ENGINEER'S ESTIMATED QUANTITIES (THIS SHEET):
THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL QUANTITIES NECESSARY TO COMPLETE THE WORK. ALL ENGINEER'S ESTIMATED QUANTITIES SHALL BE CONSIDERED APPROXIMATE.

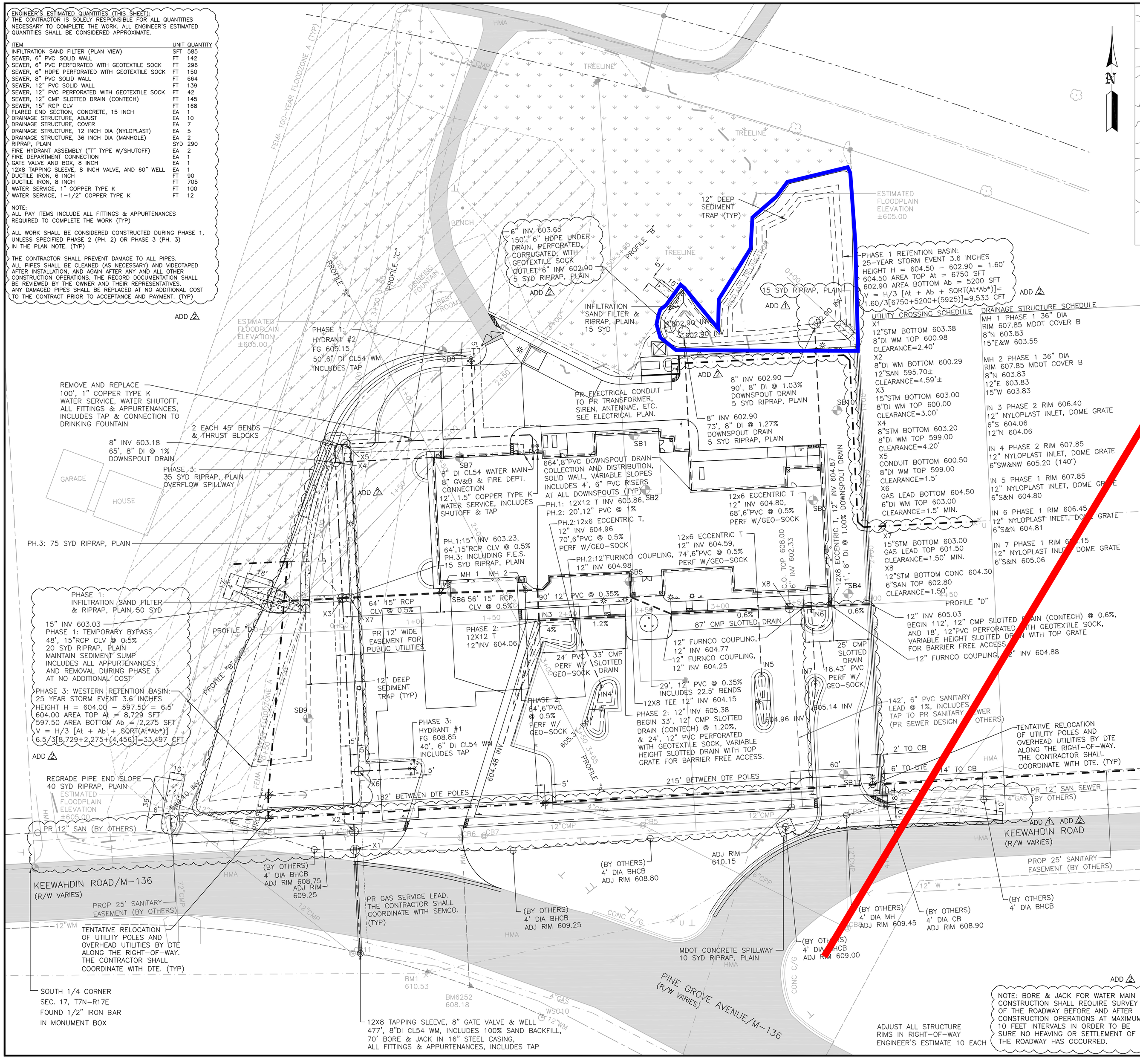
ITEM	UNIT	QUANTITY
INFILTRATION SAND FILTER (PLAN VIEW)	SFT	585
SEWER, 6" PVC SOLID WALL	FT	142
SEWER, 6" PVC PERFORATED WITH GEOTEXTILE SOCK	FT	296
SEWER, 6" HDPE PERFORATED WITH GEOTEXTILE SOCK	FT	150
SEWER, 8" PVC SOLID WALL	FT	664
SEWER, 12" PVC SOLID WALL	FT	139
SEWER, 12" PVC PERFORATED WITH GEOTEXTILE SOCK	FT	42
SEWER, 12" CMP SLOTTED DRAIN (CONTECH)	FT	145
SEWER, 15" RCP CLV	FT	168
FLARED END SECTION, CONCRETE, 15 INCH	EA	1
DRAINAGE STRUCTURE, ADJUST	EA	10
DRAINAGE STRUCTURE, COVER	EA	7
DRAINAGE STRUCTURE, 12 INCH DIA (NYLOPLAST)	EA	5
DRAINAGE STRUCTURE, 36 INCH DIA (MANHOLE)	EA	2
RIPRAP, PLAIN	SYD	290
FIRE HYDRANT ASSEMBLY ("T" TYPE W/SHUTOFF)	EA	2
FIRE DEPARTMENT CONNECTION	EA	1
GATE VALVE AND BOX, 8 INCH	EA	1
12X8 TAPPING SLEEVE, 8 INCH VALVE, AND 60" WELL	EA	1
DUCTILE IRON, 6 INCH	FT	90
DUCTILE IRON, 8 INCH	FT	705
WATER SERVICE, 1" COPPER TYPE K	FT	100
WATER SERVICE, 1-1/2" COPPER TYPE K	FT	12

