Agenda Item Number 5.3

Resolution No. 05-3574, Establishing a Regional Habitat Protection, Restoration and Greenspaces Initiative Called Nature in Neighborhoods.

Metro Council Meeting
Thursday, April 28, 2005
Metro Council Chamber

BEFORE THE METRO COUNCIL

ESTABLISHING A REGIONAL HABITAT PROTECTION, RESTORATION AND GREENSPACES INITIATIVE CALLED NATURE IN NEIGHBORHOODS	)	RESOLUTION NO. 05-3574
	)	Introduced by Metro President David Bragdon and Metro Councilor Carl Hosticka

WHEREAS, Oregonians have a long tradition of understanding the interdependent values of economic prosperity and environmental quality, both of which constitute important elements of the livability that distinguishes this state and the Portland metropolitan region; and

WHEREAS, residents of the Metro region value having nature near where they live, work, and play and have expressed the desire to keep nature in neighborhoods as a legacy to future generations; and

WHEREAS, the Metro Policy Advisory Committee (MPAC), composed of elected officials representing the region's local governments, adopted a "Vision Statement" in 2000 to enunciate the region's commitment to improve the ecological health and functionality of the region's fish and wildlife habitat; and

WHEREAS, the Metro Council has expressed, as one of four central goals for the region, the aspiration that "The region's wildlife and people thrive in a healthy urban ecosystem," and identified this goal as a priority for near term action; and

WHEREAS, the Metro Council has expressed, as a regional objective, the aspiration that "Natural areas, park land and outdoor recreation infrastructure are available near housing and employment" and identified this objective as a priority for near term action; and

WHEREAS, fish and wildlife habitat depends on healthy functioning watersheds and follows the natural contours of the landscape, while political and organizational boundaries frequently split watersheds and divide the natural landscape; and

WHEREAS, residents enjoy trails, greenspaces, streams, and wildlife throughout the region regardless of which local political jurisdiction these resources happen to fall within; and

WHEREAS, protection and restoration of fish and wildlife habitat and the integration of greenspaces into the urban landscape is of a scope and magnitude beyond the reach of any single organization and will require the concerted effort and coordinated action of many individuals and organizations including local, regional, state, and federal agencies, watershed councils, soil and water conservation districts, friends groups, building trades firms and organizations, industry groups, environmental groups, businesspeople, and homeowners across the region; and

WHEREAS, Metro, as a regional government, is well positioned to lead regional initiatives involving collaborative action among individuals and organizations throughout the region and the Metro Council has identified, through its strategic planning process, that Metro should serve in this capacity; and

WHEREAS, a successful initiative to restore and protect fish and wildlife habitat and integrate greenspaces into the urban environment will require leadership, communication, conservation education, expert assistance, new partnerships, incentives, habitat-friendly development practices, development standards, restoration of degraded habitat, willing-seller acquisition of prime habitat, coordinated and targeted investment, and performance tracking and reporting; and

WHEREAS, Metro operates successful and effective fish and wildlife education programs through the Oregon Zoo, Solid Waste and Recycling Department, Regional Parks and Greenspaces Department, and Planning Department that could be re-directed towards a coordinated regional fish and wildlife initiative; and

WHEREAS, Metro operates habitat restoration initiatives through its Regional Parks and Greenspaces Department that have restored hundreds of acres of streams and upland habitat in the region and these efforts could be an important component to a coordinated regional fish and wildlife initiative; and

WHEREAS, Metro has amassed a considerable foundation of data and expertise in evaluating habitat values, including a region-wide inventory and map of habitat comprising over 80,000 acres that has been classified for its functional values, an investment that could be central to the implementation of a coordinated regional fish and wildlife initiative; and

WHEREAS, Metro's Parks and Greenspaces Department and Planning Department has demonstrated success in integrating trails, streams, and greenspaces into the urban environment and such expertise would be valuable as part of a regional fish and wildlife and greenspaces initiative; and

WHEREAS, Metro has unique skill and expertise in willing-seller acquisition programs, having completed the purchase of more than 8,000 acres of high quality parks and greenspaces property as part of a bond measure approved by the region's voters in 1995, and this skill and expertise will be essential to the willing-seller acquisition element of a regional fish and wildlife initiative; and

WHEREAS Oregon Zoo staff are nationally renowned for their work on species conservation, and

WHEREAS, the Oregon Zoo's "Great Northwest" exhibits emphasize ecosystems proximate to the metropolitan region; and

WHEREAS Metro has authority under State Land Use Goal 5 that provides an important means to create consistency across the landscape in the protection of fish and wildlife habitat; and

WHEREAS, Metro monitors and reports on key regional performance measures relating to habitat and quality of life in the region, a function that will be essential to the ongoing guidance and management for fish and wildlife protection and restoration; and

WHEREAS, Metro provides communications related to fish and wildlife habitat protection, restoration and greenspaces through its Public Affairs and Government Relations Department and these activities could be a central component of a regional initiative; and

WHEREAS, Metro's existing fish, wildlife and greenspaces related programs and activities would be more successful and effective if they were aligned behind a single, strategic initiative to restore and protect fish and wildlife habitat in the Metropolitan Portland Region; and

WHEREAS, A coordinated regional initiative that establishes consistent and shared habitat standards and goals, Metro can help other jurisdictions, organizations and individuals in the region with a role and stake in habitat protection, restoration and greenspaces become more strategic and effective; so therefore

BE IT RESOLVED that the Metro Council hereby directs the Chief Operating Officer to implement a coordinated regional fish and wildlife habitat protection, restoration and greenspaces initiative with the following provisions:

1. The regional fish and wildlife protection, restoration and greenspaces initiative will be named "Nature In Neighborhoods."

2. Nature in Neighborhoods shall have seven goals: 1) conserve and improve streamside, wetland and floodplain habitat and their connections in watersheds, 2) conserve large areas of contiguous habitat and avoid habitat fragmentation, 3) conserve and improve connections between corridors and upland habitat, 4) promote the use of development practices that are friendly to habitat, 5) restore degraded watershed sites to compensate for adverse ecological effects of land-use practices, and mitigate impacts for new development, 6) Preserve and improve special habitats of concern such as bottom land hardwood forests, wetlands and riverine islands, 7) increase opportunities for residents to experience and enjoy the region's natural surroundings.

3. Activities and programs at Metro's Regional Parks and Greenspaces Department, Planning Department, Solid Waste and Recycling Department, Oregon Zoo, and Public Affairs & Government Relations Departments that impact or could impact fish and wildlife habitat restoration or protection shall whenever possible support and coordinate with the Nature in Neighborhoods initiative.

4. Metro shall provide regional leadership to Nature in Neighborhoods by convening, coordinating, communicating, educating, assisting, providing incentives to, focusing and leveraging the talents, skills, resources, and concerted action of the many organizations and individuals who have a role to play and a stake in the outcome of Nature in Neighborhoods.

5. Nature in Neighborhoods shall include five elements: 1) habitat friendly development practices; 2) restoration initiatives; 3) willing seller acquisition; 4) development requirements for streamside habitat; and 5) monitoring and reporting, as outlined in Exhibit A.

ADOPTED by the Metro Council this _____ day of _____, 2005.

_____
David Bragdon, Council President

Approved as to Form:

_____
Daniel B. Cooper, Metro Attorney

EXHIBIT A TO RESOLUTION NO. 05-3574

Nature in Neighborhoods Initiative Description

Nature in Neighborhoods is a regional habitat protection, restoration and greenspaces initiative that inspires, strengthens, coordinates, and focuses the activities of individuals and organizations with a stake in the region's fish and wildlife habitat, natural beauty, clean air and water, and outdoor recreation. Metro plays a lead role in Nature in Neighborhoods, but recognizes that the protection and restoration of fish and wildlife habitat and the integration of greenspaces into the urban environment is a task of scope and magnitude beyond the reach of any one organization; it will take the coordinated and strategic action of many. Nature in Neighborhoods has five elements:

1. *Habitat-friendly development practices*—encouraging development in the future to be kinder to the environment than development in the past using innovative site design, new materials and engineering techniques.
2. *Restoration and stewardship*—building on Metro's successful track record of partnering with others to restore key wetland, streamside and upland sites and naturalist programs that educate the public on the value of natural areas.
3. *Acquisition* – Metro intends to place a bond measure before the voters in 2006 that would create a funding source to acquire critical fish and wildlife habitat in the urban area.
4. *Flexible development standards* – establishing a consistent regional standard for fish and wildlife habitat protection that provides additional support for improving water quality. In new urban areas, the Nature in Neighborhood Initiative promotes planning for growth to protect natural areas better than through past practices.
5. *Monitoring and reporting* – taking responsibility for measuring the progress made in the region on habitat area protection and restoration, reporting on the results and sharing the results with all of the Nature in Neighborhood partners for use in refining the initiative elements.

Metro will provide overall leadership and coordination to the initiative, providing a range of resources and expertise to partner organizations and the region's residents. The initiative will be supported by a Nature in Neighborhoods staff team dedicated solely to the initiative. Resources available in Metro's Planning Department, Regional Parks and Greenspaces Department, Oregon Zoo, Solid Waste and Recycling Department, and Public Affairs & Government Relations Departments will be coordinated in support of Nature in Neighborhoods.

Metro will work with its public, nonprofit, and private partners to implement a comprehensive communications strategy that supports and integrates the five initiative elements and elevates the level of awareness, understanding and commitment behind the initiative.

1. Habitat-friendly development practices

Using habitat-friendly development practices, or low impact development (LID), can help a community better protect its streams, fish and wildlife habitat, wetlands, and drinking water supplies as it grows. Several cities in the region are already encouraging the use of these practices, and some developers are making a point of reducing the impacts of the built environment by meeting environmental standards such as LEED[1]. Much can be done to encourage habitat-friendly development practices in upland habitats and throughout the region by providing incentives, education, and technical assistance.

The use of these habitat-friendly practices can serve to increase the value of developments both at the outset and over time. Studies have shown that residential and commercial uses near open space and water features are more valuable and desirable. Additionally, innovative stormwater management practices that use natural processes to retain and detain stormwater runoff on-site may be less expensive to construct and maintain. The regional fish and wildlife habitat protection initiative will benefit people in addition to fish and wildlife. Protecting and restoring streamside habitat areas will have a direct positive impact on water quality. Increased management of stormwater runoff on-site through natural processes will also substantially improve water quality while allowing urban-style development to occur.

Metro will establish a Habitat-Friendly Development Practices Program to coordinate efforts to reduce the impacts of new development and collaborate with regional partners to increase public awareness of the value of habitat areas, including activities such as:

1. ***Expert assistance for developers and design awards program.*** Promote habitat-friendly development practices to the development community through a variety of technical assistance, education, and outreach activities. Examples include:
    - Award program to foster and recognize habitat-friendly development projects, including an annual award ceremony and certificates.
    - Sponsor seminars and conferences to promote habitat-friendly development practices.
    - Actively work with the development community to promote habitat-friendly development practices.
2. ***Remove barriers to habitat-friendly development.*** Provide technical assistance to cities and counties to implement fish and wildlife habitat program recommendations, including working with local jurisdictions to identify barriers in local codes that limit habitat-friendly development practices.
3. ***Financial incentives.*** Offer financial incentives for specific building projects that incorporate habitat-friendly development practices, especially those improving habitat conditions.[2]
4. ***Incorporate habitat priorities with regional transportation funding.*** Establish a priority for funding transportation projects based on their impacts to regionally significant fish and wildlife habitat.[3]

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[1] Leadership in Energy and Environmental Design, a national program implemented by the U.S. Green Building Council. Portland is recognized as a leader nationwide, with over 40 certified projects.

[2] Metro currently provides funding to projects in Centers and for Transit-Oriented Development. Projects are encouraged to use habitat-friendly practices.

2. Restoration and stewardship

Restoration is a critical component of an effective Nature in Neighborhoods Initiative. Without active restoration efforts, ecological conditions are likely to deteriorate further, even if most habitat lands are protected through regulations. Stewardship programs publicly acknowledge landowners, businesses and other entities for conserving open space, protecting or restoring habitat areas, making financial contributions or carrying out good stewardship practices in general. These programs, while not widely applied in the Metro area, have much potential for encouraging conservation behavior when combined with other programs.

Metro will take a leadership role to enhance restoration efforts carried out by individuals, cities and counties, non-profits, government agencies, and businesses and increase habitat stewardship throughout the region by supporting the following activities:

1. ***Support existing restoration efforts.*** Offer technical and/or financial assistance to groups that are actively conducting restoration projects. Examples include assisting with administrative matters, mapping, and coordination.
2. ***Identify regional restoration priorities.*** Coordinate with existing non-profit and governmental agencies to establish restoration priorities for the region, especially in those watersheds where few restoration activities are occurring.
3. ***Establish restoration pilot projects.*** Expand successful pilot projects such as the eradication of Japanese Knotweed from the streamside along the Sandy River.
4. ***Monitor restoration efforts.*** Create a regional geographic information system database drawing on watershed action plans, Metro's regional habitat inventory and other sources of information to help identify watershed restoration priorities and track implementation of restoration and mitigation projects over time
5. ***Enhance existing Metro programs.*** Coordinate fish and wildlife education messages into ongoing Metro program areas.[4]
6. ***Support habitat education.*** Coordinate regional messages on fish and wildlife habitat, watershed function, and water quality to encourage people to think on a more broad and time-sensitive scale.
    a. Increase awareness among schoolchildren, interested public, and property owners about practices that protect clean water and improve fish and wildlife habitat.
    b. Provide small group "on the ground" environmental education to children and adults focusing on the importance of urban stream corridors for wildlife connectivity, the impact of invasive weeds on wildlife health, and what citizens can do to improve fish and wildlife habitat in their local and regional community.
    c. Encourage the placement of signs in habitat areas as an important component of an educational program.
    d. Develop a list of all education programs in the region and determine which are most effective.
    e. Organize and prioritize a regional education campaign and provide a clearinghouse for education materials and referrals.

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[3] A criterion could be added to the MTIP funding priorities that focuses on habitat issues, such as culvert replacement or removal, wildlife crossing improvements, or implementation of Green Streets design standards.
[4] Zoo exhibit on Metro urban fish and wildlife habitat ("Wild in the City) and enhancement of Solid Waste and Recycling programs to target homeowners and developers of residential properties.

7. ***Increase funding available for restoration.*** Seek interagency and non-profit support for increased federal and state grant funding directed at watershed-based restoration activities.[5]
8. ***Stewardship Program.*** Develop a Regional Fish and Wildlife Habitat Stewardship program that recognizes landowners for restoring and protecting habitat on their land.
    a. Sponsor a yearly award ceremony, provide certificates, and encourage media coverage.
    b. Develop signed voluntary stewardship agreements between a property owner and Metro or another sponsor for habitat protection.
9. ***Tax incentives for habitat protection and restoration.*** Encourage cities and counties to implement existing property tax incentive programs within the Metro region.[6]

3. Acquisition

The most effective long-term strategy for protecting fish and wildlife habitat is to purchase properties to remain in natural conditions in perpetuity. A major component of Metro's Nature in Neighborhoods Initiative is to initiate a bond measure for acquisition and restoration of regionally significant fish and wildlife habitat. Metro can also undertake other activities to raise dollars and leverage bond money to permanently protect habitat. Metro will undertake the following activities:

1. ***Bond Measure.*** Prepare for initiating and managing a bond measure program, including the following components:

a. Coordinate with non-profit groups, local governments, citizens and others to identify regional target areas including habitat in the Damascus and Pleasant Valley areas
b. Identify local share funds as part of the bond measure proposal
c. Create a challenge grant program for local governments and non-profit organizations to leverage the use of public bond measure funds in acquisition and restoration efforts
d. Create a short-term revolving fund to purchase land in targeted areas, implement conservation easements and use surplus funds (resale revenue) to create a funding source for land management purposes

2. ***Pursue grants for acquisition.*** Apply for grants that can lead to targeted acquisition for prime areas, such as opportunities in the Damascus and other new urban area planning.
3. ***Tie future density increases to revenue for habitat.*** Explore the potential of requiring any future upzoning throughout the region to require the purchase of a TDR or a density transfer fee to be used for habitat protection.

Cities and counties also have opportunities to explore methods of funding the purchase of fish and wildlife habitat. Some cities have already implemented programs to purchase or permanently preserve habitat, including:

1. ***Development fees.*** System Development Charge (SDC) programs to purchase floodplains and/or other special habitats.

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[5] Potential funding sources such as National Fish and Wildlife Foundation, USFWS Conservation and Restoration funds, EPA Smart Growth funds, etc.

[6] Existing state tax incentive programs include the Wildlife Habitat Conservation Management Program (WHCMP) and the Riparian Lands Tax Incentive Program (RLTIP). Neither programs are currently implemented within the urban area, but cities and/or counties could authorize their use to encourage habitat protection and restoration.

2. ***Floodplains.*** Federal Emergency Management Agency (FEMA) grants to purchase floodplains, removing development in floodplains from future harm and potentially reducing flood risk throughout a watershed by restoring floodplain functions.

4. Flexible Development Standards for Streamside Habitat and New Urban Areas

The Metro Council proposes to protect streamside habitat (Class I and II Riparian) within the urban growth boundary and upland habitat (Class A and B) in future urban growth boundary expansion areas with flexible development standards. Of the 80,000 acres in Metro's regionally significant habitat inventory, about 41,000 are in Class I and II riparian habitats are designated as Habitat Conservation Areas and will receive extra protection. Streamside habitat areas are the most valuable, vulnerable, and in some cases most protected habitats in Metro's habitat inventory. The Nature in Neighborhoods initiative will minimize the impact on fish and wildlife habitat while allowing urban-style development to occur.

This program is intended to change the way development and redevelopment occurs near streams and wetlands, not to impact everyday actions on private property. The program would not prevent development on any property, but would require a change in the way development occurs within Habitat Conservation Areas. In some cases, a requirement for cities and counties to remove barriers to habitat-friendly development practices may, in fact, increase property values by allowing more innovation and potential reduction in stormwater impact fees.

