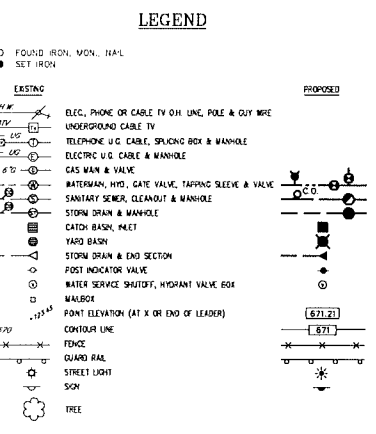
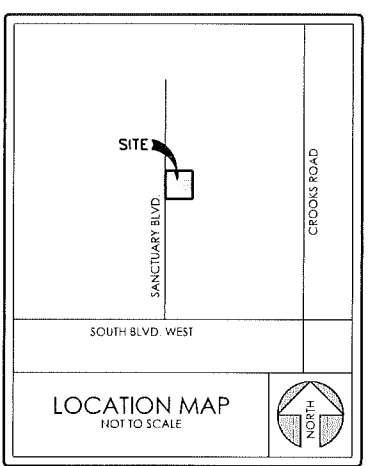


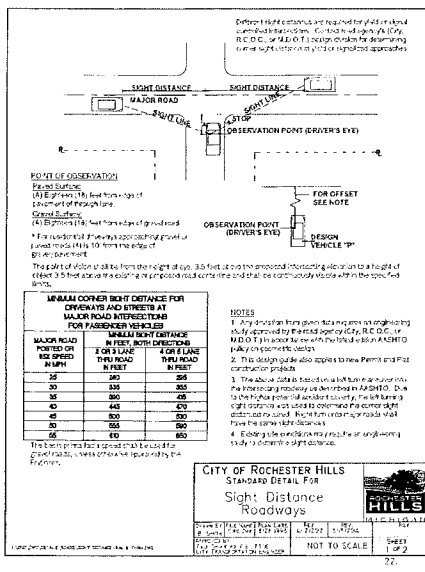
PARCEL DESCRIPTION
 Lots 82, 83, 84-88; part of Lots 84, 92, 93, 99; the vacated Grant Road adjacent to the above mentioned Lots; and the vacated Dayton Road adjacent to the above mentioned Lots of "South Boulevard Gardens" according to the plat thereof recorded in Liber 5 of Plats, Page 45, Oakland County Records, more particularly described as:
 Beginning at the northwest corner of vacated Dayton Road adjacent to Lot 95; thence S03°21'02"E 452.14 feet; thence N89°40'14"E 207.95 feet; thence N00°24'02"W 112.95 feet; thence N89°40'14"E 293.11 feet; thence N00°24'02"W 352.79 feet; thence S88°08'58"W 524.50 feet to the point of beginning.
 Containing 4.64 acres of land, more or less.



SITE DATA
 CURRENT ZONING: R-4
 PROPOSED ZONING: P.U.D.
 PID: 15-32-476-001
 PID: 15-32-476-002
 PID: 15-32-476-005
 PID: 15-32-476-006
 PID: 15-32-476-009
 PID: 15-32-477-016
 PID: 15-32-477-009

TOTAL SITE AREA = 4202,109 SF
 4.64 AC
TOTAL UNITS = 14
TOTAL BUILDINGS = 7
REQUIRED DENSITY = 3.4 UNITS PER ACRE
 4.64 x 3.4 = 15.8 UNITS
PROPOSED DENSITY = 14 UNITS / 4.64 ACRES =
 3.0 UNITS PER ACRE
SETBACKS FRONT 25 FT
 SIDE 10 FT MIN.
 REAR 15 FT
MAX BLDG. HEIGHT = 2.5 STORIES OR 30.0 FT.
REQUIRED OPEN SPACE = 5.0%, 0.23 AC.
PROPOSED OPEN SPACE = 5.0%, 0.23 AC.

FIRE DEPARTMENT NOTES:
 1. Fire lines shall be designated by the Fire Code Official and shall be conspicuously posted on both sides of the fire lanes, with fire lane signs spaced no more than 100 feet apart. The fire lane signs shall read "No Stopping, Standing, Parking, Fire Lane" and shall conform to Michigan Manual of Uniform Traffic Control Devices.
 2. Construction site shall be safeguarded in accordance with IFC 2006 Chapter 14.
 3. Open burning is not permitted including the burning of trash, debris, or land clearing materials. Open burning for warming of sand and/or water for the preparation of motor shall be within the City of Rochester Hills Burn Permit guidelines.



NOTE: FLOOD PLAIN ELEVATION BASED ON THE SANCTUARY IN THE HILLS CONDOMINIUM DEVELOPMENT RECORDS = 600.80
NOTE: PRIVATE ROAD MAINTENANCE AGREEMENT WILL BE REQUIRED.
NOTE: SIDEWALK WAIVER WILL BE REQUIRED.
BENCHMARKS
 SITE B/M#1
 ARROW ON HYDRANT ON W. SIDE OF SANCTUARY BLVD RD. 2900 NORTH OF SOUTH PROPERTY LINE ELEV: 605.83 (NGVD29 DATUM)
 SITE B/M#2
 ARROW ON HYDRANT ON W. SIDE OF SANCTUARY BLVD RD. AT SOUTH PROPERTY LINE ELEV: 604.18 (NGVD29 DATUM)
NOTE: BENCHMARK ELEVATIONS ARE BASED ON EXISTING "SANCTUARY IN THE HILLS" BENCHMARKS.

NOTE: UTILITY INFORMATION, AS SHOWN, INDICATES APPROXIMATE LOCATIONS AND TYPES OF FACILITIES ONLY, AS DISCLOSED TO THIS FIRM BY THE VARIOUS UTILITY COMPANY'S RECORDS. NO GUARANTEE IS GIVEN OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY.
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FINAL PUD PLAN
SANCTUARY IN THE HILLS EAST
 PART OF THE SE 1/4 OF SECTION 32, T3N, R11E,
 CITY OF ROCHESTER HILLS, OAKLAND COUNTY, MICHIGAN

DISTRIBUTION	
●	PRELIMINARY
○	APPROVAL
○	CONSTRUCTION
○	AS-BUILT
REVISIONS	
DATE	REMARKS
08/06/15	PER ASTI
01/29/16	PER CITY/CIVIL
04/13/16	PER CITY/ASTI
06/16/16	PER MDO
06/30/16	PER CITY
09/06/16	ADDITIONAL TREES

SEAL

CLIENT
 MACLEISH BUILDING
 CORNERSTONE VILLAGE
 SUITE F
 650 E. BIG BEAVER ROAD
 TROY, MI 48063

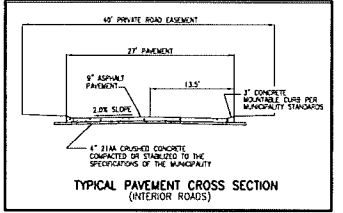
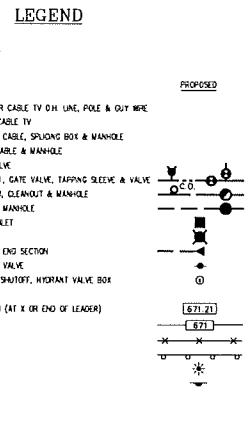
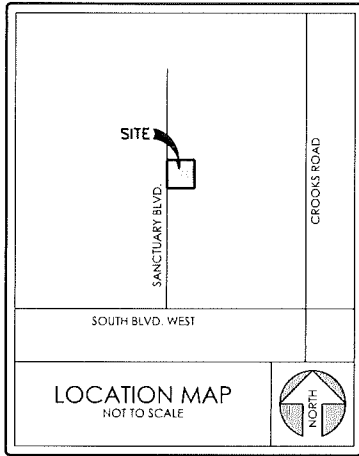
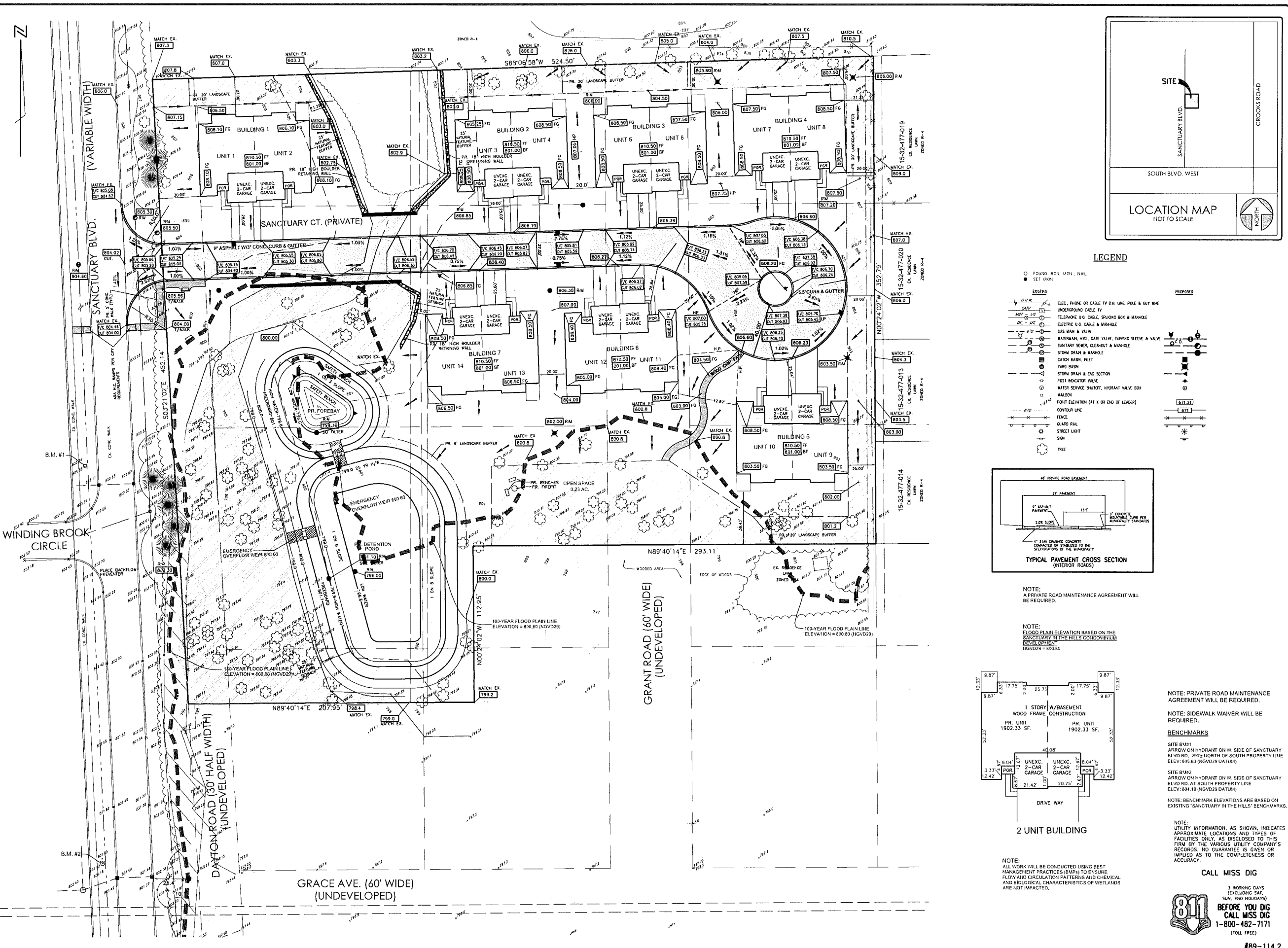
PROJECT NAME
 SANCTUARY IN THE HILLS EAST

