PUBLIC WORKS DESIGN STANDARDS

CITY OF AMITY
JULY 2021
These Standards were compiled by information obtained from or input received from the following sources and the City of Newberg:

American Association of State Highway and Transportation Officials
American Public Works Association
American Water Works Association
Asphalt Institute
City of Amity Public Works Standards
City of Tualatin Public Works Standards
City of Wilsonville Public Works Standards
Clean Water Services Agency of Washington County
Oregon Department of Environmental Quality
Oregon Department of Transportation
Oregon Health Division
Portland Cement Association
Portland General Electric
Stormwater Management Manual for Western Washington
FOREWORD

The 2021 edition of the City of Amity Public Works Design Standards will provide the technical engineering design information for all Public Works transportation projects, storm system projects, sanitary sewer projects, and water distribution system projects in the interest of health, safety and welfare of the residents of the City of Amity. These Public Works Design Standards - 2021 will supersede all previously issued Standard Specifications.

Interpretation and enforcement of these standards shall be the responsibility of the City of Amity’s Public Works Department.

All federal, state, county (Yamhill) or local laws and ordinances are to be adhered to. If there is any conflict between the Standard Specifications and pertinent laws and ordinances, the laws and ordinances shall prevail.
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SECTION 1 - GENERAL

1.1 Authority and Purpose

The purpose of these Public Works Design Standards is to provide a consistent policy under which certain physical aspects of public facility design will be implemented. Most of the elements contained in this document are Public Works oriented and it is intended that they apply to both public improvements under City contract and public improvements under private contract designated herein. Any reference to Construction Standards and/or Specifications shall be in reference to the most recent publication of the Oregon Standard Specifications for Construction (APWA/ODOT OSSC).

These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals. It is expected that engineers will bring to each project the best of skills from their respective disciplines.

The Public Works Design Standards are also not intended to unreasonably limit any innovative or creative effort which could result in higher quality, better cost savings, or both. Any proposed deviation from the Public Works Design Standards will be judged on the likelihood that such deviation will produce a comparable result in every way adequate for the user and the public.

Interpretation and enforcement of these standards shall be the responsibility of the City of Amity Public Works Department.

1.1.1 ENGINEERING Policy

It shall be the policy of the City of Amity to require compliance with Oregon Revised Statute 672 for professional engineers.

All engineering plans, reports, or documents shall be prepared by a registered professional engineer, or by a subordinate employee under the engineer's direction, and shall be signed by the engineer and wet stamped with the engineer's seal to indicate the engineer's responsibility for them. It shall be the engineer's responsibility to review with the City any proposed public facility extension, modification, or other change prior to any proposed design work to determine any special requirements or to determine whether the proposal is permissible. A "Preliminary Review" and/or a "Plans Approved for Construction" stamp of the City on the plans for any job does not in any way relieve the engineer of responsibility to meet all requirements of the City or obligation to protect life, health, and property of the public. The plan for any project shall be revised or supplemented at any time it is determined that the full requirements of the City have not been met.

Development permit application(s) for any work within current or future right-of-way and/or easements including but not limited to; public street, storm drainage, waterworks, and/or wastewater improvements shall be approved/issued by the City before commencement of any onsite building, grading, or construction activities.

1.2 Fees

Contact the City of Amity, City Hall for the fee schedule's current rates.

1.3 Intent of Public Works Design Standards

These standards for constructing public facilities in the City of Amity are intended to protect the public health, safety, and welfare by:

A. Setting forth uniform material and workmanship standards for public improvements

B. Streamlining the administration, design, and construction of public facilities in the City and minimizing repairs and allowing for the long-term maintenance of the public facilities
1.3.1 Interpretation
Where situations arise that are not clearly covered by these Standards, the City’s authorized representative will review the issue on a case-by-case basis to determine the design and/or construction methodology acceptable to the City.

1.3.2 Order of Precedence
All federal, state, county or local laws and ordinances are to be adhered to. If there is any conflict between the Standard Specifications and pertinent laws and ordinances, the laws and ordinances shall prevail.

If there is a conflict between approval documents, the document highest in precedence shall control. The order of precedence shall be:

A. Permits from other agencies or jurisdictions, as may be required by law.
B. City of Amity Development Code.
C. Land use decision-making authority’s Conditions of Approval.


2. NOTES: Permits, Land Use Conditions of Approval, and Master Plans are intended to provide the authority for what public facilities are to be constructed; the below public works Drawing No. drawings and standards and the various standards that follow describe how public facilities are to be constructed through the use of the approval component materials, equipment, and methods set forth.

D. City of Amity Public Works Design Standards.
E. City of Amity Standard Drawings.
G. ODOT, Oregon APWA and any reference specifications and standard practices adopted by nationally recognized professional societies such as ASCE, AWWA, APWA, ACI, ASTM, and AASHTO, and any reference specifications or guidelines as presented in the latest edition of the MUTCD.
H. Uniform Fire Code.
I. Uniform Building Code and City-issued building, mechanical, electrical, and plumbing permits.
J. Americans with Disabilities Act latest approved standards or guidelines as referenced in the Standard Drawings of these standards.
K. Plans and drawings prepared by the design engineer.
L. Supplemental written agreements, franchise agreements, and approved revision to plans and specifications by the appropriate jurisdictions and conforming to local, state, and federal law will take precedence over documents listed above.

Specific plans shall have precedence over general plans. In any event, the determination of the City Engineer shall be final.

1.4 Revisions to Public Works Design Standards
These standards may be amended or updated periodically to protect public health, safety, and welfare. The City Engineer shall have the authority to modify the Standard Drawings as needed to maintain conformance with national and state design requirements, guidelines, and specifications and industry standards.

The date appearing on the title page is the date of the latest revision. Users shall apply the latest edition to the work contemplated at the time of actual construction and design, and it shall be each user's responsibility to maintain their copy of these Public Works Design Standards with the latest changes.
1.5 Definitions

**Applicant:** The owner or authorized agent acting on behalf of the owner.

**Approved Backflow Prevention Device:** A device that has been investigated and approved by the City and the Oregon State Health Division for preventing backflow.

**Approved Discharge Point / Approved Point of Discharge:** A location where overflow from a stormwater facility may be directed, which includes a surface infiltration facility; storm drain or other conveyance system; a waterway (as approved by the Oregon Department of State Lands), or an underground injection control facility (as approved by the Oregon Department of Environmental Quality).

**Arterial Street:** A major facility for moving intra-area traffic and for moving traffic to and from the freeway/expressway system.

**As-built Plans:** Plans signed, dated, and stamped by the project engineer indicating that the plans have been reviewed and revised, if necessary, to accurately show all as-built construction drawings of the public facilities.

**Backflow:** The reverse of flow from its normal or intended direction of flow. Backflow can be caused by back-pressure or back-siphonage.

**Backflow Preventer:** An approved device or means to prevent backflow into the potable water system.

**Back-siphonage:** Backflow that results from negative or reduced pressure (partial vacuum) in the supply piping system.

**Bike Lanes:** A designated travel way for bicyclists that is established within the roadway directly adjacent to the outside vehicular lane or on the shoulder.

**Bike Path:** A designated travel way for bicyclists which is completely separated from the vehicular travel lanes and is within independent rights of way.

**Bike Route:** A designated travel way for bicyclists that is shared with vehicular traffic. The roadway is designated with signs for bicycling (no pavement markings for the bike route or delineation of parking spaces used).

**Building Service Lateral:** A public wastewater or stormwater sewer beginning at the property line or public easement line and extending to the collector sewer.

**Building Sewer:** A private wastewater sewer beginning five (5) feet outside the building and extending to the property line or public easement line connecting to the building service lateral.

**Building Supply:** The pipe carrying potable water from the water meter or other source of water supply to a building or other point of use or distribution on the lot. Building supply shall also mean customer line.

**Channel Morphology:** The stream channel type and the physical characteristics of the streambed.

**City:** The City of Amity, Oregon.

**City Engineer:** The individual designated by the City Administrator to have the authority for review and approval on all projects subject to these Public Works Design Standards. The Administrator may act in this role when the City Engineer position is vacant.

**Collection Systems:** Facilities maintained by the City of Amity for the collecting, pumping, conveying, and controlling of wastewater.

**Collector Sewer:** The portion of the public wastewater conveyance system which is primarily installed to receive wastewater directly from individual residences and other individual public or private structures.

**Collector Street:** A facility that allows traffic within an area or neighborhood to connect to the arterial system.

**Common Development Plan:** All lands included within the boundary of a certified survey map or subdivision
plat created for the purpose of development or sale of property where integrated, multiple, separate, and distinct land developing activity may take place at different times by future owners.

Control Vault: a chamber used for pretreatment to reduce/eliminate the number of pollutants or alter the nature of pollutants to a less harmful state or concentration prior to discharge.

Core: To cut and remove a portion of pipe, manhole, or pavement with a circular hollow drill.

Cross Connection: Any actual or potential physical connection between a potable waterline and any pipe or vessel containing a non-potable or potable (i.e., well) fluid (suspended solid or gas) so that it is possible to introduce the non-potable fluid into the potable fluid by backflow.

Cul-de-sac: A dead end street that has a vehicular turnaround area at the end.

Cut Sheets: Sheets of tabulated data, indicating stationing, structures, fittings, angle points, beginning of curve, points on curve, end of curves, storm drain slope, staking offset, various elevations, offset cuts, and storm drain depths for streets, waterlines, wastewater sewers, and storm drains.

Datum: The vertical elevation control for the City of Amity is "The North American Vertical Datum of 1988."

Dead end Street: A street or series of streets which can be accessed from only one point. Dead end streets can be either temporary (intended for future extension as part of a future street plan) or permanent. New construction of permanent dead end streets (including cul-de-sacs) must provide adequate turnaround capability and be publicly maintained.

Definition of Words: That, whenever, in these Standards, the words "directed", "required", "permitted", "ordered", "designated", or words of like importance are used, they shall be understood to mean the direction, requirement, permission, or order of designation of the City Engineer. Similarly, the words "approved," "acceptable," or "satisfactory," shall mean approved by, acceptable to, or satisfactory to the City Engineer.

Demolition: Any act or process of wrecking or destroying a building, improvement, or structure.

DEQ: Oregon Department of Environmental Quality

Designated Arterial or Collector Street: A street designated as an arterial or collector in the Amity Transportation System Plan.


Design Storm: A hypothetical discrete rainstorm characterized by a specific duration, temporal distribution, rainfall intensity, return frequency and total depth of rainfall.

Detention: Area used to temporarily contain stormwater and reduce the peak velocity and volume of runoff to provide additional system capacity and to reduce erosion in surface and/or conveyance facilities.

Development: Residential, commercial, industrial, or institutional construction, alteration, or other improvement which alters the characteristics of a property or properties.

Domestic Wastewater: The liquid and water borne waste derived from the ordinary living processes, free from industrial wastes, and of such character to permit satisfactory disposal without special treatment into the public sewer or by means of private wastewater disposal system.

Double Check Valve Assembly: An assembly composed of two singles, independently acting, approved check valves, including tightly closing shut off valves located at each end of the assembly and fitted with properly located test cocks.

Double Detector Check Valve Assembly: A line sized, approved, double check valve assembly with a parallel meter and meter sized, approved, double check valve assembly. The purpose of this assembly is to prevent backflow contamination to the distribution system and, at the same time, provide a metering of
the fire system showing any system leakage or unauthorized use of water.

**Drainage Facilities:** Pipes, ditches, detention basins, creeks, culvert bridges, etc., used singularly or in combination with each other for the purpose of conveying or storing stormwater runoff.

**Driveway:** A vehicular connection between private on-site parking and the public right-of-way.

**Driveway Apron:** A portion of the driveway connecting a street to the right-of-way; also known as driveway approach or driveway ramp.

**Easement:** Areas located outside of dedicated right-of-way, which are granted to the City for special uses. Easements may also be granted to non-City entities such as franchise utility companies for their uses.

**Engineer:** The engineer, including the City's engineer, licensed by the State of Oregon as a Professional Engineer under whose direction plans, profiles, and standards for the work are prepared and submitted to the City for review and approval, or who is in charge of and responsible for construction of the improvement.

**Expansion Joint:** A joint to control cracking in the concrete surface structure. Felt or fabric type expansion joint is not allowed.

**Fill:** A deposit of soil or other earth material placed by artificial means.

**Fire Hydrant Assembly:** The fire hydrant, with restraint devices, spool and attached auxiliary valve in valve box. Refer to 300 series drawings. Mechanical joint restraint shall be made using Megalugs or TR Flex. (no thrust blocks in new construction).

**Fire Protection Service:** A backflow protected connection to the public water main intended only for the extinguishment of fires and the flushing necessary for its proper maintenance. All fire services shall have a detector check assembly.

**Food Service Establishment (FSE):** means any place where food and/or drink that is intended for individual service and consumption is routinely provided completely prepared. The term includes any such place regardless of whether consumption is on or off the premises and regardless of whether there is a charge for the food and/or drink. The term includes a restaurant, commercial kitchen, food stand, food cart, beverage shop, caterer, hotel, school, religious institution, hospital, prison, correctional facility, or care installation. The term does not include private home where food is prepared for individual family consumption, and it does not include the location of food vending machines.

**Georeferenced:** To associate with location in physical space, containing spatial information – coordinate system (Coordinate System: NAD83 Oregon North; Datum: North American 1983).

**GIS:** Geographic Information System

**GPS:** Global Positioning System

**Grade:** The degree of inclination of a street or slope.

**Grading:** Any act by which soil is cleared, stripped, stockpiled, excavated, scarified, filled, or any combination thereof.

**Gravity Grease Interceptor (GGI):** A plumbing appurtenance or appliance that is installed in a sanitary drainage system to intercept nonpetroleum fats, oils, and greases (FOG) from a wastewater discharge and is identified by volume, thirty (30) minute retention time, baffle(s), not less than two (2) compartments, a total volume of not less than three-hundred (300) gallons, and gravity separation. Gravity grease interceptors are generally installed outside.

**Grease Interceptor:** A plumbing appurtenance or appliance that is installed in a sanitary drainage system to intercept nonpetroleum fats, oil and greases from a wastewater discharge.

**Grease Removal Device (GRD):** means any hydro-mechanical or gravity grease interceptor that automatically, mechanically removes non-petroleum fats, oils and grease form the interceptor, the control
of which are either automatic or manually initiated.

**Half-Street:** Means a minimum 50 percent portion of the ultimate width of the street (but not less than 22 feet with no parking on either side, or 28 feet with parking on one side.) The unimproved side is usually along the edge of a subdivision where the remaining portion of the street shall be provided when the adjacent property is developed per the Amity Development Code.

**Hydrant Spool:** The waterline connecting the fire hydrant to the auxiliary valve on the City distribution main.

**Hydro-mechanical Grease Interceptor (HMI):** A plumbing appurtenance or appliance that is installed in a sanitary drainage system to intercept nonpetroleum fats, oil, and grease (FOG) from a wastewater discharge and is identified by flow rate, and separation and retention efficiency. The design incorporates air entrainment, hydro-mechanical separation, interior baffling, and/or barriers in combination or separately, and one of the following: A – External flow control, with air intake (vent): directly connected; B – External flow control, without air intake (vent): directly connected; C – Without external flow control, directly connected; D – Without external flow control, indirectly connect. Hydro-mechanical grease interceptors are generally installed inside.

**Illicit Connections:** A situation that the Administrator determines would cause harm to the public, environment, or downstream stormwater facilities before the situation can be alleviated or repaired.

**Illicit Discharge:** Any direct or indirect non-stormwater discharge to the stormwater system except discharges regulated under NPDES permit or exempted by this chapter.

**Immediate Threat:** A situation that the Administrator determines would cause harm to the public, environment, or downstream stormwater facilities before the situation can be alleviated or repaired.

**Impervious:** A hard surface that either prevents or greatly retards water infiltration and causes water to runoff on the surface in greater quantities or at an increased rate of flow from that present in undeveloped conditions. Surfaces which would ordinarily be considered pervious are considered impervious if they do not allow natural infiltration of stormwater. Examples include roofs, concrete, asphalt, pavers, compacted gravel, compacted clay, plastic liners, and clogged landscape fabric.

**Industrial Waste:** Solid, liquid, or gaseous waste resulting from any industrial, manufacturing, trade, or business processes; or development, recovery, or processing of natural resources.

**Infiltration:** The passage or movement of water into the soil subsurface.

**Interceptor Sewer:** The primary public wastewater sewer line which conveys wastewater directly into the Wastewater Treatment Plant.

**Irrigation Service:** A metered connection intended for seasonal use and delivering water which is not discharged to the wastewater collection and treatment system.

**Lateral Sewer:** A building sewer service line.

**Local or Residential Street:** A facility designated to serve primarily direct access to abutting land and offers the lowest level of traffic mobility. Through traffic movement is deliberately discouraged.

**Longitudinal Joint:** A joint that follows a course approximately parallel to the centerline of the roadway.

**Low Impact Development Approaches (LIDA):** A stormwater management approach that mimics pre-development hydrology through design techniques that infiltrate, filter, store, evaporate, or detain runoff close to its source.

**Maintenance Agreement:** An agreement between the City and a maintenance organization for private stormwater facilities specifying the operation and maintenance requirements of the facilities.

**Maintenance Organization:** The person(s), company, or nonprofit organization(s) responsible for long-term operation and maintenance of stormwater facilities recorded in the maintenance agreement.
**Major Trees:** Trees within the right-of-way which have a 12” caliper or larger. Street improvement plans should identify major trees by location, caliper, and species.

**Major tree species are those that contribute to the landscape character of the area to include:** e.g. Douglas fir, cedar, redwood, sequoia, oak, ash, birch, walnut, and maple. The identification of major trees should distinguish species generally suitable for retention adjacent to streets and those species with growth habits that create nuisances, unusual maintenance problems, or hazards to the public. Major trees exist in clusters, groves, or rows within the right-of-way.

**Manufacturer's Name:** Any manufacturer's name, specification, catalog, number or type used herein is specified by make and order to establish the standard requirements of the City. Other equivalent makes will be considered for approval, providing they are comparable with this established standard.

**Natural Grade:** The grade of the land in an undisturbed state.

**Net Impervious Area:** The increase in impervious area on a property after a project is completed.

**Non-Stormwater Discharge:** Any discharge to the stormwater system that is not composed entirely of stormwater.

**Owner:** The owner of record of real property as shown on the latest tax rolls or deed records of Yamhill County, and includes a person who purchases a parcel of property and furnishes evidence of the purchase under a written recorded land sale contract.

**Partition:** To divide an area or tract of land into two or three parcels within a calendar year when such area or tract of land exists as a unit or contiguous units of land under a single ownership at the beginning of such year. Partition does not include divisions of land resulting from the creation of cemetery lots; and partition does not include any adjustment of a lot line by the relocation of a common boundary where an additional parcel is not created and where the existing parcel reduced in size by the adjustment is not reduced below the minimum lot size established by any applicable code. Partition does not include the sale of a lot in a recorded subdivision, even though the lot may have been acquired with other contiguous lots or property by a single owner.

**Peak Run Off:** The maximum stormwater runoff rate (in cubic feet per second) as determined for the design storm.

**Person:** Individual firm, corporation, association, agency, or other entity.

**Plans:** Construction plans, including any applicable system plans, sewer plans, profiles, cross sections, elevations, project specific standard drawings, standard drawings, etc., or reproductions thereof, signed by the Engineer of Record, approved or to be approved by the City Engineer, which show the location, character, dimensions, and standards of the work to be performed, and which constitute part of the construction contract documents for privately financed development projects or publicly financed infrastructure improvement projects.

**Potable Water:** Water which is satisfactory for drinking, culinary, and domestic purposes and meets the requirements of the health authority having jurisdiction over it.

**Pretreatment:** means the reduction of the number of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater to a less harmful state or concentration prior to or in lieu of discharging or otherwise introducing such pollutants into the city wastewater system.

**Private Wastewater Collection System:** A privately owned and maintained lateral wastewater conveyance system installed to serve multi-unit structures on single ownership properties which cannot legally be further divided.

**Private Storm Drain:** A storm drain located on private property or serving private parking lot catch basins.

**Project:** An activity that creates impervious area.
**Project Summary**: A narrative that includes the project description, location, emergency contacts, and other information determined by the Administrator such that the project can be located, and a determination made regarding methods of stormwater management.

**Public Wastewater System**: Any sewer in public right-of-way or easement operated and maintained by the City for carrying wastewater and industrial wastes.

**Public Storm Drain**: Any storm sewer in public right-of-way or easement operated and maintained by the City.

**Reclaimed Water**: Wastewater that is treated sufficiently for reuse but not for drinking purpose.

**Record Survey Monument**: Any physical marker, such as an iron rod with a plastic, brass, or aluminum cap, set in place by a professional land surveyor to indicate the location of a land boundary, street centerline, elevation, or other legal or physical land features as noted on a survey recorded in the County Surveyor’s Office.

**Regional Water Quality Facility**: A water quality facility that treats more than 15,000 square feet of impervious area runoff.

**Release Rate**: The controlled rate of release of drainage, storm, and runoff water from property, storage pond, runoff detention pond, or other facility during and following a storm event.

**Responsible Party**: A person or entity holding fee title to the property, tenant, lessee, or a person or entity who is acting as an owner’s representative including any person, company, nonprofit organization, or other entity performing services that are contracted, subcontracted, or obligated by other agreement to meet the requirements of this code.

**Right-of-Way**: All land or interest therein which (by deed, conveyance, agreement, easement, dedication, usage, or process of law) is reserved for or dedicated to the use of the public for sidewalk, utility, and/or roadway purposes.

**Roadway**: That portion of the right-of-way used or to be used for vehicular traffic, which exists typically between curbs, proposed curb lines or ditches.

**Sediment**: Soil or other surficial materials held in suspension in surface water or stormwater.

**Sedimentation**: The process or action of sediment being deposited as a result of decreased surface water or stormwater velocity.

**Sidewalk**: A walk or raised path along the side of a street for pedestrians. A right-of-way deeded, dedicated, and designated for the use of non-motorized vehicles (as allowed) and pedestrians.

**Silt**: Fine clay and silt textured soil particles, including clay that is easily erodible and remains in suspension even at low stream velocities.

**Site**: Any property or combination of properties where a project is being proposed or completed.

**Slope**: The change in elevation of a ground surface expressed as a ratio of horizontal distance to vertical distance, e.g., 3H:1V.

**Standard Drawings**: The drawings of structures and/or devices commonly used on public improvements and referred to on construction plans.

**Stop Work Order**: An order issued by the Administrator or Building Official which requires all project activity, except those specifically stated in the stop work order, to cease on the site.

**Stormwater**: Water that originates as precipitation on a particular site, basin, or watershed and flows over land or impervious surfaces without infiltrating into the ground.
Stormwater Facility: A location to filter, retain, or detain stormwater for the purpose of water quality or quantity management. The facility may be structural or non-structural, has been designed and constructed according to city Public Works Design Standards, and has been required by the city to control post-construction stormwater.

Stormwater Facility Operations and Maintenance Plan: The required steps to be undertaken by an owner or maintenance organization to ensure proper functioning of a stormwater facility.

Stormwater Management: Techniques or structures intentionally used to temporarily or permanently reduce or minimize the adverse effects of stormwater velocities, volumes, and water quality on receiving watercourses. A series of techniques or structures constitute a stormwater system or treatment train.

Stormwater System: The combination of both artificial and natural system of drains, ditches, canals, culverts, detention ponds, retention ponds, dams, and other water control facilities used for collecting and transporting stormwater.

Storm drain: Inlets, outlets, manholes, catch basins, pipes, and other structures used to convey stormwater to its ultimate discharge point.

Stormwater: Water that originates as precipitation on a particular site, basin, or watershed and flows over land or impervious surfaces without infiltrating into the ground.

Streets or Roads: Any public highway, road, street, avenue, boulevard, lane, alley, way, easement, or right-of-way used or to be used for vehicle movement.

Structures: Anything constructed or built, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner.

Subdivision: To divide an area or tract of land into four or more lots within a calendar year when such area or tract of land existed as a unit or contiguous units of land under a single ownership at the beginning of such year.

Super elevation: The tilting of the pavement that helps vehicles travel around a horizontal curve is measured as a vertical distance between the heights of the inner and outer edges of pavement surface. Design of super elevation shall follow the latest AASHTO (American Association of State Highway and Transportation Officials) design guide.

Three-Quarter Street: Means constructing the ultimate full width pavement section, and curbs, gutters, and sidewalk on the development’s side of the roadway. The unimproved side is usually along the edge of a subdivision where the remaining portion of the street (curb, gutter, and sidewalk) shall be provided when the adjacent property is developed.

TMDL: Total Maximum Daily Load

Transverse Joint: A joint which follows a course approximately perpendicular to the centerline of the roadway.

Traveled Way: That portion of the roadway for the movement of vehicles, exclusive of shoulder and auxiliary lanes.

Trunk Sewer: A wastewater sewer which is primarily intended to receive wastewater from a collector sewer, another trunk sewer, an existing major discharge of raw or inadequately treated wastewater, or water pollution control facility.

Turnaround Area: A paved area of sufficient size and configuration that a motor vehicle may maneuver so as to travel in the opposite direction. The City Fire Marshall may require the turnaround to be sized to accommodate turning movements of their specified design vehicle.

Uniform Plumbing Code: The Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials (current edition), as revised by the State of Oregon, called the "Oregon State
A. Support, at least periodically, plants that thrive in saturated conditions,
B. Contains predominately un-drained hydric soil, or
C. The area is saturated or covered with shallow water at some time during the growing season of each year.

1.6 Private Development Process Requirements

1.6.1 Pre-Application Conference

The City of Amity will hold a pre-application conference with the applicant (owner/developer) before formal application for development permits and review of site design and construction plans. The pre-application process allows the applicant and the City to discuss the proposed project and the standards and regulations that will apply while the project is still in a preliminary stage. Any specific development standards, regulations, or problem areas can be discussed before the applicant makes a substantial investment in the project or proceeds with a formal application unaware of the issues.

A. Plan Check and Permits

B. Permit required: No work shall be performed, nor materials stored, nor encroachment made on or within a Right-of-Way, Public Easement, or Public Utility Easement without first acquiring a permit from the City’s Public Works Department, except as provided by City Ordinance.

C. Plan checks and/or permits are required and issued on all construction projects within public rights-of-way, or easements, or on public infrastructure, which will eventually be maintained and operated by the City of Amity. Any permits required by federal, state, and other local jurisdictions shall be obtained by the person proposing the improvements, prior to issuance of the City’s permit.

D. Development permit: Projects requiring Development permits shall include, but not necessarily be limited to, improvements or upgrades to publicly owned and maintained streets, sidewalks, curbs, driveway approaches, water systems, sanitary sewer systems, and storm drainage systems. Projects that also require plan checks and permits include all private storm drainage, sanitary sewer, and water systems that will be connected to or that will discharge into a system under the jurisdictional control of the City of Amity.

E. Right of Way Permit: The construction, repair, maintenance, or replacement of all other utilities located...
within a public right-of-way or public easement, including, but not exclusively, power, telephone, gas, and cable television, shall be required to submit for plan check and obtain a Right of Way Permit.

1.7 Construction Plans

Construction plans shall follow the outline of plan submittal checklist. Prior to any construction work and plan approval, complete construction plans, specifications and all other necessary submittals shall be submitted to the City Engineer for review.

A. Construction plans and specifications shall be prepared by a professional engineer licensed in the State of Oregon. All construction plans shall be based on the current vertical datum for the City of Amity, NAVD 88.

1.7.1 Sheet Size

All construction plans shall be clearly and legibly drawn in ink on sheets measuring 22 x 34 inches (11x17", half-size reduction). Sheets shall have a 1½ inch clear margin on the left edge and a ½ inch margin on all other edges.

1.7.2 Scale of Plans

When plans are prepared for developer financed projects, the following scale of full-sized drawings is suggested.

<table>
<thead>
<tr>
<th>Plan/Scale</th>
<th>Horizontal</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street</td>
<td>1&quot; = 20'</td>
<td>1&quot; = 2'</td>
</tr>
<tr>
<td>Wastewater</td>
<td>1&quot; = 40'</td>
<td>1&quot; = 4'</td>
</tr>
<tr>
<td>Storm</td>
<td>1&quot; = 40'</td>
<td>1&quot; = 4'</td>
</tr>
<tr>
<td>Water</td>
<td>1&quot; = 20' or 40’**</td>
<td>1&quot; = 4'</td>
</tr>
<tr>
<td>Demolition</td>
<td>1&quot; = 40'</td>
<td>N/A</td>
</tr>
<tr>
<td>Erosion Control</td>
<td>1&quot; = 40'</td>
<td>N/A</td>
</tr>
<tr>
<td>Grading</td>
<td>1&quot; = 40'</td>
<td>N/A</td>
</tr>
<tr>
<td>Landscape</td>
<td>1&quot; = 40'</td>
<td>N/A</td>
</tr>
<tr>
<td>Signing &amp; Striping</td>
<td>1&quot; = 40'</td>
<td>N/A</td>
</tr>
<tr>
<td>Street Lighting</td>
<td>1&quot; = 40'</td>
<td>N/A</td>
</tr>
<tr>
<td>Topographic Survey</td>
<td>1&quot; = 40'</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Subdivision street plans, when combined with other proposed facilities listed above, may be drawn at 1" = 40' scale.

A. When a scale is used which is smaller than 1" = 20' (i.e., 1" = 40') intersection drawings showing fittings and valves shall be provided at a larger scale.

B. A horizontal scale of 1" = 20' (or 1" =30') for all drawings is recommended when half-sized drawings are utilized for bid solicitation or for field reference.

C. Architectural scales (e.g., 1/4" = 1'0") are not permitted.

1.7.3 Required Plans

Construction plan submittals shall contain the following minimum sheets: title sheet (unless not required by the City Engineer), plan and profile sheet(s) for street, storm sewer, water, and wastewater sewer, overall utility plan (existing and proposed), proposed grading, temporary and permanent erosion control, and
Drawing No. sheet(s) plus any other relevant construction standards.

1.7.4 Title Sheet

All subdivision projects and multiple sheet improvement projects shall have a title sheet as the first page of the construction plans. This sheet shall contain the following minimum information:

A. Site plan of entire project with street right-of-way and/or subdivision layout at a 1" = 100’ scale. A 1” = 200’ scale may be used if project size is too large. The site plan shall also be a composite utility plan showing all properties served by proposed sewer, water, and storm facilities, in addition to the proposed facility.

B. Vicinity map at a 1” = 1000’ scale or greater.

C. Index of sheets.

D. Complete legend of symbols used.

E. General and construction notes pertinent to project, including one-call locate note.

F. Temporary and/or permanent benchmarks used along with their descriptions, elevations of benchmark, and datum. (When topographic survey is presented separately, show this information on that sheet.)

G. Engineer's name, address, phone number including emergency contact information, email, and seal.

H. Developer/owner's name, address and phone number including emergency contact information.

I. Statement referencing City of Amity Design Standards.

J. Provide contact phone number for all affected utility companies including the City.

K. Show tax lot numbers or lot and block designations, land use designations, gross site area, and site address.

L. Date of last plan revision (large/bold).

M. Land Use Planning case file number(s).

1.7.5 Plan Sheet

The plan view of each sheet shall be drawn at the appropriate scale showing the following minimum information:

A. Adjacent street curbs, property lines, right-of-way lines, utility easements referenced to property lines, street centerlines, and intersections. Show property corner and curb elevations to determine water service level, serviceability of lot/property for wastewater sewer, points of disposal for building storm drains, and how new curbs will join to existing curbs.

B. Location of all underground utilities within 100 feet of project (if they are affected by the project), existing power/telephone poles and guy anchors, valves, manholes, catch basins, fire hydrants, meter boxes and vaults, signs, etc. location of nearest streetlight(s) and fire hydrant(s) (distance could be greater than 100’).

C. Location of all water courses, railroad crossings, culverts, bridges, large water transmission pipes and gravity sewers, and/or storm drains within 200 feet of proposed gravity sewer and storm drain extensions if they affect the design of the project. All water courses shall show the 100-year flood plain as indicated on the U.S. Army Corps of Engineers and Federal Emergency Management Agency (FEMA) maps, any current or proposed wetlands and the City’s Stream Corridor.

D. On sewer and storm drain plans, each manhole, catch basin, and cleanout shall be numbered and stationed. Stationing shall tie to existing street monuments, property corners, or manholes. Stationing for each line shall increase from left to right on the plan sheet and shall be consistent throughout the plan set. This should result in north pointing to the top or to the left of the sheet. Each separate line
shall be separately designated (e.g., sewer line 'A', storm line 'A', etc.).

E. On street plans, horizontal stationing shall show points of tangency and curvature for centerline; curve data shall show tangent length, radius distance, centerline curve length, and delta angle. Centerline intersection stationing, in both directions, shall be shown. Provide ¼ point elevations for curb returns.

F. Where streets are being widened, edge of pavement elevations shall be shown to determine pavement cross slope to new curb or pavement edge.

G. On water plans, all fittings and valves shall be shown and identified by type (i.e., MJ x MJ, FLG x MJ, etc.); fire hydrants shown; intersection drawings for valves and fittings are required when scale of plans is smaller than 1" = 20' (i.e., 1" = 40').

1.7.6 Profile Sheet

Profiles for construction plans shall be the same horizontal scale as the plan sheet. Profiles are drawn on the same sheet as the plan view and shall be immediately below the plan view. Stationing shall increase from left to right with lower stations to the left.

The following minimum information shall be shown:

A. For sewers and storm drains, show locations of manholes, catch basins, and cleanouts, with each numbered and stationed.

B. Existing profile at centerline of proposed utility or street.

C. Proposed profile grade, as appropriate, for all sewers, storm drains, and waterlines, giving pipe size, length between structures or fittings, slope, backfill and pipe material, sewer inverts, rim elevations, etc.

D. Existing underground utility that crosses the alignment of the proposed facility.

E. Beginning of all vertical curves, points of vertical intersection, end of vertical curve, low point of sag curve, and length of vertical curve. Profiles of existing centerline grade shall extend a minimum of 250 feet beyond the end of the improvement.

F. Clearly show all potential conflicts with existing public and private utilities (i.e., pipes, conduits, vaults, cathodic protection systems, etc.) that impact proposed design.

G. Future street extensions to undeveloped sites shall be designed/profiled a minimum of 150' off-site.

NOTE: City of Amity as-built records are only to be used as an aid to the engineer. The engineer shall field locate, or cause to be located, and verify the alignment, depth, and inverts of all existing facilities shown on the plans that will be crossed by the proposed facility.

1.7.7 Erosion Control Plans

The erosion control plan shall address the measures as required by the Department of Environmental Quality (DEQ) erosion control standards and policies and the Willamette Total Maximum Daily Load (TMDL) Implementation Plan. Construction activity is assumed as "active" until all permanent vegetation and/or erosion protection is established.

1.7.8 Standard Drawing Sheets

Specific drawings shall be included with all construction plans where City of Amity Standard Specifications and Standard Drawings do not exist. If a Standard Drawing, such as sewer manholes, must be modified to fit existing or unique conditions, the modified drawing shall be shown on the plans. When appropriate, due to required Drawing No. complexity, a separate Drawing No. sheet shall be drawn. When City Standard Drawing appurtenances or construction installations are to be used, a reference to the specific Standard Drawing number shall be made on the relevant sheet.

1.7.9 Supporting Information
The engineer shall submit sufficient supporting information to justify the proposed design. Such information shall include, but not be limited to, the following:

A. Design calculations.

B. Storm drainage report with all hydrology and hydraulic calculations, stormwater quantity and quality calculations, basin maps and downstream analysis as required in Section 4, Storm Drainage.

C. Alternate materials specifications including manufacturer's design application recommendation.

D. Intersection sight distance certification as outlined in Section 5, Streets.

E. Grading plan support information may include, but is not limited to:
   1. Soil’s engineering report
   2. Hydrology report
   3. Geotechnical engineering report
   4. Arborist report

F. Water model calculations and fire flow calculations for waterline systems.

G. Documentation of proper protection and/or replacement of Record Survey Monuments. If, in the course of construction of the proposed development, a record survey monument shall be removed, disturbed, or destroyed, the Engineer shall cause a registered professional land surveyor to reference and replace the monument within 90 days in accordance with ORS 209.

1.8 Plan Submittal

Construction plans for all privately financed public works facility improvements shall be submitted to the City Administrator for distribution to City Staff. The City Administrator will coordinate the plan review and approval of all construction plans which will include review by City Staff for compliance with all Amity Design Standards, the Amity Development Code, and other City Codes and Ordinances.

All plan submittals shall include information required in these Public Works Design Standards along with all other information requested by the City Engineer. This information is to include, but not be limited to, construction cost estimates, intersection sight distance certifications, easement documents, right-of-way dedications, executed agreements, and a plan check and inspection fee. All submittals will be reviewed for completeness and the engineer notified if required information is missing. Submittals should be made in a timely manner as lack of information to the City may impede the review process.

Plans deemed incomplete by the City’s authorized representative may be returned without a full plan review being completed. An explanation will be provided by the City indicating sections of the plans deemed incomplete. Once all items are addressed, plans may be resubmitted for review.

1.9 As-built Plan Requirements

For all public works facility improvements, the engineer shall submit a record drawing of as-built drawings for all plans that were approved for construction. As-built drawings shall meet the requirements of these Public Works Design Standards and shall be of archival quality.

At the time of the final as-built plan approval submittal, the applicant shall provide the City with as-built drawings of the public improvements as follows:

A. 3 mil mylar of the complete construction plan set(s).

B. Georeferenced .dwg and/or .dxf complete plan set on a USB flash drive.

C. Georeferenced .pdf format on a USB flash drive of the complete plan set.

D. Shapefiles containing all of the infrastructure, structure, underground and/or any visible asset to be
compatible with the City’s GIS and asset management system.

E. As-built drawings must show actual design numbers, “crossed out”, and updated with actual as-built numbers.

The words "As-built Drawing" shall appear as the last entry in the revision block of the plans, along with the month, day, and year the as-built drawing was prepared.

NOTE: Actual location and depth from finish grade of any other utilities encountered during construction shall be shown and noted on both plan and profile of the as-built plans.

The following minimum information shall be noted on as-built drawings:

1.9.1 Street
A. Change in horizontal alignment, curve data, and stationing of primary control points (e.g., PC, PI, PT, PRC, and PCC).
B. Vertical curve or grade changes; change in location of low point in sag vertical curve.
C. Change to approved thickness for street structural section components. Show station limits where changes in structural section have occurred including subgrade stabilization rock section.
D. Change to driveway locations or widths, or construction materials.
E. Other change(s) altering the approved plans.