NOTE:
ALL PAY ITEMS INCLUDE ALL FITTINGS & APPURTENANCES REQUIRED TO COMPLETE THE WORK (TYP)

ALL WORK SHALL BE CONSIDERED CONSTRUCTED DURING PHASE 1, UNLESS SPECIFIED PHASE 2 (PH. 2) OR PHASE 3 (PH. 3) IN THE PLAN NOTE. (TYP)

THE CONTRACTOR SHALL PREVENT DAMAGE TO ALL PIPES. ALL PIPES SHALL BE CLEANED (AS NECESSARY) AND VIDEOTAPED AFTER INSTALLATION, AND AGAIN AFTER ANY AND ALL OTHER CONSTRUCTION OPERATIONS. THE RECORD DOCUMENTATION SHALL BE REVIEWED BY THE OWNER AND THEIR REPRESENTATIVES. ANY DAMAGED PIPES SHALL BE REPLACED AT NO ADDITIONAL COST TO THE CONTRACT PRIOR TO ACCEPTANCE AND PAYMENT. (TYP)

ADD 2



PHASE 1 RETENTION BASIN:
25-YEAR STORM EVENT 3.6 INCHES
HEIGHT H = 604.50 - 602.90 = 1.60'
604.50 AREA TOP At = 6750 SFT
602.90 AREA BOTTOM Ab = 5200 SFT
V = H/3 [At + Ab + SQRT(At*Ab*)]=
1.60/3[6750+5200+(5925)]=9,533 CFT
ADD 2

UTILITY CROSSING SCHEDULE

X1
12"STM BOTTOM 603.38
8"DI WM TOP 600.98
CLEARANCE=2.40'
X2
8"DI WM BOTTOM 600.29
12"SAN 595.70±
CLEARANCE=4.59'±
X3
15"STM BOTTOM 603.00
8"DI WM TOP 600.00
CLEARANCE=3.00'
X4
8"STM BOTTOM 603.20
8"DI WM TOP 599.00
CLEARANCE=4.20'
X5
CONDUIT BOTTOM 600.50
8"DI WM TOP 599.00
CLEARANCE=1.5'
X6
GAS LEAD BOTTOM 604.50
6"DI WM TOP 603.00
CLEARANCE=1.5' MIN.
X7
15"STM BOTTOM 603.00
GAS LEAD TOP 601.50
CLEARANCE=1.50' MIN.
X8
12"STM BOTTOM CONC 604.30
6"SAN TOP 602.80
CLEARANCE=1.50'

