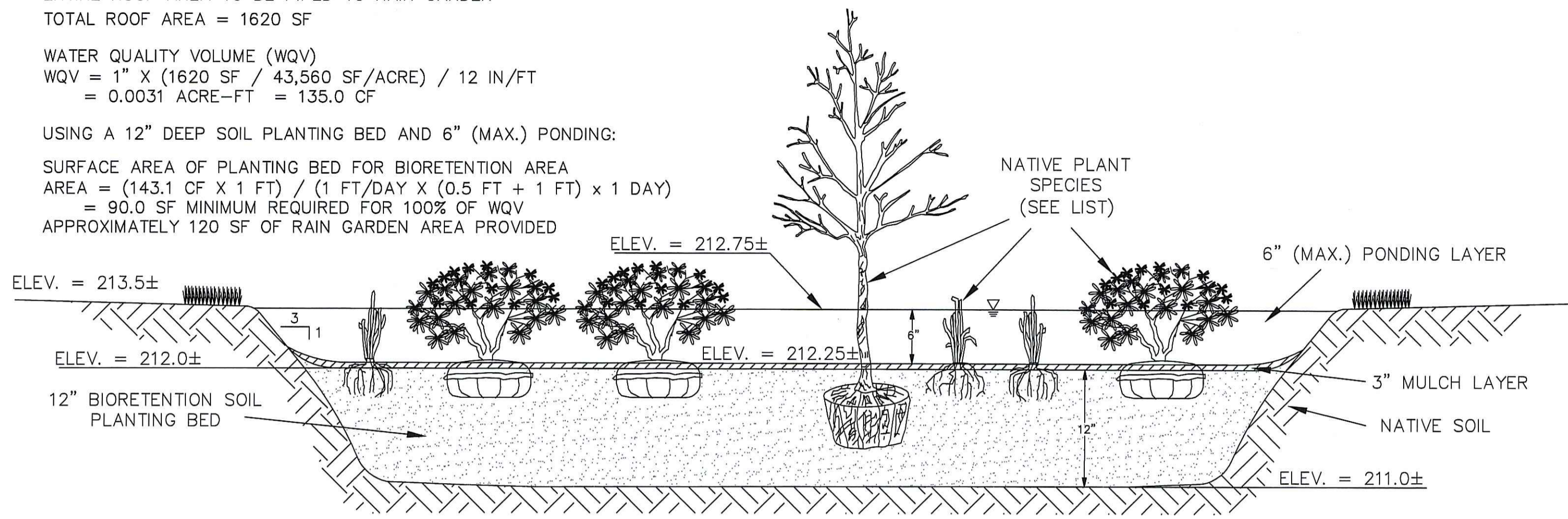


RAIN GARDEN DESIGN CALCULATIONS

ENTIRE ROOF AREA TO BE PIPED TO RAIN GARDEN
 TOTAL ROOF AREA = 1620 SF
 WATER QUALITY VOLUME (WQV)
 WQV = 1" X (1620 SF / 43,560 SF/ACRE) / 12 IN/FT
 = 0.0031 ACRE-FT = 135.0 CF

USING A 12" DEEP SOIL PLANTING BED AND 6" (MAX.) PONDING:
 SURFACE AREA OF PLANTING BED FOR BIORETENTION AREA
 AREA = (143.1 CF X 1 FT) / (1 FT/DAY X (0.5 FT + 1 FT) X 1 DAY)
 = 90.0 SF MINIMUM REQUIRED FOR 100% OF WQV
 APPROXIMATELY 120 SF OF RAIN GARDEN AREA PROVIDED



RAIN GARDEN/BIORETENTION AREA - TYPICAL CROSS-SECTION
 NOT TO SCALE

BIORETENTION SOIL

BIORETENTION SOIL SHOULD BE A UNIFORM MIX FREE OF STONES, STUMPS, ROOTS OR OTHER OBJECTS LARGER THAN 2" AND SHALL CONSIST OF USDA LOAMY SAND TO SANDY LOAM CLASSIFICATION AND MEET THE FOLLOWING GRADATION: SAND (85-88%), SILT (8-12%), CLAY (0-2%), AND ORGANIC MATTER IN THE FORM OF LEAF COMPOST (3-5%). THE BIORETENTION SOIL SHALL BE MIXED SO THAT A COEFFICIENT OF PERMEABILITY OF 1.0 FT/DAY IS ACHIEVED. SINCE THE SOIL PLANTING BED DEPTH IS 12", RATHER THAN THE RECOMMENDED 24-48", 20% BY VOLUME OF WELL AGED (6-12 MONTHS), WELL AERATED LEAF COMPOST (OR EQUIVALENT) SHALL BE ADDED TO THE BIORETENTION SOIL MIXTURE. FOR A 110 SF X 12" DEEP BIORETENTION AREA, THIS AMOUNTS TO 22 CF OF LEAF COMPOST. A TEXTURAL ANALYSIS IS REQUIRED TO ENSURE THAT THE BIORETENTION SOIL MEETS THE ABOVE CRITERIA.

THE BIORETENTION SOIL SHALL ALSO BE TESTED (MINIMUM 1 TEST PER BIORETENTION AREA BY SAME TESTING FACILITY) FOR pH, MAGNESIUM, PHOSPHORUS, POTASSIUM AND SOLUBLE SALTS TO MEET THE FOLLOWING CRITERIA:

pH RANGE	5.2 - 7.0
MAGNESIUM	NOT TO EXCEED 32 PPM
PHOSPHORUS OXIDE	NOT TO EXCEED 69 PPM
POTASSIUM OXIDE	NOT TO EXCEED 78 PPM
SOLUBLE SALTS	NOT TO EXCEED 500 PPM

IF THE pH DOES NOT TEST WITHIN THE ACCEPTABLE RANGE, LIME OR IRON SULFATE PLUS SULFUR MAY BE ADDED TO RAISE OR LOWER THE pH OF THE BIORETENTION SOIL, RESPECTIVELY.

MULCH

THE MULCH LAYER SHALL CONSIST OF WELL AGED (6-12 MONTHS) SHREDDED HARDWOOD THAT IS UNIFORM IN COLOR AND FREE OF OTHER MATERIALS (SUCH AS WEED SEEDS, SOIL, ROOTS, ETC.). GRASS CLIPPINGS SHOULD NOT BE USED AS MULCH MATERIAL. THE MAXIMUM DEPTH OF THE MULCH LAYER SHALL BE 3 INCHES.

COMPACTION

TO MINIMIZE COMPACTION OF THE BIORETENTION AREA AND REQUIRED BACKFILL, EXCAVATION HOES SHOULD BE USED TO REMOVE NATIVE SOIL. IF A LOADER IS USED TO EXCAVATE THE BIORETENTION AREA, WIDE TRACK OR MARSH TRACK EQUIPMENT SHALL BE USED. CHISEL PLOWS, RIPPER OR SUBSOILERS MAY BE USED AS TILLING OPERATIONS TO ALLEVIATE ANY COMPACTION THAT MAY OCCUR AT THE BASE OF THE BIORETENTION AREA.

WHEN BACKFILLING THE BIORETENTION AREA, SOIL IS TO BE PLACED IN LIFTS OF 12" OR MORE. HEAVY EQUIPMENT SHOULD NOT BE USED TO BACKFILL THE BIORETENTION AREA. GRADING OF BIORETENTION MATERIALS MAY BE PERFORMED WITH LIGHT EQUIPMENT SUCH AS COMPACT LOADERS OR A DOZER/LOADER WITH MARSH TRACKS.