Flexible development standards can provide property owners the ability to develop their properties while protecting some or all the habitat on a site. Some of these tools include:

- Building setback flexibility (e.g., zero or smaller setbacks).
- Clustering development on smaller lots while preserving the remaining habitat.
- Density bonus for protecting habitat.
- Transfer of development rights from one site to another more suited for higher density uses.

Metro Council will consider the regulatory component of the habitat protection program as an amendment of the Urban Growth Management Functional Plan. After acknowledgment by the State Land Conservation and Development Commission, cities and counties within the Metro region will be required to amend their comprehensive plans to be in compliance with the regional habitat protection program. Consistent with Metro's goal of providing regional consistency and local opportunity for flexibility when implementing regional policies, Metro will provide several options for a city or county to comply. Compliance with regional habitat protection requirements will also satisfy state requirements, reducing duplicative efforts.

Future Urban Growth Boundary Expansion Areas

Expectations for urban-style development are different in areas that are brought inside the urban growth boundary in the future. Metro Council supports protecting more habitat in these areas where it is easier to plan for a system of natural habitats integrated with the built environment. The Nature in Neighborhoods initiative will guide how to plan for growth in new urban areas that accounts for the most valuable streamside (Class I and II) and upland (Class A and B) habitats.

5. Monitoring and reporting

Metro will monitor and report to the region on key regional performance measures relating to the success of the region in protecting and restoring habitat areas. As part of the monitoring and reporting element, Metro will track progress in habitat acquisition and restoration efforts and will continue to map the streams, wetlands, floodplains, vegetation and habitats of concern to monitor habitat quality and quantity by watershed. By coordinating with other agencies and jurisdictions that track stream and upland health Metro will present a regional scorecard of progress in achieving performance objectives. These include:

1. Preserve and improve streamside, wetland, and floodplain habitat and connectivity
2. Preserve large areas of contiguous habitat and avoid fragmentation
3. Preserve and improve connectivity for wildlife between riparian corridors and upland wildlife habitat.
4. Preserve and improve special habitats of concern.
5. Promote the use of habitat-friendly development practices.
6. Restore degraded watershed sites to compensate for adverse ecological effects of land use practices and mitigate impacts for new development.

Agenda Item Number 5.4

Resolution No. 05-3577, Approving the Tualatin Basin Natural Resources Coordinating Committee's Fish and Wildlife Habitat Protection Program.

Metro Council Meeting
Thursday, April 28, 2005
Metro Council Chamber

BEFORE THE METRO COUNCIL

APPROVING THE TUALATIN BASIN NATURAL RESOURCES COORDINATING COMMITTEE'S FISH AND WILDLIFE HABITAT PROTECTION PROGRAM	)))))	RESOLUTION NO. 05-3577. Introduced by Michael Jordan, Chief Operating Officer, with the concurrence of David Bragdon, Council President

WHEREAS, the Regional Framework Plan and Urban Growth Management Functional Plan ("UGMFP") state that Metro will undertake a program for protection of fish and wildlife habitat; and

WHEREAS, in the year 2000 Metro initiated work that has included extensive scientific studies, mapping, and analysis to develop a regional fish and wildlife habitat protection program consistent with the requirements of Statewide Planning Goal 5 and the administrative rules adopted to guide the application of Goal 5, division 23 of chapter 660 of the Oregon Administrative Rules; and

WHEREAS, Metro completed a draft inventory of regionally significant fish and wildlife habitat in the Metro region in August 2002; and

WHEREAS, in 2002, Washington County, the cities of Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, Sherwood, Tigard, and Tualatin, Clean Water Services, and the Tualatin Hills Parks and Recreation Department joined together to form the Tualatin Basin Natural Resource Coordinating Committee ("TBNRCC"); and

WHEREAS, on May 22, 2002, Metro and the TBNRCC entered into an intergovernmental agreement (the "IGA"), approved by the Metro Council on May 16, 2002, by adoption of Resolution No. 02-3195 (which resolution includes a copy of the agreement and of the TBNRCC formation agreement), that authorized the TBNRCC, in close coordination with Metro, to conduct its own analysis of the economic, social, environmental, and energy ("ESEE") consequences of protecting or not protecting fish and wildlife habitat in the Tualatin Basin, using the draft regional fish and wildlife habitat inventory developed by Metro; and

WHEREAS, pursuant to the IGA the TBNRCC has developed its own program to protect regionally significant fish and wildlife habitat based on its ESEE analysis, almost simultaneously with Metro's development of its program based on Metro's ESEE analysis; and

WHEREAS, the IGA was twice modified, as approved by the Metro Council on May 15, 2003, by adoption of Resolution No. 03-3332, and again on March 17, 2005, by adoption of Resolution No. 05-3557, to reflect delays in the development of the Metro and TBNRCC programs to protect regionally significant fish and wildlife habitat; and

WHEREAS, pursuant to the IGA, on April 4 the Tualatin Basin Natural Resource Coordinating Committee approved the Tualatin Basin Program and on April 7, 2005, the TBNRCC submitted its fish and wildlife habitat protection program, the "Tualatin Basin Goal 5 Program," attached hereto as Exhibit A, to Metro for review, approval, and, if approved by the Metro Council, inclusion in Metro's regional habitat protection program; and

WHEREAS, Metro is considering Ordinance No. 05-1077, "Amending The Regional Framework Plan and the Urban Growth Management Functional Plan Relating to Nature in Neighborhoods," to implement a regional fish and wildlife habitat protection program and, if approved by the Metro Council, the Tualatin Basin Goal 5 Program will be included into Ordinance No. 05-1077 as part of the regional program; and

WHEREAS, pursuant to the IGA Metro has solicited and will solicit comments on the Tualatin Basin Goal 5 Program from the public and from appropriate advisory committees including the Metro Policy Advisory Committee ("MPAC"), the Metro Technical Advisory Committee ("MTAC"), the Water Resources Policy Advisory Committee ("WRPAC"), and the Goal 5 Technical Advisory Committee ("G5TAC"), consistent with Metro's citizen involvement program; and

WHEREAS, pursuant to the IGA Metro has analyzed whether the Tualatin Basin Goal 5 Program substantially complies with the "overall goal" statement included in the "Streamside CPR Program Outline—Purpose, Vision, Goal, Principle, and Context," adopted by MPAC on October 4, 2000, (the "Vision Statement") a copy of which is included in Exhibit A to Metro Resolution No. 02-3195; and

WHEREAS, the "overall goal" is to "conserve, protect and restore a continuous ecologically viable streamside corridor system, from the streams' headwaters to their confluence with other streams and rivers, and with their floodplains in a manner that is integrated with the surrounding urban landscape. This system will be achieved through conservation, protection and appropriate restoration of streamside corridors through time"; and

WHEREAS, pursuant to the IGA Metro's review of the Tualatin Basin Goal 5 Program for compliance with the above standard has included evaluation of the program's potential to improve regionally significant habitat conditions basin-wide and within each of the basin's subwatersheds; now therefore

THE METRO COUNCIL RESOLVES AS FOLLOWS:

1. The Metro Council has considered and concluded review of the Tualatin Basin Goal 5 Program and supporting record and by adoption of this resolution takes action on that recommended program and supporting ESEE analysis as provided herein.

2. The Metro Council concludes that the Tualatin Basin Goal 5 Program has the potential to improve regionally significant habitat conditions basin-wide and within each of the basin's subwatersheds, and that it substantially complies with the "overall goal" of the Vision Statement provided that the following conditions are met:

    a. Within the compliance timeline described in Paragraph 6 of the IGA, the TBNRCC and its members comply with the six steps identified in section B of Chapter 7 of the Tualatin Basin Goal 5 Program Report, attached hereto as Exhibit A;

    b. Clean Water Services approves and begins implementing its Healthy Streams Plan;

    c. The TBNRCC members agree to renew and extend their partnership to implement the projects on the Healthy Streams Project List and target projects

that protect and restore Class I and II Riparian Habitat, including habitat that extends beyond the Clean Water Services "vegetated corridors," and the TBNRCC shall continue to coordinate its activities with Metro and cooperate with Metro on the development of regional public information about the Nature in Neighborhoods Initiative;

d. Provisions are adopted that require the use of habitat-friendly development practices, where technically feasible and appropriate, in all areas identified as Class I and II riparian habitat areas on the Metro Regionally Significant Fish and Wildlife Habitat Inventory Map. Table 3.07-13a in Exhibit C to Ordinance No. 05-1077 provides examples of the types of habitat-friendly development practices that shall be required;

e. Provisions are adopted that allow cities and counties to reduce the density and capacity requirements of Title 1 of the Urban Growth Management Functional Plan, Metro Code sections 3.07.110 to 170, consistent with Section 3(H) of Exhibit C to Ordinance No. 05-1077. Particularly, the provisions shall (1) apply only to properties that were within the Metro urban growth boundary on January 1, 2002; (2) require the protection of regionally significant habitat on the property, such as via a public dedication or restrictive covenant; and (3) allow only for a reduction in the minimum density calculation based on the are protected as provided in part (2) of this paragraph. In addition, cities and counties will be required to report to Metro as provided in Section 3(H)(3) of Exhibit C to Ordinance No. 05-1077;

f. Cities and counties that are members of the TBNRCC shall comply with the provisions of Exhibit C to Ordinance No. 05-1077 as those provisions apply to upland wildlife habitat in territory added to the Metro urban growth boundary after the effective date of that ordinance. Such compliance shall include compliance with one of subsections 3(B)(1) to 3(B)(3) of Exhibit C to Ordinance No. 05-1077. For example, (1) each city and county shall either adopt and apply Metro's Title 13 Model Ordinance to upland wildlife habitat in new urban areas, (2) substantially comply with the requirements of Section 4 of Exhibit C to Ordinance No. 05-1077 as it applies to upland wildlife habitat in new urban areas, or (3) demonstrate that they have implemented an alternative program that will achieve protection and enhancement of upland wildlife habitat in new urban areas comparable with the protection and restoration that would result from one of the two previous approaches described in this sentence; and

g. Cities and counties that are members of the TBNRCC shall comply with the monitoring and reporting requirements of Section 5 of Exhibit C to Ordinance No. 05-1077.

3. The conditions described in paragraph 2 of this resolution shall be incorporated as compliance conditions in Exhibit C to Ordinance No. 05-1077, "Amending The Regional Framework Plan and the Urban Growth Management Functional Plan Relating to Nature in Neighborhoods."

ADOPTED by the Metro Council this _____ day of _____, 2005.

David Bragdon, Council President

Attest:

Approved as to Form:

Christina Billington, Recording Secretary

Daniel B. Cooper, Metro Attorney

M:\attorney\confidential\07 Land Use\04 2040 Growth Concept\03 UGMFP\02 Stream Protection (Title 3)\02 Goal 5\01 TBNRCC\Res 05-3577 COO rec 041405.doc

EXHIBIT A—RESOLUTION NO. 05-3577

TUALATIN BASIN NATURAL RESOURCES COORIDNATING COMMITTEE GOAL 5 PROGRAM (WITH MAPS)

Item 1: Program Report
Item 2: Tualatin Basin program maps
Item 3: Clean Water Services Healthy Streams Plan
Item 4: Clean Water Services Design and Construction Standards

A copy of item 1 is attached to Resolution 05-3577

Items 2-4 are available online:

http://www.co.washington.or.us/deptmts/lut/planning/tualatin_basin.htm

http://www.CleanWaterServices.org

Partners for Natural Places

REVISED RECOMMENDATION

Tualatin Basin Goal 5 Program Report

Submitted to: Metro

Submitted by: Tualatin Basin Natural Resources Coordinating Committee

Prepared by: Tualatin Basin Steering Committee

March 28, 2005

Acknowledgements

Tualatin Basin Natural Resources Coordinating Committee

Beaverton	Rob Drake, Mayor – TBNRCC Vice Chair
Cornelius	Steve Heinrich, Mayor
Durham	Dean Gibbs, Councilor
Forest Grove	Richard Kidd, Mayor
Hillsboro	Tom Hughes, Mayor
King City	Ron Shay, Councilor
Metro	Carl Hosticka, Councilor
	Susan McLain, Councilor
North Plains	Cheryl Olson, Mayor
Sherwood	Mark Cottle, Mayor
Tigard	Nick Wilson, Councilor
	Sally Harding, Councilor (alternate)
Tualatin	Ed Truax, Councilor
THPRD	Deanna Meuller-Crispin, Director
	Joel Blowers, Director (alternate)
Clean Water Services	Andy Duyck, Commissioner
	Dick Schouten, Commissioner (alternate)
Washington County	Tom Brian, Commissioner – TBNRCC Chair
	John Leeper, Commissioner (alternate)

Tualatin Basin Goal 5 Steering Committee

Beaverton	Hal Bergsma, Principal Planner
	Barbara Fryer, Senior Planner
	Leigh Crabtree, Associate Planner
Cornelius	Richard Meyer, Community Development Director
Durham	Roel Lundquist, City Manager
Forest Grove	Jon Holan, Community Development Director
	Jeff Beiswenger, Senior Planner
Hillsboro	Patrick Ribellia, Senior Project Manager
	Valerie Counts, Planning Supervisor
	Jennifer Wells, Senior Planner
	Doug Miller, Urban Planner 1 – GIS Specialist
Metro	Chris Deffebach, Planning Manager
	Lori Hennings, Associate Regional Planner - Ecologist
North Plains	Don Otterman, City Manager
Sherwood	Dave Wechner, Planning Director
	Kevin Cronin, Planning Manager
Tigard	Duane Roberts, Associate Planner
	Julia Hajduk, Associate Planner
Tualatin	Jim Jacks, Special Projects Manager
	Stacy Hopkins, Associate Planner
THPRD	Julie Reilly, Natural Resources Planner
	Sarah Cleek, Park Planner
Clean Water Services	Craig Dye, Watershed Management Division Manager
	Kendra Smith, Water Resources Program Manager
	Jill Ory, Water Resource Analyst
Washington County	Brent Curtis, Planning Manager
	Steve Kelley, Senior Planner
	Andrea Vannelli, Senior Planner
	Anne Madden, Program Educator
	Brian Hanes, GIS Specialist

Consultants

Angelo Eaton & Associates, Inc.
Chris Eaton, AICP, Project Manager
Cathy Corliss, AICP
DJ Hefferman

David C. Noren
Attorney for TBNRCC

REVISED RECOMMENDATION
Tualatin Basin Goal 5 Program Report
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REVISED RECOMMENDATION
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EXECUTIVE SUMMARY

Background

The April 2005 program recommendation from the Tualatin Basin Steering Committee represents a revised approach toward fulfilling obligations set forth in the Metro-Basin inter-governmental agreement. Under the IGA, the primary goal for the Tualatin Basin Partners for Natural Places (Partners) is to recommend a program proposal for Metro Council consideration that will result in improvement of the environmental health of the Tualatin River Basin and its component urban watersheds. Demonstrating an improvement of this nature requires a commitment over time to resource protection, impact mitigation and restoration as well as continuing monitoring of program effectiveness resulting in program adjustments as necessary. Toward this end, the Basin Approach incorporates a plan for implementation and continued cooperation and coordination among the Partners to execute the underlying commitment.

Revised Approach

The Basin Approach is designed to address Metro's inventory of regionally significant fish & wildlife habitat, demonstrate compliance with Goal 5 administrative rule requirements for LCDC acknowledgement, and support efforts to protect habitat of threatened and endangered species under the ESA, as well as the Basin's obligation to meet overall water quality standards under a combined NPDES permit. If adopted by Metro, the Basin Approach will be regarded as a means for achieving substantial compliance with pending Urban Growth Management Functional Plan (UGMFP) requirements under Title 3.

In its initial configuration, the regulatory component of the Basin proposal relied—as it continues to—upon existing Vegetated Corridor provisions for protection and enhancement of core riparian areas as adopted by Clean Water Services and implemented by cities and Washington County. As well, the program proposal for August 2004 included a regulatory framework for areas outside of Vegetated Corridors that would have advanced a consistent Goal 5 regulatory approach throughout the urban portion of the basin.

In response to a shifting focus at state and regional levels away from the use of land use regulations as a means of achieving planning objectives, the Partners developed a revised approach for March 2005 that defaults to existing resource protection programs and regulatory requirements, including local Goal 5 programs, in lieu of proposing a new regulatory scheme. While specifics of existing programs vary among jurisdictions, their composite provides a solid regulatory basis for protecting resource areas beyond the limits of Vegetated Corridors standards. The components fundamental to achieving the Partners' goal of improved health, namely the riparian enhancement investment strategy and a commitment to continued partnership for implementation and ongoing program management, remain unchanged by the recent program revision.

Program Components

At the front of the report document is a matrix entitled "Proposed Tualatin Basin Goal 5 Program Overview." This matrix summarizes the program framework in terms of its four major components, namely revenue, regulatory, voluntary and administration/monitoring; each of these is described more fully in the program report.

The program significantly augments existing regulatory programs through the following means:

- a funded, major capital investment strategy for system-wide improvements;
- efforts to facilitate various voluntary actions aimed at diminishing conflicting use impacts; and
- a commitment to continued coordination among Partners regarding implementation, project oversight, and a monitoring and adaptive management approach designed to assure the effectiveness of program efforts.

The foundation of the Basin Approach is its investment strategy, which involves the Partners coordinating with Clean Water Services in the implementation if their draft Healthy Streams Plan (HSP), which calls for $95 million in improvements and other implementation efforts over the next twenty years, including education and partnerships. Additional sources of existing and future revenue may be applied toward acquisition of key resources, including upland areas.

Report Overview

The first chapter of the program report provides an overview of the Tualatin Basin Approach, including steps involved in the Goal 5 process, extensive public outreach efforts, interim decisions and an outline of the program approach. The Basin Approach uses Metro's inventory of riparian and upland wildlife habitat to conduct an ESEE analysis, make an allow-limit-prohibit decision, and develop an implementing program. Public outreach and involvement efforts were executed at each major step in the process in conjunction with interim decisions. The Basin Approach emphasizes preservation of core riparian resource areas, overall stream system enhancement, and diminishment of future stream impacts via incentives for property owners and developers to temper conflicting use activities through a variety of habitat sensitive practices.