DRAINAGE STRUCTURE SCHEDULE

MH 1 PHASE 1 36" DIA
RIM 607.85 MDOT COVER B
8"N 603.83
15"E&W 603.55

MH 2 PHASE 1 36" DIA
RIM 607.85 MDOT COVER B
8"N 603.83
12"E 603.83
15"W 603.83

IN 3 PHASE 2 RIM 606.40
12" NYLOPLAST INLET, DOME GRATE
6"S 604.06
12"N 604.06

IN 4 PHASE 2 RIM 607.85
12" NYLOPLAST INLET, DOME GRATE
6"SW&NW 605.20 (140')

IN 5 PHASE 1 RIM 607.85
12" NYLOPLAST INLET, DOME GRATE
6"S&N 604.80

IN 6 PHASE 1 RIM 606.45
12" NYLOPLAST INLET, DOME GRATE
6"S&N 604.81

IN 7 PHASE 1 RIM 6[illegible].15
12" NYLOPLAST INLET, DOME GRATE
6"S&N 605.06

PROFILE "D"

DRAINAGE CALCULATIONS
PER THE RULES OF THE ST. CLAIR COUNTY DRAIN COMMISSIONER (SCCDC)

NORTHEASTERN RETENTION BASIN:
TRIBUTARY AREA A = 0.67 ACRES
AREA IMPERVIOUS SURFACE A-imp = 0.42 ACRES, C = 0.90
AREA PERVIOUS SURFACE A-perv = 0.25 ACRES, C = 0.20
WEIGHTED C = 0.42*0.90 + 0.25*0.20 = 0.43/0.67 = 0.64
FIRST FLUSH VOLUME 1" OVER THE SITE: 0.67 ACRES = 2,433 CFT
ALTERNATE CALCULATION: 3630 * A * C = 3630 * 0.67 * 0.64 = 1,557 CFT
BANKFULL VOLUME: 8170 * C * A = 8170 * 0.67 * 0.64 = 3,504 CFT
100-YEAR DETENTION VOLUME:
ALLOWABLE DISCHARGE Qa = 0.15 CFS/ACRE * 0.67 ACRES = 0.10 CFS
INITIAL DISCHARGE Qo = Qa / A*C = 0.10 / 0.67*0.64 = 0.23 CFS
TIME OF CONCENTRATION Tc = -25 + SQRT(10,312.5/Qo) = 185.29 SEC
VOLUME PER IMPERVIOUS ACRE: Vs=16,500*Tc/(Tc+25)-40*Qo*Tc=12,834 CFT/AC-IMP
REQUIRED DETENTION VOLUME V = Vs * A * C = 12,834*0.67*0.64 = 5,504 CFT
PROPOSED STORAGE VOLUME = 9,533 CFT
9,533 CFT/0.67 ACRES/43,560 SFT/ACRE = 0.327 FT = 3.92 INCHES OVER THE SITE

WESTERN RETENTION BASIN:
TOTAL ONSITE TRIBUTARY AREA A = 2.30 ACRES
AREA IMPERVIOUS SURFACE A-imp = 1.70 ACRES, C = 0.90
AREA PERVIOUS SURFACE A-perv = 0.60 ACRES, C = 0.20
WEIGHTED C = 1.70*0.90 + 0.60*0.20 = 1.65/2.30 = 0.71
FIRST FLUSH VOLUME: 1" OVER THE SITE: 2.30 ACRES = 8,349 CFT
ALTERNATE CALCULATION: 3630 * A * C = 3630 * 2.30 * 0.71 = 5,928 CFT
BANKFULL VOLUME: 8170 * C * A = 8170 * 2.30 * 0.71 = 13,342 CFT
100-YEAR DETENTION VOLUME:
ALLOWABLE DISCHARGE Qa = 0.15 CFS/ACRE * 2.30 ACRES = 0.35 CFS
INITIAL DISCHARGE Qo = Qa / A*C = 0.35 / 2.30*0.71 = 0.21 CFS
TIME OF CONCENTRATION Tc = -25 + SQRT(10,312.5/Qo) = 195.94 SEC
VOLUME PER IMPERVIOUS ACRE: Vs=16,500*Tc/(Tc+25)-40*QoTc=11,890 CFT/AC-IMP
REQUIRED DETENTION VOLUME V = Vs * A * C = 11,890*2.30*0.71 = 19,416 CFT
PROPOSED STORAGE VOLUME = 33,497 CFT
33,497 CFT/2.30 ACRES/43,560 SFT/ACRE = 0.334 FT = 4.01 INCHES OVER THE SITE