BIORETENTION AREA PLANTING

- LAYOUT PLANTS IN THE DESIRED PATTERN KEEPING THEM IN CONTAINERS UNTIL PLANTING.
- DIG HOLE APPROXIMATELY SIX INCHES LARGER THAN THE DIAMETER OF THE PLANTING BALL AND DEEP ENOUGH FOR 1/8 OF THE PLANT ROOT BALL TO BE ABOVE FINAL GRADE AFTER PLANTING. TAMP LIGHTLY AROUND ROOTS TO ELIMINATE AIR VOIDS.
- TREES SHOULD BE BRACED WITH 2" X 2" WOODEN STAKES, SPACED EQUALLY AROUND TREE BALL, AS NECESSARY. STAKES ARE TO BE USED THROUGH THE FIRST GROWING SEASON ONLY.
- GRASSES AND LEGUME SEED SHALL BE TILLED INTO THE SOIL TO A DEPTH OF AT LEAST 1". GRASS AND LEGUME PLUGS SHOULD BE PLANTED FOLLOWING NOTE 2 ABOVE.
- PLACE 3" OF MULCH, EVENLY SPREAD, OVER PLANTED AREA TAKING CARE NOT TO BURY THE CROWN OF THE NEW PLANTS.
- LABEL PLANT GROUPS TO HELP IDENTIFY WEEDS DURING MAINTENANCE OF THE VEGETATED AREA.
- WATER IMMEDIATELY AFTER PLANTING. CONTINUE TO WATER UNTIL PLANTS ARE ESTABLISHED. PLANTS NEED APPROXIMATELY 1" OF WATER PER WEEK. MONITOR RAINFALL AND SUPPLEMENT WITH MANUAL WATERING AS NEEDED. ONCE ESTABLISHED, THE BIORETENTION AREA WILL NORMALLY NOT REQUIRE MANUAL WATERING. FERTILIZER IS NOT TO BE USED AS THE BIORETENTION SOIL WILL PROVIDE ENOUGH ORGANIC MATERIAL TO SUPPLY NUTRIENTS TO THE PLANTS.
- GENERALLY, PLANTING SHOULD BE CONDUCTED IN EARLY SPRING OR FALL, HOWEVER PLANTING MAY OCCUR ANYTIME DURING THE GROWING SEASON AS LONG AS THE PLANTS ARE PROVIDED SUFFICIENT WATERING.

BIORETENTION AREA MAINTENANCE

- REMOVE WEEDS (BY HAND) FOR THE FIRST TWO GROWING SEASONS OR UNTIL VEGETATION IS WELL ESTABLISHED. CONTINUE TO REMOVE ISOLATED WEED PATCHES AS NEEDED.
- LEAVE STEMS AND SEED HEADS THROUGH WINTER AS A FOOD SOURCE FOR BIRDS AND COVER FOR WILDLIFE.
- CUT BACK PLANTS IN SPRING TIME AFTER NEW GROWTH REACHES 4-6". REMOVE DEAD PLANT MATERIAL AND COMPOST IF DESIRED.
- BIORETENTION AREA SHOULD BE INSPECTED FREQUENTLY UNTIL PLANTS ARE ESTABLISHED. PLANTS THAT DO NOT SURVIVE SHOULD BE REPLACED.
- BIORETENTION AREA SHOULD BE RE-MULCHED ANNUALLY.

SOIL STABILIZATION & PLANTING PROGRAM

ACCEPTABLE PLANTING MATERIALS:
 LOAM - THE MATERIAL TO BE FURNISHED SHALL CONSIST OF LOOSE, FRIABLE, SANDY LOAM OR LOAM TOPSOIL FREE OF A MIXTURE OF SUBSOIL, REFUSE, STUMPS, ROOTS, ROCKS, BRUSH, WEEDS AND OTHER MATERIAL WHICH WILL PREVENT THE FORMATION OF A SUITABLE SEED BED.

SEED MIXTURES - ALL LEGUME SEED SHALL BE INOCULATED WITHIN 24 HOURS BEFORE MIXING AND PLANTING WITH THE APPROPRIATE INOCULUM FOR EACH VARIETY. ALL INOCULA SHALL BE FRESH AND SHALL BE USED WITHIN THE DATE LIMIT PRESCRIBED BY THE MANUFACTURER.

FOR RELATIVELY FLAT SLOPES:

MIX	% BY WEIGHT
RED FESCUE - CHEWING'S PENNLAWN OR CREEPING	70
KENTUCKY BLUEGRASS	15
COLONIAL BENTGRASS - ASTORIA OR EXETER	5
PERENNIAL RYEGRASS	10

- SEEDING RATE = 100 LBS. PER ACRE FOR STEEP SLOPES 3:1 OR GREATER

MIX	% BY WEIGHT
RED FESCUE - PENNLAWN OR CREEPING	75
PERENNIAL RYEGRASS	5
COLONIAL BENTGRASS - ASTORIA OR EXETER	5
BIRDSFOOT TREFLOIL - EMPIRE	15

- SEEDING RATE: 100 LBS. PER ACRE

THE ACCEPTED PLANTING SEASON SHALL BE BETWEEN APRIL 1ST AND OCTOBER 15TH (CONTRACTOR SHOULD COORDINATE). ON ALL DISTURBED AREAS, THE CONTRACTOR SHALL PROVIDE A MINIMUM OF FOUR (4) INCHES OF LOAM ON AREAS UP TO 10% IN GRADE. ALL AREAS OVER 10% SHALL RECEIVE A MINIMUM OF SIX (6) INCHES.

REFERENCE IS HEREBY MADE TO THE RHODE ISLAND SOIL EROSION AND SEDIMENT CONTROL HANDBOOK PUBLISHED BY THE SOIL CONSERVATION SERVICE. THE GUIDELINES SHOWN THEREIN SHOULD BE INCORPORATED INTO THE CONSTRUCTION PRACTICES ON SITE.

GENERAL LANDSCAPING NOTES:

- ALL DISTURBED AREAS ARE TO BE REVEGETATED AS SOON AS POSSIBLE. ALL BANKS AND SLOPING AREAS ARE TO RECEIVE A MINIMUM OF 4" OF CLEAN TOPSOIL, THEN SEED AND FERTILIZE. LEVEL AREAS TO RECEIVE 4" MIN. OF CLEAN TOPSOIL, SEED AND FERTILIZE.
- SEED AND SOD SHALL CONSIST OF A BLEND OF KENTUCKY BLUE GRASSES. PLANT BY SUPPLIERS SPECIFICATIONS.
- LIME SHALL BE APPLIED AS NECESSARY.
- USE HAY OR STRAW MULCH DURING SLOPE STABILIZATION IN CONJUNCTION WITH TEMPORARY SEEDING. APPLY MULCH AT A RATE OF 75 TO 100 LBS. PER 1000 SQUARE FEET.
- STOCKPILE ALL STRIPPED TOPSOIL FOR LATER USE. THE LOCATION IS TO BE APPROVED BY THIS ENGINEER. MULCH AND TEMPORARY SEED THE STOCKPILE.
- REMOVE ALL ROCKS 3" OR LARGER IN PLANTING AREA.
- ALL CLEARING SHALL CONFORM TO THE LIMITS AS SHOWN ON PLANS. CLEARING LIMITS ARE TO BE MARKED IN THE FIELD BY THE ENGINEER.

WETLAND PLANTING NOTES:

- ALL DISTURBED AREAS SHALL BE LOAMED IF NECESSARY SEEDED WITH A WILDLIFE/CONSERVATION GRASS MIXTURE AND MULCHED WITH A MAT OF LOOSE HAY.
- PLANTINGS WHICH DO NOT SURVIVE ONE GROWING SEASON FROM THE DATE OF PLANTING SHALL BE REPLACED BY THE CONTRACTOR.
- ALL EXCAVATED MATERIAL SHALL BE STORED ON A SUITABLE UPLAND SITE FROM ANY AND ALL WETLANDS.

THE FOLLOWING IS A LIST OF POTENTIAL BIORETENTION AREA PLANTINGS. A FULL PLANTING DETAIL WILL BE PROVIDED FOR FINAL DEVELOPMENT PLAN REVIEW.

PLANT SPECIES WERE SELECTED FROM THE RHODE ISLAND COASTAL PLANT GUIDE PREPARED BY THE URI CELS AND RI CRMC. ONLY THOSE NATIVE PLANTS THAT ARE SUITABLE FOR RAIN GARDENS AND ARE TOLERANT OF WET SITES AND SHADE ARE SHOWN HERE.