1.9.2 Storm Drains
A. Station of wye or tee connection into main line; tie end of branch line to nearest property corner at right-of-way line and distance back from the face of curb.
B. Show alignment changes, grade changes, and changes in construction materials. If changed alignment results in station changes, a station equation shall be shown as appropriate at a manhole.
C. Other change(s) altering the approved plans.
D. Actual location and depth, from finish grade of street and City datum, of any other utilities encountered during construction.

1.9.3 Wastewater
A. Station of wye or tee into main line. Tie end of service lateral to nearest property corner at right-of-way line and distance back from the face of curb.
B. Depth at the end of service lateral measured from existing ground to invert of pipe. When required by the City Engineer, invert elevations shall be noted.
C. Length of service lateral measured from centerline of sewer main to end of pipe.
D. Show alignment changes, grade changes, and changes in construction materials. If changed alignment results in station changes, a station equation shall be shown as appropriate at a manhole.
E. Other change altering the approved plans.
F. Type of pipe, backfill material and location.
G. Actual location and depth, from finish grade of street and City datum, of any other utilities encountered during construction.
H. Depth to bedrock encountered, if any.

1.9.4 Water Main
A. Station and/or property line/corner to valves (not at standard location), all fittings, blow-offs, and dead ended lines.
B. All changes from standard 36 inch depth cover. Limits shall be shown on plan with annotated reason for change. Actual pipe elevation shall be specified at regular intervals by engineer of record.

C. Show alignment changes, grade changes, and changes in construction materials. If changed alignment results in station changes, a station equation shall be shown as appropriate at a valve.

D. Provide manufacturer of all valves and hydrants; identify types of fittings (i.e., MJ x MJ, FLG x MJ, etc.).

E. Other change altering the approved plans.

Actual location and depth, from finish grade of street and City datum, of any other utilities encountered during construction.

1.10 Approval of Alternate Materials, Methods, or Design

Any substitute material or alternate method not explicitly approved herein will be considered for approval as set forth in this section. Persons seeking such approvals shall make application in writing. Approval of any major deviation from these Public Works Design Standards will be in written form. Approval of minor matters will be made in writing if requested.

Any alternate must meet or exceed the minimum requirements set in these Public Works Design Standards.

The written application for an alternate approval is to include, but is not limited to, the manufacturer’s specifications and testing results, Public Works Design Standards, design drawings, calculations, and other pertinent information.

1.10.1 General

The City Engineer may approve a design exception request so long as it does not conflict with the City Development and/or Municipal Codes, the County or City Land Development Permit Decision, or any other relevant approvals, except as expressly provided herein. If the requested exception involves public safety, the City will rule in the direction of safety.

1.10.2 Submittal

All requests shall state the applicable standard, the desired exception, the reason for the request and a comparison between the applicable specification or standard and the exception as to function, performance, and safety. If an exception is requested due to economic hardship, the request shall contain a statement on the impact to project cost with and without the exception. The request for exception shall be prepared by an Engineer and shall be stamped and signed by the Engineer. Multiple design exception requests shall be separated, individually prepared, and submitted to the City as separate requests.

Any approved exception to these Standards shall be documented and should reference nationally accepted guidelines, specifications, or standards. The approval of an exception shall not compromise public safety or the intent of these standards. An exception shall be approved only if the City Engineer finds that the alternative proposed by the Engineer meets the criteria addressed in this section and will provide equivalent or better function, performance, and safety.

Each exception shall be reviewed on a case-by-case basis and approved or denied by the City Engineer. All exception requests granted are considered unique to each request and project, do not set a precedent, and are not uniformly applicable.

When requested by the City, complete full-size plans and design calculations shall be submitted for review with the request for approval.

1.10.3 Special Facility Designs

These standards are not intended to address the requirements for all possible public or private facilities. Facilities not addressed in these standards are considered unique and must be designed to meet site specific criteria. For these types of facilities, the design engineer must request a pre-design meeting to review the appropriate design, operating and maintenance criteria that will apply to the specific project prior
to submittal any design reports or plans.

The following are examples of facilities that will require special review and approval:

A. Sewer Force Mains
B. Water Distribution Pump Stations
C. Relining of Existing Sewers
D. Relining of Existing Water Mains
E. Internal Sealing of Existing Sewers
F. Water Pressure Regulating Devices
G. Wastewater Regulatory Devices
H. Energy Dissipaters
I. Wastewater Pump Stations
J. Water Reservoirs
K. Sewer Siphons
L. Water Treatment Plants
M. Wastewater Treatment Plants
N. Water Flow Measurement/Monitoring/Telemetry Devices
O. Wastewater Flow Measurement/Monitoring Devices

1.10.4 Review

The request for design exception will be reviewed by the City Engineer who will make one of the following decisions within fourteen days:

A. Approve as requested.
B. Approve with changes
C. Deny with an explanation

Approval of a request in one project shall not constitute a precedent for other projects.

1.10.5 Appeal

The Applicant may appeal the City Engineer’s decision to deny an exception to the Administrator. The appeal shall be submitted in writing within fourteen (14) days of the City Engineer’s decision.

The appeal shall be in writing, state the relevant facts, applicable provisions of these Standards, specific grounds for appeal, the relief sought, and shall include all information on which the applicant relies. The applicant shall have the burden of proving that an error was committed, or that the requested exception meets the criteria and equals or exceeds the applicable standard as to function, performance, and safety.

The Administrator shall review all the information submitted with an appeal. The Administrator may request additional information from the Engineer, the City Engineer, or both, and may meet with the parties. The Administrator shall render a decision in writing. The Administrator’s decision shall be final.

1.10.6 Responsibility for Exceptions
The Engineer shall be responsible for requesting, in writing, any anticipated exceptions to these standards at the time of submittal of plans. Only those exceptions so noted and expressly approved by the City Engineer, shall be lawful and permitted, notwithstanding approval of the overall “red-line” or “as-builts”.

1.11 Permit and Assurances

Before any public construction begins, a letter of commitment, letter of credit, assignment of deposit, bond, or cash deposit in form and substance satisfactory to the City shall be submitted by the applicant as a performance assurance for such construction. The amount of the performance assurance for private development projects shall be 150% of the design engineer’s estimate or bid total on public improvements and shall be conditional on the performance of all terms and conditions of the permit and these standards. The guarantee shall include, but not be limited to, restoration of settled fills, trenches, pavement, and surfaces.

When all requirements stipulated here are met and the construction plans are stamped and signed by the City's authorized representative, a Public Improvement or Right of Way Permit can be issued on payment of the permit fee.

The Permit shall be valid for 180 calendar days from the date of issuance. If time elapses on the permit, the applicant can request, in writing, a permit extension from the City Administrator or the City's authorized representative. If the request is approved, the permit holder then has an additional 180 calendar days to begin construction on permitted projects and shall show substantial progress during this permit extension, as determined by the City. If no substantial progress is made within the allotted time, no further permit extension will be granted, the permit will expire, and the permit fees will be forfeited to the City. Plans may be resubmitted, subject to payment of new fees. Resubmitted plans shall be reviewed to determine compliance with the Public Works Design Standards, including any newly approved codes and/or regulations.

1.11.1 Insurance Requirements

The City requires additional assurances from the applicant/contractor including, but not limited to, Certificates of Insurance from insurance companies or entities acceptable to the City. The Certificate shall specify all of the parties who are Additional Insured. The contractor shall be responsible for paying all deductibles, self-insured retentions and/or self-insurance included under these provisions. For City financed projects, a Certificate of Insurance shall be executed by the successful bidder and their insurance company prior to the execution of the contract by the applicant.

Such insurance shall be provided as indicated in the Construction Specifications and Project Special Provisions for coverage for not less than the following limits of liability:

- A. $1,000,000 each occurrence
- B. $2,000,000 general aggregate
- C. $1,000,000 product and completed operations aggregate
- D. $50,000 fire damage (any one fire)
- E. $500,000 employer’s liability
- F. $1,000,000 combined single limit automobile liability for owned, non-owned, and hired automobiles. "Symbol One" coverage shall be designated

1.11.2 Indemnification

The applicant/contractor shall indemnify and hold harmless the City of Amity and its officers, agents, and employees; Amity City Council; from and against all claims, demands, penalties, damages, losses, expenses, including attorney’s fees, and causes of action of any kind or character, including the cost of
defense thereof, arising or alleged to have risen in favor of any person on account of personal injury, death, or damage to property arising out of or resulting from, or alleged to have risen out of or resulted from, in whole or in part, any act or omission of the applicant, the applicant's design engineer, the applicant's contractor, or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

1.12 Inspection and Scheduling

1.12.1 Inspection

The City's authorized representative shall inspect the project as necessary and shall check materials, equipment, and the construction of the project to determine whether the work is proceeding in accordance with the City's standards. The contractor shall notify the City's authorized representative at least 24 hours (one working day) to request City inspection. No such inspection, however, shall relieve the contractor of their duties under these standards.

The City's authorized representative shall have the authority to direct replacement of defective material and uncovering work not inspected as required. Material rejected by the City's authorized representative shall be removed from the job site by the contractor immediately after its rejection and shall not be used on the project.

Instructions given by the City's authorized representative shall be respected and executed by the contractor. The City's authorized representative, however, shall not have the power to waive the obligations of the contractor to furnish high-quality equipment, supplies, and materials, or to perform good work.

Should a contractor encounter a condition different than that indicated by the construction documents, the contractor shall notify the City's authorized representative in writing of the changed condition and shall not precede with any work associated with the changed condition until a written response is received from the City. The City's authorized agent shall review the change with the contractor and the Project Engineer and issue a written directive to the contractor Any work commenced prior to the issuance of a written directive from the City will be at the contractor's risk.

1.13 Easements

Mains placed in easements along a property line, shall have a minimum easement width of ten feet (10') on the side of the property line where the main is placed (the remaining required easement width may be on the adjacent property) and the main shall be offset 36 inches from the property line. Mains placed in easements along a right-of-way line shall be offset a minimum 3 feet from the right-of-way line. For mains placed in easements located other than along a property or right-of-way line, the main shall be placed in the center of the easement. Easements, when required, shall be exclusive and conform to the dimension specified in Standard Drawing No. 109. The conditions of the easement shall be such that the easement shall not be used for any purpose that would interfere with the unrestricted use for water main purposes. Under no circumstances shall a building or structure be placed over a public utility main or public utility main easement. This includes overhanging structures with footings located outside the easement.

Easement locations for public mains serving a PUD, apartment complex, or commercial/industrial development shall be in parking lots, private drives, or similar open areas which will permit unobstructed vehicle access for maintenance by City personnel.

1.14 Project Closeout

At the conclusion of the project, the applicant shall notify the City's authorized representative in writing that the project is ready for final inspection. On receipt of this notice, the City's authorized representative will request the following:

A. Record Drawings

B. Final Inspection: Once the City's authorized representative receives the initial set of paper and
electronic PDF format record drawings, a final inspection of the project will be conducted by the City's authorized representative.

C. Project Correction List: After this inspection, a project correction/repair list (punch-list) will be issued by the City's authorized representative to the applicant and contractor. The project correction/repair list will include any items either damaged or improperly placed during construction, and any item(s) that, in the opinion of the City’s authorized representative, need repair.

D. Project Corrections: Contractor shall perform correction/repair work as required on the project correction/repair list. The City encourages the contractor to complete all correction/repair work as expeditiously as possible, the City will retain the performance assurance until the project correction list has been completed, and inspected and approved by the City’s authorized representative, and the contractor submits all maintenance and landscape maintenance assurances to the City.

The City’s authorized representative will consider the project complete and shall so state in writing when all of the following items are complete:

A. All items of the project correction list are completed, inspected and approved by the City’s authorized representative.

B. Final set of AutoCAD files and a digitally signed set of PDF record drawings submitted to the City and approved by the City’s authorized representative.

C. Confirmation that all easements and legal documents have been recorded with the County Recorder.

D. Contractor submits approved maintenance assurances and warranty

At this time, the warranty period will go into effect on written notice from the City Engineer.

1.14.1 Maintenance and Warranty

A. Maintenance Assurance Required: Contractor shall fully warrant all work from defect, for a period of time as determined by the type of work. The warranty shall be required for work to ensure post-construction quality and landscape survivability. If defective or negligent work is discovered and repaired, this warranty will automatically be extended from the date the repair is made and accepted by the City. This warranty by the Contractor is in addition to and not in lieu of any other warranties provided by various suppliers or manufacturers. Such warranty shall be guaranteed in the form of maintenance assurance. Assurances shall be in the form of a letter of commitment, letter of credit, assignment of deposit, bond, or cash deposit, in form and substance satisfactory to the City. Assurances shall remain in place until a written release is issued from the City. This provision of the Maintenance Assurance is to help secure the Contractor’s performance of any corrective work that may need to be performed within the warranty period of the Project, but in no way limits the Contractor’s liability, therefore.

B. Construction Maintenance Assurance: Maintenance assurance shall be required for all public improvements constructed by the Contractor. The construction maintenance assurance shall be for 10% of the cost to construct the public improvements and be in place for a period of not less than 2 years from the date of Final Acceptance. Prior to the end of the two-year assurance, the City will provide contractor with a maintenance project corrections list; the City reserves the option to video inspect the sanitary and/or storm sewer lines, if any were constructed, repaired or installed as part of the contract. Contractor shall make all necessary repairs and replacements to remedy any and all defects, breaks, or failures of the public improvements as identified by the City and having occurred within two years following the date of Final Acceptance due to faulty or inadequate materials or workmanship, in a manner satisfactory to the City’s authorized representative and at no cost to the City. Contractor shall repair damage or disturbances to other improvements under, within, or adjacent to the public improvements, whether or not caused by settling, washing, or slipping, when such damage or disturbance is caused, in whole or in part, from activities of the Contractor in performing his/her duties and obligations when such defects or damage occur within the warranty period. Construction
maintenance assurance shall be released two years after acceptance of any corrective work performed during the maintenance assurance period.

C. Landscape maintenance assurance: Landscape maintenance assurance shall be for 100% of the cost to install all required landscaping in water quality/quantity facilities, plus 100% of the cost to maintain the landscaping in these areas and be in place for a period of not less than 2 years from the date of Final Acceptance. The assurance shall be released two years after acceptance of construction, providing the landscaping meets the 90% survival level.

D. Prompt Compliance: If Contractor, after written notice, fails within 10 days to proceed to comply with the terms of this section, Owner may have the defects corrected, and Contractor and Contractor’s Surety shall be liable for all expenses incurred. If the assurance is in the forms of cash or letter of credit, the City may immediately draw upon such amount. In case of an emergency where, in the opinion of the Engineer, delay would cause serious loss or damage, repairs may be made without notice being given to Contractor and Contractor or Surety shall pay the cost of repairs. Failure of the Engineer to act in case of an emergency shall not relieve Contractor or Surety from liability and payment of all such costs.
SECTION 2 - WASTEWATER

2.1 Performance Standards

Wastewater system design shall meet the policies and guidelines of the current City of Amity Wastewater Master Plan and the Oregon Department of Environmental Quality wastewater design guidelines and shall be designed with a 75 year life expectancy.

Public wastewater systems within the public right of way shall be designed to provide gravity service to all areas of development.

Wastewater system capacity shall be designed for ultimate development density of the urban growth boundary. The system shall allow for future system extension and for future development.

Stormwater, including street, roof, or footing drainage, shall not be discharged into the wastewater system but shall be removed by a system of storm drains or by some other method separate from the wastewater system.

Unpolluted or non-contact cooling waters shall not be discharged into wastewater systems. The overflow drains and filter backwash lines of swimming pools and "hot tubs" shall drain into a wastewater sewer.

As a condition of wastewater service, all developments will be required to provide public wastewater lines to adjacent upstream parcels in order to provide for an orderly development of the drainage area as required by the Amity Development Code. This shall include the extension of waste mains in easements across the property to adjoining properties, and across or along the street frontage of the property to adjoining properties when the main is located in the street right-of-way. This shall include trunk sewers that are oversized to provide capacity for upstream development within the urban growth boundary.

All wastewater facilities shall be located within the public right-of-way for ease of maintenance and access, control of the facility, operation of the facility, and to provide required replacement and/or repair. Exceptions may be made on a case-by-case basis as approved by the City Engineer.

2.2 Pipe Materials and Size

2.2.1 General

It is not intended that the materials listed herein are to be considered equal or to be generally interchangeable for all applications. The material suitable for project conditions shall be determined by the Engineer of Record and approved by the City’s authorized representative.

Generally, sanitary sewer mains and laterals shall be Polyvinyl Chloride Pipe (PVC) pipe, ASTM D-3034, SDR 35 or lower, unless otherwise recommended by the Engineer of Record and directed by the City’s authorized representative.

Pipe and fittings shall consist of one type of material throughout and no interchanging of pipe and fitting material is allowed.

Sanitary sewer pipe shall have flexible gasket joints, and joints on all fittings shall be installed to the manufacturer's recommendations. Caps or plugs shall be furnished with each fitting, outlet, or stub, as required, and shall have the same type of gasket or joint as the pipe.

Each piece of pipe and fitting shall be clearly identified as to strength, class, and date of manufacture.

2.2.2 Aggregate and Cement

Aggregate shall meet the standards set forth in ODOT SSC Section 02690, "PCC Aggregates"; Portland cement shall meet the standards set forth in ODOT SSC Section 02001, "Portland Cement."
2.2.3 Concrete
PCC for poured in place manholes and structures shall conform to ODOT Class 3000 - DA, Commercial Grade Concrete. Slump shall be between 2 and 4 inches.

2.2.4 Manhole Frames and Covers
Casting shall be of new material, tough, close-grained gray iron conforming to ASTM A-48, Class 30B and AASHTO M 105, Class 30B. Where the ASTM and AASHTO specifications differ, the more stringent shall apply. Casting shall be smooth and clean, free of blisters, blowholes, and all defects. Bearing surfaces shall be planed or ground to ensure flat, true surfaces. Covers shall be true and set within rings at all points.

Rings shall be grouted in place and made watertight with a high-strength, non-shrink grout meeting ODOT SSC Section 02080.40, “Non-Shrink Grout,” such as Alcrete Twenty Minute Fast Setting Grout® or approved equal. Unused grout shall be discarded after 20 minutes and shall not be used. Rings shall not be brought to grade with lumber.

Frames and covers shall be standard or suburban, depending on the manhole location and as approved by the City’s authorized representative. Suburban style manhole frames shall not be installed in PCC streets or arterial roadways and shall be pre-approved by the City Engineer.

2.2.5 Manhole Types
Manholes shall be pre-formed rubber O-ring gasket design only and conform to the following:

A. Precast 48-Inch-Diameter Manholes
   1. Materials shall conform to the requirements of ASTM C-478. Minimum wall thickness shall be 5 inches.

B. Precast Large-Diameter (60-inch or larger) Manholes
   1. Materials shall conform to the requirements of ASTM C-478. Manhole structural dimensions shall be reviewed and approved on a case-by-case basis.

C. Precast Manhole Tops
   1. Standard eccentric cone, and short eccentric cone tops shall be provided. Eccentric cones shall conform to all requirements of ASTM C-478, with the exception of the steel reinforcement requirement. Precast manhole tops shall be designed to withstand AASHTO H-20 loadings.

D. Precast Bases
   1. Precast manhole bases shall be used, except when placing a manhole over existing pipe. Precast bases shall conform to the requirements of ASTM C-478. The base riser section shall be integral with the base slab.

E. Poured-in-place Bases
   1. Poured-in-place manhole bases may only be used when placing a manhole over an existing pipe.

F. Manhole Pipe Connectors
   1. Connections to manholes shall be made with an approved flexible connector specifically manufactured for the intended use, conforming to ASTM C923, and in accordance with Drawing 204, 205, 206, and 208 of these standards. Field fabricated water stops or improvised adapters, such as gaskets stretched over the pipe, will not be allowed.
G. Pipe Stub outs for Future Sewer Connections
   1. Pipe stub outs shall be the same type as approved for use in the lateral, main, or trunk sewer construction.
   2. Gaskets
      a) Manhole sections shall be installed with preformed rubber O-ring gaskets only. Rubber gaskets shall conform to AASHTO M 315 and ASTM C-443.

H. Manhole Steps
   1. No steps are allowed in manholes.

2.2.6 Pipe Materials
Materials shall be the following types or approved equal:
A. Polyvinyl Chloride Pipe: Polyvinyl Chloride Pipe (PVC) pipe and fittings shall conform to ASTM D-3034 (SDR 35 or lower) and ASTM F-679. Where added pipe strength is required, PVC pipe shall conform to AWWA C-900 and AWWA C-905.
B. Ductile Iron Pipe (D.I.) shall be cement mortar lined with push on joints conforming to the requirements of AWWA C-151/ANSI A21.51 and AWWA C-104/ANSI A21.4. The minimum thickness class shall be Class 50 (up through 12-inch diameter pipe) and Class 51 (for 14-inch diameter and larger pipe).

2.2.7 Fittings
Manufactured tee fittings shall be provided in the sewer main for laterals. Fittings shall be of sufficient strength to withstand all handling and load stresses encountered.
Fittings shall be of the same materials as the pipe. Material joining the fittings shall be of the same material as the pipe.
Material joining the fittings to the pipe shall be free from cracks and shall adhere tightly to each joining surface.
All fittings shall be capped or plugged and shall be gasketed with the same gasket material as the pipe joint, fitted with an approved mechanical stopper, or have an integrally cast knockout lug. The plug shall be able to withstand all test pressures without leaking. When later removed, the plug shall permit continuation of piping with jointing similar to joints in the installed line.

2.2.8 Mechanical Couplings
Mechanical couplings shall be wrought steel or ductile iron. Couplings shall be cement mortar or epoxy lined. Installation procedures must meet the manufacturers’ recommendations.

2.2.9 Line Tap Saddle for Service Laterals
PVC Tee Saddle manufactured in accordance with ASTM D-3034 (SDR 35 or lower) with minimum cell classification of 12454B-C or 12364-C as defined in ASTM D-1784. Elastomeric seals shall meet ASTM F-477 specifications; locate seals at both the lead and skirt ends of the saddle. Saddles shall be banded to pipe with 316 Stainless Steel bands, 9/16-inch wide. This saddle is allowed on PVC, clay, IPS, concrete, asbestos cement, and PE pipe.
Romac Style "CB" Saddle shall be made of casting of ductile iron, which meets ASTM A-536, grade 65-45-12. Rubber gaskets shall conform to AWWA C-111/ANSI A21.11. The band shall be stainless steel with Teflon coated nuts and bolts. This saddle is not allowed on plastic pipe except C-900. Install the saddle per manufacturer’s instructions.
2.3 Minimum Design Criteria

2.3.1 Velocity

All wastewater lines shall be designed on a grade which produces a mean velocity, when flowing 80% full, of no less than two feet (2’) per second. The minimum slope for each pipe size shall be found in the following table:

<table>
<thead>
<tr>
<th>Nominal Sewer Size</th>
<th>Minimum Slope in Feet Per 100 Feet (m/100 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 inch (200 mm)</td>
<td>0.40</td>
</tr>
<tr>
<td>10 inch (250 mm)</td>
<td>0.28</td>
</tr>
<tr>
<td>12 inch (300 mm)</td>
<td>0.22</td>
</tr>
<tr>
<td>15 inch (375 mm)</td>
<td>0.15</td>
</tr>
<tr>
<td>18 inch (450 mm)</td>
<td>0.12</td>
</tr>
<tr>
<td>21 inch (525 mm)</td>
<td>0.10</td>
</tr>
<tr>
<td>24 inch (600 mm)</td>
<td>0.08</td>
</tr>
<tr>
<td>27 inch (675 mm)</td>
<td>0.067</td>
</tr>
<tr>
<td>30 inch (750 mm)</td>
<td>0.058</td>
</tr>
<tr>
<td>33 inch (825 mm)</td>
<td>0.052</td>
</tr>
<tr>
<td>36 inch (900 mm)</td>
<td>0.046</td>
</tr>
<tr>
<td>39 inch (975 mm)</td>
<td>0.041</td>
</tr>
<tr>
<td>42 inch (1050 mm)</td>
<td>0.037</td>
</tr>
</tbody>
</table>

2.3.2 Manning Equation

When calculating minimum pipe slopes and velocities, the engineer shall use the Manning pipe friction formula.

2.3.3 Coefficient

The minimum pipe roughness coefficient for wastewater sewers shall be 0.013.

2.3.4 Inflow and Infiltration

An allowance of 1,000 gallons/acre/day shall be added for all land area in the basin being served for calculation purposes.

2.3.5 Fats, Oils and Grease (Fog)

All Food Service Establishments (FSE) are required to install a grease removal device (GRD) for the kitchen or food/beverage preparation area. GRD’s should be cleaned and maintained on a regular basis in order to insure proper functioning and insect free performance.

2.4 Alignment and Cover

2.4.1 Right-Of-Way Location

Wastewater lines shall be located north and west from the right-of-way centerline as defined in Standard Drawing No. 103. All gravity sewer junctions and changes in direction or size of pipe shall be made at a manhole.
Sewers shall be located in the street right-of-way whenever possible.

Utility infrastructure may not be placed within one foot of a survey monument location noted on a subdivision or partition plat per ORS 92.044 (7).

2.4.2 Minimum Cover

In new residential hillside subdivisions, mainline and lateral sewers shall be placed in the street at a depth sufficient to drain building sewers on the low side of the street.

Wastewater sewers in residential areas shall be placed in the street with the following minimum cover, Standard Drawing No. 211 & 212:

- Building Service Lateral Six feet (6’)
- Trunk and Collector Sewer
- In the roadway - Eight feet (8’)
- In easements - Eight feet (8’)

Where the topography is relatively flat and existing sewers are shallow alterations to the coverage may be approved by the City Engineer.

2.4.3 Relation to Watercourses

Sewers located along streams shall be located outside of the stream bed and sufficiently removed there from to provide for future, possible stream channel widening. All manhole covers shall be watertight at or below the 100-year flood elevation.

For crossings, pipe material shall be Class 52 ductile iron or ASTM C-900 PVC with a 20-foot length of pipe centered on the stream or drainage channel centerline. The pipe shall extend to a point where a one-to-one slope begins at the top of the bank and slopes down from the bank away from the channel centerline and intersects the top of the pipe. (No tees are allowed in DI runs).

2.5 Manholes

Manholes shall conform to ASTM C 478.

Manholes shall be located at all changes in slope, alignment, pipe size, pipe material, and at all pipe junctions with present or future wastewater sewers. Manhole spacing shall not be greater than 300 feet.

Designs for manholes are shown in Standard Drawing No.204-208. They are suitable for most conditions. New designs or revisions should not be shown on the construction drawings unless the standard designs are not suitable.

New or revised designs may be necessary if:

A. One or more of the sewers to be connected to the manhole is over 36 inches in diameter (smaller diameters may require a special design if the manhole is at an alignment change.)

B. Several sewers will be connected to the manhole.

C. There is less than 90° between the incoming and outgoing sewer.

D. The manhole will be subject to unusual structural loads.

E. Diversion or other flow control measures are required.

Where one or more of conditions I, II or III is encountered, a drawing of the manhole base should be made to determine if it is feasible to use designs shown in the Standard Drawings. It may be necessary to restrict the options to a specific Standard Drawing specified by a note on the construction drawings. If a special design is required for any reason, it will be necessary to show the Drawing Numbers on the construction drawings and to provide structural calculations as needed and be approved by the City Engineer.
2.5.2 Alternate Manhole Features

Some alternate manhole features are shown in the Standard Drawings. Where these features are required, they must be specified by a note on the construction drawings. Some examples are:

A. Short cones must be used in lieu of standard cones where there will be less than five (5) feet between the lowest pipe invert elevation and the top of the manhole lid. Flat top manholes may not be used on a case-by-case basis if a standard frame can be used. Pre-approval required.

B. Watertight manhole frames and covers are to be used if flood waters are expected to cover the manhole top or be below 100-year flood elevation. Such conditions should be avoided wherever feasible. For manhole joint seal, apply wrap-around heat-shrink protection sleeves as approved by City Engineer. In remote locations, the finish grade of the manhole casting needs to be 2 feet above existing grade.

C. Tamperproof manhole frames and covers are not allowed.

Standards for elevation differences at manholes have been established to compensate for normal energy losses and to prevent surcharging of a sewer by a larger sewer. For purposes of slope calculation and for establishing elevation differences, the elevations are given at the intersection of the sewer center lines (usually the center of the manhole). The rules for elevation differences at manholes are:

A. The crowns of incoming sewers shall be at least as high as the crown of the outgoing sewer.

B. If the incoming and outgoing sewers are of equal size and are passing straight through the manhole, there shall be 0.10 ft. difference in elevation.

C. The slope of a sewer within a manhole shall be no less than the slope of the same sewer outside of the manhole.

D. Drop connections are required when the vertical distance between flow-lines exceeds two (2) feet. The diameter of the drop connection must be specified on the construction drawings. Smooth flowlines with vertical distances of less than one foot must be provided wherever feasible.

E. All connections must enter the manhole through a channel in the base. This includes drop connections and connections to existing manholes. Inside drop connections can be constructed per Standard Drawing No. 206.

F. Channels shall be installed in the base of all manholes to maintain minimum velocity of no less than 2 feet per second when flowing at a depth of 80% of the outlet pipe diameter. Channels shall also allow for insertion of televised sewer inspection equipment into the pipe from outside of the manhole. All connections shall be made with an approved Rubber Boot. Where conditions make compliance with these rules impractical, exceptions will be permitted. It will be necessary, however, for the designer to provide a complete analysis of the need for such designs and be pre-approved by the City Engineer.

2.6 Cleanouts

Cleanouts will not be approved as substitutes for manholes on public sewer lines. Cleanouts are permitted at the upper end of a sewer that will be extended during a future construction phase. If future extension requires a change in sewer alignment or grade, a manhole will be required at the cleanout location. A manhole or clean out is required between public and private property.

2.7 Service Laterals

Service laterals are those public wastewater lines to which a private building sewer connects. See Standard Drawing No. 211 & 212.

Each individual building site shall be connected by a separate, private, building wastewater service line connected to the public sewer. Multifamily, commercial, and industrial service laterals shall connect into the public mainline at a manhole. Combined wastewater service lines will be permitted only when the property cannot legally be further divided. An example of this is a residential lot with a house and an unattached
garage or shop with plumbing facilities.

The minimum inside diameter of a wastewater service lateral shall be four inches (4") and shall be equal to or greater than the building sewer diameter. Service laterals shall be built to the same construction standards and of the same materials as the wastewater mainline. Laterals must be green colored pipes. Service laterals in general shall be placed at 90 degrees to the main wastewater line to avoid excessive exposure to other utilities during excavation for construction or maintenance of the service lines. Angles other than 90 degrees (45 degrees minimum) may be approved for special conditions such as cul-de-sac lots. Service line connections may be made at manholes if such placement would not interfere with other present or future connections to the manhole.

The minimum slope of wastewater service lines shall be 2.00 percent (1/4 inch per foot). Except that for unusual conditions, a slope of 1.00 percent (1/8 inch per foot) may be approved. It will be necessary, however, for the designer to provide a complete analysis of the need for any wastewater service lateral slope less than 2.00 percent. The maximum slope shall be 100.00 percent (45 degrees or one foot per foot).

Tees for service laterals, with a slope greater than 100 percent, shall have 1/16th or 1/8th bend to provide proper grade for service laterals. Service laterals shall be installed to the street right-of-way line or easement line. A watertight plug shall be installed in end of the lateral with a 2" x 4" standard wood marker placed from pipe invert to 12 inches above finish grade. The 2" x 4" top to be painted green and marked with the depth of the lateral measured from ground to invert of pipe. Curb line and concrete gutter surface shall have an "S" branded into both surfaces at lateral crossing.

2.8 Connection to Existing Sewers

Connections to, and extensions of, existing sewers will occur to facilitate new development. Certain requirements will be placed on the design engineer as to the permitted methods and/or locations.

Connections to existing manholes shall be made with the following guidelines:

A. All manhole wall holes, and base channels shall be cored; approved Rubber Boots shall be used.

B. Where the invert of the connecting pipe is two feet (2') or less above the invert out elevation, an inside drop (beaver slide) will be constructed utilizing Portland cement concrete. The wastewater entering the manhole will follow a smooth concrete channel transitioning evenly from the invert of the inlet pipe into main channel. Wastewater will not be allowed to fall freely to the manhole base.

C. Where the invert of the connecting pipe is more than two feet above the manhole shelf, the contractor will be required to construct an inside drop manhole per Standard Drawing No. 206 with the inlet pipe invert being located at the manhole shelf. The wastewater entering the manhole will follow a smooth concrete channel transition from the inlet pipe into the main channel. Plastic pipe connections to existing manholes shall be core drilled and installed with an approved rubber boot connection.

D. Where the invert is required to enter below the shelf of the manhole, the inlet pipe will not enter below a point where the crown of the new inlet pipe is below the crown of the outlet pipe. The base of the manhole shall be rebuilt if damaged in this process. The wastewater will enter the main flow in a smooth channel transitioning from the inlet pipe to the main channel.

E. No pipe will enter an existing manhole where the angle between the incoming flow and the outgoing flow is greater than 90°.

When sewers are extended from cleanouts, the entire cleanout assembly, including the wye, shall be removed.

New building service laterals will be made at existing tees where possible.

When tees do not exist on the Public Wastewater Conveyance System, the new lateral sewer will enter the collection system through a "cored" opening with an approved connector saddle tap, or ‘cut in’ tee. This
connection shall be done in conformance with City standards.

2.9 Waste Control from Industrial Developments

Where necessary and as determined by the City, any user of the sewer system shall provide, at their own expense, such preliminary treatment as may be necessary to reduce objectionable characteristics or constituents within the City’s prohibited discharges, that may cause pass through or interference, or to comply with water quality standards.

Plans, specifications, and any other pertinent information relating to proposed preliminary treatment facilities shall be submitted for the approval of the Administrator or designee.

The approval of the plans and inspection of construction shall not relieve the owner from complying with the discharge limitations.

Some industrial facilities shall install a control vault to facilitate the observation, measurement, and sampling of the process wastewater from the facility. Such a control vault, when required, shall be 24 hour accessible and constructed in accordance with plans approved by the City. The control vault shall be installed and maintained by the owner at his/her expense. After installation is complete, the owner shall provide the City with keys necessary to access the vault.

Industries that may be required to install a control vault, but not limited to:

If the development will discharge 25,000 gpd or more, contributes a process waste stream greater than 5% of the WWTP average dry weather flow and/or organic loading, or is designated by the City on the basis that it has a reasonable potential for adversely affecting the WWTP’s operation they will be considered a Significant Industrial User (SIU) and an additional permit will be required. This permit will be issued by the Administrator or designee.

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2.10 Sanitary Sewer Line Acceptance Policy

The City of Amity will accept new sanitary installations or systems built to the “Public Works Design Standards,” providing that the following conditions are met.
A. Legal Recordings

B. Dedication of any required easements or rights-of-way have been recorded with the County Recorder and the Engineering Department receives a reproducible copy of the recorded documents.

C. Project Completion

D. After completion of construction of the total project, and after all testing has been satisfactorily completed, project closeout shall proceed as outlined in Section 1.17.

E. Maintenance Period

F. The Contractor or Applicant shall be responsible for providing Maintenance Assurance for Public Improvements as outlined in Section 1.16.1. Public sanitary improvements shall be warranted for a minimum of two years.

At any time during the warranty period, the City’s authorized representative has reason to believe the public sanitary improvements have defects that were the result of faulty workmanship or flaws in construction material, the responsible party shall be required, at that party’s own cost, to video-inspect the sewer line and repair any defects.
SECTION 3 - WATER SYSTEMS

3.1 Performance Standards

Water distribution systems shall be designed to meet Oregon Administrative Rules Chapter 333 and Oregon Revised Statutes 448, AWWA Standards, and guidelines of the current Amity Water System Master Plan.

Water system design shall provide adequate flow for fire protection and ultimate water system demand. Required water system demands shall be met by maintaining the minimum operating pressures required by the City. Minimum fire flow for one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses shall be 1000 GPM with a 20-psi residual pressure. Minimum fire flow for commercial development shall be 1500 GPM with a 20-psi residual pressure.

Water system design shall meet distribution needs for ultimate water system demand within a given service area. New water systems shall allow for future extensions beyond present development that are consistent with the Master Plan.

All waterlines shall be located within the public right-of-way or as directed by the City Engineer. Waterlines are placed within the public right-of-way for ease of maintenance and access, control of the facility, operation of the facility, and to permit required replacement and/or repair. The City Engineer, under special conditions, may allow a public waterline to be located within a public water easement as referenced in Section 3.2.5.

Utility infrastructure may not be placed within one foot of a survey monument location noted on a subdivision or partition plat, per ORS 92.044 (7).

3.2 Pipe Materials and Size

3.2.1 Materials

All public water distribution systems shall be constructed with ductile iron pipe, minimum thickness Class 52. All such pipe shall be cement mortar lined pipe with push-on or mechanical type joints meeting manufacturer and AWWA standards.

3.2.2 Minimum Pipe Size

Water distribution main sizes shall generally conform to the following:

A. Be consistent with the most recently adopted Water Master Plan.

B. 8 inch minimum or as required to supply adequate fire flow to the proposed development.

3.2.3 Alignment and Cover

A. Grid System

1. The distribution system mains shall be looped at all possible locations. All developments will be required to extend mains across existing or proposed streets for future extensions of other developments by the City. All terminations shall be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended. The installation of permanent dead-end mains greater than 250 feet, upon which fire protection depends and the dependence of relatively large areas on single mains, will not be permitted.

B. Dead End Mains

1. Dead end mains, which will be extended in the future, shall be provided with end of line gate valve and a properly sized blow-off or fire hydrant assembly. Permanent dead-end mains shall terminate with a standard blow-off or fire hydrant assembly see Standard Drawing No. 311.

C. Right-of-Way Location
1. Water systems shall be located east and south from the right-of-way centerline as defined in Standard Drawing No. 103. All waterlines shall be located in the public right-of-way, unless otherwise approved by the City Engineer. All abrupt changes in vertical or horizontal alignment shall be made with a fitting and secured with approved restrained joint system. No concrete thrust blocks are allowed unless approved in unique circumstances.

D. Curved Alignments

1. Curved alignments for waterlines or mains are permitted and shall follow the street centerline when practical. The minimum allowed radius shall be based on allowable pipe deflection for the pipe diameter and the pipe laying length, but not to exceed 3° joint deflection.

E. Minimum Cover

1. The standard minimum cover over buried water mains within the street right-of-way shall be thirty-six inches (36") from finish grade.

The minimum cover for mains in easements across private property shall be thirty-six inches (36") from finish grade.

Finish grade shall normally mean the existing or proposed pavement elevation. Where the main is located in the cut or fill side slope or where mains are located in easements, finish grade shall mean final ground elevation at the water main alignment.

