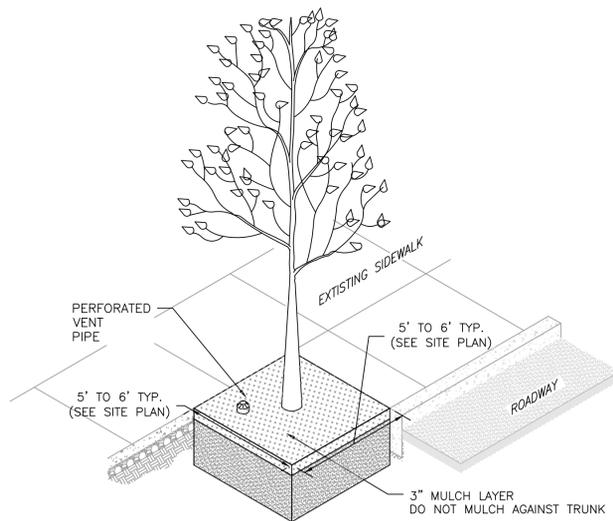
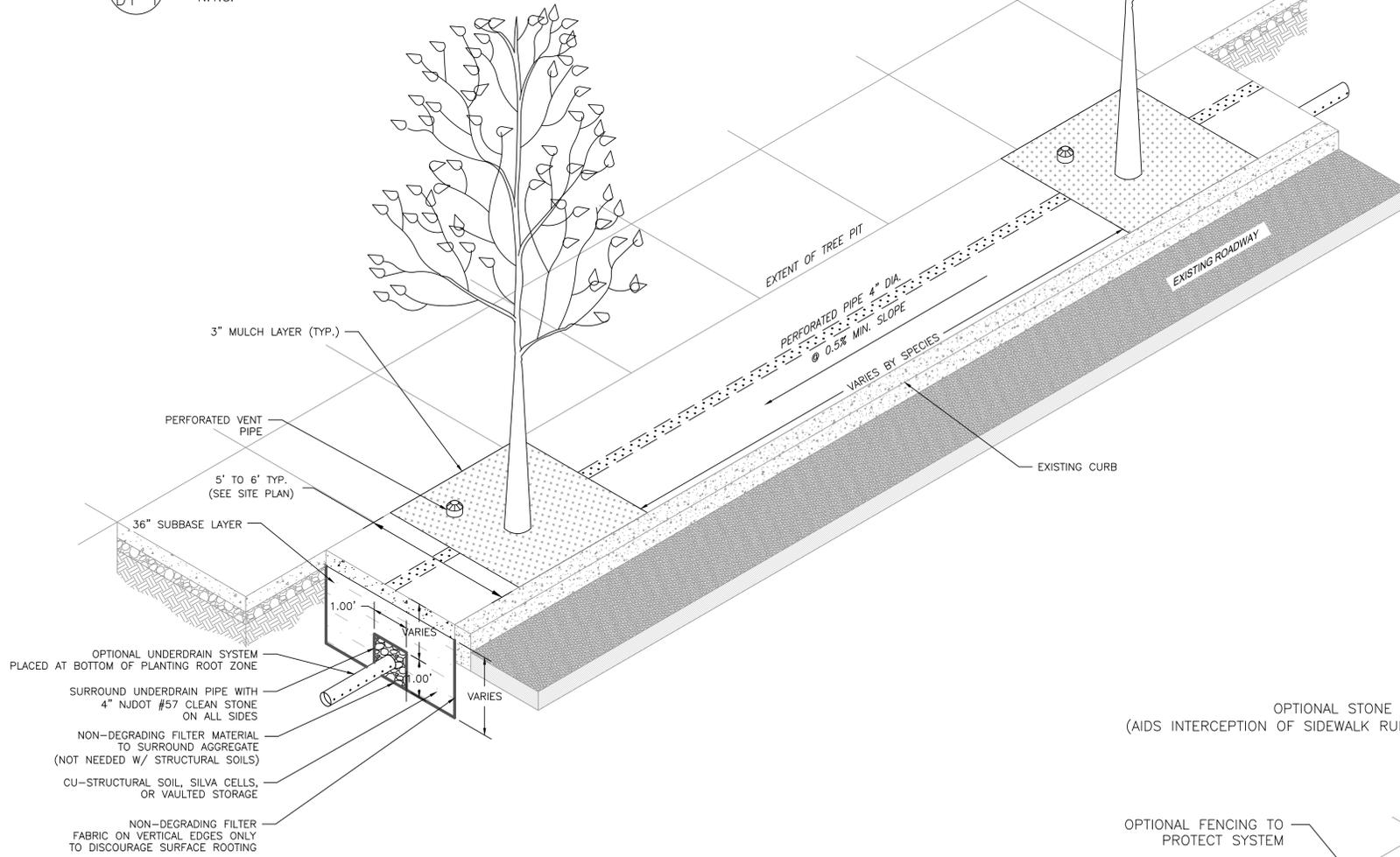
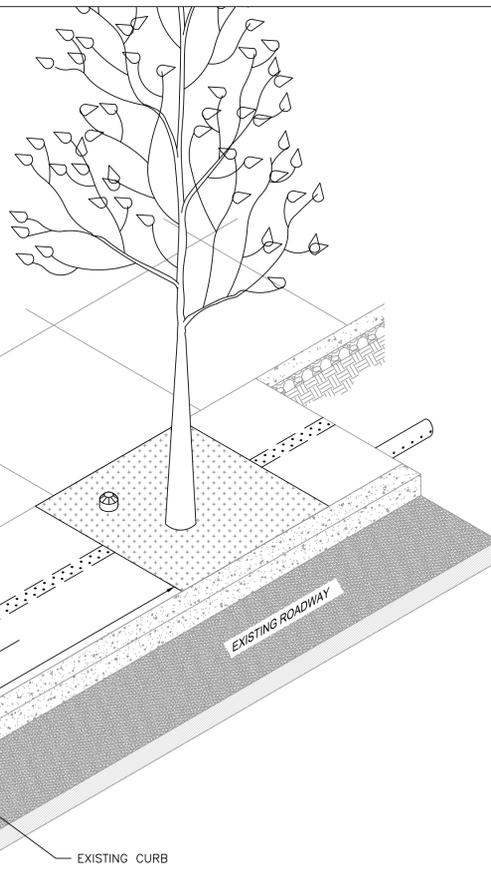


SCALE OPTIONS

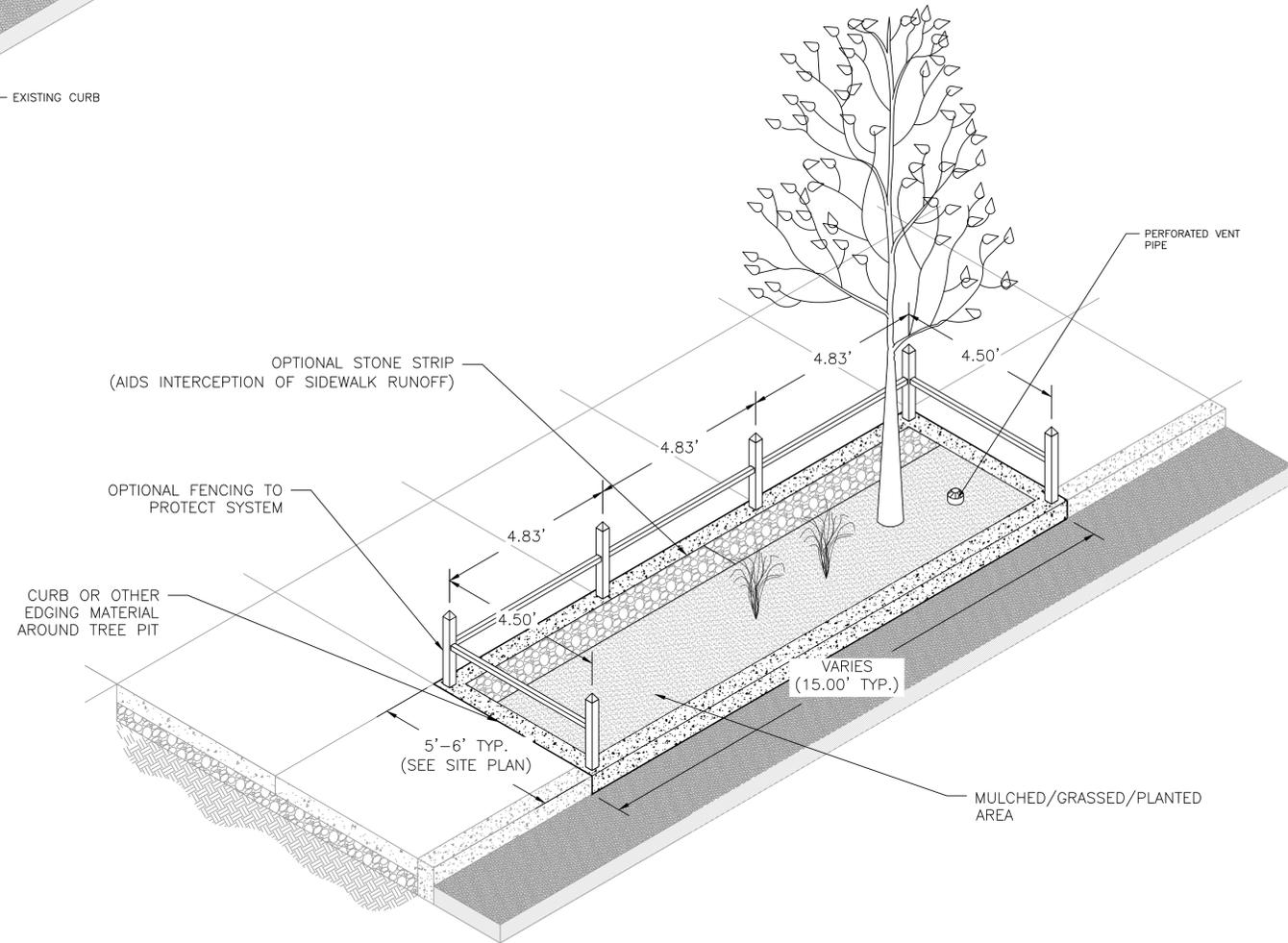
1 CONTINUOUS TREE TRENCH
DT-1 N.T.S.



