STORM WATER DRAINAGE DESIGN MANUAL AMENDMENT 2016

Prepared by

Alpine City

Alpine City
20 N. Main
Alpine, UT 84004

ADOPTED August 23, 2016

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August 2016

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INTRODUCTION

March 1, 2016 the State of Utah issued an updated Municipal Separate Storm Sewer System (MS4) permit (UTR090000) to municipalities. The permit had multiple updates, two of which that affect the way storm water is handled within MS4's. These will be briefly explained with details to follow. First, Low Impact Development (LID) is now required. LID uses alternative ways of handling storm water to infiltrate water where it falls rather than forcing it downstream. Second, the total volume of rainwater to discharge from a site is now regulated where in the past only the rate of flow was regulated. Municipalities are now required to retain, infiltrate, evapotranspire, or re-use rainwaters up to and including the 90th percentile storm event. This means all storms less than or equal to a size of storm the city receives 90 percent of the time must be retained onsite via LID practices or retention.

AMENDMENTS

LOW IMPACT DEVELOPMENT

Low Impact Development is added after the first paragraph of section 3.2 of the Storm Water Drainage Design Manual (SWDDM) to read as follows:

"Low Impact Development is a required approach for storm water control. State MS4 Permit UTR090000 Section 4.2.5.3.2 reads:

> *"For new development or redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, the program shall include a process which requires the evaluation of a Low Impact Development (LID) approach which encourages the implementation of BMPs that infiltrate, evapotranspire or harvest and use storm water from the site to protect water quality. Structural controls may include green infrastructure practices such as rainwater harvesting, rain gardens, permeable pavement, and vegetated swales. If an LID approach cannot be utilized, the Permittee must document an explanation of the reasons preventing this approach and the rationale for the chosen alternative controls on a case by case basis for each project."*

State MS4 Permit UTR090000 Section 4.2.5.3.4 reads:

> *"Each Permittee shall develop and define specific hydrologic method or methods for calculating runoff volumes and flow rates to ensure consistent sizing of structural BMPs in their jurisdiction and to facilitate plan review. Within 180 days from the effective date of this Permit, new development or redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale must manage rainfall on-site, and prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 90th percentile rainfall event. This objective must be accomplished by the use of practices that are designed, constructed, and maintained to infiltrate, evapotranspire and/or harvest and reuse rainwater. The 90th percentile rainfall event is the event whose precipitation total is greater than or equal to the 90 percent of all storm events over a given period of record. If meeting this retention standard is technically infeasible, a rationale shall be provided on a case by case basis for the use of alternative design criteria. The project*

must document and quantify that infiltration, evapotranspiration and rainwater harvesting have been used to the maximum extent technically feasible and that full employment of these control are infeasible due to site constraints."

90TH PERCENTILE STORM

1. Historical rain data is available for Alpine City dated to the year 1900. Using this data, the 90th percentile storm event for Alpine City is 0.55 inches which is shown in Appendix E. This is the amount that must be retained onsite. The applicant must provide calculations and details as to how this will be achieved.
2. Only storm volumes greater than the 90th percentile storm can be discharged at the rate described in section 3.3, though it is encouraged LID be maximized on each site. 100-year storage requirements still apply (SWDDM Section 3.1.1).

LID REQUIREMENTS

1. No two developments are the same due to changing site conditions. Every development will be different in how the LID requirement is achieved. Appendix F contains a list of LID details and more explanation. Alpine City is open to review ideas that are not contained in Appendix F, final approval must be obtained from the City Engineer. "

AMENDED SECTION 2.2

Section 2.2, first paragraph, shall be amended to read as follows:

"A Conceptual Drainage Plan and Report is required for *new development or redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale*. The report shall contain the following information."

Item 9 shall be added to Section 2.2 (report requirements) to read as follows:

"*9. General description of how the development will achieve the Low Impact Development and 90th percentile storm event requirements as set forth in section 3.2.*"

Item 12 of Section 2.2 (drawing requirements) shall be amended to read as follows:

"*12.* Other relevant drainage features *including but not limited to indicating all existing and proposed low points on the plan to ensure proper drainage.*"

AMENDED SECTION 2.3

Section 2.3, first paragraph, shall be amended to read as follows:

"A final Drainage Plan and Report is required for *new development or redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale* and shall be prepared by a

professional civil engineer registered in the State of Utah. The report portion of the Drainage Plan and Report shall contain the following:"

Items 20 and 21 shall be added to Section 2.3 (report requirements) to read as follows:

"20. *Description and calculations of how the development achieved the Low Impact Development and 90th percentile storm event requirements as set forth in section 3.2.*

21. If the Final Plat is to be presented in sections, a general drainage plan for the entire area shall be presented with the first section, an appropriate development stages for the drainage system for each section indicated."

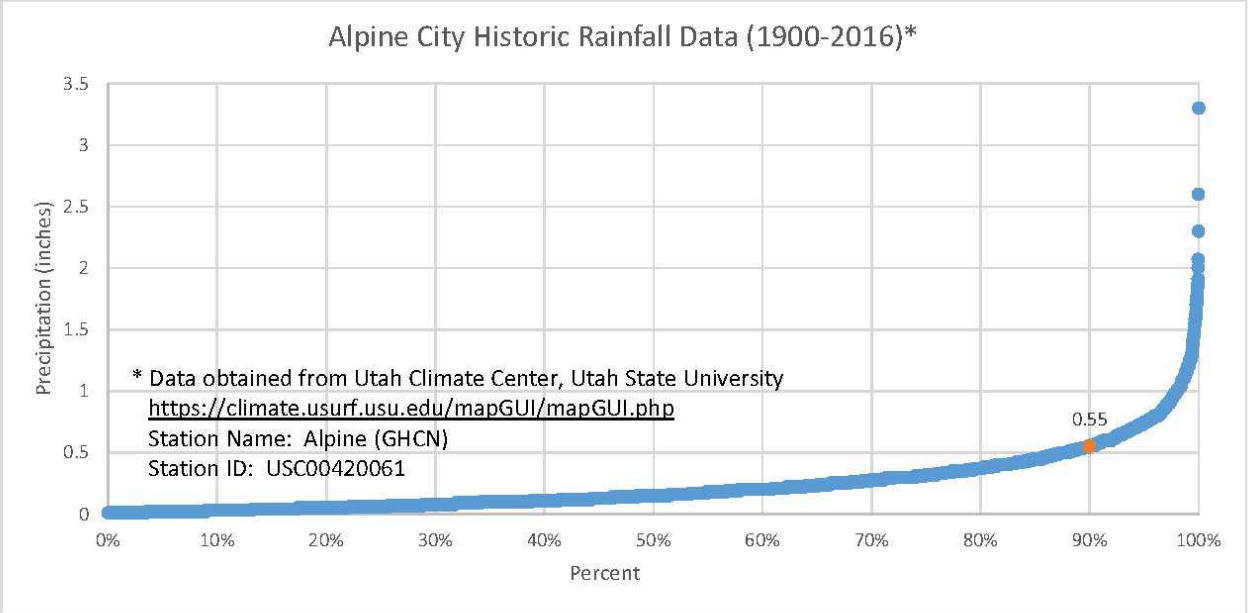
AMENDED SECTION 3.3.4

Section 3.3.4 shall be changed to read as follows:

"4. Landscaping and sprinklers shall be installed upon recommendation of the *City Engineer* and Planning Commission to the City Council."

APPENDIX E – 90th PERCENTILE EVENT DATA

Data to calculate the 90th percentile storm for Alpine City Utah was taken from the Utah Climate Center, Utah State University. Daily values were acquired for the years 1900 to 2016. The data was then sorted by precipitation and all non-rainfall values were eliminated. What was left was the rainfall values, they were sorted by amount and charted as shown below. As shown, the 90th percentile storm for Alpine City is 0.55 inches are rainfall.



APPENDIX F – LOW IMPACT DEVELOPMENT

Low-Impact Development Techniques

State Permit UTR09000 requires that municipalities consider Low Impact Developments (LID's) for communities referenced in 4.2.5.3.2, 4.2.6.4, and 4.2.4.3.3. The following 7 categories with associated links are intended to assist developers of any sized project in proper planning and construction to encourage LID practices.

Bio-Retention areas: designed for site specific conditions to optimize the effectiveness of water filtration and retention. There is no standard. Creativity, ingenuity and dedication are the key to success.

- Aquatic Buffers
- Green Parking Lots
- Bioretention
- Soil Amendments
- Soil Restoration
- Created Wetlands
- Dispersal Trench
- Conveyance Furrow
- Urban Forestry
- Vegetation Restoration
- Biofiltration
- Stormwater Planters

Green Roofs: A bio retention area as well as a form of rain water collection; it also adds a public place and social element.

- Green Roofs
- Biofiltration

Permeable Pavements: allow for water to permeate through the surface, yet still give a hard surface for pedestrian and vehicular traffic.

- Break Up Flow Directions From Paved Surfaces
- Use Alternative Surfaces
- Green Parking Lots

Rain water collection: Utah law allows for re-use on site. For larger buildings such as offices and malls this is an impact that could greatly reduce storm drain usage in the area.

- Water Harvesting and Reuse
- Parking Lot and Street Storage
- Dispersal Trench
- Pop-Up Emitter

Riparian Buffers: Applied along a watershed by restricting development along creeks, streams, washes, etc. This keeps the natural flow of water, mitigates erosion and contamination, as well as provides an interconnected habitat for animals, and recreation opportunities.

- Protect Natural Site Functions
- Preserve Natural Corridors

- Aquatic Buffers

Green Street System: Includes the different aspects of rain gardens and swales along roads into an incorporated system for retention and filtration of storm water.