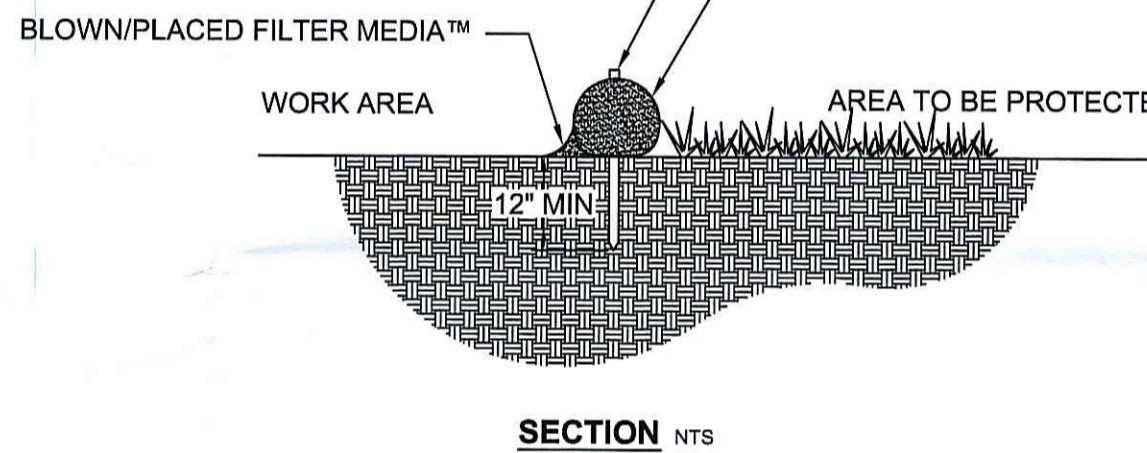
SPECIES	COMMON NAME	PLANT TYPE
<i>Ilex opaca</i>	AMERICAN HOLLY	TREE
<i>Iris versicolor</i>	BLUE FLAG	PERENNIAL
<i>Carex stricta</i>	TUSsock SEDGE	GRASS
<i>Cephalanthus occidentalis</i>	COMMON BUTTOMBUSH	SHRUB
<i>Comptonia peregrina</i>	SWEET FERN	SHRUB
<i>Cornus racemosa</i>	GRAY DOGWOOD	SHRUB
<i>Ilex glabra</i>	INKBERRY HOLLY	SHRUB
<i>Ilex verticillata</i>	WINTERBERRY HOLLY	SHRUB
<i>Lindera benzoin</i>	SPICEBUSH	SHRUB
<i>Photinia melanocarpa</i>	BLACK CHOKEBERRY	SHRUB
<i>Photinia pyrifolia</i>	RED CHOKEBERRY	SHRUB
<i>Vaccinium corymbosum</i>	HIGHBUSH BLUEBERRY	SHRUB
<i>Viburnum dentatum</i>	ARROWWOOD	SHRUB

TREES SHALL BE PLANTED WITH A DENSITY OF NO MORE THAN ONE PER 250 SF, SPACED 15 FT ON CENTER. SHRUBS SHALL BE PLANTED 5-10 FT ON CENTER AND HERBACEOUS VEGETATION PLANTED 2.5 FT ON-CENTER.

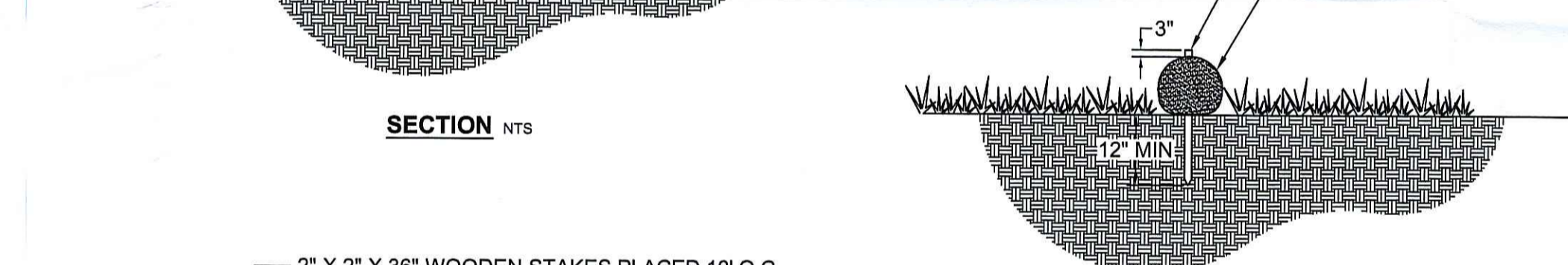
NOTE: BIORETENTION AREA LOCATED AT LEAST 10 FT FROM BUILDING FOUNDATION, 15 FT FROM EXIST. OWTS AND 25 FT FROM ANY WELL OR WATER SUPPLY.

ROOF GUTTER DOWNSPOUTS SHALL DIRECT WATER TO BIORETENTION AREA VIA UNDERGROUND PIPING OR OVERLAND WHERE UNDERGROUND PIPING IS UNFEASIBLE OR NOT PERMISSIBLE. NO UNDERGROUND PIPING IS PERMITTED WITHIN 25' OF THE EXIST. OWTS.

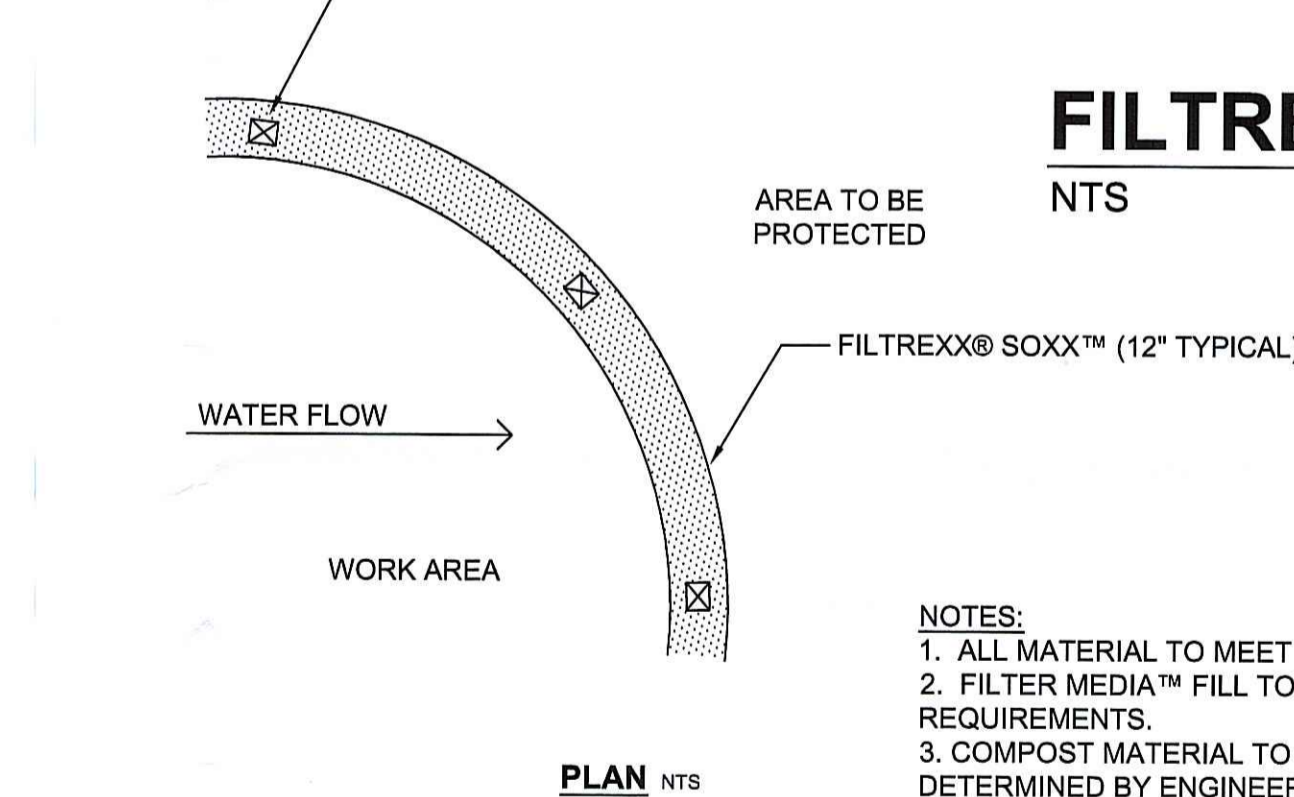
BLOWN/PLACED FILTER MEDIA™
 2" X 2" X 36" WOODEN STAKES PLACED 10' O.C.
 FILTREXX® SOXX™ (12" TYPICAL)