2 ENHANCED TREE BED
DT-1 N.T.S.



3 EXTENDED TREE BED
DT-1 N.T.S.



CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL VERIFY ALL INFORMATION PRIOR TO EXCAVATION INCLUDING ELEVATIONS AND LOCATIONS OF EXISTING UTILITIES.
2. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY IF ANY FIELD CONDITIONS DIFFER MATERIALLY FROM THOSE REPRESENTED ON THESE DRAWINGS AND THE SPECIFICATIONS OR IF, IN THE CONTRACTOR'S OPINION, SAID CONDITIONS CONFLICT WITH THE DESIGNS SHOWN HEREON.
3. THE ENGINEER SHALL INSPECT ALL PLANTING BED AREAS BEFORE PLANTING TO ENSURE THAT ADEQUATE DRAINAGE EXISTS. IF ANY AREAS TO BE PLANTED SHOW EVIDENCE OF POOR DRAINAGE, THE CONTRACTOR SHALL TAKE CORRECTIVE ACTION.
4. THE CONTRACTOR SHALL HAVE ALL UTILITIES MARKED BEFORE ANY EXCAVATION. IF ANY UTILITIES INTERFERE WITH THE PROJECT, THE CONTRACTOR SHALL NOTIFY THE ENGINEER.
5. THE ENTIRE CONTINUOUS TREE TRENCH AND/OR ENHANCED TREE BED SHALL BE EXCAVATED, THE CONTRACTOR SHALL DISPOSE OF ANY EXCESS MATERIALS.
6. THE CONTRACTOR SHALL AVOID OVER COMPACTING THE EXISTING MATERIALS IN ORDER TO AVOID POOR INFILTRATION OR SHORT LIFETIME OF THE SYSTEM.
7. THE CONTRACTOR SHALL ESTABLISH ALL ELEVATIONS AND LINES AS SHOWN IN THE SITE PLAN FOR REVIEW BY THE ENGINEER BEFORE ANY CONSTRUCTION BEGINS.
8. THE CONTRACTOR SHALL VERIFY THAT THE SUBGRADE IS CONSISTENT WITH LINE, GRADE, AND ELEVATIONS AS INDICATED IN THE SITE PLAN. ANY AREAS SHOWING EROSION OR POTENTIAL PONDING SHALL BE REGRADED BEFORE SUBBASE INSTALLATION.
9. IMMEDIATELY AFTER THE SUBGRADE IS APPROVED BY THE ENGINEER, THE CONTRACTOR SHALL BEGIN SUBBASE CONSTRUCTION WHICH INCLUDES ALL MATERIALS BELOW THE PAVEMENT AND ABOVE THE EXISTING SUBGRADE.
10. THE CONTRACTOR SHALL PLACE GEOTEXTILE FABRIC IN CONFORMANCE WITH MANUFACTURER'S STANDARDS. ALL ADJACENT FABRIC SHALL BE OVERLAPPED BY AT LEAST 16 INCHES. THE FABRIC SHALL BE SECURED AT LEAST FOUR FEET OUTSIDE OF THE EXCAVATED BASE. THE ENTIRE BED PERIMETER SHALL BE LINED WITH GEOTEXTILE FABRIC.
11. THE STORAGE LAYER SHALL BE INSTALLED EVENLY OVER THE EXISTING SUBGRADE. STORAGE LAYER AGGREGATE SHALL BE INSTALLED TO A MAXIMUM OF 95% STANDARD PROCTOR COMPACTION.
12. CONTRACTOR SHALL PERFORM REQUIRED TESTING TO DETERMINE SOIL PERMEABILITY AND SEASONAL HIGH WATER TABLE ELEVATION AT THE SITE TO VERIFY INFILTRATION CAPABILITIES. TESTING SHALL BE DONE PRIOR TO EXCAVATION AND INSTALLATION OF THE PROPOSED PROJECTS. PROJECT ENGINEER SHALL BE PRESENT DURING TESTING AND SHALL BE INFORMED OF THE RESULTS.
13. THE INFILTRATION RATE SHALL BE AT LEAST 0.5 IN/HR OR 50% OF THE HYDRAULIC CONDUCTIVITY (D3385).
14. AFTER SUBBASE AGGREGATE INSTALLATION THE GEOTEXTILE FABRIC SHALL BE FOLDED BACK ALONG ALL BED EDGES. THE FABRIC SHALL REMAIN SECURE UNTIL ADJACENT SOILS ESTABLISH VEGETATION. ANY NECESSARY MEASURES SHALL BE TAKEN TO PREVENT SEDIMENT FROM WASHING INTO BEDS.
15. PAVEMENTS SHALL BE INSTALLED IN CONFORMANCE WITH NJDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2007 OR LATEST VERSION.

SPECIFICATIONS:

1. WHERE ADJACENT PAVEMENTS ARE TO BE SUPPORTED, THE STORAGE LAYER SHALL BE COMPRISED OF EITHER CU-STRUCTURAL SOILS (REFER TO CORNELL'S STANDARDS) OR A SILVA CELL SYSTEM WITH A LOAMY SAND OR SITE APPROPRIATE ALTERNATIVE. WHERE NO ADJACENT PAVEMENTS ARE TO BE SUPPORTED, A LOAMY SAND OR SITE APPROPRIATE ALTERNATIVE CAN BE USED. ADJACENT SOILS SHOULD BE ACCOUNTED FOR IN THE SELECTION OF SOIL MEDIA TO ENSURE SOIL STABILITY.
2. THE LOAMY SAND MUST CONSIST OF THE FOLLOWING MIX, BY WEIGHT: 85 TO 95% SAND, WITH NO MORE THAN 25% OF THE SAND AS FINE OR VERY FINE SANDS; NO MORE THAN 15% SILT AND CLAY WITH 2% TO 5% CLAY CONTENT. THE ENTIRE MIX MUST THEN BE AMENDED WITH 3 TO 7% ORGANICS, BY WEIGHT. THE PH OF THE SOIL BED MATERIAL SHOULD RANGE FROM 5.5 TO 6.5. PH REQUIREMENT MAY BE ADJUSTED IF THE SPECIES REQUIRED A DIFFERENT PH RANGE.

CHRISTOPHER C. OBROPTA, Ph.D., P.E.
PROFESSIONAL ENGINEER - NJ LICENSE # 37552
DATE 12/08/2022
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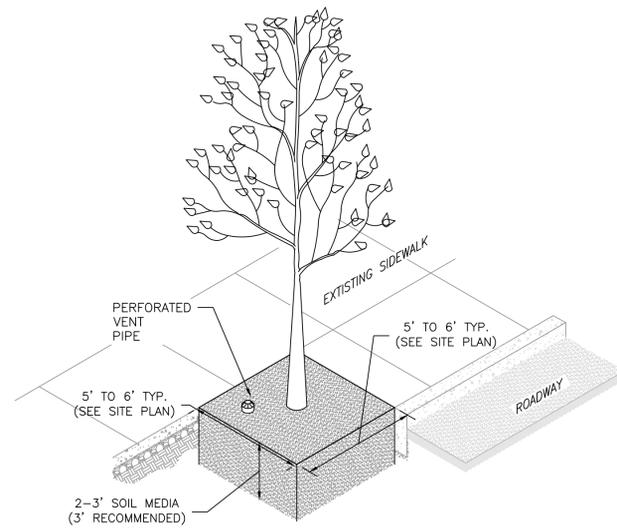
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ENHANCED TREE PLANTINGS FOR STORMWATER
LANDSCAPE SCALE RESTORATION GRANT
GENERAL TREE BED TYPES DETAILS



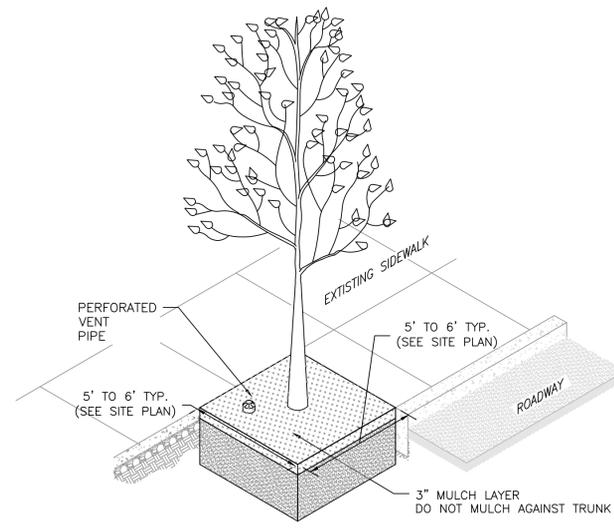
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DT-1

SINGLE BED VARIATIONS\WOOD MULCH ALTERNATIVES



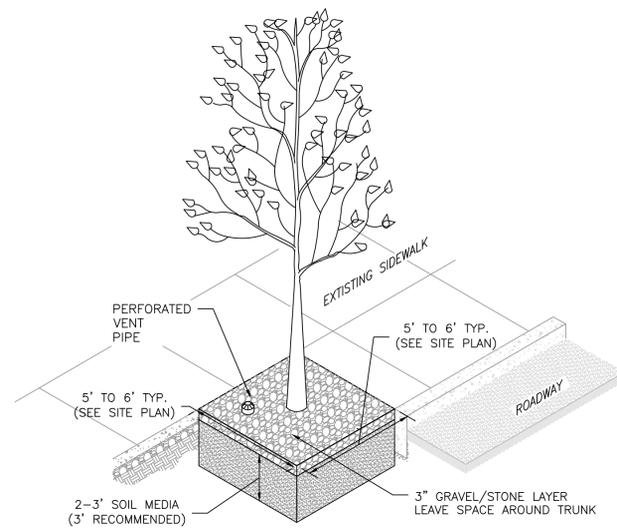
1 UNMULCHED TREE BED
DT-2 N.T.S.