The second chapter provides a relevant regulatory context, including those related to Goal 2 coordination requirements, as well as regional and local policy issues regarding Goal 5 resource areas. This chapter additionally describes baseline references for future basin environmental health assessments.

Chapter 3 describes urban program elements, including: descriptions of ALP designations, overlap with existing local programs, low impact development guidelines, best management practices, administration and procedures, and inventory maintenance. The proposed program incorporates existing regulatory provisions applicable to riparian resource areas as defined by Clean Water Services' Design & Construction standards for Water Quality Sensitive Areas (WQSAs) and Vegetated Corridors. These standards exceed the minimum necessary to substantially comply with existing Title 3 requirements for water quality under Metro's UGMFP inasmuch as development along similar stream corridors is regulated and restoration of degraded corridors is required in association with new adjacent development. Pursuant to Goal 5 administrative rule provisions, the vegetated corridor standards are considered clear and objective and are not modified as part of this proposal. While the areas regulated as WQSAs and Vegetated Corridors are not mapped, GIS analyses conservatively estimate that over 65% of

these areas correlate with Class I and II Riparian inventory areas[1]. In addition, the proposed Basin Approach relies upon (but does not incorporate) a variety of existing resource-related programs throughout the region. Some of these include local tree protection ordinances, best management practices for ESA compatibility regarding roadway operations and right-of-way vegetation maintenance, and local wetland and floodplain protections. These programs have direct and indirect benefits for Goal 5 resources and in many instances go beyond the boundaries of the Metro resource inventory area.

Program elements applicable outside the UGB are addressed in Chapter 4. While local authority does not cover regulation of farm and forestry practices, there are upland and riparian habitat conservation programs in place for development activities, as well as floodplain protections. In addition to these regulatory-based programs, best management practices mentioned above are implemented, and there are efforts in practice to improve and preserve urban fringe headwater areas through CWS enhancement of a federal conservation incentive program. These elements of the rural program component represent features of the proposed Basin Approach that exceed Metro's draft program.

Chapter 5 provides a preliminary description of the non-regulatory and voluntary program elements the Partners are committed to exploring and implementing if feasible. These elements are designed to augment the regulations and capital improvements in environmentally sensitive areas. The non-regulatory options include:

- targeting of revenue to extend restoration and enhancement activities outside of vegetated corridor areas;
- education and outreach programs for property owners, builders and developers;
- review and implementation of appropriate tax incentives;
- stewardship recognition;
- development of a model low impact development (LID) ordinance with commitments to removal of barriers to implementation of LID techniques;
- provision of technical assistance for property owners and developers;
- provision of support for volunteer activities; and
- review of, participation in and support for state, federal and private grant programs.

Collectively (and independent of the other program elements), these proposed actions and activities can provide significant improvement to regionally significant habitat and work toward improving environmental conditions throughout the basin.

Chapter 6 outlines the program's response to meeting the Partners' goal of improving the environmental health of the basin, and reviews the fundamental program components from the standpoint of achieving this goal. In general, the existing regulatory structure—including various local Goal 5 and related programs—provides a basis for preserving and enhancing the habitat function of core stream resource areas, as well as protecting broader ecological functions. Proposed capital investments will augment regulatory programs, and will be focused on Class I and II Riparian resource areas. The program proposes further enhancement of these activities through efforts to promote non-regulatory program elements described above, particularly

[1] During the summer of 2004, Metro updated their inventory to incorporate existing CWS stream data for the Tualatin Basin that resulted in a significant increase in the amount of area covered by the Metro inventory.

through voluntary and incentive efforts such as educational programs and technical assistance for property owners and developers. In addition, local jurisdictions will be required to amend local codes to incorporate guidelines for low impact development and green design, and facilitate their implementation.

The Healthy Streams Plan includes a strategy for directing a cost-effective capital improvements instrumental to enhancement of stream health. The capital investments outlined in this plan will cover community tree planting, necessary culvert replacements, stormwater outfall retrofits, flow restoration and a variety of riparian corridor restoration and enhancement projects. The latter will potentially include streamside preservation and re-vegetation, channel and wetland enhancement, large wood placement, in-stream pond adjustments, and streamside property owner education. The intent of the HSP is to guide the adaptive management of the surface water system. The Basin Approach endorsement of the HSP reflects a progressive step in inter-governmental coordination of habitat-related issues in the Basin that is modeled after the successful WCCC coordination of transportation projects. Local funding to begin these projects has already been committed.

Basin plans for program implementation, administration and monitoring are addressed in Chapters 6 and 7. A strength of the Basin's program lies in the Partners' commitment to continue to coordinate resource protection and enhancement efforts at both the regional and local levels by establishing the Tualatin Basin Natural Resources Coordinating Committee as a permanent standing committee. Chapter 7 further outlines steps anticipated for future implementation and coordination with Metro.

ESEE Update

In spite of the fact that the Basin's revised approach no longer includes additional development restrictions, the conclusions drawn from the original ESEE work continue to be applicable. The analysis therefore has been supplemented with an update to address changes related to Economic and Social factors. It is expected that the investment strategy will be more than adequate to achieve the Partners' goal without the need for new land use restrictions.

CHAPTER 1 INTRODUCTION

A. Purpose

This chapter documents the Basin Partners recommendations for a proposed program to implement the *Tualatin Basin Goal 5 / Natural Resources Draft Economic, Social, Environmental and Energy (ESEE)-ALP decision.* This proposed program addresses significant **Riparian Corridor** and **Wildlife Habitat** resources and their impact areas within the Tualatin Basin Program Area in compliance with State Goal 5 and in cooperation with Metro's Goal 5 planning efforts.

Goal 5 Process

Oregon's nineteen statewide planning goals are the framework for local planning programs in the State. The purpose of Goal 5, Oregon Administrative Rule (OAR) 660-023-0000, is to protect natural resources and conserve scenic and historic areas and open spaces. Local governments, both counties and cities, must address Goal 5. In addition, the Goal 5 rule provides for a "Regional" Goal 5 process to be conducted by the Metropolitan Service District (Metro).

The steps necessary for compliance with Goal 5 are described in OAR 660, Division 23 Procedures and Requirements for Complying with Goal 5. However, in general, the basic steps include:

Step 1. Map Significant Regional Resources. The Metro Council has adopted Resolution 01-3141C establishing criteria to define and identify regionally significant riparian corridors and wildlife habitat relating to the inventory phase of the Goal 5 aspects of its Fish and Wildlife Habitat Protection Program. The Tualatin Basin ESEE analysis is based on Metro's inventory of Riparian Corridors and Wildlife Habitat that have been determined to be regionally significant consistent with State Goal 5. Clean Water Act requirements and Endangered Species Act listings are also addressed in a basin watershed approach.

Step 2. ESEE Analysis. A general analysis of the Economic, Social, Environmental and Energy (ESEE) consequences of allowing, limiting or prohibiting conflicting uses in resource and impact areas throughout the inventoried portion of the Basin was completed in April 2004. After significant resource sites were identified, land uses that *conflict* with Goal 5 resource sites (known as "conflicting uses") were identified. The economic, social, environmental, and energy consequences of allowing or not allowing conflicting uses were then considered. The ESEE analysis is the basis of the Basin's determination of whether to:

- **Allow** conflicting uses,
- **Limit** (Lightly [LL], Moderately [ML], Strictly [SL]) conflicting uses, and/or
- **Prohibit** conflicting uses.

The Allow, Limit, Prohibit analysis is referred to as the "ALP decision." For the Basin Approach, the mapped ALP determinations were refined through a second

phase ESEE analysis, which resulted in several site-specific modifications to the ALP decision. This work was completed in July 2004.

In March 2005, new program direction called for a modification of the social and economic analysis factors of the general Basin ESEE analysis. The results of the cumulative analysis are summarized in Table 1-1, below.

Table 1-1: Tualatin Basin ALP Decision

Land Area Category	Conflicting Use Category			
	High Intensity Urban	Other Urban	Future Urban (2002 and 2004 additions)	Non-Urban (outside UGB)
Class I and II Riparian resource (**Inside** Vegetated Corridor)	ML*	SL	SL	N/A
Class I and II Riparian resource (**Outside** Vegetated Corridor)	ML	ML	ML	ML
All Other Resource Areas	LL	LL	LL	LL
Inner Impact Area	LL	LL	LL	LL
Outer Impact Area	LL	LL	LL	LL

* Vegetated Corridor standards are applied consistently throughout the District; in HIU areas they supercede the ALP designation.

The ESEE analysis and ALP decision provide the findings and the basis for Step 3: the program.

Step 3. Develop a Program to implement the ESEE decision. The primary focus of this chapter is todocument the process and procedures utilized to develop the recommended program to implement the ALP decision within significant Riparian Corridor and Wildlife Habitat resources and their impact areas within the Tualatin Basin Study Area.

Resources Considered in the Tualatin Basin

The Tualatin Basin Goal 5 program addresses:

- Riparian Corridors (OAR 660-023-0090), and
- Wildlife Habitat (OAR 660-023-0110).

Riparian Areas. A riparian area is defined in the Goal 5 rule as "the area adjacent to a river, lake, or stream, consisting of the area of transition from an aquatic ecosystem to a terrestrial ecosystem." A *Riparian corridor* is defined as "a Goal 5 resource that includes the water areas, fish habitat, adjacent riparian areas, and wetlands within the riparian area boundary". A *Riparian corridor boundary* is "an imaginary line that is a certain distance upland from the top of bank..."

The Goal 5 riparian corridors provide essential habitat for many fish and wildlife species during critical life stages for some and general development for others. These corridors also provide basic food and shelter and serve as travel corridors for the movement of fish and wildlife across

the landscape. A well-vegetated corridor can moderate stream temperatures and protect water quality as stormwater runoff is filtered before it flows into streams..

Wildlife Habitat. Through the use of Geographic Information Systems (GIS), Metro created a model of upland wildlife habitat. The wildlife habitat assumptions included:

- Large patches are better than smaller patches
- Interior habitat is more important to at-risk species than edge habitat
- Connectivity to other patches is important
- Connectivity and/or proximity to water is important
- Unique or at-risk habitats that deserve special consideration

Each of the wildlife criteria or characteristics was modeled in the study area and the aggregate score was mapped. Additionally, Habitats of Concern (HOC) were mapped for known sensitive and at-risk habitat areas in the region. This information was collected from a variety of agencies, citizens, groups, and other sources of habitat information. In addition, all significant wetlands were included as HOC's. The Goal 5 "Wildlife Habitat" resource provides for the food and shelter requirements of wildlife in the area including small mammals, birds, and others found in the study area. Riparian corridors and wildlife habitat share many functions and values. Although fish are considered wildlife too, for this analysis, fish habitat is considered as part of the riparian corridor discussion.

Impact Areas. The Goal 5 rule directs that an impact area be delineated for significant natural resources in order to identify the area for the ESEE consequences analysis. The only guidance given in the Goal 5 rule for determining impact areas is that the impact area shall be drawn to include only the area in which allowed uses could "adversely affect" the identified resource. The impact area defines the geographic limits within which to conduct the ESEE analysis for the identified significant resource site. In addition, any regulatory program that may result from the Goal 5 process must be limited to those areas mapped as significant Goal 5 resource sites and impact areas.

For the purposes of the Tualatin Basin ESEE analysis, two types of Impact Areas have been identified:

- Inner Impact Areas. The inner impact areas are comparable to the impact areas established by Metro for the purposes of the Regional ESEE analysis. It includes:
  - The area within 150 feet of a stream, wetland or lake that is not within a significant resource site; and
  - The area within 25 feet of Wildlife Habitat and HOC significant resource sites and within 25 feet of the edge of remaining Riparian Corridor significant resource sites (not already covered in first part).

- Outer Impact Areas. The outer impact areas include all land within the Tualatin Basin ESEE Study Area, which is not within a resource or an inner impact area. Establishing outer impact areas supports a watershed approach and is consistent with Effective Impervious Area data. Literature cited throughout Metro's work establishes a nexus between the levels of general development throughout watersheds to the viability of significant resources. For example, one source established that altered hydrology and increased impervious surfaces increase flooding and damage streams. Recognizing that

riparian corridor and wildlife habitat health is the responsibility of the entire watershed will enable the impacts of any eventual program to be more equitably shared among beneficiaries and property owners.

B. Tualatin Basin Partners for Natural Places

"Partners for Natural Places" is the name of the collective community efforts underway to improve the natural environment. The Partners' work will lead to programs to conserve, protect, and restore streams and waterways, to support healthy fish and wildlife habitat. Tualatin Basin Partners for Natural Places is an alliance of local governments in Washington County working together with Metro to meet federal and state requirements for protecting natural resources in the Tualatin Basin. The draft Tualatin Basin ESEE Analysis and Program Report has been prepared by the Tualatin Basin Partners, through their participation by elected officials in the Tualatin Basin Natural Resource Coordinating Committee (TBNRCC) and by technical staff in the Tualatin Basin Steering Committee (TBSC):

Tualatin Basin Partners	
• Clean Water Services	
• Metro*	
• Tualatin Hills Parks and Recreation District	
• Washington County, and	
• The cities of:	
o Beaverton	o King City
o Cornelius	o North Plains
o Durham	o Sherwood
o Forest Grove	o Tigard
o Hillsboro	o Tualatin

*While Metro coordinated with and provided input throughout the Partners' process, they did not assist in preparing this report; Metro Councilors participate as non-voting members on the TBNRCC.

The Tualatin Basin Partners developed the "Basin Approach" (Appendix A) wherein local governments in the Tualatin Basin have worked together to develop a more detailed ESEE analysis and ultimately suggest a program approach to address the impacts of conflicting uses that might occur within resource areas.

The Basin Approach

The Basin Approach provides an opportunity for the Partners to coordinate concurrent, joint efforts by the Tualatin Basin governments, Clean Water Services (District) and others that are working to address Federal Clean Water Act requirements and Endangered Species Act listings that likely will affect the same areas as Metro's fish and wildlife habitat protection plan. In addition to reducing the number of times that the same areas are analyzed and public outreach provided and applying more detailed information than is readily available region-wide, the Basin Approach allowed for coordination among similar but distinct, Federal, State and Regional requirements. The Basin Approach also provided local governments with an opportunity to shape a basin-wide program that is tailored to local conditions within the Tualatin River basin while addressing regional Goal 5 objectives.

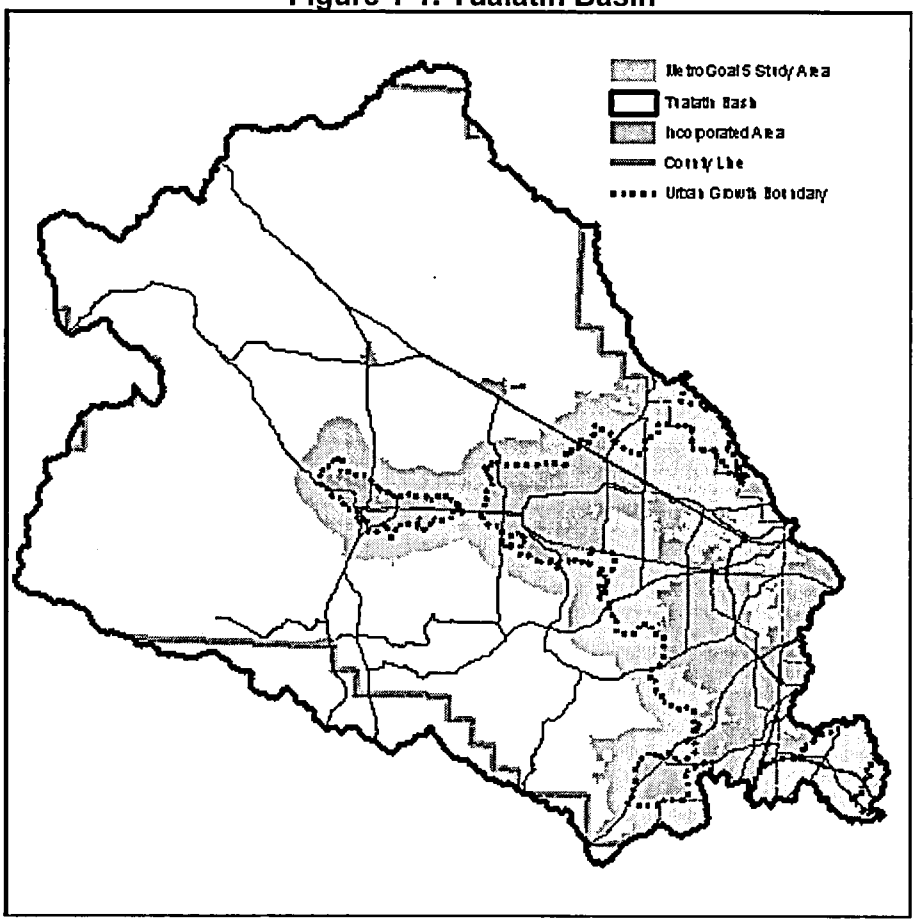
The following is the goal statement from the Basin Approach document:

> *Metro's fish and wildlife vision articulates the overriding goal of the Basin Approach:*
>
> *The overall goal is to conserve, protect and restore a continuous ecologically viable streamside corridor system, from the streams' headwaters to their confluence with other streams and rivers, and with their floodplains in a manner that is integrated with the surrounding urban landscape. This system will be achieved through conservation, protection and appropriate restoration of streamside corridors through time.*
>
> *Improvement of habitat health within each of the Region's 27 hydrologic units including the eleven hydrologic units inside the Tualatin Basin shall be a primary objective of the Basin Approach. The following objectives within Metro's Fish and Wildlife Habitat Vision Statement shall be pursued by the Basin Approach: to sustain and enhance native fish and wildlife species and their habitats; to mitigate high storm flows and maintain adequate summer flows; to provide clean water; and to create communities that fully integrate the built and natural environment. The region wide system of linked significant fish and wildlife habitats will be achieved through preservation of existing resources and restoration to recreate critical linkages, as appropriate and consistent with ESEE conclusions about whether to prohibit, limit or allow conflicting uses within a regionally significant resource site. Avoiding any future ESA listings is another primary Basin Approach objective.*