PROJECT NUMBER
 C15-011.04

SHEET NAME
 SITE PLAN

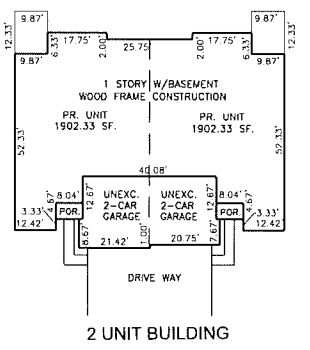
DRAWING SCALE: 1" = 30'
DATE: 07/15
PROJECT MANAGER: T.W.D.
DESIGNED BY: MAS
DRAWN BY: MAS/J.S. P.E.
FIELD BY: A.C. B.J.H.
CHECKED BY: T.W.D./S.R. P.E.

SHEET NUMBER
 1 OF 8



NOTE: A PRIVATE ROAD MAINTENANCE AGREEMENT WILL BE REQUIRED.

NOTE: FLOOD PLAIN ELEVATION BASED ON THE SANCTUARY IN THE HILLS CONDOMINIUM DEVELOPMENT NGVD29 = 800.00



NOTE: ALL WORK WILL BE CONDUCTED USING BEST MANAGEMENT PRACTICES (BMP) TO ENSURE FLOW AND CIRCULATION PATTERNS AND CHEMICAL AND BIOLOGICAL CHARACTERISTICS OF WETLANDS ARE NOT IMPACTED.

NOTE: PRIVATE ROAD MAINTENANCE AGREEMENT WILL BE REQUIRED.

NOTE: SIDEWALK WAIVER WILL BE REQUIRED.

BENCHMARKS

SITE BVM1
ARROW ON HYDRANT ON W. SIDE OF SANCTUARY BLVD RD. 2902 NORTH OF SOUTH PROPERTY LINE ELEV: 895.83 (NGVD29 DATUM)

SITE BVM2
ARROW ON HYDRANT ON W. SIDE OF SANCTUARY BLVD RD. AT SOUTH PROPERTY LINE ELEV: 884.18 (NGVD29 DATUM)

NOTE: BENCHMARK ELEVATIONS ARE BASED ON EXISTING "SANCTUARY IN THE HILLS" BENCHMARKS.

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01/29/16	PER CITY/CIVIC
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06/16/16	PER MDO
06/30/16	PER CITY
09/06/16	ADDITIONAL TREES

SEAL

CLIENT
MACLEISH BUILDING
CORNERSTONE VILLAGE
SUITE F
650 E. BIG BEAVER ROAD
TROY, MI 48063

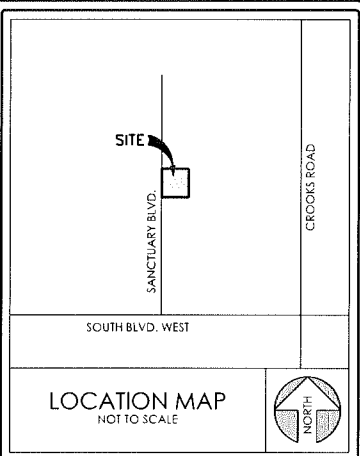
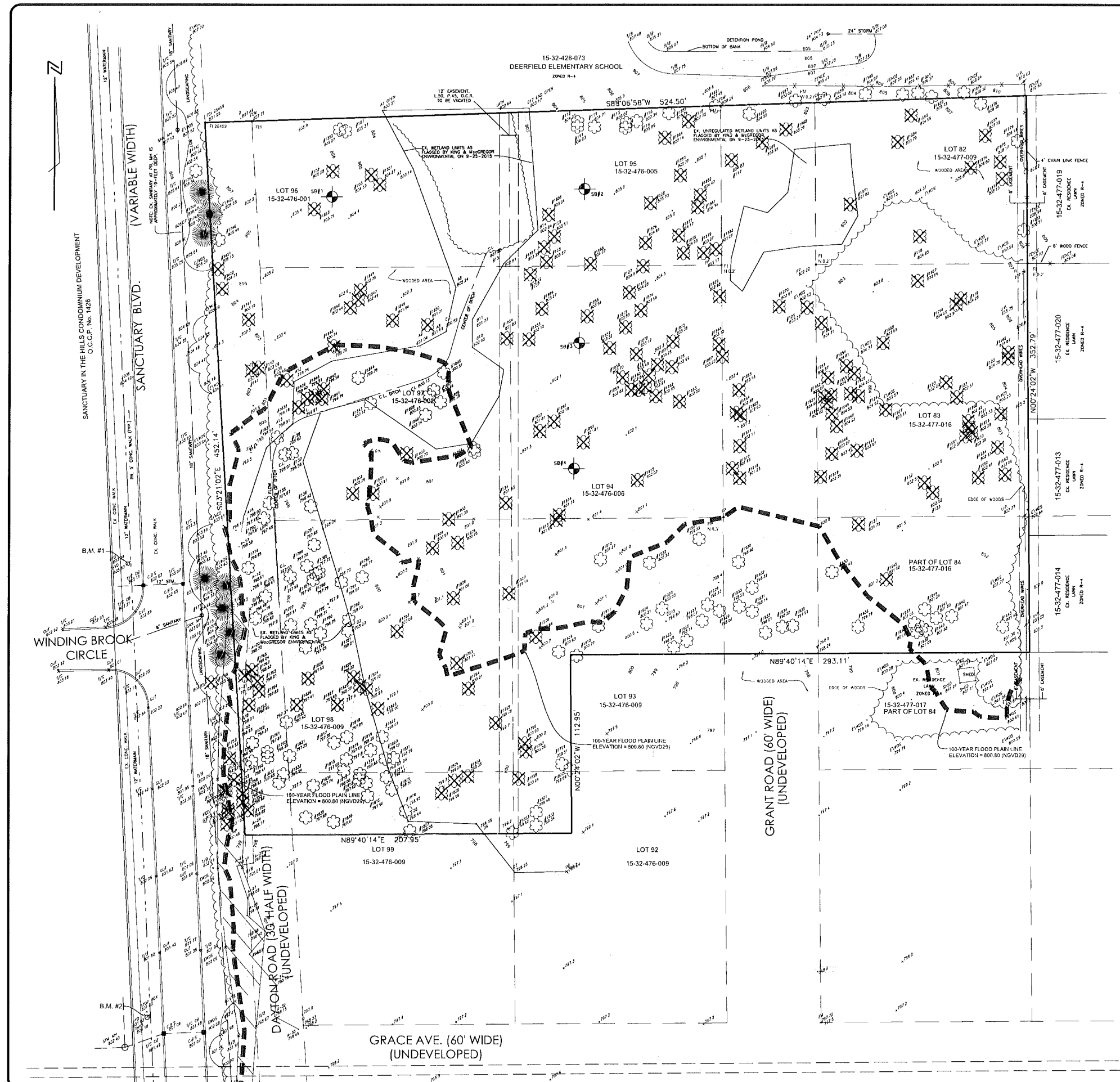
PROJECT NAME
SANCTUARY IN THE HILLS EAST

PROJECT NUMBER
C15-011.04

SHEET NAME
PRELIMINARY GRADING PLAN

DRAWING SCALE: 1" = 30'
DATE: 07/15
PROJECT MANAGER: T.V.D.
DESIGNED BY: MAS
DRAWN BY: MANSUR P.E.
FIELD BY: A.C. B.H.
CHECKED BY: THD/SR P.E.