Deviation from the above standards will be considered on a case-by-case basis. When there is underlying rock strata that prohibits placement of the water main thirty-six inches (36") below finish grade, a written request must be submitted to the City Engineer for consideration, together with submission of a soils report, with a plan and profile certifying that bed rock exists less than three feet (3') below the undisturbed ground surface.

3.2.4 Separation with Wastewater and Other Utilities

Water mains shall be installed a minimum clear distance of ten feet (10') horizontally from wastewater sewers and shall be installed to go over the top of such sewers with a minimum of 18 inches of clearance at intersections of these pipes (in accordance with the requirements of OAR Chapter 333, Public Water Systems). Exceptions shall first be approved by the City Engineer. In all instances the distances shall be measured edge to edge. The minimum spacing between water mains and storm drains, gas lines, and other underground utilities, excepting wastewater sewers, shall be three feet (3') horizontally when the standard utility location cannot be maintained.

Where water mains are being designed for installation parallel with other water mains, utility pipe, or conduit lines, the vertical location shall be twelve inches (12") below (or in such a manner which will permit future side connections of mains, hydrants, or services) and avoid conflicts with parallel utilities without abrupt changes in vertical grade of the above mentioned main, hydrant, or service. Where crossing of utilities is required, the minimum vertical clearance shall be six inches (6"). Check all crossings to avoid conflicts.

3.2.5 Easements

Any water main placed within a water main easement will be permanently marked with steel posts and metal signs at all angle points, and no less than every 100 feet. In addition, such posts and signs shall be placed where the waterline intersects the public right of way at the easement location. A monument cap set in the pavement of parking lots shall be an acceptable alternative to the sign. The City shall provide wording for the sign/monument.

All easements must be furnished to the City for review and approval prior to recording.
3.2.6 Relation to Watercourses

New water mains may cross over or under existing streams, ponds, rivers, or other bodies of water as follows:

A. Above Water Crossings

B. The pipe shall be engineered to provide support, anchorage, and protection from freezing and damage, yet shall remain accessible for repair and maintenance. All above water crossings will require review and approval by the City Engineer.

C. Underwater Crossings

1. Mains crossing stream or drainage channels shall be designed to cross as nearly perpendicular to the channel as possible.

2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for testing and repair. The valves shall be easily accessible and not subject to flooding.

3. The following surface water crossings will be treated on a case-by-case basis:
   a. Stream or drainage channel crossing for pipes twelve inches (12”) inside diameter and greater.
   b. River or creek crossing requiring special approval from the Division of State Lands.

4. The minimum cover from the bottom of the stream bed or drainage channel to the top of pipe shall be thirty-six inches (36”) except as noted below in (e).

5. A scour pad centered on the waterline will be required for mains less than twelve inches (12”) inside diameter when the cover from the top of the pipe to the bottom of the stream bed or drainage channel is thirty inches (30”) or less. The scour pad shall be concrete, six inches (6”) thick and ten feet (10’) wide; reinforced with number four bars twelve inches (12”) on center both ways; and shall extend to a point where a one-to-one slope begins at the top of the bank and slopes down from the bank away from channel centerline and intersects the top of the pipe. The upstream edge of the scour pad shall be thickened or protected with rip rap to a depth below the scour depth of bank full velocities.

3.3 Appurtenances

3.3.1 Valves

A. Valve ends are to be flanged when located above ground or in a vault and mechanical joint for buried applications and conform to AWWA C-111 and ANSI Class 125. Buried service valves shall open with a counterclockwise rotation of a 2-inch operating nut.

B. All internal parts shall be accessible without removing the body from the line. The one-piece wedge shall be completely encapsulated by resilient material. The resilient sealing material shall be permanently bonded to the wedge with a rubber tearing bond meeting the requirements of ASTM D-429.

C. Valves shall have non-rising stems (NRS) and shall be cast bronze with integral collars in compliance with AWWA C-509 and C-515. The NRS shall have two O-ring seals above the thrust collar and one below. The two top O-rings are to be field replaceable (in the fully open position) without removing the valve from service. Low-friction thrust bearings shall be placed above and below the stem collar. The stem nut shall be bronze and independent of the wedge.

D. Outside screw and yoke valves shall have a bronze stem attached to the disc assembly. An adjustable follower gland shall be incorporated to compress braided packing and seal the stem.

E. The waterway in the seat area shall be smooth, unobstructed, and free of cavities.
F. The ductile iron body and bonnet shall be fully coated, both interior and exterior, with a fusion-bonded, heat-cured thermo setting material meeting all the application and performance requirements of AWWA C-550.

G. Gate valves shall meet the testing requirements as presented in AWWA C-509.

H. Butterfly valves shall be the rubber-seated type, suitable for direct-burial service.

I. They shall withstand 250 psi working pressure and a 250 psi pressure differential across the valve. Except as noted, the butterfly valve shall conform to AWWA C-504 for Class 250B.

J. All joint accessories shall be furnished with valves.

K. Valves shall be equipped with an ASTM A536 ductile iron body and 304 stainless-steel circular shaft. Shaft and disc seals shall be designed for a bubble-tight seal. The valve disc shall be ductile iron ASTM A536 and a stainless-steel edge with Buna N rubber seat bonded to the valve body.

L. Butterfly valves shall be furnished with a totally enclosed, integral valve operator design to withstand a minimum of 300 foot-pound input torque without damage to the valve or operator. Operators shall be fully gasketed and grease-packed and designed to withstand submersion in water to a pressure of 10 psi. Valves shall open with a counterclockwise rotation of a 2-inch operating nut. A minimum of 30 turns of the operating nut shall be required to move the disc from a fully opened position to a fully closed position.

M. Butterfly valves shall meet the testing requirements as presented in AWWA C-504.

N. All potable valves and fittings shall be NSF-61 certified.

3.3.2 Extension Stems for Valve Operators

Where the depth of the operating nut is more than 3 feet, operating extensions shall be provided to bring the operating nut to a point 18 inches below the surface of the ground or pavement (Drawing No. 311 & 312).

Where the depth of the operating nut is more than 6 feet, install a second rock guard plate equidistant between the first rock guard plate and the 2-inch operating nut.

The extension shall be constructed of solid steel rod and approved by the City’s authorized representative. Cut extensions to the proper length so the valve box does not ride on the extension when set at grade.

3.3.3 Size

In general, valves shall be the same size as the mains in which they are installed. Distribution system valves shall be located at the tee or cross fitting. There shall be a sufficient number of valves so located that not more than four (4), and preferably three (3) valves, must be operated to affect any one particular shutdown. The spacing of valves shall be such that the length of any one shutdown in commercial or industrial areas shall not exceed 300 feet or one block, whichever is less.

In general, a tee intersection shall be valved in two branches and a cross intersection shall be valved in three branches. Transmission water mains shall have valves at not more than 300-foot, or one block spacing’s, whichever is less. Hazardous crossings such as creeks, railroad and freeway crossings, shall be valved on each side per Drawing No. 313.

3.3.4 Valve Boxes

Shall be model 910 Vancouver VC 212 self-centering gate valve cover or equal and placed at finished grade, centering vertically over operating wheel (2”) or nut.
3.3.5 Fire Hydrants

A. Materials

1. Hydrants shall have a nominal 5H-inch main valve opening with 6-inch bottom connections. The main valve shall be equipped with O-ring seals and shall open when turned counterclockwise.

2. The operating nut shall be a 1/2-inch national standard pentagon nut.

B. Hydrants shall be equipped with two (2) 2 ½ inch hose nozzles and one (1) 5” Storz fitting.

1. Hydrants shall conform to AWWA C-502 and have a self-lubricating rising stem. The normal depth of bury shall be 4 feet. Nozzle threads shall be American National Standard. The inlet connection shall be mechanical joint, restrained by a mechanical joint restraint system such as Megalug® Series 1100 as manufactured by EBAA Iron, Inc., or approved equal.

2. Hydrants shall be Mueller Centurion, or approved equal. Public hydrants shall be painted Yellow and private hydrants shall be painted Red per Drawing No. 312.

C. Design Requirements

1. The public fire hydrant system shall be designed to provide up to a maximum of 3,500 GPM. The distribution system shall be designed in commercial/industrial areas to accommodate fire flows up to 4,500 GPM. Minimum fire flow for one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses shall be 1000 GPM with a 20-psi residual pressure. Minimum fire flow for commercial development shall be 1500 GPM with a 20-psi residual pressure.

2. The distribution of hydrants shall be based upon the required average fire flow for the area served. Design coverage shall result in hydrant spacing of approximately 500 feet in residential areas, approximately 250 feet or as required by Oregon Fire Code in commercial or industrial subdivisions, or as approved by the Fire Chief and City Engineer. In addition, sufficient hydrants shall be available within 600 feet of a building in commercial/industrial areas to provide its required fire flow.

3. Residential hydrants shall be located as nearly as possible to the corner of street intersections and not more than 600 feet from any cul-de-sac radius point.

4. No fire hydrant shall be installed on a main of less than eight inches (8”) inside diameter unless it is in a looped system of six-inch (6”) mains. The hydrant lead shall be a minimum six inch (6”) inside diameter.

5. All fire hydrants will be located behind the existing or proposed sidewalk or in the planter strip. If any public hydrant encroaches on private property, an easement will be provided as directed by the City Engineer.

6. No hydrant shall be installed within five feet (5’) of any existing aboveground utility nor shall any utility install facilities closer than five feet (5’) from an existing hydrant.

7. Hydrant installation shall conform to Standard Drawing No. 312. Full depth hydrants will be required in all installations. Installation of hydrant extensions will not be allowed in new construction, unless approved by the City Engineer.

8. Each fire hydrant shall have an auxiliary valve and valve box which will permit repair of the hydrant without shutting down the main supplying to the hydrant. The auxiliary valve shall have mechanical flange joint ends as referenced in the Standard Drawing No. 313. The valve shall be connected directly to the water main using a flange joint tee, restrained spool full length using mega lugs and/or field loc gaskets.
9. Hydrants shall not be located within twenty feet (20') of any building, nor will they be blocked by parking. The large hydrant port shall face the road or fire lane.

Guard posts, a minimum of three feet (3') high, shall be required for protection from vehicles when necessary. Such protection shall consist of four inch (4") diameter steel pipes, six feet (6') long, filled with concrete, and buried a minimum of three (3') feet deep in concrete, and spaced not more than 4 feet between posts on center. Use of posts other than at the four corners may be approved by the City Engineer.

3.3.6 Air Release Valves And Combination Air/Vacuum Release Valves

When designated by the City Engineer, air release valves shall be installed. Such valves will be required on main lines at all high points in grade.

3.3.7 Restrained Joints

Provide joint restraint (locked joints) to prevent movement of the pipe or fitting at all bends tees, crosses, plugs, and hydrants. For pipe sizes 12" and smaller, refer to Standard Drawing No. 306 for required pipe restraint distance from mechanically restrained fittings. For pipe sizes larger than 12", pipe joints shall be restrained at a distance from mechanically fittings as calculated by the design engineer. Restraint calculations shall be submitted with design of pipelines

A. Mechanical Joint Restraint

B. Mechanical joint restraints were incorporated into the design of the follower gland shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be made of grade 60-42-10 to ductile iron conforming to ASTM A-536-84. The wedges shall be ductile iron heat-treated to a minimum hardness of 370 BHN. Dimensions shall be appropriate to match pipe materials being utilized. Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges.

C. The system shall be rated for working pressures of at least 350 psi for pipes 16 inches and smaller diameter and 250 psi for larger sizes. The devices shall be UL listed up through 24-inch diameters and FM approved through 12 inch diameters. The restraint systems and devices shall be Series 1100 Megalug restraint, or approved equal. Contractor shall perform visual inspection of the restraint devices for flaws before installation. Faulty restraint devices shall not be used at all. Contractor shall bear all cost of repairing and subsequent retesting to correct the defect.

D. Flexible Joint Restraint

E. All pipes shall be ductile iron with TR Flex restrained joints with Tyton joint gaskets. Contractor shall perform visual inspection of the restraint devices for flaws before installation. Faulty restraint devices shall not be used at all. Contractor shall bear all cost of repairing and subsequent retesting to correct the defect. See Standard Drawing No. 306.

3.3.8 Railroad or Highway Crossings

All such crossings defined above, or as determined by the City to be of a hazardous nature, shall be valved on both sides of the crossing. Casing of railroad or highway crossings, if required, shall be as noted in the permit from the respective agency.

3.3.9 Water Service Line

The sizes of water service lines that may be used are 3/4", 1", 2", 4", 6", 8". Water service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.

For two-inch (2") and greater services, a design drawing must be submitted showing the vault and fitting requirements with the expected flow (normal and maximum day flow) requirements and proposed usage.

Domestic service lines 3/4" through 2" shall normally extend from the main to behind the curb, with a meter
curb stop and meter box located at the termination of the service connection Standard Drawing No. 307, 308 & 309. Meter must be purchased from and installed by City. Meter boxes are to be provided by the developer. Contractor to install meter box, main line tap, and service line. In general, individual service connections shall terminate in front of the property to be served and shall be located 18 inches each side of a common side property line.

3.3.10 Water Meter and Box

Water meters shall be installed at a minimum of one foot behind the ROW line on the private property. Service line, meter, and box installation to follow standard drawing 307 and 309.

3.3.11 Fire Service

The water fire service line shall normally extend from the main to the property line and end with a vault and an approved backflow prevention device.

A vault will be required when a development provides fire sprinklers. The vault drawing will be included on construction drawings submitted to the City. The vault shall contain all valves, fittings, meters, and appurtenances required for fire service to the development and be located on private property adjacent to the to the public right-of-way.

3.3.12 Backflow Prevention

Backflow prevention devices shall be required on all irrigation services, fire sprinkler system services, water services 1 1/2" and larger, any other services where there is a risk for cross-connection or contamination, and where required by City Ordinance and current OAR. All backflow prevention shall conform to OAR 333-061-0070 and 333-061-0071.
SECTION 4 - STORM SEWER

The City’s Public Works Design Standards (PWDS) shall govern all construction and upgrades to the City public stormwater system and privately owned stormwater systems and include the collection, flow control, treatment, and conveyance of stormwater from both private property and from within the public right of way. These PWDS provide the requirements for the design of stormwater infrastructure consisting of conveyance, treatment, and flow control systems.

4.1 Oregon Drainage Law:

Oregon has adopted the civil law doctrine of drainage. Under this doctrine, adjoining landowners are entitled to have the normal course of natural drainage maintained. The lower owner must accept water which naturally comes to their land from above, but they are entitled not to have the normal drainage changed or substantially increased. The lower landowner may not obstruct the run-off from the upper land if the upper landowner is properly discharging the water.

4.2 Performance Standards

All storm sewer system designs shall make adequate provisions for collecting, treating, detaining, and conveying all stormwater runoff. The system shall accommodate all runoff from upstream tributary areas whether or not such areas are within the proposed development. The amount of runoff to be accommodated shall be based upon ultimate development of all upstream tributary areas.

New or modified existing storm sewer systems shall not adversely impact any downstream system.

Utility infrastructure may not be placed within one foot of a survey monument location noted on a subdivision or partition plat, per ORS 92.044 (7).

A development must include provisions to adequately control runoff from all public and private streets and the roof, footing, and area drains of residential, multi-family, commercial, or industrial buildings. The design must ensure future extension of the drainage system to the entire drainage basin in conformance with the adopted Storm Sewer Master Plans and these Public Works Design Standards. These provisions include:

A. Surface and/or subsurface drainage, caused or affected by the alteration of the natural grade, removal of natural ground cover/vegetation, or placement of impervious surfaces, shall not be allowed to flow over adjacent public or private property in a volume, velocity, or location materially different from that which existed before development occurred. Surface and/or subsurface drainage shall be managed, treated, and infiltrated or collected, and conveyed in an approved manner, to an approved point of discharge.

B. Surface water entering the subject property shall be received at the naturally occurring locations and surface water exiting the subject property shall be discharged at the natural locations with adequate flow control and energy dissipation, to prevent adverse impacts from flooding, erosion, or sedimentation.

C. Approved points of discharge for stormwater may include but not be limited to a storm sewer, existing open channel, creek, low impact development approach facility, detention pond, or retention pond, as approved by the City Engineer. Acceptance of suggested facilities will depend upon the prevailing site conditions, capacity of existing downstream facilities, and feasibility of alternate designs. Curb weep hole drainage systems shall only be utilized for single home developments.

D. A drainage report with the required analysis of downstream system conditions is required with all plan submittals. Planning applications shall include a preliminary report.

E. When private property must be crossed to reach an approved point of discharge, it shall be the developer's responsibility to acquire a recorded public drainage easement on a City form prior to commencement of construction. The drainage facility installed must be a closed conduit system. Temporary drainage ditch facilities, when approved, must be engineered to contain the stormwater without causing erosion or other adverse effects to the public and/or private property.
F. Drainage from roofs, footings, and downspouts may drain directly to a street through the curb under the following circumstances:

1. The building pad ground elevation is at least 12 inches above the existing street curb.
2. The existing street is adequately crowned to avoid sheet flow across the street.
3. Stormwater quantity and quality facility provisions have been satisfactorily addressed.
4. Springs/sump pumps shall not be connected to a piping system, unless approved by the City Engineer.

4.3 Private Storm sewers

Properties that slope and drain away from the public storm sewer systems may need to provide a private drainage system in private easements. This system shall be for the collection of roof drains, footing drains, and surface runoff. It shall be designed to meet the Uniform Plumbing Code requirements. For multifamily, commercial, and industrial laterals, a manhole is required at the connection between private and public storm systems.

Mainlines crossing multiple lots may be required to be public, such as rear lot drain lines as approved by the City Engineer on a case-by-case basis. A clean-out shall be installed at the lateral connection between private and public storm system. When required by the City Engineer, a backflow preventer shall be installed on the private side at the lateral connection between private and public storm systems.

Developers shall consider potential drainage from sump pumps and/or flow from perennial flowing wall/building footing drains. Such drainage systems shall not connect to curb weep holes and will be connected to a storm sewer piping system.

4.3.1 Alignment

All pipes shall run in straight lines, with a constant slope, material, and diameter from manhole to manhole.

4.3.2 Right-Of-Way Location

Public storm lines shall be located within the public right-of-way as directed by the City Engineer. These lines are placed in the public right-of-way for ease of maintenance and access, control, and operation of the facility, and to facilitate replacement and/or repair. Storm sewer lines shall be located according to Standard Drawing No. 103.

4.3.3 Minimum and Maximum Depth of Pipe Cover

For storm sewer pipe cover requirements, reference Standard Drawing No. 110.

4.4 Structures

4.4.1 Manholes

Manholes and inlet manholes shall be located at all changes in slope, alignment, pipe size, and at all pipe junctions with existing or future storm sewer connections. The distance between structures shall not exceed 300 feet.

When standard manholes are required at pipe junctions, short cone manholes shall be used when rim to lowest pipe invert elevation is less than five feet (5'). Flat tops with a standard frame may be approved on a case-by-case basis.

When the downstream pipe size increases, the crown of all upstream pipes shall not be lower than the crown of the larger downstream pipe.

All manholes shall be designed with no vertical drop across the structure from the inlet to outlet invert elevations. The City preference is for the use of inlet manholes Standard Drawings No. 407, 409, & 410, behind the curb piping systems.
4.4.2 Inlet Manholes and Catch Basins

All structures shall be located in streets at the curb line to receive stormwater runoff and provide conveyance to the main storm sewer.

Structures shall be located at the following locations, but in no case be spaced further than 300 feet:

A. At curb returns on the upstream side of an intersection.

B. At the end of all dead-end streets with a descending grade.

C. At intermediate locations so that storm flows at the curb line do not exceed three feet (3') in width (measured from the curb face) or three inches (3") in depth (measured at the curb face), whichever is less, refer to Table 4-1 for design storm.

D. An oversized inlet manhole at low point (sag) of all vertical curves. Street and or vertical curves with flat slopes may require installation of additional inlets (Standard Drawing No. 409).

E. All structures shall be capable of completely intercepting the 100-year design storm flow at the curb.

4.4.3 Culverts

Culverts at road crossings in natural, perennial channels shall be designed to pass the peak discharge for the specified design storm such that the headwater:

A. Does not exceed 0.8 times the culvert diameter; or

B. Remains at least 1 foot below the roadway subgrade, whichever is less.

C. Bottomless or fish friendly culverts shall be installed in wetland and/or water quality sensitive areas. Final designs shall be permitted by applicable regulatory agencies. Approved permits shall be submitted to the City.

D. Culvert material shall have a minimum design life of 75 years.

4.4.4 Bridges

New and replacement bridges over natural, perennial channels shall be designed to pass the 100-year peak discharge from the tributary area assuming full development. Vertical clearance between the design water surface and the bottom of any part of the bridge shall be a minimum of one foot.

4.5 Drainage Report

A final drainage report containing the information listed below shall be submitted at the time of the development permit application review meeting with the City. An abbreviated preliminary drainage report shall be prepared and submitted during the site design review application meeting that is an outline/draft form of the final report requirements listed below. The City does not require a drainage report for single-family residential projects and projects where post-development impervious surfaces constitute less than 25% of the parcel. The applicant must participate in a pre-design meeting to discuss the proposed project and its stormwater impacts prior to the land use approval process submittal.

A. Narrative, with tables where appropriate, describing
   1. Areas and flows used for design calculations per this design manual.
   2. Results of downstream analysis.
   3. How water quality and quantity requirements of these rules are met by the project.

B. Maps showing the following information
   1. Upstream basin flowing through the site with contours.
   2. Downstream basin to the point where analysis is required in the downstream analysis, with contours.
3. Site plan showing development layout with contours.
4. Existing stormwater facilities on and adjacent to the site.
5. Stormwater facilities proposed to be constructed by the project.
6. Delineated basins contributing to the stormwater facility including labels and area calculations.

C. Calculations
   1. Hydrological calculations for both existing and post development conditions.
   2. Conveyance system sizing, including calculations showing portions of existing conveyance system that are not proposed to be altered have adequate capacity according to the criteria in these rules.
   3. Sizing of water quality and quantity facilities.

D. Downstream Analysis
   1. A stamped certificate of investigation stating that the developer has taken downstream impacts into consideration is required for each development constructing, collecting, or discharging more than 5,000 square feet of new impervious area.
   2. Projects that receive approval for a fee in lieu of construction and/or install partial or no stormwater quantity control facilities must extend the analysis shall downstream to a point in the sewer system where the additional flow from the proposed development site constitutes 10 percent or less of the total tributary drainage flow.
   3. When the downstream analysis does not continue for at least one-quarter (1/4) mile, the design engineer shall provide a stamped certification of investigation that states the developer has visually investigated the downstream system for at least one-quarter (1/4) mile downstream and is aware of no downstream impacts to the conveyance system.

E. For privately maintained water quantity or quality facilities or conveyance systems, a maintenance plan that clearly identifies maintenance activities and frequency is required in a form that can be easily understood by the people responsible for its maintenance.
4.6 Design Storms and Computational Methods

All public storm sewer systems shall be designed for the storm recurrence interval and 24-hour rainfall depths as outlined in Table 4.1 and Table 4.2 below.

Table 4.1: Drainage System Design Requirements

<table>
<thead>
<tr>
<th>Drainage System Elements</th>
<th>Design Storm Recurrence Interval (24-hour, years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities: Water Quantity &amp; Quality Control</td>
<td>See Sections 4.8.5 &amp; 4.7.1</td>
</tr>
<tr>
<td>Minor: Minor Collector Streets, Local Streets, Curbs, Gutters, Inlets Manholes and Mainlines up to 250 Tributary Acres</td>
<td>25</td>
</tr>
<tr>
<td>Major: Major Collector, Arterial Streets, the Drainage System in or under Arterial Streets, and anything greater than 250 Tributary Acres</td>
<td>50</td>
</tr>
<tr>
<td>Watercourses: Without FEMA Designated Floodplain</td>
<td>50</td>
</tr>
<tr>
<td>Watercourses: FEMA Designated Floodplain</td>
<td>100</td>
</tr>
<tr>
<td>Bridges:</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.2 24-hour Rainfall Depths

<table>
<thead>
<tr>
<th>Amity, Oregon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrence Interval (years)</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>Water Quality Design Storm</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>100</td>
</tr>
</tbody>
</table>

4.6.1 Computational Methods for Runoff Calculations

Design of storm sewers shall be based on full build-out of the upstream basin based upon the most recent and realistic estimates of development densities within the Urban Growth Boundary.

Unless an alternative method is approved by the City in writing, calculation of storm runoff used for conveyance design shall be based on one of the following methods with the limitations on use of each listed. A maximum overland distance for sheet flow used in calculations shall be 100 feet.

4.6.2 Rational Method

The rational method is allowed with the following limitations:

A. Drainage sub-basin area cannot exceed 1 acre for a single calculation without approval from the City.
B. The time of concentration shall be a minimum of 5 minutes.
C. The calculation methodology shall conform to the procedures outlined in Chapter 7 and Appendix A &
F of the 2011 Oregon Department of Transportation (ODOT) Hydraulics Manual. The City of Amity Intensity, Duration, and Frequency (IDF) recurrence interval curves to be used in the calculations shall be ODOT Zone 8.

4.6.3 Santa Barbara Urban Hydrograph (SBUH)

SBUH methods shall be based on the following information:

A. The rainfall distribution to be used within the City is the design storm of 24-hour duration based on the standard Natural Resources Conservation Service (NRCS) Type 1A rainfall distribution using rainfall depths included in Table 4.3.

B. Curve numbers shall be derived from the NRCS runoff curve numbers contained in Technical Release 55 (TR-55) Urban Hydrology for Small Watersheds.

C. Soil types shall be derived from the NRCS Soil Survey for the project area.

4.6.4 TR-55

The TR-55 method developed by NRCS when used for runoff calculations shall be based on the following information:

A. A standard NRCS Type 1A storm shall be assumed.

B. Curve numbers shall be derived from the NRCS runoff curve numbers contained in TR-55.

C. Soil types shall be derived from the NRCS Soil Survey for the project area.

4.6.5 Stormwater Management Model (Swmm)

The SWMM method developed by EPA may be used on medium to large projects for computing runoff volumes for conveyance and only with prior City approval.
4.7 Conveyance Design

A. Design for Full Build Out

1. Storm sewer conveyance facilities shall be designed and constructed to accommodate all future full build-out flows generated from the upstream drainage basin. Conveyance system adequacy shall be demonstrated by performing a backwater analysis. The calculated hydraulic grade line shall in all cases be lower than a 1-foot minimum from finished grade at all structure locations during a 100-year storm event.

B. Velocity and Slope
1. All storm sewers shall be on a grade that produces a mean velocity, when flowing full, of at least 3 feet per second (fps).

C. Pipe Roughness Coefficient
   1. The manning’s roughness coefficient to be used in conveyance calculations shall be a minimum of 0.013.

D. Open Channels
   1. Open channel systems shall be designed for minimum 1 foot freeboard from bank full provided no structures are impacted by the design water surface elevation during a 100-year event.

E. Natural Channels
   1. Control of discharge from developed areas to natural channels shall be such that the average velocity resulting from all design storms less than or equal to the 10-year event remains below the erosive velocity of the channel.

F. Manmade Channels (Ditches)
   1. Ditches are only allowed as temporary facilities; rock lining is required when flows are greater than 3 fps. Manmade channels shall be designed for a 10-year storm with a maximum depth of 2 feet and 3H:1V side slopes. Restore areas used for ditches or provide permanent connections to the storm sewer system when temporary facilities are no longer required.
   2. Water Quality Facilities are not considered ditches.

G. Overflow Analysis
   1. Overland/Overflow analysis shall be performed for all conveyance, water quality and water quantity systems to demonstrate that the 100-year event will not impact or inundate any buildings. Developer shall submit documentation indicating the overland/overflow path during the permitting process to the City.

4.7.1 Upstream Impacts

Modifications to the existing on-site storm sewer facilities shall not restrict flows or create backwater onto off-site property to levels greater than the existing condition, unless approved by the impacted off-site Property Owners and the City. When approved, the off-site Property Owner(s) shall agree to and sign a permanent drainage easement legally describing the location of the backwater storage and authorizing the use of their property for stormwater drainage and detention purposes. The easement shall be in a form approved by the City.

4.7.2 Downstream Impacts

Downstream restrictions that create backwater during the 25-year design storm in the current or post-development condition may be required to be removed by the developer, at the discretion of the City. The engineer of record shall evaluate downstream impacts per Section 4.5.

Removal of downstream obstructions shall not be allowed if the removal will cause, contribute, or exacerbate flooding and/or erosion damages to existing buildings, dwellings, or properties during the 100-year design storm.

When downstream restrictions are not removed, an on-site detention facility shall be required.

4.7.3 Cross-Lot Drainage

Developments shall accommodate existing off-site drainage entering the site to not impact upstream property owners or negatively impact the new development.

4.7.4 Outlet Protection/Dissipation of Runoff
Runoff exiting a development site shall be discharged with adequate energy dissipation to prevent downstream damage. Storm sewer lines shall enter a creek or drainage channel at 90° or less to the direction of flow. The outlet shall have a head wall and appropriate scour protection to prevent erosion of the existing bank or channel bottom. The size of pipe or channel being entered will govern which protective measures are required.

4.7.5 Subsurface Drains

Subsurface drains (under drains) shall be provided at the following locations:

A. For all existing springs and field tile intercepted during construction activity for other facilities, i.e., wastewater, water, mains, street excavations, foundations, etc.

B. Where high ground water exists or when it is necessary to reduce the piezometric surface to an acceptable level to prevent land slippage or under floor flooding of buildings.

C. Subsurface drainage shall not discharge into a street or a street gutter.

4.8 Water Quantity and Quality Facilities - General

This section describes the thresholds and requirements for when stormwater quality and quantity controls are required for projects. Stormwater must be managed on-site to the maximum extent practicable.

4.8.1 Applicability and Exemptions

All proposals related to development that create greater than or equal to 5,000 square feet of new or replaced impervious surface, both public and private must provide post-construction stormwater quality and flow control best management practices (BMPs). This requirement applies to the total amount of impervious surface that will be developed or redeveloped at full build-out of the project. Stormwater management requirements apply to projects on both private and public property or right-of-way with existing or new impervious area, including, but not limited to, all roofs, patios, walkways, parking lots, streets, alleys, driveways, and sidewalks. Stormwater management requirements include drainage and conveyance of stormwater in a manner that protects and improves water quality.

Development is defined as any human-induced change to improved or unimproved real estate, whether public or private, including, but not limited to, construction, installation, or expansion of a building or other structure; land division; street construction; drilling; and site alteration such as dredging, grading, paving, excavation, filling or clearing. Development includes both new development and redevelopment. Redevelopment is defined as any project where existing land cover, which was previously developed, is changed to another land cover

Stormwater that is generated from impervious area on a property must be managed on the same property in facilities maintained by the property owner, whether publicly or privately owned. Stormwater that is generated within the public right-of-way must be managed in the public right-of-way in publicly maintained facilities. BMPs must manage runoff from all landscaped and hardscaped areas for the project site.

A. Single family residential improvements that are not part of a new subdivision / common plan of development.

B. Residential structures being re-built following natural disaster, so long as the footprint is not bigger.

C. Interior remodeling projects and tenant improvements.

D. Maintenance activities, such as top-layer grinding (grind and overlay), repaving when aggregates or gravels are exposed but not replaced, or reroofing when the structure or existing plumbing is not altered.

E. Standalone projects that consist solely of linear utility trenching in paved public rights-of-way or on private property.
Figure 4.4 Stormwater Quality and Quantity Design Flow Chart

Match the 2-, 5-, 10-, and 25-year, 24-hour, post-development peak stormwater runoff rates to the pre-developed, ½ of the 2-, 5-, 10-, and 25-year, 24-hour peak stormwater runoff rates.

4.8.2 Onsite Stormwater Performance Standard

Stormwater must be managed onsite to the maximum extent practicable. The onsite performance standard is considered met when proposed stormwater BMPs retain and infiltrate, evaporate, or reuse onsite stormwater generated from a dry weather storm event totaling 1.0 inches of precipitation falling in 24 hours with an average storm return period of 96 hours NRCS Type 1A rainfall distribution without stormwater runoff discharging from the site (refer to Table 4.3 for design storm events).

4.8.3 Water Quality (Treatment) Standard

For sites that are unable to fully meet the Onsite Stormwater Performance Standard, the remainder of the stormwater runoff must be treated in stormwater BMPs that have been designed to remove 80% of the total suspended solids (TSS) for stormwater runoff prior to off-site discharge into an approved discharge point.

Additionally, the City is subject to the Willamette Basin Mercury Total Maximum Daily Limit (TMDL) and is in the process of developing an implementation plan. All developments shall complete the with the City’s Mercury Implementation Plan (most recent version) once implemented.

4.8.4 Water Quantity (Flow Control) Performance Standard

Flow control is intended to protect downstream properties, infrastructure, and natural resources from the increases in stormwater runoff peak flow rates and volumes resulting from development. Water quantity control is required when a development creates or replaces more than 5,000 square feet of impervious area, if downstream capacity of an open or closed stormwater system is not sufficient to convey the post-development flows, or if required by the City Engineer.

Proposed development and redevelopment projects should be designed so that post-development peak stormwater runoff flow rates are less than or equal to pre-development peak stormwater runoff flow rates unless other criteria are identified in an adopted watershed management plan or storm sewer master plan. Applicants may discharge their runoff into offsite stormwater facilities that have capacity or retain or detain flows onsite with an approved infiltration facility.

4.8.5 Facility Selection Hierarchy

The hierarchy of preference for public and or private water quantity and/or water quality facilities is listed below in the order of preference. The highest technically feasible option must be used (1=highest, 4=lowest). Applicants must provide the appropriate technical analysis and evaluation and demonstrate the need to move from a higher option to a lower option as reviewed & approved by the City during the land
use application or permit review application process.

<table>
<thead>
<tr>
<th>Order of Preference</th>
<th>Detention Facilities</th>
<th>Water Quality Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LIDA Facilities/Regional Facility</td>
<td>LIDA Facilities/Regional Facility</td>
</tr>
<tr>
<td>2</td>
<td>Surface Pond</td>
<td>Swale</td>
</tr>
<tr>
<td>3</td>
<td>Underground Tanks/Pipes</td>
<td>Proprietary Treatment Systems</td>
</tr>
<tr>
<td>4</td>
<td>Fee in lieu of construction payment</td>
<td>Fee in lieu of construction payment</td>
</tr>
</tbody>
</table>

### 4.8.6 Fee In Lieu Of Construction Payment

At the City’s discretion, development projects may request a fee-in-lieu payment when stormwater facilities are not technically feasible for the area being managed. Typically, site constraints related to grading, slopes, or topography are most likely to make construction of a stormwater facility infeasible. Stormwater management must be achieved to the maximum extent practicable before the City will approve a fee-in-lieu payment. The request for fee-in-lieu must be accompanied by a Drainage Report stamped by a licensed professional engineer clearly documenting the area, in square feet, which cannot be managed, a description of the features of the project that make constructing a stormwater facility infeasible; a description of how stormwater will be managed from all impervious areas on the site subject to the requirements of the PWDS, including proposed stormwater management facilities (if applicable), proposed discharge point(s), the approved point of discharge, and how runoff from the site will be conveyed; plans for the proposed project; and supplement information such as geotechnical reports or other technical information that will help to clarify the request.

Payment shall be made to the City before recording of the final partition or subdivision plat for single family home construction, or the issuance of building permits for all other projects. Fee in lieu of construction payments for water quantity and quality facilities will be collected by the City and used to fund the enhancement/upsizing of existing facilities and development of regional facilities when feasible.

### 4.9 Water Quality Facility Design

#### 4.9.1 Required Treatment Design Efficiency

The following approaches are available to meet the stormwater quality requirements of this Chapter:

A. Unless approved by the City, flow from impervious surfaces to stormwater management facilities, including offsite or regional facilities, shall be pre-treated using a water quality manhole or other City-approved method.

B. Onsite low impact development approaches (LIDA) or off-site regional water quality and detention facilities that can be demonstrated, to the satisfaction of the City, to meet treatment efficiency standards.

C. Proprietary treatment systems meeting the requirements of this Chapter.

#### 4.9.2 Design Considerations

A. If an onsite water quality facility cannot be constructed to treat the runoff from the development’s impervious surface, then with City Engineer approval, an off-site water quality facility may be designed to treat runoff from an equivalent area of adjacent untreated impervious surfaces.

B. Facilities shall be designed such that flow from the development is treated off-line from the storm conveyance system and reconnected to upstream flows following treatment.

C. Discharges to riparian and/or wetland sensitive areas shall maintain the flows of pre-development site conditions to the extent necessary to protect the characteristic functions of the sensitive area. Conversely, discharge of flows that may be damaging to downstream water quality sensitive areas into other catchments will not be permitted.

D. The maximum drawdown time shall be 48 hours.
4.9.3 Water Quality Volumes and Flow Rates

Water quality volumes and flow rates shall be calculated using the computational methods for runoff calculations included in Section 4.7.2 using the water quality design storm.

The Water Quality Volume (WQV) equals 1.0 inches over the impervious area that is required to be treated as shown in the equation below.

\[
\text{Water Quality Volume (WQV, cubic ft.)} = \frac{1.0 \text{ inch} \times \text{Area (sq. ft.)}}{12 \text{ in/ft}}
\]

The Water Quality Flow (WQF) is the average design flow anticipated from the water quality storm as shown in the formulas below:

\[
\text{Water Quality Flow (WQF, cfs)} = \frac{WQV}{14,400 \text{ seconds}}
\]

4.9.4 Low Impact Development Approaches (Lida)

LIDAs offer options to comply with stormwater management requirements. The five objectives of LIDA are to:

A. Conserve Existing Resources
B. Minimize Disturbance
C. Minimize Soil Compaction
D. Minimize Imperviousness
E. Direct Runoff from Impervious Areas onto Pervious Areas

4.9.5 Lida Design Considerations

A. LIDA may be used in combination with standard water quantity and quality facilities to meet the requirements of this Section. The engineer shall maximize LIDA to the extent practicable.
B. The applicant shall provide an analysis in the drainage report of the ability of any proposed LIDA to meet the water quantity and quality requirements for a project.
C. For developers creating less than 5,000 square feet of impervious surface Drawing No. 451, LIDA Sizing Form may be used. Projects creating more than 5,000 square feet of impervious area shall be designed by registered design professional in accordance with the Standards.
D. The applicant shall provide a report from a registered design professional providing infiltration rates of existing soils for LIDA facilities that are proposed to fully discharge into existing soils.
E. Maintenance access shall be provided for all LIDA facilities adjacent to collector or arterial roadways as approved by the City Engineer.
F. Approval of use of a LIDA by the City does not eliminate the need for the applicant to secure approval from other appropriate agencies for use of LIDA on their project. A potential example maybe DEQ’s underground injection control (UIC) permit.
G. LIDA facility planting shall follow the guidelines in Appendix A of this Design Manual.
H. The bottom of LIDA facilities shall be a minimum of 3-feet above the seasonal high groundwater table, competent bedrock, or other restrictive layer.