Tualatin Basin Program Area

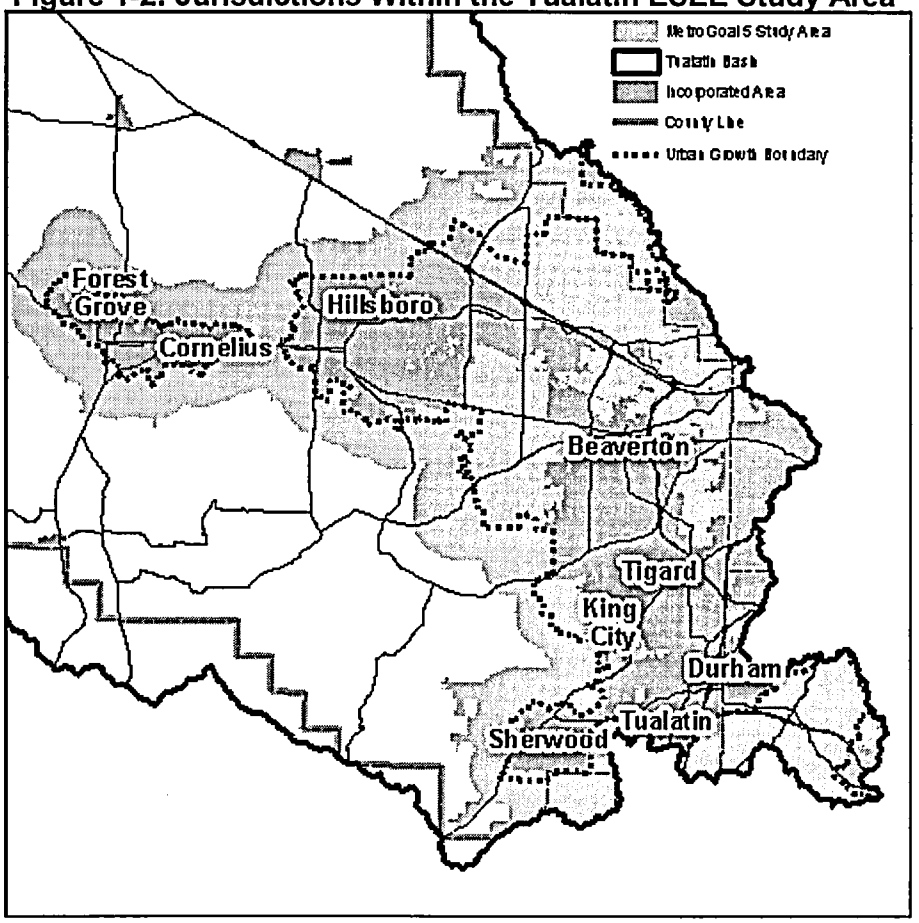
The general geographic extent of the Basin Program Area is that area draining the Tualatin River within the corporate limits of Washington County. The majority of the basin falls within Washington County. However, as shown in Figure 1-1, portions of the Tualatin Basin also fall within unincorporated Tillamook, Yamhill, Columbia, Multnomah and Clackamas counties including the cities of Lake Oswego, Portland, River Grove and West Linn as well.

Figure 1-1: Tualatin Basin



For the purposes of this Goal 5 program, the Tualatin Basin Urban Program Area includes those areas of the Tualatin River basin within the Portland Metropolitan Area Urban Growth Boundary and lands within one mile of the Metro jurisdictional boundary as shown in Figure 1-2. Rural, farm and forest lands that are more than one mile from the UGB were not included in the ESEE Study Area due to limitations of the Goal 5 inventory area. Natural resource protection for all rural areas are addressed in Chapter 4 pursuant to local, regional, state and federal regulations.

Figure 1-2: Jurisdictions Within the Tualatin ESEE Study Area



C. Public Outreach Efforts

In 2002, the intergovernmental agreement forming the Tualatin Basin Natural Resources Coordinating Committee was signed. It's designated *Steering Committee* formed subcommittees to aid in its work, one of which was the *Public Outreach* subcommittee. This subcommittee has met and coordinated Basin Goal 5 public outreach since June of 2002. Members include public involvement or planning staff from the thirteen public partner agencies, and importantly, also include representatives from an assortment of interested private agencies: Community Planning Organizations (CPO), Audubon Society of Portland, Tualatin Riverkeepers, Home Builders Association, Associated General Contractors, Westside Economic Alliance, and SOLV. They named themselves, and the Basin's coordinated Goal 5 effort, *Partners for Natural Places*. Members include:

- Anne Madden, Washington County, Chair
- Sheri Wantland, Clean Water Services
- Gina Whitehill-Baziuk, Metro
- Karen Withrow, Metro
- David Endres, Tualatin Hills Park and Recreation District
- Megan Callahan, Beaverton

- Barbara Fryer, Beaverton
- Jennifer Wells, Hillsboro
- Julia Hajduk, Tigard
- Stacy Hopkins, Tualatin
- Steve Kelley, Washington County, liaison with Steering Committee

Private agency partners:

- Linda Gray/Patt Opdyke, CPOs
- Jim Labbe, Audubon Society of Portland
- Brian Wegener, Tualatin Riverkeepers
- Kelly Ross, Home Builders Association of Metropolitan Portland
- Cindy Catto, Associated General Contractors
- Betty Atteberry, Westside Economic Alliance (WEA)

The Partners undertook a lengthy series of outreach efforts, which are summarized in tables in Appendix B. This report summarizes their public outreach efforts to-date and what they have heard from the public about the Tualatin Basin Goal 5 fish and wildlife habitat protection program.

Phase One: Inventory Outreach

In **September 2003,** the Partners organized three open houses to share Goal 5 progress to-date with the general public. These were held in Forest Grove, Beaverton and at the Tualatin Valley Fire & Rescue Training Facility between Tualatin and Sherwood. In all, approximately 240 people attended the open houses. Additional outreach activities included publication of a Newssheet, two televised presentations at the Washington County Public Affairs Forum in October 2003, talks at CPO's 1 and 5, the creation of a Partners' website, and numerous articles in jurisdictions' newsletters. Media releases and posters combined with creative outreach by all the Partners helped with public awareness. The Partners produced a panel television show under the auspices of Tualatin Valley Television (TVTV), which was broadcast throughout the late winter and early spring of 2004. Outreach from other entities included multiple Metro presentations to interested parties, a well-attended Goal 5 Business Summit organized by Commercial Real Estate Economic Council (CREEC) in October 2003, a Raindrops to Refuge open house, and other outreach by organizations, such as the Audubon Society of Portland and the Tualatin Riverkeepers.

Comment Forms

Jurisdictional staff and elected officials were available at the Fall 2003 open houses to answer questions and listen to individuals' views on the habitat program. Maps of regionally significant habitat and informational newssheets were available at these events, along with public comment forms. The Basin Partners made use of the Comment Sheet created by Metro, which set forth six questions.

1. The first asked whether habitat protection should be equal or varied based on ecological value. The numbers were almost equally split between protecting the most ecologically valuable areas first and protecting all equally; a small minority said no new regulations were needed.

2. The second asked about varying protection by land use (zoning) and considering habitat while planning for roads and utilities. Respondents called for balance and flexibility in regulations to preserve economic viability, and were pleased with the idea of local knowledge being applied in decision making. However, they affirm that natural resource protection does improve property values. Regarding infrastructure, respondents overwhelmingly favored considering the impacts of roads and utilities on habitat areas.

3. The third asked if habitat areas that provide connections to other areas should be given priority. Most respondents supported greater protection efforts for these areas, though a few of these suggest that all habitat areas should be equally protected. A few respondents raised concerns about the impacts of this decision on private property. Others mentioned acquisition of these areas as a potential policy approach.

4. The fourth addressed protecting established versus new development, allowing exceptions from development restriction, and requiring mitigation. Most respondents support protection standards on newly developed and re-developed land, while some people favor exempting already developed land from protections. Still others favor protections on all land. Respondents mostly favor mitigation, though a few expressed concerns about whether mitigation was equal to protection. In general, people favored a balanced approach of avoiding impacts when possible and mitigating losses when they occur.

5. The fifth asked the public for input on the types of incentives that should be used to protect habitat. The most commonly reported suggestions include: tax incentives (e.g., reduced property taxes), grants and technical assistance for habitat protection and restoration, education efforts including school programs, community recognition and awards for habitat protection and restoration, free or reduced cost native plants and other restoration materials, and conservation easements or transfer of development rights.

6. The sixth addressed how the habitat protection program should be funded and personal willingness to support public financing mechanisms. The majority of respondents were supportive of public financing mechanisms, including bonding. Other funding mechanisms mentioned include fees on development, stormwater fees, grants, and voluntary contributions.

Letters

One letter was received from the Audubon Society of Portland and one from an interested citizen, both calling for strong protection standards. The Audubon Society is particularly concerned about riparian corridor continuity and upland wildlife habitat, which has fewer protections in place than riparian areas do.

Postcards

The Friends and Advocates of Urban Natural Areas (FAUNA) distributed pre-addressed postcards to be sent to Metro and the Tualatin Basin partners in support of the Goal 5 protection program. Metro received 1,320 postcards and Tualatin Partners received another 168. Only two expressed concerns about property rights and were less supportive of a habitat protection program. The following are major themes expressed in the postcards that support a regional habitat protection program:

- Desire and need for additional regulations to protect watershed and habitat resources
- Need to pursue responsible development and stop reckless development
- Importance of habitat areas for environmental health and neighborhood livability
- Positive influence protected natural areas have on property rights
- Long time frame involved in recovering resource health relative to the short timeframe of degrading resources
- Desire and need to protect habitat resources to maintain the character of our region and for the benefit of future generations

Summary

Based on that early feedback, the public appeared generally supportive of protecting fish and wildlife habitat and including regulatory and non-regulatory measures. Metro reports that the majority of the critical feedback received was through phone calls from concerned citizens who worry about the impacts of Metro's habitat protection program on the use of their property or who oppose all habitat protection based on private property rights or anti-tax sentiments. Other critical feedback suggested that Metro was not currently doing *enough* for the protection of fish and wildlife habitat.

Phase Two: ESEE Analysis and Allow/Limit/Prohibit Decision

Over the fall and winter of 2003-2004, as the ESEE analysis and development of Allow-Limit-Prohibit maps was proceeding, Tualatin Basin staff spoke before the Washington County Medical Society, WEA, CPOs 10 and 5, and the Tualatin River Watershed Council. They also made a presentation at the second CREEC Goal 5 Business Summit March 2, 2004. Media releases, posters, and continued creative outreach by all the Partners continued to help build public awareness.

In **March 2004** the Partners held three open houses, one in Hillsboro, one in Tualatin, and one in Beaverton, to share the results of the ESEE analysis and the proposed Allow-Limit-Prohibit maps; 255 people attended. The public notice for these events was created and mailed jointly by the Partners and Metro to 43,011 citizens. Planners and laptop computers loaded with property information were available for one-on-one interaction. A second edition of the Newssheet was produced for wide distribution. A slide show presentation on the status of the process was shown five times each evening (except in Beaverton). The Clean Water Services' video *Wild by Design* was shown. Citizens were encouraged to write their comments for the public record.

The March 29, 2004 Open House in Beaverton was followed by the Partners' first Goal 5 **Public Hearing**. Taped by TVTV, it was rebroadcast around the Basin through June of 2004 approximately a dozen times. About 100 persons attended, with 40 providing formal testimony.

Summary

All told, counting oral testimony, comment cards, letters, and e-mail, approximately 160 pieces of testimony were received. Although the lines of demarcation were not always clear and many spoke to the need to balance environmental and economic concerns, in general the ratio of comments received was two-to-one in favor of higher levels of protection. Of the 56 who expressed support for development rights, these were their major themes:

- Regulations are already in place; stop moving the goal posts.
- Landowners must be compensated for loss of economic value.

- If the public wants more greenspace, they should buy it.
- Metro's inventory maps contain errors, especially in counting as habitat suburban gardens, orchards, etc.
- Site specific analysis is necessary.
- Honor the UGB and agricultural land by keeping development constrained, even if it means loss of habitat within the UGB.
- Institutional campuses (schools, universities, hospitals) are pressed for space.
- The region suffers from a shortage of industrial land.
- Too-strict regulations prohibit responsible stewardship, force people to harvest timber, etc.

Of the 104 who called for strengthening habitat protection, their major issues were as follows:

- We support science-based efforts to preserve and enhance eco-system health.
- It is foolish to develop flood-prone land or steep slopes.
- Please identify the habitat land already in public ownership (parks, etc.); this will help alleviate concerns.
- Please develop proactive conservation education programs.
- Environmental health improves economic value.
- Fragmenting habitat lessens its value.
- Environmental degradation is a major "takings" from us all and from our own future.
- Please protect the best interests of the greatest number of the citizenry.
- This is a unique opportunity to do the right thing – make the most of it.

One person summed it up this way: "No one these days objects to sanitary sewer requirements, as it is generally accepted that as population densities increase, our aquifers would suffer without the waste water management sewer systems provide. Our densities now require further community actions to protect broader aspects of our natural environment. Flood control, wildlife protection, water quality, etc. are all required for a reasonable quality of life. If these benefits are sacrificed, property values throughout the basin will be reduced. Property values and natural values converge. I urge you to protect our region's natural assets for our children."

Phase Three: The Program

Public outreach efforts continued throughout the spring and summer of 2004. Media releases and editorial briefings resulted in stories in the major newspapers, as well as in the newsletters of all the Partners, including the CPOs. Mayor Tom Hughes of Hillsboro and Senior Planner Hal Bergsma of Beaverton made a guest appearance on TVTV's Talk of the Town (rerun on cable TV four times). Information was also available at many community events, including Tualatin's Songbird Festival and a Public Works Fair at Washington Square on May 15; Beaverton's Neighborhood Clean Up on June 5; Tigard's Balloon Festival June 17-20; Tualatin River Discovery Day on June 26; Beaverton's Summerfest July 16-18; and the Washington County Fair July 28 through August 1. Information was also available on the County's Planning web site.

Open houses in July and a public hearing in August were set to share possible program options with the public. In mid-July, Public Notices were mailed to approximately 35,000 property owners and interested parties inviting them to these events. Open Houses on the proposed Tualatin Basin Goal 5 program were scheduled for the following dates and locations:

- Monday July 26, 4 to 7:30 pm, Beaverton Library, 12375 SW 5th Street, Beaverton

- Wednesday July 28, 4 to 8 pm, Forest Grove Community Auditorium, 1915 Main Street, Forest Grove
- Thursday July 29, 4 to 8 pm, Tualatin High School, 22300 SW Boones Ferry Road, Tualatin

The Public Hearing was held on:

- Monday August 2, 6 to 8 pm, Public Services Building Auditorium, 155 N First Avenue, Hillsboro – this hearing was continued until August 9th.

Continuations of the initial Hearing on the proposed Basin Program:

- Monday August 9, 1 pm, at the Beaverton City Library, 12375 SW Fifth Avenue, Beaverton; public comment period held open until 5:00 pm - hearing was continued until Monday, August 16th
- Monday August 16, 1 pm, at the Beaverton City Library, 12375 SW Fifth Avenue, Beaverton; hearing was continued until Monday, August 30th for continued deliberations on proposed Program
- Monday August 30, 1 pm, at the Beaverton City Library, 12375 SW Fifth Avenue, Beaverton; hearing was continued until Monday, September 13, 2004 for continued deliberations on proposed Program
- Monday September 13, 1 pm, at the Beaverton City Library, 12375 SW Fifth Avenue, Beaverton; hearing was continued until Monday, September 27, 2004 for continued deliberations on proposed Program
- Monday September 27, 1 pm, at the Beaverton City Library, 12375 SW Fifth Avenue, Beaverton; at this hearing, decisions on the draft Program were deferred for further consideration of outstanding issues

Further TBNRCC Public Meetings considering proposed Basin Program:

- On Monday November 15, 1:00 pm, at Beaverton City Hall, 4755 SW Griffith Drive, Beaverton; meeting to consider issues and potential revisions to Metro's Regional Goal 5 Program (Metro Draft Resolution 04-3506A) – discussed Measure 37 implications and determined that potential changes to Regional Program and/or effects of Measure 37 may require new direction for Basin program. Directed Steering Committee to work with Metro on affects of Measure 37.
- Through August 9th at 5:00 pm the public was also invited to submit comments in writing to:

  The Tualatin Basin Natural Resources Coordinating Committee
  Washington County Department of Land Use and Transportation
  Planning Division, 155 N First Avenue, Suite 350-14
  Hillsboro, OR 97124

After holding final public hearings, the Coordinating Committee will make final recommendations to the Metro Council on a Goal 5 program for the Tualatin River Basin. Metro will consider the Tualatin Basin program and, in turn, hold its own public hearings. The Basin Partners anticipate that Metro will accommodate the Tualatin Basin program into their regional Goal 5 program. Following Metro's approval, local governments will have 180 days to adopt implementing ordinances. A subsequent update to the Basin-Metro IGA extends the implementation period to one year.

Phase Four: Program Revision

Public involvement activities during recent Program Revisions have focused on invitations for public comments at Steering Committee meetings being held three to four times per month since early February as well as invitations for public comment at TBNRCC meetings in January and February. An extended public comment period is being scheduled during the upcoming TBNRCC public hearing on March 28th.