SHEET NUMBER
2 OF 8



LEGEND

SECTION CORNER	R RECORDED
FOUND IRON, MON., NAIL	M MEASURED
SET IRON	C CALCULATED

EXISTING

ON W	ELEC. PHONE OR CABLE TV OH. LINE, POLE & DUT WIRE
CITY	UNDERGROUND CABLE TV
MT	TELEPHONE U.G. CABLE, SPLICING BOX & MANHOLE
CE	ELECTRIC U.G. CABLE & MANHOLE
0.75"	GAS MAIN & VALVE
WATER	WATERMAIN, W.P.D., GATE VALVE, TAPPING SLEEVE & VALVE
0.75"	SANITARY SEWER, CLEANOUT & MANHOLE
0.75"	STORM DRAIN & MANHOLE
0.75"	COMBINED SEWER & MANHOLE
0.75"	CATCH BASIN, INLET
0.75"	YARD BASIN
0.75"	STORM DRAIN & END SECTION
0.75"	POST HOOD/STOVE VALVE
0.75"	WATER SERVICE SHUTOFF, HYDRANT VALVE BOX
0.75"	MAILBOX
0.75"	POINT ELEVATION (AT X OR END OF LEADER)
0.75"	CONTOUR LINE
0.75"	FENCE
0.75"	GUARD RAIL
0.75"	STREET LIGHT
0.75"	SOB
0.75"	TREE

BENCHMARKS

SITE B/M1
ARROW ON HYDRANT ON W. SIDE OF SANCTUARY BLVD RD. 290.1 NORTH OF SOUTH PROPERTY LINE ELEV: 858.83 (NGVD25 DATUM)

SITE B/M2
ARROW ON HYDRANT ON W. SIDE OF SANCTUARY BLVD RD. AT SOUTH PROPERTY LINE ELEV: 864.18 (NGVD DATUM)

NOTE: BENCHMARK ELEVATIONS ARE BASED ON EXISTING "SANCTUARY IN THE HILLS" BENCHMARKS.

PARCEL DESCRIPTION
Lots 82, 83, 84-89; part of Lots 84, 92, 93, 99; the vacated Grant Road adjacent to the above mentioned Lots; and the vacated Dayton Road adjacent to the above mentioned Lots of "South Boulevard Gardens" according to the plat thereof recorded in Liber 5 of Plats, Page 45, Oakland County Records, more particularly described as:
Beginning at the northwest corner of vacated Dayton Road adjacent to Lot 86; thence S03°21'02"E 452.14 feet; thence N89°40'14"E 293.11 feet; thence N00°24'02"W 352.79 feet; thence S88°06'58"W 524.50 feet to the point of beginning.
Containing 4.64 acres of land, more or less.

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○	CONSTRUCTION
○	AS-BUILT

REVISIONS

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01/29/16	PER CITY/CLIENT
04/13/16	PER CITY/ASTI
06/16/16	PER MDEQ
06/30/16	PER CITY
09/06/16	ADDITIONAL TREES

SEAL

CLIENT
MACLEISH BUILDING
CORNERSTONE VILLAGE
SUITE F
650 E. BIG BEAVER ROAD
TROY, MI 48063

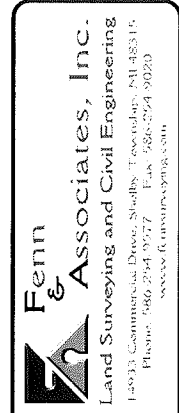
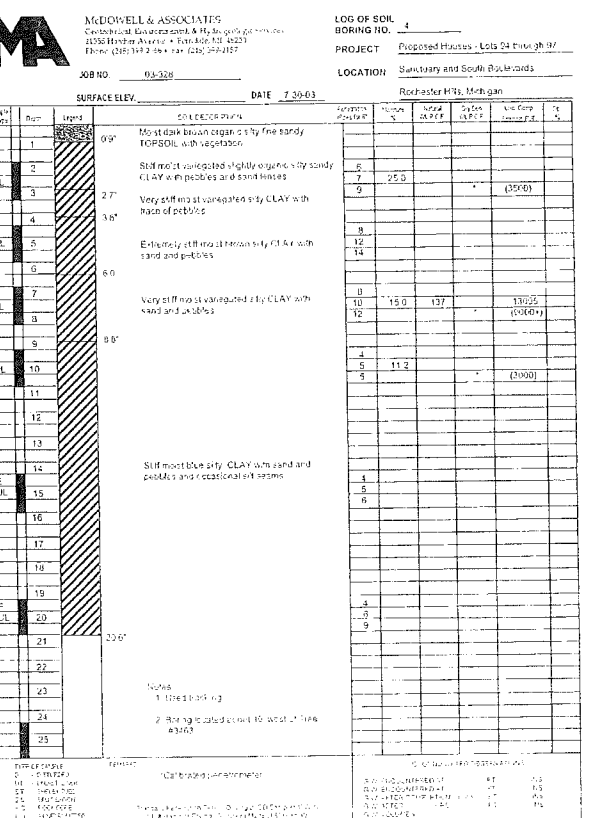
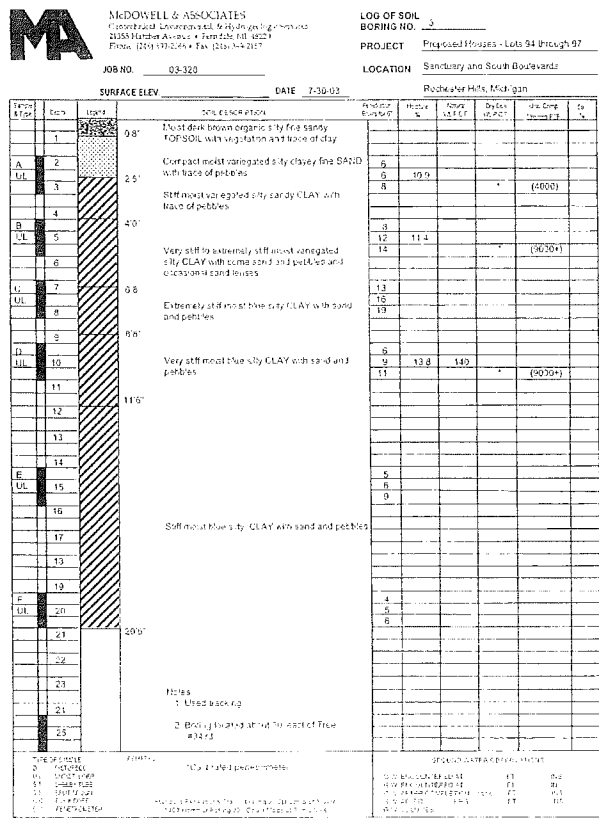
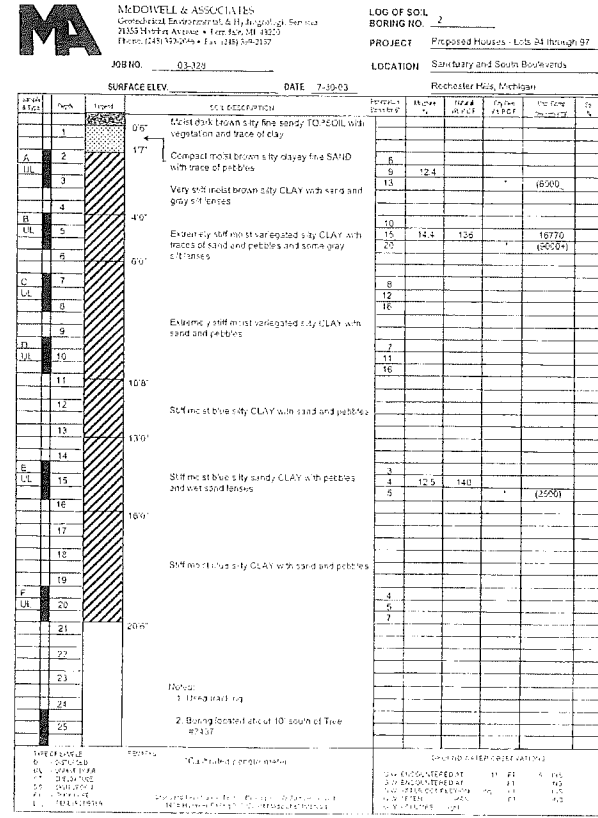
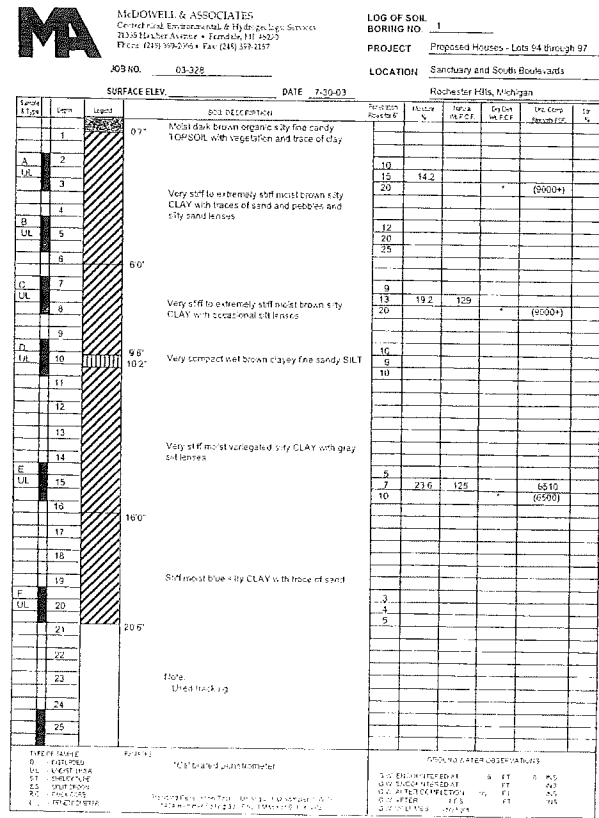
PROJECT NAME
SANCTUARY IN THE HILLS EAST