2" X 2" X 36" WOODEN STAKES PLACED 10' O.C.
 FILTREXX® SOXX™

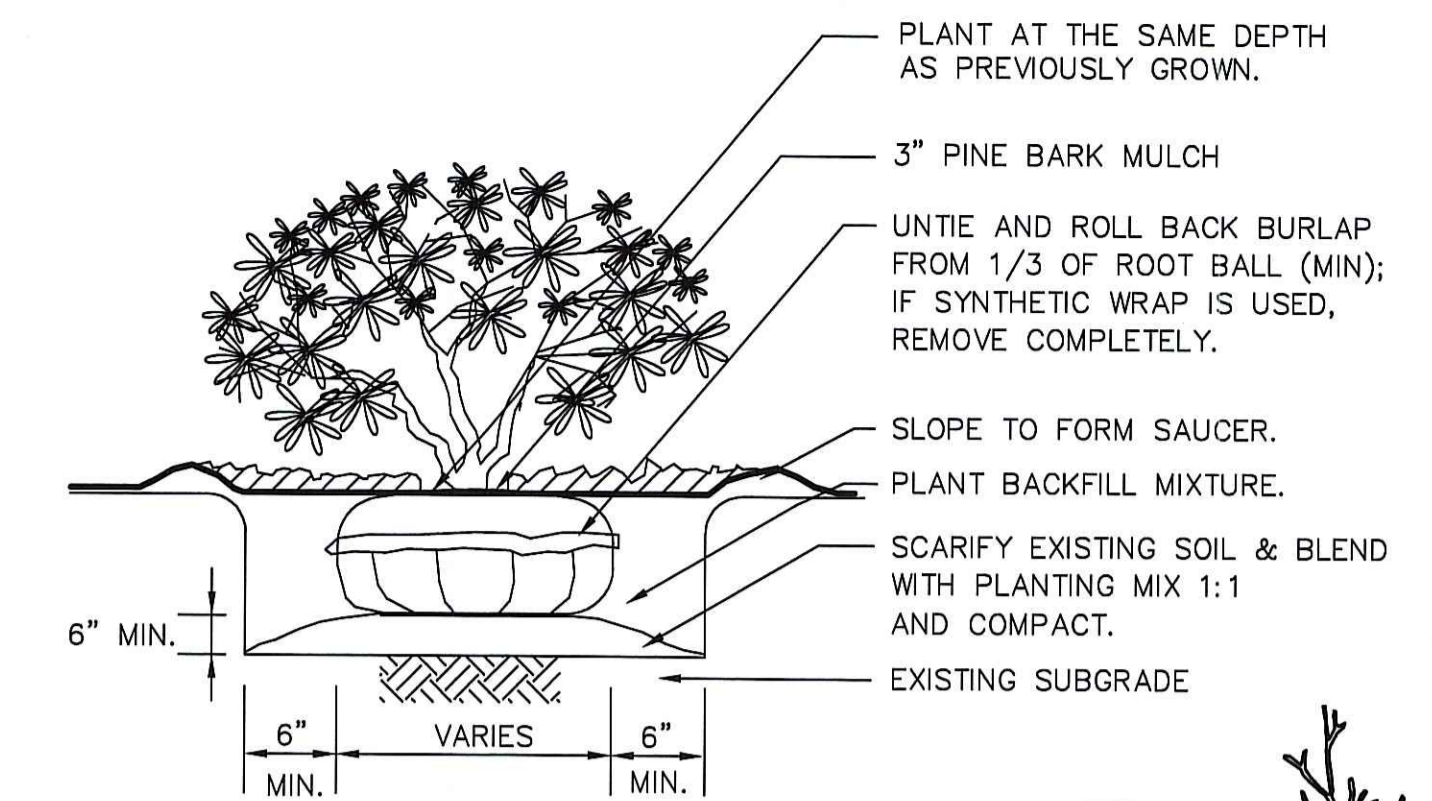


2" X 2" X 36" WOODEN STAKES PLACED 10' O.C.