WHILE MULCH IS STRONGLY RECOMMENDED TO RETAIN MOISTURE, NO MULCH CAN BE USED IF A SUFFICIENT GRASS COVER IS MAINTAINED TO PREVENT EROSION. TREE GRATES ARE STRONGLY DISCOURAGED IN LIEU OF MULCH OR OTHER COVER.



2 WOOD MULCHED TREE BED
DT-2 N.T.S.

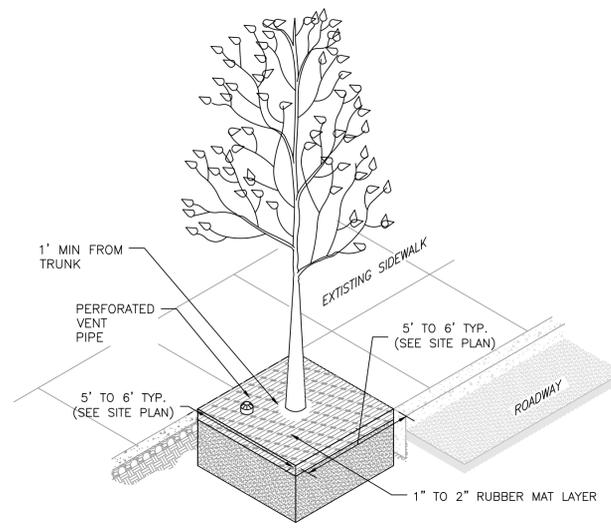
WOOD MULCH RECOMMENDED IN MOST AREAS WHERE FEASIBLE AND MAINTENANCE WILL TAKE PLACE TO REPLACE AS NEEDED. MAY BECOME HYDROPHOBIC IF COMPACTED AND NOT MAINTAINED.



3 GRAVEL/STONE TREE BED
DT-2 N.T.S.

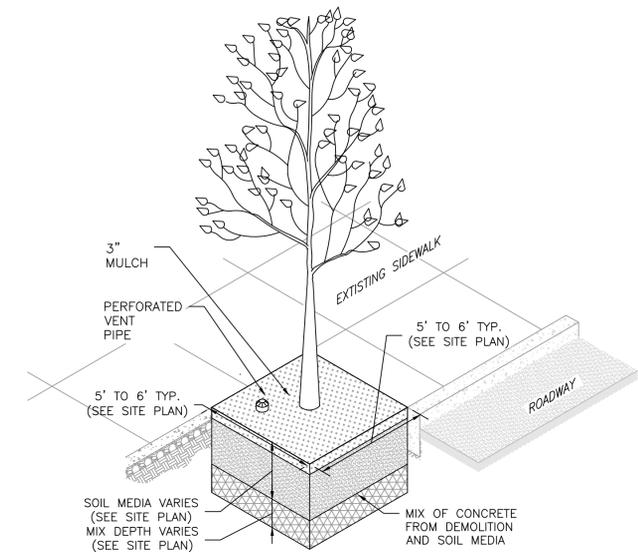
A GRAVEL OR STONE LAYER WILL ALSO HELP RETAIN MOISTURE AND PREVENT WEEDS. REQUIRES LESS REGULAR MAINTENANCE THAN MULCH. UNLIKE ORGANIC MULCH, DOES NOT PROVIDE NUTRIENTS BACK TO THE SOIL. ISSUES MAY OCCUR WITH WASHING OUT OVER TIME FOR SMALLER STONE. LARGER STONE CAN BE A THROWING HAZARD.

A GRAVEL LAYER CAN BE SEALED TOGETHER WITH RESIN AND REMAIN PERMEABLE TO ALLOW WATER INTO THE PIT. THIS HAS THE ADDED BENEFIT OF PREVENTING LOSS OF GRAVEL AS EASILY OVER TIME. MAY BE USEFUL IN HIGH TRAFFIC AREAS.



4 RUBBER MAT TREE BED
DT-2 N.T.S.

PROVIDES A SOLID WALKABLE SURFACE THAT REMAINS PERMEABLE AND WILL NOT EASILY DEGRADE. RESEARCH VARIES IF CHEMICALS MAY LEACH INTO THE SOIL AS IT DEGRADES SO MAY NOT BE IDEAL FOR TREE HEALTH. MAY BE USEFUL IN HIGH TRAFFIC AREAS OR PLAY AREAS. NOT RECOMMENDED OVER ALTERNATIVES.



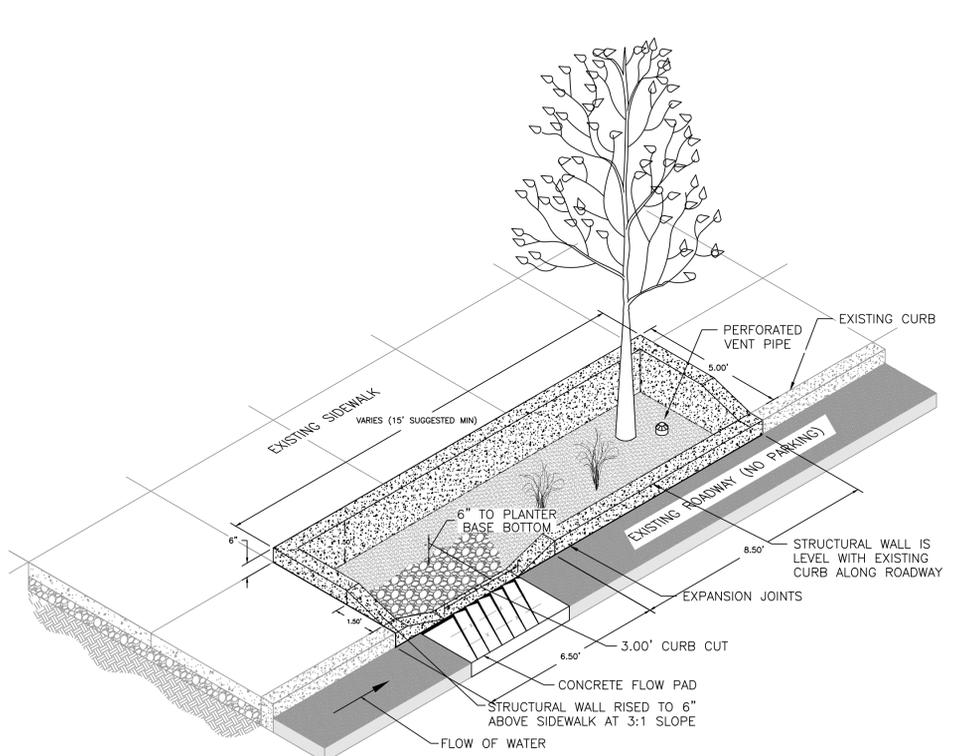
5 CONCRETE REUSE TREE BED
DT-2 N.T.S.

A COST EFFECTIVE PRACTICE TO AVOID DISPOSAL OF REMOVED CONCRETE BY INCORPORATING IT INTO THE SOIL MATRIX. DO NOTE THIS MAY NOT BE IDEAL FOR TREE HEALTH AS THE CRUSHED CONCRETE CAN LEAD TO MORE ALKALINE SOILS.

NOTE: CONCRETE SHALL BE CRUSHED TO A SMALL SIZE OF 3 INCHES OR LESS. NOMINAL MAXIMUM TO NOMINAL MINIMUM SIZE NO GREATER THAN 2:1. AGGREGATE SHAPE TARGET 1:1 UP TO 2:1 IN LONGEST EDGE TO SHORTEST EDGE.