Following TBNRCC adoption of final Program recommendations for the Basin, those recommendations, together with relevant findings will be forwarded to Metro for Council consideration for incorporation in the draft Regional Program. Additional opportunities for public involvement and comments on the Basin Program will be in afforded as Metro holds Open Houses and Public Hearings on the Regional Program in April and May of this year. Metro is also expected to provide public notice in compliance with the requirements of ORS 197.047 (also known as Measure 56 notice) prior to holding public hearings for final adoption of a Regional Program. This notice is expected to cover all potentially affected properties in the Tualatin Basin and will provide opportunities for public comment at Metros adoption hearings. Finally, prior to any new Basin Goal 5 Program elements becoming effective, local governments throughout the Basin will be required to provide yet another public notice pursuant to Measure 56 standards and hold public hearings before their local Commissions, Boards and/or Councils.

D. Organization and Approach to Goal 5 Program

The Tualatin Basin Goal 5 Program approach emphasizes three key elements:

- **Preserve** existing system through regulation of new development and landscape alteration activities in core resource areas, and requiring mitigation of disturbances;
- **Enhance** overall health of regional sites through capital improvements designed to restore natural function of riparian corridors; and
- **Mitigate** new development impacts to significant resources throughout Basin through encouraging the use of Low-Impact-Development (LID) practices, along with the removal of existing barriers to implementing those guidelines for LID approaches. Provide incentives to utilization of LID such as flexible development standards.

In addition to the above, the non-regulatory program component addresses non-development related activities, and includes the following elements:

- Education
- Stewardship Recognition
- Restoration Funds
- Tax Incentives
- Technical Assistance
- Promote Volunteer Activities
- Acquisition.

CHAPTER 2 RELATIONSHIPS TO OTHER ENVIRONMENTAL REGULATIONS AND PROGRAMS

The policy framework under which this Program Report is submitted is part of a state and regional land use and natural resource policy framework that is complex. This chapter describes various other activities and explains how the Tualatin Basin Goal 5 Program fits into this framework.

A. Statewide Planning Goal 2 Coordination

Land Conservation and Development Commission's (LCDC) Statewide Planning Goal 2 requires coordination with affected local governments. Prior to completion of the original Tualatin Basin Approach and the formation of the Tualatin Basin Natural Resources Coordinating Committee, all governments within the Tualatin Basin were invited to be members and/or participants. Multnomah County, Columbia County, Clackamas County, Yamhill County, the city of Portland, the city of Lake Oswego and the city of West Linn all declined the invitation. However, all requested they receive notices and be allowed to comment on all technical and policy work products. That coordination has been happening since the beginning of this work. Additionally, the Tualatin Basin Partners participated and periodically briefed a variety of the Regional Goal 5 committees hosted by the Metropolitan Service District (Metro) as well as the Metro Council and its policy advisory committee (MPAC).

B. Regional and Local Policy Framework

Metro's Regional Goal 5 ESEE and Program

The Goal 5 rule provides for a "Regional" Goal 5 process to be conducted by Metro. Specifically, OAR 660-023-0080 defines "regional resources" and authorizes Metro to adopt one or more regional functional plans to address all applicable requirements of Goal 5 and the OAR for one or more resource categories. Ultimately, the program requirements for Metro's Goal 5 work will become part of the Urban Growth Management Functional Plan (Functional Plan), specifically, Title 3, Section 5. Once adopted by the Metro Council and acknowledged by LCDC, the Functional Plan text will become part of the Metro Code and local governments will be required to take actions and/or show "compliance" with its provisions.

Metro began conducting a Goal 5 process for the area within its service boundaries in 1999. In 2002, Metro adopted an inventory for Regionally Significant Riparian Corridors and Wildlife Habitat and began work on a regional ESEE analysis. The Basin Approach is being completed concurrently with Metro's regional tasks. The Tualatin Basin is most likely to be implemented sooner than other portions of the region if the non-basin jurisdictions wait for the Metro regional safe harbor to be completed and acknowledged by the state before they begin local implementation tasks.

Clean Water Services (District)

Water quality problems have long been recognized in the Tualatin Basin. To address these issues, the Unified Sewerage Agency (USA, now Clean Water Services) was formed as a special district under Oregon Revised Statutes (ORS) 451 by a vote of the people in the 1969 election season in order to combine the 26 operating wastewater treatment plants operating in the

Tualatin Watershed at the time. This action was motivated by the Environmental Quality Commission (EQC) establishing a building moratorium in the watershed until the poor water quality was corrected (an order, not a lawsuit). The ORS requires that its Board of Directors be the County Commission. This is the only connection to County government.

Over the years, Clean Water Services built two new "regional" plants (Durham and Rock Creek), upgraded two more to modern operating standards for the watershed (Hillsboro, formerly West Hillsboro, and Forest Grove), and took the remainder out of wastewater treatment and replaced them with pump stations, hooked them into "interceptor lines" and moved the waste to the regional plants for treatment.

The Department of Environmental Quality (DEQ), in compliance with section 303 of the Clean Water Act (CWA), is required to establish Total Maximum Daily Loads (TMDLs) in twelve watersheds, the first being the Tualatin. When the TMDLs were established in 1988, twelve cities within Washington County asked the District to form a stormwater utility. To do so, the District had to ask the Legislature to amend ORS 451 to allow stormwater management along with the existing wastewater collection. Following that amendment, the cities established interagency agreements with the District to allow the agency to do wastewater collection and stormwater management in the respective cities.

Basin Approach to Title 3 – Vegetated Corridors

The local governments in the Tualatin Basin developed a unified program, implemented through the Clean Water Services District's Design & Construction Standards, to successfully comply with Title 3 of Metro's Urban Growth Management Functional Plan, which outlines water quality and flood management requirements for the region. The District's Design and Construction Standards exceed the minimum requirements of Title 3 for water quality protection of the Tualatin and its 700 miles of tributaries, providing for vegetated stream corridor buffers up to 200 feet wide and mandating restoration of corridors in marginal or degraded condition. District compliance with existing Title 3 requirements also addresses protection of flood management areas in order to protect life and property from dangers associated with flooding; and provides for flood storage, reduction of flood velocities, reduction of flood peak flows and reduction of wind and wave impacts. The multi-jurisdictional approach resulted in a method for implementation of Title 3 based on water quality standards, good science, and best management practices that meet Metro's substantial compliance requirements.

Clean Water Services Healthy Streams Plan

The Healthy Streams Plan (HSP) is an updated watershed plan designed to address the Clean Water Act and Endangered Species Act (ESA), with a focus on the urban and urban fringe portions of the Tualatin Basin. The District, local cities, Washington County, Metro, and Tualatin Hills Park and Recreation District, are all partners in the Healthy Streams Plan development and implementation. The Healthy Streams Plan contains the following key elements: an inventory of the stream location and condition (Watersheds 2000), an analysis of public habits and values, an economic analysis, policy and programmatic focus areas (effective impervious area reduction, vegetated corridors, hydrology / hydraulics, and operations and maintenance). The HSP was recommended for approval by its project advisory committee, and is anticipated to be before the District Board for consideration in June 2005.

Watersheds 2000 is the ecological stream inventory and water resource modeling component of the Healthy Streams Plan. The study area for Watersheds 2000 included the urban and urban fringe areas draining into waters primarily managed by Clean Water Services. Consultants were used to gather field information and generate the hydrology and hydraulic models. Project Committee's of citizens, regulators, cities, and other stakeholders were formed for three separate regions of the study area to assist with identifying desired conditions for specific stream reach types based on the scientific data delivered and social values of the participants.

The Water Resource Engineering element of the Watersheds 2000 Inventory developed detailed topographic surveys of the floodplain and stream cross sections. Hydrology models using HEC-HMS and Hydraulic models using HEC-RAS were developed. The engineers and ecologists also evaluated culverts and bridges for conveyance and fish passage.

The ecological inventory element of Watersheds 2000 was conducted from July to early November 2000. Follow-up gap analysis, replicate sampling, and detailed macroinvertebrate sampling also occurred from September through early November 2001. Ecologists sampled streams using the Tualatin Basin Rapid Stream Assessment Technique (RSAT). Numerous sites were sampled and applied to a proportionate stream reach in miles to determine the physical condition and habitat character of our stream system. Streams and other water quality sensitive features in the study area that were not sampled were still field verified for location and condition (piped, open, etc.). In addition, Clean Water Services and the Watershed Council worked with Oregon Department of Fish and Wildlife to collect fish and crawfish at 67 sites between 1999 and 2001. Clean Water Services contracted the monitoring of 63 macroinvertebrate sites in 2002.

Existing Environmental Health Report (March 2004)

The Existing Environmental Health Report (EEHR) was prepared by the Tualatin Basin Partners for Natural Places to provide an assessment of the environmental health of the eleven Regional Sites found within the urban portion of the Tualatin River Basin, which are the subject of Metro's Goal 5 natural resource planning process. The EEHR serves as a preliminary indication for reviewing strategies for improving the health of Tualatin Basin Watersheds in future programs, as well as a reference for determining whether program strategies achieve the goal of promoting improved overall health.

The EEHR is based on a comparative model of existing data sources: Metro Regionally Significant Inventories for Riparian Corridor and Wildlife Habitat, Clean Water Services Rapid Stream Assessment Technique (RSAT) data, and Clean Water Services Effective Impervious Area (EIA) data. Each set of information represents a different method for assessing the environmental health. The EEHR uses the Metro inventory to provide the boundaries of the natural resource Regional Sites and associated scoring attributes. The Metro Regional Sites are then analyzed on a local level utilizing available Clean Water Services data.

The EEHR is principally organized around the following environmental key environmental criteria:

1. Effective Impervious Area (EIA)
2. Stream Flow
3. Geomorphology
4. Riparian Vegetation
5. Water Quality
6. Aquatic Habitat
7. Upland Wildlife Habitat

The comparative assessment of the District's and Metro inventory data provided one approach to evaluating the existing environmental health of the urban portion of the Tualatin Basin and eleven major sub basins. In addition, this methodology provides the basis that will allow for measurement of improvement in environmental health over time. This process provides both a static snapshot of current health as well as a tool for dynamic measurement of future health over time. The table below provides a summary of the assessments for each of the eleven Regional Sites and an overall summary of the environmental health for the entire Basin Study Area. While there is considerable variability, when considered as a whole, the riparian and wildlife habitat conditions within the urban portion of the Tualatin River Basin merit an overall environmental health rating of "Fair."

Table 2-1: Summary of Basin Study Areas from the EEHR

Study Area Sub Basins	Metro Regional Site	Overall Rating
Council Creek, Gales Creek, and Upper Dairy Creek	Site 5	Fair to Good
Dairy Creek, McKay Creek, and Waibel Creek	Site 6	Fair
Middle and Upper Rock Creek, Abbey Creek, Holcomb Creek	Site 7	Poor to Good
Lower and Upper Beaverton Creek, Bronson Creek, Cedar Mill Creek, and Basin	Site 8	Poor to Fair
Rock Creek, Reedville Creek, Dawson Creek, and Turner Creek	Site 9	Fair
Butternut Creek, Gordon Creek, and Tualatin River Tributary	Site 10	Fair
Hedges, Nyberg, and Saum Creeks	Site 11	Fair
Ash Creek, Upper Fanno Creek, Sylvan Creek, Vermont Creek, and Woods Creek	Site 12	Poor to Fair
Summer Creek	Site 13	Poor to Fair
Ball Creek, Lower Fanno Creek and Red Rock Creek	Site 14	Fair
Chicken Creek, Cedar Creek, and South Rock Creek	Site 15	Fair
Entire Basin Study Area		**Fair**

C. Clean Water Act Wetland Fill and Removal Permits (Section 404)

Army Corps of Engineers and Oregon Division of State Lands

These two agencies implement sections of the Clean Water Act that require case by case review and permitting for fill and/or removal of over 50 cubic feet of material from a wetland or waters of the United States (creeks and streams). These permits are coordinated by both of these state and federal agencies, who in turn seek and receive comments from other state and federal agencies as well as local land use permitting agencies. Currently, the District's Design & Construction standards for Water Quality Sensitive Areas and their associated Vegetated Corridors do not regulate areas that are part of a 404 permit application and mitigation plan. The final Tualatin Basin Goal 5 program will address the hierarchy of mitigation and permit activities so that resource protection is coordinated and reviews are not duplicative.

CHAPTER 3 URBAN PROGRAM ELEMENTS

A. Introduction

This chapter of the Tualatin Basin Program Report identifies proposed Fish & Wildlife Habitat Protection program elements that will be applied to the study area located within the Urban Growth Boundary (UGB) area of Washington County. These elements of the proposed program are intended to meet the requirements of the Goal 5 Administrative Rule, and satisfy Metro's criteria for meeting regional Goal 5 requirements, pursuant to the Metro-Tualatin Basin Natural Resources Coordinating Committee (TBNRCC) intergovernmental agreement.

The proposed program consists of four major components, including a revenue component, a non-regulatory (voluntary and incentive) component, a regulatory component and a monitoring component. The program proposal serves as a basis for implementing the recommendations of the draft Tualatin Basin Goal 5 Economic, Social, Environmental, and Energy (ESEE) analysis and Allow-Limit-Prohibit (ALP) decision. The focus of this chapter is to describe the proposed program elements that will apply to the urban portion of the Tualatin River Basin, including those use categories defined in the ESEE report as High Intensity Urban (HIU), Other Urban (OU) and Future Urban (FU). The program approach that is proposed for the Non-Urban (NU) use category is described in Chapter 4 of this report, which is entitled "Rural Program Elements."

The existing regulatory element of the proposed urban program approach applies to proposed development and redevelopment activities within and adjacent to areas designated as Water Quality Sensitive Areas and Vegetated Corridors and subject to Clean Water Services' (CWS) Design & Construction Standards. As proposed, incentive and voluntary elements of the program apply to all areas of the Basin, and special development flexibility is available for development of Class I and II Riparian inventory areas and their vicinities, where they occur outside of Vegetated Corridors. The proposed program is structured to achieve the following three goals:

- *Improvement of the environmental health of the basin* through restoration, mitigation and enhancement efforts in riparian areas, funded by the investment of fee-generated revenue, in conjunction with the Healthy Streams Plan (HSP);
- *Preservation of the existing core system* through resource conservation, impact reduction and enhancement of degraded and disturbed resource areas among lands classified as Water Quality Sensitive Areas and Vegetated Corridors; and
- *Mitigation of future resource impacts* by encouraging and providing incentives for the use of Low Impact Development practices in resource areas, in part to meet water quantity management targets pursuant to Clean Water Services' Design & Construction standards.

This chapter elaborates on the regulatory aspects of the second and third bulleted goals. The description of the program approach toward meeting the first bulleted goal is provided in the Healthy Streams Plan. This draft watershed plan has been recommended for adoption and is anticipated for CWS Board consideration in June 2005.

B. Applicability and Resource Location

As will be explained throughout this chapter, the proposed program applies differently in different areas of the Basin. Generally speaking, the program regulatory component intended to preserve and enhance the core riparian system is reliant upon existing Design & Construction standards currently administered by CWS and Basin cities. These standards, specifically applicable to Water Quality Sensitive Areas (WQSAs) and their associated Vegetated Corridors, are particularly relevant for the protection of riparian fish and wildlife habitat, and thus provide a Goal 5 function. All Goal 5 resource areas with a Basin ALP designation of Strictly Limit (SL) fall within the parameters of the Vegetated Corridor boundaries. Vegetated Corridor areas are not regulated beyond the CWS District boundary, which generally corresponds with the UGB. As such, there are no SL areas identified outside the UGB.

The Basin resource areas identified with a Moderately Limit (ML) ALP designation are generally consistent with the areas where Class I and Class II Riparian inventory lands occur beyond the limits of the Vegetated Corridors. This is the case throughout the entire inventoried area, which extends approximately one-mile beyond the year 2000 UGB, however the application of the ML designation can be characterized differently in urban versus rural situations. Outside the UGB (where Vegetated Corridor standards do not apply), all inventoried Class I and II Riparian resource areas feature a ML designation. The rural ML areas very generally represent significant stream corridors with approximate widths typically ranging from 300 to 350 feet, and much broader in floodplain areas. Within the UGB, Class I and II Riparian areas typically occur within 100 feet of the Vegetated Corridor boundary, although these also are much broader in floodplain areas. For cases where the Class I and II resources correspond with HIU conflicting use areas, the ALP designation reflects a ML designation. In addition, there are limited cases throughout the Basin where a Site-level ESEE decision adjusts for a Lightly Limit designation in Class I and II Riparian resource areas. These adjustments are based on unique circumstances and are reflected on the ALP map.

All other portions of the study area, including Inner and Outer Impact Areas, are provided with a Lightly Limit ALP designation. While the impact areas are not considered to feature significant fish and wildlife habitat resources per se, activities that occur in all areas of the watershed could have a potentially adverse impact on stream resources. Accordingly, the Basin Outer Impact Areas meet the definition for impact area provided by the Goal 5 OAR (660-023-0010(3)).

Implementation of ALP Designations

Pursuant to the Design & Construction standards, the limits of WQSAs and Vegetated Corridors are to be identified using parameters defined in the standards. The basis for this is the site-specific and fluctuating nature of the resource; factors such as soil type, water table level and slope each represent significant determining factors. Accordingly, the identification and delineation of these features occurs on a case-by-case basis. In order to properly administer the applicable regulations, any proposed development activity for areas nearby potential wetland or stream vicinities is required to undergo a site review to make a more accurate determination of sensitive area locations. This procedural practice will continue to apply, and therefore there is no need for implementing jurisdictions to adopt maps of SL areas for Goal 5 purposes. As explained in Part Two of the ESEE analysis, even in cases where the underlying ALP decision is less than SL for Goal 5 purposes, the Vegetated Corridor standards will apply consistently within

CWS-defined areas regardless of the Goal 5 decision. However, the clear and objective Design & Construction Standards related to Vegetated Corridors include an option for an alternative review process which may be used in cases with corresponding ML and LL designations in order to achieve additional flexibility to accommodate development while achieving necessary objectives for stream corridor protection.