4.9.6 Lida Approvable by The City

A. Figure 4-5 identifies acceptable LIDA facilities to meet the requirements of this chapter. Designers are also encouraged to consult the City of Portland’s Stormwater Management Manual, Clean Water Services LIDA Handbook, and/or Oregon State University Extension Service LID facility design drawings for additional specific designs and other considerations.
B. LIDA facilities not included in Figure 4-5 may be approved by the City Engineer if the applicant can demonstrate that the proposed LIDA can meet the requirements of this Chapter.

C. LIDA facilities require a long-term recorded maintenance plan identifying maintenance techniques, schedule, and responsible parties.

D. All private LIDA Facilities shall be designed and constructed in locations that are approved by the City.

Figure 4.5 Approvable Low Impact Development Approaches

<table>
<thead>
<tr>
<th>Application</th>
<th>Green Roof</th>
<th>Porous Pavement/Pavers</th>
<th>Flow-through Planter</th>
<th>Infiltration Planter1 / Rain Garden</th>
<th>Vegetated Filter Strip</th>
<th>Swale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity Control</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Quality Control</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Impervious Area Reduction</td>
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<td>✓</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Infiltrate</td>
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<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Private Property</td>
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<td>✓</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Public Street/ROW</td>
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<td>Soils with Low Infiltration Rate2</td>
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<td></td>
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<tr>
<td>Contaminated Soils</td>
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<tr>
<td>Pre-treatment Required</td>
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<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

1 Water proofing maybe required for the building, foundation or a crawlspace.
2 Infiltration testing is required to determine rate.
3 When the contributing impervious area is more than 15,000 square feet
4 When flows are concentrated within a conveyance system prior to sheet flow dispersion

4.9.7 Infiltration-Based Facilities

Soil data and infiltration rates are required for the design of infiltration-based facilities. Obtain soil data from either:

A. NRCS Soil Survey

B. Onsite infiltration tests: minimum of 1 per ¼ acre or 1 per 2 proposed infiltration-based facilities, as needed to support facility design, performed at the depth of the base of the infiltration facility.

4.9.8 Proprietary Treatment Systems

Proprietary treatment systems shall meet the removal efficiency requirements of Section 4.6.3 above. Proprietary treatment systems shall be allowed, upon City approval, in situations meeting one of the following criteria:

4.9.9 Private
A. Treatment of runoff from a single parcel.

B. Treatment of runoff from an adjoining commercial, industrial, or multi-family, or condominium parcels which share a common parking lot.

C. Treatment of runoff from high-density zoning classifications where the development is primarily single family residential, and the average lot size is 3,000 or less square feet.

D. Proprietary treatment systems will be maintained by private parties, except for systems that are approved by the City Engineer on a case-by-case basis, to treat runoff from a public street.

E. Proprietary systems require a long-term maintenance plan identifying maintenance techniques, schedule, and responsible parties. This maintenance plan shall be submitted and approved with the drainage report for the project.

F. All proprietary treatment systems shall be subject to maintenance responsibilities as stated under 4.7.2.

4.9.10 Public

The use of proprietary treatment systems for the treatment of stormwater from the public right-of-way may be allowed on a case-by-case basis and where no other opportunities exist for treatment without necessitation of the removal of homes or businesses.

4.9.11 Water Quality Manholes

A. Hydraulic Criteria:
   2. Upstream flow splitter may be used to bypass conveyance flows in excess of the Water Quality flow.

B. Design Criteria:
   1. Shall conform to City Standard Drawings
   2. Minimum Manhole Diameter: 60-inch
   3. Maximum size of incoming pipe: 18-inch (high flow splitter may be required.)
   4. Sump Depth: No deeper than 5 feet from invert out to bottom of sump
   5. Volume of sump: 20 cubic feet/ 1.0 cfs of flow into the water quality manhole, up to the 25-year flow. Flow calculations shall include the effect of an upstream flow splitter.
   6. Maintain a 3-foot clear access zone between the inside structure.
   7. Orient access to structure in a clear zone.

4.10 Water Quantity Facility Design Standards

4.10.1 Detention Facilities

Detention facilities temporarily store stormwater runoff in a pond, tank, vault, or pipe. The water is slowly released from the facility, typically over several hours.

4.10.2 Retention Facilities

Retention facilities also store stormwater runoff. Rather than storing and releasing the entire runoff volume, however, the facility permanently retains a portion of the water on-site, where it infiltrates and recharges the groundwater aquifer, and in the case of surface retention facilities, evaporates or is absorbed and used by surrounding vegetation. Retention facilities reduce the total volume of water released downstream.

Flow control facilities include detention and retention ponds: wet pond; wet extended pond; and dry detention pond

4.10.3 General Requirements
A. Each new development shall incorporate techniques for mitigating its impacts on the public stormwater system in accordance with Chapter 13 of the Municipal Code by the construction of permanent on-site stormwater quantity detention facilities designed in accordance with this Chapter.

B. All water quantity facilities shall be designed in accordance with City guidance documents and be consistent with this Chapter.

C. Applicable LIDA facilities, designed in accordance with this Chapter, can be utilized to meet all or part of any detention requirements on a site.

D. For all sites, the threshold and approach for the design of water quantity facilities shall be based on Chapter 4.8.

4.10.4 Hydraulic Design Criteria

A. Detention design shall be assessed by dynamic flow routing through all the conveyance components within the basin. Documentation of the proposed design shall be included in the drainage report. Acceptable analysis programs include those listed below, as well as others using the SBUH or TR-55 methodology.

1. HEC-1
2. HEC-HMS
3. SWMM
4. HYDRA
5. Others as approved by the City Engineer

B. A pond overflow system shall provide for discharge of the design storm event without overtopping the pond embankment or exceeding the capacity of the emergency spillway.

C. Provide an emergency spillway sized to pass the 100-year, 24-hour storm event or an approved hydraulic equivalent. The emergency spillway shall be located in existing soils when feasible and armored with riprap or other approved erosion protection extending to the toe of the embankment. The emergency spillway shall direct flows away from proposed or existing structures.

4.10.5 Facility Design Criteria

A. The facility may be a combined water quality and quantity facility provided it meets all relevant criteria.

B. Provide an approved outlet structure for all flows and an approved emergency overflow structure if the primary outlet or conveyance system fails.

C. Outlet structures may require the use of multiple orifice plates to achieve desired outflow rates.

D. The maximum allowed depth of stormwater detention or retention facilities is 5 feet. unless approved by the City Engineer.

4.10.6 Walls In Water Quantity Facilities

A. Retaining walls may serve as pond walls if the design is prepared and stamped by a registered professional engineer and a fence is provided along the top of the wall. At least 25% of the pond perimeter shall be vegetated with a side slope of 3H:1V or flatter allowing for maintenance access. All retaining walls in publicly maintained facilities shall be cast in place concrete with a decorative surface finish, unless otherwise approved by the City Engineer.

B. Walls that are 4 feet or higher that are surcharged and/or are periodically inundated shall meet all of the following criteria:

1. The party responsible for maintenance of the walls within the water quantity tract or easement area shall be clearly documented on the final plat, or in alternate form, both with review and approval by the City Attorney and City Engineer.
4.11 Materials

4.11.1 Aggregate and Cement


4.11.2 Concrete

Concrete for poured-in-place manholes and structures shall conform to ODOT Class 3000 - 12, Commercial Grade Concrete. Slump shall be between 2 and 4 inches.

4.11.3 Manhole Frames and Covers

A. Casting shall be of new material, tough, close-grained gray iron conforming to ASTM A-48, Class 30B and AASHTO M 105, Class 30B. Where the ASTM and AASHTO specifications differ, the more stringent shall apply. Castings shall be smooth and clean, free of blisters, blowholes, and all defects. Bearing surfaces shall be planed or ground to ensure flat, true surfaces. Covers shall be true and set within rings at all points.

B. Rings shall be grouted in place and made watertight with a high-strength, non-shrink grout meeting ODOT SSC Section 2080.40, “Non-Shrink Grout,” such as Alcrete Twenty Minute Fast Setting Grout® or approved equal. Unused grout shall be discarded after 20 minutes and shall not be used. Rings shall not be brought to grade with lumber.

C. Frames and covers shall be standard or suburban, depending on the manhole location and as approved by the City’s authorized representative. Suburban style manhole frames shall not be installed in PCC streets or arterial roadways. Manholes covers shall clearly designate it as a storm line, using the approved manhole cover with message as per Drawing 411.

D. Manholes installed outside of paved street or sidewalk areas shall be installed with a tamperproof frame and cover as shown in Drawing No. 411 of these standards. In remote areas, manhole casting finish grade shall be 18” above existing grade.

4.11.4 Manhole Types

Manholes shall conform to the following.

A. Precast 48-Inch-Diameter Manholes

Materials shall conform to the requirements of ASTM C-478. Minimum wall thickness shall be 5 inches.

B. Precast Large-Diameter (60-inch or larger) Manholes

Materials shall conform to the requirements of ASTM C-478. The manufacturer or design engineer shall submit supporting calculations, stamped by a Professional Engineer registered in the State of Oregon, documenting the structural integrity of the manhole.

C. Precast Manhole Tops

D. Standard eccentric cone, short eccentric cone, and flat slab tops shall be provided in accordance with Drawing 412. Eccentric cones shall conform to all requirements of ASTM C-478, except for the steel reinforcement requirement. Precast manhole tops shall be designed to withstand AASHTO H-20 loadings.

E. Permeability Testing

F. Before precast manhole sections of any size are delivered to the job site, the sections shall meet the permeability test requirements of ASTM C-14 and ASTM C-497.

G. Precast Bases

H. Precast manhole bases shall be used, except when placing a manhole over existing pipe. Precast bases shall conform to the requirements of ASTM C-478. The base riser section shall be integral with
the base slab.

I. Poured-in-place Bases

Poured-in-place manhole bases may only be used when placing a manhole over an existing pipe.

4.11.5 Manhole Pipe Connections

Connections to manholes shall be made with an approved flexible connector specifically manufactured for the intended use, conforming to ASTM C923, and in accordance with Drawing No. 412 & 413. Field fabricated water stops or improvised adapters, such as gaskets stretched over the pipe, will not be allowed.

Connections to existing manholes may be made with a sand collar fabricated of the same material as the connecting pipe by an approved manufacturer in accordance with these standards. Sand collars shall be constructed with a gasketed joint located within 12” or half the pipe diameter, whichever is greater, from the manhole wall. Sand collars shall not be fabricated in the field.

4.11.6 Pipe Stub-Outs for Future Sewer Connections

A. Pipe stub-outs shall be the same type as approved for use in the lateral, main, or trunk sewer construction. Strength classifications shall be the same class as in adjacent trenches. Where two or more different classes of pipe exist at a manhole, the City’s authorized representative shall determine the strength classification. Rubber-gasketed, watertight plugs shall be furnished with each stub-out and shall be adequately braced against air test pressures.

B. Gaskets: Manhole sections shall be installed with reformed rubber gaskets manholes. Rubber gaskets shall conform to AASHTO M 315 and ASTM C-443. See Drawing 412.

C. Steps shall be required and shall be constructed as specified and shown in Drawing No. 412 of these standards, unless otherwise approved by the City’s authorized representative. When pipe is 24 inches in diameter or smaller, steps shall be located as indicated in Drawing No. 412 of these standards. For pipe larger than 24 inches in diameter, steps shall be located over a bench as coordinated with the City’s authorized representative.

4.11.7 Catch Basins and Inlets

A. Frames, Grates, and Covers: All materials shall be flat bar steel (standard grade), cast iron or ductile iron complying with the requirements of ASTM A-36, A-663, or A-709.

B. Forms: All exterior surfaces shall be formed with steel or plywood. Other surfaces shall be formed with matched boards, plywood, or other approved material. Trench walls, rock, or earth will not be acceptable as form material on interior sides.

C. Metal Reinforcement: All metal reinforcement shall conform to the requirements of ASTM A-615, Grade 60, deformed bars.

D. Precast Concrete Units: All precast units shall conform to the same requirements as manholes (ASTM C-478).

4.11.8 Storm Pipe

Storm sewer pipe installed by open trenching shall have a minimum pipe stiffness at 5% deflection of at least 45 psi. Materials shall be the following types or approved equal:

A. Reinforced Concrete Pipe

1. Reinforced concrete, non-pressure pipe shall conform to the requirements of ASTM C-76 and shall be of the class specified. Unless otherwise specified, pipe shall meet the design requirements of Wall B.

2. Gaskets shall conform to the requirements of ASTM C-443.

3. All steam-cured concrete pipe must be at least seven days old before it can be used. If the pipe has not been steam-cured, it must not be used before it has cured for 28 days.
4. Fittings shall be manufactured integrally and be of a class at least equal to that of the adjacent pipe. Field taps shall be machine-drilled.

5. Mortar used shall be standard non-shrink premixed mortar conforming to ASTM C-387 or in a proportion of one part Type II Portland cement to two parts clean, well-graded sand. Mortar mixed for longer than 30 minutes shall not be used.

B. Ductile Iron Pipe (D.I.P.)

1. Ductile iron pipe with push-on joints conforming to the requirements of AWWA C-151/ANSI A21.51 and AWWA C-104/ANSI A21.4. The minimum thickness class shall be Class 50 (up through 12-inch diameter pipe) and Class 51 (for 14-inch diameter and larger pipe).

2. Fittings shall be mechanical or push-on and be of a class at least equal to that of the adjacent pipe. Mechanical joint ductile iron fittings shall conform to AWWA C-110/ANSI A21.10. Push-on joint fittings shall be gray iron, with body thickness and radii of curvature conforming to ANSI A-21.10. Rubber gasket joints shall conform to AWWA C-111/ANSI A-21.11.

C. Polyvinyl Chloride Pipe (PVC)

1. PVC pipe and fittings shall conform to ASTM D-3034 (SDR 35 or lower) and ASTM F-679. Where added pipe strength is required, PVC pipe shall conform to AWWA C-900.


D. High Density Polyethylene (HDPE)

1. HDPE pipe to meet or exceed the material standards and specifications found in the ODOT Standard Specifications for Construction Section 02415, Plastic Pipe.

E. Fittings

1. General

   a. Manufactured tee fittings shall be provided in the sewer main for side sewers. Fittings shall be of sufficient strength to withstand all handling and load stresses encountered.

   1) Fittings shall be of the same materials as the mainline pipe. Material joining the fittings shall be of the same material as the mainline pipe.

   2) Material joining the fittings to the pipe shall be free from cracks and shall adhere tightly to each joining surface.

   3) All fittings shall be capped or plugged and shall be gasketed with the same gasket material as the pipe joint, fitted with an approved mechanical stopper, or have an integrally cast knockout lug. The plug shall be able to withstand all test pressures without leaking. When later removed, the plug shall permit continuation of piping with jointing similar to joints in the installed line.

   4) Mechanical Couplings: Mechanical couplings shall be wrought steel. Installation procedures must meet the manufacturers' recommendations.

4.11.9 Line Tap Saddle

A. All saddles approved for sanitary sewer tap installation (see Section 2) shall be allowed on storm taps.

4.12 Planting and Vegetation

Planting and vegetation shall be in accordance with Appendix A: Planting Requirements. No invasive species shall be planted or permitted to remain within a facility, including, but not limited to the following:

A. Himalayan blackberry (Rubus discolor)
B. Reed canarygrass (Phalaris arundinacea)
C. Teasel (Dipsacus fullonum)
D. English Ivy (Hedra helix)
E. Nightshade (Solanum sp.)
F. Clematis (Clematis ligusticifolia and C. vitabla)
G. Cattail (Typhus latifolia)
H. Thistle (Cirsium arvense and C. vulgare)
I. Scotch Broom (Cytisus scoparius)

4.13 Fencing

Any facility with the potential of storing (18) inches or more of water at any time shall require fencing around facilities or tracts containing the facilities. The fence shall be a minimum of 4-foot high, black, or brown vinyl-clad chain link fence in conformance with the City Standard Drawing No. 419.

A. When a facility is fenced, the fence shall include a 12-foot-wide lockable gate for maintenance access conforming to the City Standard Drawing No. 419.

B. If a facility is located adjacent to a riparian corridor, wildlife friendly fencing shall be utilized, as approved by the City Engineer.

4.14 Access

Access roads shall be provided for maintenance of all water quality and quantity facilities. The following criteria are the minimum required for facilities maintained by the City. If the design Engineer anticipates that any of the requirements will not be met due to the configuration of the proposed development, the design Engineer is advised to meet with the City Engineer to gain approval for the deviation prior to submittal.

4.14.1 Standard Road Design

A. The road section shall be designed according to Standard Drawing No. 513; the subgrade shall be compacted to 91-percent AASHTO T-180; or the developer may submit an alternate design certified as capable of supporting a 30-ton maintenance vehicle in all weather conditions.

B. Strengthened sidewalk and driveway sections shall be according to Standard Drawing No. 510.

C. Maximum roadway profile grade shall be 10-percent with a maximum 3-percent cross-slope.

D. Minimum width shall be 12 feet on straight runs and 15 feet on curves. Minimum gravel shoulder width shall be 1-foot, matching the cross slope of the access road.

E. Curves shall have a minimum 40-foot interior radius.

F. Access shall extend to within 10-feet of the center of all structures unless otherwise approved by the City.

G. The City may require a curb or other delineator at the edge of the road for drainage, a curb stop, or to demarcate the road where the road edge is not apparent.

H. The side slope for road embankments shall be 2H:1V or flatter, as approved by the Geotechnical Engineer for the project.

I. A vehicle turnaround shall be provided when the access road exceeds 150’ in length, reference Standard Drawing No. 529.

4.15 Erosion Protection

Inlets to water quality and quantity facilities shall be protected from erosive flows through the use of an energy dissipater or rip rap stilling basin of appropriate size based on flow velocities. Flow shall be evenly distributed across the treatment area.

All exposed areas of water quality and quantity facilities shall be protected using coconut or jute matting.
Coconut matting or high-density jute matting (Geojute Plus or approved equal) shall be used in the treatment area of swales and below the water quality volume levels of ponds. Low density jute matting (Econoju or approved equal) may be used on all other zones.

4.16 Maintenance Responsibilities

4.16.1 Public Facilities

A. Unless otherwise approved by the City Engineer, newly constructed water quality or quantity facilities serving public roads shall be privately maintained to City Standards.

B. The developer, or other legally bound party, shall be responsible for Public facility bonding and maintenance. The City of Amity will not maintain private stormwater quality or flow control facilities.

4.16.2 Private Facilities

Private facilities shall be maintained by the owner. The owner or responsible party shall complete the City standard private maintenance agreement forms and submit to the City for review and approval. The maintenance agreement shall be approved by the City and recorded with Yamhill County before the issuance of building occupancy permits.

A maintenance plan is required for all private stormwater facilities. It shall:

A. Be composed of an agreement signed by the owner of the stormwater facilities and the City and an explanation of the operation, maintenance, and preservation of the stormwater facility including a schedule of required maintenance activities. The maintenance plan will be appended to the property deed. Operations and maintenance manuals will be provided by the developer to all present and subsequent owners of the facility that describes the stormwater facility, maintenance procedures including methods of waste disposal, maintenance schedule, and the location of the installation and maintenance records of previous years.

B. Components

1. Inspection schedule including storm-related inspections.

2. Description of facility components, the observable trigger for maintenance, and the method of maintenance including appropriate waste disposal method.

3. Type of maintenance for plants and other landscaping material required for proper functioning of the stormwater facility and to maintain a 75% vegetative cover.

C. Contain the location for stormwater installation records. The installation records will be kept until the facility is dismantled and no longer discharges to the City’s stormwater system. They include at a minimum, the design calculations and assumptions and the construction drawings that show the individual components and the entire system.

D. Provide requirements for maintenance records. Annual reports will be submitted to the City by the owners of the stormwater facility attesting to the proper maintenance, safety, and functioning of the stormwater facility. The maintenance records will be kept with the facility installation records and be available for inspection by the City for at least five (5) years. Installation records will be kept until the stormwater facility is dismantled and no longer discharges to the City’s stormwater system.

4.16.3 Acceptance

The City of Amity will accept new stormwater and surface water installations or systems built to the “Public Works Design Standards” and Section 1.16
SECTION 5 - STREETS

5.1 Performance Standards

All street designs shall provide for the safe and efficient travel to the motoring public. Streets shall be designed to carry the recommended traffic volumes identified for each street classification. Street classifications are set forth in Section 1.6 Definitions of these Design Standards.


All vertical and horizontal curves shall meet the guidelines of the AASHTO Policy and the design speed for each street classification.

5.2 Right-of-way and Pavement Width

All street width requirements shall be reviewed on a case-by-case basis by the City Engineer. The width and classification of all streets must conform to any approved transportation master plan or recorded subdivision plat. Unless otherwise indicated in an approved Master Plan or subdivision plat, the minimum design widths shall be as shown in the following table:

Table 5.1: Typical Design Widths

<table>
<thead>
<tr>
<th>Section</th>
<th>Type of Street</th>
<th>Minimum ROW Width (ft)</th>
<th>Minimum Roadway Width (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Arterial Streets</td>
<td>88</td>
<td>64</td>
</tr>
<tr>
<td>B</td>
<td>Collector Streets</td>
<td>66</td>
<td>44</td>
</tr>
<tr>
<td>C</td>
<td>Commercial and Industrial other than Arterials</td>
<td>80</td>
<td>44</td>
</tr>
<tr>
<td>D</td>
<td>Local Residential Streets Serving 20 or More Dwelling Units</td>
<td>60</td>
<td>34</td>
</tr>
<tr>
<td>E</td>
<td>Local Residential Streets Serving 20 or Less Dwelling Units</td>
<td>50</td>
<td>28</td>
</tr>
<tr>
<td>F</td>
<td>Circular End of Cul-de-sacs (Diameter)</td>
<td>114</td>
<td>90</td>
</tr>
</tbody>
</table>

Standard roadway designs and standard details can generally be used for residential streets and collector streets. Standard sections are only to be considered minimum designs as actual soil conditions may require thicker base rock or pavement installations.

5.3 Traffic Analysis

The City Engineer will require a traffic analysis report as determined by the type of development and its potential impact to existing street systems. A traffic analysis will generally be required for a development:

A. When it will generate in excess of 50 trips in either the AM or PM peak hour, or
B. When a development's location, proposed site plan, and traffic characteristics could affect traffic safety, access management, street capacity, or known traffic problems or deficiencies in a development's study area.

The report shall be prepared by a professional engineer or traffic engineer licensed in the State of Oregon. At a minimum, the report shall contain the following:

5.3.2 Purpose of Report And Study Objectives

A discussion of key traffic issues to be addressed and the transportation system and development objectives related to a specific development.
General transportation system objectives are:

A. To provide safe and effective transfer of vehicle traffic between the site and the street system
B. To maintain easy and safe traffic flow on surrounding street system
C. To provide convenient, safe, and efficient onsite and off-site movement of vehicles, pedestrians, transit, service and delivery vehicles, and bicycles
D. To effectively mitigate adverse site generated traffic impacts on affected streets and intersections. Site specific objectives may be established by the City for each study.

5.3.3 Executive Summary

A concise summary of the study purpose/objectives, site location and study area, development description, key assumptions, findings, conclusions, and recommendations.

5.3.4 Description of Site and Study Area Roadways

Anticipated nearby development and committed roadway improvements, which would affect future traffic in the study area.

5.3.5 Study Area And Horizon Years

The study area will be defined by all intersection approaches through which peak hour site traffic composes at least 5% of the existing traffic volume, or roadway sections on which crash history or residential traffic character is expected to be significantly impacted.

The horizon years to include in the analysis are:

A. Fewer than 200 new peak hour trips: opening year only
B. Between 200 and 500 new peak hour trips: opening year and five years after opening
C. Over 500 new peak hour trips: opening year, five years after opening, and ten years after opening

5.3.6 On Site Traffic Evaluation

An evaluation of the proposed (and alternative) site access locations, the adequacy of access drive depth, driveway lanes, and queuing storage, the safety and efficiency of proposed vehicular circulation, parking layout, pedestrian, and service vehicle routes/facilities, together with recommendations for onsite traffic markings and controls.

5.4.5 Technical Appendix

A technical appendix including worksheets, charts, and drawings to support findings described in the body of the report.

5.3.7 Recommendations for Public Improvements

Recommendations should be made for external roadway improvements, such as additional through lanes and turn lanes, and traffic control devices necessitated as a result of the development. Recommended improvements to transit facilities, and pedestrian and bike circulation should also be reported.

The recommendations should specify the time period within which improvements should be made, particularly if improvements are associated with a phased development, the estimated cost of improvements, and any monitoring of operating conditions and improvements that may be needed. If needed street improvements unrelated to the development are identified during the analysis, such improvements should be reported.

5.3.8 Access Management

On sites with arterial and collector street frontages, the report shall evaluate and recommend the use of access management plans or techniques:
A. To separate basic conflict areas (reduce number of driveways or increase spacing between driveways and intersections).

B. To remove turning vehicles or queues from the through lanes (reduce both the frequency and severity of conflicts by providing separate paths and storage area for turning vehicles and queues).

These techniques may include turn restrictions, striping, medians, frontage roads, channelization of lanes or driveways, shared driveways and access between similar uses, access consolidation, lanes for left or right turns, and other transportation system management (TSM) actions.

5.3.9 Offsite Traffic Evaluation

Offsite traffic should include:

A. Existing A.M. and P.M. peak hour counts by traffic movements at intersections effected by generated traffic from the development (use traffic flow diagrams).

B. Projected A.M. and P.M. peak hour volumes for these same intersections and proposed access points when the development is in full service. (Use traffic flow diagrams)

C. A determination of the existing levels of service and projected levels of service at each intersection and access points studied.

D. A discussion of the need for roundabouts or traffic signals. This should include a traffic warrant computation based on the latest edition of Manual on Uniform Traffic Control Devices, as adopted by the State of Oregon.

E. The recommendations made in the report should be specific and should be based on a minimum level of service "D" with maximum volume to capacity (v/c) ratio of 0.90 when the development is in full service. As an example, if a traffic signal is recommended, the recommendation should include the type of traffic signal control and what movements should be signalized. If a storage lane for right turns or left turns is needed, the recommendation should include the amount of storage needed. If several intersections are involved for signalization and an interconnect system is considered, specific analysis should be made concerning progression of traffic between intersections.

F. The report should include a discussion of bike and pedestrian usage, safe route to schools, and the availability of public transit to serve the development.

5.4 Intersections

Connecting street intersections shall be located to provide for traffic flow, safety, and turning movements, as conditions warrant. Where signalized, design shall provide for optimal signal phasing. Consideration for arterial street progression, protected/permitted and permitted left turn phasing shall occur. New signal proposals in remote locations shall first include an evaluation of alternate applications such as roundabouts.

5.4.1 Arterial Intersections

Exclusive left and right turn lanes will be provided; bus turnouts will be provided if traffic flow and safety conditions warrant; designated crosswalks will be provided at controlled locations; street alignments across intersections shall be continuous.

5.4.2 Minor Collector and Local Street Intersections

Street and intersection alignments should facilitate local circulation but avoid alignments that encourage nonlocal, through traffic.

Streets shall be aligned so as to intersect at right angles (90°). Angles of less than 75° will not be permitted. Intersection of more than two streets at one point will not be permitted.

New streets shall intersect with existing street intersections so that center lines are not offset, except as provided below. Where existing streets adjacent to a proposed development do not align properly, conditions may be required of the development to provide for proper alignment.

For intersections which are not directly aligned with street center lines, the centerline spacing must meet
the following minimum separation distance:

<table>
<thead>
<tr>
<th>Street Class</th>
<th>Intersection Spacing (FT.) *</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Lane Major/Minor Arterial</td>
<td>300</td>
</tr>
<tr>
<td>Major Collector</td>
<td>200</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>150</td>
</tr>
<tr>
<td>Local/Cul-de-sac</td>
<td>100</td>
</tr>
</tbody>
</table>

*The City Engineer may permit a lesser spacing when comprehensive findings are made to establish that:

A. Without the change, there could be no public street access from the parcel(s) to the existing street, and
B. All other provisions of the street design requirements can be met.

### 5.5 Half Street Construction

Half street construction is generally not acceptable. Where such a street is justified, the City Engineer will approve the right-of-way and pavement width. In no case shall the pavement width required be less than 22-ft. Half streets will only be approved when the abutting or opposite frontage property is undeveloped and the full improvement will be provided with development of the abutting or opposite (upon right-of-way dedication) frontage property. Half street shall be signed “No Parking” until the full width of the street is improved. A clear 22 feet for travel shall be maintained at all times.

A development on an unimproved street shall be responsible for constructing a continuous, City standard street to a connection with the nearest standard (publicly maintained) street.

### 5.6 Street Classification

All streets within the City shall be classified as listed in Amity Transportation System Plan. The classification for any street not listed shall be that determined by the City Engineer.

### 5.7 Design Speed

Design speeds for classified streets shall be as follows*:

<table>
<thead>
<tr>
<th>Street Class</th>
<th>Design Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Lane Major/Minor Arterial</td>
<td>35 – 45 mph</td>
</tr>
<tr>
<td>Major Collector</td>
<td>25 – 35 mph</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>25 – 35 mph</td>
</tr>
<tr>
<td>Local/Cul-de-sac</td>
<td>25 mph</td>
</tr>
</tbody>
</table>

*Where existing traffic conditions identify speeds in excess of design speeds listed, then the higher speed will be used for design purposes.

### 5.8 Horizontal/Vertical Curves and Grades

#### 5.8.1 Horizontal Curves

Horizontal curve radius (on centerline) for each street classification shall be designed according to the roadway design speed. The radius shall not be less than the following:

<table>
<thead>
<tr>
<th>Design Speed (MPH)</th>
<th>Radius (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>180’</td>
</tr>
<tr>
<td>30</td>
<td>300’</td>
</tr>
<tr>
<td>35</td>
<td>450’</td>
</tr>
<tr>
<td>40</td>
<td>670’</td>
</tr>
</tbody>
</table>

All horizontal curves shall be designed to the current version of the American Association of State Highway...

5.8.2 Vertical Curves

Vertical curve length shall be based on the design criteria which include:

A. Design speed
B. Crest vertical curve
C. Sag vertical curve - stopping sight distance for crest and sag vertical curves shall be based on sight distance and headlight sight distance, respectively.

All vertical curves shall be parabolic, and the length shall be computed for each location and shall be designed to the current version of the American Association of State Highway and Transportation Officials (AASHTO) Manual.

5.8.3 Grades

Maximum grades for each street classification shall be as follows:

<table>
<thead>
<tr>
<th>Section</th>
<th>Slope (ft/ft)</th>
<th>Slope (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>0.060 ft/ft</td>
<td>(6%)</td>
</tr>
<tr>
<td>Major Collector</td>
<td>0.080 ft/ft</td>
<td>(8%)</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>0.100 ft/ft</td>
<td>(10%)</td>
</tr>
<tr>
<td>Local/Cul-de-sac</td>
<td>0.120 ft/ft</td>
<td>(12%)</td>
</tr>
</tbody>
</table>

Local and cul-de-sac streets may exceed 12%, but in no case permitted to exceed 15%. The City Engineer may approve a grade greater than 12% when all of the following conditions exist:

A. Topographic constraints do not allow the development to be served by a street with a maximum grade of 12% without causing destabilization of soils by excessive cuts and fills.
B. There is no access to the property being developed through adjacent properties at a maximum 12% grade.
C. The section of local street will not exceed a combination of length, horizontal alignment, and/or grades exceeding 12% which will create hazardous traffic conditions.
D. In no case shall the maximum street grade exceed 15%.
E. Minimum grade for all streets shall be 0.0050 feet per foot (0.50%) however, in all cases street grades shall allow for proper and adequate drainage. Cul-de-sac "bulbs" shall have a minimum slope of 0.0060 feet per foot (0.60%).

Street cross slopes shall be as shown in street typical sections.

5.9 Pavement Design

In general, all streets shall be constructed with asphaltic concrete; however, Portland Cement Concrete (PCC) streets are permitted as approved by the City Engineer.

Typical flexible pavement thicknesses will be as shown in Standard Drawing No. 513. This will apply only to local streets and lower classifications.

The Design Engineer will provide a street structural design section for all roadways classified as “Minor Collector” and higher, and for local streets in industrial zones. Minimum standards for roads classified as “Minor Collector” and higher shall be as shown in Standard Drawing No. 527.

5.10 Concrete Curb

All development projects will be required to construct street improvements with concrete curbs. Monolithic curb and gutter, as shown in the Standard Drawings, shall be used on all streets. Curb exposure for monolithic curb and gutter shall be six inches (6") and eight inches (8") at catch basins. Joint spacing in
curbs shall be 15 foot maximum for contraction joints and 45 foot maximum for expansion joints. In addition, expansion joints shall be located at all curb return points and at driveway curb-drop transition points.

A minimum of two drainage block outs to accommodate 3” drainpipe shall be provided for each lot. Typically, these block outs are located five feet (5’) from each side of property line.

5.11 Curb Return Radius

A WB-67 design vehicle shall be used when designing curb radii for all truck routes. Unless otherwise required, or approved by the City Engineer, all other curb radii at public street intersections shall be designed in accordance with the following:

<table>
<thead>
<tr>
<th>Primary Street Classification</th>
<th>Secondary Street Classification</th>
<th>Zoning</th>
<th>Minimum Radii (ft)</th>
<th>Design Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Local</td>
<td>Residential</td>
<td>25</td>
<td>Emergency</td>
</tr>
<tr>
<td>Local</td>
<td>Local</td>
<td>Non-Residential</td>
<td>25</td>
<td>Emergency</td>
</tr>
<tr>
<td>Collector</td>
<td>Local</td>
<td>Residential</td>
<td>25</td>
<td>Emergency</td>
</tr>
<tr>
<td>Collector</td>
<td>Local</td>
<td>Non-Residential</td>
<td>25</td>
<td>WB-50</td>
</tr>
<tr>
<td>Collector</td>
<td>Collector</td>
<td>Residential</td>
<td>25</td>
<td>WB-50</td>
</tr>
<tr>
<td>Collector</td>
<td>Collector</td>
<td>All</td>
<td>35</td>
<td>WB-67</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>Collector</td>
<td>All</td>
<td>35</td>
<td>WB-67</td>
</tr>
</tbody>
</table>

5.12 Parking

<table>
<thead>
<tr>
<th>Street Class</th>
<th>Parking Lanes</th>
<th>Parking Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Lane Major/Minor Arterial</td>
<td>None</td>
<td>Not Allowed</td>
</tr>
<tr>
<td>Major Collector</td>
<td>None</td>
<td>Variable (1) (2)</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>2</td>
<td>Yes</td>
</tr>
<tr>
<td>Local/Cul-de-sac</td>
<td>2</td>
<td>Yes (3) (4)</td>
</tr>
</tbody>
</table>

A. Where bike lanes exist, parking may be prohibited.
B. No parking within 45’ of curb return.
C. No parking within 30’ of curb return.
D. Local Streets and Cul-de-sacs in areas of steeper topography, which are approved for reduced 32 feet pavement width, will be required to have one parking lane; to assure that on street parking is adequate for adjacent uses, a reduced street design will consider clustered parking bays adjacent to the street, if needed. Parking will not be allowed in reduced radius cul-de-sacs.

For streets designated as “Major Collector” and below, the City Engineer may consider design modifications to conserve major trees in the public right-of-way. Subject to approval by the City Engineer, parking lanes may be removed on one or on both sides of a street.

5.13 Sidewalks

In general, new sidewalks are required for all development requiring a development permit. Where planter strips are required, sidewalks shall be one (1) foot off the right-of-way line (except cul-de-sacs). Where no planter strips are required, sidewalks shall abut curbs. Minimum sidewalk width is five feet.

For streets designated as “Major Collector” and below, the City Engineer may modify design of sidewalk to
conserve major trees in the public right-of-way. Include handrails or fences to protect pedestrians when there is a vertical drop of 30-inches or greater adjacent to sidewalk.

5.13.1 Sidewalk Ramps

All new street intersections shall provide sidewalk ramps (for access) that meet the requirement of the Americans with Disabilities Act (ADA). In residential areas the ramp will be located at the midpoint of the curb return. On streets classified above local or cul-de-sac, ramps may be required at different locations within the curb return. It may also be required to construct two (2) ramps at a curb return when a different location is required. Retrofit of existing ramps within the project limit may be required.

Locations of sidewalk ramps shall be designed with regard to stormwater flows, street grades, and pole locations. Other factors may also dictate sidewalk ramp location, see Standard Drawing No. 505 for standard locations.

5.14 Driveways

Access to private property shall be permitted with the use of driveway curb cuts. The access points with the street shall be the minimum necessary to provide access while not inhibiting the safe circulation and carrying capacity of the street.

On Major Collector streets and above, one driveway per site frontage will be the normal maximum number. Double frontage lots and corner lots on these streets may be limited to access from a single street, usually the lower classification street. If additional driveways on a frontage are approved by the City Engineer, a finding shall be made that no eminent traffic hazard would result and impacts on through traffic would be minimal; restrictions may be imposed on additional driveways, such as limited turn movements, shared access between uses, closure of existing driveways, or other access management actions. Please refer to Section 2.211 of the Amity Development Code.

Driveway approach types shall generally be limited to those shown in the Standard Drawings for residential driveways, and commercial/industrial driveways. Residential driveways shall conform to Standard Drawing No. 508 & 509; commercial/industrial driveways shall conform to Standard Drawing No. 510 & 511. Curb return driveway approaches must be approved by the City Engineer.

Table 5.1 Driveway Widths (Minimum/Maximum in Feet)

<table>
<thead>
<tr>
<th>Street Classification</th>
<th>Residential Zone</th>
<th>Commercial Zone</th>
<th>Industrial Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Lane Major/Minor Arterial</td>
<td>NA (1)</td>
<td>NA (1)</td>
<td>NA (1)</td>
</tr>
<tr>
<td>Major Collector</td>
<td>12/24 (2)</td>
<td>12/36 (5)</td>
<td>12/40 (5)</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>12/24 (2)</td>
<td>12/36 (3)</td>
<td>12/40(3)</td>
</tr>
<tr>
<td>Local/Cul-de-sac</td>
<td>12/24 (2)</td>
<td>12/36</td>
<td>(4)</td>
</tr>
</tbody>
</table>

A. Special conditions may warrant access.
B. 28’ maximum with 3-car garage (measured at low curb cut)
C. Frontage greater than 130/ft. permitted one additional curb cut.
D. Build to Minor Collector standard.
E. Certain businesses may warrant one additional curb cut for service driveway.