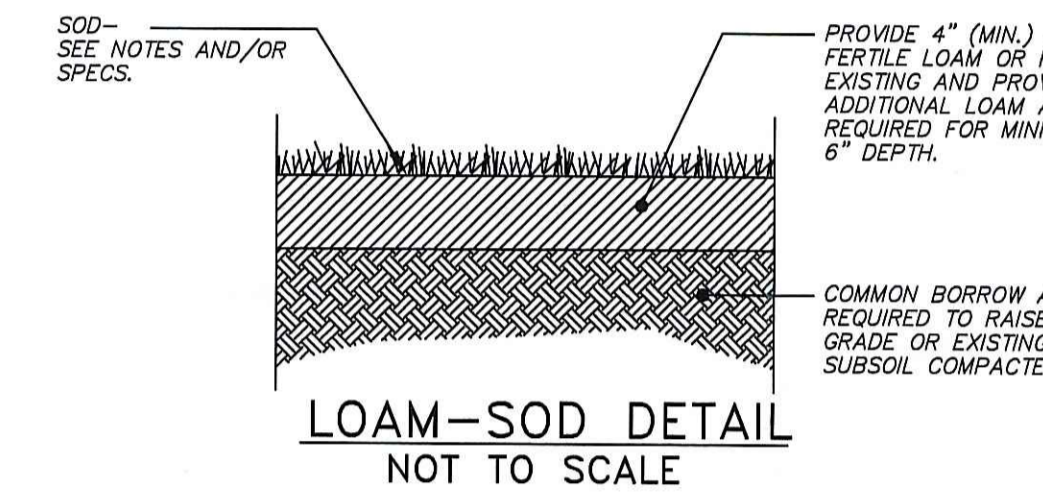


FILTREXX® SEDIMENT CONTROL
 NTS

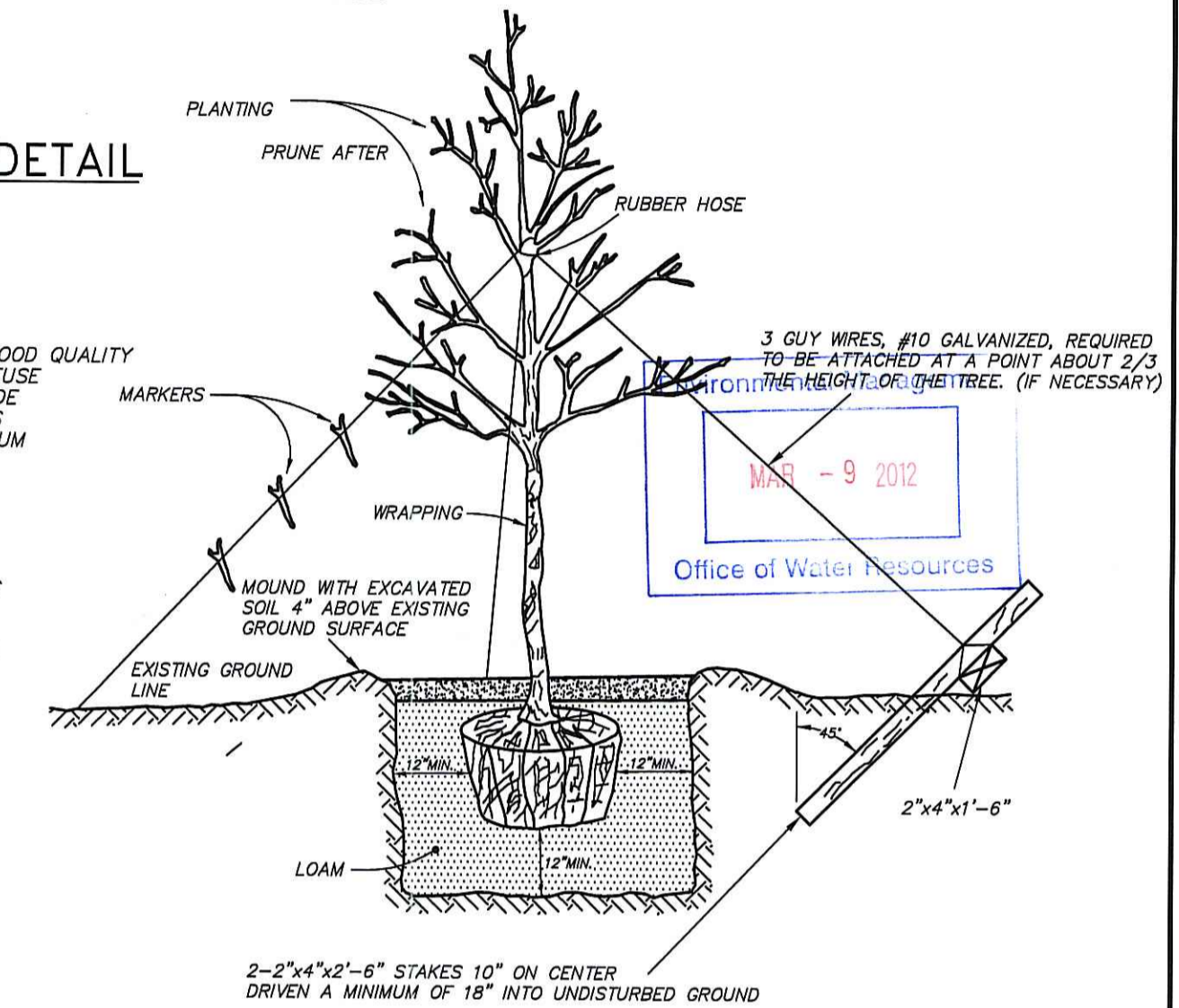
- NOTES:
- ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
 - FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
 - COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.



TYPICAL SHRUB PLANTING DETAIL
 NOT TO SCALE



LOAM-SOD DETAIL
 NOT TO SCALE



TYPICAL TREE PLANTING DETAIL
 NOT TO SCALE

EROSION CONTROL PROGRAM

PRIOR TO START OF CONSTRUCTION, FILTREXX SOXX COMPOST SOCKS, OR APPROVED EQUAL, AND ALL OTHER SPECIFIED EROSION CONTROL DEVICES SHALL BE IN PLACE.

CRITICAL AREAS SUCH AS WETLAND AREAS, SLOPES AND STREAMS SHALL BE PROTECTED AS PER PLAN AND, IN THE PRESENCE OF WETLANDS, THE CONDITIONS OF ANY ISSUED PERMIT SHALL BE ADHERED TO.

THE CONTRACTOR SHALL BE REQUIRED TO ESTABLISH AND FULLY MAINTAIN ALL REQUIRED EROSION AND SEDIMENTATION CONTROLS.

SEDIMENTATION CONTROL PROGRAM

ALL EXPOSED SLOPES, INCLUDING STOCKPILES OF MATERIAL, SHALL RECEIVE TEMPORARY SEDIMENTATION AND EROSION CONTROLS. THIS WILL INCLUDE LOAMING AND SEEDING, MULCHING, HAYMATS, FILTREXX SOXX, ETC., TO STABILIZE THE AREA.

ANY DRAINAGE STRUCTURES SHALL BE SURROUNDED BY FILTREXX SOXX COMPOST SOCKS, OR APPROVED EQUAL, TO PREVENT INFILTRATION OF SEDIMENTS.

SHOULD SEDIMENTS ENTER A CRITICAL AREA (WETLAND, BUFFER ZONE, ABUTTING PROPERTY) THE CONTRACTOR SHALL IMMEDIATELY CLEAN AND RESTORE THE AFFECTED AREA.

SLOPE PROTECTION TO BE INSTALLED ON ANY DISTURBED AREAS SUBJECT TO EROSION.

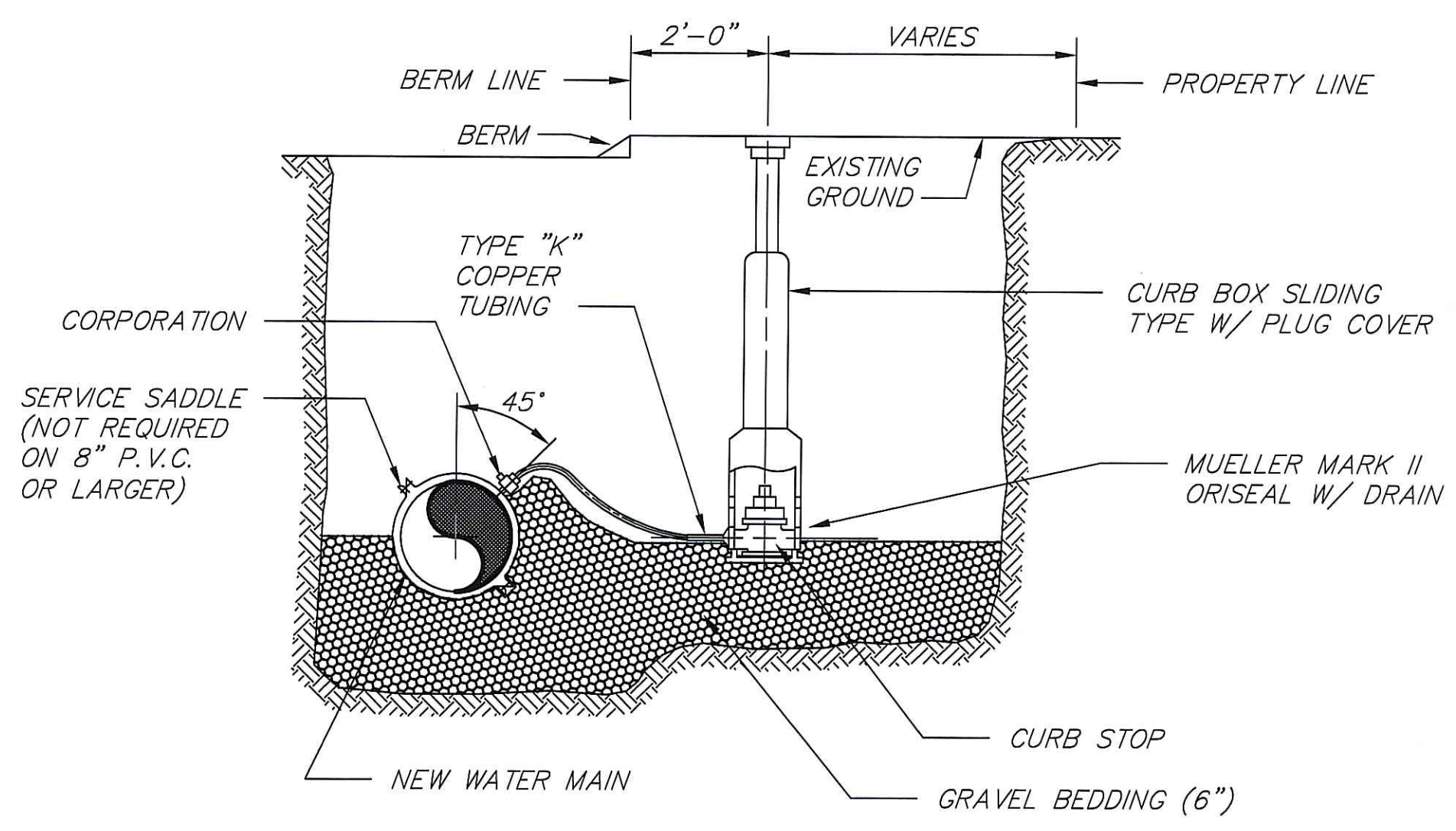
EXTREME CARE SHALL BE TAKEN TO PREVENT SEDIMENT OR UNSUITABLE MATERIAL FROM ENTERING WETLANDS, ROADWAYS AND/OR DRAINAGE STRUCTURES.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSPECTING AND MAINTAINING ALL EROSION CONTROL MEASURES PROMPTLY AFTER EACH RAINFALL AND TO ENSURE THAT RUNOFF FLOW PATTERNS ARE NOT INHIBITED DURING RAINFALL AND/OR SNOWMELT.