As explained above, land areas with ML designations are part of significant riparian corridors. Outside the UGB, these generally correspond with vegetated stream corridors and are thus relatively easy to locate at the site level or with aerial photography. Inside the UGB, ML areas typically are located in-between SL and LL areas. While there is a process for identifying the outer margins of SL areas as they correspond with the regulatory measures for Vegetated Corridors, delineating the boundary between ML and LL areas is a different matter. As further explained elsewhere in this chapter, the precise site-level distinctions between ML and LL areas are not critical for programmatic purposes. To begin with, the boundaries between ALP designations do not follow "site" boundaries from a development (i.e., conflicting use) standpoint. For development purposes, site boundaries are generally consistent with tax lot lines, which form the basis for articulating the limits of proposed development activity in nearly all cases. Individual development activities are expected to overlap ML and LL areas on a regular basis.

The general programmatic distinction between ML and LL areas is the availability of bonus flexibility in development regulations pertaining to site design, in exchange for resource benefits. For example, on-site density transfer, reduced setbacks, and below-minimum residential densities may be utilized by a property developer where special provisions are made to permanently preserve significant resource areas on a site. Provisions such as these are more likely to be useful if they are applied to the entire site, rather than a limited portion of a site, particularly in the urban area where most affected tax lots are of a relatively small scale. These provisions are intended to provide resource benefits, and it is appropriate for them to extend beyond the limits of streamside ML areas if opportunities exist to protect significant resource areas in this manner. It is therefore not important for local jurisdictions to adopt maps showing the precise extent of ML areas. The Basin ALP map recommended for adoption by Metro is sufficient to generally locate properties where the special provisions for design flexibility can be applied, as well as the adjacent LL inventory areas into which they may be extended.

C. Program Elements

The following provides more detail in describing salient Basin program elements. A comparative overview of the urban program is provided below in **Table 3-1**, Program Approach – Summary Table. This Table summarizes the program approach for each of the three program resource areas, in order to illustrate the relative distinctions among them. In general, the proposed program approach is most liberal in the Lightly Limit areas and most rigorous in Strictly Limit areas.

Traditionally, the practice of Goal 5 programming has involved land use planning and regulatory approaches to achieving administrative rule requirements. The Partners' approach is less traditional in that it provides a revenue basis for limiting impacts to significant resources. In addition, the proposed program incorporates existing regulatory procedures to address habitat

protection in core riparian areas. The program elements described in this chapter elaborate on the Partners' objective to provide development-related incentives for reducing resource impacts.

Table 3-1: Program Approach – Summary Table

	PROGRAM LIMIT DECISION		
	Lightly Limit	**Moderately Limit**	**Strictly Limit**
Goals:	▪ encourage minimizing impact through sensitive development and maintenance practices ▪ encourage and support preservation and enhancement of resource areas ▪ optional resource retention, where resources are present	▪ target and fund environmental projects for riparian system enhancement ▪ design flexibility for minimizing disturbance ▪ encourage minimizing impact through sensitive development and maintenance practices ▪ encourage and support preservation and enhancement of resource areas ▪ optional resource retention	▪ target and fund environmental projects for riparian system enhancement ▪ development generally not allowed ▪ development that is permitted must avoid or minimize disturbance of resource area ▪ require use of sensitive development and maintenance practices ▪ require enhancement of degraded resource areas
Approach:	▪ incentives to preserve and enhance vegetation ▪ technical assistance available to facilitate and encourage use of tools and incentives ▪ guidelines for LID and habitat sensitive green design approaches	▪ special development tools available to minimize potential resource disturbance area ▪ incentives to preserve and enhance vegetation via credit toward on-site storm water management requirements ▪ technical assistance available to facilitate and encourage use of tools and incentives ▪ guidelines for LID and habitat sensitive green design approaches	▪ development allowed in limited cases or under certain circumstances ▪ any permitted disturbance must be mitigated ▪ required enhancement of degraded resource areas within vegetated corridors ▪ technical assistance available to facilitate and encourage use of tools and incentives ▪ guidelines for LID and habitat sensitive green design approaches

ALP Designations

Strictly Limit (SL) Areas: In Strictly Limit areas, protection, conservation, enhancement and mitigation are required. Projects must be designed to avoid impacting Strictly Limit areas and may not encroach into these areas except under limited circumstances as provided for under CWS' Design & Construction Standards. (Examples of exceptions include one house on a lot that is entirely within a Vegetated Corridor area, and utility crossings). The use of land use tools, such as height and setback flexibility, would be supported in order to avoid or minimize the total disturbance area.

Moderately Limit (ML) Areas: Conservation and restoration will be encouraged in ML areas. Density reduction would be allowed provided conserved resource lands are permanently protected. Resources in ML areas would be targeted for restoration or enhancement projects.

Lightly Limit (LL) Areas: A Lightly Limit Program decision is applied to all remaining Goal 5 resource areas as well as to Impact Areas. The focus in Lightly Limit areas will be on education and incentives for the implementation of LID and green design approaches.

Impact Areas: The Goal 5 Administrative Rule requires that the ESEE address conflicting uses in impact areas. The March 2004 Tualatin Basin ESEE describes the approach to impact areas in detail, modified by the March 2005 addition to address Part Two of the Basin-Wide ESEE. The basin ESEE Report describes the Partners' approach to impact areas, which reflects a conviction that impacts to fish and wildlife habitat resources are not limited to areas immediately adjacent to the resource. Factors such as non-point source pollutants and hydrology have significant impacts on stream condition and water quality, and incremental impacts of development and increased impervious surfaces exacerbate these problems which, in turn, have a rippling effect on habitat quality throughout the basin's identified resource areas. The basin's urban program approach identifies the entire watershed as an impact area, and does not distinguish between Inner Impact Areas (which are based on Metro's definition for Impact Area) and Outer Impact Areas, which cover the remainder of the urban portion of the basin, from the standpoint of available program elements.

Overlap with Existing Floodplain and Local Goal 5 Programs

Goal 5 resource areas often correspond with areas already subject to regulation by cities and the District through floodplain, wetlands, tree protection ordinances and other existing Goal 5 programs. These existing regulations meet regional requirements under Metro's Title 3 provisions, as well as state and federal requirements to comply with the Clean Water Act. For these areas, existing regulatory programs such as local floodplain ordinances and wetland inventories, the District's Design & Construction Standards, and state/federal Removal and Fill permits would remain in place and the proposed Basin Goal 5 program would apply as well. For most cases, both sets of provisions would take effect; however, existing regulations would dominate where they are more restrictive. For example, an applicant may not be permitted to develop in a ML area if it also is within a floodplain and under a jurisdiction that restricts floodplain development.

Local floodplain and wetland ordinances vary to some degree by jurisdiction. For example, some cities actively manage development in the floodplain while others permit development in floodplain areas provided there is no decrease in flood water storage capacity as a result of the project (i.e., balanced cut and fill). This represents a circumstance where the proposed Goal 5 program provisions would add value to existing regulations because any development allowed in floodplain areas where a ML designations also applies would be allowed to incorporate a LID and/or density-reducing approach to the site design. This could effectively result in a more environmentally sensitive treatment of floodplain areas throughout the urban portion of the basin.

The District's requirements include the following:

- Preparation of a surveyed delineation and Natural Resource Assessment for evaluation of Vegetated Corridors adjacent to Sensitive Areas (defined as intermittent or perennial streams, the Tualatin River, wetlands and springs). A Natural Resource

Assessment (Site Analysis) may be required for site developments located within 200 feet of a Sensitive Area in order to obtain a Service Provider Letter from the agency.

- Revegetation of degraded and marginal condition Vegetated Corridor areas with native vegetation.
- Placement of areas adjacent to streams and wetlands in separate public easements or tracts.
- Other enhancement of Vegetated Corridors such as removal of invasive plants, in accordance with Design & Construction standards.
- Some buffer averaging is permitted.
- Very limited uses are allowed.
- Rules for erosion control and prevention.

Low Impact Development (LID) Guidelines

The proposed program encourages the use of environmentally sensitive site design practices throughout the watershed in order to reduce the impact of new development on fish and wildlife habitat in the basin and to aid in improving environmental quality. These design practices include a variety of techniques known collectively as Low Impact Development (LID).

Habitat Benefits: Low-impact stormwater management is a tool that can be used to limit development impacts on fish and wildlife habitat. These development impacts typically arise from altered hydrology and non-point source pollution to sensitive water bodies resulting from high levels of impervious surfaces.[1] The LID approach would encourage the retention of existing habitat resources on a given site because undeveloped resource areas would be factored into a site's EIA calculation and would be counted as unconnected impervious surface area (i.e., would help off-set the impact of the new development).

Stormwater Management Benefits: Urban imperviousness causes significant negative hydrologic impacts to habitat areas by way of increased stormwater flow rate and volume, resulting from decreased soil infiltration and plant uptake.[2] Low Impact Development techniques are a means by which proposed development projects can meet Clean Water Service's storm and surface water management requirements. The water quantity management component of the Healthy Streams Plan proposes revising water quantity design standards so that LID techniques may be utilized to meet these requirements in lieu of the traditional use of a detention facility.

Low Impact Development (LID) is a stormwater management strategy concerned with maintaining or restoring the natural hydrologic functions of a site designed to achieve natural resource protection objectives and fulfill environmental requirements. LID employs a variety of natural and built features that reduce the rate of runoff, filter out its pollutants, and facilitate the infiltration of water into the ground. By reducing water pollution and increasing groundwater recharge, LID helps to improve the quality of receiving surface waters and stabilize the flow rates of nearby streams. LID incorporates a set of overall site design strategies as well as highly localized, small-scale, decentralized source control techniques known as Integrated Management Practices (IMPs). IMPs may be integrated into buildings, infrastructure, or landscape design.

[1] Sherman, 2004.
[2] Sherman, 2004.

Rather than collecting runoff in piped or channelized networks and controlling the flow downstream in large stormwater management facilities, LID takes a decentralized approach that disperses flows and manages runoff closer to where it originates. Because LID embraces a variety of useful techniques for controlling runoff, designs can be customized according to resource protection goals, as well as site constraints. New projects, redevelopment projects, and capital improvement projects can all be viewed as candidates for implementation of LID techniques.

Typically, on-site runoff retention measures to meet hydrology impact requirements entail the construction of a detention basin. The proposed LID requirements would implement similar hydrologic performance standards on a given site through a design approach that incorporates conservation, storage, conveyance, landscaping and/or infiltration techniques to retain runoff on site. Features such as stormwater planters and bioswales in parking lots or adjacent to roads would be designed to balance out or reduce the effect of impervious area for a given development, thereby reducing the indirect, cumulative impact of urbanization on water quality and habitat resources in the basin. While hydrology requirements will continue to apply throughout the District service area, the use of LID techniques should be established as the preferred method of meeting those requirements.

It is intended that program implementation include the development of a model ordinance to address a menu of several applicable low impact development (LID) approaches and the inclusion of LID guidelines in local development codes. The program will also address removal of current impediments to the implementation of LID development techniques. As well, the permit process will be streamlined to allow beneficial activities, such as tree planting, resource enhancement, and removal of noxious plant species either "by-right" or through a relatively simple and low-cost administrative review process. Procedures relating to enhancement activities for improvement of resource conditions (including invasive species removal, revegetation, grading to create habitat or stabilize stream banks, large wood placement, and fish habitat improvements) that are consistent with the Healthy Streams Plan (and coordinated with the District) will be streamlined and subject to an administrative review only.

Note that for many if not most jurisdictions in the basin, removal of obstacles in existing regulations will be required in order to allow for an LID approach to meeting stormwater management requirements. Program development will include a review of the Audubon Society's Stormwater/Pavement Impacts Reduction (SPIR) report for identification of specific conflicts.

Reducing Effective Impervious Area (EIA): According to the July 2002 Draft of CWS' Tualatin Basin Effective Impervious Area Reduction Task Force Report:

> *In a simplified undisturbed hydrological cycle, precipitation falls from the sky, gets intercepted by vegetation, infiltrates into the rich duff layers of forests and prairies, recharges groundwater, and emerges in local streams and wetlands as base flow.*

In the typical urbanized landscape in Washington County, the amount of effective impervious area increases dramatically over pre-development conditions, and most storm water from this

urbanization is typically handled in a piped system. Impervious surfaces or "hardscapes" circumvent the natural hydrologic cycle and concentrate water into a piped stormwater system, which is composed of above ground retention ponds, detention basins, underground catch basins, pipes, curbs and gutters. Most stormwater controls currently in place are designed to quickly direct water away from the built environment (roads and buildings) and to prevent flooding, erosion and impacts to adjacent property. Impervious area that collects and drains the water directly to a stream or wetland system via pipes or sheet flow is considered "effective impervious area" (EIA) because it effectively drains the landscape. Impervious area that drains to landscaping, swales, parks, and other pervious areas is **not** considered EIA because the water infiltrates through the soil and into ground water, without a direct connection to the stream or wetland. The term EIA better describes urban hydrology and provides an objective measurement for management of stormwater from impervious areas.

Low Impact Development Applicability: As a key element of the proposed Basin Program, guidelines for the implementation of LID techniques will be developed and LID approaches will be encouraged in order to reduce the impacts of future development on environmental health. Program implementation will include the development of a model Low Impact Development ordinance for the Basin. This ordinance would be developed in cooperation with Clean Water Services ongoing efforts to update their stormwater management program.

Low Impact Development Techniques: It is anticipated that a model LID ordinance will provide incentives for the use of a variety of optional tools designed to reduce the total EIA of typical land development activities. A broad array of LID techniques (tools) are currently in use throughout the world. Many of these techniques can be applied to typical development here in the Pacific Northwest. Examples include:

1. **Landscaping**: Techniques can be employed that maximize effectiveness of runoff filtration and detention. This includes practices such as the use of compost at least twelve inches in depth and a multi-layered canopy in forested areas. Landscaping standards could be coordinated with the District's requirements for use of native species, as outlined in the Design & Construction standards. The program would also promote limited pesticide and herbicide use through property owner education and as a result of incorporating native species, which are more suitable as low-maintenance plantings. A requirement to incorporate predominantly native plants will augment the habitat benefits of this approach, and may decrease maintenance costs.

2. **Tree Canopy Preservation**: Tree canopy preservation and maintenance of native understory vegetation is recognized as an effective method of reducing EIA.

3. **Bioswales**: The creation of bioswales can improve water quality, help reduce EIA, and provide new habitat. Bioswales can be flexibly integrated into site design with a variety of alternative shapes and sizes. Rooftops, parking lots, decks, walkways and other impervious features can be designed to drain into bioswales. "Weepholes" in curbs can allow stormwater to drain into bioswales or other pervious landscape areas.

4. **Green Streets**: The term "Green Street" describes an alternative roadway design incorporating LID type stormwater treatments. Typical designs drain stormwater runoff from paved road surfaces through a bioswale within the right-of-way. The design of these bioswales includes vegetation that cleans the stormwater before it is allowed to infiltrate into the ground. For the proposed program, the "green streets" option could apply to either public or private streets or parking lots, where feasible.

   Note that there may be maintenance concerns related to green street design which will require further review and analysis prior to final implementation. Recently, a technical group from jurisdictions in the Tualatin Basin met as an advisory committee to discuss what types of changes or design parameters should be included if green street design options were to be included in local road design standards. There were a variety of concerns expressed by the group, including new and untested/unknown maintenance methods, concerns about areas that may not be appropriate for green streets such as steep slopes and aquifer protection areas, and that specific clay soil types that may not readily allow for infiltration of stormwater. The latter concern, however, can be overcome by sub-grade application of gravel and other soil amendments.

5. **Pervious Pavement**: Pervious pavements which soak up and infiltrate storm water may be applied in a variety of situations without conflicts with other standards (ADA). Some examples include pavers, porous asphalt or concrete, and grass paver systems.

6. **Eco-roofs and Disconnected Downspouts**: Eco-roofs are also known as green roofs, and include those planted with vegetation that absorbs rainfall, and are built to be pervious instead of impervious. Large roof areas drain acres of stormwater though downspouts, many of which are typically required to drain directly into the piped system in accord with local codes. There are several examples of eco-roofs in the Portland metropolitan area, including the Clean Water Services Field Operations Center on Merlo Road and the Multnomah County Building in southeast Portland. Rain gardens are areas designed to manage disconnected downspouts and allow slow filtration of stormwater runoff. For example, stormwater scuppers (which are openings at the side of a building for the drainage of water from the roof) can effectively drain a rooftop into stormwater gardens or planter boxes. Note that the use of the eco-roof option may be more appropriate for larger scale development, such as commercial, industrial and multi-family residential structures. Single family dwellings however, can also disconnect roof drains in order to reduce the effect of their impervious roof surfaces.

Administration: While there are clearly habitat benefits to the proposed program's LID component (particularly with regard to the use of native plantings and incentives to preserve tree canopy), the EIA reduction aspect helps implement the stormwater management element of Clean Water Services' Healthy Streams Plan and NPDES MS4 permit. The dispersion and detention of runoff on-site effectively mitigates concentrated flows and non-point source

pollution loads, which result in cleaner, more stable stream conditions. In addition, EIA reduction approaches result in increased volume and duration of summertime flows. In other words, reducing the volume and rate at which stormwater enters the surface management system more closely simulates the runoff performance of a less urbanized area, which in turn reduces impacts on basin fish and wildlife habitat areas.

As proposed in the HSP, the District's surface water management program will update the Design & Construction standards to include specifics on impervious area management and the LID approaches as described above, which can be used to achieve required EIA targets throughout the urban area. Local jurisdictions would adopt these standards by reference. In addition, the District is developing a template to facilitate and standardize data input for applicants to utilize in calculating increases in EIA. EIA targets would be determined by the District, and engineers with local jurisdictions would review for compliance.

Best Management Practices

Washington County's Best Management Practices for Roadway Operations (BMPRO) 2003 is the result of an analysis of roadway management activities and the integration of public works engineering with environmental sciences, and has been designed to for submittal to provide guidance to county employees in the effective operation of the roadway system. These practices are designed to maintain the functional integrity of the roadway system, to provide for public safety, to preserve critical habitat and to meet the specific requirements outlined by NOAA Fisheries for coverage under the Endangered Species Act (ESA) Section 4(d) rules for threatened salmon and steelhead species. BMPRO 2003 includes a description of roadway management activities along with a description of techniques to minimize or avoid actions that may cause harm to endangered fish species, resource waters or wildlife habitats.