For classification of Major Collector and above, driveways adjacent to street intersections shall be located beyond the required queue length for traffic movements at the intersection. If this requirement prohibits access to the site, a driveway with restricted turn movements may be allowed.

Within commercial, industrial, and multi-family areas, shared driveways and internal access between similar uses are encouraged to reduce the access points to the higher classified roadways; to improve internal site circulation; and to reduce local trips or movements on the street system. Shared driveways or internal...
access between uses will be established by means of common access easements at the time of development.

Driveway grades shall not exceed twelve percent (12%) from the curb line to the front edge of setback (Drawing No. 508).

5.15 Trees, Names and Signage

Signs will conform to current MUTCD Standards.

The City’s Planning Division, prior to recording of any maps or plats will approve street names for all new development. The city planner shall refer proposed street names to the Amity Fire Department for their consideration. No new street name shall be used which will duplicate or be confused with the name of existing streets within the Amity Fire District.

5.16 Permanent Dead-end Streets

A standard cul-de-sac turnaround shall be provided at the end of a permanent dead-end street that does not provide looped circulation. Permanent dead-end streets shall be limited to serving no more than twenty-five dwellings and shall not exceed four hundred feet in length from the point of the nearest centerline/centerline intersection.

A permanent dead-end street is measured from the right-of-way line at the nearest intersecting street which has at least two points of access, to the right of way line at the furthest end of the dead end street. Exceptions to the dead end street standard must comply with the Amity Development Code.

An existing dead end street system which is more than 600 feet long or which serves more than 25 dwelling units may be terminated in a cul-de-sac if no Future Street Plan has been adopted and the following criteria are met:

A. Alternative emergency vehicle access or fire protection is provided satisfactory to the Manager; and,

B. Neighborhood traffic circulation needs are not adversely impacted by the proposed cul-de-sac termination of the street.

5.17 Alleyways and Private Residential Streets/Access ways

5.17.1 Alleyways

Alleyways may be provided in commercial and industrial developments with approval by the City Engineer. When approved, alleyways shall be dedicated to the City. The right-of-way width shall be 20 feet with a 20-foot pavement width.

Design for alleyways shall meet the same criteria as other public streets. The exception to those criteria may be centerline radius and design speed. Generally, alleyways shall be designed for one way operation.

5.17.2 Private Streets

Private streets shall be built to the same structural section and material requirements as public streets.

5.18 Local Street Design for Adverse Topography

Local streets shall have a minimum cross section slope of 2.5% ("crown") in accordance with Standard Drawing No. 513, except in situations of adverse topography. The Design Engineer may utilize an "offset" or unequal crown section when the existing ground slope exceeds 8.00% across the roadway section.

The offset crown design shall meet the following conditions:

A. Minimum distance from "crown" to (one) face of curb is 10 feet.

B. Maximum cross slope of pavement is 5.00%.

C. Maximum differential in top of curb elevation from one side to the other is 1 foot.

The existing ground "side slope" criteria are based on the relationship of the slope of the ground to the
transverse slope of the roadway profile. This relationship shall be met for the entire length of the roadway alignment utilizing an offset.

5.19 Trench Restoration Requirement

The actual trench cut shall be repaired as per standard drawing number 517. Asphaltic concrete shall be replaced in a minimum of 2 lifts and be at least 91% of rice theoretical maximum density as determined in conformance with AASHTO T-209.

5.19.1 Trench Repair

After performing trench cut restoration, a 2” grind/inlay for a distance of 1’ per posted mile per hour (mph) each direction from the cut is required. The extent of surface grind/inlay width will be as follows:

A. A single lane that is impacted will have full restoration for the width of the lane.
B. If multiple lanes, the full width of those lanes shall be restored.
C. If impact extends past the centerline, all lanes curb to curb shall be restored.
D. All inlayed asphaltic concrete shall be placed with a self-propelled slip form paver. Drag boxes shall not be used.
E. All tie-in joints to existing asphaltic concrete surfaces shall be sealed with rubberized asphalt emulsion (hot or cold).

5.19.2 Striping Restoration

All striping removed by grinding shall be replaced with thermoplastic. All symbols, emblems, arrows, letters, and bars shall be performed thermoplastic.

5.20 Intersection Sight Distance

It is the policy of the City to have the applicant’s Project Engineer evaluate safe intersection sight distance using the principles and methods recommended by the current edition of AASHTO. This policy shall apply to the design of new streets and driveways, and to the placement of any object in the public right-of-way, including landscaping features. Unless superseded by the current version of AASHTO, the following minimum standards shall apply:

A. Intersection (and Driveway) Sight Distance: The following table is for intersection and driveway sight distances:

<table>
<thead>
<tr>
<th>Intersection Sight Distance Design Speed (MPH)</th>
<th>Minimum Intersection Sight Distance (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>145</td>
</tr>
<tr>
<td>20</td>
<td>195</td>
</tr>
<tr>
<td>25</td>
<td>240</td>
</tr>
<tr>
<td>30</td>
<td>290</td>
</tr>
<tr>
<td>35</td>
<td>335</td>
</tr>
<tr>
<td>40</td>
<td>385</td>
</tr>
<tr>
<td>45</td>
<td>430</td>
</tr>
</tbody>
</table>


Sight distance shall be determined for each street approach to an intersection. A driver on the approach street should be able to see each vehicle on the intersecting street from the time that the vehicle is the sight distance from the intersection until the time that the vehicle reaches the intersection. Poles, trees, and similar obstructions will be allowed within the sight distance area only if it can be shown that such
obstructions do not prevent the continuous view of the vehicle approaching on the intersecting street. For purposes of this calculation, the driver’s eye is assumed to be 15 feet from the near edge of the nearest lane of the intersecting street, and at a height range of 3.5 feet to 7.6 feet above the approach street pavement. The sight distance criteria should be met throughout the range of driver’s eye heights. The top of the vehicle on the intersecting street is assumed to be 3.5 feet above the cross-street pavement.

The traffic speed used in the calculation shall be the highest of the following:

A. The design speed of the intersecting street
B. The posted speed of the intersecting street; or
C. The measured 85th percentile speed of the intersecting street. Where the intersecting street is controlled by a stop sign or yield sign, a design speed of zero may be assumed.

Where traffic signal control exists at an intersection or where a traffic signal is likely to be installed in the future, adequate sight distance shall be provided for potential right turns on red. In some locations, maintenance of the required sight distance may require restrictions to potential development outside the public right-of-way. The Project Engineer shall demonstrate that adequate restrictions are in place (and enforceable by the City such as sight distance easements) to assure that the required sight distance can be maintained in the future.

At the time of construction plan submittal, the project engineer shall submit a stamped intersectional sight distance report for each new or modified intersection by a development which generally includes a sketch, calculations, narrative, and photographs, for review by the City.

No modifications or exceptions to these standards shall be allowed unless approved by the City Engineer.

5.21 Material Specifications

5.21.1 Granular Fill

A. Crushed aggregate for base rock, leveling course, and surface replacement shall consist of an aggregate base as specified by the design engineer, with approval of the City’s authorized representative, and shall be in conformance with ODOT SSC Section 02630, “Base Aggregate,” for gradation, fractured faces, and durability.

B. The leveling course shall consist of 3/4”-0” grade crushed aggregate material and be a minimum thickness of 2 inches when compacted.

C. The aggregate shall consist of uniform-quality, clean, tough, durable fragments of rock or gravel, free from flat, elongated, soft, or disintegrated pieces, and other objectionable matter occurring either free or as a coating on the stone.

5.21.2 Asphalt Concrete

A. Courses of asphalt concrete pavement shall consist of the following unless otherwise specified by the design engineer and approved by the City Engineer.

B. The wearing surface of AC pavement shall consist of 1 1/2” Hot Mixed Asphalt Concrete (HMAC), conforming to ODOT SSC Section 00745; “Asphalt Concrete Pavement (ACP)”.

C. The base courses for AC pavement shall consist of 1 1/2” Hot Mixed Asphalt Concrete (HMAC) conforming to ODOT SSC Section 00745, “Asphalt Concrete Pavement (ACP)”.

D. The AC pavement shall be either Level 2 or Level 3 ACP, as determined by Section 5.10.

E. Asphalt cement shall be 85-100 penetration paving asphalt conforming to ASTM D-946.

F. Liquid asphalt for use as a prime coat under AC shall be RC-70 rapid-curing liquid asphalt conforming to AASHTO M-81, or MC-70 medium-curing liquid asphalt conforming to AASHTO M-82.

5.21.3 Portland Cement Concrete
Concrete shall have a minimum compressive strength of 3300 psi, 28 days after placement. An air-entraining admixture shall be used. Entrained air (percent of volume) range shall be 4% to 7% (ASTM C138, C173 or C231). The maximum water/cement ratio shall be 0.52 and the slump range shall be between 3 and 5 inches (ASTM C143). Temperature of the concrete at time of placement shall range from 50°F to 90°F (ASTM C1064). Concrete aggregates shall conform to ASTM C33 requirements.

All forms for curbs and sidewalks shall be 2-inch dimensioned lumber, plywood, or metal forms. Forms for curb and sidewalk radii shall consist of bender board as approved by the City’s authorized representative. Forms on the face of the curb shall have no horizontal form joints within 7 inches of the top of the curb. All forms shall be approved by the City’s authorized representative.

Reinforcement steel shall conform to ASTM A-615, Grade 40, deformed bars.

5.22 Street Names and Traffic Control Signage and Striping

5.22.1 Street Name Signs and Posts

All newly platted streets shall be signed with the name as shown on the approved or proposed county plat; proposed county plats shall show street names as approved. Signs are to conform to Drawing No. 523, 524A, 524B, 525A, and 525B.

5.22.2 Traffic Control Signage and Striping

Traffic control signing and striping shall be in conformance with the MUTCD. A “Signage and Striping Plan” shall be included with plan submittals for new street construction and street improvements.

5.23 Street Acceptance Policy

The City of Amity will accept new public street installations or systems built to the “Public Works Design Standards,” providing that the following conditions are met.

5.23.1 Legal Recordings

All plats are recorded with the County Surveyor, all easements and dedications are recorded with the County Recorder and the Engineering Department receives a reproducible copy of the recorded documents.

5.23.2 Project Completion

After completion of construction of the total project, and after all testing has been satisfactorily completed, project closeout shall proceed, and the City will accept the project as complete in writing.

5.23.3 Maintenance Period

A. The Contractor or Applicant shall be responsible for providing Maintenance Assurance for Public Improvements as outlined in Section 1.14.1.

B. At any time during the warranty period, the City’s authorized representative has reason to believe the public street improvements have defects that were the result of faulty workmanship or flaws in construction material, the responsible party shall be required, at that party’s own cost, to repair any faults to the public street improvements deemed necessary by the City’s authorized representative.

Before the end of the Construction Maintenance period, the City's authorized representative shall inspect the project for any remaining deficiencies. If the deficiencies that remain are determined to be the responsibility of the contractor or the applicant, the contractor or applicant shall then make such repairs at no cost to the City.
SECTION 6 - TRENCH EXCAVATION AND BACKFILL

6.1 Definitions

Trench Excavation: Trench excavation is the removal of all material encountered in a trench to the depths shown on the plans or as directed by the City’s authorized representative. Trench excavation shall be classified as either common or rock excavation.

A. "Common excavation" is defined as the removal of all material that is not classified as rock excavation. The term "rock excavation" shall be understood to indicate a method of removal and not a geological formation.

B. "Rock excavation" is defined as the removal of material that cannot, in the City Engineer's judgment, be reasonably excavated with equipment comparable in machine weight and rated horsepower to a hydraulic excavator with a minimum weight of 45,000 pounds and a net horsepower rating of 130 to 140. Rock excavation is also the removal of material by drilling and blasting or power-operated rock breaking equipment. Boulders or concrete pieces larger than 1 cubic yard encountered in the trench excavation shall be classified as rock excavation if removing them requires any of the above excavation methods, in the opinion of the City’s authorized representative.

Trench Foundation: The bottom of the trench where the pipe bedding will lie. The trench foundation supports the pipe bedding.

Pipe Bedding: The furnishing and placing of specified materials on the trench foundation to uniformly support the barrel of the pipe, from the trench foundation to the spring line of the pipe.

Pipe Zone: The full width of the trench, from 12 inches above the top outside surface of the barrel of the pipe to the spring line of the pipe.

Spring Line: Halfway up the sides of the pipe (horizontal centerline) when the pipe is laid on the pipe bedding.

Haunch: That portion of the pipe below the spring line.

Trench Backfill: The furnishing, placing, and compacting of material in the trench between the top of the pipe zone material and the bottom of the pavement base rock, ground surface, or surface materials.

Native Material: Earth, gravel, rock, or other common material free of humus, organic matter, vegetative matter, frozen material, clods, sticks, and debris, isolated points or areas, or larger stones that would fracture or dent the structure or subject it to undue stress.

6.2 Materials

6.2.1 Trench Foundation

Trench foundation (as defined in Section 6.1) shall be native material in all areas except where groundwater or other conditions exist and, in the opinion of the City’s authorized representative, the native material cannot support the bedding and pipe. Under those conditions, geotextile fabrics approved by the City’s authorized representative shall be installed, or the unsuitable material shall be removed, as determined by the City’s authorized representative, and the trench foundation backfilled with Class B backfill in accordance with Drawing No. 201A and 201B.

6.2.2 Aggregates

The aggregates shall meet the requirements for fractured faces and durability as specified in ODOT Standard Specifications for Construction Section 00640.

A. Fracture of Rounded Rock:

1. Fracture of rounded rock will be determined according to ODOT TM 213. Provide at least one
mechanically fractured face based on the following percentage of particles retained on the ¼” sieve for the designated size:

<table>
<thead>
<tr>
<th>Designated Size</th>
<th>Minimum % Retained on the ¼” Sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½” – 0 and larger</td>
<td>50</td>
</tr>
<tr>
<td>Smaller than 1 ½” - 0</td>
<td>70</td>
</tr>
</tbody>
</table>

B. Durability: base aggregate shall meet the following durability requirements:

<table>
<thead>
<tr>
<th>Test</th>
<th>Test method</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrasion</td>
<td>AASHTO T96</td>
<td>30% max</td>
</tr>
<tr>
<td>Degradation passing 850um sieve</td>
<td>ODOT TM 208</td>
<td>30% max</td>
</tr>
<tr>
<td>Degradation sediment height</td>
<td>ODOT TM 208</td>
<td>3” max</td>
</tr>
</tbody>
</table>

6.2.3 Pipe Area

Pipe Bedding: Pipe bedding material shall be Class B backfill in accordance with Section 6.2.5, or as approved by the City’s authorized representative.

6.2.4 Pipe Zone

The pipe zone material shall consist of Class B backfill in accordance with Section 6.2.5.

6.2.5 Trench Backfill

Above the pipe zone, trench backfill will be divided into the following classifications:

6.2.6 Class A Backfill

Class A backfill shall be native or common material, which in the opinion of the City’s authorized representative meets the characteristics required for the specific surface loading. Selected trench backfill material shall contain no frozen soil, gravel, or cobbles larger than 6 inches in diameter, and shall be free of organic or other deleterious material.

6.2.7 Class B Backfill

Class B backfill shall be 3/4”-0” granular grade crushed aggregate material, unless otherwise approved by the City’s authorized representative. The aggregate shall conform to section 02630.10 of the ODOT/APWA OSSC.

6.2.8 Class D Backfill

Class D backfill shall be commercially mixed Controlled Low- Strength Material (CLSM) made up of a mixture of fly ash, cement, fine aggregate, water and admixtures, if necessary. Fine aggregate shall consist of commercial quality concrete sand. CLSM shall attain a 28-day compressive strength of 100 psi - 200 psi.
SECTION 7 - STREET LIGHTING

7.1 Streetlights

All street lighting in the City of Amity will be Portland General Electric (PGE) owned and maintained. This following ‘Option A’ on PGE’s “Statement of Streetlight Installation Responsibilities” document found on their website. Option A is for luminaires owned, maintained, and supplied with electric energy by PGE. PGE is to supply and install the streetlight pole and fixture. Developer is responsible to install any streetlight footings and grounding material (may include the ground rod & copper wire) for the streetlight pole and/or junction box.

For Option A streetlights, the developer is responsible to provide the PGE Lighting Design Project Manager with the streetlight design layout that was submitted to the City for review, which includes complete streetlight design details (pole and fixture specifications). Designs for Option A streetlights require materials to be specified from PGE’s approved street lighting equipment list. PGE Lighting Design Project Managers are available to assist with pole and fixture information needed on the project, this information will be based on City direction. The final lighting design layout requires the City’s stamped approval or an email from the City with their approval. The lighting design layout will need to meet the recommended maintained illuminance values in the current revision of ANSI/IES RP-8 American National Standard Practice for Roadway Lighting. The City has the option to accept and authorize streetlight designs that do not meet ANSI/IES RP-8 guidelines, PGE will put a notation on the letter of authorization that is signed by the City as well as the sketch. The City is responsible to define road classifications.
APPENDIX A - PLANTING REQUIREMENTS

A1.0 INTRODUCTION

A1.1 General

The City recognizes the need to improve water quality and preserve aquatic species. To meet the intent of both the federal Clean Water and the Endangered Species Acts, the City developed requirements for planting Stormwater Facilities.

Successful vegetation of Stormwater Facilities is key for the benefit of water quality and quantity management, and aquatic species preservation. This Appendix aids professionals, the development community, and field crews in planning, designing and implementing successful vegetation projects. This document guides design decisions to promote successful planting efforts, while allowing flexibility to address opportunities and constraints at each site.

A1.2 Jurisdiction

Most Sensitive Areas are regulated by the Department of State Lands (DSL) and/or the U.S. Army Corps of Engineers (Corps). Where the Corps and/or DSL permit mitigation, planting plans for these areas shall follow DSL and Corps guidelines and approved plans. Stormwater Facilities are regulated by the City and the plans and management strategies for these areas shall follow the steps outlined in this document. Alternative plans and management strategies may be approved by the City.

A1.3 Professional Assistance

Vegetation in Stormwater Facilities should facilitate succession toward low-maintenance plant communities. Consultation with a professional landscape architect, ecologist, or horticulturist knowledgeable in native plants is highly recommended when preparing plans. Satisfying the landscaping requirements may require the services of a registered landscape architect. See ORS 671.310 through 671.459.

Non-native, invasive plant management and wildlife damage management strategies may need to be developed. Especially challenging management situations may require assistance from a landscape maintenance contractor or a wildlife biologist.

A2.0 Planting Plan Methods

Planting plans shall be required for development projects with Stormwater Facilities. When a planting plan is required, four major components shall be addressed: hydrology, soils, plant materials, and maintenance. When developing planting plans, the following steps should be used:

A2.1 Step 1: Assess Hydrologic and Hydraulic Conditions

A. Determine the frequency and duration of water inundation, including appropriate elevations of the vegetation area. In some cases, current site conditions (i.e., wetland presence) will suffice. For Stormwater Facilities, the models used to design and size the facility shall be used to determine frequency, duration, and surface water elevations within the facility.

B. Assign appropriate hydrologic zones to the vegetation area and apply them to the plan. Most project sites include one or more of the following planting zones with respect to hydrology during the growing season:

1. Wet - standing or flowing water/nearly constant saturation; anaerobic soils
2. Moist - periodically saturated; anaerobic and/or aerobic soils
3. Dry - infrequent inundation/saturation, if any; aerobic soils

A2.2 Step 2: Assess Soil Conditions and Assign Appropriate Preparation
Specifications to Plans:

A. Determine the organic content and non-native, invasive seed bank likely in the soil. For most Stormwater Facilities, the soil is often high in clay, gravel, or minerals devoid of topsoil and organic material, and/or high in non-native, invasive weed content. The conditions in Sensitive Areas and adjacent areas can vary greatly.

B. For upland sites with at least one foot of native topsoil, but containing a non-native, invasive seed bank or plants, add notes to the plan to remove the undesirable plants, roots, and seeds prior to planting.

C. For upland sites with either disturbed and compacted soils or less than one foot of topsoil and invasive, non-native seed bank or plants that have become established, the following notes shall be added to the plan:
   1. Remove the undesirable plants, roots, and seeds prior to adding topsoil.
   2. Till the sub-grade in these areas to a depth of at least four inches and add at least 12 inches of clean compost-amended topsoil. The compost-amended topsoil shall have the following characteristics to ensure a good growing medium:
      a. Texture – material passes through one-inch screen
      b. Fertility – 35% organic matter
      c. In lieu amending onsite soils, the contractor can import a certified amended soil in the treatment area which is composed of equal parts of organic compost, gravelly sand, and topsoil. Compost is weed-free, decomposed, non-woody plant material; animal waste is not allowed. Check with the City of Amity or Clean Water Services for Seal of Testing Approval Program (STA) Compost provider.
   3. In the event of floodplain grading, over-excavate the sub grade to ensure 12 inches of topsoil can be applied without impacting surface water elevations.
      a. For wet areas in Sensitive Areas and Stormwater Facilities, the soil conditions shall be hydric or graded to hold sufficient water to promote hydric soil formation. The addition of organic muck soil will improve plant establishment for some bulbs and tubers.
      b. Where appropriate and necessary for erosion control or to enhance organic matter, leaf compost may be placed uniformly on topsoil. (Refer to the Erosion and Sediment Control Manual). Other amendments, conditioners, and bio-amendments may be added as needed to support the specified plants or adjust the soil pH. Traditional fertilization techniques (applying N-P-K) are not necessary for native plants.

A2.3 Step 3: Identify Plants to be Preserved

Select Re-vegetation Plant Materials, Quantities, Placement, and Assign Planting Zones and Specifications to Plans

A. Preservation: Every effort shall be made to protect a site’s existing native vegetation. Native vegetation along Sensitive Areas and adjacent areas shall be retained to the maximum extent practicable.

B. Selection: Plant selection shall be from a native species palette and shall consider site soil types, hydrologic conditions, and shade requirements. Containerized or bare root plants may be used. A list of common native plant community types appropriate for planting Sensitive Areas, and Stormwater Facilities are provided in Planting Tables. Unless approved by the City Engineer, planting restrictions are limited to the following:
   1. Deep rooting trees and shrubs (e.g. willow) shall not be planted on top of concrete pipes, or
within 10 feet of retaining walls, inlet/outlet structures or other culverts; and

2. Large trees or shrubs shall not be planted on berms over four feet tall that impound water. Small trees or shrubs with fibrous root systems may be installed on berms that impound water and are less than four feet tall.

C. Quantities:

1. Sensitive Areas

   a. *make lowercase letters*Trees and shrubs shall be planted using the following equations to achieve the specified densities:
      1) Total number of trees: 1 tree per every 200 square feet of area.
      2) Total number of shrubs: 1 shrub per every 100 square feet of area.
      3) Groundcover: plants and seeds to achieve 100% areal coverage

2. Stormwater Facilities

   a. Stormwater Facilities in tracts or easements less than 30 feet wide shall be planted using the following equations to achieve the specified densities on a per acre basis:
      1) Total number of shrubs: 1 shrub per every 100 square feet of area.
      2) Groundcover: plant and seed to achieve 100% areal coverage

   a) Stormwater Facilities in tracts or easements 30 feet wide or more shall be planted using the following equations to achieve the specified densities on a per acre basis:
      1) Total number of trees: 1 tree per every 200 square feet of area.
      2) Total number of shrubs: 1 shrub per every 100 square feet of area.
      3) Groundcover: plant and seed to achieve 100% areal coverage

Size: Potted plants shall follow size requirements outlined in (Planting Tables). Bare root plants shall be 12 to 16 inches long.

Placement: Plant placement shall be consistent with naturally occurring plant communities. Trees and shrubs shall be placed in singles or clusters of the same species to provide a natural planting scheme. This arrangement may follow curved rows to facilitate maintenance. Distribution and relative abundance shall be dependent on the plant species and on the size of the re-vegetation area. Plant placement and seeding shall promote maximum vegetative cover to minimize weed establishment.

A2.4 Step 4: Determine Plant Installation Requirements and Assign Specifications to Plans

A. Timing

B. Containerized stock shall be installed only from February 1 through May 1 and October 1 through November 15. Bare root stock shall be installed only from December 15 through April 15. Plantings outside these times may require additional measures to ensure survival which shall be specified on the plans.

C. Erosion Control

1. Grading, soil preparation, and seeding shall be performed during optimal weather conditions and at low flow levels to minimize sediment impacts. Site disturbance shall be minimized, and desirable vegetation retained, where possible. Slopes shall be graded to support the
establishment of vegetation. Where seeding is used for erosion control, an appropriate native grass, Regreen (or its equivalent), or sterile wheat shall be used to stabilize slopes until permanent vegetation is established. Biodegradable fabrics (coir, coconut or approved jute matting (minimum 1/4” square holes) may be used to stabilize slopes and channels. Fabrics such as burlap may be used to secure plant plugs in place and to discourage floating upon inundation. No plastic mesh that can entangle wildlife is permitted. Refer to the Erosion and Sediment Control Manual for additional information.

2. Mulching

3. Trees, shrubs, and groundcovers planted in upland areas shall be mulched a minimum of three inches in depth and 18 inches in diameter, to retain moisture and discourage weed growth around newly installed plant material. Appropriate mulches are made from composted bark or leaves that have not been chemically treated. The use of mulch in frequently inundated areas shall be limited, to avoid any possible water quality impacts including the leaching of tannins and nutrients, and the migration of mulch into waterways.

4. Plant Protection from Wildlife

5. Depending on site conditions, appropriate measures shall be taken to limit wildlife-related damage.

6. Irrigation

Appropriate plant selection, along with adequate site preparation and maintenance, reduces the need for irrigation. However, unless site hydrology is currently adequate, a City approved irrigation system or equivalent (i.e., polymer, plus watering) shall be used during the two-year plant establishment period. Watering shall be at a minimum rate of at least one inch per week from June 15 through October 15. Other irrigation techniques, such as deep watering, may be allowed with prior approval by the City Engineer.

A. Access

Maintenance access for plant maintenance shall be provided for Stormwater Facilities. Stormwater Facility access requirements are provided in the Chapter 4.

A2.5 Step 5: Determine Plant Monitoring and Maintenance Requirements

A. Monitoring

B. Site visits are necessary throughout the growing season to assess the status of the plantings, irrigation, mulching, etc. and ensure successful re-vegetation.

C. Weed Control

D. The removal of non-native, invasive weeds shall be necessary throughout the maintenance period, or until a healthy stand of desirable vegetation is established.

E. Plant Replacement and Preservation

F. Installed plants that fail to meet site review inspections by the City Engineer shall be replaced during the maintenance period. Prior to replacement, the cause of loss (wildlife damage, poor plant stock, etc.) shall be documented by a landscape, arboriculture, and/or wildlife specialist with a description of the corrective actions taken.

A2.6 Step 6: Prepare Construction Documents and Specifications

G. The construction documents and specifications shall include:

1. Sensitive Area boundaries that include limits of approved, temporary construction encroachment.
2. Site Preparation plan and specifications, including limits of clearing, existing plants and trees to be preserved, and methods for removal and control of invasive, non-native species, and location and depth of topsoil and or compost to be added to re-vegetation area.

3. Planting plan and specifications, including all of the following:
   a. Planting table that documents the common name, scientific name, distribution (zone and spacing), condition and size of plantings
   b. Installation methods for plant materials
   c. Mulching
   d. Plant tagging for identification
   e. Plant protection
   f. Seeding mix, methods, rates, and areas
      1) Irrigation plan and specifications, including identification of water source, watering timing and frequency, and maintenance of the system.
      2) Maintenance schedule: including responsible party and contact information, dates of inspection (minimum three per growing season and one prior to onset of growing season) and estimated maintenance schedule (as necessary) over the two-year monitoring period.
      3) Good, rated corridor notes i.e., invasive species removal resulting in cleared areas exceeding 25 square feet shall be replanted with native vegetation.
      4) Access points for installation and maintenance including vehicle access if available.
      5) Standard drawing (north arrow, scale bar, property boundaries, project name, drawing date, name of designer and Property Owner).

### Public Streets Planting

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Facility Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Botanic name, Common Name</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Mahonia repens, Creeping Oregon Grape</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Public Swale</td>
<td>Curb Extension</td>
</tr>
<tr>
<td></td>
<td>Zone</td>
<td>X</td>
</tr>
<tr>
<td><em>Rubus calcynoides &amp; pentalobus, Creeping Bramble</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>X</td>
</tr>
</tbody>
</table>
PLANTING TEMPLATES AND PLANT LISTS

Zone A: Area of the facility defined as the bottom of the facility to the designed high water mark. This area has moist to wet soils and plants located here shall be tolerant of mild inundation.

Zone B: Area of the facility defined as the side slopes from the designed high water line up to the edge of the facility. This area typically has dryer to moist soils, with the moist soils being located further down the side slopes. Plants here should be drought tolerant and help stabilize the slopes.

**Swale Planting Zones**

![Swale Planting Zones Diagram]

**Planter Planting Zones**

![Planter Planting Zones Diagram]

**Basin Planting Zones**

![Basin Planting Zones Diagram]
## Public Streets Planting

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Facility Type</th>
<th>Characteristics</th>
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<td><strong>Accent Plants</strong></td>
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</tr>
<tr>
<td>Camassia leichtlinii, Great Camas</td>
<td>A/B</td>
<td>X</td>
</tr>
<tr>
<td>Camassia quamash, Common Camas</td>
<td>A/B</td>
<td>X</td>
</tr>
<tr>
<td>Iris douglasiana, Douglas Iris</td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td>Iris tenax, Oregon Iris</td>
<td>B</td>
<td>X</td>
</tr>
</tbody>
</table>

| **Street Trees** | | |
|------------------|| |
| *Acer campestre Evelyn*, Queen Elizabeth Hedge Maple | A/B | X | X | X | N | N | 30" | | |
| Betula jacquemontii, Jacquemontii Birch | A/B | X | X | X | N | N | 60" | | |
| Celtis occidentalis, Hackberry | A/B | X | X | X | N | N | 50" | | |
| Koelreuteria paniculata, Goldenrain Tree | A/B | X | X | X | N | N | 30" | Y | |
| Nyssa sylvatica, Black Tupelo | A | X | X | X | N | N | 50" | | |
| Prunus virginiana *‘Canada Red’*, Canada Red Chokecherry | A/B | X | X | X | N | N | 25" | Y | |
| Quercus shumardii, Shumard Oak | A/B | X | X | X | N | N | 70" | N | |
| Rhamnus purshiana, Cascara | A/B | X | X | X | Y | N | 30" | Y | |

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## Public Streets Planting List

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Facility Type</th>
<th>Characteristics</th>
</tr>
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<td><em>Botanic name, Common Name</em></td>
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<td><strong>Herbaceous Plants</strong></td>
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<tr>
<td>Carex densa, Dense Sedge</td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td>Carex morrowii, Ice Dance</td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td>Carex obturata,</td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td>Slough Sedge</td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td>Deschampsia cespitosa,</td>
<td>A/B</td>
<td>X</td>
</tr>
<tr>
<td>Tufted Hair Grass</td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td>Helictotrichon sempervirens,</td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td>Blue Oat Grass</td>
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<td></td>
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<tr>
<td>Juncus patens, Spread Rush</td>
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<tr>
<td><strong>Shrubs</strong></td>
<td></td>
<td></td>
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<tr>
<td>Cornus serticea 'Kelseyii',</td>
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</tr>
<tr>
<td>Dogwood</td>
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<td></td>
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<tr>
<td>Euonymus japonicus</td>
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<tr>
<td>'Microphyllus' Boxleaf Evergreen</td>
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<tr>
<td>Mahonia nervosa,</td>
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<tr>
<td>Dull Oregon Grape</td>
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<tr>
<td>Spiraea betulifolia,</td>
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<tr>
<td>Birchleaf Spiraea</td>
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<tr>
<td>Spiraea densiflora,</td>
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<tr>
<td>Sub-alpine Spiraea</td>
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<tr>
<td>Spiraea japonica, Japanese Spirea cultivars: Dart's Red, Goldflame, Goldmound, Little Princess, Magic Carpet</td>
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<tr>
<td><strong>Groundcovers</strong></td>
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<tr>
<td>Arctostaphylos uva-ursi,</td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td>Kinnickinnick</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fragaria chiloensis,</td>
<td>B</td>
<td>X</td>
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<tr>
<td>Coastal Strawberry</td>
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</table>
## Facility Plant List

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Private Zone</th>
<th>Swale</th>
<th>Planter</th>
<th>Basin</th>
<th>Public Basin</th>
<th>N/A Native Evergreen</th>
<th>Potential Hgt</th>
<th>O.C. Spacing</th>
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<tbody>
<tr>
<td>Aster suspicatus, Douglas' Aster</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Y</td>
<td>N</td>
<td>36&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>Athyrium felix-femina, Lady Fern</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>N</td>
<td>36&quot;</td>
<td>24&quot;</td>
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<tr>
<td>Blechnum spicant, Deer Fern</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>N</td>
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<td>24&quot;</td>
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<tr>
<td>Bromus carinatus, California Brome Grass</td>
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<td></td>
<td>X</td>
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<td>Y</td>
<td>18&quot;</td>
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<tr>
<td>Bromus sitchensis, Alaska Brome</td>
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<td>Y</td>
<td>Y</td>
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<tr>
<td>Bromus vulgaris, Columbia Brome</td>
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<tr>
<td>Camassia leichtlinii, Camas Lily</td>
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<td>X</td>
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<td>12&quot;</td>
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<tr>
<td>Camassia quamash, Common Camas</td>
<td>A/B</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>N</td>
<td>24&quot;</td>
<td>12&quot;</td>
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<tr>
<td>Carex deweyanna, Dewey Sedge</td>
<td>A</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>Y</td>
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<td>12&quot;</td>
</tr>
<tr>
<td>Carex densa, Dense Sedge</td>
<td>A</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>24&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>Carex obovata, Slough Sedge</td>
<td>A</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>14&quot;</td>
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<tr>
<td>Carex rupestris, Curly Sedge</td>
<td>A</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>N</td>
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<tr>
<td>Carex stipata, Sawbeak Sedge</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>N</td>
<td>N</td>
<td>20&quot;</td>
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<tr>
<td>Carex testacea, New Zealand Orange Sedge</td>
<td>A</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Carex vesicaria, Inflated Sedge</td>
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<td>X</td>
<td>X</td>
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<td>12&quot;</td>
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<tr>
<td>Deschampsia cespitosa, Tufted Hair Grass</td>
<td>A/B</td>
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<td>Y</td>
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<td>Eleocharis acicularis, Needle Spike Rush</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Eleocharis ovata, Ovate Spike Rush</td>
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<td>X</td>
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<td>Y</td>
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<td>30&quot;</td>
<td>12&quot;</td>
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<tr>
<td>Eleocharis palustris, Creeping Spike Rush</td>
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<td>X</td>
<td></td>
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<td>Y</td>
<td>Y</td>
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<td>12&quot;</td>
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<tr>
<td>Elymus glaucus, Blue Wild Rye</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
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<td>12&quot;</td>
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### Facility Plant List

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Proposed Facility Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Swale</td>
</tr>
<tr>
<td><em>Botanic name, Common Name</em></td>
<td>Zone</td>
<td></td>
</tr>
<tr>
<td><em>Herbaceous Plants (continued)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Festuca occidentalis</em>, Western Fescue Grass</td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td><em>Festuca rubra</em>, Red Fescue</td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td><em>Glycera occidentalis</em>, Western Manna Grass</td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td><em>Hebe 'Autumn Glory', Hebe</em></td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td><em>Iris douglasiana</em>, Douglas Iris</td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td><em>Iris sibirica</em>, Siberian Iris</td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td><em>Iris tenax</em>, Oregon Iris</td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td><em>Juncus balticus</em>, Baltic Rush</td>
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<td>X</td>
</tr>
<tr>
<td><em>Juncus effusus var. pacificus</em>, Soft rush</td>
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<td>X</td>
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<tr>
<td><em>Juncus ensifolius</em>, Daggerleaf Rush</td>
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<td>X</td>
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<tr>
<td><em>Juncus patens</em>, Spreading Rush</td>
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<td>X</td>
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<tr>
<td><em>Juncus tenuis</em>, Slender Rush</td>
<td>A</td>
<td>X</td>
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<tr>
<td><em>Lupinus micranthus</em>, Small Flowered Lupine</td>
<td>B</td>
<td>X</td>
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<tr>
<td><em>Lupinus polyphyllus</em>, Largeleaved Lupine</td>
<td>A/B</td>
<td>X</td>
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<tr>
<td><em>Polypodium glycyrrhiza</em>, Licorice Fern</td>
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<td>X</td>
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<tr>
<td><em>Polystichum munitum</em>, Sword Fern</td>
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<tr>
<td><em>Pteridium aquilinum</em>, Bracken Fern</td>
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<td>X</td>
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<tr>
<td><em>Scriptus acutus</em>, Hardstem Bulrush</td>
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<tr>
<td><em>Scriptus americanus</em>, American Bulrush</td>
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<td><em>Scriptus microcarpus</em>, Small Fruited Bulrush</td>
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<tr>
<td><em>Scriptus validus</em>, Softstem Bulrush</td>
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</table>
## Facility Plant List

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<thead>
<tr>
<th>Plant Name</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Zone</td>
<td>Swale</td>
</tr>
<tr>
<td><strong>Herbaceous Plants (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Sedum oreganum, Oregon Stonecrop</em></td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td><em>Sisyrinchium californicum, Yellow-eyed Grass</em></td>
<td>A/B</td>
<td>X</td>
</tr>
<tr>
<td><em>Veronica iwanensis, Speedwell</em></td>
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<td>X</td>
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<tr>
<td><strong>Large Shrubs and Small Trees</strong></td>
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<td></td>
</tr>
<tr>
<td><em>Acer circinatum, Vine Maple</em></td>
<td>A/B</td>
<td>X</td>
</tr>
<tr>
<td><em>Amelanchier alnifolia, Western Serviceberry</em></td>
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<td>X</td>
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<td><em>Ceanothus sanguineus, Oregon Redstem Ceanothus</em></td>
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<td><em>Holodiscus discolor, Oceanspray</em></td>
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<td>X</td>
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<tr>
<td><em>Lonicera involucrata, Black Twinberry</em></td>
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<td>X</td>
</tr>
<tr>
<td><em>Oemleria cerasiformis, Indian Plum</em></td>
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<td>X</td>
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<tr>
<td><em>Philadelphus lewisii, Wild Mock Orange</em></td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td><em>Ribes sanguineum, Red-Flowering Current</em></td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td><em>Rubus parviflorus, Thimbleberry</em></td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td><em>Rubus spectabilis, Salmonberry</em></td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td><em>Salix filifolia, Columbia Willow</em></td>
<td>A/B</td>
<td>X</td>
</tr>
<tr>
<td><em>Salix lucida var. 'Lasiandra', Pacific Willow</em></td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td><em>Salix purpurea nana, Blue Arctic Willow</em></td>
<td>B</td>
<td>X</td>
</tr>
<tr>
<td><em>Salix stenopetala, Sitka Willow</em></td>
<td>A</td>
<td>X</td>
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## Facility Plant List