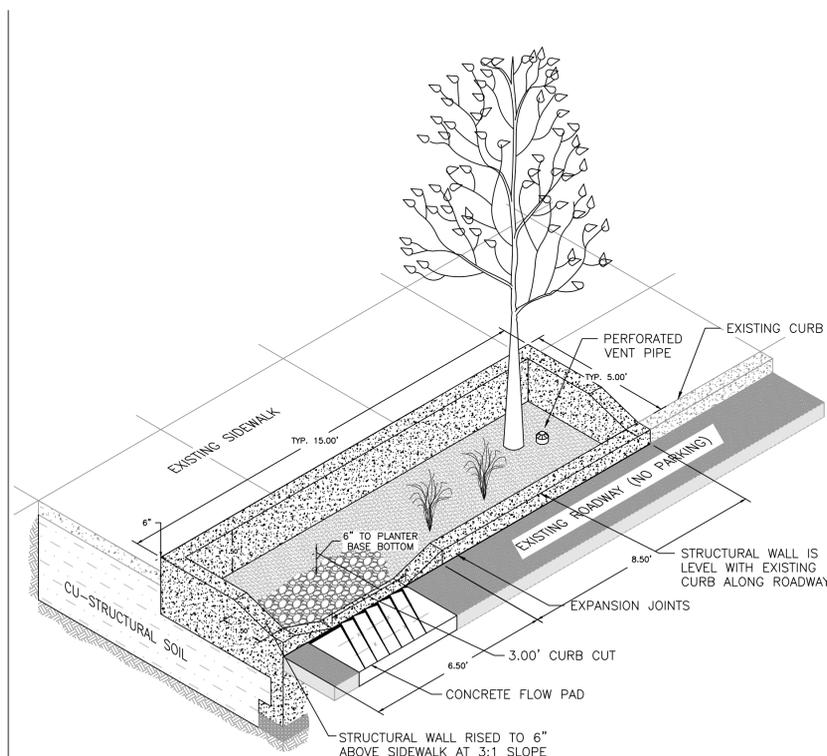
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STORAGE OPTIONS (EXTENDED TREE BEDS, ALSO APPLIES FOR CONTINUOUS TREE BEDS)



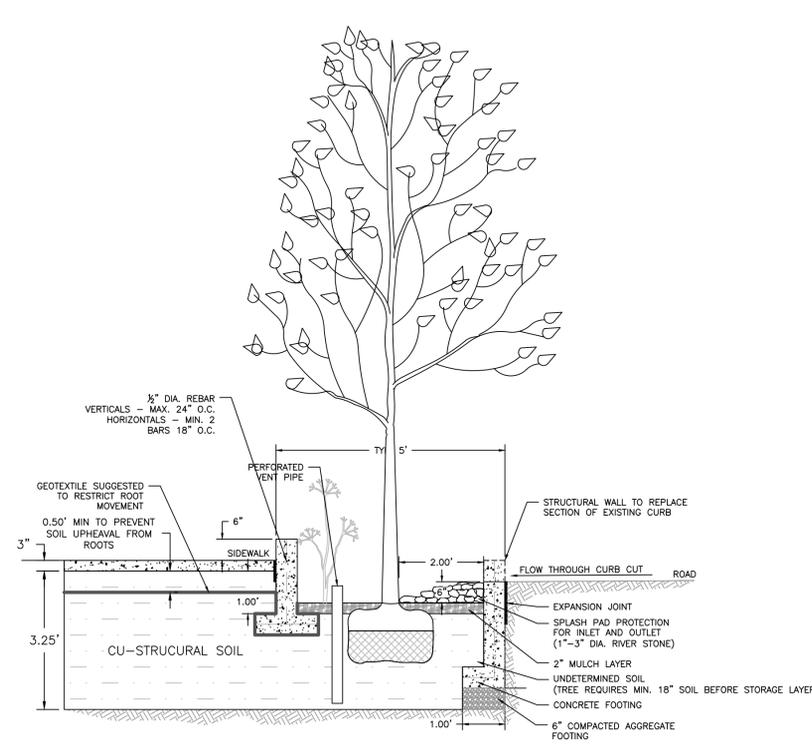
1 EXTENDED TREE BED (W/ DROP)
DT-3 N.T.S.

THIS VERSION INCLUDES A 6" DROP FROM THE STREET LEVEL TO ALLOW STORMWATER INTO THE SYSTEM FROM THE ROADWAY. PROTECTION IS NEEDED WITH EITHER A RAISED CURB OR FENCING TO AVOID A TRIPPING HAZARD



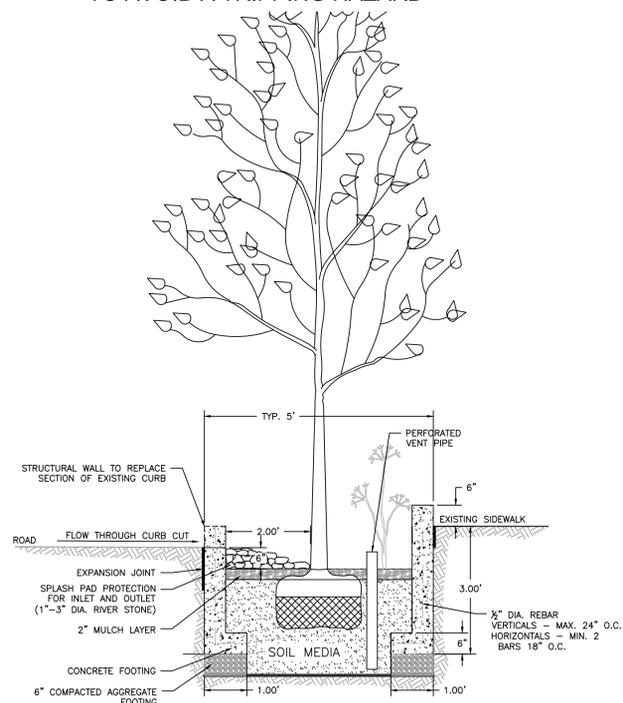
3 EXTENDED TREE BED (EXPANDED STORAGE)
DT-3 N.T.S.

PROVIDES GREATER SOIL VOLUME AND STORMWATER STORAGE VOLUME. CONSIDER EXPANDED STORAGE UNDER THE ROADWAY AS WELL.

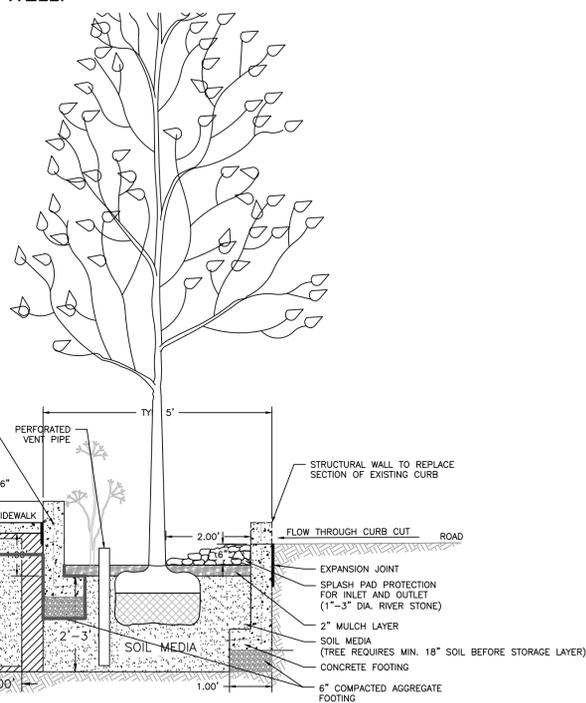


4 EXTENDED TREE BED (STRUCTURAL SOIL) CROSS SECTION
DT-3 N.T.S.

STRUCTURAL SOILS HAVE 25% VOIDS COMPARED TO 35% OF STONE (LESS STORMWATER STORAGE), BUT PROVIDE SOIL VOLUME TO THE TREE BY SUPPORTING THE PAVEMENT TO PREVENT COMPACTION.

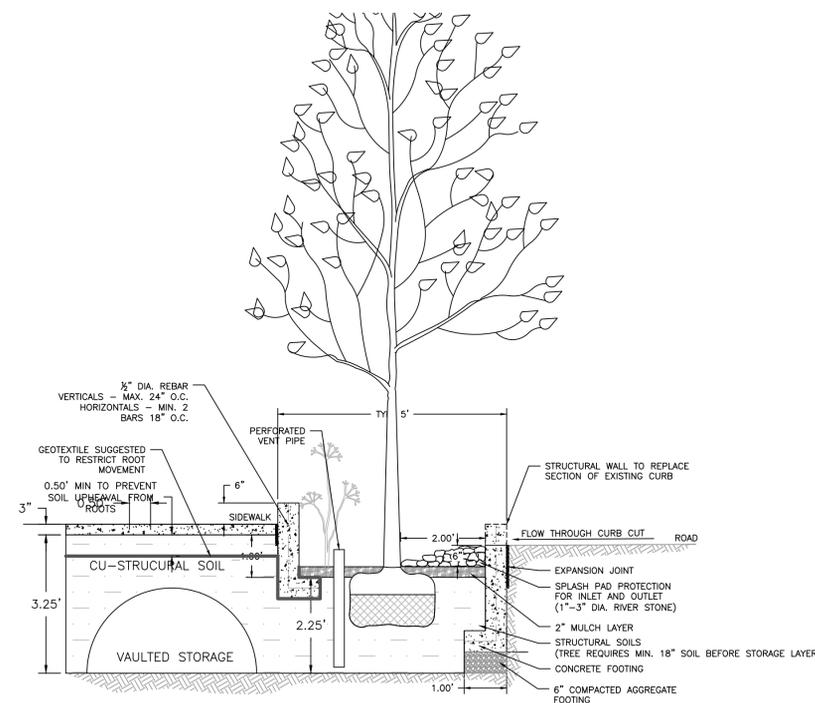


2 EXTENDED TREE BED (STANDARD) CROSS SECTION
DT-3 N.T.S.



5 EXTENDED TREE BED (SUPPORTED PAVEMENT) CROSS SECTION
DT-3 N.T.S.

THIS SYSTEM IS MORE COMPLEX TO INSTALL, BUT PROVIDES HIGHER POROSITY FOR STORMWATER AND ALLOWS USE OF MORE SPECIFIED SOILS. NEED TO CONSIDER BOTH PLANTING SYSTEM AND SIMILARITY TO SURROUNDING SOILS. CAN UTILIZE STRUCTURAL CELLS OR SUSPENDED SIDEWALKS.