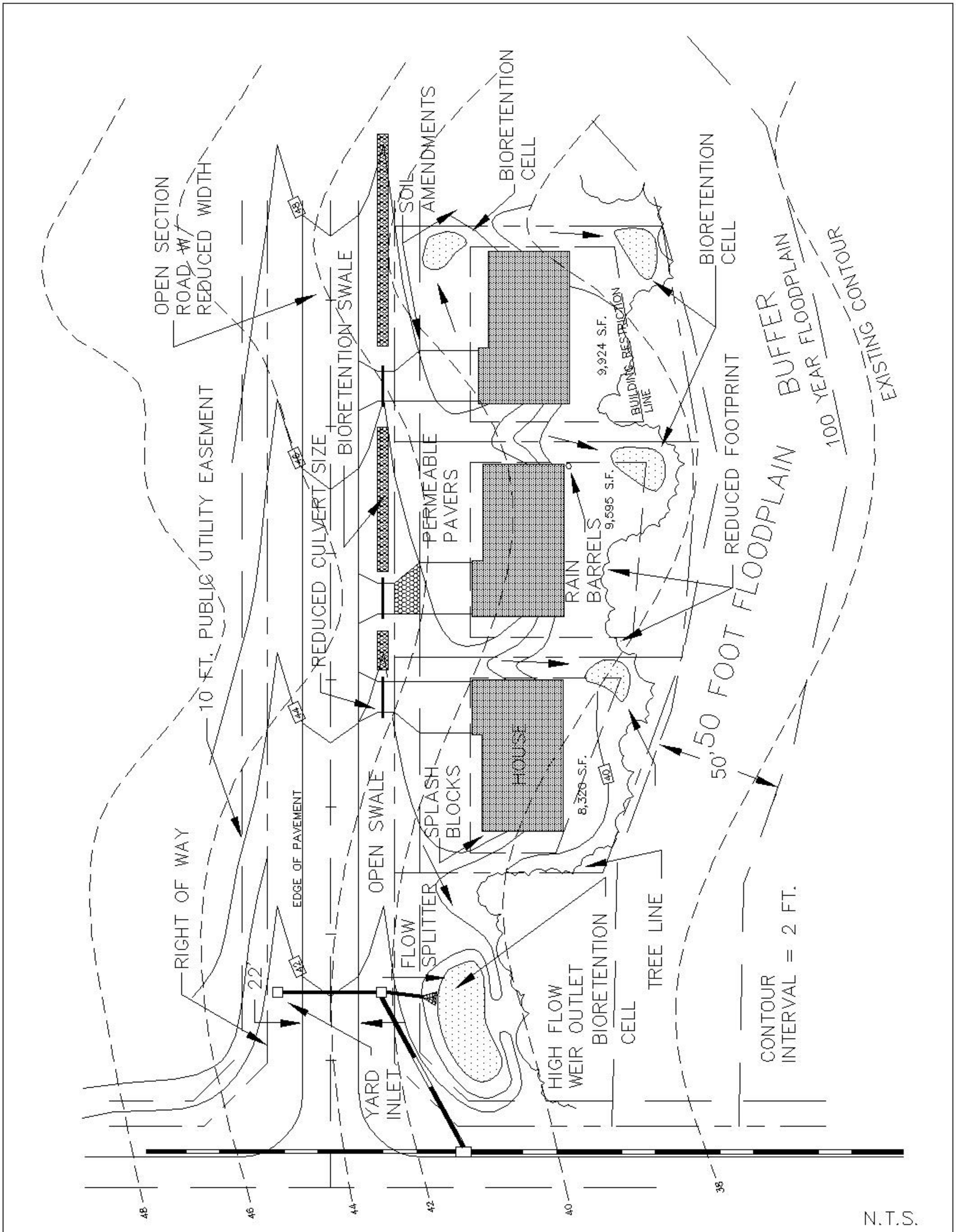
- Reduced Clearing and Grading
- Functional Grading
- Locate Impervious Surfaces to Drain to Natural Systems
- Minimize Directly Connected Impervious Areas
- Break Up Flow Directions From Paved Surfaces
- Trail and Path Network
- Narrow Roadways
- Reconfigure Driveways
- Alternative Turnarounds
- Green Parking Lots
- Stormwater Planters
- Urban Forestry
- Alternative Street Layouts
- Eliminate Curb and Gutter
- Tree Box Filters

Zoning/Alternative Development Configurations and Standards: creative zoning and development standards directed towards minimizing disturbances of the natural habitat and hydrology of the area.

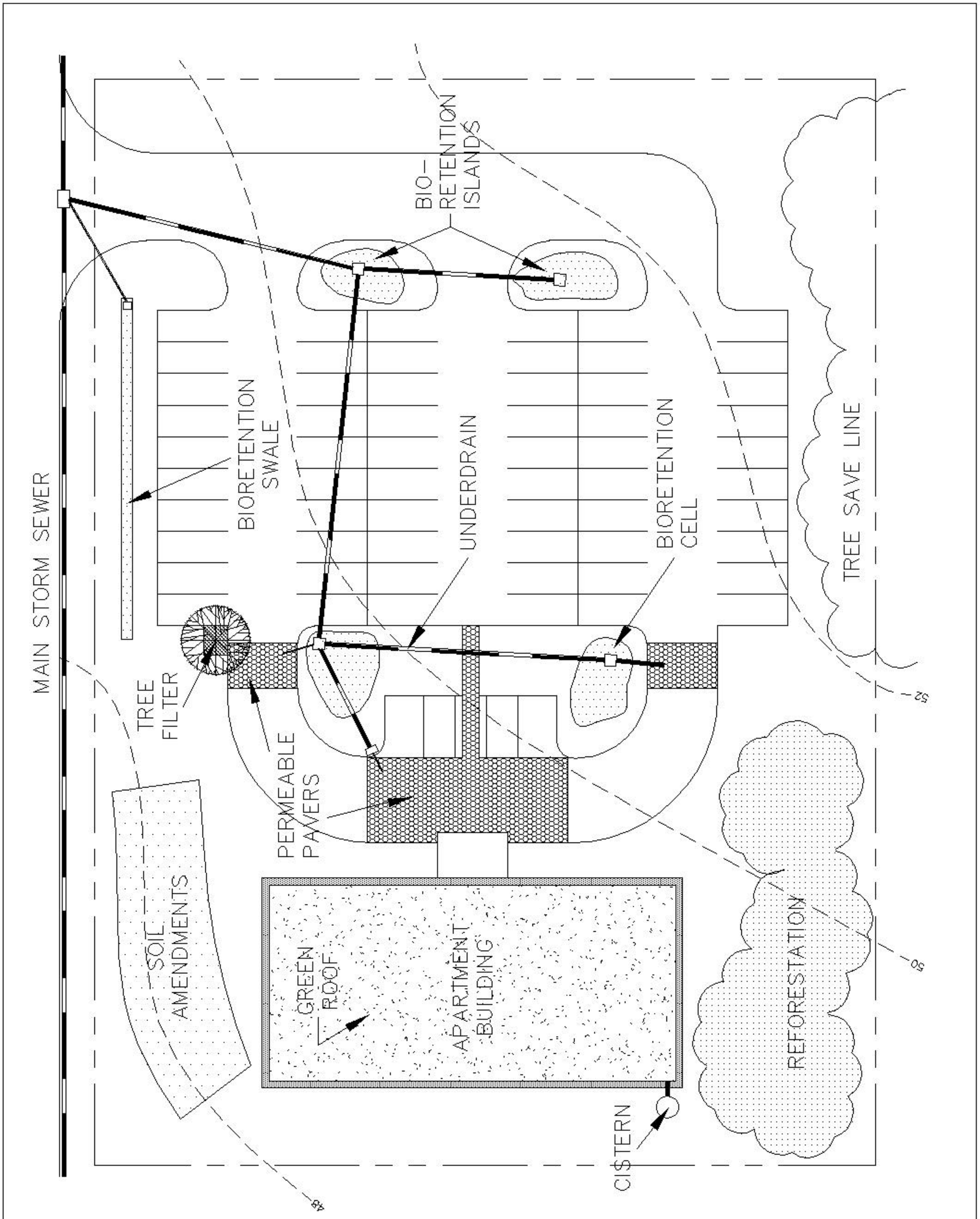
- Site Fingerprinting
- Fit Development to Natural Gradient
- Alternative Development Configurations
- Define Development Envelope
- Identify Sensitive Areas
- Alternative Lot Configuration
- Reconfigure Driveways
- Alternative Turnarounds
- Reduced Sidewalk Application
- Alternative Street Layouts
- Eliminate Curb and Gutter
- Large lot sizes – higher impervious area percentage
- Cluster Zoning – consolidating development – fewer impacted areas
- Development credits – limiting overall development in a community
- Considering conservation easements
- Limit maximum Directly Connected Impervious Areas (DCIA)

References:
www.lid-stormwater.net
(Tool created through Cooperative Assistance Agreement under the US EPA Office of Water 104b(3) Program)
http://www.epa.gov/owow/NPS/lid/lid.pdf *(Google "epa lid" if links do not work)*
http://www.deq.idaho.gov/water/data_reports/storm_water/catalog/sec_3/text.pdf