PROJECT NUMBER
C15-011

SHEET NAME
BOUNDARY AND TOPOGRAPHIC SURVEY

DRAWING SCALE: 1" = 30'
DATE: 9/3/15
PROJECT MANAGER: T.W.D.
DESIGNED BY: M.A.S.
DRAWN BY: M.A.S./J.S.P.E.
FIELD BY: A.C. B.H.
CHECKED BY: T.W.D./J.S.P.E.

SHEET NUMBER
3 OF 8



FINAL PUD PLAN
SANCTUARY IN THE HILLS EAST
 PART OF THE SE 1/4 OF SECTION 32, T3N, R11E,
 CITY OF ROCHESTER HILLS, OAKLAND COUNTY, MICHIGAN

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○	APPROVAL
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○	AS-BUILT
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06/16/16	PER UDEQ
06/30/16	PER CITY
09/06/16	ADDITIONAL TREES

SEAL

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 SUITE F
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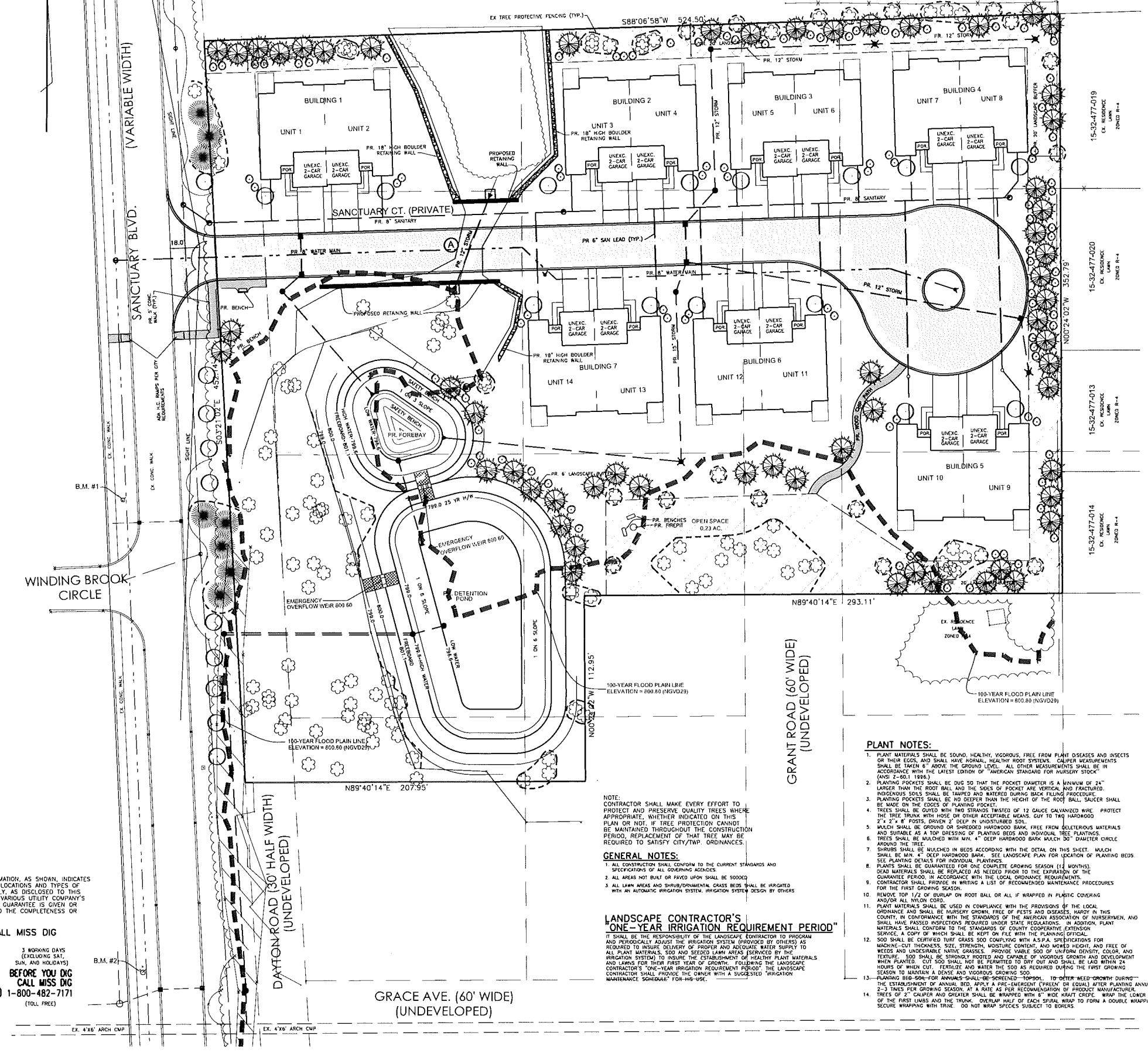
PROJECT NAME
SANCTUARY IN THE HILLS EAST

PROJECT NUMBER
C15-011.04

SHEET NAME
SOIL BORINGS

DRAWING SCALE:	N/A
DATE:	07/7/15
PROJECT MANAGER, I.W.D.	
DESIGNED BY:	MAS
DRAWN BY:	MAS/JS/P.E.
FIELD BY:	A.C. B.H.
CHECKED BY:	TWD/JSR/P.E.

Z



REQUIRED LANDSCAPING

NORTH PROPERTY LINE: 524.5' -	10 DECIDUOUS
	8 ORNAMENTAL
	21 EVERGREEN
	31 SHRUBS
EAST PROPERTY LINE: 465.7' -	9 DECIDUOUS
	7 ORNAMENTAL
	19 EVERGREEN
	28 SHRUBS
SOUTH PROPERTY LINE: 501.0' -	10 DECIDUOUS
	8 ORNAMENTAL
	20 EVERGREEN
	30 SHRUBS
SANCTUARY BLVD. R.O.W.: 452.1' -	13 DECIDUOUS
	8 ORNAMENTAL
DETENTION POND & FOREBAY: 214.0' -	3 DECIDUOUS
	2 EVERGREEN
	9 SHRUBS
TOTAL REQUIRED LANDSCAPING:	45 DECIDUOUS
	31 ORNAMENTAL
	62 EVERGREEN
	98 SHRUBS

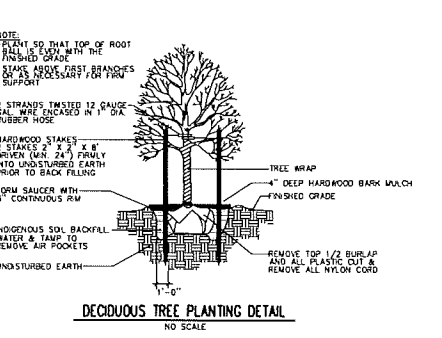
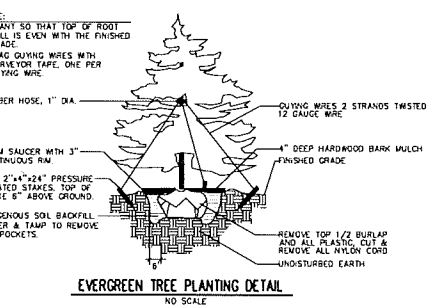
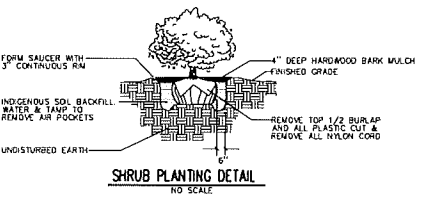
EXISTING TREES TO REMAIN

115 DECIDUOUS TREES
7 ORNAMENTAL TREES
8 EVERGREEN TREES

PLANT LIST:

NO.	COMMON NAME	BOTANICAL NAME	SIZE
24	CHANTICLEER PEAR	PYRUS CALLERYANA	2" CAL. B&B
58	WHITE SPRUCE	PICEA GLAUCA	10' HT. B&B
	WHITE PINE	PINUS STROBUS	10' HT. B&B
	NORWAY SPRUCE	PICEA ABIES	10' HT. B&B
99	BURNING BUSH	EUONYMUS ALATUS	24" SPD., 3 GAL.