6 EXTENDED TREE BED (VAULTED STORAGE) CROSS SECTION
DT-3 N.T.S.

FOR OPTIMIZING STORMWATER STORAGE, CONSIDER A VAULTED STORAGE OPTION. THERE WILL BE A TRADE OFF IN TERMS OF SOIL VOLUME FOR THE TREE.

CHRISTOPHER C. OBROPTA, Ph.D., P.E.
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ENHANCED TREE PLANTINGS FOR STORMWATER
LANDSCAPE SCALE RESTORATION GRANT

STORAGE VARIATION DETAILS



SHEET NAME

DT-3

INLET OPTIONS (EXTENDED TREE BEDS)

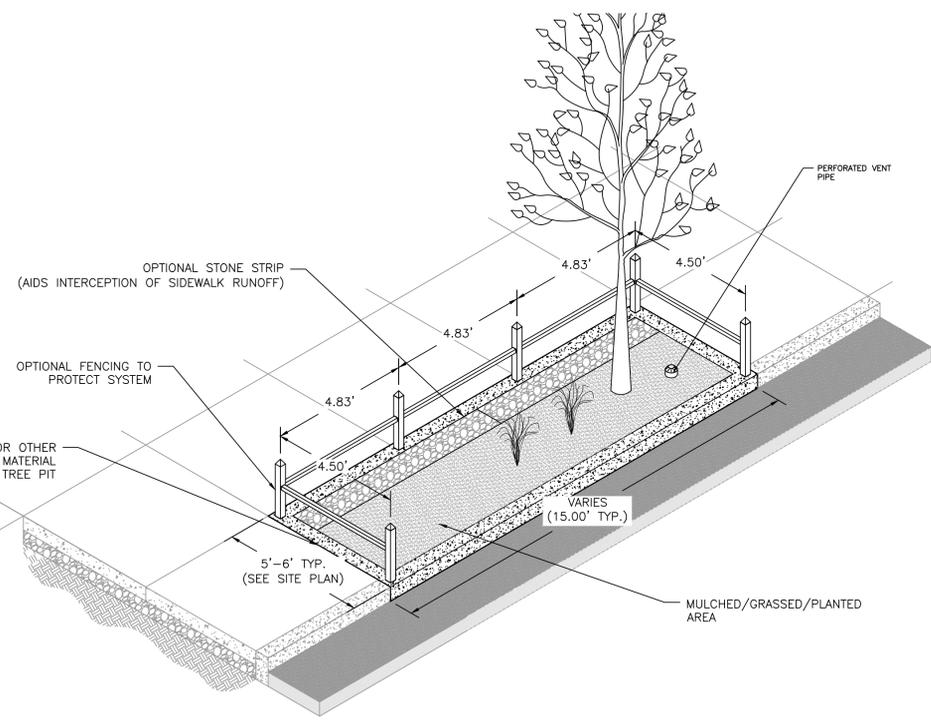
CHRISTOPHER C. OBROPTA, Ph.D., P.E.
 PROFESSIONAL ENGINEER - NJ LICENSE # 37532
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ENHANCED TREE PLANTINGS FOR STORMWATER
 LANDSCAPE SCALE RESTORATION GRANT
 INLET VARIATIONS DETAILS

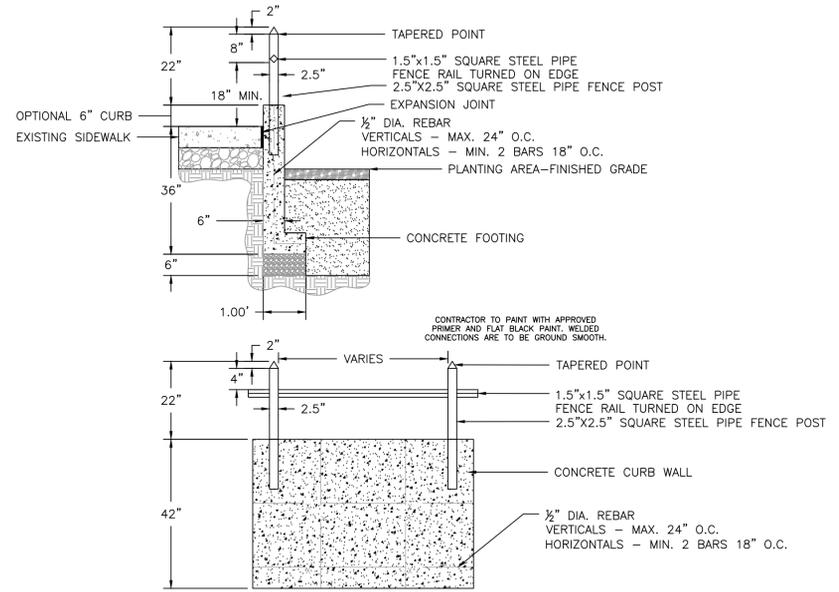


SHEET NAME
 DT-4



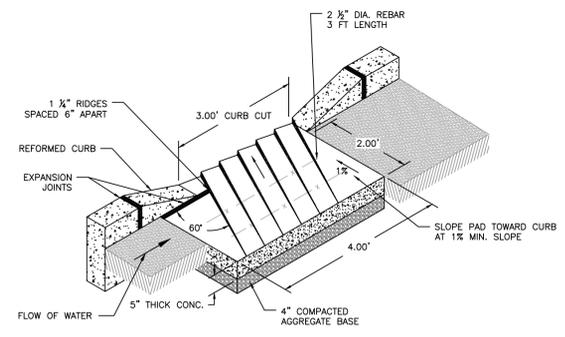
1 EXTENDED TREE BED (VAR. A)
 DT-4 N.T.S.

THIS SYSTEM IS FLUSH WITH THE SIDEWALK LEVEL AND ONLY WILL INTERCEPT RUNOFF FROM THE SIDEWALK. TO AVOID WATER GOING AROUND THE SYSTEM, STONE CAN BE USED TO HELP INTERCEPT RUNOFF.



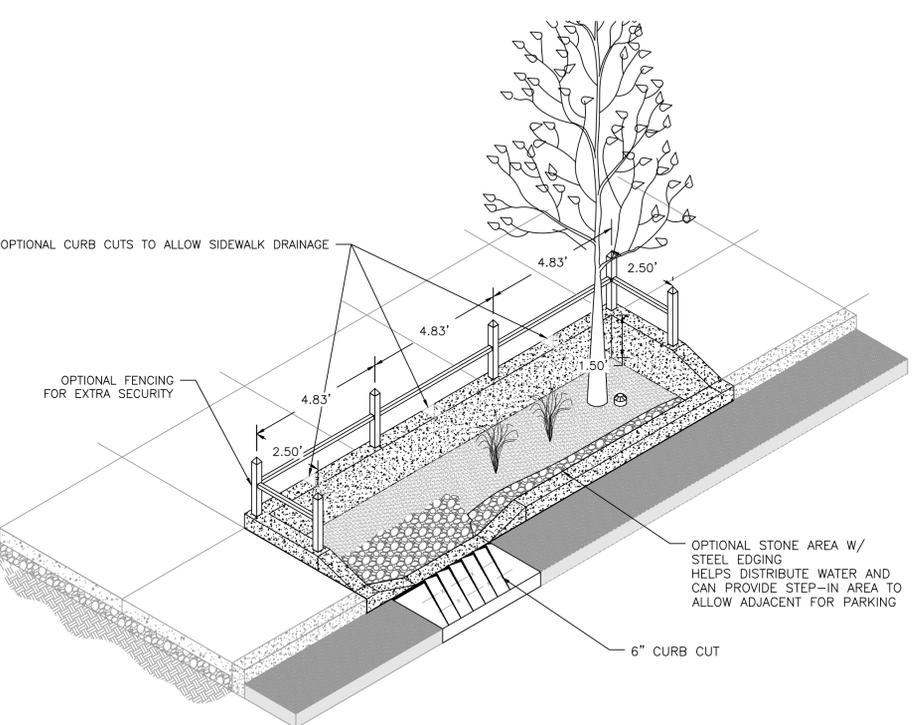
2 TREE BED FENCING DETAIL
 DT-4 N.T.S.

AN EXAMPLE FENCING DETAIL.



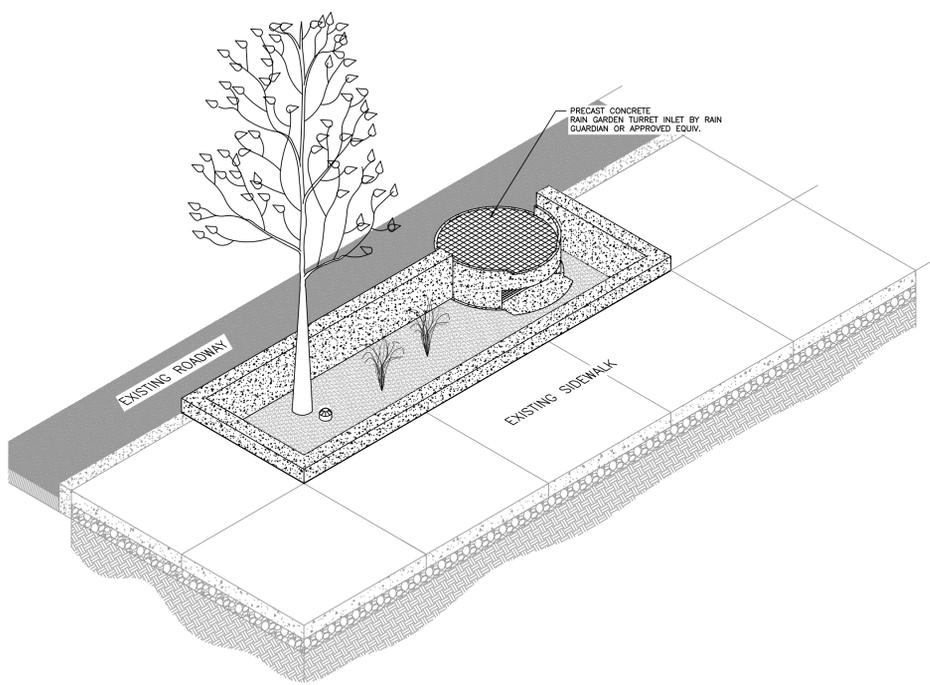
3 CONCRETE FLOW PAD DETAIL
 DT-4 N.T.S.