LID STANDARD DETAILS & IDEAS

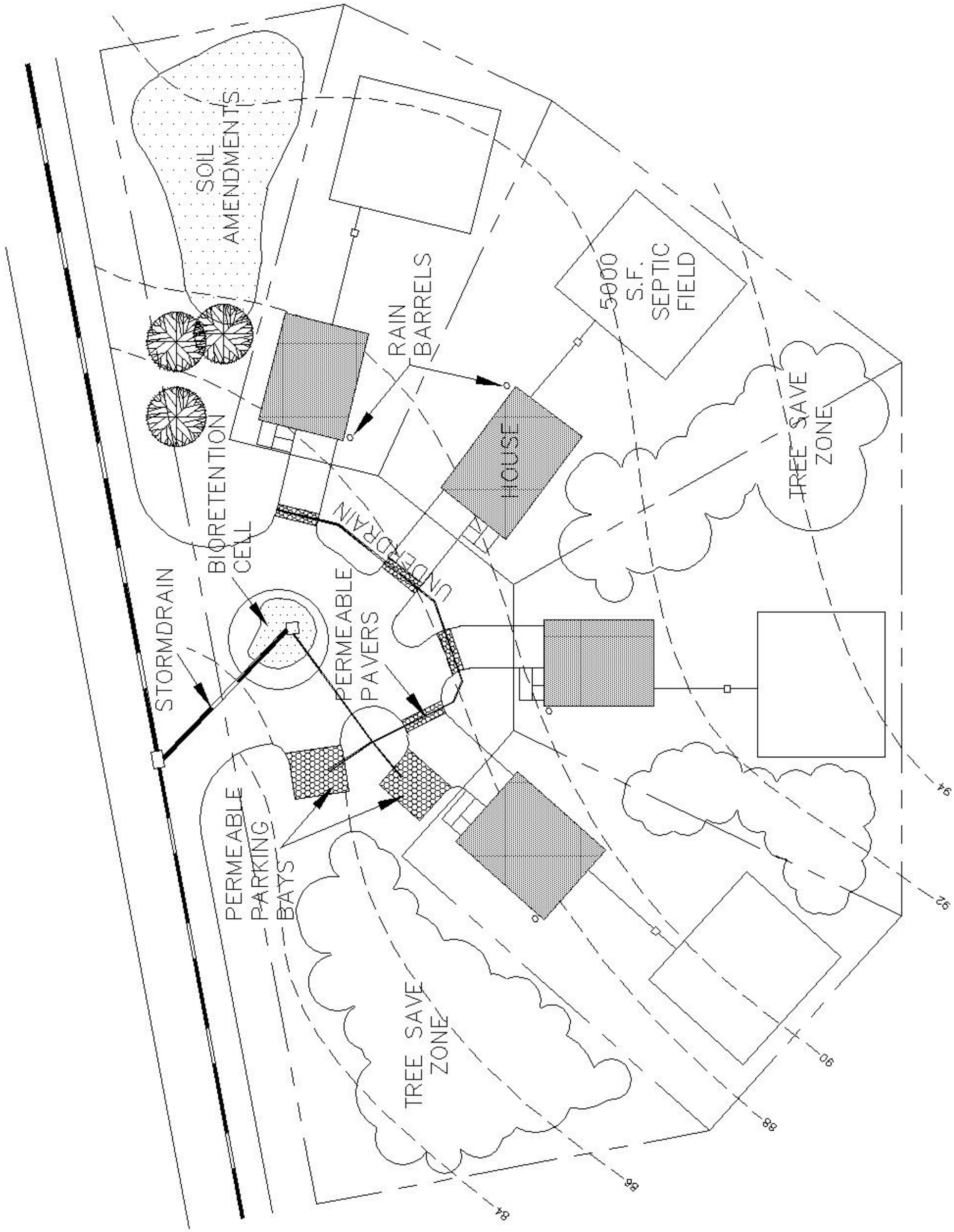


THE LOW IMPACT DEVELOPMENT CENTER, INC. WWW.LOWIMPACTDEVELOPMENT.ORG	LID SINGLE FAMILY EXAMPLE	EX. 1.0 NOV 2002

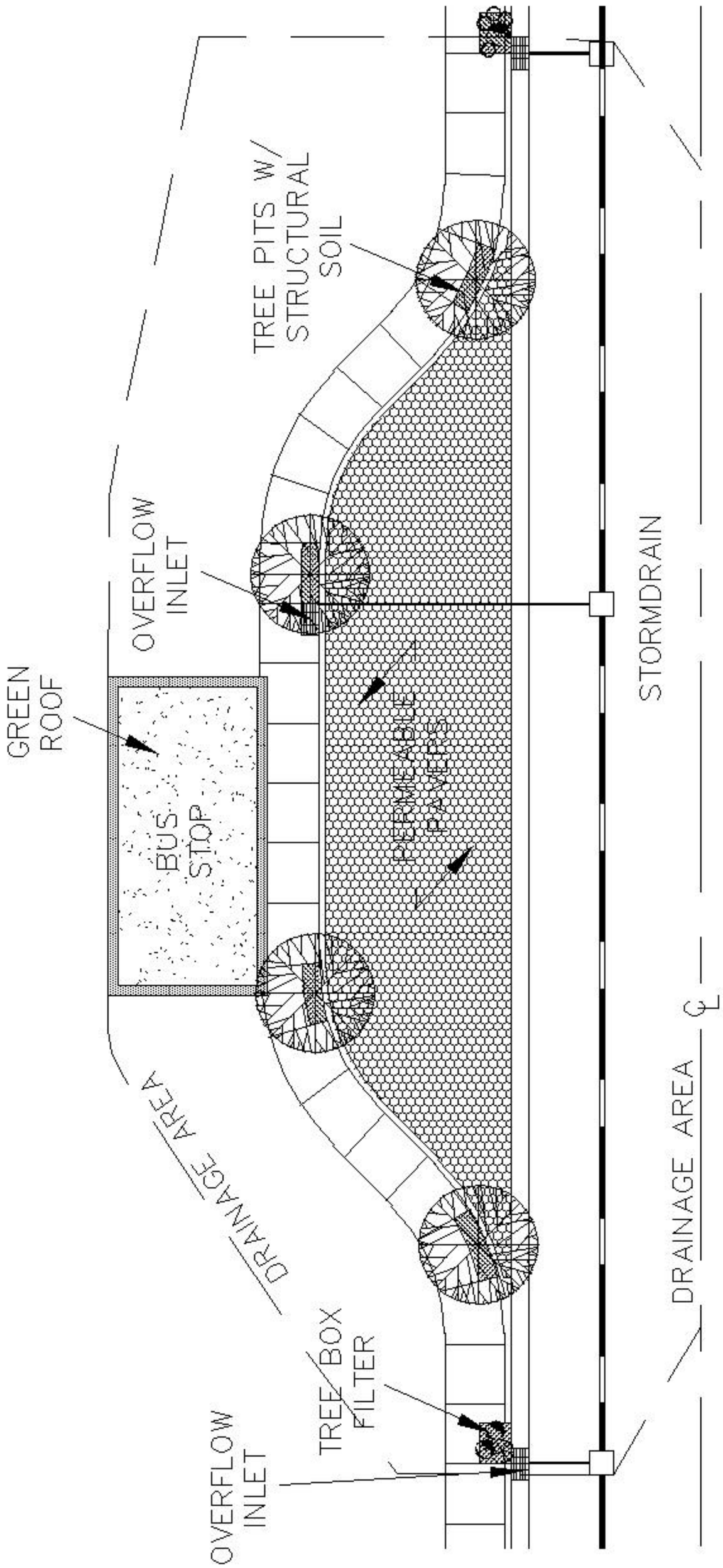


N.T.S.

THE LOW IMPACT DEVELOPMENT CENTER, INC. WWW.LOWIMPACTDEVELOPMENT.ORG	LID SUBURBAN HIGHRISE APARTMENT EXAMPLE	EX. 2.0 NOV 2002



THE LOW IMPACT DEVELOPMENT CENTER, INC. WWW.LOWIMPACTDEVELOPMENT.ORG	LID SUBDIVISION – ZERO LOT LINE EXAMPLE	EX. 3.0 NOV 2002



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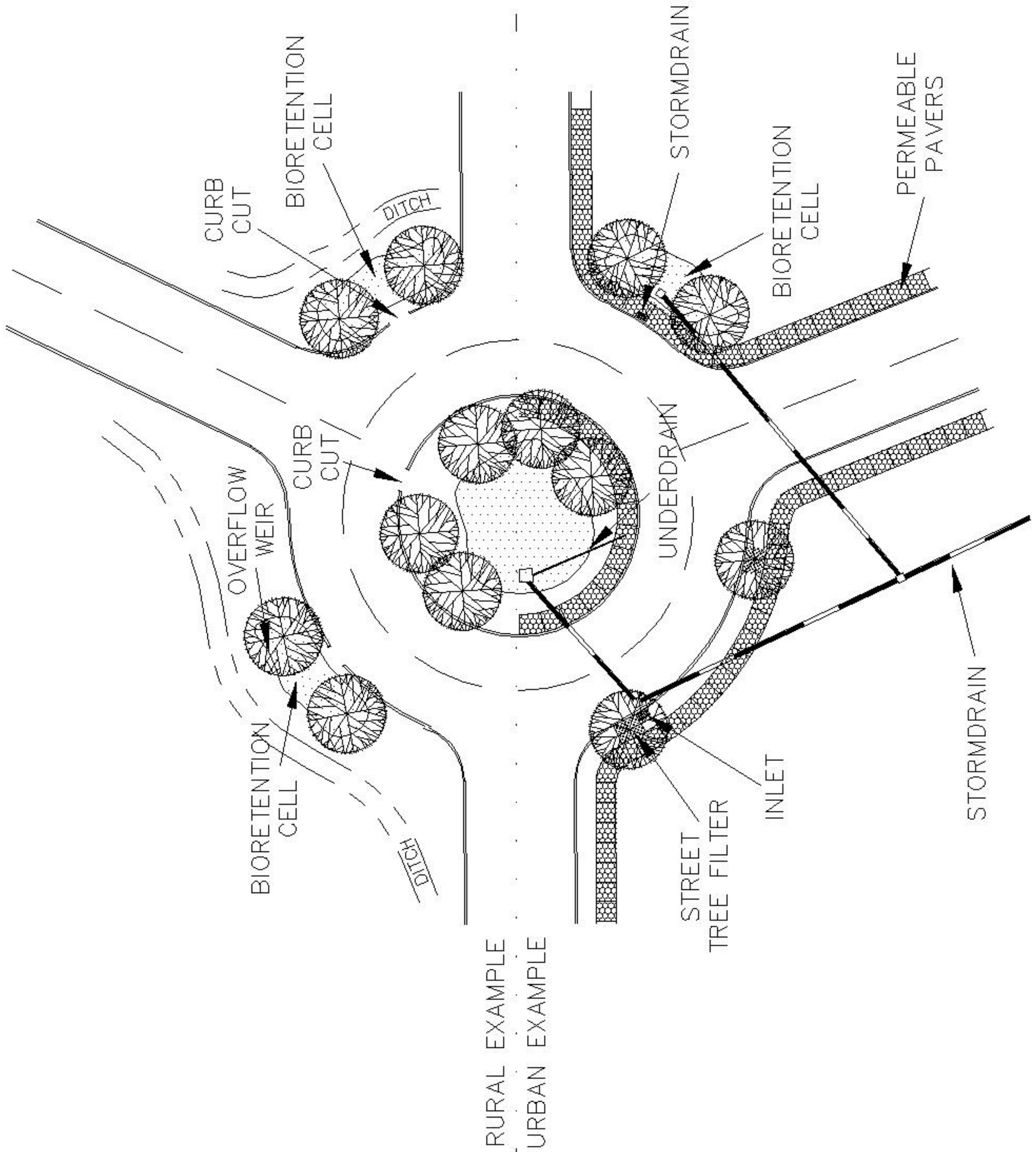
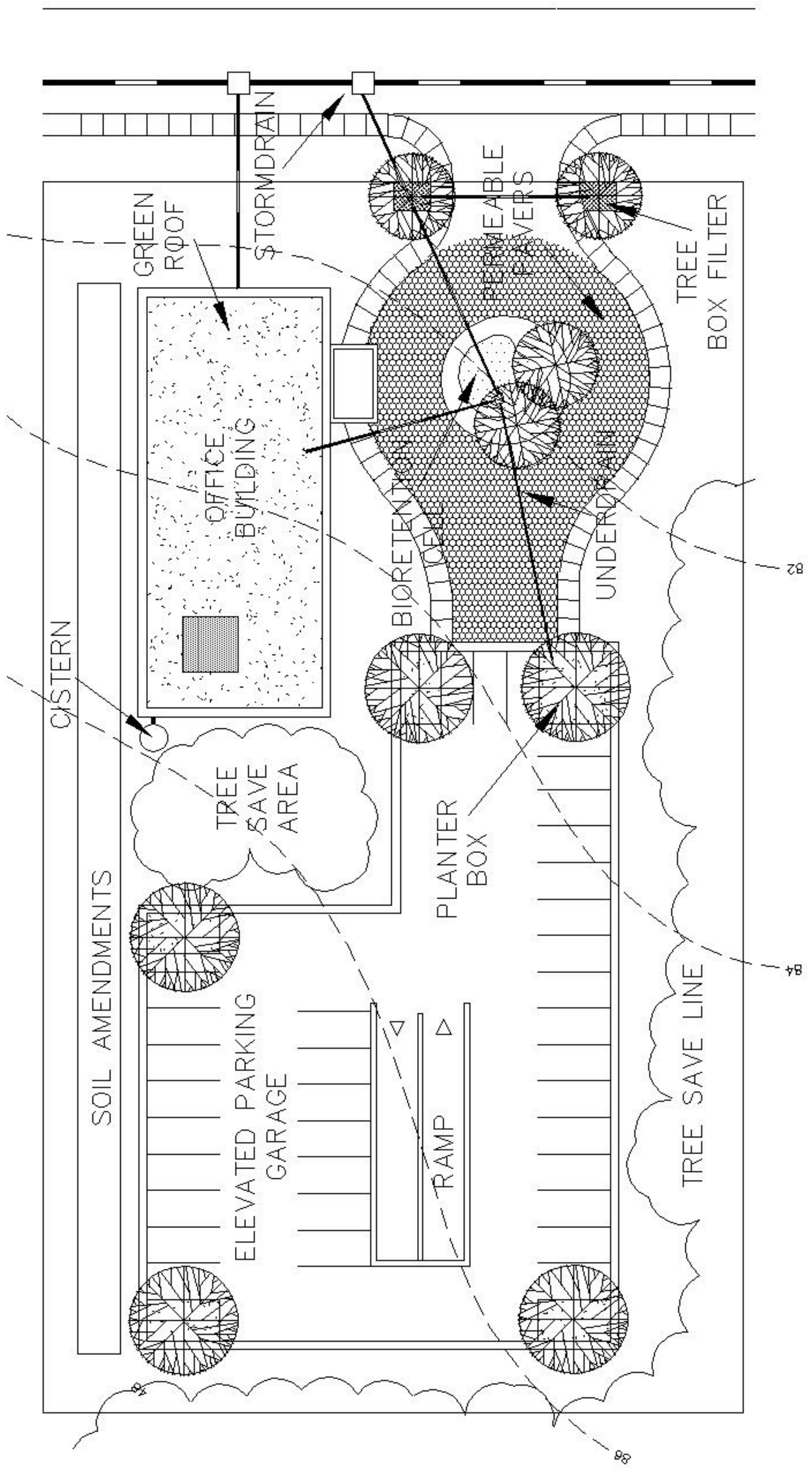
THE LOW IMPACT DEVELOPMENT CENTER, INC. WWW.LOWIMPACTDEVELOPMENT.ORG	LID URBAN BUS STOP EXAMPLE	EX. 4.0 NOV 2002