EX. DECIDUOUS/ORNAMENTAL TREES TO REMAIN
EX. EVERGREEN TREES TO REMAIN



- PLANT NOTES:**
- PLANT MATERIALS SHALL BE SOUND, HEALTHY, VIGOROUS, FREE FROM PLANT DISEASES AND INSECTS ON THEIR EGGS, AND SHALL HAVE NORMAL, HEALTHY ROOT SYSTEMS. CALIPER MEASUREMENTS SHALL BE TAKEN 8" ABOVE THE GROUND LEVEL. ALL OTHER MEASUREMENTS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "AMERICAN STANDARD FOR NURSERY STOCK" (ANSI Z-60.1 1998).
 - PLANTING POCKETS SHALL BE DUG SO THAT THE POCKET DIAMETER IS A MINIMUM OF 24" LARGER THAN THE ROOT BALL AND THE SIDES OF POKETS ARE VERTICAL AND FRACTURED. INDIGENOUS SOILS SHALL BE TAMPED AND WATERED DURING BACK FILLING PROCEDURE.
 - PLANTING POCKETS SHALL BE NO DEEPER THAN THE HEIGHT OF THE ROOT BALL. SAUCER SHALL BE MADE ON THE EDGES OF PLANTING POCKET.
 - TREES SHALL BE GUIDED WITH TWO STRAINS TWISTED OF 12 GAUGE GALVANIZED WIRE. PROTECT THE TREE TRUNK WITH HOSE OR OTHER ACCEPTABLE MEANS. CUT TO TWO HARDWOOD 2" x 2" x 8' POSTS, DRIVEN 2' DEEP IN UNDISTURBED SOIL.
 - MULCH SHALL BE GROUND OR SHREDDED HARDWOOD BARK, FREE FROM DELICIOUS MATERIALS AND SUITABLE AS A TOP DRESSING OF PLANTING BEDS AND INDIVIDUAL TREE PLANTINGS.
 - TREES SHALL BE MULCHED WITH MIN. 4" DEEP HARDWOOD BARK MULCH 30" DIAMETER CIRCLE AROUND THE TREE.
 - SHRUBS SHALL BE MULCHED IN BEDS ACCORDING WITH THE DETAIL ON THIS SHEET. MULCH SHALL BE MIN. 4" DEEP HARDWOOD BARK. SEE LANDSCAPE PLAN FOR LOCATION OF PLANTING BEDS. SEE PLANTING DETAILS FOR INDIVIDUAL PLANTINGS.
 - PLANTS SHALL BE GUARANTEED FOR ONE COMPLETE GROWING SEASON (12 MONTHS). DEAD MATERIALS SHALL BE REPLACED AS NEEDED PRIOR TO THE EXPIRATION OF THE GUARANTEE PERIOD. IN ACCORDANCE WITH THE LOCAL ORDINANCE REQUIREMENTS.
 - CONTRACTOR SHALL PROVIDE IN WRITING A LIST OF RECOMMENDED MAINTENANCE PROCEDURES FOR THE FIRST GROWING SEASON.
 - REMOVE TOP 1/2 OF BURLAP ON ROOT BALL OR ALL IF WRAPPED IN PLASTIC COVERING AND/OR ALL NYLON CORD.
 - PLANT MATERIALS SHALL BE USED IN COMPLIANCE WITH THE PROVISIONS OF THE LOCAL ORDINANCE AND SHALL BE NURSERY GROWN, FREE OF PESTS AND DISEASES, HARDY IN THIS COUNTY, IN CONFORMANCE WITH THE STANDARDS OF THE AMERICAN ASSOCIATION OF NURSERMEN, AND SHALL HAVE PASSED INSPECTIONS REQUIRED UNDER STATE REGULATIONS. IN ADDITION, PLANT MATERIALS SHALL CONFORM TO THE STANDARDS OF COUNTY COOPERATIVE EXTENSION SERVICE. A COPY OF WHICH SHALL BE KEPT ON FILE WITH THE PLANNING OFFICIAL.
 - SOIL SHALL BE CERTIFIED TURF GRASS SOIL COMPLYING WITH A.S.P.A. SPECIFICATIONS FOR MACHIE-CUT THICKNESS, SIZE, STRENGTH, MOISTURE CONTENT, AND MOVED HEIGHT, AND FREE OF WEEDS AND UNDESIRABLE NATIVE GRASSES. PROVIDE VISIBLE SOIL OF UNIFORM DENSITY, COLOR, AND TEXTURE. SOIL SHALL BE STRONGLY ROOTED AND CAPABLE OF VIGOROUS GROWTH AND DEVELOPMENT WHEN PLANTED. CUT SOIL SHALL NOT BE PERMITTED TO DRY OUT AND SHALL BE LAID WITHIN 24 HOURS OF WHEN CUT. FERTILIZE AND WATER THE SOIL AS REQUIRED DURING THE FIRST GROWING SEASON TO MAINTAIN A DENSE AND VIGOROUS GROWING SOIL.
 - PLANNING DEPT. SHALL BE NOTIFIED PRIOR TO THE ESTABLISHMENT OF ANNUAL BED. APPLY A PRE-EMERGENT (FRESH OR EQUAL) AFTER PLANTING ANNUALS, 2-3 TIMES PER GROWING SEASON, AT A RATE AS PER RECOMMENDATION OF PRODUCT MANUFACTURER.
 - TREES OF 2" CALIPER AND GREATER SHALL BE WRAPPED WITH E-WIDE WHIT CREPE. WRAP THE LOWER PARTS OF THE FIRST LIMBS AND THE TRUNK. OVERLAP HALF OF EACH SPIRAL WRAP TO FORM A DOUBLE WRAPPING. SECURE WRAPPING WITH TRAPE. DO NOT WRAP SPECIES SUBJECT TO BOLETS.

GENERAL NOTES:

- ALL CONSTRUCTION SHALL CONFORM TO THE CURRENT STANDARDS AND SPECIFICATIONS OF ALL GOVERNING AGENCIES.
- ALL AREAS NOT BUILT OR PAVED UPON SHALL BE SOODED.
- ALL LAWN AREAS AND SHRUB/ORNAMENTAL GRASS BEDS SHALL BE IRRIGATED WITH AN AUTOMATIC IRRIGATION SYSTEM. IRRIGATION SYSTEM DESIGN BY OTHERS.

LANDSCAPE CONTRACTOR'S ONE-YEAR IRRIGATION REQUIREMENT PERIOD*

IT SHALL BE THE RESPONSIBILITY OF THE LANDSCAPE CONTRACTOR TO PROGRAM AND PERIODICALLY ADJUST THE IRRIGATION SYSTEM (PROVIDED BY OTHERS) AS REQUIRED TO INSURE DELIVERY OF PROPER AND ADEQUATE WATER SUPPLY TO ALL PLANT MATERIALS, SOIL AND SEEDED LAWN AREAS (SERVICED BY THE IRRIGATION SYSTEM) TO INSURE THE ESTABLISHMENT OF HEALTHY PLANT MATERIALS AND LAWNS FOR THEIR FIRST YEAR OF GROWTH. FOLLOWING THE LANDSCAPE CONTRACTOR'S ONE-YEAR IRRIGATION REQUIREMENT PERIOD, THE LANDSCAPE CONTRACTOR SHALL PROVIDE THE OWNER WITH A SUGGESTED IRRIGATION MAINTENANCE SCHEDULE FOR HIS USE.

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MACLEISH BUILDING
CORNERSTONE VILLAGE
SUITE F
650 E. BIG BEAVER ROAD
TROY, MI 48063

PROJECT NAME
SANCTUARY IN THE HILLS
EAST

PROJECT NUMBER
C15-011.04

SHEET NAME
LANDSCAPE
PLAN

DRAWING SCALE: 1" = 30'

DATE: 7/2/15

PROJECT MANAGER: T.W.D.