AN EXAMPLE CONCRETE FLOW PAD DETAIL.



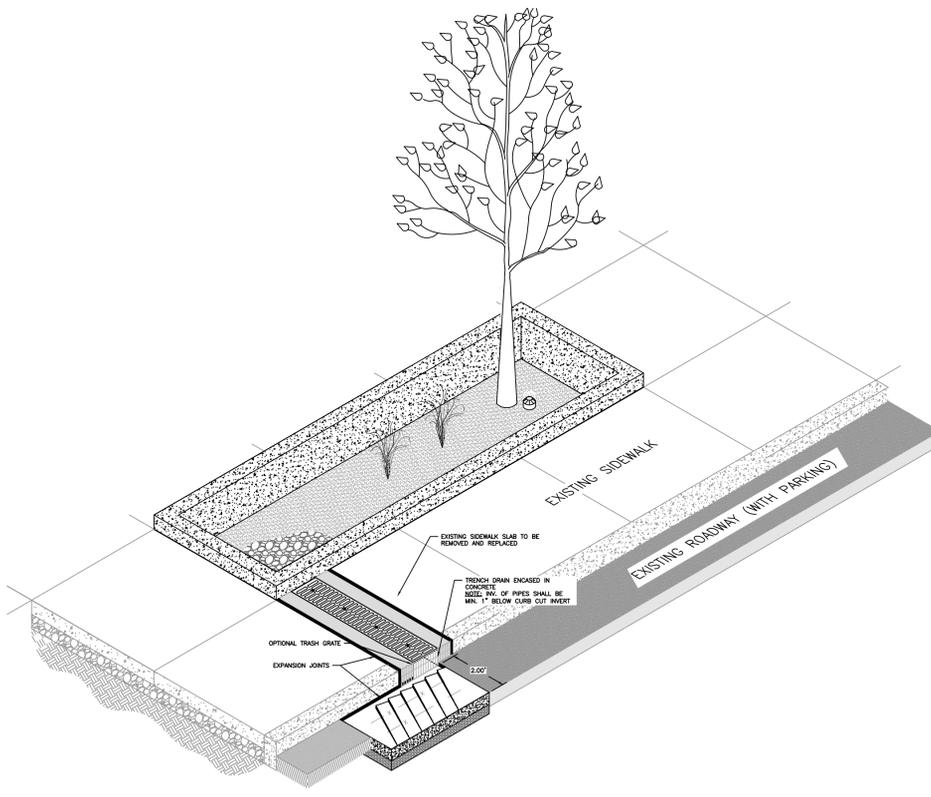
4 EXTENDED TREE BED (CURB CUT)
 DT-4 N.T.S.

A CURB CUT WITH CONCRETE FLOW PAD HELP REDIRECT WATER FROM THE ROADWAY INTO THE SYSTEM. ADDITIONAL CUTS IN THE SURROUNDING CURB CAN BE ADDED TO ALLOW FLOW OF WATER FROM THE SIDEWALK TOO.



5 EXTENDED TREE BED (CATCH BASIN)
 DT-4 N.T.S.

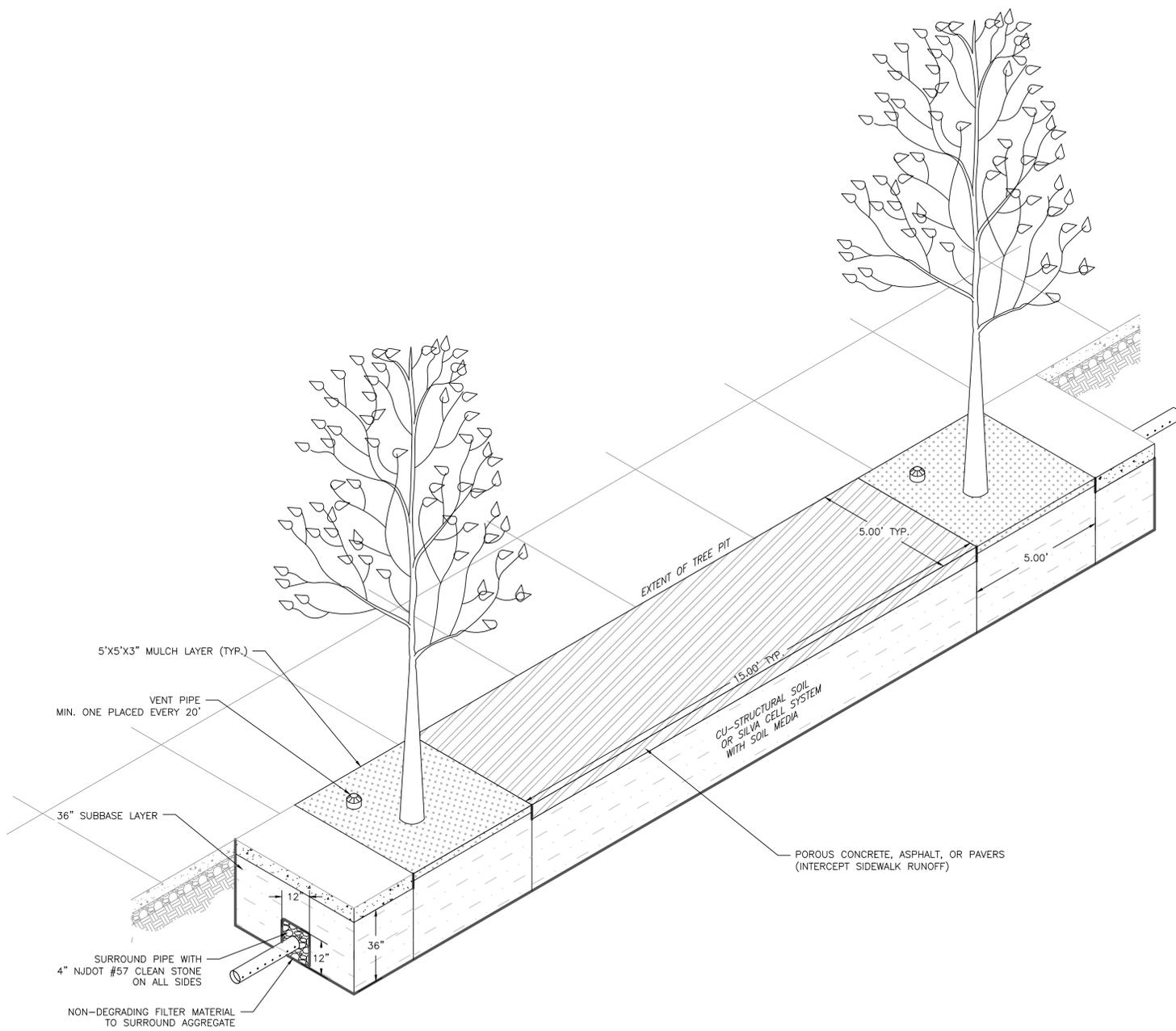
A CATCH BASIN INSET INTO OR ADJACENT TO THE SYSTEM CAN HELP RELIABLY INTERCEPT STORMWATER WHILE KEEPING DEBRIS FROM GETTING INTO THE SYSTEM.