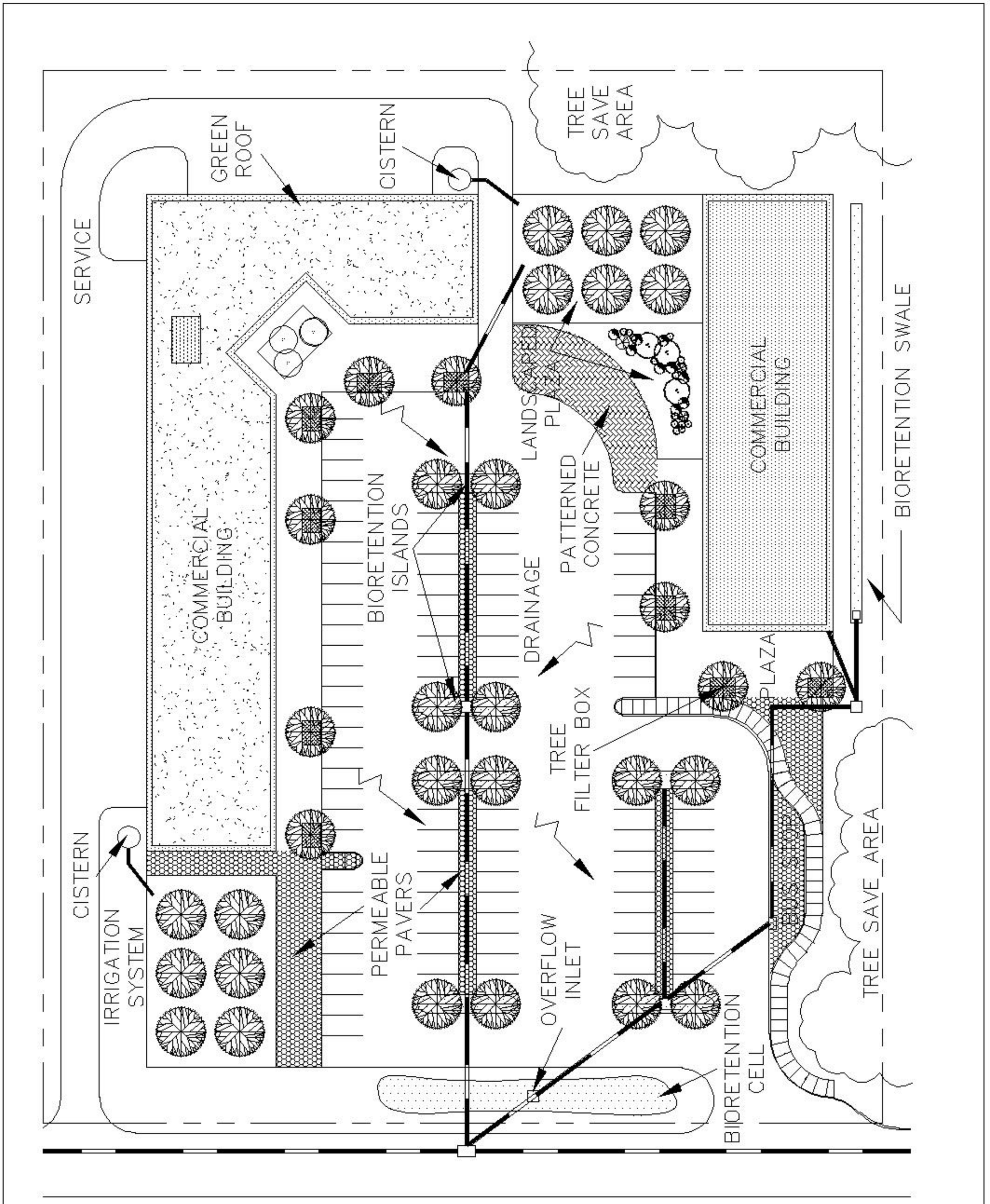
N.T.S.

THE LOW IMPACT DEVELOPMENT CENTER, INC. WWW.LOWIMPACTDEVELOPMENT.ORG	LID TRAFFIC CIRCLE — RURAL & URBAN	EX. 5.0 NOV 2002



N.T.S.

THE LOW IMPACT DEVELOPMENT CENTER, INC. WWW.LOWIMPACTDEVELOPMENT.ORG	LID URBAN OFFICE & PARKING EXAMPLE	EX. 6.0 NOV 2002



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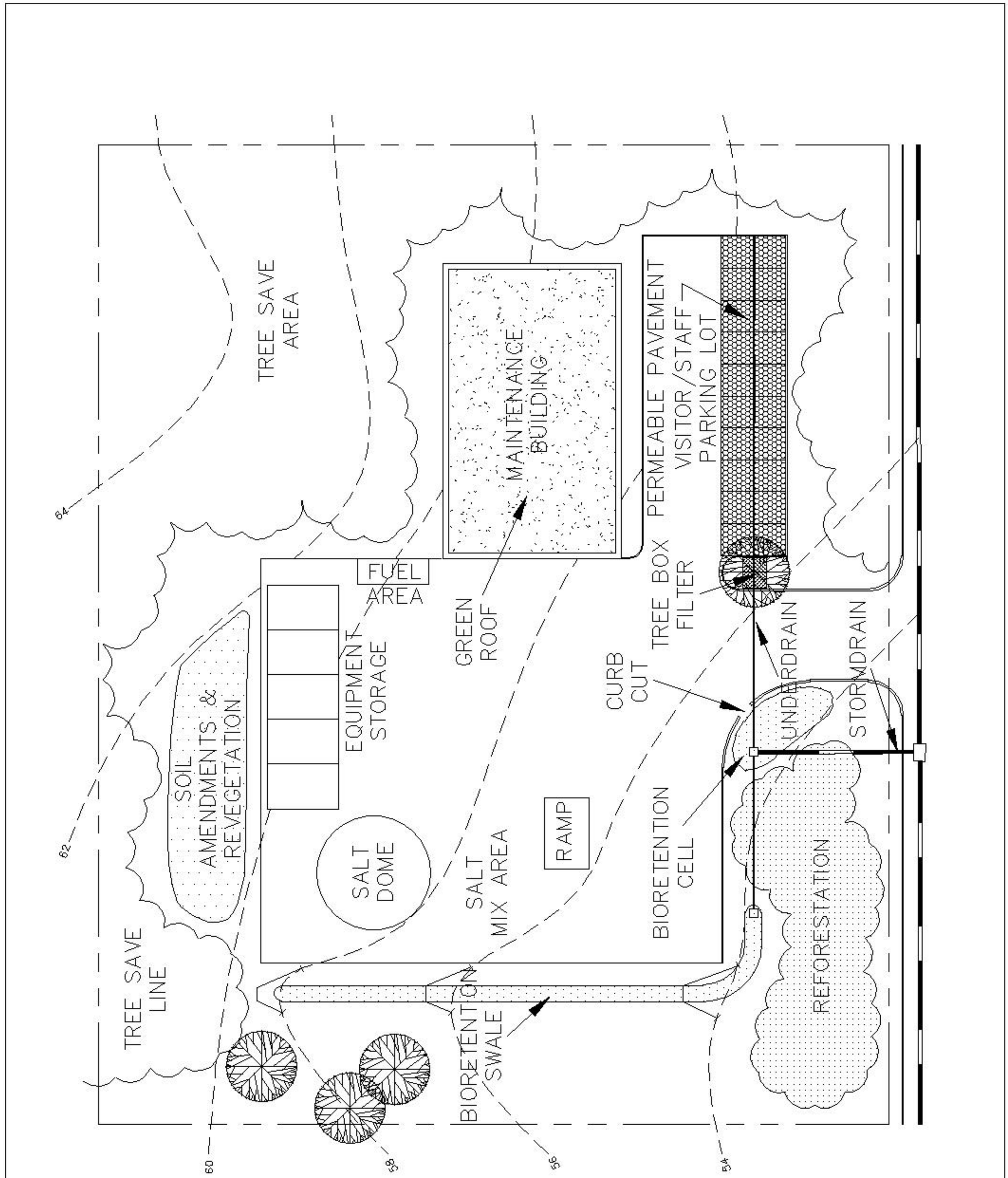
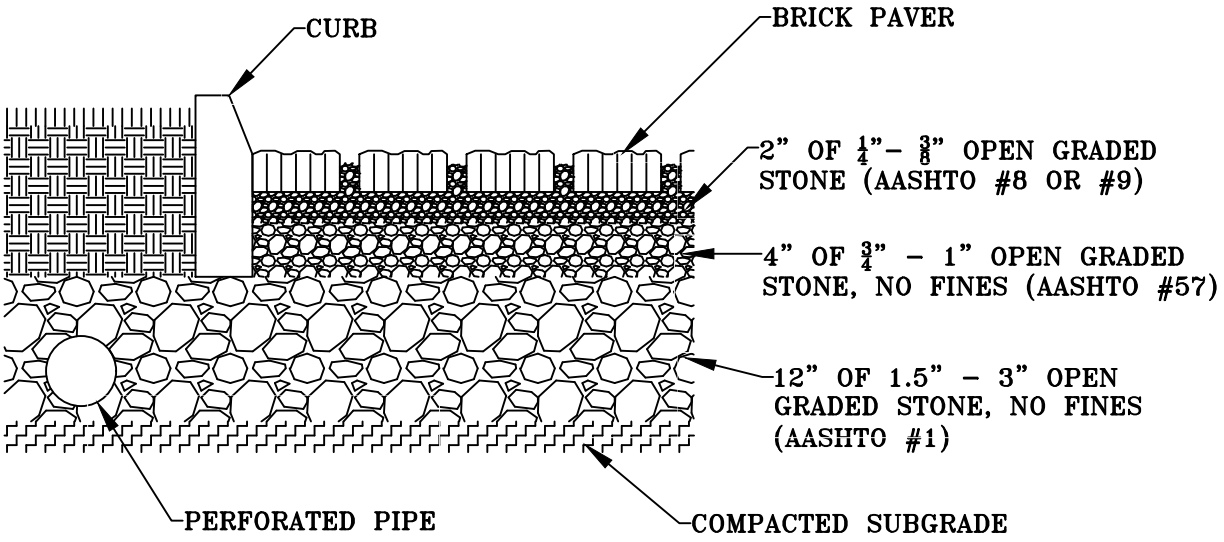
THE LOW IMPACT DEVELOPMENT CENTER, INC. WWW.LOWIMPACTDEVELOPMENT.ORG	LID COMMERCIAL STRIP PARKING LOT	EX. 7.0 NOV 2002



N.T.S.

THE LOW IMPACT DEVELOPMENT CENTER, INC. WWW.LOWIMPACTDEVELOPMENT.ORG	LID HIGHWAY MAINTENANCE FACILITY	EX. 8.0 NOV 2002



NOTES
1. TYPICAL DRAWING SHOWN, SUBMITTALS REQUIRED FOR APPROVAL
2. STORM WATER CALCULATIONS REQUIRED

LOW IMPACT DEVELOPMENT
PERMEABLE PAVEMENTS

N.T.S.