<table>
<thead>
<tr>
<th>Plant Name</th>
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<th>Characteristics</th>
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<tr>
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<td>Public</td>
</tr>
<tr>
<td></td>
<td>Swale</td>
<td>Planter</td>
</tr>
<tr>
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### Large Shrubs and Small Trees (continued)

<table>
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<tbody>
<tr>
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<td>Zone</td>
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</tr>
<tr>
<td></td>
<td>Swale</td>
<td>Planter</td>
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<tr>
<td></td>
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#### Shrubs

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<td>Swale</td>
<td>Planter</td>
</tr>
<tr>
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<td>Private</td>
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#### Groundcovers

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<tbody>
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<td>Swale</td>
<td>Planter</td>
</tr>
<tr>
<td></td>
<td>Private</td>
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## Facility Plant List

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<th>Characteristics</th>
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<td>Private</td>
<td>Swale</td>
</tr>
<tr>
<td><em>Botanic name, Common Name</em></td>
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<td></td>
</tr>
<tr>
<td><strong>Trees (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Rhamnus purshiana, Cascara</em></td>
<td>A/B</td>
<td>X</td>
</tr>
<tr>
<td><em>Salix hookeriana, Hooker's Willow</em></td>
<td>A/B</td>
<td>X</td>
</tr>
<tr>
<td><em>Salix scouleriana, Scouler's Willow</em></td>
<td>A/B</td>
<td>X</td>
</tr>
<tr>
<td><em>Thuja plicata, Western Red Cedar</em></td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td><em>Tsuga heterophylla, Western Hemlock</em></td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td><em>Tsuga mertensiana, Mountain Hemlock</em></td>
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## Facility Plant List

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Proposed Facility Type</th>
<th>Characteristics</th>
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<td>Public</td>
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<tr>
<td></td>
<td>Swale</td>
<td>Planter</td>
</tr>
<tr>
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<td>NW Native</td>
<td>Evergreen</td>
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### Groundcovers (continued)

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Zone</th>
<th>Swale</th>
<th>Planter</th>
<th>Basin</th>
<th>NW Native</th>
<th>Evergreen</th>
<th>Potential Hgt.</th>
<th>O.C. Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragaria vesca, Woodland Strawberry</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>N</td>
<td>Y</td>
<td>10”</td>
<td>12”</td>
<td></td>
</tr>
<tr>
<td>Fragaria virginiana, Wild Strawberry</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>N</td>
<td>Y</td>
<td>10”</td>
<td>12”</td>
<td></td>
</tr>
<tr>
<td>Helictotrichon sempervirens, Blue Oat Grass</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>N</td>
<td>Y</td>
<td>24”</td>
<td>12”</td>
<td></td>
</tr>
<tr>
<td>Mahonia repens Creeping Oregon Grape</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>12”</td>
<td>12”</td>
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### Trees

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Zone</th>
<th>Swale</th>
<th>Planter</th>
<th>Basin</th>
<th>NW Native</th>
<th>Evergreen</th>
<th>Potential Hgt.</th>
<th>O.C. Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abies grandis, Grand Fir</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>150”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acer griseum, Paperbark Maple</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>N</td>
<td>N</td>
<td>30”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acer macrophyllum, Big Leaf Maple</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>60”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alnus rubra, Red Alder</td>
<td>A</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>80”</td>
<td></td>
</tr>
<tr>
<td>Arbutus menziesii, Madrone</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>N</td>
<td>35”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crataegus douglasii, Black Hawthorn</td>
<td>A</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>N</td>
<td>40”</td>
<td>10”</td>
<td></td>
</tr>
<tr>
<td>Fraxinus latifolia, Oregon Ash</td>
<td>A/B</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>30”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malus fusca, Pacific Crabapple</td>
<td>A</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>30”</td>
<td>10”</td>
<td></td>
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<tr>
<td>Metasequoia glyptostroboideae, Dawn Redwood</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>N</td>
<td>N</td>
<td>80”</td>
<td></td>
<td></td>
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<tr>
<td>Populus tremuloides, Quaking Aspen</td>
<td>A</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>N</td>
<td>40”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prunus emarginata var. mollis, Bitter Cherry</td>
<td>A/B</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>N</td>
<td>50”</td>
<td></td>
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<tr>
<td>Pseudotsuga menziesii, Douglas Fir</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>200”</td>
<td></td>
<td></td>
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<tr>
<td>Quercus garryana, Oregon White Oak</td>
<td>B</td>
<td>X</td>
<td>X</td>
<td>Y</td>
<td>N</td>
<td>100”</td>
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## Pond Plant List

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Planting Zone</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Botanic name, Common Name</em></td>
<td>Wet to Saturated</td>
<td>Moist to Dry</td>
</tr>
<tr>
<td><em>Herbaceous Plants</em></td>
<td></td>
<td>Dry/Upland</td>
</tr>
<tr>
<td>Alisma plantago-aquatica, Water Plantain</td>
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<td>Y</td>
</tr>
<tr>
<td>Alopecurus geniculatus, Water Foxtail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aster suspicatus, Douglas' Aster</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bidens cernua, Nodding Beggerticks</td>
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</tr>
<tr>
<td>Blechnum spicant, Deer Fern</td>
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<td>X</td>
</tr>
<tr>
<td>Bromus sitchensis, Alaska Brome</td>
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<td></td>
</tr>
<tr>
<td>Camassia quamash, Common Camas</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Carex deweyanna, Dewey Sedge</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Carex obnupta, Slough Sedge</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Deschampsia cespitosa, Tufted Hair Grass</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Eleocharis ovata, Ovate Spike Rush</td>
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<td></td>
</tr>
<tr>
<td>Eleocharis palustris, Creeping Spike Rush</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Elymus glaucus, Blue Wild Rye</td>
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<td></td>
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<tr>
<td>Glycera occidentalis, Western Manna Grass</td>
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<td></td>
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<tr>
<td>Lemna minor, Common Lesser Duckweed</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Juncus effusus var. pacificus, Soft rush</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Juncus ensifolius, Dagger-leaf Rush</td>
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## Pond Plant List

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Planting Zone</th>
<th>Characteristics</th>
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<tbody>
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<td>Wet to Saturated</td>
<td>Moist to Dry</td>
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<td><strong>Herbaceous Plants (continued)</strong></td>
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<tr>
<td>Juncus oxymeris, Pointed Rush</td>
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<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Juncus patens, Spreading Rush</td>
<td>X</td>
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<td>N</td>
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<tr>
<td>Juncus tenuis, Slender Rush</td>
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<td>X</td>
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<tr>
<td>Lupinus polyphyllus, Large-leaved Lupine</td>
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<tr>
<td>Myosotis laxa, Small-flowered Forget-Me-Not</td>
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<td>Polystichum munitum, Sword Fern</td>
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<td>Y</td>
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<td>Sagittaria latifolia, Wapato</td>
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<td>Potamogeton natans, Floating leaved Pondweed</td>
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<td>Y</td>
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<td>Schoenoplectus microcarpus, Small Fruited Bulrush</td>
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<td>Y</td>
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<td>Sisyrinchium idahoense, Blue-eyed Grass</td>
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<td>Sparganium emersum, Narrowleaf Bur-reed</td>
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<td>Y</td>
<td>N</td>
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<td>Veronica liwanensis, Speedwell</td>
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<tr>
<td>Viola palustris, Marsh Violet</td>
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<tr>
<td><strong>Large Shrubs and Small Trees</strong></td>
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<tr>
<td>Acer circinatum, Vine Maple</td>
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<tr>
<td>Amelanchier alnifolia, Western Serviceberry</td>
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<td>N</td>
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<td>Helodiscus discolor, Oceanspray</td>
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<td>Lonicera involucrata, Black Twinberry</td>
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A-16
### Pond Plant List

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<th>Plant Name</th>
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<tbody>
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<td>Moist to Dry</td>
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<td>Botanic name, Common Name</td>
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<tr>
<td><strong>Large Shrubs and Small Trees (continued)</strong></td>
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<tr>
<td><strong>Oemleria cerasiformis, Indian Plum</strong></td>
<td>X</td>
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</tr>
<tr>
<td><strong>Philadelphu lewisii, Wild Mock Orange</strong></td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Ribes sanguineum, Red-Flowering Current</strong></td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Rubus parviflorus, Thimbleberry</strong></td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Rubus spectabilis, Salmonberry</strong></td>
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<tr>
<td><strong>Salix fluviatilis, Columbia Willow</strong></td>
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<td><strong>Salix lucida var. ‘Lasiandra’, Pacific Willow</strong></td>
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<td>X</td>
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<tr>
<td><strong>Salix stichensis, Sitka Willow</strong></td>
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<tr>
<td><strong>Sambucus racemosa, Red Elderberry</strong></td>
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</tr>
<tr>
<td><strong>Spiraea douglasii, Douglas Spirea</strong></td>
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</tr>
<tr>
<td><strong>Viburnum edule, Highbush Cranberry</strong></td>
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</tr>
<tr>
<td><strong>Shrubs</strong></td>
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<tr>
<td><strong>Cornus sericea, Red-twig Dogwood</strong></td>
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<td>X</td>
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<tr>
<td><strong>Fragaria vasa, Woodland Strawberry</strong></td>
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<td>X</td>
</tr>
<tr>
<td><strong>Fragaria virginiana, Wild Strawberry</strong></td>
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</tr>
<tr>
<td><strong>Mahonia aquifolium, Oregon Grape</strong></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Mahonia nervosa, Dull Oregon Grape</strong></td>
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<td>Y</td>
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### Pond Plant List

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<thead>
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<th>Plant Name</th>
<th>Planting Zone</th>
<th>Characteristics</th>
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<tbody>
<tr>
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<td>Wet to Saturated</td>
<td>Moist to Dry</td>
</tr>
<tr>
<td><strong>Botanic name, Common Name</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Shrubs (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physocarpus capitatus, Pacific Ninebark</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Rosa gymnocarpa, Baldhip Rose</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Rosa nutkana, Nootka Rose</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Rosa pisocarpa, Swamp Rose</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Spiraea betulifolia, Birchleaf Spirea</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Symphoricarpus alba, Snowberry</td>
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<td>Y</td>
</tr>
<tr>
<td><strong>Trees</strong></td>
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<td></td>
</tr>
<tr>
<td>Abies grandis, Grand Fir</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Acer macrophyllum, Big Leaf Maple</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Alnus rubra, Red Alder</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Arbutus menziesii, Madrone</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Cornus nuttallii, Western flowering Dogwood</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Crataegus douglasii, Black Hawthorn</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Fraxinus latifolia, Oregon Ash</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Malus fusca, Pacific Crabapple</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pinus ponderosa, Ponderosa Pine</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Pinus monticola, Western White Pine</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Prunus emarginata var. mollis, Bitter Cherry</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>Pseudotsuga menziesii, Douglas Fir</td>
<td>X</td>
<td>Y</td>
</tr>
</tbody>
</table>
### Pond Plant List

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Planting Zone</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wet to Saturated</td>
<td>Moist to Dry</td>
</tr>
<tr>
<td><strong>Botanic name, Common Name</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trees (continued)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Quercus garryana, Oregon White Oak | X | Y | N | 100' |
| Rhamnus purshiana, Cascara | X | Y | N | 30' |
| Salix hookeriana, Hooker's Willow | X | X | Y | N | 15' |
| Salix scouleriana, Scouler's Willow | X | X | Y | N | 15' |
| Thuja plicata, Western Red Cedar | X | X | Y | Y | 150' |
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1. Maintain 8' of clearance between sidewalk and tree limbs. No obstructions may protrude into sidewalk travel area.

2. Maintain 14' of clearance between street grade and tree limbs.
NOTES
1. ALL ABOVE GROUND FIXTURES ARE TO BE ALIGNED WITH PROPERTY LINE WITHIN TOLERANCES SHOWN.
2. VARIATION FROM THIS STANDARD ALLOWED ONLY WITH THE APPROVAL OF THE CITY ENGINEER.
3. THE LOCATION OF UNDERGROUND UTILITIES IS SHOWN ON STANDARD DRAWING 103, UTILITIES PLAN.
**STORM SEWER LOCATION TO MATCH PELICAN STYLE INLETS. LOCATION VARIES WITH PIPE SIZE.**

ALL PRIVATE UTILITY CONDUITS SHALL BE PLACED IN UTILITY EASEMENT. ONLY PERPENDICULAR CROSSINGS AND STREET LIGHT CONNECTIONS ALLOWED IN PUBLIC RIGHT-OF-WAY.

**TOP NUMBER FOR CURB TIGHT SIDEWALK (TYPE "B")**

**BOTTOM NUMBER SETBACK SIDEWALK (TYPE "A")**

1) SIDEWALK WIDTH SHALL BE 6' WHEN CURB SIDE FOR LIMITED RESIDENTIAL
3" MIN X 3/8 "X 6' STEEL TUBING
(4" DIP MUST BE USED IN ALL CASES WHERE BOLLARD IS PROTECTING FIRE HYDRANT)

PAINT WITH HIGH GLOSS ENAMEL - CHROME YELLOW

FILL CENTER OF TUBING WITH CONCRETE; 1/2" CROWN AT TOP

MINIMUM OF 12" ROUND EXCAVATION

CONCRETE FILL AROUND TUBING BURY 3'-0"
ALL FENCES AND/OR OBSTRUCTIONS WITHIN VISION TRIANGLES SHALL BE A MAXIMUM OF 30" (2½') HIGH.
ALL FENCES WITHIN VISION TRIANGLES SHALL BE A MAXIMUM OF 30" (2') IN HEIGHT.
NOTES:

1. MAINLINES SHALL BE PLACED IN PUBLIC RIGHT OF WAY & MAY BE PLACED IN EASEMENTS WHEN NECESSARY & APPROVED BY THE CITY ENGINEER.

2. FOR MAINLINES PLACED IN EASEMENTS LOCATED OTHER THAN ALONG A PROPERTY LINE, THE MAINLINE SHALL BE PLACED IN CENTER OF EASEMENT.

3. LARGER EASEMENT WIDTHS MAY BE REQUIRED FOR SPECIAL CIRCUMSTANCES SUCH AS EXCESSIVELY DEEP PIPES, e.g. 1:1 SLOPE FROM BOTTOM OF FOUNDATION TO BOTTOM EDGE OF PIPE TRENCH.

4. OPEN CHANNELS SHALL HAVE EASEMENT WIDTHS SUFFICIENT TO COVER THE 100 YEAR FLOOD PLAIN LINE WHEN A 100 YEAR DESIGN STORM IS REQUIRED, OR 15’ FROM THE WATERWAY CENTERLINE, OR 10’ FROM THE TOP OF THE RECOGNIZED BANK, WHICHEVER IS GREATER. A 15’ WIDE ACCESS SHALL BE PROVIDED ON BOTH SIDES OF THE CHANNEL FOR CHANNEL WIDTHS GREATER THAN 14’ AT THE TOP OF THE RECOGNIZED BANK.

5. EASEMENT LOCATIONS FOR PUBLIC STORM DRAINS SERVING A PLANNED UNIT DEVELOPMENT, APARTMENT COMPLEX, OR COMMERCIAL/INDUSTRIAL DEVELOPMENT SHALL BE IN PARKING LOTS, PRIVATE DRIVES, OR SIMILAR OPEN AREAS WHICH WILL PERMIT UNOBSTRUCTED VEHICLE ACCESS FOR MAINTENANCE.

5. ALL EASEMENTS MUST BE FURNISHED ON CITY FORM, TO THE CITY FOR REVIEW AND APPROVAL PRIOR TO RECORDING.

6. MULTIPLE PIPES IN A COMMON EASEMENT DETERMINED ON A CASE BY CASE BASIS.

<table>
<thead>
<tr>
<th>MINIMUM EASEMENT WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>(L) EASEMENT WIDTH (ft.)</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>LARGER</td>
</tr>
</tbody>
</table>
NOTES:

1. THE MINIMUM PIPE COVER SHALL BE ACCORDING TO TABLE 1, BELOW. WHEN CIRCUMSTANCES DictATE, THEN A LESSER DESIGN COVER MAY BE CONSIDERED PER TABLE 2 BELOW.

2. PIPE COVER SHALL BE MEASURED FROM FINISHED GRADE TO THE UPPER MOST EXTERIOR SURFACE ELEVATION OF THE PIPE.

3. A PIPE UNDER A ROADWAY SHALL NOT INTRUDE INTO THE SUBGRADE AND SHALL BE PROTECTED DURING CONSTRUCTION.

4. SUFFICIENT DEPTH SHALL MEAN FROM THE TOP OF THE PIPE TO FINISHED GRADE. ALL STORM DRAINS SHALL BE LAID AT SUFFICIENT DEPTH TO PROTECT AGAINST DAMAGE FROM INTERIM CONSTRUCTION LOADS, FINAL TRAFFIC LOADS, AND TO DRAIN BUILDING FOOTINGS WHERE PRACTICAL. IN AREAS OF RELATIVELY FLAT TERRAIN, THE DESIGN ENGINEER MUST SHOW THAT SUFFICIENT DEPTH PROVIDED AT THE BOUNDARY OF THE DEVELOPMENT TO PROPERLY SERVE THE REMAINDER OF THE UPSTREAM BASIN AREA TRIBUTARY TO THE SITE.

<table>
<thead>
<tr>
<th>TABLE 1: MINIMUM COVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER</td>
</tr>
<tr>
<td>STORM</td>
</tr>
<tr>
<td>SEWER</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2: PIPE COVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF PIPE</td>
</tr>
<tr>
<td>PVC C900</td>
</tr>
<tr>
<td>PVC 3034 SDR35</td>
</tr>
<tr>
<td>DUCTILE IRON</td>
</tr>
<tr>
<td>*RCP CLASS II</td>
</tr>
<tr>
<td>*RCP CLASS IV</td>
</tr>
<tr>
<td>*RCP CLASS V</td>
</tr>
</tbody>
</table>

* WHEN APPROVED
201A TRENCH BACKFILL

CLASS "A"

CLASS "B"

CLASS "D"

CLASS "CDF"
CONTROLLED DENSITY FILL

LOW STRENGTH CONCRETE
100 PSI
@ 28 DAYS

PIPE ZONE

REMOVE UNSUITABLE MATERIAL REPLACE WITH APPROVED BEDDING MATERIAL

G. Mathis
March 2021

G. Mathis
March 2021
NOTES:
1. LAY PIPE THROUGH MANHOLE FOR CHANNEL IF THE SLOPE IN AND OUT OF THE MANHOLE ARE THE SAME.
2. RUBBER BOOT ONLY. SAND COLLAR PER PRE-APPROVAL BY CITY ENGINEER.

APPLY LIGHT BROOM FINISH TO INSIDE OF BASE

6" COMPACTED 3/4"-0" CRUSHED ROCK ON STABLE SUBGRADE

3000 PSI CONCRETE

6" PRECAST BASE

6" COMPACTED 3/4"-0" CRUSHED ROCK ON STABLE SUBGRADE

POURED IN PLACE BASE

MANHOLE BASE
FLOW

CAST IRON
FRAME AND COVER
SEE STD. DWGS. 209 & 411

NOTE:

1. Standard 48" Manhole to be used for pipes 24" and less.
2. Precast concrete structures shall have strength of 4000 PSI.
3. Standard Manhole Depth = 8' top of frame to invert.
4. Lateral lines to match top of inlet pipe at Manhole.
5. All interior joints and connections shall be water tight, and grouted with non-shrink grout.
6. All Manholes shall be vacuum tested prior to acceptance.
7. If end of line Manhole, step shall be located on downstream side and channel shall be constructed full width of interior.
8. Locate Manhole cover over upstream of mainline.
9. Gasket style Manholes only. Key-Loc style is for retrofit only and requires exterior joints to be sealed with Rapid Seal or interior coating with Raven Coating.
NOTES

1. Per City Engineer approval oversized Manhole can be 60", 72", or 84" in diameter. Design needs to specify size on construction plan.
2. Precast concrete structures shall have strength of 4000 PSI.
3. Standard Manhole Depth = 8' top of frame to invert.
4. Lateral lines to match top of inlet pipe at Manhole.
5. All interior joints and connections shall be water tight, and grouted with non-shrink grout.
6. All Manholes shall be vacuum tested prior to acceptance.
7. If end of line Manhole, step shall be located on downstream side and channel shall be constructed full width of interior.
8. Locate Manhole cover over upstream of mainline.
9. Gasket style Manholes only, Key-Loc style is for retrofit only and requires exterior joints to be sealed with Rapid Seal or interior coating with Raven Coating.

CAST IRON
FRAME AND COVER
SEE STD. DWG. 209 OR 411

STANDARD FRAME
WITH COVER
FINISH GRADE
EXTERIOR GROUTING
OF FRAME
RISER RINGS—MAX. 6"

ECCENTRIC CONE
SECTION

WALL THICKNESS PER TABLE BELOW

RUBBER GASKETS
SECTIONS ONLY

NO STEPS WILL
BE ALLOWED IN
MANHOLES

SECTION
1" TO 4"

BASE SECTION
2" TO 4"

MANHOLE BASE
SEE STD. DWG 203

SEE NOTE #1

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>MANHOLE DIAMETER</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot;-30&quot;</td>
<td>60&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>36&quot;-42&quot;</td>
<td>72&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>48&quot;-54&quot;</td>
<td>84&quot;</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>
NOTES

1. Standard 48" Manhole to be used for pipes 24" and less.
2. Precast concrete structures shall have strength of 4000 PSI.
3. Standard Manhole Depth = 8' top of frame to invert.
4. Lateral lines to match top of inlet pipe at Manhole.
5. All interior joints and connections shall be water tight, and grouted with non-shrink grout.
6. All Manholes shall be vacuum tested prior to acceptance.
7. If end of line Manhole, step shall be located on downstream side and channel shall be constructed full width of interior.
8. Locate Manhole cover over upstream of mainline.
9. Gasket style Manholes only, Key-Loc style is for retrofit only and requires exterior joints to be sealed with Rapid Seal or interior coating with Raven Coating.

CAST IRON FRAME AND COVER
SEE STD. DWG. 209

PLACE STEPS UPSTREAM ON MAIN CHANNEL
NO STEPS WILL BE ALLOWED IN MANHOLES

SECTION 1' TO 4'

BASE SECTION 2' TO 4'

EXTERIOR GROUTING OF FRAME
RISER RINGS—MAX. 6"

ECCENTRIC CONE SECTION 36"

RELINER DROP BOWL OR EQUIVALENT

SECURE TO MANHOLE WITH STAINLESS STEEL FASTENERS
PIPE COUPLER

FASTENER CONNECTIONS TO MANHOLE TO BE A MIN OF 6" FROM ANY JOINT

6" MAX DIA. PVC PIPE SECURED TO STRUCTURE WITH STAINLESS STEEL FASTENERS AT 4' INTERVALS (MIN. OF 2)

CHANNEL MANHOLE TO DIRECT FLOW AS REQUIRED

MANHOLE BASE
SEE STD. DRAWING 203
**NOTES**

1. ALL CONCRETE SHALL HAVE STRENGTH OF 3000 PSI AT 28 DAYS.
2. MANHOLE TO BE USED FOR PIPE SIZES 24" AND GREATER.
NOTES

1. USE SUBURBAN TYPE FRAME IN NON–TRAFFIC AREAS ONLY.
2. COVER AND FRAME SHALL BE CAST IRON, ASTM A–48 CLASS 30 AND MEET H–20 LOAD RATING.
3. COVER AND FRAME TO HAVE TRUE BEARING ALL AROUND.
WATERTIGHT EXPANDABLE MECHANICAL PLUG
WITH TRACE WIRE VISIBLE AT TOP

STANDARD CAST IRON
CLEAN-OUT RING AND
COVER

ASPHALT CONCRETE

FINISH GRADE

BACKFILL TYPE AS
SPECIFIED

NOTES
1. STANDPIPE SHALL BE THE SAME SIZE AS THE
PIPELINE (MAX 6” PIPE DIA.)
2. MANHOLE SHALL BE USED FOR ANY MAINLINE
LARGER THAN 8” IN SIZE.
2" x 4" from invert to 2' above finished grade. Stake shall be continuous and remain vertical after backfilling. End shall be painted green. (Typical)

Property Line

Cleanout box, Carson 910-10 or equivalent

Brand "S" on top of curb and gutter

Water line 18" min.

12 ga. tracer wire

Min. slope 2.0%

6" pipe (ASTM D-3034)

Bed pipe with 4" of 3/4" - 0" crushed rock

Extend lateral 2' outside right of way or past P.U.E. whichever is greater

Extend past P.U.E.

Watertight expandable mechanical plug

Notes:

1. Uses - Single residential service, 6" pipe with cleanout

2. Service shall not be backfilled prior to inspection.

3. Minimum slope 2.0%.
FOR USE IN PRIVATE AREAS ONLY

CAST IRON LID WITH 1" RAISED LETTERS AS MANUFACTURED BY BROOKS PRODUCTS INC. PORTLAND, OREGON OR EQUAL

CAST IRON RING WITH LIFTING SOCKETS

EXPANDABLE MECHANICAL PLUG

CONCRETE BARREL

PVC SEWER PIPE
NOTES:
1. PRIOR TO ABANDONMENT OF MANHOLE VERIFY THAT ANY AND ALL SEWER SERVICES HAVE BEEN CONNECTED TO NEW SEWER MAIN.
REMOVE EXISTING MANHOLE TO INCLUDE BASE SECTION

BACKFILL, EXCAVATION WITH 3/4"– 0" CRUSHED ROCK 91% COMPACTION, T–180

FILL WITH NON–SHRINKING GROUT / CLSM / CDF TO INSURE WATERTIGHT SEAL
WATER Pipe BEdding

Trench Paving Per Std. DWG. 517

Class "D"

3' Min.

Backfill Per Std. DWG. 201A & 201B

Ductile Iron Pipe

4" Minimum Granular Material

Excavate Bell Holes at Bell Ends of Pipe

Undisturbed Earth

CITY OF AMITY
STANDARD CONSTRUCTION
DRAWINGS
CITY HALL: 109 MADDOX AVENUE
MAILING ADDRESS: P.O. BOX 159 AMITY, OR 97101
OFFICE PHONE: (503) 835-3711

WATER PIPE BEDDING

Scale: N.T.S
Date: March 2021
Approved By: G. Mathis

Standard Drawing 301
NOTES
1. WATER MAIN SHALL BE CLEANED BEFORE ATTACHING SLEEVE.
2. SLEEVE AND VALVE SHALL BE PRESSURE TESTED BEFORE MAKING TAP
3. PRESSURE TEST AND TAP SHALL BE MADE IN THE PRESENCE OF AN
   AUTHORIZED CITY REPRESENTATIVE BY A CONTRACTOR APPROVED BY
   THE ENGINEER.
4. 3/4"-0" CRUSHED ROCK SHALL BE PLACED AND COMPACTED TO 91%
    OF MAXIMUM DENSITY AS DETERMINED BY AASHTO T-180.
5. TAP SHALL BE MADE NO CLOSER THAN 18" FROM THE NEAREST JOINT.
6. SLEEVE AND VALVE SHALL BE WRAPPED AND SEALED WITH 8 MIL PLASTIC.
7. FLUSH ALL METAL SHAVINGS FROM THE TAPPING PROCESS.
8. STAINLESS STEEL TAPPING SLEEVE ON DUCTILE IRON PIPE
9. COUPON MUST BE RETAINED BY TAPPING BIT AND REMOVED
    FROM WATER MAIN.
CAST IRON VALVE BOX, "VANCOUVER" STYLE, MODEL NO. 910

6" PVC SEWER PIPE, ASTM 3034, SDR35

FINISHED GRADE

VALVE BOX TO BE CONCRETE ENCASED IF NOT IN PAVED AREA

A = VARIABLE, MAXIMUM OF 11"
B = 7" MINIMUM

WATER LINE

VALVE OPERATING NUT EXTENSION SHALL BE USED IF OPERATING NUT IS GREATER THAN 3' DEPTH FROM FINISHED GRADE.

NOTES:

1. VALVE BOXES SHALL BE CENTERED DIRECTLY OVER THE NUT IN A VERTICAL Position.
2. VALVE BOX SHALL BE ADJUSTED TO MEET FINISHED GRADE.
3. PVC SHALL BE ONE CONTINUOUS PIECE — NO BELLS OR COUPLERS.
4. SEE STANDARD DRAWING NO. 304 VALVE BOX AND COVER.
NOTES:
1. MATERIALS - CAST IRON PER ASTM A48 CL30
2. OLYMPIC FOUNDRY PART # 910 OR APPROVED EQUAL PER PRE-APPROVAL BY CITY ENGINEER
LENGTH (L1) OF PIPE REQUIRED FOR RESTRAINT (FEET)

<table>
<thead>
<tr>
<th>Diameter</th>
<th>90°</th>
<th>45°</th>
<th>22° 1/2'</th>
<th>11 1/4'</th>
<th>4'</th>
<th>6'</th>
<th>8'</th>
<th>10'</th>
<th>12'</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>30</td>
<td>23</td>
<td>20</td>
<td>19</td>
<td>44</td>
<td>--</td>
<td>37</td>
<td>53</td>
<td>65</td>
</tr>
<tr>
<td>6&quot;</td>
<td>35</td>
<td>25</td>
<td>21</td>
<td>20</td>
<td>55</td>
<td>--</td>
<td>--</td>
<td>38</td>
<td>53</td>
</tr>
<tr>
<td>8&quot;</td>
<td>40</td>
<td>27</td>
<td>22</td>
<td>20</td>
<td>66</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>37</td>
</tr>
<tr>
<td>10&quot;</td>
<td>44</td>
<td>29</td>
<td>23</td>
<td>21</td>
<td>76</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>12&quot;</td>
<td>48</td>
<td>31</td>
<td>24</td>
<td>21</td>
<td>86</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

NOTES:
1. ALL JOINTS WITHIN THE LENGTH "L1" FROM THE ABOVE TABLE, SHALL BE RESTRAINED.
2. THE JOINT RESTRAINT LENGTHS CALCULATED ARE FOR FITTINGS USED TO CHANGE PIPE HORIZONTAL ALIGNMENT ONLY. FOR APPLICATIONS WHERE FITTINGS ARE USED TO CHANGE THE SLOPE OF THE PIPE, THE DESIGN ENGINEER SHALL INCLUDE THE JOINT REQUIREMENTS ON THE PROJECT DRAWINGS.
3. IF AN UNANTICIPATED NEED FOR JOINT RESTRAINT ARISES TO CHANGE THE SLOPE OF THE PIPE, THE CONTRACTOR SHALL CONTACT THE DESIGN ENGINEER.
4. JOINT TYPES NOT COVERED IN ABOVE TABLE MUST BE DESIGNED INDIVIDUALLY IN ORDER TO DETERMINE APPROPRIATE RESTRAINED LENGTH.
5. THE SMALL SIDE OF A REDUCER DOES NOT REQUIRE RESTRAINT IF THE LARGE DIAMETER SIDE IS PROPERLY RESTRAINED.
6. ABOVE RESTRAINED LENGTHS ARE BASED ON:
   a. TEST PRESSURE OF 150 PSI
   b. MINIMUM OF 3 FEET COVER
   c. CLASS "B" PIPE ZONE CONDITIONS
   d. WHEN ORGANIC OR CLAY SOILS ARE BEING USED FOR BACKFILL, GRANULAR BACKFILL MUST BE USED FOR BEDDING AND BACKFILL TO A HEIGHT OF 6 9/32" OVER THE TOP OF THE PIPE BEFORE OTHER SOILS ARE PLACED.
   e. UNCOATED PIPE, THIS TABLE DOES NOT APPLY TO PIPE ENCASED IN POLYETHYLENE

ANY REDUCTION OF THESE VALUES AS A RESULT OF OTHER CONDITIONS ENCOUNTERED SHALL BE BASED ON THE APPROPRIATE EVALUATION AND RECOMMENDATION BY A QUALIFIED, REGISTERED ENGINEER AND WITH APPROVAL BY THE CITY.
STANDARD 3/4" AND 1" WATER SERVICE

McDONALD "T", FORD "O" OR MUELLER "110" CORPORATION STOP SET AT 45° ANGLE.

METER BOXES SHALL BE 11x18x12 HDPE
MTR BOX W/MOUSE HOLES - GRAY
NON-STACKING IF <1"
BOX PART#: RMB111812NSW-G
LID: NICOR B12 POLYMER LID

WATER SERVICE LINE CENTENNIAL CENCORE HDPE 200
PSI CTS (BLUE ONLY) WITH HM/JJ COMPRESSION
FITTINGS SLEEVED IN 2" SCH. 80 PVC

INSTALL SECONDARY FORD OR EQUAL GLOBE
VALVE ON HOMEOWNER'S SIDE OF THE METER

McDONALD, FORD OR MUELLER
"ANGLE BALL VALVE" METER
STOP WITH "LOCK WING".

ALL FITTINGS MUST BE COMPRESSION TYPE
NO SOLDERED, FLARED OR JOINT FITTINGS

NOTES
1. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE CITY ENGINEER
2. ALL PIPE AND STRUCTURE ZONES SHALL BE BACKFILLED USING 3/4" - 0" CRUSHED
ROCK AND COMPACTED TO 91% MAXIMUM DENSITY AS DETERMINED BY AASHTO T-180
3. WHEN AN ACTIVE CATHODIC PROTECTED SYSTEM IS ENCOUNTERED, SCHEDULE 40 PVC
SHALL BE INSTALLED ACCORDING TO STANDARD DRAWING NO. 316
4. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER ASSEMBLY
5. METER BOX SHALL MATCH SIDEWALK GRADE (IF SIDEWALK EXISTS) OR BE SET FLUSH
WITH GROUND SURFACE.
6. ALL FITTINGS SHALL BE COMPRESSION TYPE.
7. FOR LOCATION OF WATER MAIN, SEE STANDARD DRAWING NO. 103
METER BOXES SHALL BE 13x24x12 HDPE MTR BOX W/MOUSE HOLES - GRAY NON-STACKING IF >1"
BOX PART#: RMB132412NSW-G
LID: NICOR B30 POLYMER LID
METER BALL VALVE WITH LOCKING WING SHALL BE USED THAT WILL ACCEPT BOTH 1 1/2" AND 2" METERS

WATER SERVICE LINE CENTENNIAL CENCORE HDPE 200 PSI CTS (BLUE ONLY) WITH HM/JJ COMPRESSION FITTINGS SLEEVED IN 2" SCH. 80 PVC

ALL FITTINGS MUST BE COMPRESSION TYPE
NO SOLDERED, FLARED OR JOINT FITTINGS

NOTES
1. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE CITY ENGINEER.
2. ALL PIPE AND STRUCTURE ZONES SHALL BE BACKFILLED USING 3/4"–0 CRUSHED AGGREGATE AND COMPACTED TO 91% MAXIMUM DENSITY AS DETERMINED BY AASHTO T-180.
3. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER ASSEMBLY.
4. VALVE OPERATING NUT EXTENSION SHALL BE USED IF OPERATING NUT IS GREATER THAN 3' DEPTH FROM FINISH GRADE.
NOTES:
1. WHERE THE PROPOSED WATERLINE WILL BE INSTALLED PARALLEL TO AN EXISTING GRAVITY SEWER MAIN OR LATERAL LINE, THE SEPARATION BETWEEN THE TWO SHALL BE AS INDICATED ABOVE.

2. CROSSINGS
   a. WHEREVER POSSIBLE, THE BOTTOM OF THE WATERLINE SHALL BE 1.5 FEET ABOVE THE TOP OF THE SEWER LINE, AND ONE FULL LENGTH OF WATERLINE SHALL BE CENTERED AT THE CROSSING.
   b. WHERE IT IS NOT POSSIBLE FOR THE WATERLINE TO BE 1.5 FEET ABOVE THE SEWER LINE, OR THE WATERLINE PASSES UNDER THE SEWER LINE, THE EXISTING SEWER LINE SHALL BE EXPOSED FOR A DISTANCE OF 10 FEET ON EACH SIDE OF THE CROSSING AND THE EXISTING PIPELINE SHALL BE REPLACED WITH C-900 PVC, DR-18, DR-25 OR CLASS 50 DUCTILE IRON PIPE AS APPROVED BY THE ENGINEER, AND THE FULL LENGTH OF WATER PIPE SHALL BE CENTERED AT THE CROSSING OR AS APPROVED BY THE ENGINEER.
   A DISTANCE OF 10 FEET ON EACH SIDE OF THE CROSSING.
1. COAT ALL GALVANIZED PIPE OR EXPOSED STEEL WITH PROTECTIVE COATING CONFORMING TO AWWA C 203
2. RESTRAIN TYTON JOINT PLUG TO PIPE
3. THIS STANDARD APPLICABLE FOR PIPE SIZES THROUGH 8"
4. VALVE OPERATING NUT EXTENSION SHALL BE USED IF OPERATING NUT IS GREATER THAN 3' DEPTH FROM FINISH GRADE.
1. HYDRANT TO HAVE TWO 2 1/2" AND ONE 4 1/2" OPENING (ANSI STD.).
2. 6" MINIMUM PIPE SIZE SUPPLYING HYDRANT.
3. USE 6" MJ HOLDING SPOOL PER DWG. 305
4. ADJUSTING SPOOL NOT TO BE USED ON NEW CONSTRUCTION.
5. HYDRANTS SHALL BE INSTALLED UPON A PRE-FORMED CONCRETE BLOCK
   WITH CLEAN 2" DRAIN ROCK PLACED A MINIMUM OF 6" ABOVE DRAIN
   HOLES.
6. 30# TAR PAPER SHALL BE PLACED ON TOP OF THE DRAIN ROCK TO
   SEPARATE ROCK FROM NATIVE MATERIAL.
7. ENTIRE FIRE HYDRANT SPOOL SHALL BE RESTRAINED WITH FIELD-LOK
   GASKETS/MEGALUGS
8. VALVE OPERATING NUT EXTENSION SHALL BE USED IF OPERATING
   NUT IS GREATER THAN 3' DEPTH FROM FINISH GRADE.
9. PUBLIC HYDRANTS SHALL BE PAINTED YELLOW AND PRIVATE HYDRANTS SHALL
   BE PAINTED RED

FIRE HYDRANT
ASSEMBLY
Valve Locations and Spacing

3 Valves to be used unless otherwise noted on plans

2 Valves to be used unless otherwise noted on plans

Note:
1. All MJ fittings shall use Megalugs or equal
2. Valve spacing in accordance to Section 3.3.3 in Design Standards Manual

300' Max

In Line
1" COMBINATION AIR-VACUUM RELEASE VALVE SHALL BE VAL-MATIC SERIES 201C.2 OR EQUAL

1" LINE SHALL BE CENTENNIAL CENCORE HDPE 200 PSI CTS (BLUE ONLY)

2. McDONALD "T", FORD "Q" OR MUELLER "110" BALL CORPORATION STOP.

3. McDONALD, FORD OR MUELLER BALL VALVE WITH OPERATING HANDLE

4. ALL FITTING SHALL BE HM/JJ COMPRESSION FITTINGS OR APPROVED EQUAL

5. "TEE" STYLE GALVANIZED BLOW OFF (MINIMUM 6" ABOVE FINISHED GRADE.)