The BMPRO 2003 program includes several goals that relate to the management of vegetation along county roadways. An important part of this Best Management Practices program is the research, development and implementation of an Integrated Vegetation Management Program (IVMP) that will provide for an appropriate balance between conflicting uses such as maintenance practices and the basin's diverse natural environments. The IVMP incorporates multiple methods of vegetation management to achieve goals for public safety, cooperation with neighbors, environmental protection, and operational effectiveness.

Administration and Procedures

Because of the overlapping nature of Goal 5 resource areas with those managed by Clean Water Services, the program concepts outlined in this report will require District-jurisdictional coordination of proposed development activities. It is logical to accomplish this through the expansion of existing procedures. Although the details of program administration cannot be well articulated until after the program is more fully developed, below are some preliminary thoughts about how they might operate.

The aim of this expanded review process would be to provide technical assistance to property owners and developers regarding the implementation of special development provisions and site design techniques for minimizing impacts to habitat resources. The intention would be to explore site design alternatives and regulatory flexibility to achieve balanced results. Local

government and development interests would be best addressed through a process that involves District participation and technical assistance at an early stage in the development review process, such as through the service provider letter process, when site designs are typically in a preliminary phase. Current review practices require applicants for development proposals on property near WQSAs to obtain a service provider letter from the District.

For development sites that also include ML Goal 5 overlays, the proposed program provides for technical assistance to explore potential site design solutions that would conserve and/or protect sensitive habitat areas. However, this represents an expansion of District responsibilities and would likely require funding for the District to support additional staffing, or a fee assessment for the service provided that could cover added staffing costs. Alternatively, the cities and the county may wish to collectively subsidize a shared staff person who has land use planning and ecological expertise. Ideally, Goal 5 technical review staff would be housed within the District and would be familiar with the Design & Construction standards, but funded by the local jurisdictions. This would allow for the most efficient, simultaneous provision of resource area design assistance and vegetated corridor review.

Inventory Maintenance

Development activities in the basin will result in adjustments to inventoried resource areas. For instance, some areas that are set aside in tracts or easements via the development review process may be re-assigned with a SL program determination, while resource areas that are encroached upon through the development review process may garner a reduced inventory score or removal from the inventory. In addition, newly mitigated or enhanced areas will create fish and wildlife habitat where it may not have existed previously. To adjust for these modifications over time, the program will include the development of an inventory maintenance process, to be coordinated with Metro. Metro staff have noted the logic in having a centralized venue for processing these adjustments, particularly because of the regional nature of the inventory. Further, having Metro oversee the adjustments is appropriate because they developed the inventory scoring methodology and, therefore, can continue to apply it consistently to areas that require re-evaluation. As the details of the basin's program are developed, consideration will be given to a notice procedure that would keep Metro informed of inventory adjustments as they occur as a result of development, mitigation and enhancement activities. The TBNRCC may also be periodically apprised of basin-wide inventory adjustments resulting from development and enhancement activities.

Proposed Tualatin Basin Goal 5 Program Overview

DRAFT

MAJOR PROGRAM COMPONENTS

REVENUE — SOURCES

SWM fee portion	- coordinate with CWS HSP - $95M over 20 years - implementation of targeted tasks - adaptive management plan	CAPITAL IMPROVEMENTS: - focus on SL and ML areas - culvert replacements - outfall retrofits - riparian enhancement - tree planting challenge (partnerships)
		some SWM funding also applicable to VOLUNTARY efforts
Metro bond measure	- anticipated for November 2006 vote - potential funding for regionally significant acquisitions	
Future Considerations	- other local revenue options - grants	

REGULATORY — APPLICABILITY

BASIN-WIDE	Road Projects	Best Management Practices for ESA compliance	- Washington County BMPRO 2003, adopted September 2004 - opportunities for additional local programs (cities)
	CWS stormwater management program	- program to be updated for spring 2006 - incentive to implement green development approaches	
RURAL	Within inventoried areas (one-mile UGB buffer)	- will coordinate with Metro to re-evaluate these areas as future UGB expansions occur - comply with Title 11 of Metro UGMFP - concept planning for new urban land	
	Beyond inventoried area	- existing county Goal 5 program continues to apply	

REGULATORY — URBAN — ALP LIMIT LEVEL DETERMINATION

STRICTLY LIMIT: protection, conservation, enhancement and mitigation required	Consistent with CWS existing Design & Construction Standards for WQSAs and Vegetated Corridors (clear and objective standards)	STANDARDS: - includes measures that extend beyond Metro's existing Title 3 UGMFP requirements - no development of WQSAs, including wetlands and stream corridors (with exceptions) - riparian buffers required (i.e., Vegetated Corridors) - nearby development triggers enhancement of degraded vegetated buffer areas (average 50' widths) - limited development of floodplain areas - 125-ft. buffers for Tualatin River	EXCEPTIONS: - DSL-approved projects are permitted - local programs may be more restrictive about development of wetland and floodplain areas - downtown Tualatin and central Beaverton Title 3 exempt areas

VOLUNTARY — CATEGORIES — DEVELOPMENT RELATED — ALP LIMIT LEVEL DETERMINATION

MODERATELY LIMIT: conservation and restoration encouraged	RIPARIAN	- target areas for restoration and enhancement projects - allow flexibility in development approaches - includes remainder of Metro Class I/II inventory areas - CWS standards still apply within Vegetated Corridor areas - existing local Goal 5 programs will continue to apply	DEVELOPMENT OPTIONS to MINIMIZE IMPACTS: - decreased density, provided conserved resource area is permanently protected - clustering/reduced setbacks - on-site density transfers - guidelines for LID/green design approaches - technical assistance
LIGHTLY LIMIT: focus on education and incentives	UPLANDS	- possible future ML designation of significant resources, to be determined - possible future acquisition of significant sites, to be determined	DEVELOPMENT OPTIONS to MINIMIZE IMPACTS: - technical assistance - guidelines for LID/green design approaches - local tree ordinance may apply - some areas already protected as parks and open space - CWS standards still apply within Vegetated Corridor areas - existing local Goal 5 programs will continue to apply
	REMAINDER OF URBAN AREA	- includes balance of Metro resource inventory area	

VOLUNTARY — CATEGORIES — NON-DEVELOPMENT RELATED

PRIVATELY-OWNED PROPERTY and BASIN-WIDE EFFORTS	- education and outreach - stewardship recognition - explore local implementation of available tax incentive programs - partnering with environmental community - promote and support volunteer activities - CWS property owner partnerships to support riparian corridor conservation

ADMINISTRATION and MONITORING — LEVEL

REGIONAL — METRO	- coordination to provide data for regional monitoring activities and updates to regional resource inventory
LOCAL — TBNRCC	- extend Formation Agreement (which includes ex-officio Metro membership) - coordinate with CWS on implementing HSP program objectives - continued involvement in decision-making and project coordination
LOCAL — CWS	- continuous monitoring activities in place for DEQ permit purposes - planned re-sampling of Watersheds 2000 stream data (every 5 years)

acronyms:

BMPRO: Best Management Practices for Roadway Operations
CWS: Clean Water Services
DEQ: Department of Environmental Quality
DSL: Division of State Lands
HSP: Healthy Streams Plan
LID: low impact development
ML: Moderately Limit
SL: Strictly Limit
SWM: surface water management
TBNRCC: Tualatin Basin Natural Resources Coordinating Committee
UGB: Urban Growth Boundary
UGMFP: Urban Growth Management Functional Plan
WQSA: Water Quality Sensitive Area

3/23/05

CHAPTER 4 RURAL PROGRAM ELEMENTS

A. Applicability

The program elements described in this chapter apply to that portion of the Tualatin Basin in rural Washington County, outside of existing UGB. This includes the Non-Urban (NU) conflicting use category addressed in the Basin ESEE Analysis (basically consisting of the Metro study area extending approximately one mile beyond their jurisdictional boundary) and the remainder of the county that extends beyond the study area. The Basin study area includes new Goal 5 resource inventory data provided by Metro. While there is no new inventory data for the outlying rural portion of the county, the county will continue to implement its existing, acknowledged Goal 5 program in that area. In addition, the Basin program proposes to augment the existing program as described below.

B. Rural Elements of the Proposed Basin Goal 5 Program

The rural element of the proposed Basin program is addressed in two parts based upon the geographic area covered. Each of these is described in general terms below.

Within Metro Study Area

As mentioned above, the NU conflicting use category lands fall within the study area for the Metro resource inventory and generally extend approximately one mile beyond the Metro jurisdictional boundary. The program recommendations for this area focus on targeting high-value, regionally significant resources for restoration, enhancement and/or acquisition. The following program directions will apply to rural lands within the Metro inventory area:

For all areas within the one-mile buffer, including those with Moderately Limit and Lightly Limit ALP designations, the urban program applications proposed for resource areas will be applied as appropriate for rural development. These include the following:

- continued application of regulatory requirements of the Rural/Natural Resources element of the Washington County Comprehensive Plan, including Significant Natural Resources overlays and related standards;
- potential re-evaluation of resources in areas subject to future UGB expansions (coordination with Metro through Title 11 concept planning provisions);
- support of CWS Enhanced CREP (Conservation Reserve Enhancement Program) efforts;
- continued state oversight of standards applicable under the Oregon Forest Practices Act;
- continued state oversight of standards applicable under regulations administered by the Oregon Department of Agriculture;
- continued state oversight of water quality standards administered by the Oregon Department of Environmental Quality; and
- the implementation of the county's Best Management Practices for Roadway Operations and associated Integrated Vegetation Management Program for ESA compliance (described in chapter 3 of this report).

In the working landscapes of rural Washington County, agricultural and forestry practices near streams may have a much greater impact on water resources than rural residential development activities. However, the county does not have land use authority over farm and forest practices,

which fall under the auspices of the state departments of Agriculture and Forestry, respectively. Thus, the existing land use regulatory program (and any proposed program) will continue to be limited in applicability to non-farm and non-forest activities only.

For those areas within the one-mile buffer portion of the study area that are identified as regionally significant Class I & II Riparian resources (and thus feature a Moderately Limit ALP designation), the following additional program activities are proposed:

- identification of target areas for restoration and enhancement projects; and
- identification of target areas for future acquisition opportunities (willing seller).

The combined effect of these efforts will contribute to the improvement of basin environmental health by targeting concerns in key urban fringe areas.

Beyond Metro Study Area

The proposed Basin program also includes measures to enhance the county's existing rural Goal 5 program beyond the basin study area. In this area, the County has identified significant Goal 5 resource areas on the Rural/Natural Resources Map Element of its Comprehensive Plan. The following program directions will apply to rural lands in this area:

- continued application of regulatory requirements of the Rural/Natural Resources element of the Washington County Comprehensive Plan, including Significant Natural Resources overlays and related standards;
- support of CWS Enhanced CREP (Conservation Reserve Enhancement Program) efforts;
- continued state oversight of standards applicable under the Oregon Forest Practices Act;
- continued state oversight of standards applicable under regulations administered by the Oregon Department of Agriculture; and
- the implementation of the county's Best Management Practices for Roadway operations and associated Integrated Vegetation Management Program for ESA compliance (described in chapter 3 of this report).

C. Enhancement of Existing Rural Goal 5 Program

Washington County regulates development activity in all rural areas within its jurisdiction and has had a Goal 5 program in place for areas outside the Urban Growth Boundary since 1986. Currently, for lands outside the UGB pursuant to Community Development Code (CDC) Section 421 (Floodplain and Drainage Hazard Areas) and CDC Section 422 (Significant Natural Resources), Washington County regulates the area within 125 feet of a stream. In order to develop within this area, applicants must submit the following:

- Peak volume/velocity hydrology report for designated drainage hazard areas; and
- Habitat report for significant natural resource areas.

The standards of Section 422 allow for resource encroachment with a finding that the development "will not seriously interfere with preservation" of habitat. These standards, while not as rigorous as the Clean Water Services' Vegetated Corridor standards, do provide water resource and habitat benefits to rural stream corridors. Section 421 outlines standards that generally regulate development within 125 feet of a stream where they are applicable. However, these standards only regulate from a flood or drainage hazard perspective, and thus do not apply to all rural stream corridors.

Other Program Opportunities

In the working landscapes of rural Washington County, agricultural and forestry practices near streams can, and often do, have a much greater impact on water resources than rural residential development activities. Proper management of streamside vegetation and channel morphology can lead to significant improvements in both water and biological quality of streams (Johnson and Ryba, 1992). Working with the Department of Forestry on a process for review and input into forestry practices could help reduce problems caused by streamside logging activities. Working in partnership with the agricultural community to fund and implement streamside management agreements that support improvements such as livestock fencing and revegetation could also help improve stream health. Cooperative agreements and funding for improvement of stream health in farm and forestry areas would likely have a very positive impact on resource quality and quantity.

Clean Water Services is currently engaged in program efforts to work cooperatively with willing rural land owners on critical water quality issues such as livestock in streams and the clear-cutting of headwaters. There are additional positive, incentive-based efforts being made by the Soil and Water Conservation Districts and non-profit organizations to encourage more water and wildlife friendly land management practices.

Recognizing the limitations imposed by state-assumed regulation of farm and forest practices and in lieu of adopting new regulatory standards, it is recommended that the county, consider a process to identify the following:

- opportunities to work with the state departments of Agriculture and Forestry to reduce impacts to potentially sensitive habitat areas located on agricultural and forest lands; and
- other program elements that will serve to protect riparian and wildlife resources indirectly.

Minimum Stream Buffer Areas

It is well documented that vegetated stream buffers offer a variety of ecosystem benefits including: stream bank stability, erosion management, pollutant filtering, microclimate moderation, fish and wildlife habitat, and storm water attenuation (Johnson and Ryba, 1992). The ecosystem benefits of stream buffers occur both inside and outside the urban growth boundary; data from Watersheds 2000 study of Tualatin Basin streams generally suggests overall stream health rankings improve with increasing streamside buffer width and decreasing presence of non-native vegetation (Figures 5-1 a-b). Ecological investigations of riparian corridors have demonstrated they are a key landscape feature with substantial influence on environmental vitality (Naiman et al., 1993). The issue of how best to protect riparian corridors in the rural area should therefore be addressed as recommended above during Program implementation.

Additional program efforts that may be considered include:

- Opting back into the Wildlife Habitat Conservation and Management Program (supported by the Department of Agriculture and Department of Forestry). In addition to the political concerns, there are economic considerations associated with increasing regulatory buffers for rural residential owners. If the property owner chooses to dedicate a conservation easement over certain portions of its property for water and wildlife habitat, any existing regulation will diminish the value of the conservation easement. This

will negatively impact the property owner in terms of income and property tax benefits of a conservation easement donation; the buffer regulation thus becomes a disincentive to a long-term protection strategy.

Washington County has chosen to opt out of the Wildlife Habitat Conservation and Management program that allows conservation easement areas on farm and forestry parcels to still be taxed as farm and forestry use. This implementing legislation has since been revised. The County may reconsider its position regarding the revised tax program in order to remove the disincentive surrounding farm and forestry use land tax conversion that results when a conservation easement is put in place. For rural residential owners, the implementation and expansion of the Riparian Tax Credit program could provide the incentive needed for enhanced near stream resource management, without regulation.

- Coordination with Clean Water Services and the Department of Forestry to develop and implement a memorandum of understanding designed to minimize pre-emptive clear cutting of near stream areas on the urban fringe and in headwater areas.

- Continued implementation and enforcement of current floodplain balance cut and fill and drainage hazard area regulations.

- Coordination with local partners to provide necessary funding to acquire and maintain conservation easements on critical habitat lands.

- Support for the implementation of the Riparian Tax Credit program throughout the County.

CHAPTER 5 NON-REGULATORY PROGRAM OPTIONS

A. Overview

The Tualatin Basin Goal 5 Program is built upon three pillars: **revenue** for capital improvements, **regulations** to protect the health of riparian corridors (Clean Water Services' Vegetated Corridors) and **voluntary efforts;** together these components will improve the environmental health of the Basin. This chapter explains the voluntary aspects of the Basin Program, which will be further developed during the program implementation phase. It notes the potential effectiveness of these efforts, their costs, and the partners who will help implement them. These efforts will educate Tualatin Basin commercial interests and residents to a higher level of awareness of the environmental effects of their actions. The efforts will be coordinated Basin-wide in order to make the most of each partners' resources.

Partners will be chosen that have already established trusted local reputations in the field of environmental enhancement and protection. Costs will be rated high if they include granting funds; medium if they include dedicated staff; and low if they include materials only with some staff time. (A summary is provided at the end of this chapter in Table 5-2.) Funding for public awareness and educational purposes will come from a variety of sources including, but not limited to, Metro's forthcoming Nature in the Neighborhoods bond measure, Clean Water Services educational programs and resources from local jurisdictions.

In order to understand these voluntary efforts, it is first important to understand the term "**limit**" as it is used in various ways throughout the Basin program. The programmatic requirement in **Strictly Limit (SL)** areas is for protection and conservation of resources. These areas are predominantly consistent with the limits of Clean Water Services Water Quality Sensitive Areas and associated Vegetated Corridors (generally 50' buffers along streams and 125' buffers along the Tualatin River). With few exceptions, development is not allowed in SL areas. For the most part, the non-regulatory program measures described in this chapter are not targeted at SL areas, which are the focus of the proposed program's regulatory component.

The **Moderately Limit (ML)** designation generally applies to Class I and II Riparian Resource areas beyond the Vegetated Corridor boundaries. In areas identified as ML, conservation and restoration is encouraged, and the revenue tools the Basin has at its disposal will be directed to help make such conservation and restoration happen. The **Lightly Limit (LL)** designation applies to the remainder of the Tualatin Basin. The term does NOT mean that new regulations are in place in these areas. It does mean that the Basin Partners recognize that the health of our environment should not rest solely on streamside property owners. Thus education and incentives will be offered to everyone.