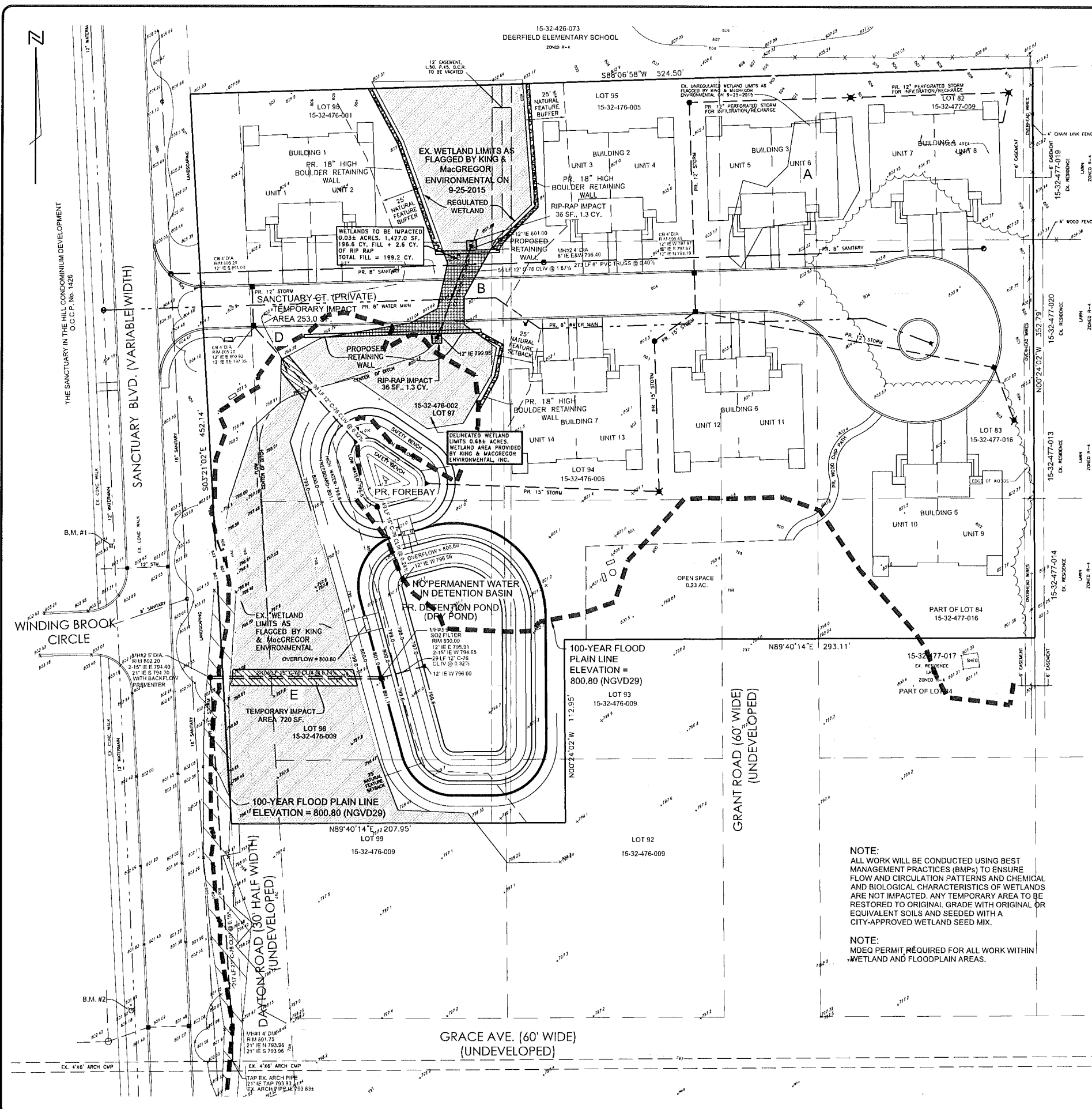
DESIGNED BY: MAS

DRAWN BY: J.J.S. P.E.

FIELD BY: A.C. B.H.

CHECKED BY: T.W.D./S.R. P.E.

SHEET NUMBER
6 OF 8

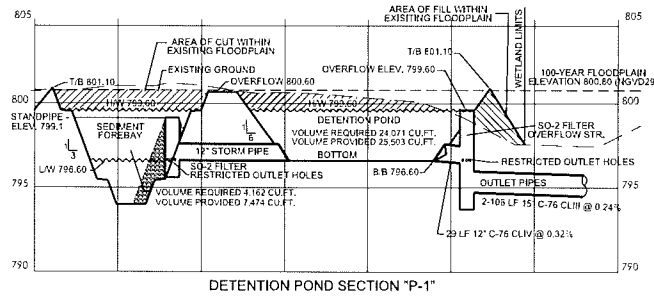
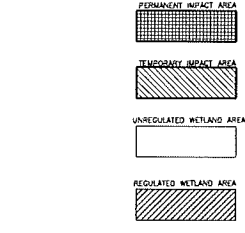


PARCEL DESCRIPTION
 Lots 82, 83, 94-98; part of Lots 84, 92, 93, 99; the vacated Grant Road adjacent to the above mentioned Lots; and the vacated Dayton Road adjacent to the above mentioned Lots of "South Boulevard Gardens" according to the plat thereof recorded in Liber 5 of Plats, Page 45, Oakland County Records, more particularly described as:
 Beginning at the northwest corner of vacated Dayton Road adjacent to Lot 98; thence S03°21'02"E 452.14 feet; thence N89°40'14"E 207.95 feet; thence N00°24'02"W 112.95 feet; thence N89°40'14"E 293.11 feet; thence N00°24'02"W 352.79 feet; thence S89°06'58"W 524.50 feet to the point of beginning.
 Containing 4.64 acres of land, more or less.

SITE DATA
 CURRENT ZONING: R-4
 PROPOSED ZONING: P.U.D.
 PID: 15-32-476-001
 PID: 15-32-476-002
 PID: 15-32-476-006
 PID: 15-32-476-009
 PID: 15-32-477-016
 PID: 15-32-477-009

TOTAL REGULATED WETLAND AREA	29919 SF	0.68 AC
UNREGULATED WETLAND AREA	3704 SF	0.09 AC
TOTAL	33623 SF	0.77 AC
PERMANENT WETLAND IMPACT AREA	1827 SF	0.04 AC
TOTAL	1827 SF	0.04 AC
TEMPORARY WETLAND IMPACT AREA	254 SF	
TOTAL TEMPORARY IMPACT	254 SF	0.01 AC
COMBINED TOTAL	2080 SF	0.05 AC
TOTAL WETLAND USABLE IMPACT AREA	27819 SF	0.63 AC

100-YEAR FLOOD PLAIN LINE
 ELEVATION = 800.80 (NGVD83)
 (NOW REGULATED)

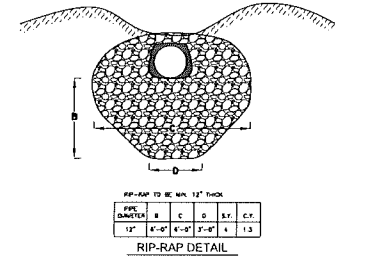
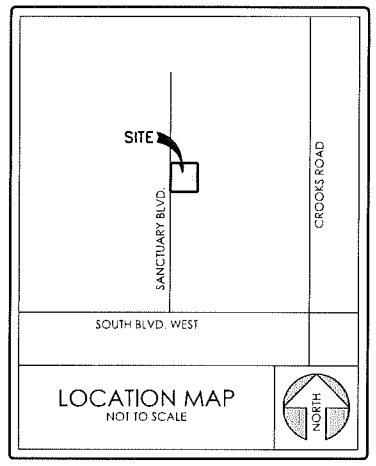


NOTE:
 ALL WORK WILL BE CONDUCTED USING BEST MANAGEMENT PRACTICES (BMPs) TO ENSURE FLOW AND CIRCULATION PATTERNS AND CHEMICAL AND BIOLOGICAL CHARACTERISTICS OF WETLANDS ARE NOT IMPACTED. ANY TEMPORARY AREA TO BE RESTORED TO ORIGINAL GRADE WITH ORIGINAL OR EQUIVALENT SOILS AND SEEDED WITH A CITY-APPROVED WETLAND SEED MIX.

NOTE:
 MDEQ PERMIT REQUIRED FOR ALL WORK WITHIN WETLAND AND FLOODPLAIN AREAS.

BENCHMARKS
 SITE BM#1
 ARROW ON HYDRANT ON W. SIDE OF SANCTUARY BLVD RD. 280'4" NORTH OF SOUTH PROPERTY LINE ELEV: 805.83 (NGVD29 DATUM)
 SITE BM#2
 ARROW ON HYDRANT ON W. SIDE OF SANCTUARY BLVD RD. AT SOUTH PROPERTY LINE ELEV: 804.18 (NGVD DATUM)

NOTE: BENCHMARK ELEVATIONS ARE BASED ON EXISTING "SANCTUARY IN THE HILLS" BENCHMARKS.



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 Land Surveying and Civil Engineering
 10023 Commercial Drive, Shelby Township, MI 48315
 Phone: 588-254-9577 Fax: 588-254-9020
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FINAL PUD PLAN
SANCTUARY IN THE HILLS EAST
 PART OF THE SE 1/4 OF SECTION 32, T3N, R11E,
 CITY OF ROCHESTER HILLS, OAKLAND COUNTY, MICHIGAN

DISTRIBUTION

●	PRELIMINARY
○	APPROVAL
○	CONSTRUCTION
○	AS-BUILT

REVISIONS

DATE	REMARKS
08/26/15	PER ASTI
01/26/16	PER TWP/CITY
04/13/16	PER CITY/ASTI
06/16/16	PER MDEQ
06/30/16	PER CITY
08/06/16	ADDITIONAL TREES

SEAL

CLIENT
 MACLEISH BUILDING
 CORNERSTONE VILLAGE
 SUITE F
 650 E. BIG BEAVER ROAD
 TROY, MI 48063

PROJECT NAME
SANCTUARY IN THE HILLS EAST

PROJECT NUMBER
C15-011.08X

SHEET NAME
WETLAND IMPACT PLAN

DRAWING SCALE: 1" = 30'

DATE: 2/10/16

PROJECT MANAGER: T.W.D.