6. METER BOXES SHALL BE DFW1324C4-12-BODY, DFW1324C-4C-LID NO HOOK IF >1"
CATHODICALLY PROTECTED SYSTEM (GAS, L.R.T., ETC.)

CLAY PLUG

PVC SCH. 40 DUCT 1" LARGER THAN SERVICE

DUCTILE IRON

OR COPPER

5’ MIN.

5’ MIN.
VAULT FOR REDUCED PRESSURE BACKFLOW DEVICE OR DOUBLE CHECK VALVE (PRIVATE)

PROPERTY OWNER INSTALLED VALVE

WATER METER BOX

VALVE

WATER SERVICE LINE

DUCTILE IRON OR COPPER TO METER

GATE VALVE REQUIRED ON SERVICE 2" OR GREATER

DUCTILE IRON FIRE LINE

GATE VALVE

WATER MAIN

VAULT AND WATER SERVICE
METER, BOX, AND ALL FITTINGS AND COMPONENTS FOR SERVICES 1-1/2" AND LARGER TO BE INSTALLED BY THE CONTRACTOR AND INSPECTED BY THE CITY.

ALL VAULT WALL OPENINGS SHALL BE CORE DRILLED AND SEALED WITH LINK-SEAL BRAND PIPE SEAL OR APPROVED EQUAL.

TOP OF VAULT SHALL BE A MINIMUM OF 12" ABOVE FINISHED GRADE.

INSTALL 4" DRAIN FROM BOTTOM OF VAULT FLOOR TO DAYLIGHT, TO BACKFLOW ASSEMBLY VAULT, TO STORM DRAIN SYSTEM OR TO APPROVED SUMP WITH SUMP PUMP. IN NO CASE SHALL BACKFLOW ASSEMBLY VAULT DRAIN INTO METER VAULT.

INSTALL 4" BACKWATER VALVE, MDL. NO. 7022 AND SMITH 4" FLOOR DRAIN MDL. NO. 2210 OR APPROVED EQUAL ON FLOOR DRAIN.

VAULT SHALL BE CLEAN, DRY AND FREE OF DEBRIS PRIOR TO METER INSTALLATION

ALL MECHANICAL JOINTS SHALL BE RESTRAINED WITH "MEGALUG" RETAINER CLINCHS, OR EQUAL.

SERVICE LINE INTO VAULT SHALL BE MECHANICALLY RESTRAINED FROM MAINLINE THROUGH VAULT.

ALL PIPING TO BE BACKFILLED WITH GRANULAR MATERIAL.

INSTALL A MIN. OF 3 PIPE SUPPORTS IN VAULT (GRINNELL NO. 264, ELCEN NO. 50 OR APPROVED EQUAL).

ALL PIPING AND FITTINGS IN VAULT SHALL BE LEVEL AND A MINIMUM OF 12" AND A MAX. OF 48" ABOVE THE FLOOR OF VAULT.

ONLY APPROVED RESILIENT WEDGE VALVES ARE ALLOWED.

ALL VAULT LIDS SHALL BE EQUIPPED WITH 1 TRPL METER HOLE IN DOORS. DOORS SHALL BE LOCATED NEAREST METER, CLOSEST TO STREET OR PUBLIC R-D-W.

VAULT SHALL BE EQUIPPED WITH AN OSHA APPROVED LADDER. IF VAULT DEPTH IS GREATER THAN 6', AN OSHA APPROVED EXTENSION LADDER SHALL BE INSTALLED.

ALL PIPE UP TO THE CUSTOMERS GATE VALVE SHALL BE CLASS 52 DUCTILE IRON AND INSTALLED LEVEL.

ALL FITTINGS, VALVES AND PIPING THROUGH ENTIRE VAULT SHALL BE LEVEL AT COMPLETION OF INSTALLATION.

VAULT SHALL BE SEALED WITH "CRYSTAL SEAL" AT MANUFACTURER.

ADJUST PIPE SIZE ACCORDING TO METER SIZE. (4" MINIMUM)
BOTTOM OF BASE ROCK IN PAVEMENT AREA OR 1' BELOW FINISHED GRADE IN UNPAVED AREA.

NORMAL TRENCH WIDTH

2.0'

WATER LINE

NORMAL TRENCH DEPTH

2.0'

NOTES:

1. TRENCH DAM MATERIAL SHALL BE 100 PSI CDF.

2. BEARING AREA OF TRENCH DAM SHALL BE RESTING ON UNDISTURBED SOIL.

3. NO FITTINGS SHALL BE LOCATED WITHIN 5' OF TRENCH DAM.

4. REMOVE ALL ORGANIC MATERIAL PRIOR TO POURING CDF CONCRETE.
1. CONCRETE SHALL HAVE A MINIMUM COMpressive STRENGTH OF 3000 PSI.
2. CATCH BASIN TO BE CAST IN PLACE.
3. FRAME TO BE SET FLUSH WITH FACE OF CURB.
4. 4” WEEP HOLES REQUIRED AT SUBGRADE ON STREET AND UPHILL SIDES OF BASIN.
5. STANDARD INLET MANHOLE IS THE STANDARD; THIS DETAIL REQUIRES APPROVAL FROM THE CITY FOR USAGE.
NOTES
1. ALL MATERIAL TO BE A-36 STEEL.
2. CROSS BARS TO BE FLUSH WITH SURFACE AND MAY BE FILLET WELDED.

<table>
<thead>
<tr>
<th>INLET TYPE</th>
<th>V</th>
<th>Y1</th>
<th>NO. OF BARS</th>
<th>TYPE</th>
<th>REMARKS</th>
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<tr>
<td>N-1, CN-1</td>
<td>2'-3¾&quot;</td>
<td>2'-2¾&quot;</td>
<td>17</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>N-2, N-2</td>
<td>2'-9¾&quot;</td>
<td>1'-4&quot;</td>
<td>17</td>
<td>2</td>
<td>2 GRATES</td>
</tr>
</tbody>
</table>
NOTES:

1. CONCRETE SHALL HAVE A MINIMUM STRENGTH OF 3000 PSI AT 28 DAYS.
2. SEE STANDARD DRAWING NO. 404 FOR FRAME AND GRATE.
3. 4 TO 6 INCHES OF ANGULAR RIPRAP, 6 INCHES IN DEPTH, SHALL EXTEND A MINIMUM OF 2 FEET AROUND ALL SIDES OF THE INLET.
NOTES:

ALL METAL PARTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.

TOP AND COVER SHALL BE REINFORCED WITH 4" x 4" #6 WIRE MESH REINFORCING.

CONCRETE SHALL ATTAIN A STRENGTH OF 3000 PSI AT 28 DAYS.
PLAN VIEW

SECTION A—A

PERSPECTIVE VIEW SHOWING DEPRESSED GUTTER AT CURB INLET

4" WEEP HOLES REQUIRED AT SUBGRADE ON STREET AND UPHILL SIDES OF BASIN

OVERSIZED INLET MANHOLE

DATE: March 2021
SIGNED: G. Mathis
PLAN VIEW

SECTION A-A

PERSPECTIVE VIEW SHOWING
DEPRESSED GUTTER AT CURB INLET

4" WEEP HOLES REQUIRED AT SUBGRADE ON STREET AND UPHILL SIDES OF BASIN

SUPER SIZED INLET MANHOLE

N.T.S

DATE: March 2021

APPROVED BY: G. Mathis

STANDARD DRAWING 410
STORM WATER MANHOLE FRAME AND COVER

NOTES
1. USE SUBURBAN TYPE FRAME IN NON–TRAFFIC AREAS ONLY.
2. COVER AND FRAME SHALL BE CAST IRON, ASTM A–48 CLASS 30 AND MEET H–20 LOAD RATING.
3. COVER AND FRAME TO HAVE TRUE BEARING ALL AROUND.
NOTES

1. STANDARD MANHOLE TO BE USED FOR PIPES 18" AND LESS.
2. PRECAST CONCRETE STRUCTURES SHALL HAVE STRENGTH OF 4000 PSI.
3. LATERAL LINES TO MATCH TOP OF INLET PIPE AT MANHOLE.
4. ALL INTERIOR JOINTS AND CONNECTIONS SHALL BE WATER TIGHT, AND GROUTED WITH NON-SHRINK GROUT.
5. IF END OF LINE MANHOLE, STEPS SHALL BE LOCATED ON DOWNSTREAM SIDE AND CHANNEL SHALL BE CONSTRUCTED FULL WIDTH OF INTERIOR.
6. GASKET STYLE MANHOLES ONLY, KEY-LOC STYLE IS FOR RETROFIT ONLY AND REQUIRES EXTERIOR JOINTS TO BE SEALED WITH RAPID SEAL OR INTERIOR COATING WITH RAVEN COATING.

FORM CHANNEL AND SLIDE WITH GROUT. SMOOTH SURFACE FINISH SIMILAR TO CONCRETE PIPE.

BEAVER SLIDE

LOCATE MANHOLE COVER UPSTREAM OVER MAIN LINE

CAST IRON FRAME AND COVER SEE STD. DWG. 411

EXTerior GROUTING OF FRAME

RISER RINGS—MAX. 6"

ECCENTRIC CONE SECTION 18" TO 24"

MANHOLE BASE SEE STD. DRAWING 203

48" DIA. SECTIONS RUBBER GASKETS SECTIONS ONLY

SHAALLOW MANHOLE
NO STEPS IN ANY MANHOLE STRUCTURES

NOTES:
1. ALL MANHOLE SECTIONS SHALL CONFORM TO THE REQ. OF ASTM C-478 AND APPLICABLE PROVISIONS OF STD. MANHOLE DRAWING NO. 204 & 205.
2. INLET AND OUTLET PIPE NOT TO EXCEED 18" DIAMETER.
3. PROVIDE SPECIAL DETAIL FOR OUTLET FLOW CONTROL EXCEEDING 18" DIA.
4. ALL OUTLETS SHALL HAVE FLOW CONTROL DEVICE.

SUMPS VOLUME AVAILABLE

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<tr>
<th>M.H SIZE</th>
<th>MIN (CF)</th>
<th>MAX (CF)</th>
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<tr>
<td>60&quot;</td>
<td>58.9</td>
<td>98.1</td>
</tr>
<tr>
<td>72&quot;</td>
<td>84.8</td>
<td>141.3</td>
</tr>
<tr>
<td>84&quot;</td>
<td>115.4</td>
<td>192.3</td>
</tr>
</tbody>
</table>

*PROVIDE SPECIAL DETAIL FOR VOLUME REQUIREMENTS EXCEEDING 192.3 CFs.

SUMPS VOLUME REQUIREMENTS

20 CF/1.0 CFs OF INFLOW

58.9 CF MINIMUM REQUIRED

MANHOLE DIAMETER TO BE DETERMINED BY:
1. SUMP VOLUME REQUIREMENTS.

ANCHOR TO WALL WITH STAINLESS STEEL RISER CLAMP OR STAINLESS STEEL BAND AND STAINLESS STEEL EXPANSION ANCHORS MIN. 2 PLACES. STEEL BAND TO BE MIN. OF 2" WIDE

1/4" SELF TAPPING CONCRETE ANCHOR PHILLIPS 5-12 OR EQUAL. 1/4"X1 1/2" STAINLESS STEEL BOLT.
NO STEPS OR LADDERS IN ANY MANHOLE STRUCTURES

FLOW CONTROL STRUCTURE DETAIL

SECTION A-A

SECTION B-B

FLOW LINE IN

FLOW LINE OUT

ELEVATION

OVERFLOW ELEVATION

NO STEPS OR LADDERS IN ANY MANHOLE STRUCTURES

ONICE C ELEVATION

(When Specified)

Onice B Elevation

(When Specified)

Inlet/Outlet

See Plan And Profiles

Restrictor Plate Orifice "A" (See Table And Detail)

Baffle Wall

12" Diameter Hole

Orifice A Elevation

Orifice B Elevation

Orifice C Elevation

(When Specified)

Lift Handle

Manhole Ring And Cover

With Locking Bolts, Marked "DRAIN"

8" Shear Gate

See Detail

See ELBOW DETAIL

NO STEPS OR LADDERS IN ANY MANHOLE STRUCTURES

SIDE

MAXIMUM OPENING OF GATE DETAIL

LIFT HANDLE DETAIL

SHEAR GATE

AS MANUFACTURED BY KENNEDY VALVE OR EQUAL

ELBOW DETAIL

Removable Watertight
Coupling

Grouted

Restrictor Plate With
Orifice B & C
(When Specified)

Baffle Wall

Adjustable Lock
Hook With Lock
Screw

1" Rod Or Tubing

Level Line

Lift Handle Attachment

PLAN

FRONT

March 2021

G. Mathis

March 2021

G. Mathis
### Notes:

1. Baffle wall shall have #4 bar at 12" spacing each way.
2. Precast baffle shall be keyed and grouted in place. Joint between concrete baffle and manhole wall shall be watertight.
3. Upper flow orifice shall be stainless steel or aluminum.
4. Frame and ladder or steps are to be offset so that: shear gate is visible from the top; climb-down space is clear of riser and gate; frame is clear of curb.
5. Multi-orifice elbows shall be pre-installed to insure ladder clearance.
6. Restrictor plate with orifice as specified in the contract. Opening is to be cut round and smooth. Neoprene gasket shall be installed between the orifice plate and concrete baffle to provide a watertight seal.
7. Shear gate shall be made of aluminum alloy in accordance with ASTM B 26M and ASTM B 275, designation Zg32A or cast iron in accordance with ASTM A 48, class 30B. Lift handle may be solid rod or hollow tubing with adjustable hook as required. Neoprene rubber gasket required between riser mounting flange and gate flange. Mating surfaces of lid and body shall be machined for proper fit.
8. Flange mounting bolts shall be 1/2" diameter stainless steel.
9. Shear gate maximum opening shall be controlled by limited hinge movement, stop tab or some other devise.
10. Alternate shear gates designs are acceptable, if material specifications are met and flange bolt pattern matches.
11. Manhole certification required for traffic loading.

### Flow Control Structure Table

|--------------------------|---------------|----------------|----------------------------|-------------------|---------------------|---------------------------|-------------------|---------------------------|-------------------|-------------------------|------------------|-------------|---------------------|

### Diagram

- 18" x 18" x 1/4" Stainless Steel Plate
- Orifice "A" (See Table)
- 1/2" Dia. Hole For 1/2" Stainless Steel Expansion Bolts, 1" Embedment
- Restricctor Plate, Orifice "A"
NOTES:

1. CONNECTING PIPE AND TEE SHALL BE 4", 6", OR 8" AWWA C-900 OR ASTM 3034 PVC, AND ONE SIZE LARGER THAN THE ORIFICE OPENING.

2. MAXIMUM ORIFICE OPENING SHALL BE 6" DIAMETER.

3. STRUCTURES SHALL CONFORM TO STANDARD DRAWING NO. 390 DITCH INLET.

4. FRAME AND GRATE SHALL CONFORM TO STANDARD DRAWING NO. 403, DITCH INLET FRAME AND GRATE.

5. PLATE AND GUIDE SHALL BE SECURED FLUSH AGAINST WALL OF STRUCTURE AS APPROVED.

6. MAINTENANCE ACCESS REQUIRED TO WITHIN 10' OF CENTER OF BOTH STRUCTURES.
DESIGN ENGINEER TO SPECIFY:
ORIFICE SIZE ______
ORIFICE ELEVATION ______

SLOT SHALL BE 1"X3" CENTERED

ALIGN INVERT OF ORIFICE TO INVERT OF PIPE.

2" MIN.

3" MIN.

3 1/2" MIN.

1 1/2" MIN.

6" (TYP.)

2" MIN.

10" MINIMUM

2" MIN.

2" MIN.

1/8" DIA. WEEPHOLES

3/8" STAINLESS STEEL CHAIN OR CABLE ATTACHED TO ORIFICE PLATE AND STRUCTURE AS APPROVED. CHAIN OR CABLE SHALL BE SMALL ENOUGH TO ALLOW ORIFICE PLATE TO BE REMOVED FROM GUIDE. ORIFICE PLATE AND GUIDE TO BE MANUFACTURED FROM 3/8" HDPE OR 3/8" STAINLESS STEEL.

SPACER REQUIRED FOR MULTIPLE ORIFICES

PLATE THICKNESS ±1/4"

TOP OF GUIDE ±3" BELOW GRATE

ORIFICE PLATE GUIDE SHALL FIT STOP GATE AND INCLUDE BOTTOM CHANNEL ORIFICE PLATE GUIDE.

NOTE:
FOR MULTIPLE ORIFICE APPLICATION A 3" MIN. SPACER IS REQUIRED AS SHOWN. SPACER TO MATCH PLATE GUIDE DIMENSIONS, WIDTH, MATERIAL WITH A WATER TIGHT SEAL.

1/8" SELF TAPPING CONCRETE ANCHORS, PHILLIPS 5-12 OR APPROVED EQUAL. 1/4" X 1-1/2" STAINLESS STEEL BOLT.
NOTES:

1. ALL FITTINGS, FASTENERS, OR FABRIC TIES SHALL BE BLACK OR BROWN VINYL FENCING.
2. CONCRETE SHALL BE MIN. 2500 PSI @ 28 DAYS.
3. PROVIDE BRACE RAIL BETWEEN END POSTS AND LINE POSTS. LENGTHS AS REQUIRED.
4. PROVIDE GATE STOPS AND DROP RECEIVERS SET IN CONCRETE, EACH GATE.
5. PROVIDE EXTENSION ARMS ON LINE, END AND CORNER POSTS & GATE POSTS AS REQUIRED.
6. PROVIDE SIGHT OBSCURING SLATS WITH ALL WASTEWATER PUMP STATIONS.
7. CENTER BRACE RAIL NOT REQUIRED WITH FENCE HEIGHT OF 5’ OR LESS.
8. ALL POSTS AND RAILS TO MATCH FENCE COLOR.
RIPRAP:

- ROCK FOR RIPRAP SHALL BE ANGULAR IN SHAPE.
- THICKNESS OF A SINGLE ROCK SHALL NOT BE LESS THAN ONE-THIRD ITS LENGTH.

RIPRAP INSTALLATION:

- EXCAVATE BELOW FINISH GRADE TO DEPTH & DIMENSIONS SHOWN ON APPROVED PLANS.
- INSTALL WOVEN GEOTEXTILE FABRIC.
- PLACE RIP RAP TO FINISH GRADE.

GRADE RIPRAP SHALL BE THE CLASS AND SIZE OF ROCK ACCORDING TO THE FOLLOWING:

<table>
<thead>
<tr>
<th>CLASS</th>
<th>CLASS</th>
<th>CLASS</th>
<th>CLASS</th>
<th>CLASS</th>
<th>PERCENT (BY WEIGHT)</th>
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<tr>
<td>50</td>
<td>100</td>
<td>200</td>
<td>700</td>
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<td>50-30</td>
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<td>30-15</td>
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<td>8-0</td>
<td>20-0</td>
<td>40-0</td>
<td></td>
</tr>
</tbody>
</table>
NOTES:

1. USES – SINGLE RESIDENTIAL SERVICE, 4” PIPE
   – SPLIT RESIDENTIAL SERVICE, 6” PIPE

2. SERVICE SHALL NOT BE BACKFILLED PRIOR TO INSPECTION. LOCATE WIRE
   SHALL BE TESTED PRIOR TO BACKFILL AND AFTER BACKFILL IS
   COMPLETE WITH THE WITNESS OF A CITY REPRESENTATIVE.

3. MINIMUM SLOPE 2.0%.
DESIGN STEPS FOR LIDA FACILITIES:

1. DETERMINE THE IMPERVIOUS AREA REQUIRING TREATMENT.
   REFER TO CHAPTER 4 OF THE STANDARD DESIGN MANUAL FOR ASSISTANCE IN DETERMINING OR
   CALCULATING THE IMPERVIOUS AREA REQUIRING TREATMENT.

2. DEDUCT IMPERVIOUS AREA LIDA CREDITS.
   DEDUCT THE SITE AREAS DESIGNED WITH POROUS PAVEMENT OR GREEN ROOFS FROM THE
   IMPERVIOUS AREA CALCULATED IN STEP 1.

3. IF NEEDED, DESIGN WATER QUALITY/ QUANTITY FACILITIES FOR REMAINING UNTREATED
   IMPERVIOUS AREA. SIZING FACTORS FOR INFILTRATION BASED LIDA’S ASSUME EXISTING SOIL
   UNFACTORED INFILTRATION RATE OF GREATERTHAN 2 INCHES PER HOUR. EACH FACILITY MUST
   BE SIZED FOR THE AMOUNT OF IMPERVIOUS AREA DRAINING ONTO IT.

4. THE SIZING FACTORS NOTED IN THIS SECTION ARE TO BE USED TO SIZE EACH LIDA FACILITY
   TREATING RUNOFF FROM A MAXIMUM OF 15,000 SQUARE FEET OF IMPERVIOUS AREA IN EACH
   FACILITY. FOR LARGE DEVELOPMENT SITES AND IMPERVIOUS AREAS, A REGIONAL WATER
   QUALITY/ QUANTITY FACILITY (VEGETATED SWALE, EXTENDED DRY BASIN OR CONSTRUCTED
   WATER QUALITY WETLAND) OR PROPRIETARY FACILITY MAY BE APPROPRIATE, AS DESIGNED BY
   A REGISTERED PROFESSIONAL ENGINEER.

GENERAL NOTES:

1. FOR PLANTING REQUIREMENTS REFERENCE APPENDIX A OF THE STANDARD DESIGN MANUAL.

2. FOR FACILITY SIZING REFERENCE STANDARD DRAWING NO. 451, LIDA SIZING FORM.

3. ENERGY DISSIPATORS REQUIRED AT ALL DISCHARGE POINTS INTO THE FACILITY, MINIMUM OF
   18”X18”X 6” DEEP, 4” TO 6” CLEAN ANGULAR RIPRAP.

4. DISCHARGES INTO NATIVE SOILS WILL REQUIRE INFILTRATION TESTING COMPLETED BY A
   REGISTERED DESIGN PROFESSIONAL.

GROWING MEDIUM NOTES:

THE GROWING MEDIUM SHALL BE ONE THIRD ORGANIC COMPOST, ONE THIRD GRAVELY SAND AND
ONE THIRD TOP SOIL.

1. ORGANIC COMPOST SHALL BE THE RESULT OF BIOLOGICAL DEGRADATION AND TRANSFORMATION
   OF PLANT DERIVED MATERIALS UNDER CONDITIONS DESIGNED TO PROMOTE AEROBIC
   DECOMPOSITION, FREE OF VIABLE WEED SEEDS AND STABLE WITH REGARD TO OXYGEN
   CONSUMPTION AND CARBON DIOXIDE GENERATION, AND OTHERWISE CONFORMING TO THE US
   COMPOSTING COUNCIL STA COMPOST TECHNICAL DATA SHEET; WWW.COMPOSTINGCOUNCIL.ORG.

2. GRAVELY SAND SHALL BE 1” MINUS IN CONFORMANCE WITH ASTM C117/C136 (AASHTO
   T11/T27) STANDARDS WITH A COEFFICIENT OF UNIFORMITY (D60/D10) EQUAL TO OR GREATER
   THAN 6.

3. TOP SOIL SHALL BE FREE OF WOOD PIECES, PLASTIC, AND OTHER FOREIGN MATTER, CHEMICAL
   AND BIOLOGICAL POLLUTANTS, AND CONTAIN NO VISIBLE FREE WATER.
City of Amity LIDA Sizing Form

Project Title: 

Project Address: 

Project Taxlot/ Taxmap#: 

Project Location: 

Contact Name/Title/Company: 

Phone/e-mail: 

STEP 1: Determine Impervious Area Requiring Treatment

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<th>Total Gross Site Area (acres):</th>
<th>Pre. Dev. Impervious Area (ft):</th>
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<table>
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<tr>
<th>Proposed Net New Impervious Area (ft): (PA)</th>
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STEP 2: Deduct Impervious Area LIDA Credits

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<th>Porous Pavement (sq. ft.):</th>
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<tbody>
<tr>
<td>Green Roof (sq. ft.):</td>
<td>(G)</td>
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<tr>
<td>Other Credits as approved (sq. ft.):</td>
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<tr>
<th>Total Credits (sq. ft.): (C)= (P)+(G)+(O)</th>
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<tbody>
<tr>
<td>(C)</td>
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<td>(IA)= (PA) - (C)</td>
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STEP 3: Size LIDA Facilities for Remaining Impervious Area

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<th>SF, Sizing Factor</th>
<th>LIDA Facility Size (sq. ft.)</th>
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<tbody>
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<tr>
<td>Flow-through Planter</td>
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<td>Public Flow-through Planter</td>
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<table>
<thead>
<tr>
<th>Total Impervious Area Treated (sq. ft.)</th>
<th>MUST BE EQUAL TO (IA)</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
NOTES:

1. MAXIMUM SLOPE OF PLANTER 0.5%.
2. NO TREES OR DEEP ROOTED VEGETATION OVER PIPING IS ALLOWED IN FACILITY.
3. STORM PIPING TO FACILITY THROUGH WALL CORE HOLES, MAINTAIN MAXIMUM DISTANCE FROM THE OVERFLOW PIPE AS POSSIBLE.
4. PRIVATE OVERFLOW PIPE TO BE MINIMUM SPECIFIED IN PLUMBING CODE, SEE TABLE. PUBLIC FACILITIES SHALL BE Sized TO CONVEY THE 25 YEAR STORM.
5. ENERGY DISSIPATERS REQUIRED AT WATER ENTRANCES MINIMUM 18”X18”X6” OF 4 TO 6 INCH ANGULAR RAPID.
6. PERMEABLE FILTER FABRIC REQUIRED BETWEEN LAYERS.
7. IMPERMEABLE LINER REQUIRED AT FACILITY BOTTOM AND ON WALLS ADJACENT TO STRUCTURES (AS SHOWN).
8. "PARTIAL" INFILTRATION FACILITIES ARE ENCOURAGED. IMPERMEABLE LINER LOCATED AT FACILITY BOTTOM, MAY BE REMOVED FOR "PARTIAL" INFILTRATION, APPROVAL BY DESIGN PROFESSIONAL AND BUILDING DEPARTMENT REQUIRED.
9. BUILDING OFFSET REQUIRED ONLY WHEN INFILTRATING, 10 FT MINIMUM.
10. MUST BE LOCATED A MINIMUM OF 3 FT FROM ADJACENT PROPERTY LINE.
NOTES:

1. MAXIMUM SLOPE OF PLANTER 0.5%.
2. NO TREES OR DEEP ROOTED VEGETATION OVER PIPING IS ALLOWED IN FACILITY.
3. STORM FLOW INLETS THROUGH WALL CUT OUTS, BOTH TO MAINTAIN MAXIMUM LINEAR DISTANCE FROM THE OVERFLOW PIPE.
4. PRIVATE OVERFLOW PIPE TO BE MINIMUM SPECIFIED IN THE PLUMBING CODE, SEE TABLE. PUBLIC FACILITIES SHALL BE SIZED TO CONVEY THE 25 YEAR STORM.
5. ENERGY DISSIPATORS REQUIRED AT WATER ENTRANCES MINIMUM 18”X18”X6” OF 4 TO 6 INCH ANGULAR RIPRAPP.
6. SIZING FACTORS, FOR INFILTRATION FACILITIES ASSUME AN UNFACTORED INFILTRATION RATE GREATER THAN 2 IN PER HOUR.
7. MUST BE LOCATED 3’ MINIMUM FROM ADJACENT PROPERTY LINE.
DESIGN NOTES:

1. PROVIDE BEGINNING AND END STATION FOR EACH FACILITY. PROVIDE STATIONING AND/OR DIMENSIONS AND ELEVATIONS AT EACH INLET, Outlet, CHECK DAM, PLANTER CORNER AND SIDEWALK NOTCHES.

2. SIDEWALK ELEVATION MUST BE SET ABOVE CHECK DAM AND INLET ELEVATIONS TO ALLOW OVERFLOW TO DRAIN TO STREET BEFORE SIDEWALK.

3. EXISTING UTILITY LINES MUST BE SLEEVED OR RELOCATED. PROPOSED UTILITY LINES TO BE LOCATED OUT OF FACILITY.

4. LONGITUDINAL SLOPE OF PLANTER TO MATCH ROAD.

5. MINIMUM INTERIOR PLANTER WIDTH IS 3 FEET. A MINIMUM OF 4 FEET IS REQUIRED FOR PLANTERS WITH STREET TREES.

RELATED DETAILS:

6. CONCRETE INLET, STANDARD DRAWING NO. 452– CURB CUT.

7. CHECK DAM, STANDARD DRAWING NO. 455, CONCRETE CHECK DAM.

8. REQUIREMENTS FOR WATER LINES, METERS, AND FIRE HYDRANTS REFERENCE STANDARD DRAWING NO. 458, METER & HYDRANT LOCATIONS.

9. FACILITY SIZING AND TOPSOIL PER STANDARD DRAWING NO. 450, GENERAL REQUIREMENTS.

10. PLANTER WALL, STANDARD DRAWING NO. 456, PUBLIC PLANTER WALLS.
DESIGN NOTES:

1. PROVIDE BEGINNING AND END STATION FOR EACH FACILITY. PROVIDE STATIONING AND OR DIMENSIONS AND ELEVATIONS AT EACH INLET, OUTLET, CHECK DAM, PLANTER CORNER AND SIDEWALK NOTCHES.

2. SIDEWALK ELEVATION MUST BE SET ABOVE CHECK DAM AND INLET ELEVATIONS TO ALLOW OVERFLOW TO DRAIN TO STREET BEFORE SIDEWALK.

3. EXISTING UTILITY LINES MUST BE SLEEVED OR RELOCATED. PROPOSED UTILITY LINES TO BE LOCATED OUT OF FACILITY.

4. LONGITUDINAL SLOPE OF PLANTER TO MATCH ROAD.

5. MINIMUM INTERIOR PLANTER WIDTH IS 3 FEET. A MINIMUM OF 4 FEET IS REQUIRED FOR PLANTERS WITH STREET TREES.

RELATED DETAILS:

6. CONCRETE INLET, STANDARD DRAWING NO. 462— CURB CUT.

7. CHECK DAM, STANDARD DRAWING NO. 465, CONCRETE CHECK DAM.

8. REQUIREMENTS FOR WATER LINES, METERS, AND FIRE HYDRANTS REFERENCE STANDARD DRAWING NO. 468, METER & HYDRANT LOCATIONS.

9. FACILITY SIZING AND TOPSOIL PER STANDARD DRAWING NO. 451, GENERAL REQUIREMENTS.

10. PLANTER WALL, STANDARD DRAWING NO. 466, PLANTER WALLS.
SECTION B-B
PLANTER WITH PARKING

SECTION A-A
PLANTER WITHOUT PARKING

NOTES:

1. IE OF OVERFLOW PIPE TO BE FLUSH WITH CHECK DAM HEIGHT.

2. PUBLIC OVERFLOW PIPE SHALL BE SIZED TO CONVEY THE 25 YEAR DESIGN STORM EVENT.

3. PERFORATED PIPE SHALL RUN LENGTHWISE OF FACILITY AND SHALL BE LOCATED 6" ABOVE EXISTING SUBGRADE. REFERENCE STANDARD DRAWING NO. 463, PERFORATED PIPE.
NOTES:

1. 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.

2. FLOW DISSIPATORS SHOULD BE USED IF ENTRY SLOPE TO THE BASIN IS GREATER THAN 5:1.

3. SEPARATION BETWEEN DRAIN GRAVEL AND GROWING MEDIUM SHALL BE PERMEABLE FILTER FABRIC.

4. TREATMENT AREA SHALL HAVE HIGH DENSITY JUTE OR COCONUT MATTING OVER 18" MINIMUM OF GROWING MEDIUM OR BASE STABILIZATION METHOD AS APPROVED BY THE CITY.

5. REFER TO APPENDIX A OF THE STANDARDS DESIGN MANUAL FOR PLANTING REQUIREMENTS.

6. TOP OF BANK OF FACILITY MUST BE LOCATED 10' FROM ANY STRUCTURE AND 3' FROM ADJACENT PROPERTY LINES.
NOTES:

1. COLLECTION AND CONVEYANCE OF OVERFLOW FROM FILTER STRIP SHALL BE SPECIFIED ON PLANS TO APPROVED PUBLIC CONVEYANCE SYSTEM.

2. ENTIRE FILTER STRIP MUST HAVE 100% COVERAGE BY APPROVED, NATIVE GRASSES, WILDFLOWER BLENDS, GROUND COVERS, OR ANY COMBINATION THEREOF.

3. A GRADE BOARD, SPREADER, OR SAND/GRAVEL TRENCH MAY BE REQUIRED TO DISPERSE THE RUNOFF EVENLY ACROSS THE FILTER STRIP TO PREVENT POINT OF DISCHARGE/CHANNELIZATION. THE TOP OF THE LEVEL SPREADER MUST BE HORIZONTAL AND AT AN APPROPRIATE HEIGHT TO PROVIDE SHEETFLOW DIRECTLY TO THE SOIL WITHOUT SCOUR. LEVEL SPREADERS SHALL NOT HOLD A PERMANENT VOLUME OF RUNOFF. SPREADERS MAY BE CONCRETE PER STANDARD DRAWING NO. 420. TRENCHES USED AS LEVEL SPREADERS CAN BE FILLED WITH WASHED CRUSHED ROCK, PEA GRAVEL OR SAND.

4. CHECK DAMS SHALL BE PLACED ACCORDING TO FACILITY DESIGN OTHERWISE:
   A. EQUAL TO THE WIDTH OF THE FILTER
   B. PLACED EVERY 10' WHERE SLOPE EXCEEDS 5%, 2.5” TO 3” DEEP.

5. FILTER STRIP IS FOR WATER QUALITY ONLY, SIZING FACTOR OF 0.06.
NOTES:

1. PAVEMENT SURFACE TO BE CONSTRUCTED WITH HIGH PERMEABILITY (> 8" PER HR).

2. UNIFORM–GRADED CRUSHED DRAIN ROCK BED WITH MINIMUM 40% VOID SPACE

3. PROVIDE PERFORATED PIPE MANIFOLD IN RESERVOIR LAYER FOR CONVEYANCE, IF UNFACTORED SOIL INFILTRATION RATES LESS THAN 2"/HR. SEE PERFORATED PIPE DRAWING NO. 463.

4. NOT RECOMMENDED FOR TRAFFIC SURFACES WITH SLOPE > 5%.

5. DO NOT PLACE DRAIN ROCK BED ON COMPACTED FILL AREAS.

6. HIGHEST SEASONAL WATER TABLE MUST BE AT LEAST 5' BELOW RESERVOIR LAYER. STRUCTURE MUST BE ‘100’ AWAY FROM DRINKING WATER WELL. MINIMUM OF ‘100’ AWAY UP SLOPE & ‘10’ AWAY DOWN SLOPE FROM STRUCTURE FOUNDATIONS. A WRITTEN REPORT IS REQUIRED.

7. FLOWS FROM OTHER IMPERVIOUS AREAS SHALL NOT DRAIN TO POROUS PAVEMENT.

8. ONSITE INFILTRATION TESTING REQUIRED BEFORE AND DURING CONSTRUCTION BY A DESIGN PROFESSIONAL.
HYDRAULIC DESIGN CRITERIA:
1. DESIGN FLOW: WATER QUALITY FLOW
2. MIN. HYDRAULIC RESIDENCE TIME: 9 MINUTES
3. MAXIMUM WATER DESIGN DEPTH: 0.5 FEET
4. MINIMUM FREE BOARD: 1.0 FOOT (FOR FACILITIES NOT NOT PROTECTED FROM HIGH FLOWS)
5. MANNING "n" VALUE: 0.24
6. MAXIMUM VELOCITY: 2.0 fps BASED ON 25-YEAR FLOW

FACILITY DESIGN CRITERIA:
7. THE USE OF INTERMEDIATE FLOW SPREADERS IS REQUIRED, SPACING FOR CONCRETE SPREADERS TO BE DETERMINED BY DESIGN ENGINEER.
8. EXTEND RIVER ROCK, TOPSOIL, AND HIGH DENSITY JUTE OR COCONUT MATTING TO TOP OF TREATMENT AREA (OR WQV LEVEL). EXTEND TOPSOIL AND LOW DENSITY JUTE MATTING TO THE EDGE OF WATER QUALITY TRACT.
9. WHERE SWALES WRAP 180-DEGREES FORMING PARALLEL CHANNELS, FREEBOARD SHALL BE PROVIDED BETWEEN EACH OF THE PARALLEL CHANNELS. A 1 FOOT WALL ABOVE GROUND SURFACE MAY ALSO BE USED. ALTERNATIVE: A SOIL BASED BERM WITH A MIN. TOP WIDTH OF 1 FOOT & MAX 2.5H:1V SIDE SLOPES MAY BE USED.
10. WHERE SWALES ARE DESIGNED WITH DITCH INLETS & OUTLET STRUCTURES & DESIGN OF MAINTENANCE ACCESS TO SUCH STRUCTURES MAY BE DIFFICULT DUE TO SWALE LOCATION, SWALES MAYBE DESIGNED AS FLOW THROUGH FACILITIES WITH UNSUMPED STRUCTURES. MAINTENANCE ACCESS TO STRUCTURE END OF THE FACILITY IS REQUIRED.
HYDRAULIC DESIGN CRITERIA:

1. MIN. WATER QUALITY DETENTION VOLUME: 1.0 X WATER QUALITY VOLUME (WQV)

2. 48 HOURS WATER QUALITY DRAWDOWN TIME

3. FOR ORIFICE SIZE USE: 
   \[ D = 24^\star \left( \frac{Q}{C(2gH)^{1/2}} \right)^{1/3} \] WHERE: 
   \[ D(n) = \text{DIAMETER OF ORIFICE} \]
   \[ Q(cf) = \frac{WQV(cf)}{48\times60\times60} \]
   \[ C = 0.62 \]
   \[ H(ft) = \frac{H}{G} \] (TEMPORARY WATER QUALITY DETENTION HEIGHT TO CENTERLINE OF ORIFICE)

FACILITY DESIGN CRITERIA:

6. MINIMUM OF 2 CELLS, WITH THE FIRST CELL (FOREBAY) AT LEAST 10% OF SURFACE AREA. THE FOREBAY SHALL ALSO CONSTITUTE 20-PERCENT OF THE TREATMENT VOLUME. WHERE SPACE LIMITS MULTI-CELL DESIGN, USE ONE CELL WITH A FOREBAY AT THE INLET TO SETTLE SEDIMENTS AND DISTRIBUTE FLOW ACROSS THE WET POND.