REVISION

NO.	DESCRIPTION	BY	APRL	DATE

CAD FILE: E:\ENGINEERING\STANDARD DRAWINGS\2015 UPDATED\27 LID PERMEABLE PAVEMENTS

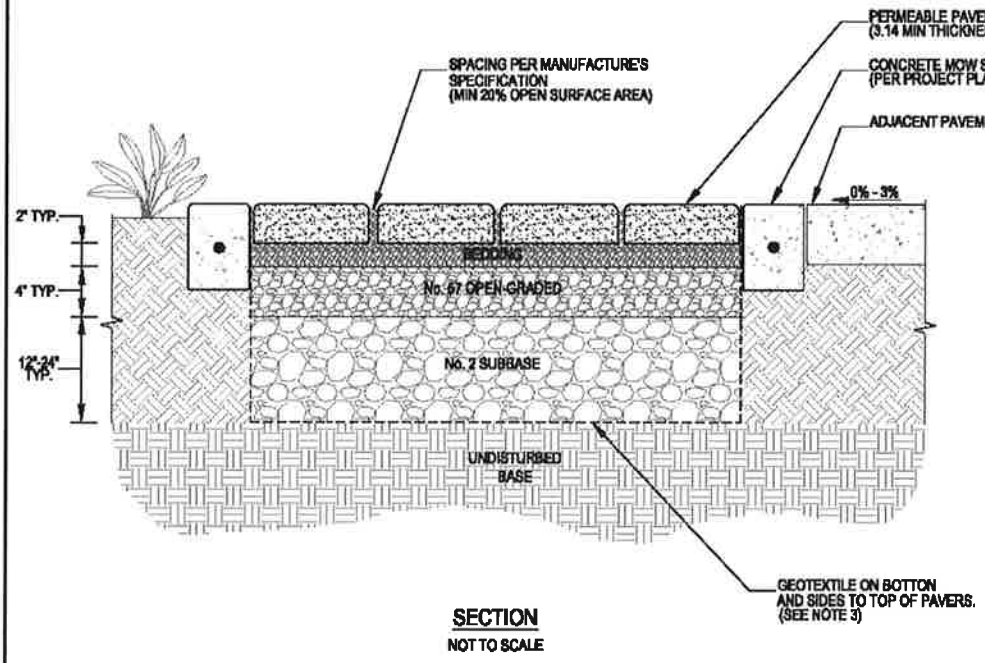
ALPINE CITY
ESTABLISHED 1850

LID - PERMEABLE PAVEMENTS

ALPINE CITY
20 NORTH MAIN
ALPINE, UT 84004

STANDARD DRAWING NUMBER: 27

PLOT SCALE:	N.T.S.
DRAWN BY:	J.M.
DESIGN BY:	
CHECKED BY:	
ADOPTED DATE:	--



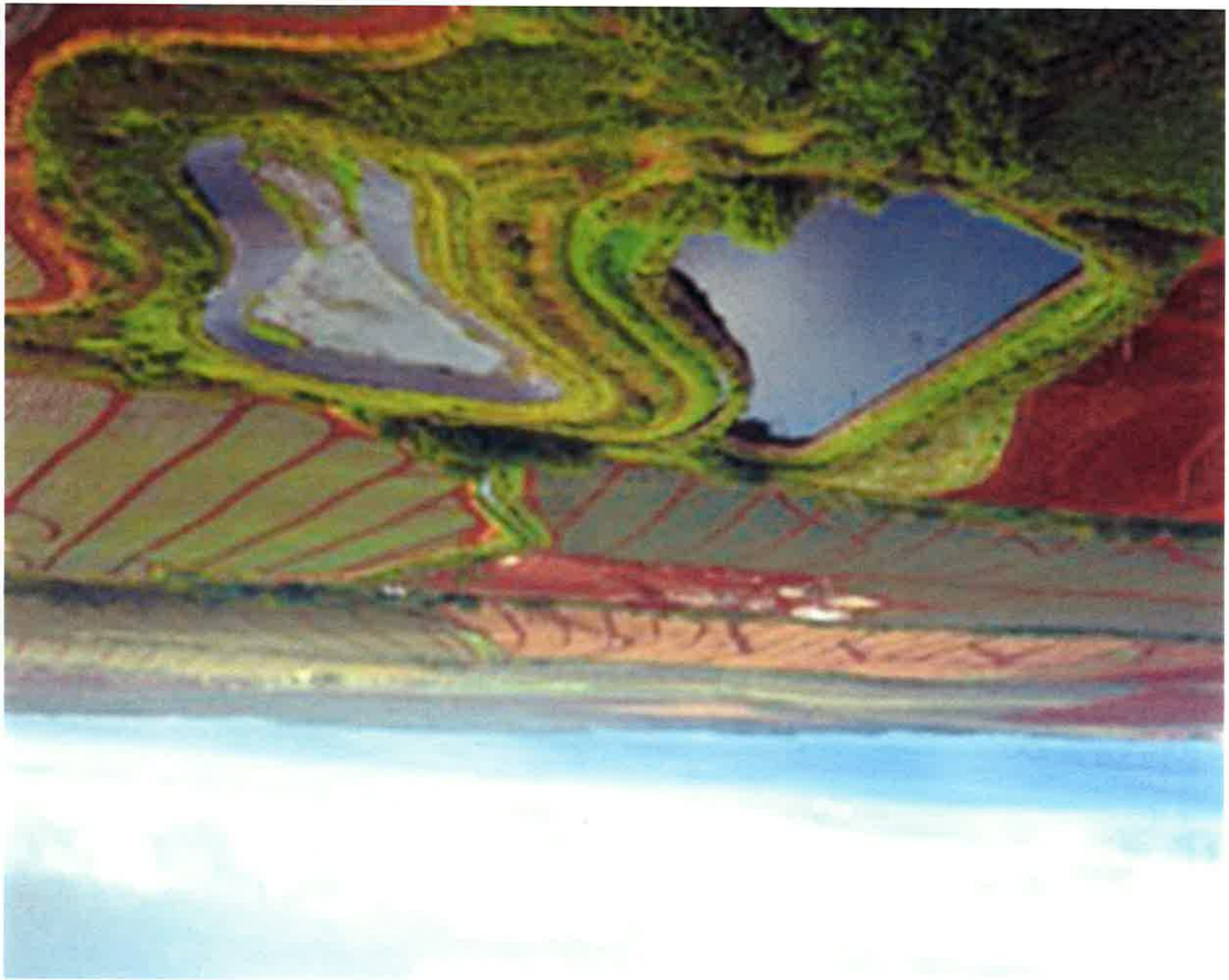
SECTION

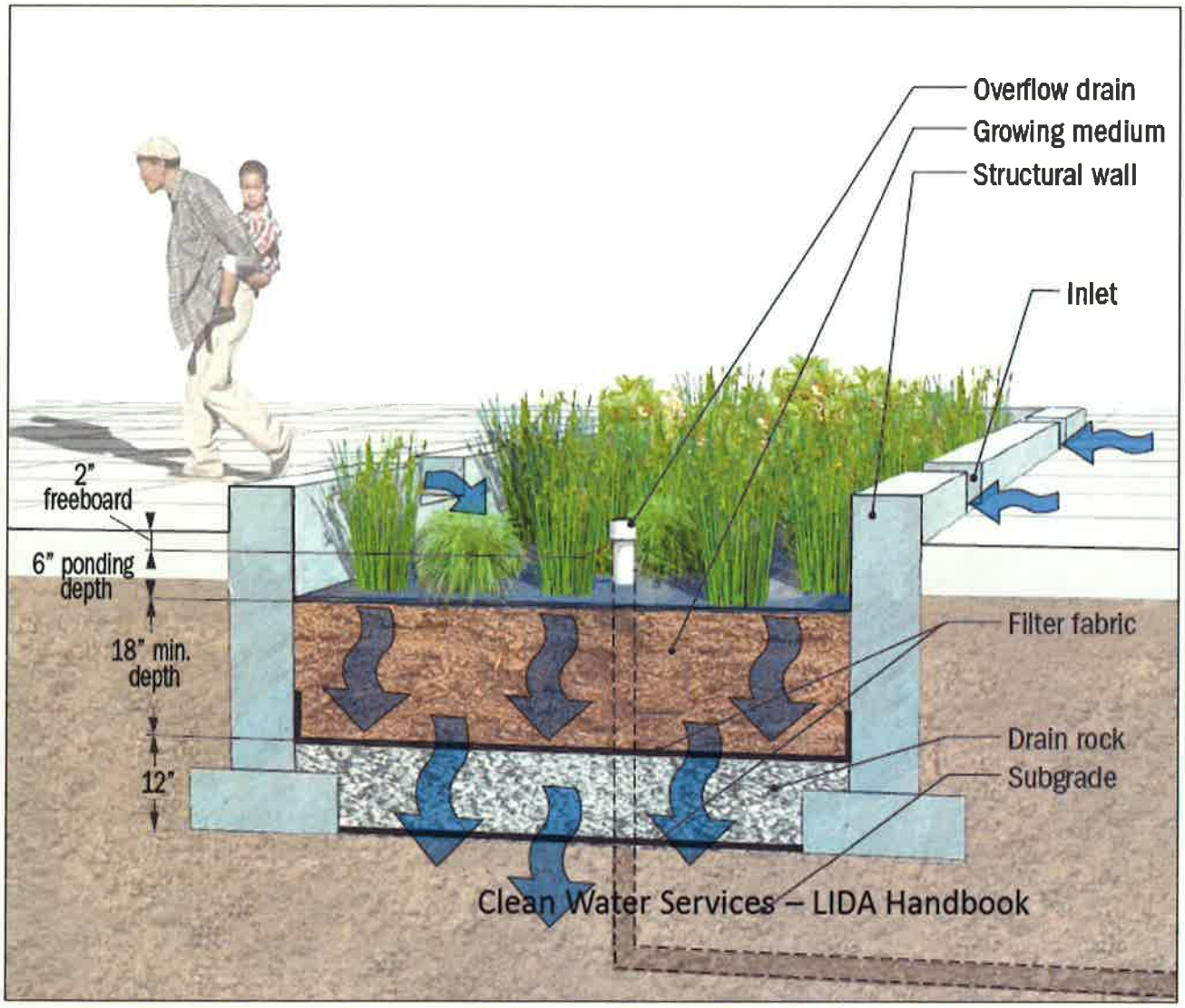
NOT TO SCALE

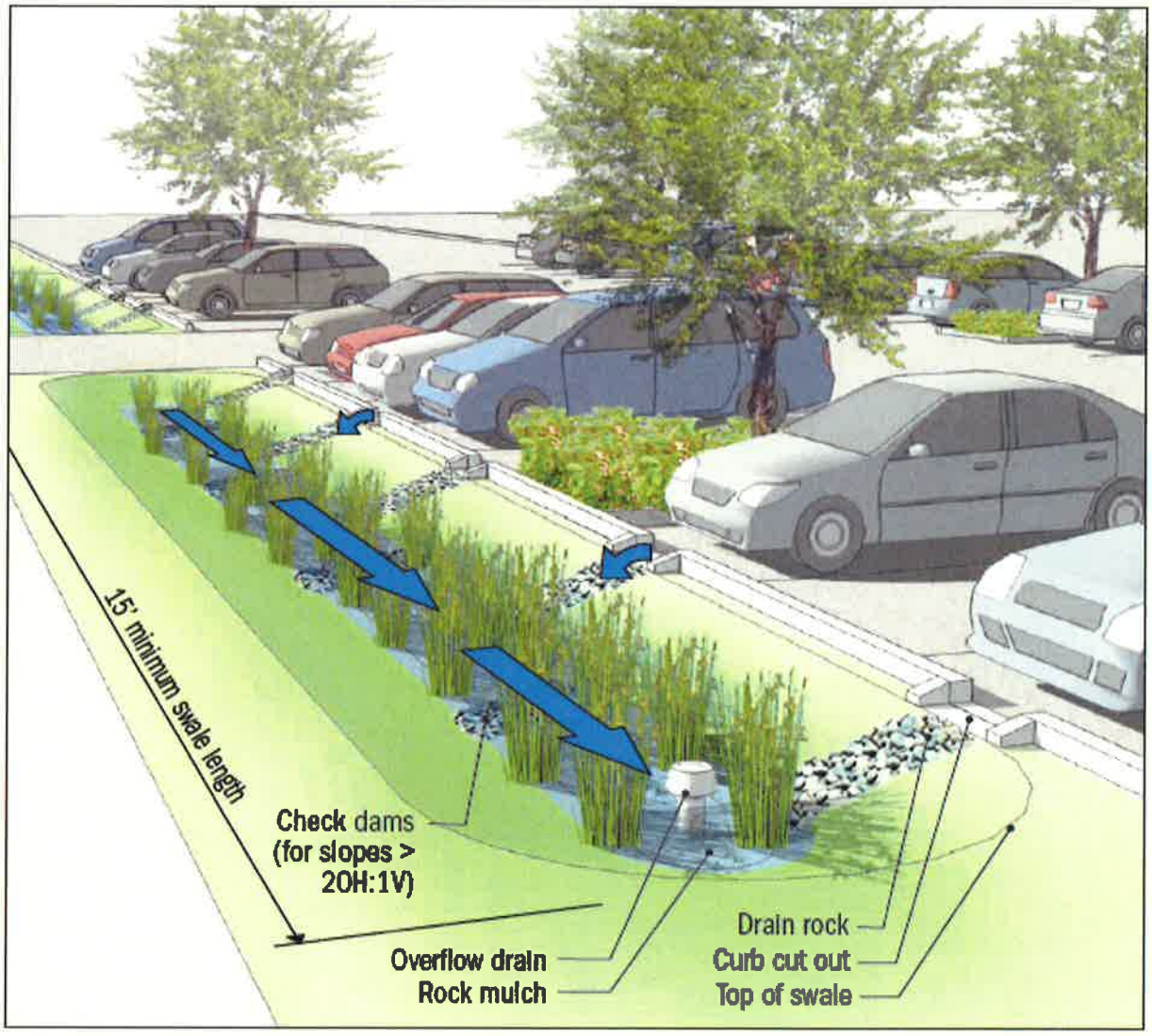
NOTES:

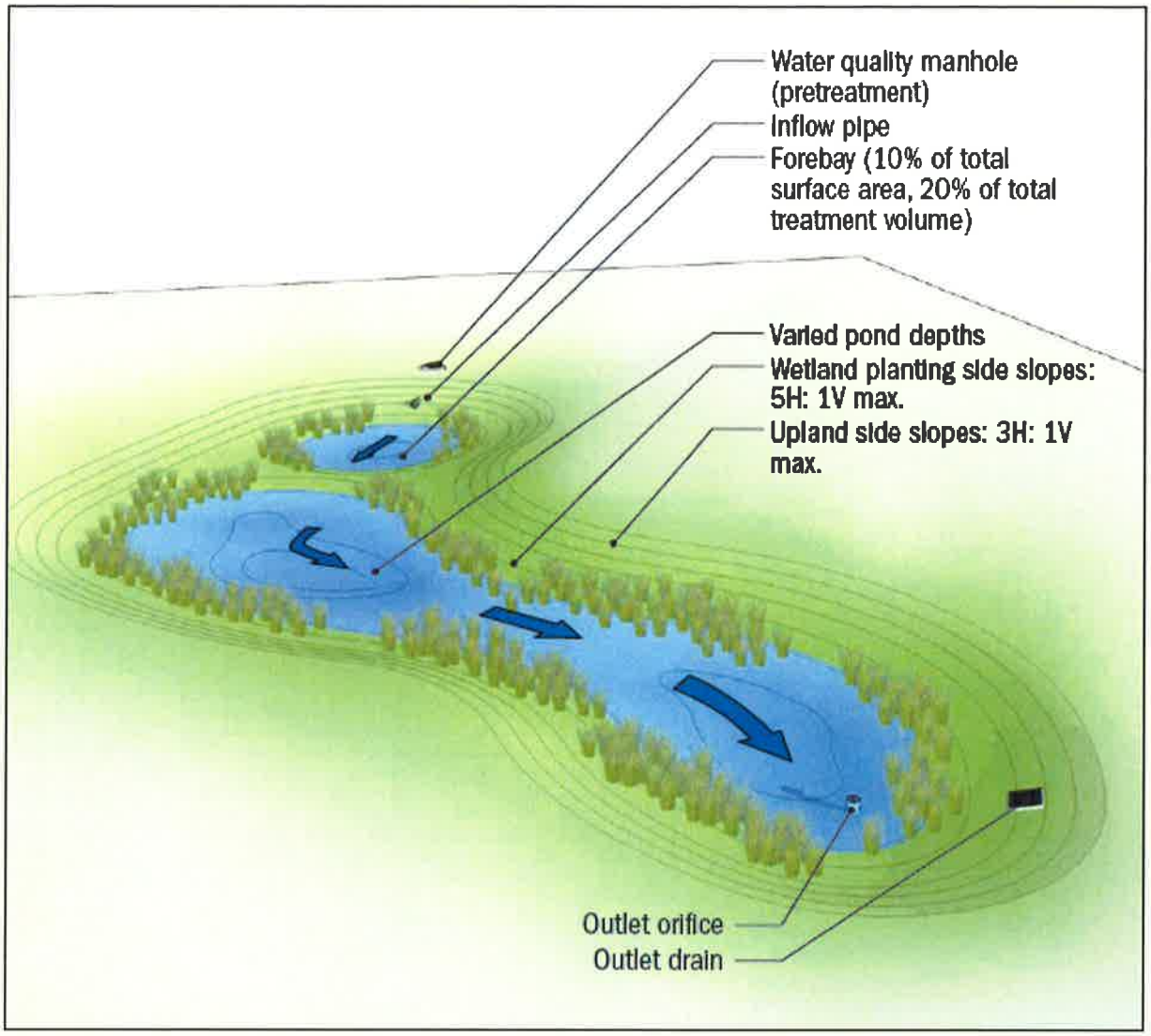
1. SITE SOILS SHALL HAVE ADEQUATE DRAINAGE (AT LEAST 0.5 INCHES PER HOUR).
2. INFILTRATION SHALL NOT CAUSE GEOTECHNICAL HAZARDS RELATED TO EXPANSIVE SOIL MOVEMENT, TUNNEL EROSION, OR SLOPE STABILITY.
3. IF INFILTRATION HARZARDS ARE A CONCERN, AN UNDERDRAIN SHALL BE INSTALLED TO DRAIN WATER INTO STORM DRAIN INLET OR ONSITE BMP. GEOTEXTILE SHALL BE REPLACED WITH IMPERMEABLE LINER AND UNDERDRAIN PREFERRED PIPE.
4. ANY OVERFLOW SHALL BE DISCHARGED PER BUREAU OF ENGINEERING AND BUILDING & SAFETY REQUIREMENTS.
5. SLOPE IS NOT GREATER THAN 3 PERCENT.
6. FLOW DIRECTED TO PERMEABLE PAVEMENT SHALL BE DISPERSED SO AS NOT TO BE CONCENTRATED AT A SMALL AREA OF PAVEMENT.
7. PRE-FABRICATED PRODUCTS HAVE BEEN INSTALLED PER ALL APPROPRIATE MANUFACTURER'S SPECIFICATIONS. IF REQUIRED, SUB-GRADE SOIL SHALL BE COMPACTED IN ACCORDANCE WITH PRODUCT INSTALLATION SPECIFICATION.
8. SEE PERMEABLE PAVERS FACT SHEET FOR MORE INFORMATION.

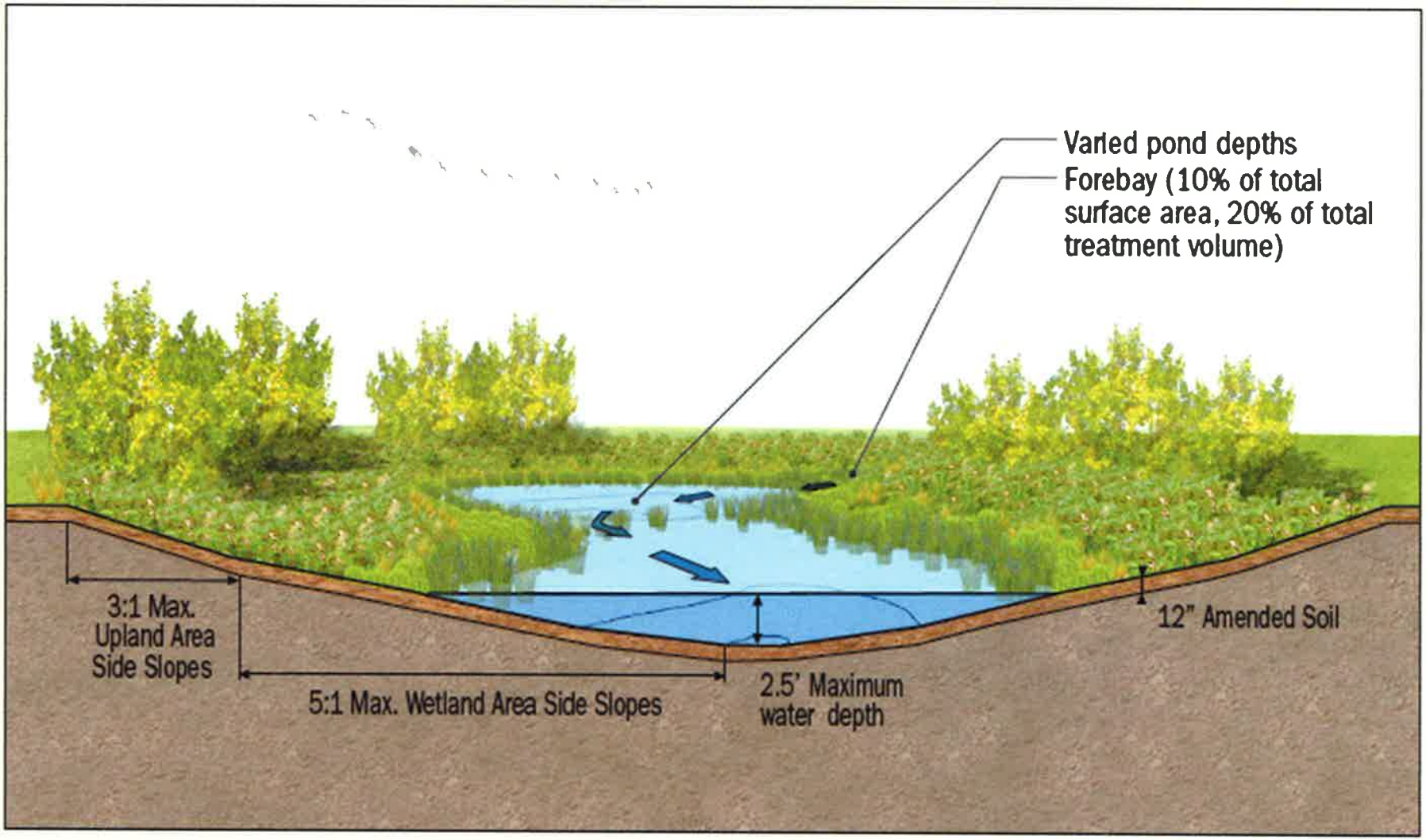
PERMEABLE PAVING – STONE
FOR SMALL SCALE RESIDENTIAL