DESIGNED BY: MAS

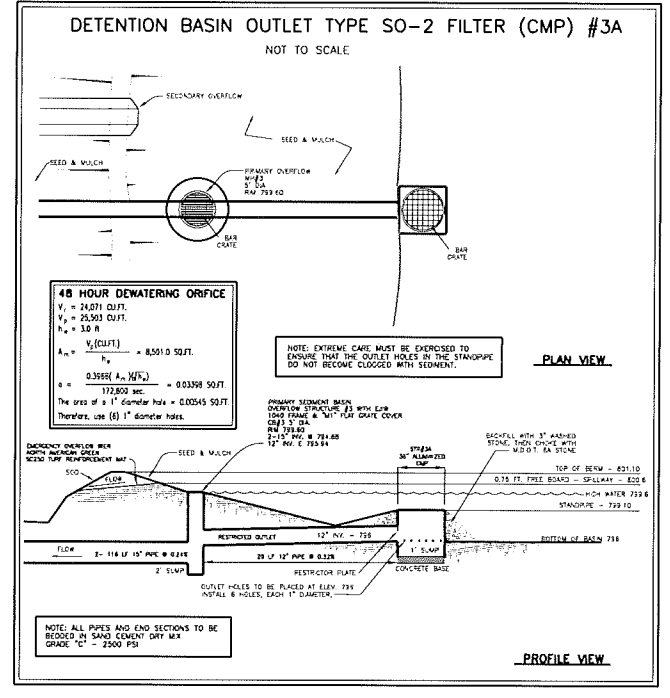
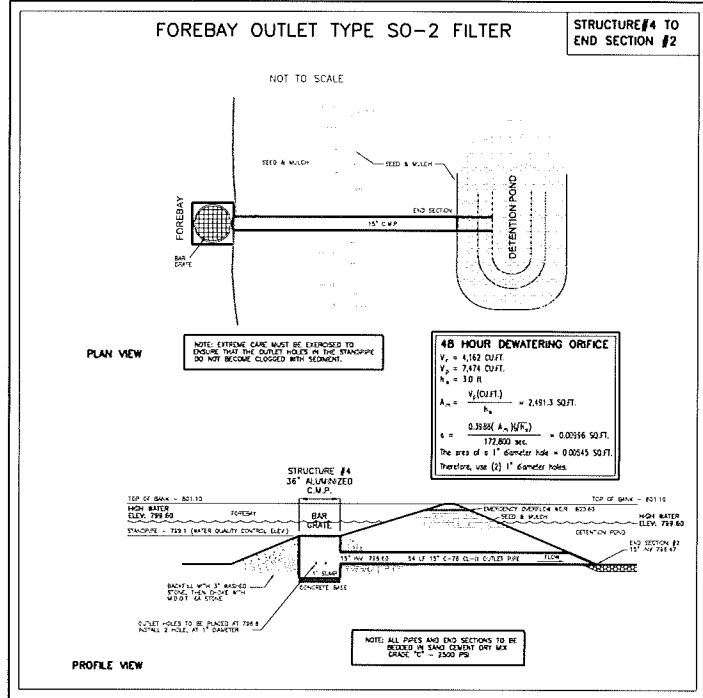
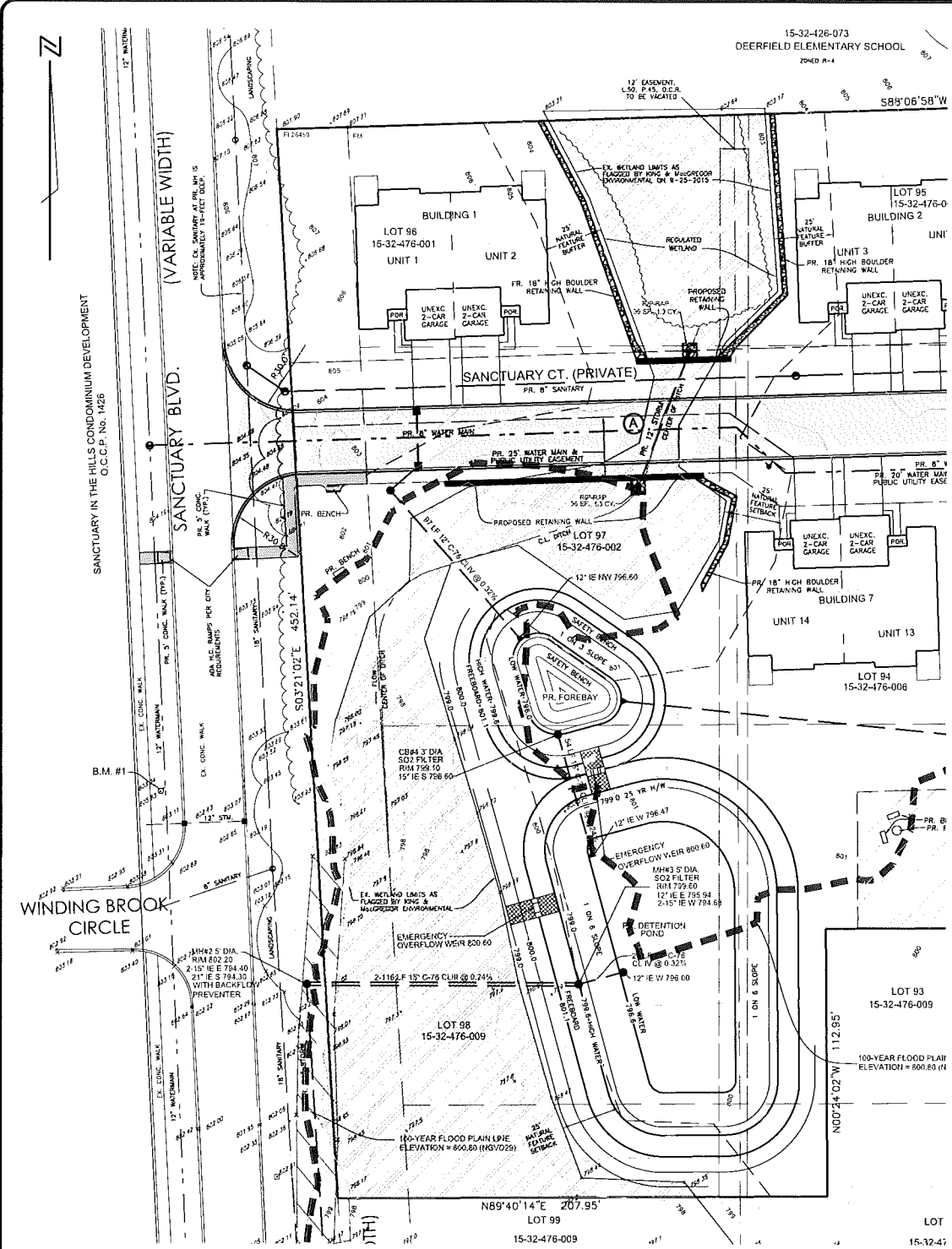
DRAWN BY: MAS/J.S.P.E.

FIELD BY: A.C.B.H.

CHECKED BY: TWD/J.S.P.E.

SHEET NUMBER
7 OF 8





FOREBAY DETENTION CALCULATION 1 YEAR STORM PER OAKLAND COUNTY STANDARDS

ALLOWABLE DISCHARGE	C1 = 0.20 CFS/ACRE
AREA	A = 4.64 ACRES
RUNOFF COEFF	C = 0.45
TOTAL ALLOWABLE DISCHARGE	QA = C1 x A = 0.93 CFS
ALLOWABLE OUTFLOW	Q0 = QA / (A x C) = 0.44 CFS/ACRE
PEAK STORAGE TIME	T = 25 + (SQRT(1032.5 / Q0)) = 52.94 MINUTES
MAX. STORAGE VOLUME/ACRE	VS = (4320 x T) / (T + 25) = (40 x Q0 x T) = 1993.16 CU.FT./ACRE
TOTAL STORAGE REQUIRED	VT = VS x A x C = 4161.72 CU.FT.
STORAGE HEIGHT PROVIDED	H = 3.0 FEET
TOP AREA OF BASIN	AREA OF CONTOUR 799.6 A1 = 3874.4 SQ.FT.
AREA OF CONTOUR 796.6	A2 = 1329.8 SQ.FT.
TOTAL STORAGE VOLUME PROVIDED	V = ((A1 + A2 + SQRT(A1 x A2)) x H) / 3 = 7474.0 CU.FT.
AREA OF ORIFICE	AR = C1 x A / (0.62 x SQRT(2 x 32.2 x H)) = 0.11 SQ.FT.
DIAMETER OF OUTLET	D = 2 x SQRT(AR / PI) = 4.44 INCHES