PER MDEQ, SAND FILTER INFILTRATION FROM SURFACE WATER TO GROUND WATER:

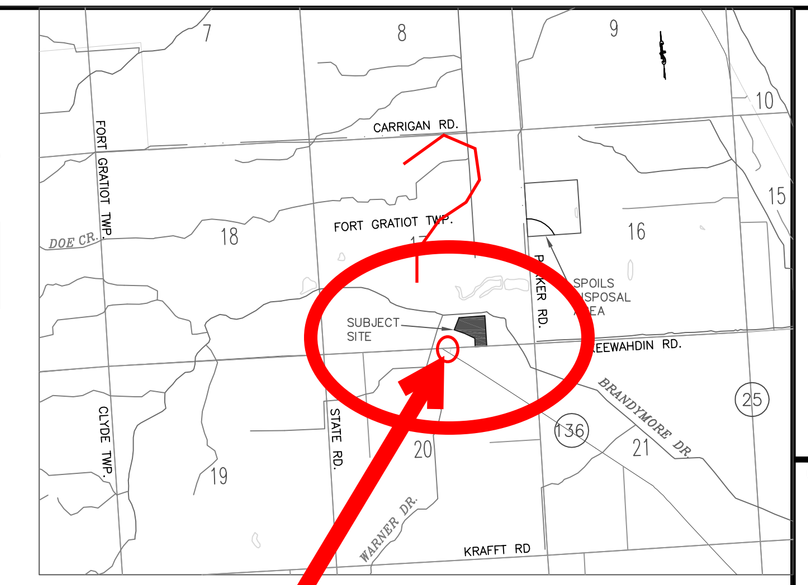
WESTERN RETENTION BASIN:
2.30 ACRES * 3.6 INCHES OVER SITE = 30,056 CFT
30,056 CFT, INFILTRATE WITHIN 72 HOURS
PROVIDED 33,497 CFT / 72 HOURS / 3,600 SEC/HR = 0.13 CFS
SAND K=10^3 GAL/DAY/SFT / 7.4808 GAL/CFT / 86,400 SEC/DAY = 0.0015 CFS/SFT
PLAN VIEW AREA OF SAND FILTER = 0.13 CFS / 0.0015 CFS/SFT = 86 SFT AVERAGE
TOTAL AREA = 2 * 86 = 172 SFT

NORTHEASTERN RETENTION BASIN:
0.67 ACRES * 3.6 INCHES OVER SITE = 8,756 CFT
8,756 CFT, INFILTRATE WITHIN 72 HOURS
PROVIDED 9,533 CFT / 72 HOURS / 3,600 SEC/HR = 0.0368 CFS
SAND K=10^3 GAL/DAY/SFT / 7.4808 GAL/CFT / 86,400 SEC/DAY = 0.0015 CFS/SFT
PLAN VIEW AREA OF SAND FILTER = 0.0368 CFS / 0.0015 CFS/SFT = 24.5 SFT AVERAGE
TOTAL AREA = 2 * 24.5 = 49 SFT