7. INLET AND OUTLET STRUCTURES SHALL BE DESIGNED TO AVOID DIRECT FLOW BETWEEN STRUCTURES WITHOUT RECEIVING TREATMENT (i.e. SHORT CIRCUITING OF FLOW)

8. MINIMUM FREEBOARD: 1 FOOT FROM 25 YEAR DESIGN WATER SURFACE ELEVATION.

9. EXTEND RIVER ROCK, TOPSOIL, AND HIGH DENSITY JUTE OR COCONUT MATTING TO TOP OF TREATMENT AREA (OR WQV LEVEL). EXTEND TOPSOIL AND LOW DENSITY JUTE MATTING TO THE EDGE OF WATER QUALITY TRACT OR EASEMENT AREA.

10. THE ENGINEER SHALL CERTIFY THAT THE POND STORM SEWER DESIGN WILL PASS THE 25 AND 100 YEAR STORM EVENTS AND THAT AT NORMAL DESIGN WATER SURFACE THAT THE UPSTREAM STORM SEWER WILL NOT BE IN A SURCHARGED CONDITION FOR LONGER THAN 24 HOURS.
NOTES:

1. SPLASH PAD LENGTH TO BE 12 INCHES FROM BACK OF CURB

2. INFLOW STRUCTURE – CURB CUTOUT SHALL HAVE MINIMUM 2” DROP AT THE FLOW LINE LEADING TO THE SPLASH PAD, SEE DETAIL.

3. SPLASH PAD DRAIN ROCK MINIMUM SIZE 2” TO 4” CLEAN ANGULAR ROCK OR SIZED BY DESIGN INFLOW. ROCK TO BE PLACED 2.5” TO 3” DEEP BEHIND CONCRETE SPLASH PAD.
NOTES:

1. BRANCH SPACING AND NUMBER OF BRANCHES TO BE CALCULATED BASED ON STORM FLOWS FROM IMPERVIOUS AREA BEING TREATED.

2. WRAP PERFORATED PIPE WITH GEOTEXTILE TO PREVENT INFILTRATION OF FINES.

3. NO TREES OR DEEP ROOTED VEGETATION OVER PIPING, UNLESS LINER IS INSTALLED PER DRAWING NO. 108 & PER DIRECTION OF CITY ENGINEER.

4. GRADE SUBGRADE TO PROVIDE MANIFOLD WITH POSITIVE DRAINAGE.

5. CONVEYANCE SIZED AT MINIMUM FOR 25 YEAR EVENT STORM FLOWS.

6. DETENTION (IF REQUIRED) VOLUME BASED ON DEPTH OF DRAIN ROCK RESERVOIR LAYER AND POSITION OF MANIFOLD WITHIN THE DRAIN ROCK LAYER.

7. FITTINGS TO BE SAME MATERIAL AS PERFORATED PIPE.

8. PIPE SECTIONS EXPOSED TO SUNLIGHT SHALL BE OF MATERIAL NOT SUBJECT TO DEGRADATION FROM THE EFFECTS OF SUNLIGHT.
NOTES:

1. LINER MATERIALS TO BE HDPE OR PVC. LINER TO EXTEND FROM TOP OF TOPSOIL TO THE BOTTOM OF EXCAVATION.

2. 3" OF CONCRETE IS REQUIRED ON ALL SIDES OF ATTACHMENT. ADJUST SIDEWALK DEPTH AS NECESSARY.

3. LINER REQUIRED WHEN FACE OF NEW CURB IS LESS THAN 2' FROM OD OF ADJACENT WATER MAIN.

4. LINER REQUIRED ON NEIGHBORHOOD COLLECTORS AND HIGH STREET CLASSIFICATIONS. LINER MAY BE REQUIRED ON LOCAL STREETS WITH TRANSIT ROUTES, HIGHER TRAFFIC VOLUMES, OR WHEN A FACILITY IS ADJACENT TO TRAVEL LANE AT THE DISCRETION OF THE CITY ENGINEER.

5. IN AREAS WITH CONTAMINATED SOILS THE FACILITY MUST BE COMPLETELY LINED WITH A 40 MIL LINER UNLESS FACILITY'S BOTTOM AND SIDES ARE MONOLITHIC CONCRETE.

6. ADHERE 30 MIL LINER TO CONCRETE WITH TOPCOAT MOLDABLE SEALANT, OR APPROVED EQUAL.

7. SECURE LINER TO CONCRETE WITH 2" ALUMINUM FLAT BAR, PLACED AS DIRECTED (CURB SIDE OR ENTIRE FACILITY).

8. ATTACH FLAT BAR WITH CONCRETE HIT ANCHORS, 12" O.C.

9. TRIM EXCESS LINER TO THE TOP OF FLAT BAR.
NOTES:

1. PROVIDE ELEVATIONS AND STATIONING AND/ OR DIMENSIONING FOR CHECK DAMS.

2. ENSURE THAT CHECK DAM ELEVATIONS DO NOT CAUSE STORMWATER TO OVERFLOW TO SIDEWALK.

3. FOR USE IN PUBLIC STREET PLANTERS.

4. FOR CHECK DAMS THAT SPAN LONGER THAN 12' SPECIFY REBAR OVERLAP LENGTH.

5. EMBED #3 REBAR 3" INTO CURB AND 3" INTO PLANTER WALL. 12" MINIMUM OVERLAP REQUIRED FOR REBAR LAP SPICE.
NOTES:

1. SPECIAL DESIGN CONSIDERATIONS OR STRUCTURAL REVIEW MAY BE REQUIRED FOR LONGER PLANTER WALL SPANS. STEEL REINFORCEMENT OR ADDITIONAL CONCRETE CHECK DAMS MAY BE NEEDED FOR STABILITY.

2. SPECIFY ONE OF THE ABOVE PLANTER WALL OPTIONS BASED ON SITE CONDITIONS.

3. MAINTAIN 1:6 BATTER FOR WALLS AND 4” MINIMUM TO TOP OF CURB.

4. IF A LINER IS USED WITH AND L-SHAPED WALL, THE WALL HEIGHT MUST BE INCREASED. THREE INCHES OF CONCRETE IS REQUIRED ON ALL SIDE OF THE LINER ATTACHMENT (STANDARD DRAWING NO. 464)

5. BROOM FINISH ALL EXPOSED CONCRETE SURFACES.
**NOTES:**

1. SPACING BETWEEN TREES VARIES 20' TO 30' ON CENTER.
2. REFER TO STANDARD DRAWING NO 450 FOR GROWING MEDIUM.
3. STREET TREE LIST PROVIDED FOR REFERENCE DO NOT INCLUDE ON PLANS.
4. INCLUDE TREE WELL AND STREET TREE VIEWS ON PLANS.
5. DIMENSION TOPSOIL AND ROCK LAYERS ON NON-TREE SIDE TO CORRESPOND TO PLANTER SECTION.
6. INCLUDE LINER AND CALL-OUT IF USED, FOR TREE LINER REFERENCE DRAWING NO 108.
7. REMOVE WIRE AND BURLAP FROM ROOT BALL PRIOR TO BACKFILLING.
8. SET TOP OF ROOT BALL 1" TO 2" ABOVE TOPSOIL FACILITY.
9. DEEPEN SOIL SECTION MINIMUM, 4' X 6' X 4' DEEP.
10. OTHER SPECIES OF STREET TREES MAY BE PERMITTED WITH APPROVAL FROM PLANNING DEPARTMENT.

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**STREET TREES WITH POWER LINES**

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<thead>
<tr>
<th>BOTANICAL NAME</th>
<th>COMMON NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARPINUS CAROLINIANA</td>
<td>AMERICAN HORNBEAM</td>
</tr>
<tr>
<td>FRAXINUS PENNSYLVANICA 'JHONSON'</td>
<td>LEPRECHAUN ASH</td>
</tr>
<tr>
<td>GLEITISIA TRIACANTHOS 'IMPICOLE'</td>
<td>IMPERIAL HONEYLOCUST</td>
</tr>
<tr>
<td>KOELREUTERIA PANICULATA</td>
<td>GOLDENRAIN TREE</td>
</tr>
<tr>
<td>PRUNUS VIRGINIANA 'CANADA RED'</td>
<td>CANADA RED CHOKECHERRY</td>
</tr>
</tbody>
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**STREET TREES WITHOUT POWER LINES**

<table>
<thead>
<tr>
<th>BOTANICAL NAME</th>
<th>COMMON NAME</th>
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<tbody>
<tr>
<td>NYSSA SYLVARISCA</td>
<td>BLACK TUPelo</td>
</tr>
<tr>
<td>CELTIS OCCIDENTALIS</td>
<td>HACkBERRY</td>
</tr>
<tr>
<td>QUERCUS SHUMARDII</td>
<td>SHUMARpD OAK</td>
</tr>
<tr>
<td>BETULA JACQUMONTII</td>
<td>JACQUMONTII BIRCH</td>
</tr>
<tr>
<td>ACER CAMPESTRE 'EVELYN'</td>
<td>QUEEN ELIZABETH HEDGE MAPLE</td>
</tr>
<tr>
<td>GLEITISIA TRIACANTHOS 'SKYCOLE'</td>
<td>SKYLINE HONEYLOCUST</td>
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</table>
METER & HYDRANT LOCATIONS

SECTION A-A
- Copper tubing (type "K")
- Water main
- Curb & gutter
- Parking egress
- Sidewalk
- Tape wrap and sleeve

SECTION B-B
- Copper tubing (type "K")
- Water main
- Curb & gutter
- Parking egress
- Sidewalk

SECTION C-C
- Copper tubing (type "K")
- Water main
- Curb & gutter
- Parking egress
- Planter
- Tape wrap and sleeve

SECTION D-D
- Copper tubing (type "K")
- Water main
- Curb & gutter
- Parking egress
- Planter
- Tape wrap and sleeve

SECTION E-E
- Copper tubing (type "K")
- Water main
- Curb & gutter
- Parking egress
- Planter
- Tape wrap and sleeve

NOTES:
1. Refer to fire hydrant assembly standard drawing no. 312. Center of fire hydrant must have a minimum clearance of 5' from outside edge of stormwater facility.
2. Standard meter location is option A. Option B or C can be used only if the meter box is fully within the right-of-way.
3. Refer to standard 6" and 1" water service, standard drawing no. 307. For larger services contact the engineering department.
4. Maintain 2 ft. skin-to-skin separation distance between face of gutter pan and the water main. If water main is < 2 ft from face of gutter pan, the water main must be relocated unless otherwise approved by the city. Verification of water main depth depth is required prior to city approval.
5. Cross-section views are not required on construction plans.
NOTES:

1. THE ABOVE ARE APPROVED SAMPLE TEMPLATES.

2. AN APPROVED PLANT LIST AND QUANTITY REQUIREMENTS IS AVAILABLE IN APPENDIX A OF THE STANDARDS DESIGN MANUAL.

3. PLANTING TABLE REQUIRED. STATE PLANT SPECIES, SPACING, AND QUANTITIES PER PLANTER. INCLUDE THE SQUARE FOOTAGE OF PLANTER.
7. Aggregate base to be 3/4"-0" compacted crushed rock minimum thickness 4" or to match roadway base thickness, whichever is greater.
5. AGGREGATE BASE TO BE 3/4"-0" COMPACTED CRUSHED ROCK MINIMUM THICKNESS 4" OR TO MATCH ROADWAY BASE THICKNESS, WHICHEVER IS GREATER.
NOTES:

1. SLOPE FROM THE PROPERTY LINE TO THE STREET AT 2%.
2. WORK AGGREGATE INTO CONCRETE PRIOR TO FINISHING CONCRETE.
3. FINISHING DETAILS
   —EDGE CONCRETE WITH 3” EDGING TROWEL.
   —SCORE CONCRETE AT 5’ INTERVALS.
   —INSTALL 1/8” x 1 1/2” CONTRACTION JOINTS EVERY 15’.
   —FABRIC TYPE EXPANSION JOINT NOT TO BE USED
   —APPLY LIGHT BROOM FINISH TRANSVERSE TO THE SIDEWALK.
4. CONCRETE SHALL HAVE STRENGTH OF 3300 P.S.I. AT 28 DAYS.
5. APPLY CURING COMPOUND (PETROLEUM BASE) TO FRESH
   CONCRETE TO RETAIN MOISTURE.
6. TOLERANCES
   —SURFACE SHALL NOT VARY MORE THAN 1/4” FROM A 10’
     STRAIGHT EDGE.
   —ALIGNMENT SHALL BE WITHIN 1/4” OF TRUE LINE.
NOTES:

1. SLOPE FROM THE PROPERTY LINE TO THE STREET AT 2%.
2. WORK AGGREGATE INTO CONCRETE PRIOR TO FINISHING CONCRETE.
3. FINISHING DETAILS.
   - EDGE CONCRETE WITH 3" EDGING TROWEL.
   - SCORE CONCRETE AT 5’ INTERVALS.
   - INSTALL 1/8” x 1 1/2” CONTRACTION JOINTS EVERY 15’.
   - FABRIC TYPE EXPANSION JOINT NOT TO BE USED.
   - APPLY LIGHT BROOM FINISH TRANSVERSE TO THE SIDEWALK.
4. CONCRETE SHALL HAVE STRENGTH OF 3300 P.S.I. AT 28 DAYS.
5. APPLY CURING COMPOUND (PETROLEUM BASE) TO FRESH CONCRETE TO RETAIN MOISTURE.
6. TOLERANCES.
   - SURFACE SHALL NOT VARY MORE THAN 1/4” FROM A 10’ STRAIGHT EDGE.
   - ALIGNMENT SHALL BE WITHIN 1/4” OF TRUE LINE.
ALL CURB RAMP INSTALLATIONS REQUIRE DETECTIBLE/TACTILE WARNING MATS SEE STANDARD DRAWINGS 506&507.
NOTES:
1. CONCRETE SHALL HAVE STRENGTH OF 3300 P.S.I. AT 28 DAYS.
2. SIDEWALK RAMPS ARE REQUIRED AT ALL NEW INTERSECTIONS.
3. REPLACEMENT CURBS MUST BE Poured AGAINST A VERTICAL EDGE OF EXISTING CURB.
4. CONCRETE IN A REPLACEMENT CURB SHALL NOT PROTRUDE PAST THE FACE OF THE CURB IN THE ASPHALT REPLACEMENT AREA.
5. HORIZONTAL AND VERTICAL ALIGNMENT SHALL BE WITHIN 1/8" IN 10'.
6. DETECTIBLE SURFACE SHALL BE CONSTRUCTED WITH PREFABRICATED UNITS. TEXTURE SHALL NOT BE WET IMPRINTED. TRUNCATED DOME PATTERN SHALL BE IN LINE, ALIGNED IN THE DIRECTION OF THE RAMP.
7. DETECTIBLE SURFACE SHALL BE YELLOW (FEDERAL COLOR #33538).
8. THIS DETAIL IS APPROVED FOR USE IN THE PUBLIC RIGHT OF WAY ONLY.
RAMP TEXTURE PATTERN DETAIL

2' x 4' TRUNCATED DOME HIGH CONTRAST YELLOW DETECTIBLE WARNING MAT

USE INLINE GRID PATTERN

SLOPE 1:50 TO BACK OF SIDEWALK

NO LIP

4" CONCRETE

4" OF 3/4" - 0" COMPACTED CRUSHED ROCK COMPACTED BASE

SECTION A-A

SECTION B-B

NOTES:
1. CONCRETE SHALL HAVE STRENGTH OF 3300 P.S.I. AT 28 DAYS.
2. SIDEWALK RAMPS ARE REQUIRED AT ALL NEW INTERSECTIONS.
3. REPLACEMENT CURBS MUST BE Poured AGAINST A VERTICAL EDGE OF EXISTING CURB.
4. CONCRETE IN A REPLACEMENT CURB SHALL NOT PROTRUDE PAST THE FACE OF THE CURB IN THE ASPHALT REPLACEMENT AREA.
5. HORIZONTAL AND VERTICAL ALIGNMENT SHALL BE WITHIN 1/8" IN 10'.
6. DETECTIBLE SURFACE SHALL BE CONSTRUCTED WITH PREFABRICATED UNITS. TEXTURE SHALL NOT BE WET IMPRINTED. TRUNCATED DOME PATTERN SHALL BE INLINE, ALIGNED IN THE DIRECTION OF THE RAMP.
7. DETECTIBLE SURFACE SHALL BE YELLOW (FEDERAL COLOR #33538).
8. THIS DETAIL IS APPROVED FOR USE IN THE PUBLIC RIGHT OF WAY ONLY.
NOTES

1. CONCRETE SHALL HAVE STRENGTH OF 4000 P.S.I. AT 28 DAYS.
2. LIMITS OF DRIVEWAY SHALL BE SAW CUT.
3. APPLY A LIGHT BROOM FINISH TRANSVERSE TO THE SIDEWALK.
4. CURB AND APPROACH SHALL BE POURED MONOLITHICALLY.
5. IF WIDTH IS GREATER THAN 15 FEET, INSTALL CONTRACTION JOINT IN CENTER OF THE DRIVEWAY.
6. FABRIC EXPANSION JOINT SHALL NOT BE USED.
7. WORK AGGREGATE INTO CONCRETE PRIOR TO FINISHING CONCRETE.
8. APPLY CURING COMPOUND TO FRESH CONCRETE TO RETAIN MOISTURE.
9. MINIMUM DRIVEWAY WIDTH OF 12’ AND MAXIMUM WIDTH OF 24’ 3 CAR GARAGE MAXIMUM WIDTH OF 28’.
NOTES:

1. MINIMUM SLOPES
   0.5% AT CURB AROUND BULB
   2.0% CROSS SLOPE TO CURB

STANDARD

OFFSET

PROFILE

NTS

+2.0%
RESIDENTIAL STREET CROSS SECTION

TYPE "A" SIDEWALK
STD DWG. NO. 503

CURB AND GUTTER
STD DWG. NO. 501

CROWN OF ROAD
MEET GRADE OF CURB

2 - 1 1/2" LIFTS - CLASS "C" A.C.
3" - 3/4" - 0" COMPACTED CRUSHED ROCK
6" - 1 1/2" - 0" COMPACTED CRUSHED ROCK
COMPACTED SUBGRADE

54' TO 60'
27' TO 30'
16' TO 18'

CITY OF AMITY
STANDARD CONSTRUCTION
DRAWINGS
CITY HALL: 109 MADDOX
AVENUE
MAILING ADDRESS: P.O. BOX
159 AMITY, OR 97101
OFFICE PHONE:
(503) 835-3711
INTERSECTION PAVING PLAN

STREET WIDTH "A" | TRAFFIC LANE WIDTH "B"
---|---
32' | 11'
34' | 12'
36' | 13'
40' | 15'
46' | 18'

NOTE:
THIS PAVING PATTERN NOT TO BE USED WHEN INTERSECTING GRADES ARE LESS THAN .50%
NOTES

1. MONUMENTS TO BE SET AT ALL STREET INTERSECTIONS, POINTS OF CURVATURE AND POINTS OF TANGENCY.
NARROWING OF DRIVING AREA

NOTES:
ALTERNATING RED & WHITE HIGH INTENSITY PRISMATIC 0.080 ALUMINUM SHEETING SHALL BE SCREWED TO THE HORIZONTAL RAILS = MINIMUM 1" SCREWS
ALL FASTENERS TO BE STAINLESS STEEL OR RUST PROOF HEAVY GALVANIZED
FOR STREET BARRICADES HORIZONTAL RAIL LENGTH SHALL EQUAL THE DISTANCE BETWEEN THE FACE OF CURB PLUS 2'. (EG. 34' CURB TO CURB= 36' RAILS)
HORIZONTAL WOOD RAILS TO BE PRESSURE TREATED AND PAINTED WHITE
USE 2"X5" GALVANIZED CARRIAGE WITH FLAT AND LOCK WASHER, 2 BOLTS PER RAIL PER POST

END OF ROAD BARRICADE
(TYPICAL DIMENSIONS AND LAYOUT)
1. **MATERIALS:**

   - 2" x 2" x 63", 12 GA. GALV. PERFORATED STEEL POST.
   - 3/8" x 3 1/2", GALVANIZED HEX HEAD BOLT WITH LOCK WASHER.
   - 2 1/2" x 2 1/2" x 18", 12 GA. GALV. PERFORATED STEEL STIFFNER POST.
   - 2 1/4" x 2 1/4" x 30", 12 GA. GALV. PERFORATED STEEL ANCHOR.
   - 7/16" x 5", GALVANIZED CARRIAGE WITH FLAT AND LOCK WASHER, 2 BOLTS PER RAIL PER POST.

2. **BARRICADE FOR SIDEWALK IS SIMILAR.**

**SECTION A - A**

1. FOR APPLICATION OF BARRICADE ON EXISTING CONCRETE, USE TELSPAR STEEL BASE PLATE PER DETAIL ON STANDARD DRAWING #525B, STANDARD SIGNPOST CONCRETE APPLICATIONS DETAIL.
**NOTE:**

1. **2"x8" TYPICAL STANDARD OR BETTER**
   - **Sheeting**
   - **1" TYPICAL**
   - **12" MAX.**

2. **Firm native compacted soils typical**
   - **See post support detail 516B**
   - **Backfill and compact with 3/4"-0" crushed rock typical**

3. **END OF SIDEWALK BARRICADE**
   - (TYPICAL DIMENSIONS AND LAYOUT)

4. **END OF SIDEWALK ('TYPE A')**
5. **END OF SIDEWALK ('TYPE B')**

- **Maintain 2' from edge of roadway typical**
- **Maintain 1' from edge of roadway typical**

- **Curb**
- **Sidewalk Barricade**
- **Roadway**
- **Landscaping**

**NOTES:**

- **Alternating red & white high intensity prismatic 0.080 aluminum sheathing shall be screwed to the horizontal rails - minimum 1" screws**
- **All fasteners to be stainless steel or rust proof heavy galvanized**
- **Use 3"x5" galvanized carriage with flat and lock washer, 2 bolts per rail per post**
- **Sheeting to angle towards the roadway**

---

**CITY OF AMITY STANDARD CONSTRUCTION DRAWINGS**

**CITY HALL: 109 MADDOX AVENUE**

**MAILING ADDRESS: P.O. BOX 159 AMITY, OR 97101 OFFICE PHONE: (503) 835-3711**

**END OF SIDEWALK BARRICADES**

**SCALE:**

**DATE:** March 2021

**APPROVED BY:** G. Mathis

**STANDARD DRAWING:** 516C
TRENCH PAVING

MAXIMUM PAYMENT WIDTH

PIPE O.D. + 30"

Saw Cut Edge

Saw Cut Edge

ASPHALT CONCRETE

3/4" - 0" CRUSHED ROCK

91% RELATIVE COMPACTION

CLASS "B" BACKFILL

NOTES:

1. SAW CUT ASPHALT TO NEAT STRAIGHT LINES.
2. ASPHALT – CLASS "C" MIX PLACED IN 2 LIFTS.
3. ALL JOINTS SHALL BE SEALED WITH RUBBERIZED ASPHALT EMULSION (HOT OR COLD) AND DE-TACKED WITH SAND IF IMMEDIATE TRAFFIC IS NEEDED AT ALL JOINTS.
4. ACTUAL PAYMENT WIDTH TO BE DETERMINED AT SITE PRIOR TO PAVING.
5. REFERENCE DESIGN STANDARDS MANUAL SECTION 5.22 FOR ADDITIONAL TRENCH PAVING REQUIREMENTS.
1 1/2" VERTICAL SAW CUT

3" PVC
MIN. SLOPE 1%

1/2" DEEP SAW CUT ON DASHED LINES

REMOVE CURB IN CROSS HATCHED AREA

CITY OF AMITY
STANDARD CONSTRUCTION
DRAWINGS
CITY HALL: 109 MADDOX
AVENUE
MAILING ADDRESS: P.O. BOX
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RAIN DRAIN CURB CUT
GEO Textile Specifications

<table>
<thead>
<tr>
<th>Property</th>
<th>Test</th>
<th>Min. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength, lbs</td>
<td>ASTM D-4632</td>
<td>80</td>
</tr>
<tr>
<td>Elongation, %</td>
<td>ASTM D-4632</td>
<td>50</td>
</tr>
<tr>
<td>Asphalt Retention, gal/sy</td>
<td>OSHD TM-817</td>
<td>0.20</td>
</tr>
<tr>
<td>Melting Point, °F</td>
<td>ASTM D-276</td>
<td>300</td>
</tr>
</tbody>
</table>

NOTES

1. Overlay pattern for different width streets will be similar.
2. Offset paving panels 12" min. from joints of existing pavement.
ALL SIGNS SHALL BE HIGH INTENSITY REFLECTIVE PRISMATIC GRADE SHEETING AT MINIMUM

SIGN POST SHALL NOT EXTEND ABOVE THE SIGN

PRIMARY SIGN

SECONDARY SIGN

1" MIN.

2" STANDARD
(1" MINIMUM)

2" SQUARED 12 GAUGE POST

6" MINIMUM

7" MINIMUM

REFERENCE: MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES SECTION 2

SIGN CLEARANCES
<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>BLADE SIZE</th>
<th>UPPER CASE LETTER HEIGHT</th>
<th>LOWER CASE LETTER HEIGHT</th>
<th>DIRECTION (N,S,E,W)</th>
<th>DESIGNATION (ST,DR,ETC.)</th>
<th>LETTER SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 OR LESS</td>
<td>8&quot; High</td>
<td>4&quot;</td>
<td>3&quot;</td>
<td>2 1/2&quot;</td>
<td>1/2&quot; SMALLER THAN LOWER CASE LETTER</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>30 OR HIGHER</td>
<td>9&quot; High</td>
<td>5&quot;</td>
<td>3 3/4&quot;</td>
<td>3 1/4&quot;</td>
<td></td>
<td>3/4&quot;</td>
</tr>
</tbody>
</table>

Private streets shall be as shown below with a blue background in place of green.

Adjust blade length to accommodate length of street name type:

Flat double faced, .125 aluminum.

Street name sign: High intensity reflective prismatic grade sheeting.

Color/design:
White lettering on green with white border as shown.

Notes:
Maintain 9" of clearance from the bottom of the lowest street sign to finish grade.

Sleeve shall be 30" - 12GA x 23/8" SQ. TUBE.

Post shall be 12GA x 2" SQ. TUBE.

Locate posts so traffic control signs can be placed on the same post with proper clearance.

Do not use abbreviations for street names (MT. View vs. Mountainview).

All signs shall be high intensity prismatic grade sheeting.

---

**Sign Post Locations**

- **Type 'B' Sidewalk**
  - 2' from the back of sidewalk

- **Type 'A' Sidewalk**
  - 36"
  - 1 3/4"
  - 5"
  - 2 1/2"
  - 1/2" thick border
  - 1-1/2" radius

- **E.R.**
  - 7/8" radius
  - 5/16"
  - 7/8" radius

- **N First St**
  - 24" min.
  - 1 3/4"
  - 8"
  - 4"
  - 2 1/2"
  - 1/2" thick border

- **N First Pvt St**
  - 2 1/2"
  - 5/16"
NOTES:

1. SIGN POST SHALL BE INSERTED A MINIMUM OF 12" INTO THE 30" BASE.
2. SLEEVE SHALL BE 30" 12 GAUGE x 2 3/4" - POST SHALL BE 12GA x 2".
3. CAP AND CROSSPIECE TO BE THE SAME STYLE, 12" BLADE MINIMUM.
4. SEE DETAILS 525A & 525B FOR GROUND & CONCRETE SIGN APPLICATIONS
5. SEE CHAPTER 5 IN THE ENGINEERING DESIGN MANUAL FOR THE MATERIAL SPECIFICATIONS.
EXCAVATE STREET TO MINIMAL DEPTH SPECIFIED IN TABLE. CONSTRUCT MATERIAL AS SHOWN BELOW. SITE SOILS AND WEATHER CONDITIONS MAY REQUIRE GREATER STRUCTURAL SECTIONS AND GEOTEXTILE (NON-WOVEN) PER CITY ENGINEER.

<table>
<thead>
<tr>
<th>STREET TYPE</th>
<th>LOCAL</th>
<th>COLLECTOR</th>
<th>ARTERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPTH</td>
<td>LIFTS</td>
<td>DEPTH</td>
<td>LIFTS</td>
</tr>
<tr>
<td>CLASS C A.C.</td>
<td>3”</td>
<td>1</td>
<td>4”</td>
</tr>
<tr>
<td>LEVELING COURSE</td>
<td>3”</td>
<td>1</td>
<td>3”</td>
</tr>
<tr>
<td>3/4”-0” CRUSHED ROCK</td>
<td>6”</td>
<td>1</td>
<td>9”</td>
</tr>
</tbody>
</table>

TOTAL DEPTH

12” 16” 21”

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST</th>
<th>MIN. VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TENSILE STRENGTH, lbs</td>
<td>ASTM D-4632</td>
<td>120</td>
</tr>
<tr>
<td>ELONGATION, WET %</td>
<td>ASTM D-4632</td>
<td>40</td>
</tr>
<tr>
<td>COEFFICIENT OF WATER PERMEABILITY, cm/sec</td>
<td>ASTM D-4491</td>
<td>0.10</td>
</tr>
<tr>
<td>PUNCTURE STRENGTH, lbs</td>
<td>ASTM D-4833</td>
<td>80</td>
</tr>
<tr>
<td>MULLEN BURST STRENGTH, psi</td>
<td>ASTM D-3786</td>
<td>250</td>
</tr>
</tbody>
</table>

* LOCAL STREET TYPE = INTERIOR RESIDENTIAL SINGLE FAMILY DETACHED ZONES
NOTES
1. CONCRETE MIX: 4,000 PSI AT 28 DAYS
   WITH 6% ENTRAINED AIR.
### Requirements for dead end fire access roads

<table>
<thead>
<tr>
<th>Length (feet)</th>
<th>Width (feet)</th>
<th>Turnarounds Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-150'</td>
<td>20'</td>
<td>None Required</td>
</tr>
<tr>
<td>151'-500'</td>
<td>20'</td>
<td>120' hammerhead, 60' &quot;Y&quot;, or 96' diameter cul-de-sac</td>
</tr>
<tr>
<td>501'-750'</td>
<td>26'</td>
<td>120' hammerhead, 60' &quot;Y&quot;, or 96' diameter cul-de-sac</td>
</tr>
<tr>
<td>OVER 750'</td>
<td>SPECIAL APPROVAL REQUIRED</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
- Where a fire hydrant is located on a fire apparatus access road, the minimum road width shall be 26 feet.
- Road surfaces must be capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds.
- Fire apparatus access roads shall not exceed ten percent in grade. Grades steeper than ten percent must be approved by the Fire Marshal.
NOTES:
1. The entrance shall be maintained in a condition that will prevent tracking or flowing of sediment onto public right-of-ways. This may require top dressing, repair and/or cleaning of any measures used to trap sediment.
2. When necessary, wheels shall be cleaned prior to entrance onto public right-of-way.
3. When washing is required, it shall be done on an area stabilized with crushed stone that drains into an approved sediment trap or sediment basin.
4. Where runoff containing sediment-laden water is leaving the site via the construction entrance, other measures shall be implemented to divert runoff through an approved filtering system.
5. DIMENSIONS
   SINGLE FAMILY AND DupLEX
   20' LONG BY 20' WIDE, 8' DEEP OF 3/4" MINUS CLEAN ROCK.
   COMMERCIAL
   50' LONG BY 20' WIDE, 3-6' DEEP CLEAN ROCK.
   Governing authority may require geotextile fabric to prevent sub-soil pumping.
1. EXCAVATE TRENCH

2. PLACE AND STAKE STRAW BALES

3. BACKFILL AND COMPACT THE EXCAVATED SOIL

GENERAL NOTES:

1. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF 4”.

2. BALES SHALL BE SECURELY ANCHORED IN PLACE BY ½” REBAR OR 2"x2" WOODEN STAKES DRIVEN THROUGH THE BALES.

3. INSPECTION SHALL BE PERFORMED WEEKLY OR AFTER EACH RAINFALL EVENT. REPAIR AND OR REPLACEMENT SHALL BE MADE AS NEEDED BY THE CONTRACTOR, OR AS DIRECTED BY THE INSPECTOR.

4. WHEN SILT REACHES A DEPTH OF 6”, IT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED SITE.

5. AFTER THE SITE IS COMPLETELY STABILIZED, THE BALE AND ACCUMULATED SILT SHALL BE REMOVED AND DISPOSED OF AT AN APPROVED DISPOSAL SITE.
SILT FENCING
INSTALLATION PER
STANDARD DETAIL #602

FILTER FABRIC
GATHER EXCESS
FABRIC AT CORNERS

2x4 WOOD
FRAME

1.5' MAX.
3' MIN.

STRAW BALES ARE TO BE PLACED 4 INCHES
INTO THE SOIL TIGHTLY ABUTTING WITH NO
GAP, STAKE AND BACKFILL AROUND THE
ENTIRE OUTSIDE PERIMETER.

2x2 WOODEN STAKE
OR ... REBAR

WOVEN POLYPROPYLENE SACK

CATCH BASIN
1' REBAR FOR
BAG REMOVAL

CATCH
 Grate

STORM PIPE

POLYPROPYLENE
FILTER SACK
(8 woven)

2x2x2 RUBBER
BLOCKS

EXPANSION
RESTRAINT

BIO BAG FILTER

THIS METHOD OF INLET PROTECTION IS TO BE USED WHERE THE INLET
DRAIN IS LOCATED IN A RELATIVELY FLAT UNPAVED AREA (SLOPE <5%).

THIS METHOD OF INLET PROTECTION SHALL NOT BE USED IN STREETS,
TRAVELED AREAS, OR AREAS OF CONCENTRATED FLOW (DITCHES).
NOTES:
1. ADDITIONAL MEASURES MUST BE CONSIDERED DEPENDING ON SOIL TYPES.

2. BIO-FILTER BAGS SHOULD BE STAKED WHERE APPLICABLE USING (2) 1"x2" WOODEN STAKES OR APPROVED EQUAL PER BAG.

3. WHEN USING 30" BIO-BAGS TO PROTECT A CATCH BASIN YOU MUST HAVE 4 BAGS AND THEY SHALL BE OVERLAPPED BY 6".
W = GREATER OF: DIAMETER + 6' OR 3x DIAMETER
L = GREATER OF: 12' OR 4x DIAMETER

NOTES:
1. BIOFILTER BAGS REQUIRED ONLY WHEN DISCHARGING SEDIMENT-LADEN WATER.
2. STAKING OF BIOFILTER BAGS REQUIRED USING (2) 1"x2" WOOD STAKES OR APPROVED EQUAL PER BAG.
ABOVE-GROUND BASIN PLAN VIEW

10-MIL PLASTIC LINING

STRAW BALE (OR WOOD FRAME EQUIV.)

STAKES (2 PER BALE)

BELOW-GROUND BASIN PLAN VIEW

ABOVE-GROUND BASIN SECTION

10-MIL PLASTIC LINING

CONCRETE WASHOUT

(NO UNAUTHORIZED DUMPING)

BELOW-GROUND BASIN SECTION

10-MIL PLASTIC LINING

REMOVABLE RAIN COVER

REMOVABLE RAIN COVER

NOTES:
1. ACTUAL LAYOUT DETERMINED IN THE FIELD.
2. "CONCRETE WASHOUT" SIGN TO BE LOCATED ADJACENT TO WASHOUT FACILITY.
3. REMOVABLE RAIN COVER REQUIRED DURING WET WEATHER SEASON.
UNDISTURBED VEGETATION

INTERCEPTOR SWALE

USE DOZER TRACKS TO CREATE GROOVES PERPENDICULAR TO SLOPE

SLOPE

BMP NEEDED AT MIN. AT TOE OF SLOPE

ALL SLOPES TO BE SEEDED

SURFACE ROUGHENING CAT TRACKING
CHANNEL INSTALLATION

NOTES:
1. INFORMATION PROVIDED IS MINIMUM REQUIREMENTS. MANUFACTURES REQUIREMENTS WHICH ARE MORE STRINGENT SHALL BE USED.
2. INSTALL MAT PARALLEL IN CENTER OF CHANNEL IN THE DIRECTION OF FLOW. FOR CULVERT OUTFALLS, PLACE MAT UNDER CULVERT OR RIP RAP A MINIMUM OF 12 INCHES.
3. IN CHANNEL BOTTOM, OVERLAP LENGTH ENDS A MINIMUM OF 12 INCHES.
4. LENGTH OF STAPLES SHALL BE DETERMINED BY SOIL TYPE—COHESIVE SOIL USE 6 INCH, NON-COHESIVE SOILS 8–12 INCH.
MATS/BLANKETS SHOULD BE INSTALLED VERTICALLY DOWNSLOPE.

TYPICAL SLOPE
SOIL STABILIZATION

NOTES:
1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.
4. STAKING OR STAPLING LAYOUT PER MANUFACTURERS SPECIFICATIONS.

ISOMETRIC VIEW

STAPLES

BERM

NOT TO SCALE
TABLE 3-12 BARRIER SPACING FOR GENERAL APPLICATION

<table>
<thead>
<tr>
<th>% SLOPE</th>
<th>SLOPE</th>
<th>MAX SPACING ON SLOPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10%</td>
<td>&lt;10:1</td>
<td>300 ft</td>
</tr>
<tr>
<td>10-15%</td>
<td>10:1 to 7.5:1</td>
<td>150 ft</td>
</tr>
<tr>
<td>15-20%</td>
<td>7.5:1 to 5:1</td>
<td>100 ft</td>
</tr>
<tr>
<td>20-30%</td>
<td>5:1 to 3.5:1</td>
<td>50 ft</td>
</tr>
<tr>
<td>30-50%</td>
<td>3.5:1 to 2:1</td>
<td>25 ft</td>
</tr>
</tbody>
</table>

NOTES:
1. STAKING SPECIFICATIONS:
   A. 1"x2" WOODEN STAKES.
   B. ADDITIONAL STAKES MAY BE INSTALLED ON DOWNHILL SIDE OF WATTLES ON STEEP SLOPES OR HIGHLY EROSI VE SOILS.
2. SPACING IN ACCORDANCE WITH TABLE 3-12.