ACCUMULATED SEDIMENTS SHALL BE REMOVED AS DIRECTED BY THE OWNER, ENGINEER, BIOLOGIST, APPLICANT, LOCAL OR STATE OFFICIALS.

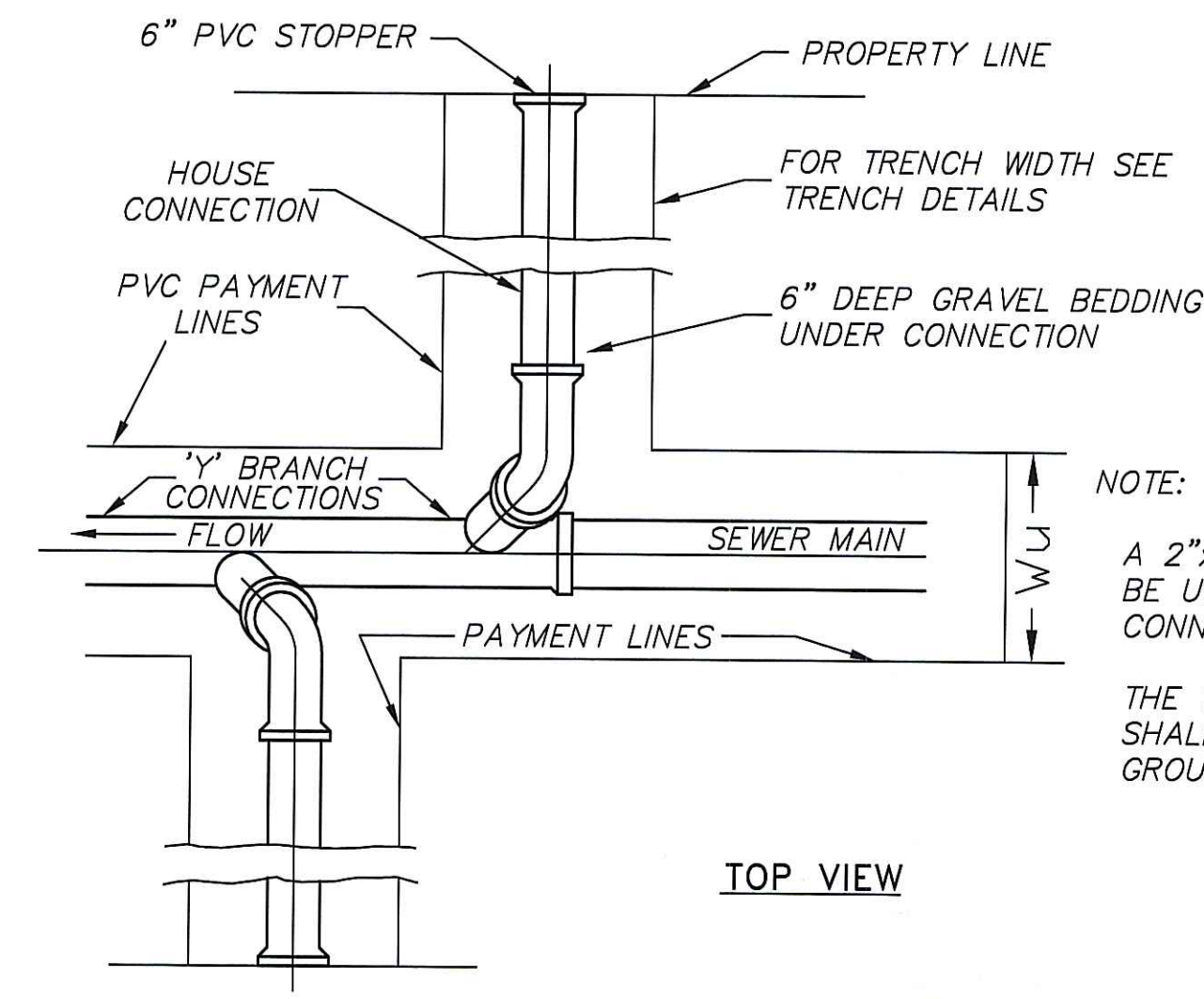
APPROVED WITH CONDITIONS
 AS SPECIFIED IN THE LETTER OF APPROVAL
 DATED APR 03 2012 FILE # 12-0042
 NO CHANGES ALLOWED WITHOUT PRIOR APPROVAL
 APPROVED PLANS MUST BE AT CONTRACTOR'S OFFICE

	TITLE: LAND DEVELOPMENT PLAN	PROJ. NO: 2011120
	PROJECT: A.P. 54 LOT 585 10 MT. PLEASANT VIEW CUMBERLAND, RHODE ISLAND	DATE: 03/01/12
CLIENT: PATRICK RYAN & BRENDA VISCIONE	2/3	
SCALE: AS SHOWN	GARY C. LAMOND, PE, LLC 194 HATCHERY ROAD NORTH KINGSTOWN, RI 02852	



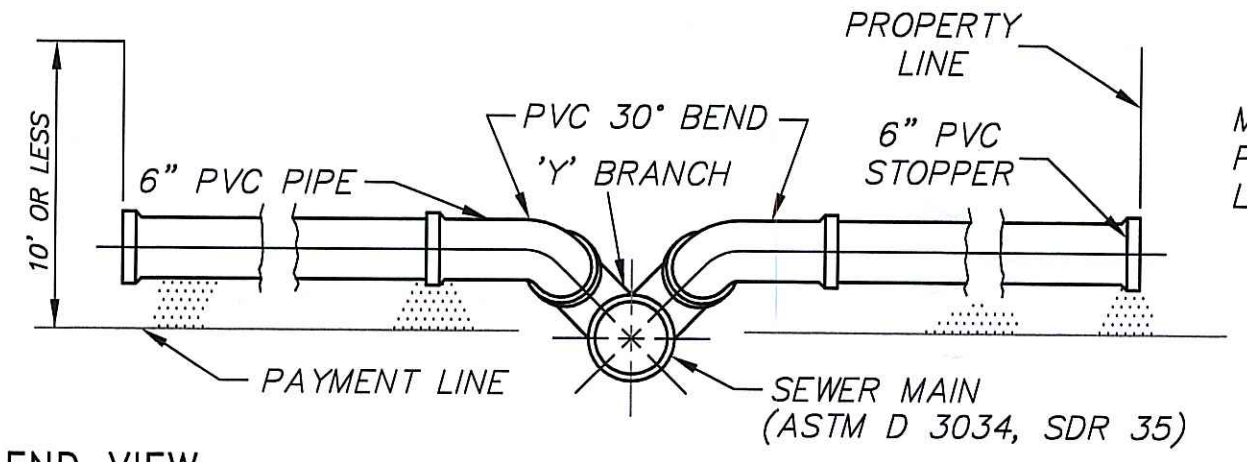
NOTES: 1. CURB STOP & BOX SHALL BE INSTALLED 2'-0" BEYOND BERM.
2. EACH BRANCH SHALL HAVE A CURB STOP AND CURB BOX.