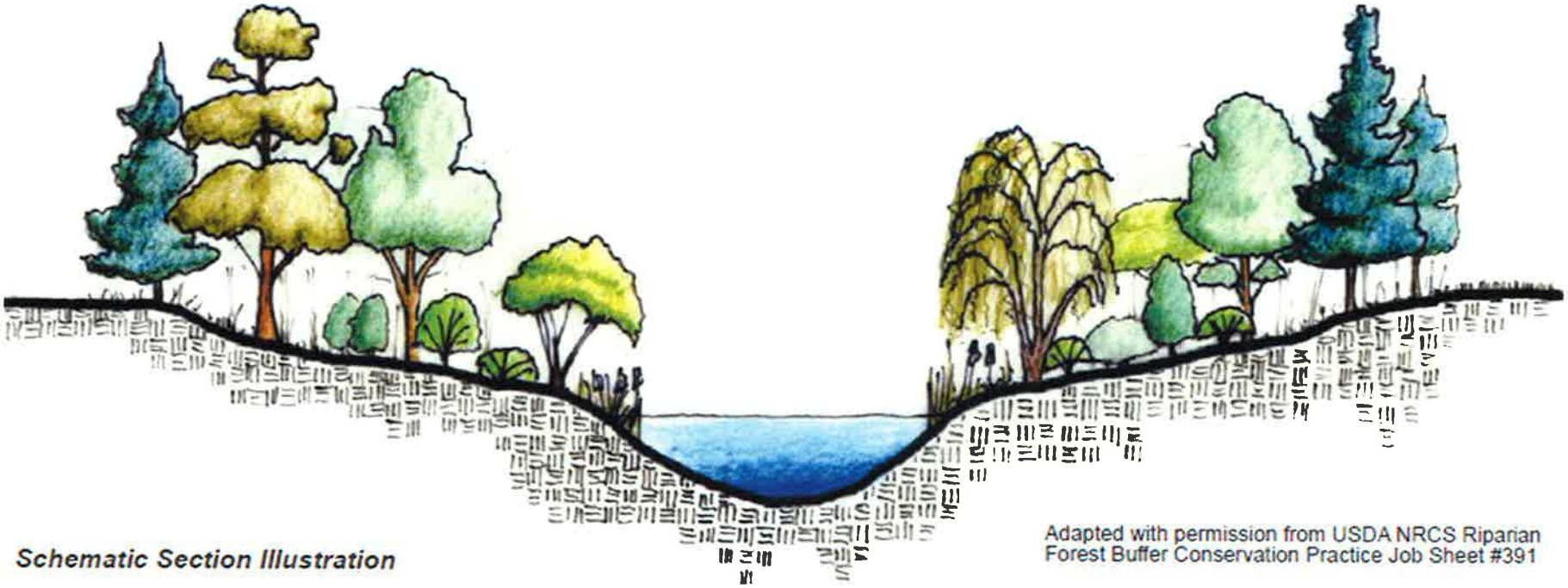



Overflow drain
Growing medium
Structural wall
Inlet
2" freeboard
6" ponding depth
18" min. depth
12"
Filter fabric
Drain rock
Subgrade
Clean Water Services – LIDA Handbook


15' minimum Swale length
Check dams
(for slopes >
20H:1V)
Overflow drain
Rock mulch
Drain rock
Curb cut out
Top of swale

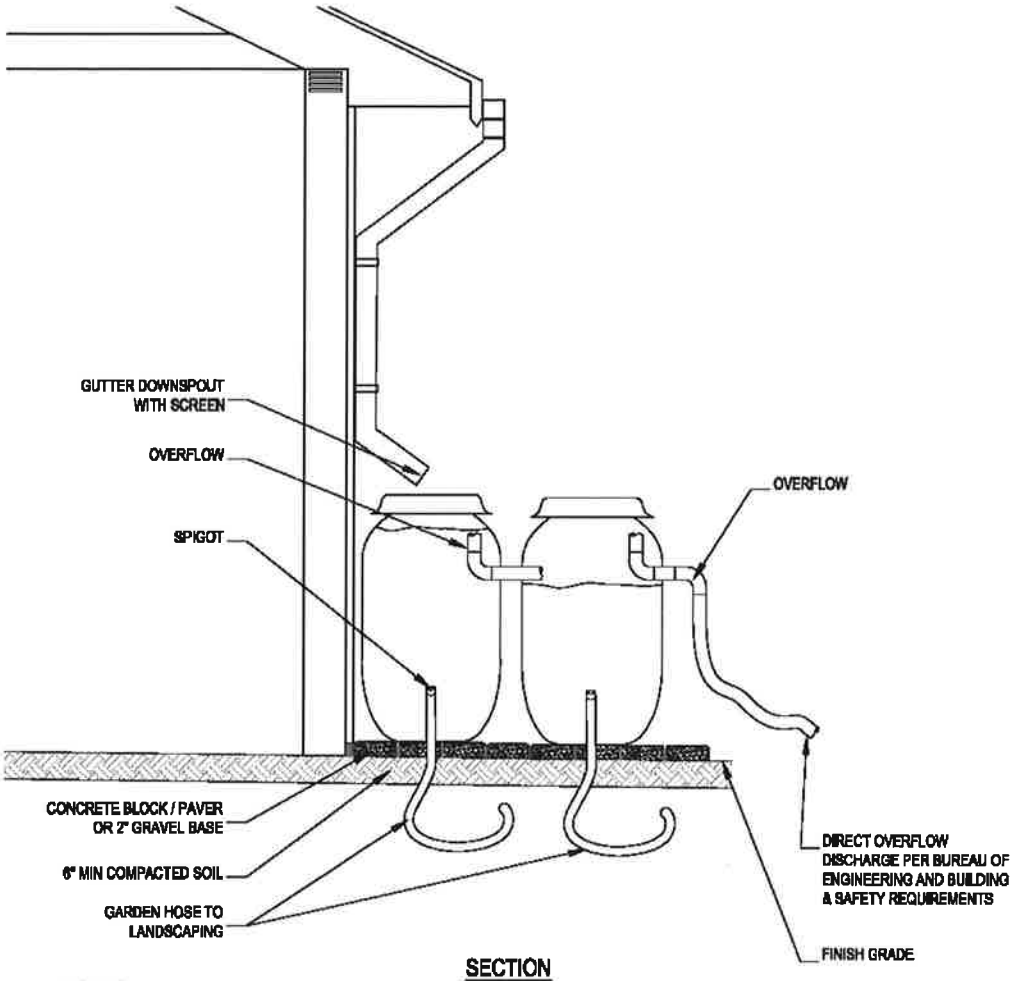

Water quality manhole (pretreatment)
Inflow pipe
Forebay (10% of total surface area, 20% of total treatment volume)
Varied pond depths
Wetland planting side slopes: 5H: 1V max.
Upland side slopes: 3H: 1V max.
Outlet orifice
Outlet drain


Varied pond depths
Forebay (10% of total surface area, 20% of total treatment volume)
3:1 Max. Upland Area Side Slopes
5:1 Max. Wetland Area Side Slopes
2.5' Maximum water depth
12" Amended Soil



Schematic Section Illustration

Adapted with permission from USDA NRCS Riparian Forest Buffer Conservation Practice Job Sheet #391



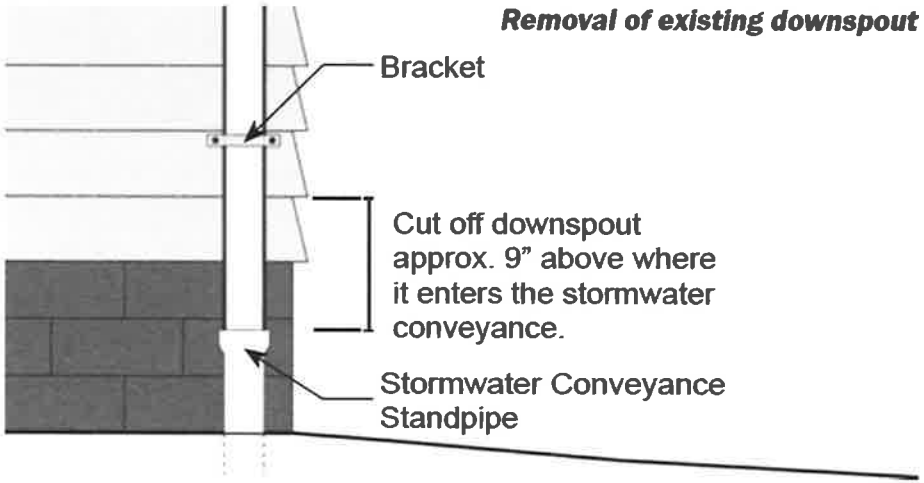
SECTION

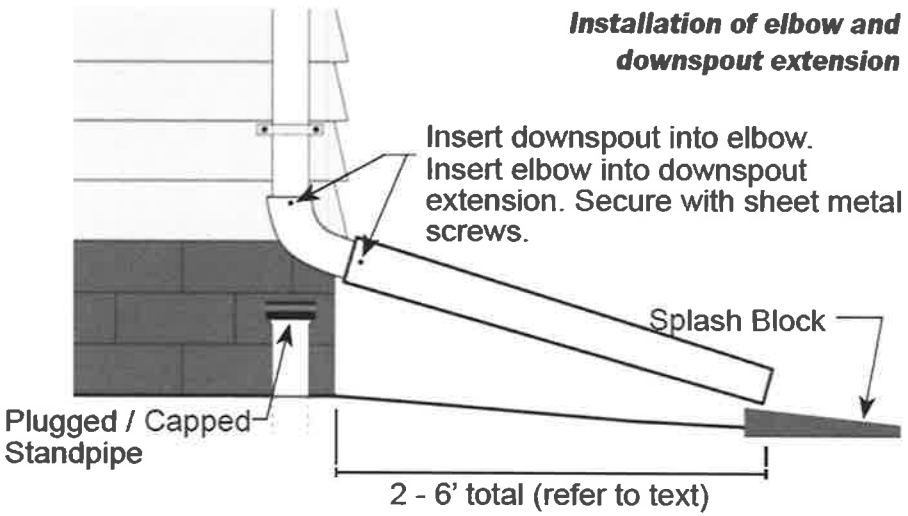
NOT TO SCALE

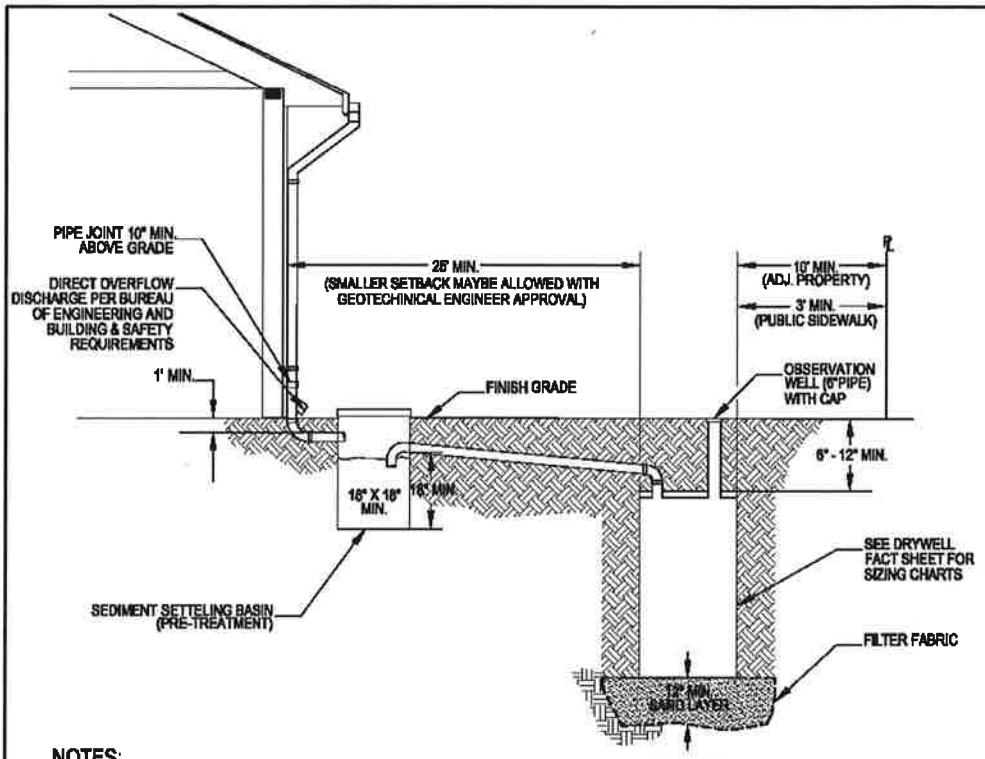
NOTES:

1. SCREENS ARE PRESENT ON ALL RAIN BARREL INLETS TO REMOVE DEBRIS AND LARGER PARTICLES AS THE WATER ENTERS THE BARREL. REMOVABLE CHILD-RESISTANT COVERS AND MOSQUITO SCREENING ARE IN PLACE.
2. BARREL IS CHILD SAFE: ACCESS IS CHILD-PROOF AND THE BARREL IS PROPERLY SITED AND ANCHORED ON A STABLE SURFACE TO PREVENT BARREL FROM TIPPING OVER.
3. ABOVE-GROUND BARRELS SHALL NOT LOCATED ON UNEVEN OR SLOPED SURFACE; IF INSTALLED ON A SLOPED SURFACE, THE BASE WHERE THE BARREL IS INSTALLED HAS BEEN LEVELED USING APPROPRIATE CONSTRUCTION MATERIAL PRIOR TO INSTALLATION.
4. INSTALLED RAIN BARRELS SHALL NOT BEEN PLACED ON ELEVATED PLATFORMS, DECKS OR PORCHES WITHOUT CONSULTING LOCAL BUILDING CODE OFFICIALS.
5. DIRECT OVERFLOW DISCHARGE PER BUREAU OF ENGINEERING AND BUILDING AND SAFETY REQUIREMENTS.
6. DISPERSION IS DIRECTED SO AS NOT TO KNOWINGLY CAUSE GEOTECHNICAL HAZARDS RELATED TO SLOPE STABILITY OR TRIGGERING EXPANSIVE (CLAYEY) SOIL MOVEMENT.
7. RAIN BARRELS SHALL BE OPAQUE AND DARK IN COLOR TO PREVENT UV LIGHT PENETRATION AND DISCOURAGE ALGAE GROWTH.
8. BARREL PLACEMENT SHALL ALLOW EASY ACCESS FOR REGULAR MAINTENANCE.
9. SEE RAIN BARREL FACT SHEET FOR MORE INFORMATION.

RAIN BARREL
FOR SMALL SCALE RESIDENTIAL


Removal of existing downspout
Bracket
Cut off downspout approx. 9" above where it enters the stormwater conveyance.
Stormwater Conveyance Standpipe


Installation of elbow and downspout extension
Insert downspout into elbow. Insert elbow into downspout extension. Secure with sheet metal screws.
Splash Block
Plugged / Capped Standpipe
2 - 6' total (refer to text)

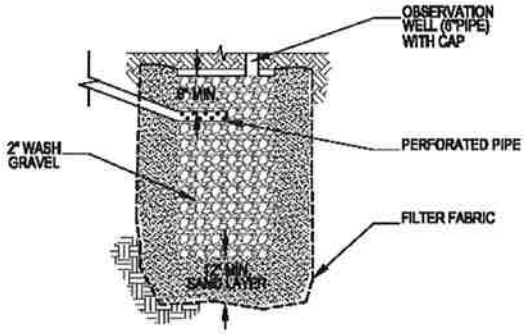


SECTION

NOT TO SCALE

NOTES:

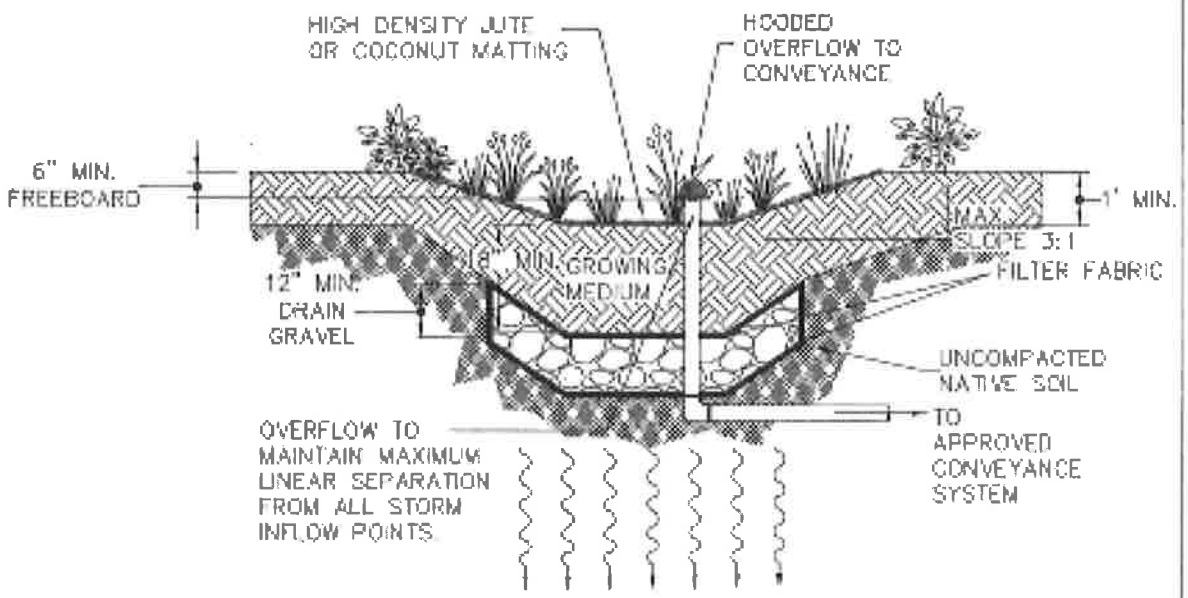
1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR, DURING, AND AFTER CONSTRUCTION.
2. SITTING CRITERIA: DRYWELL SHALL NOT BE LOCATED ON A SLOPE WITH GRADIENT GREATER THEN 20% (5:1, M:V)
3. TOP OF WELL MUST BE BELOW LOWEST FINISH FLOOR.
4. IF DRYWALL IS LOCATED WITHIN MINIMUM SETBACK REQUIREMENTS, THE DRYWELL SHALL BE DESIGNED BY A LICENSED ENGINEER.
5. DIRECT OVERFLOW DISCHARGE PER BUREAU OF ENGINEERING AND BUILDING & SAFETY REQUIREMENTS.
6. SEE DRYWELL FACT SHEET FOR ADDITIONAL GUIDELINES.



ALTERNATIVE DRYWELL SECTION

NOT TO SCALE

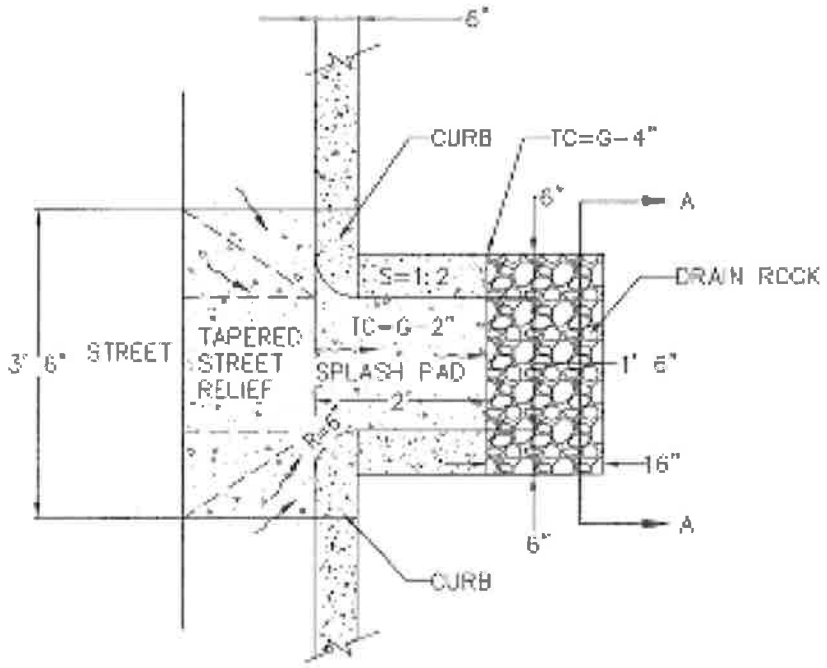
DRYWELL
FOR SMALL SCALE RESIDENTIAL



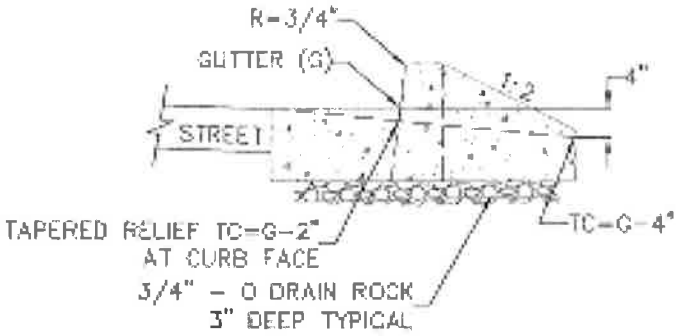
NOTES:

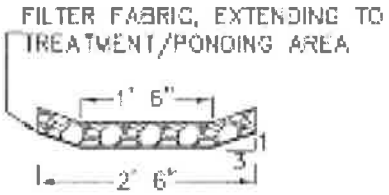
1. PUBLIC WATER QUALITY AND/OR QUANTITY SYSTEM
2. PROVIDE OVERFLOW CONVEYANCE SYSTEM, OVERFLOW CONVEYANCE HEIGHT TO ALLOW 6" MAXIMUM PONDING. PIPING TO A MINIMUM OF THE PLUMBING CODE OR CONVEY THE 25 YEAR STORM.
3. IF USING THE NATIVE SOIL INFILTRATION FOR SIZING, THE RATE SHALL BE DETERMINED BY ASTM STANDARD TESTING METHODS.
4. FLOW DISSIPATORS SHOULD BE USED IF ENTRY SLOPE TO THE BASIN IS GREATER THAN 3:1. FLOW DISSIPATORS SHALL BE CONSTRUCTED OUT OF ROCK OR GRAVEL PER DESIGN FLOW VELOCITY AT ENTRY OF THE FACILITY.
5. SEPARATION BETWEEN DRAIN GRAVEL AND GROWING MEDIUM SHALL BE APPROVED FILTER FABRIC.
6. TREATMENT AREA SHALL HAVE HIGH DENSITY JUTE OR COCONUT MATTING OVER 18" MINIMUM OF GROWING MEDIUM OR BASE STABILIZATION METHOD AS APPROVED BY THE DISTRICT.
7. VEGETATION TO BE USED IN WET AREAS OF THE BASIN IS PER APPENDIX "A" OF R&O 07-20 FOR THE WET MOISTURE CONDITIONS.
8. VEGETATION TO BE USED IN OTHER AREAS OF BASIN CONFORMS TO _____ OF THIS HANDBOOK AS APPROVED BY DISTRICT.

LIDA HANDBOOK	NON-STRUCTURAL INFILTRATION PLANTER	Clean Water Services Our commitment is clean	DRAWING NUMBER 797 102



CURB CUT-OUT





SECTION A-A

NOTES:

1. INFLOW STRUCTURE PER LOCAL JURISDICTION. CURB CUT OUTS NOT ALLOWED ON WASHINGTON COUNTY ROADS - USE MODIFIED CG-30 SEE DETAIL, FOR INLET STRUCTURE, OR ODOT DETAIL DET 1750 FOR APPROPRIATELY SIZED CURB CUT.
2. INFLOW STRUCTURE - CURB CUTOUT SHALL HAVE MINIMUM 2" DROP AT THE FLOW LINE LEADING TO THE SPLASH PAD, SEE DETAIL.
3. FLOW RETARDING DRAIN ROCK MINIMUM SIZE 2" - ¾ MINUS OR SIZED BY DESIGN INFLOW TO BE PLACED 2.5" TO 3" DEEP BEHIND SPLASH PAD.
4. CURB PROFILE PER LOCAL JURISDICTION.

LIDA HANDBOOK	CURB CUT OUT NON WASHINGTON COUNTY ROADS	Clean Water Services	DRAWING NUMBER 401