DETENTION POND DETENTION CALCULATION 100 YEAR STORM PER OAKLAND COUNTY STANDARDS

ALLOWABLE DISCHARGE	C1 = 0.20 CFS/ACRE
AREA	A = 4.64 ACRES
RUNOFF COEFF	C = 0.45
TOTAL ALLOWABLE DISCHARGE	QA = C1 x A = 0.93 CFS
ALLOWABLE OUTFLOW	Q0 = QA / (A x C) = 0.44 CFS/ACRE
PEAK STORAGE TIME	T = 25 + (SQRT(1032.5 / Q0)) = 52.94 MINUTES
MAX. STORAGE VOLUME/ACRE	VS = (16500 x T) / (T + 25) = (40 x Q0 x T) = 11528.42 CU.FT./ACRE
TOTAL STORAGE REQUIRED	VT = VS x A x C = 24071.31 CU.FT.
STORAGE HEIGHT PROVIDED	H = 3.0 FEET
TOP AREA OF BASIN	AREA OF CONTOUR 799.6 A1 = 11974.6 SQ.FT.
AREA OF CONTOUR 796.6	A2 = 5449.9 SQ.FT.
TOTAL STORAGE VOLUME PROVIDED	V = ((A1 + A2 + SQRT(A1 x A2)) x H) / 3 = 25502.9 CU.FT.
AREA OF ORIFICE	AR = C1 x A / (0.62 x SQRT(2 x 32.2 x H)) = 0.11 SQ.FT.
DIAMETER OF OUTLET	D = 2 x SQRT(AR / PI) = 4.44 INCHES

WEIGHTED "C" VALUE

TOTAL AREA OF SITE = 4.64 AC = 202,109 SF
 AREA OF BUILDINGS AND PAVEMENT = 57,241 SF C = 0.95
 AREA OF LAWN = 144,868 SF C = 0.25

$C_{WTD} = \frac{57,241}{202,109} (0.95) + \frac{144,868}{202,109} (0.25) = 0.4483$

USE C = 0.45

OVERFLOW STRUCTURE #3 GRATE COVER CALCULATIONS ASSUMING 6" OF WATER (FREEBOARD) OVER COVER USE (EJHW 1040 TYPE A1) FLAT COVER)

$A = \frac{Q}{0.108A \sqrt{d}}$
 $Q = 6.14 CFS$
 $d = 9 INCHES$
 $A = \frac{6.14 CFS}{0.108 \sqrt{9}} = 6.14 CFS = 189.5 in^2$

$Q_2 = 6.14 C.F.S. (CAPACITY OF 21" PIPE)$

25 YEAR STORM EMERGENCY OVERFLOW CALCULATIONS (FOREBAY) SEDIMENT BASIN

Calculation of Flow Rate Over a Rectangular Weir (Sharp-crested, Contracted)

Inputs	Calculations
Height of weir crest above channel invert, P = 3.5 ft	(B - L)/4H = 1.00
Width of channel, B = 8 ft	(B - L)/4H ≥ 1? yes
Length of weir, L = 4 ft	P/2H = 1.75
Measured head over the weir, H = 1 ft	P/2H ≥ 1? yes
	H/L = 0.25
	H/L ≤ 0.33? yes
	H/L ≤ 0.33? yes

If all three answers are yes, flow is fully contracted.

$Q = 3.33(L - 0.2H)(H^{3/2})$

Flow Rate, Q = 12.65 cfs

100 YEAR STORM EMERGENCY OVERFLOW CALCULATIONS DETENTION BASIN

Calculation of Flow Rate Over a Rectangular Weir (Sharp-crested, Contracted)

Inputs	Calculations
Height of weir crest above channel invert, P = 3.5 ft	(B - L)/4H = 1.00
Width of channel, B = 8 ft	(B - L)/4H ≥ 1? yes
Length of weir, L = 4 ft	P/2H = 1.75
Measured head over the weir, H = 1 ft	P/2H ≥ 1? yes
	H/L = 0.25
	H/L ≤ 0.33? yes
	H/L ≤ 0.33? yes

If all three answers are yes, flow is fully contracted.

$Q = 3.33(L - 0.2H)(H^{3/2})$

Flow Rate, Q = 12.65 cfs

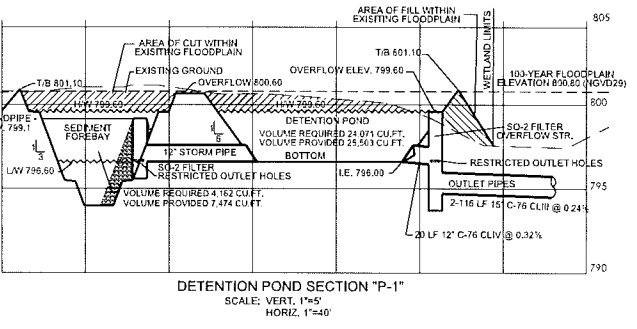
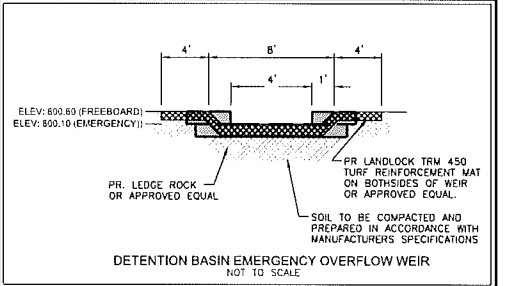
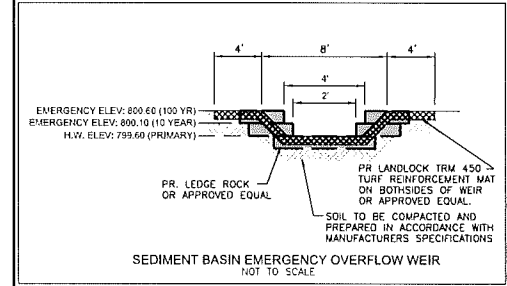
POND OVERFLOW CAPACITY CALCULATIONS 100-YEAR STORM (EMERGENCY)

REQUIRED FLOW - 100 YEAR STORM
 RUNOFF COEFF (C) = 0.45
 INTENSITY (I) = 5.80 in/hr
 AREA (A) = 4.64 AC.
 $Q_2 = CIA = 12.11 C.F.S.$

SEDIMENT BASIN OVERFLOW CALCULATIONS 25-YEAR STORM (EMERGENCY)

REQUIRED FLOW - 25 YEAR STORM
 RUNOFF COEFF (C) = 0.45
 INTENSITY (I) = 4.76 in/hr
 AREA (A) = 4.64 AC.
 $Q_2 = CIA = 9.94 C.F.S.$

NOTE:
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DETENTION BASIN DETENTION CALCULATION 25 YEAR STORM PER OAKLAND COUNTY STANDARDS

ALLOWABLE DISCHARGE	C1 = 0.20 CFS/ACRE
TIME INITIAL	20.00 MINUTES
AREA	A = 4.64 ACRES
RUNOFF COEFF	C = 0.45
TOTAL ALLOWABLE DISCHARGE	QA = C1 x A = 0.93 CFS
ALLOWABLE OUTFLOW	Q0 = QA / (A x C) = 0.44 CFS/ACRE
PEAK STORAGE TIME	T = 25 + (SQRT(8062.5 / Q0)) = 109.89 MINUTES
MAX. STORAGE VOLUME/ACRE	VS = (12900 x T) / (T + 25) = (40 x Q0 x T) = 8555.57 CU.FT./ACRE
TOTAL STORAGE REQUIRED	VT = VS x A x C = 17884.03 CU.FT.
STORAGE HEIGHT PROVIDED	H = 2.4 FEET
TOP AREA OF BASIN	AREA OF CONTOUR ELEV. 799.0 A1 = 10506.8 SQ.FT.
AREA OF CONTOUR ELEV. 796.6	A2 = 5449.9 SQ.FT.
TOTAL STORAGE VOLUME PROVIDED	V = ((A1 + A2 + SQRT(A1 x A2)) x H) / 3 = 18819.0 CU.FT.
AREA OF ORIFICE	AR = C1 x A / (0.62 x SQRT(2 x 32.2 x H)) = 0.12 SQ.FT.
DIAMETER OF OUTLET	D = 2 x SQRT(AR / PI) = 4.70 INCHES

NOTE: UTILITY INFORMATION, AS SHOWN, INDICATES APPROXIMATE LOCATIONS AND TYPES OF FACILITIES ONLY. AS DISCLOSED TO THIS FIRM BY THE VARIOUS UTILITY COMPANY'S RECORDS, NO GUARANTEE IS GIVEN OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY.

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FINAL P.U.D. PLANS

SANCTUARY IN THE HILLS EAST
 PART OF THE SE 1/4 OF SECTION 32, T3N, R11E,
 CITY OF ROCHESTER HILLS, OAKLAND COUNTY, MICHIGAN

DISTRIBUTION

PRELIMINARY	APPROVAL
CONSTRUCTION	AS-BUILT

REVISIONS

DATE	REMARKS
08/06/15	PER ASTI
01/23/16	PER CITY/CIANT
04/13/16	PER CITY/ASTI
06/16/16	PER VIDEO
06/30/16	PER CITY
09/06/16	ADDITIONAL TREES

SEAL

CLIENT
 MACLEISH BUILDING
 CORNERSTONE VILLAGE
 SUITE F
 650 E. BIG BEAVER ROAD
 TROY, MI 48063

PROJECT NAME
 SANCTUARY IN THE HILLS
 EAST

PROJECT NUMBER
 C15-011.04

SHEET NAME
 DETENTION BASIN
 CALCULATIONS
 & DETAILS

DRAWING SCALE: 1" = 30'

DATE: 7/7/15

PROJECT MANAGER: T.V.D.

DESIGNED BY: MAS

DRAWN BY: MAS/J.S.P.E.

FIELD BY: A.C.B.H.

CHECKED BY: TWO/J.S.P.E.

SHEET NUMBER
 8 OF 8

89-114.2