ADD 2

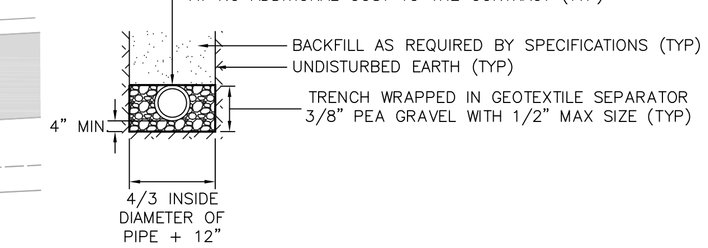
ADJUST ALL STRUCTURE RIMS IN RIGHT-OF-WAY ENGINEER'S ESTIMATE 10 EACH

ADD 2
NOTE: BORE & JACK FOR WATER MAIN CONSTRUCTION SHALL REQUIRE SURVEY OF THE ROADWAY BEFORE AND AFTER CONSTRUCTION OPERATIONS AT MAXIMUM 10 FEET INTERVALS IN ORDER TO BE SURE NO HEAVING OR SETTLEMENT OF THE ROADWAY HAS OCCURRED.

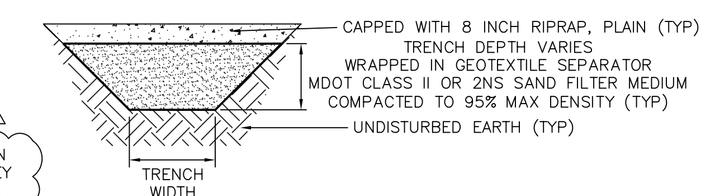


VICINITY MAP
NO SCALE

CONTRACTOR SHALL PROTECT DRAINAGE PIPES FROM DAMAGE, & REPLACE ANY PIPE DAMAGED BY CONSTRUCTION OPERATIONS, AT NO ADDITIONAL COST TO THE CONTRACT (TYP)



DOWNSPOUT DRAIN/UNDER DRAIN DETAIL
NOT TO SCALE



INFILTRATION SAND FILTER DETAIL
NOT TO SCALE

NOTE: SEE SHEET AS-1 FOR LEGEND & SEE SHEET C-6 FOR MORE SITE DETAILS

HURON CONSULTANTS
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3811 24th Ave, Suite A
Fort Gratiot, MI 48059
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FORT GRATIOT CHARTER TOWNSHIP
3720 KEEWAHDIN ROAD
FORT GRATIOT, MI 48059
TEL: 810.385.4489
FAX: 810.385.9010

3 WORKING DAYS
800-482-7171
Know what's below. Call before you dig.

PRIOR TO CONSTRUCTION, ALL EXISTING UTILITIES LOCATION AND DEPTH WITHIN THE PROJECT AREA SHALL BE FIELD VERIFIED. CALL MISS DIG SYSTEM 3 WORKING DAYS PRIOR TO CONSTRUCTION.

UTILITY INFORMATION SHOWN ON THIS DRAWING ARE APPROXIMATE AND MAY BE ACCORDING TO AVAILABLE RECORD OR DISCLOSED INFORMATION BY VARIOUS UTILITY COMPANIES, PUBLIC AGENCIES, OR OTHER SOURCES AND THUS MAY NOT NECESSARILY REFLECT ACTUAL FIELD LOCATIONS AND NO GUARANTEE IS GIVEN TO COMPLETENESS OR ACCURACY.

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PROJECT NAME:
FORT GRATIOT CHARTER TOWNSHIP MUNICIPAL CENTER

UTILITY PLAN

PROJECT LOCATION:
SEC'S 16&17, T7N, R17E
FORT GRATIOT TOWNSHIP
SAINT CLAIR COUNTY

Drawn By: TDP
Checked By: SKS
Approved By: EJO

REVISIONS:
1. 2013-11-25
2. 2013-12-03
3. 2013-12-05
4. 2013-12-18
5. 2014-01-20
6. 2014-02-03
7. 2014-02-12
8. 2014-02-24 ADD 1
9. 2014-02-28 ADD 2

SCALE VERIFICATION:
0 0.5 1
BAR IS ONE-INCH
ADJUST SCALES ACCORDINGLY IF NOT

SCALE:
1"=30'

HC PROJECT NO:
13-10672

HC DRAWING NO:
UP1

C-3