TYPICAL HOUSE SERVICE CONNECTION
NOT TO SCALE



NOTE:
A 2"x2" OAK MARKER SHALL BE USED TO SPECIFY SEWER CONNECTION LOCATIONS.
THE TOP OF THE MARKER SHALL BE BURIED 2" BELOW GROUND SURFACE.

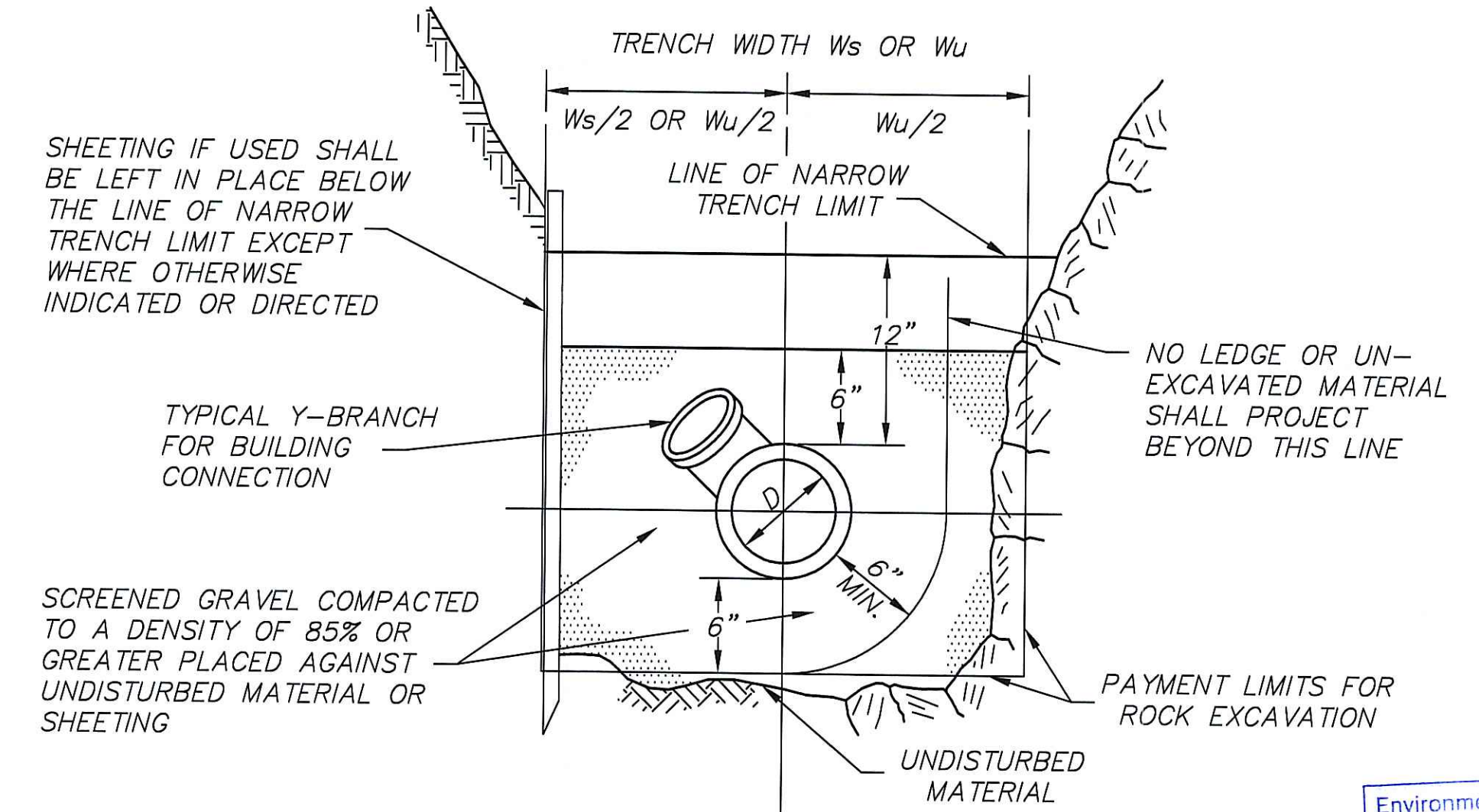
TOP VIEW



MINIMUM SLOPE OF 1/4 INCH PER FOOT FOR BUILDING LATERALS.

PIPE DETAIL

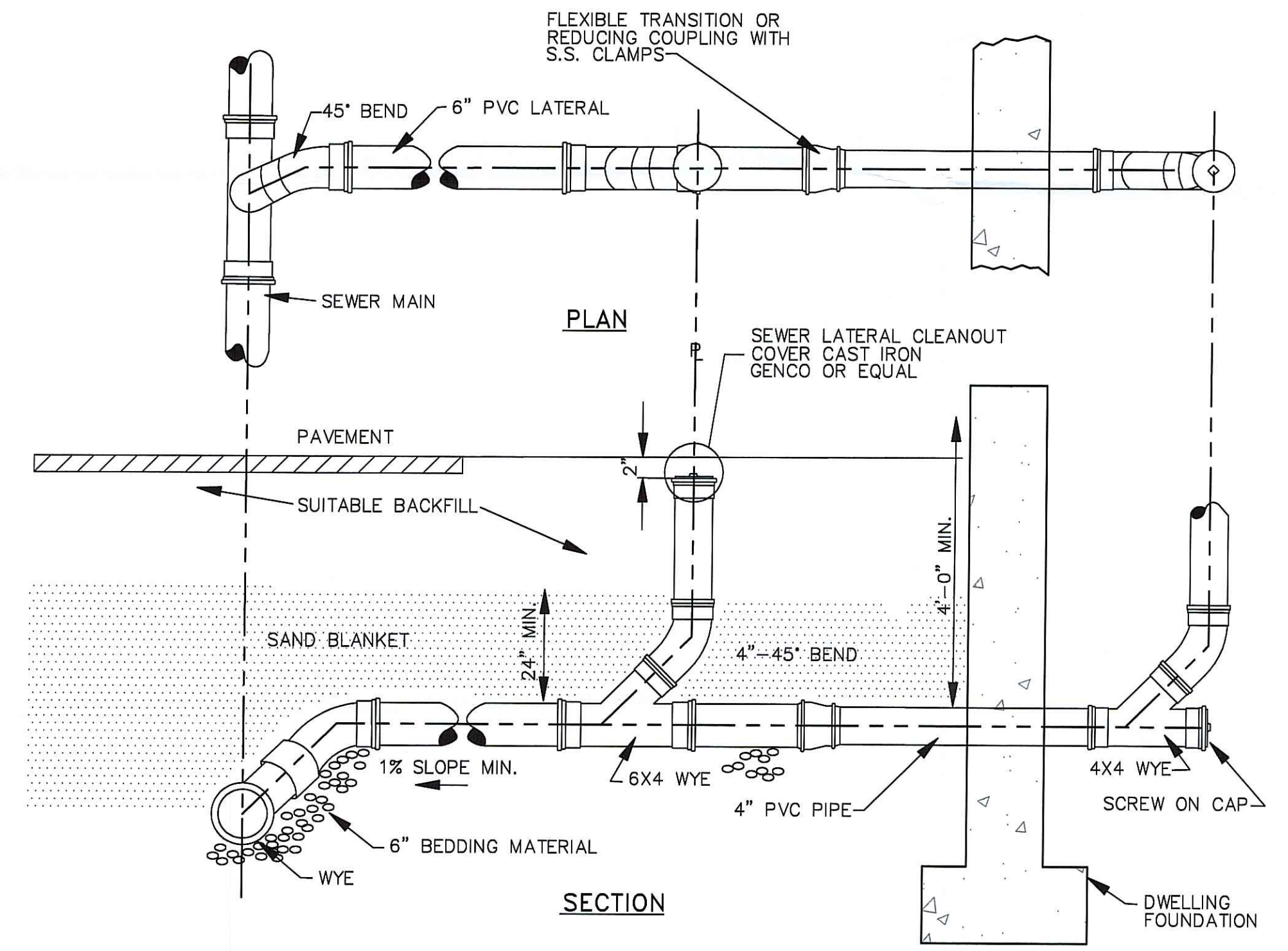
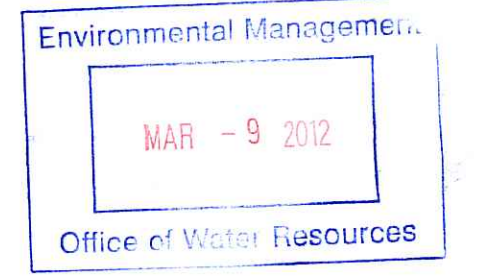
SEWER CONNECTION DETAIL
NOT TO SCALE



