. The polyethylene encasement must be installed in accordance with the specifications and requirements of ANSI/AWWA C105/A21.5. For open cut applications a single wrap is required, and for directional drill applications a double wrap is required.

B. The polyethylene encasement must be taped and overlapped at pipe joints and must be taped in a spiral configuration along the length of the pipe.

3.07 CONNECTION TO EXISTING MAINS

A. All connections to existing water mains shall be made at the locations as shown on the plans.

B. All valves shall be operated by the Pittsfield Township Utilities Department.

C. Prior to beginning construction of the final connections, the CONTRACTOR shall provide sequence of all final connections to the existing system and coordinate a meeting between the ENGINEER, OWNER and CONTRACTOR in the field to review the procedure.

D. When making a dry connection to an existing main, the existing main to which a connection is to be made shall be isolated by the closing of the necessary existing valves, and the water from the existing main shall then be pumped out or removed by other means so the connection may be made in the dry. After the connection has been acceptably made, the portion of the new line to the nearest valve shall be satisfactorily tested and disinfected, along with the drained portion of the existing water main, before the isolated existing main is placed back in service, except as the ENGINEER may otherwise direct. In as much as residents served by this isolated main will be temporarily out of water during this period, the work shall be executed as rapidly as possible, and the time of, and the procedure in, making such connections shall be subject to the review of the ENGINEER. Such work may be required to be done at night in order to minimize inconvenience of water users. The CONTRACTOR shall not be entitled to any additional compensation because of night work or other special requirements in work under this section.

E. The CONTRACTOR shall make particular effort, prior to bidding, to ascertain whether or not valves in the existing mains to be connected to the new mains are so located as to provide isolation. If valves are not found to be adequate, then the CONTRACTOR shall utilize other means to make the connections with a minimum of interruption to service.

F. When making a wet tap connection to an existing main, a tapping sleeve designed for the type of pipe being tapped shall be utilized and the tap shall be made in accordance with the manufacturer of the tapping equipment.

G. Wherever adapters are required to properly connect the pipe with existing pipe or other material or manufacturer, the nominal I.D. of adapters shall be the same size as the nominal diameter of pipe connected thereto. Adapters shall also be furnished and used as required by the manufacturer for connection to fittings.

3.08 BEDDING

A. Ductile iron pipes shall be fully enclosed in polywrap and laid on a compacted sand cushion, 4 inches thick. Sand shall conform to fine aggregate 2NS as defined in 2003 MDOT, Section 902.

B. 2NS sand bedding material shall be placed around and above the main to a height of 12 inches above the main.

C. Sand shall be compacted on top of the 12-inches of sand above the pipe to not less than 95 percent of the maximum unit density as determined at optimum moisture content.

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Permit-Seal

Client/Project
PITTSFIELD TOWNSHIP

Pittsfield Township, Michigan

Title
WATER MAIN SPECIFICATIONS

Project No.
2075001300

Scale

Revision