6 EXTENDED TREE BED (TRENCH DRAIN)
 DT-4 N.T.S.

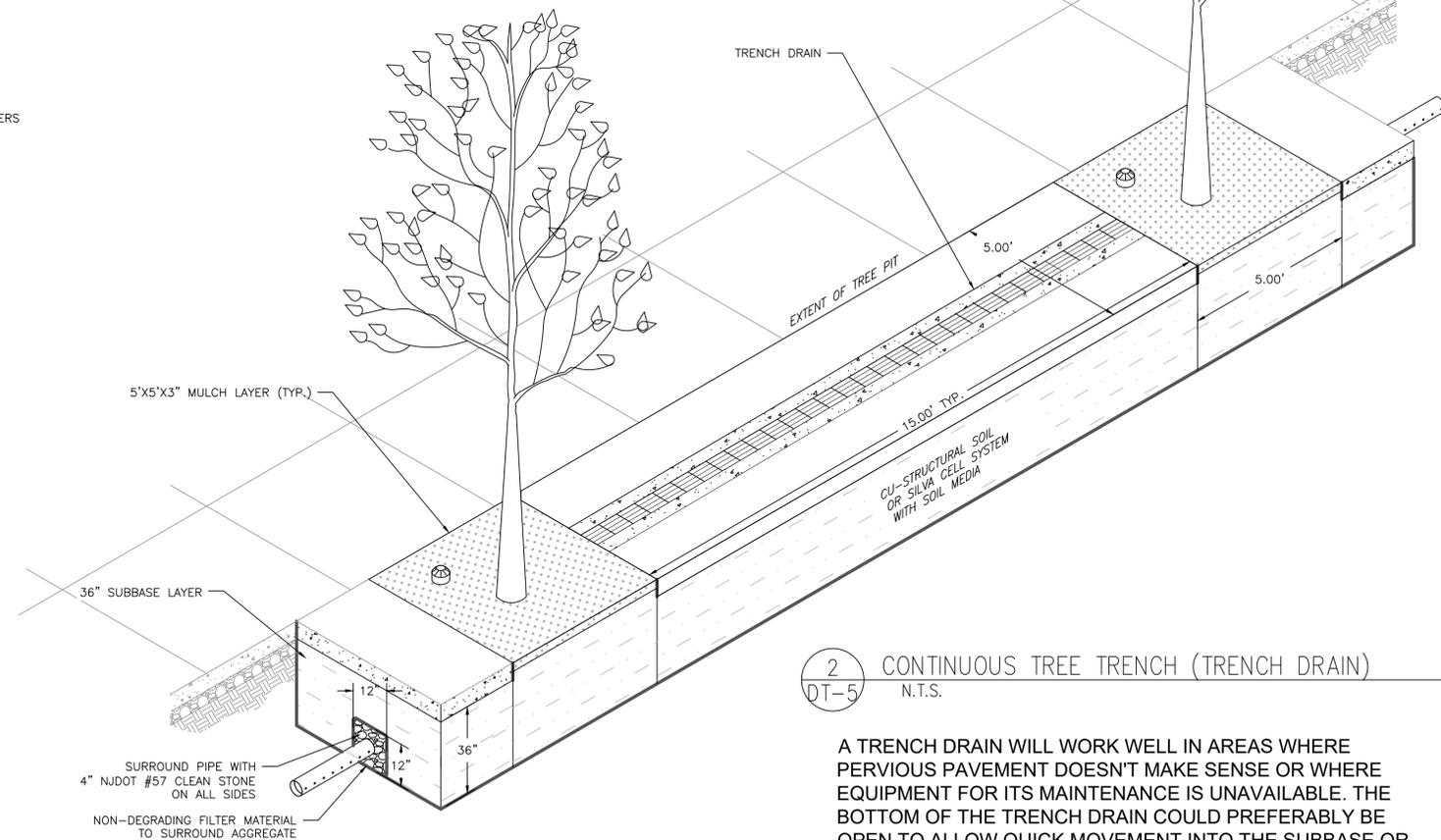
A TRENCH DRAIN CAN HELP WHERE PARKING MUST BE PRESERVED ALONG THE ROADWAY, SO THE SYSTEM DOES NOT CONFLICT.

CONTINUOUS TREE TRENCH SIDEWALK INTERCEPTION



1 CONTINUOUS TREE TRENCH (PERVIOUS PAVEMENT)
DT-5 N.T.S.

PERVIOUS PAVEMENT (CONCRETE, ASPHALT, OR PAVERS) WILL INTERCEPT THE WATER FROM THE SIDEWALK AND ALLOW RAPID FLOW INTO THE UNDERLYING LAYERS. THE WIDTH OF THE STRIP CAN BE FLEXIBLE



2 CONTINUOUS TREE TRENCH (TRENCH DRAIN)
DT-5 N.T.S.

A TRENCH DRAIN WILL WORK WELL IN AREAS WHERE PERVIOUS PAVEMENT DOESN'T MAKE SENSE OR WHERE EQUIPMENT FOR ITS MAINTENANCE IS UNAVAILABLE. THE BOTTOM OF THE TRENCH DRAIN COULD PREFERABLY BE OPEN TO ALLOW QUICK MOVEMENT INTO THE SUBBASE OR BE PITCHED TOWARD THE ADJACENT TREES.

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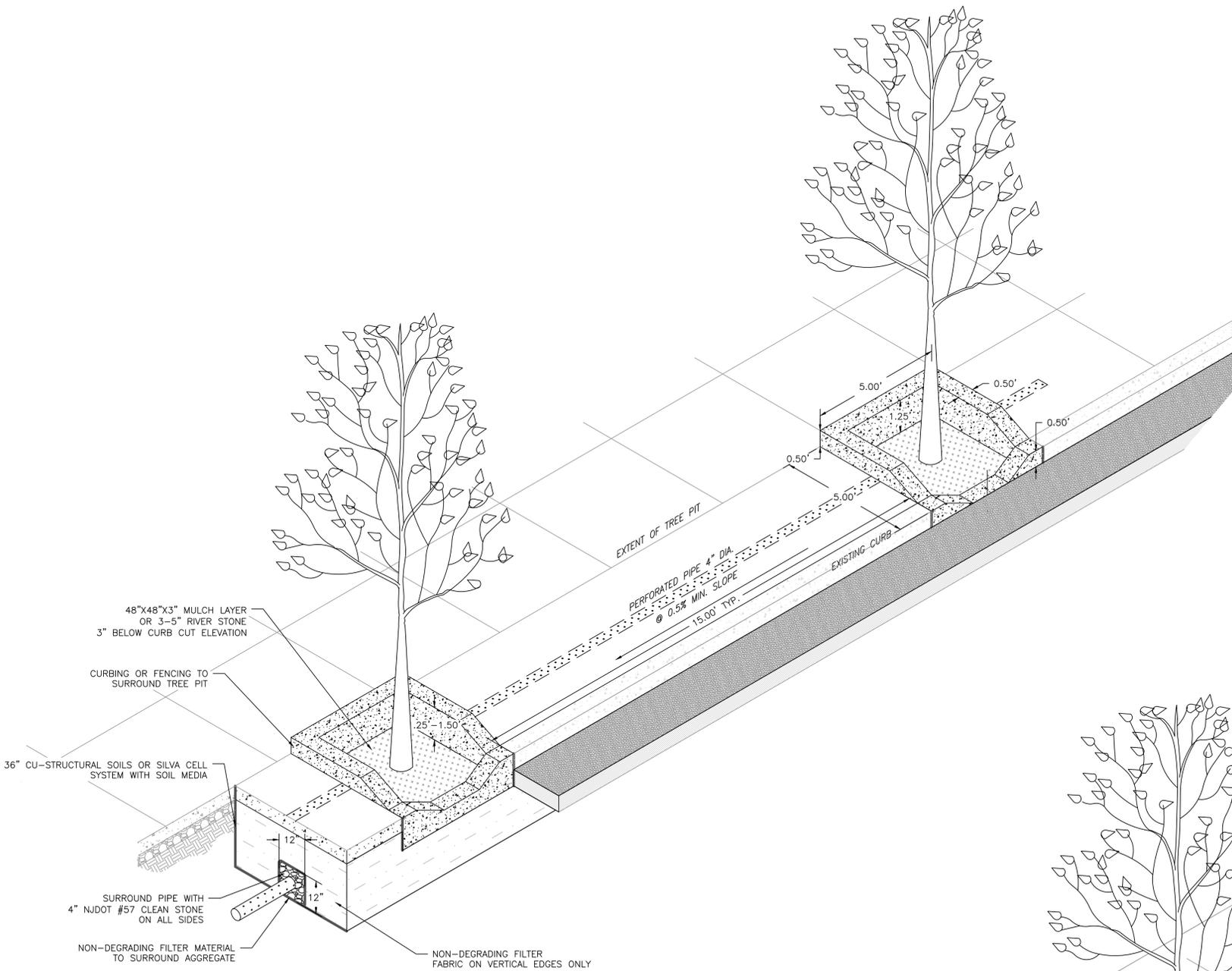
ENHANCED TREE PLANTINGS FOR STORMWATER
LANDSCAPE SCALE RESTORATION GRANT

CONTINUOUS TREE TRENCH DETAILS 1



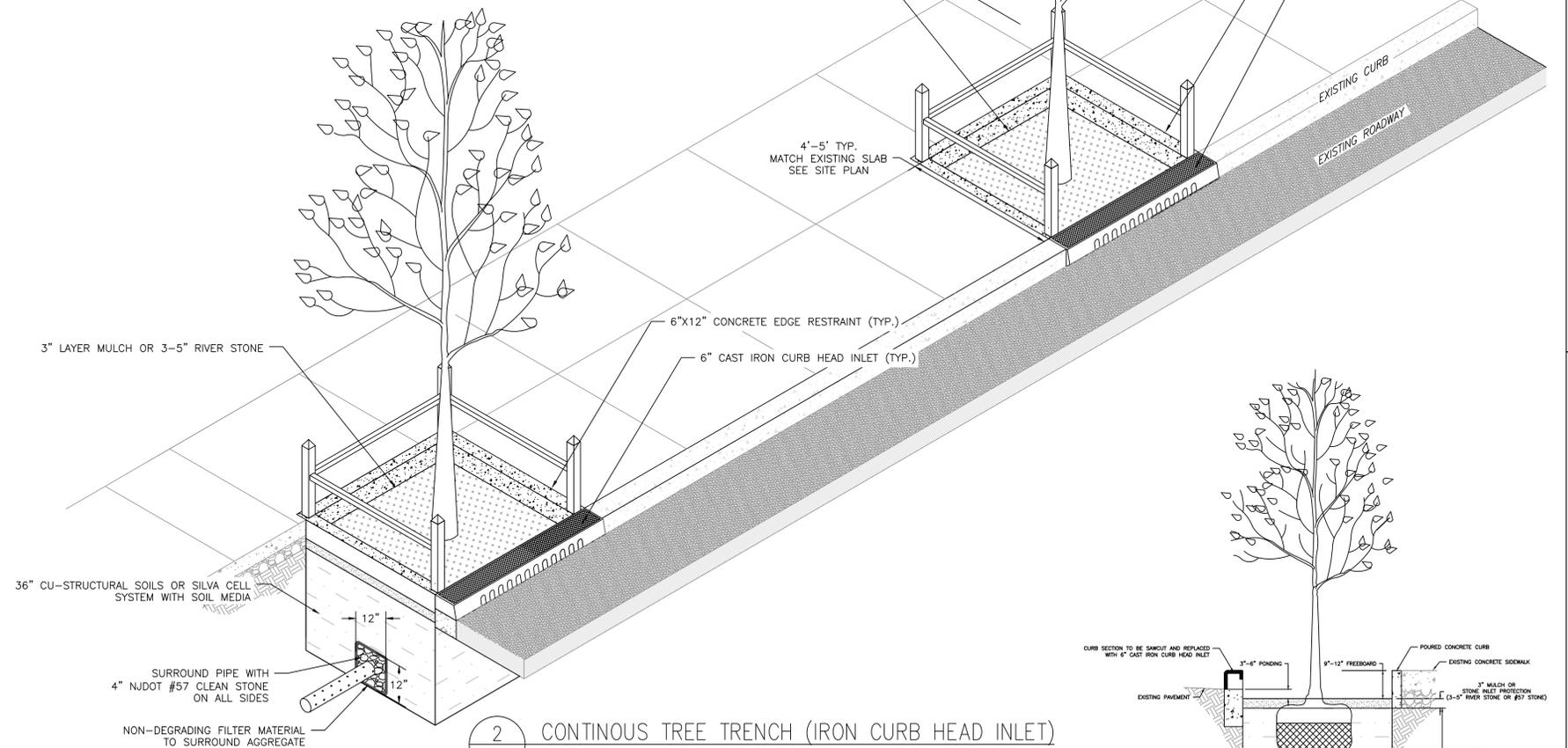
CONTINUOUS TREE TRENCH ROADWAY INTERCEPTION