HALF SECTION IN EARTH
HALF SECTION IN ROCK

DIAMETER OF PIPE D	TRENCH WIDTH W_s OR W_u	
	W_u UNSHEETED	W_s SHEETED
12" AND SMALLER	3'-0"	4'-2"
15"	3'-2"	4'-4"

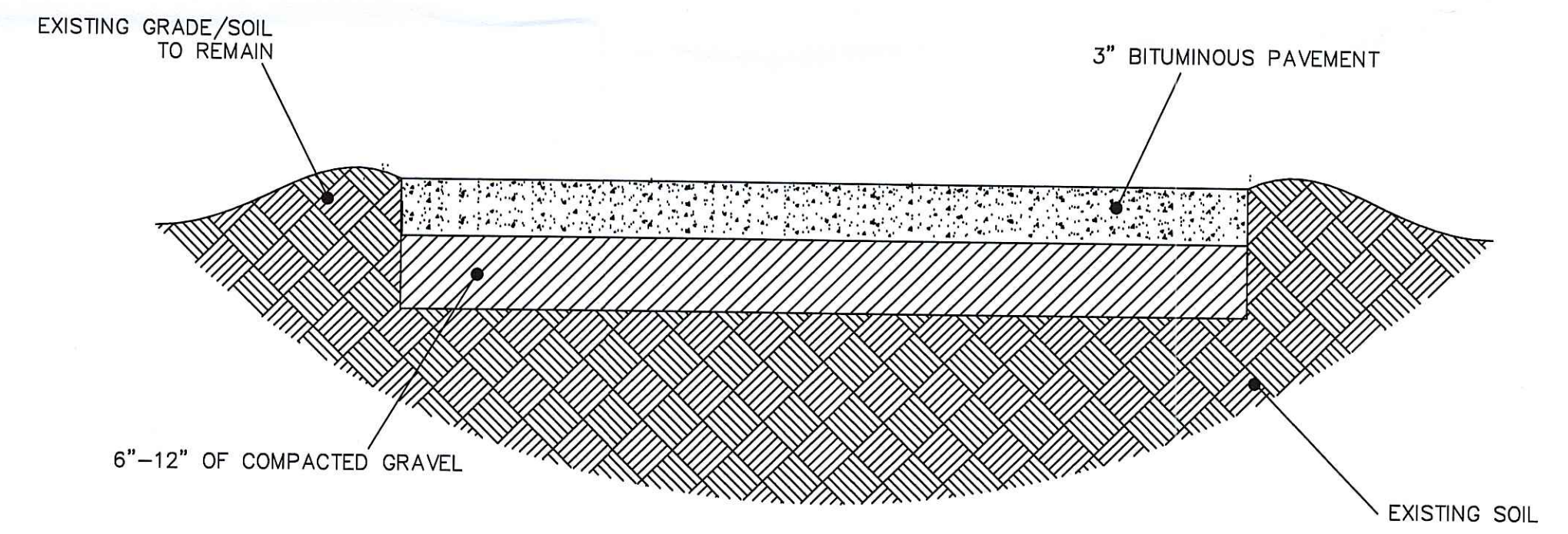
SANITARY SEWER TRENCH SECTIONS
(FOR PVC PIPE)
NOT TO SCALE



NOTE: 1. FOR AN EXISTING SEWER MAIN THAT DOES NOT HAVE A WYE INSTALLED, THE CONTRACTOR SHALL INSTALL A PIPE SADDLE.

STANDARD HOUSE CONNECTION DETAIL
NOT TO SCALE

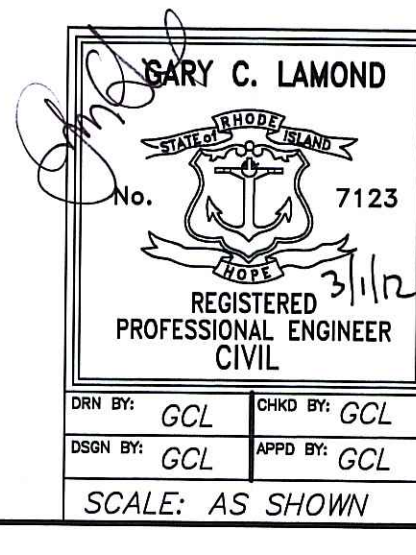
1. LOCATION OF UNDERGROUND UTILITIES IS BASED ON INFORMATION GATHERED IN THE FIELD AND TOWN OF CUMBERLAND UTILITY RECORDS AND SHOULD BE CONSIDERED APPROXIMATE. THE CONTRACTOR SHOULD VERIFY LOCATIONS OF ALL UNDERGROUND UTILITIES WITH THE APPROPRIATE UTILITY COMPANY AND NOTIFY THE ENGINEER OF DISCREPANCIES PRIOR TO CONSTRUCTION.
2. CONTRACTOR TO NOTIFY DIG-SAFE AT LEAST 72 HOURS PRIOR TO EXCAVATION.
3. A 10' HORIZONTAL SEPARATION SHOULD BE MAINTAINED BETWEEN THE PROPOSED SEWER LINE AND ANY EXISTING OR PROPOSED WATER LINE. WHERE A SEWER LINE CROSSES A WATER LINE THE CONTRACTOR SHALL ENCLOSE THE SEWER LINE IN A CONTINUOUS SLEEVE WITHIN 10' OF THE WATER LINE.
4. ELEVATIONS ARE BASED ON AN ASSUMED DATUM.
5. PROPOSED SEWER INTENDED TO CONVEY DOMESTIC WASTEWATER ONLY. THE PROPOSED SYSTEM SHALL BE WATERTIGHT IN ORDER TO PREVENT SURFACE AND GROUNDWATER FROM ENTERING THE SYSTEM. CONNECTION OF EXISTING OR PROPOSED SUMP PUMPS/FRENCH DRAINS IS PROHIBITED. THE DUMPING OF HAZARDOUS MATERIALS INTO THE SYSTEM IS ALSO PROHIBITED.
6. PROPERTY LINE BASED ON CLASS I SURVEY PLAN BY MARSH & LONG SURVEYING, INC., DATED JANUARY 5, 2012.



PROPOSED DRIVEWAY DETAIL
NOT TO SCALE

ALL MATERIAL UNDER THE PROPOSED DRIVEWAY SHALL BE FREE OF DEBRIS, STONES LARGER THAN 6" DIAMETER, BRUSH, ROOTS, AND OTHER ORGANIC MATERIAL SUBJECT TO DECOMPOSITION. THE MATERIAL SHALL BE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DENSITY AT A MOISTURE CONTENT THAT IS WITHIN 3% OR LESS OF OPTIMUM AS OBTAINED FROM COMPACTION TESTS. FILL MATERIAL SHALL BE PLACED IN 6-8" LIFTS WITH EACH LIFT PROPERLY COMPACTED BEFORE STARTING THE NEXT.

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
FRESHWATER WETLANDS PROGRAM
APPROVED WITH CONDITIONS
AS SPECIFIED IN THE LETTER OF APPROVAL
DATED APR 03 2012 FILE # 12-DDAD
NO CHANGES ALLOWED WITHOUT PRICE APPROVAL
APPROVED PLANS MUST BE AT COMPLETION



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GARY C. LAMOND, P.E., LLC 194 HATCHERY ROAD NORTH KINGSTOWN, RI 02852	

SCALE: AS SHOWN