A DISTRIBUTION PIPE MAY BE NEEDED IN THESE SYSTEMS TO HELP DISTRIBUTE WATER RAPIDLY ENOUGH INTO THE SUBBASE DUE TO THE SMALL RELATIVE AREA OF THE TREE PIT.



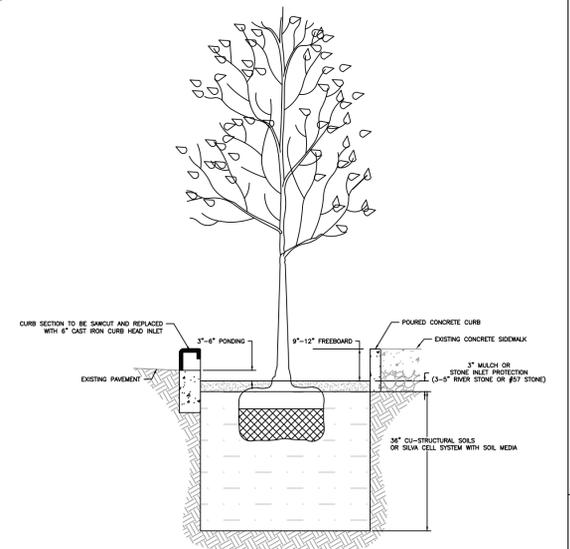
1 CONTINUOUS TREE TRENCH (CURB CUTS)
DT-5 N.T.S.

A CURB CUT INTO THE TREE PIT WILL ALLOW WATER TO ENTER THE SYSTEM FROM THE ROADWAY. A DROP (3"-6") IS NEEDED IN THE TREE BED TO AID IN THE CONVEYANCE OF WATER INTO THE SYSTEM. A CONCRETE FLOW PAD CAN ALSO ASSIST IN CONVEYING WATER INTO THE SYSTEM. THE COVERING MAY STILL BE MULCH, BUT A RIVER STONE MAY BE PREFERRED AS THE DROP MAY LEAD TO EROSION OVER TIME.



2 CONTINUOUS TREE TRENCH (IRON CURB HEAD INLET)
DT-5 N.T.S.

A CAST IRON CURB HEAD INLET WOULD ALLOW NO DISTINCT CUT IN THE CURB AND MAY BE BETTER WHERE THERE IS ADJACENT PARKING. THE INLET COULD POTENTIALLY GET CLOGGED AND NEED TO BE CLEANED THOUGH.



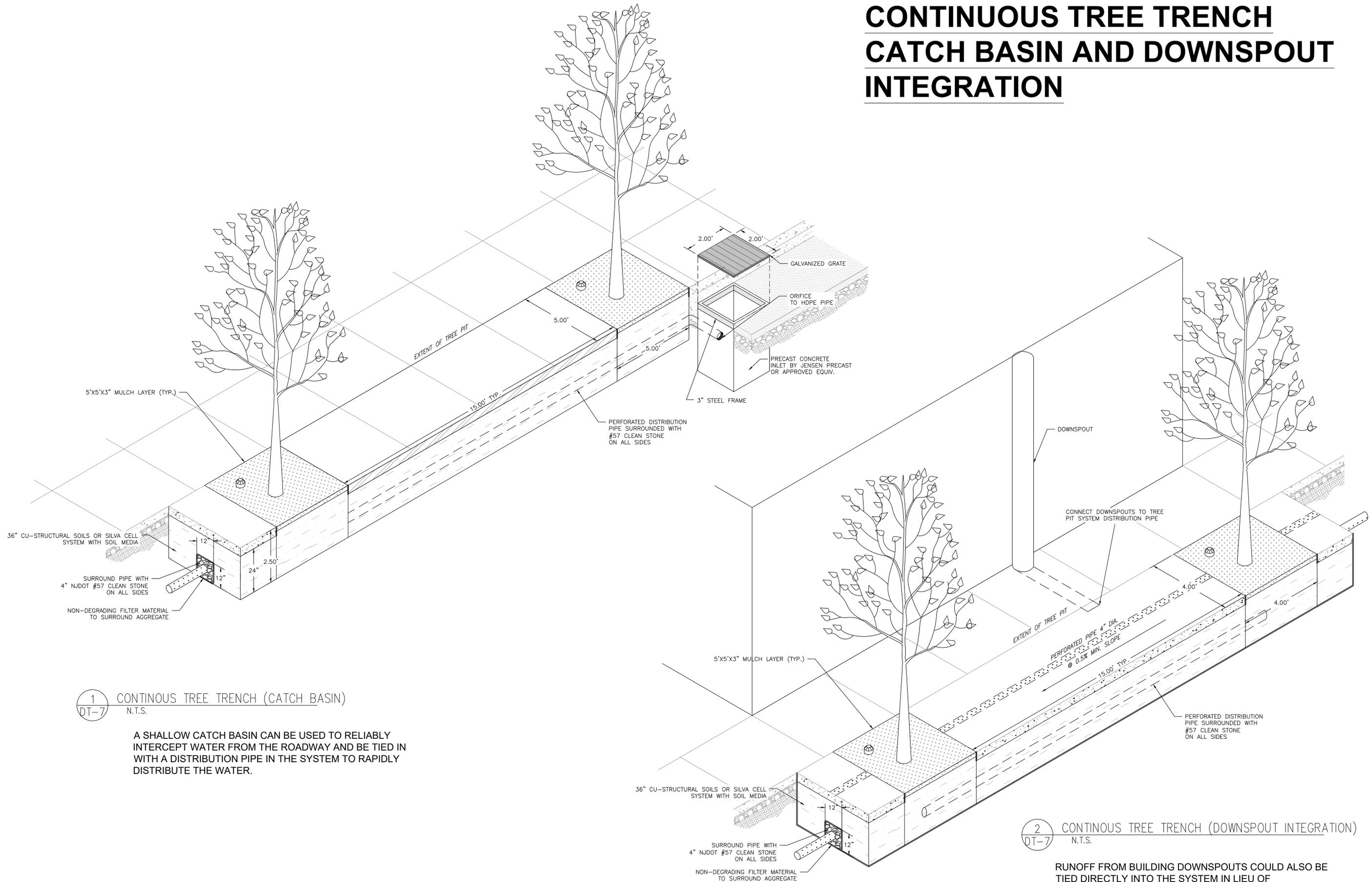
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ENHANCED TREE PLANTINGS FOR STORMWATER
LANDSCAPE SCALE RESTORATION GRANT
CONTINUOUS TREE TRENCH DETAILS 2



CONTINUOUS TREE TRENCH CATCH BASIN AND DOWNSPOUT INTEGRATION



1 CONTINUOUS TREE TRENCH (CATCH BASIN)
DT-7 N.T.S.

A SHALLOW CATCH BASIN CAN BE USED TO RELIABLY INTERCEPT WATER FROM THE ROADWAY AND BE TIED IN WITH A DISTRIBUTION PIPE IN THE SYSTEM TO RAPIDLY DISTRIBUTE THE WATER.

2 CONTINUOUS TREE TRENCH (DOWNSPOUT INTEGRATION)
DT-7 N.T.S.

RUNOFF FROM BUILDING DOWNSPOUTS COULD ALSO BE TIED DIRECTLY INTO THE SYSTEM IN LIEU OF DISCONNECTING IT AND USING PERVIOUS PAVEMENT OR TRENCH DRAIN TO INTERCEPT IT. A DISTRIBUTION PIPE ALSO MAKES SENSE HERE TO AVOID ANY BACK-UP IN THE DOWNSPOUT SYSTEM.

CHRISTOPHER C. OBROPTA, Ph.D., P.E.
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CONTINUOUS TREE TRENCH DETAILS 3