With these definitions in mind, voluntary efforts are divided into two categories: development-related and non-development related. These are described below.

B. Development-Related Options

Development-related efforts for riparian areas with ML designations include targeting revenue to extend **restoration and enhancement** projects into these areas. The agents will be governmental or private, and the properties could be public or private. Such restoration grants will come with provisos that mandate future protection. They will go to developers in return for habitat restoration in concert with habitat-friendly development. Such grants will encourage innovative practices and increase the effectiveness of regulations. Tree planting and preservation will be especially encouraged. Grants will also go to public works agencies to help build and maintain better wildlife crossings and culverts.

Effective restoration work will require a trained and experienced staff with monitoring capability. Maintenance and monitoring of restoration sites over time will be needed for effective long-term restoration. Possible partners will be Clean Water Services, the Tualatin River Watershed Council, Wetlands Conservancy and Cities.

Cost of restoration varies based on type and quality of habitat. Current Metro projects range from $1,800-3,500 per acre; removal of one small dam, for example, would cost approximately $80,000. The cost of restoration grants/activities will be medium to high. For example, $100,000 will fund:

- ten small restoration grants for residential or business owners, OR
- two habitat friendly development/redevelopment grants, OR
- one grant for a wildlife crossing/culvert replacement project

Clean Water Services reports that costs for tree planting are highly variable depending on the condition of the site, the availability of plant stock and water to irrigate, whether contract laborers, staff or volunteers do the work, etc. However, a rule of thumb might be drawn from their recently adopted rates for mitigation of vegetated corridors. An excerpt from the R&O is provided below:

Table 5-1: Vegetated Corridor Payment

Square Footage to be Mitigated	Cost Per Square Foot
1 – 5,000 sq. ft.	$8.66
5,001 – 10,000 sq. ft	$4.33
10,001 – 20,000 sq. ft.	$2.22
20,001 – 40,000 sq. ft.	$1.11
Over 40,000 sq. ft.	$0.55

The Basin partners will also work to allow much more **flexibility in development approaches** on these lands, including options for decreased density, for clustering development and/or reducing setbacks, and for making on-site density transfers. Most importantly, Washington County will work to create a **model Low-Impact Development (LID) ordinance** which local governments can adopt to streamline regulations to encourage environmentally friendly "green" building practices. The county and the Basin Partners will also work together to remove barriers in existing codes that represent barriers to the

implementation of LID practices. An example will be removing the obligation to construct a storm water piping system where a developer alternatively opts to build a storm water management system that utilizes vegetated swales and other biofiltration techniques to slow the flow of runoff and increase site permeability. Educational efforts will not be sufficient to implement Low-Impact Development to its greatest practical extent; removing regulatory barriers to LID is key. Clean Water Services has agreed to support this effort and, in fact, CWS is currently funding a study to improve hydrologic modeling that could encourage the more effective use of LID techniques.

What about **upland habitat** (significant stands of trees)? Such natural resources treasures are not covered by the SL/Vegetated Corridor regulations. However, they are mapped as areas for possible future acquisition. This approach stresses that in ML areas, revenue sources (including possible use of park district SDC's) are most important. Some of the inventoried upland habitat areas are already protected as parks and open space. In addition, local tree ordinances (where applicable) and local Goal 5 programs that exceed the Basin's proposed program will continue to apply.

Beyond the ML resource lands, in areas with a LL designation, the proposed Basin Approach provides that a program of education and incentives will guide **all** development throughout our urban areas. Besides offering guidelines for LID and green design approaches, this will include a **technical assistance** program. Technical Assistance entails dedicating staff to give direct help to property owners, businesses and developers, one-on-one or in groups with workshops, seminars, etc. Such staff will be particularly useful during preliminary development stages by helping applicants understand the range of flexible site design measures and how they can be implemented to effectively conserve the most valuable resource areas on site. In many cases an applicant will be able to receive "credit" toward stormwater management requirements through the appropriate use of vegetation on site. Technical assistance staff will also develop and distribute habitat restoration/protection/ enhancement literature, including habitat-friendly development and green business practice manuals, web sites, etc. They will help make native plants more widely valued and available.

An example of a program effort that will reduce costs and that will benefit private property owners is supplying free or low-cost native plants and trees for planting during habitat restoration/reforestation, protection and enhancement. The nature of much of this technical assistance work is a natural extension of Clean Water Services' development review process for Water Quality Sensitive Areas. Accordingly, it seems logical that technical assistance will be provided through the addition of personnel at CWS (as described in Chapter 3 of this report). This technical assistance staff would be available to help city and county staffs assist property owners, including help in compliance with the Vegetated Corridor regulations. They could help private landowners develop a Habitat Protection Plan for their individual properties. The success of this option will depend on the level of partner commitment and the longevity of the program. It will be helpful in supporting many of the other options, such as the stewardship and grants programs. It will increase the effectiveness of the regulatory program. Partners might be a consortium of local governments and agencies, including the Wetlands Conservancy. This option will be staff intensive; the staff will have to be technically proficient, and a high staff-to-client ratio will be desirable. Thus the cost will be medium.

C. Non-Development-Related Options

With regard to non-development related voluntary efforts, some will apply on a case-by-case basis to **private property owners**. These will include **education and outreach, stewardship recognition** and exploring local implementation of available **tax incentive** programs.

Education and outreach for property owners to help them properly manage the habitat land they own could include brochures, newsletters, web sites, even a telephone hot line to help owners maintain and enhance natural resource lands on their property. Developers will be further enlightened as to the economic benefits of sustainable site design and low-impact development (LID). Education will also include helping schools develop and implement curricula. This will have to be a long-term effort, as a long-term commitment is required to change behaviors and practices. Over time, a well-crafted education program can reach a large number of people and have a significant social effect (examples: campaigns against litter and for recycling).

Possible partners include organizations that provide habitat-oriented classes, such as naturescaping and natural gardening. Clean Water Services, the Tualatin River Watershed Council, the Tualatin Basin Public Awareness Committee (TB PAC), the Audubon Society of Portland and the Tualatin Riverkeepers (TRK) are prime examples. Working together with many natural resource partners will provide a consistent message and economy of scale throughout the Basin. Costs will be low to medium.

TB PAC is presently drawing up a proposal for Naturescaping classes that will be a paradigm for this option. CWS reports that its most recent venture at bringing naturescaping to the Tualatin Basin priced out at $900 per class, which assumes free meeting rooms, reproduction of materials, and snacks to be provided by a host jurisdiction. A good target attendance is thirty-five persons per class. Metro's existing environmental education program in the Parks & Greenspaces Department costs $245,000 per year.

Stewardship recognition will involve voluntary agreements set up with property owners or even entire neighborhoods that agree to restore, protect, and maintain their habitat according to best management practices. Stewards will be private landowners, or developers or businesses acting in a habitat-friendly manner. They will be recognized publicly for their achievements, culminating in annual awards and special ceremonies.

This option relies on willing participants. It will be more effective with long-term monitoring, and when coupled with grants and technical assistance to encourage more successful projects. Possible partners might be Clean Water Services, the Tualatin River Watershed Council, the Tualatin Basin PAC, the Audubon Society of Portland and the Tualatin Riverkeepers. Cost will be low to medium.

Tax incentive programs already exist under Oregon state law: the Riparian Lands Tax Incentive Program and the Wildlife Habitat Conservation Management Program. These

programs reduce property taxes or provide a credit to streamside property owners who sign management agreements or easements that result in preservation of enhancement of healthy riparian areas. Thus far there is a limited landowner enrollment in these programs, which may be due to the lack of enabling local ordinances. This issue needs more study. We will make options available for property owners to sign up for programs that reduce their property taxes or provide credit to streamside property owners. These do require ongoing management with the Oregon Department of Fish and Wildlife, and landowners can opt out of the program simply by paying the withheld taxes.

As counties are the agents of these state programs, a possible partner will be Washington County. The cost will be low to medium. Costs include lost property taxes, administrative costs, potential restoration costs, approval of habitat management plans. A related option might be for fee reductions on the part of Clean Water Services and the other jurisdictions in Washington County in return for a property owner providing certain benefits to the stream system. Note that Clean Water services already is engaging in effective property owner partnerships (i.e. the Enhanced CREP program) to support riparian corridor conservation in agricultural areas outside the UGB.

Other non-development related voluntary efforts will be applied **Basin-wide**. These will include similar education and outreach as described above. Public works agencies are already gearing up to educate staff in environmental **best management practices**. Washington County has recently appointed a Senior Environmental Resource Specialist, heading up their recently formed Environmental Services section, whose job is making sure road maintenance activities protect the environment. Her first goal is to make sure all road workers are trained in the county's Best Management Practices (BMPs) for Routine Road Maintenance that were adopted by the Board of County Commissioners in September 2004. She is developing a training program and field manual to increase workers' awareness of the impact of their activities. She also plans to implement a monitoring program to ensure the BMPs are effective. A fish passage barrier assessment is one of her longer-term goals. She intends to identify opportunities to partner with other agencies and find funding to remove fish barriers associated with the county's roadway system. Being a more proactive voice for the transportation industry in setting state environmental policy is also on her list of things to do. The county's BMPs are available online: www.co.washington.or.us/limit10.

Basin-wide voluntary efforts will also mean extensive partnering with the environmental community, promoting and supporting their **volunteer activities**, focused on restoration of significant habitat areas. Substantial restoration work is already being conducted in the Basin with volunteer efforts; the program will augment them with new financial resources, volunteer training, etc. For example, more "Watershed Wagons" will be purchased and outfitted with naturescaping tools.

This option will be more successful on public than private land. Partners will include SOLV, various Friends groups, the Tualatin River Watershed Council, the Audubon Society of Portland, Tualatin Riverkeepers and the Tualatin Basin PAC. More "Friends" groups will be encouraged and supported to form. The cost will be low to medium. One example is SOLV's

"Team Up for Watershed Health" program. Metro's existing volunteer coordination program (Greenspaces) costs $136,000 per year.

For more than 15 years, Clean Water Services has made a priority of public education and has developed and shared numerous and diverse, award-winning public information, awareness and outreach programs, including:

- Facility Tours open to the public at the Durham Facility and available on request throughout the year to students, visiting dignitaries, etc. Tours are advertised in local newspapers and invitations are mailed to facility neighbors, community groups and elected officials.
- Facility Brochures describe the Durham and Rock Creek Facilities, the wastewater treatment process, and technical details.
- Tualatin River Rangers Classroom Presentations teach children the wastewater treatment process and how they can protect water resources; employees present classes to up to 5,000 fourth graders annually and the program is marketed to other facilities throughout the U. S.
- Videos/DVDs have been produced by the District on several topics, with the most recent being the award-winning Tualatin: *A Watershed Restored and Wild by Design: Restoring Urban Steams & Wetlands.*
- Exhibitor at Community Events including Washington County Fair, Tualatin Crawfish Festival, Earth Day at the Nature Park, Public Works Fair, Tigard Balloon Festival, Tualatin Riverkeepers Discovery Day, Hillsboro Fourth of July Parade, Beaverton Summerfest and more creates an opportunity for staff to share information with thousands of residents, informing them of about the facilities and how to protecting water resources.
- Regional Coalition for Clean Rivers and Streams is one of many partnerships by which Clean Water Services has leveraged public education resources to develop and distribute information more effectively. A charter member of the Coalition (Portland, Gresham, Clackamas County, Clean Water Services, Metro, City of Vancouver, Clark County, and other metropolitan governments), Clean Water Services' contribution to a $60,000 transit and print advertising campaign in 2004 was $17,000. The 2004 Campaign was "*Is Your Lawn Chemical Free?*"
- *Go Native* Campaign provides a link to the District's web site and native plant line to request a free Gardening with Native Plants poster. In one year, there were nearly 7500 requests for the posters.
- Stream and River Clean Up and Restoration Events on the Tualatin River and its tributaries regularly benefit from District financial support and technical expertise. In 2004, 2,180 volunteers planted 8,290 native trees and shrubs at District stream and wetland sites; 90,000 pounds of invasive plants were removed, and volunteers clocked 6,540 hours on planting restoration.
- Community Based Restoration Projects receive funding, technical assistance, plants and other support. Last year, the Division coordinated six Home Owners Association volunteer projects, two school enhancement projects, two church/Eagle Scout projects, and eight stream enhancements at over 20 sites.

- Tualatin Basin Public Awareness Committee (TB PAC) is comprised of partner cities and stakeholder groups to do public education and outreach as a combined effort. In the past ten years, they have installed more than 800 signs on stream crossings, developed brochures and informational materials, sponsored a movie theater ad campaign, festivals, and a bilingual project to promote water quality awareness. In the past year they gave monetary support for Tualatin River Discovery Day, watershed education performances and *Naturescaping for Clean Rivers* classes.
- *Watershed Wagon* is a 14-foot enclosed trailer equipped with tools and equipment for stream restorations that has helped staff and volunteers focus on projects rather than gathering equipment and supplies. Since March 2001 it has aided community groups in over 88 stream restoration projects.
- Community Best Management Practices Cooperative Funding program established in 1996 by the District's Public Affairs and Watershed Management programs provides technical and organizational support for community water quality projects. In 2004, key support included $1,500 for the Children's Clean Water Festival; $1,000 for the Tualatin Riverkeepers annual Discovery Day, $2,500 for Jackson Bottom Wetlands Preserve *Tweet of Dreams* fund-raiser; $100 to the River Network; $1,100 for the Audubon Society annual dinner; funding to sustain a native plant nursery at Fernhill Wetlands, and support for stream enhancement projects by providing drop boxes for debris and invasive nonnative plants removed by volunteers.
- *Fats, Oils and Grease Campaign: Gravy, cooking oil, shortening, and sauces, oh my!* The battle of the bulge isn't just at our waistline; it's in our sewers causing clogs and messy overflows. To combat the fatty enemies, the *Freeze the Grease, Save the Drain!* campaign was jointly developed in November 2004 by the City of Portland Bureau of Environmental Services, Clackamas County Water Environment Services, City of Gresham and Clean Water Services. Radio and newspaper ads ran over a three-week period that encouraged residents to call and request a free kit which included a pan scraper, can lid, and a step-by-step informational bookmark in Spanish and English. More than 1,500 callers have responded to date, ready to take part in the fat-free sewer regime.

Other District ongoing public education activities include:

- Information Brochures and Booklets
- "Clean Water Starts at Home" Website
- Billing Inserts, Bookmarks, Door hangers
- Leaf Pick Up Program
- Household Hazardous Waste Disposal Events
- Eco-Logical Business Certification
- Clean Water Action Day
- "Dump No Waste, Drains to Stream" storm drain stenciling
- Customer Awareness and Satisfaction Survey
- Stream Friends Support
- Tualatin Watershed Enhancement Coalition
- Streamside Owner Direct Mail
- Mercury Awareness Campaign

Under the Basin's proposed Goal 5 program and with the on-going guidance of the Tualatin Basin Natural Resources Coordinating Committee, such efforts will gather force and continue. All these voluntary paths, taken together, will help achieve the goal of improving the environmental health of the Tualatin Basin.

Table 5-2: Summary of Non-Regulatory Measures

Option	Cost	Partners
1) Acquisition	High	Governments at the local, regional, state or federal level; nonprofit agencies such as the Wetlands Conservancy
2) Education	Low to medium	District, TRWC, TB PAC, Audubon Portland, TRK
3) Recognition	Low to medium	District, TRWC, TB PAC, Audubon Portland, TRK
4) Restoration grants	Medium to high	District, TRWC, TRK, Wetlands Conservancy
5) Reduction in property taxes	Low to medium	Washington County
6) Technical assistance	Medium	Consortium of local governments and agencies such as the Wetlands Conservancy
7) Volunteer support	Low to medium	SOLV, Friends groups, TRWC, Audubon Portland, TRK, TB PAC.

CHAPTER 6 PROGRAM RESPONSE TO ENVIRONMENTAL HEALTH

A. Introduction

The Intergovernmental Agreement (IGA) between the Tualatin Basin Natural Resources Coordinating Committee (TBNRCC) and Metro describes the goals the Basin must strive to achieve. The overriding goal of the Basin Approach is taken from Metro's Streamside CPR Program Outline "Vision Statement," which states:

> *The overall goal is to conserve, protect and restore a continuous ecologically viable stream-side corridor system, from the stream's headwaters to their confluence with other streams and rivers, and with their floodplains in a manner that is integrated with the surrounding urban landscape. This system will be achieved through conservation, protection and appropriate restoration of stream-side corridors through time.*

In order to achieve this goal (and to provide further definition), the IGA also identifies improvement of the environmental health of each of the eleven regional sites and the entire Tualatin Basin as a primary objective. This chapter describes how the following program components function to achieve this goal relative to the current condition of the Basin.

B. Summary of Key Elements of Proposed Program Components

As described in Chapter 3, the overarching structure of the proposed program consists of four major components: revenue, regulations, voluntary or non-regulatory, and monitoring. The following key elements of program components are described in more detail elsewhere in this report.

Revenue Component:

1. $95 Million in Healthy Streams Plan recommended capital improvements (ranging from $3.5-$6.5 million per year over the next twenty years) will be focused in areas of highest resource quality. Typical projects will include:
   - community tree planting
   - riparian corridor restoration and enhancements
   - culvert replacements
   - stormwater outfall retrofits
   - flow restoration;
2. Regional Bond Measure providing funding for site acquisition and preservation; and
3. Other potential funding alternatives (including grants, local bond measures, opportunities for park SDCs, etc.) – may be utilized for education, restoration and enhancement or acquisition.

Regulatory Component:

1. Existing Clean Water Services Design & Construction Standards:
   - development related activity restrictions in Water Quality Sensitive Areas (wetlands, springs, streams, and the Tualatin River) and their associated Vegetated Corridor areas. (Vegetated Corridors average approximately 50 feet and range up to 200 feet depending on resource type and size, drainage area, slope, and site conditions.)
   - required enhancement of degraded or marginal condition vegetated corridors;

2. Existing local Goal 5 program requirements;
3. Existing local tree protection standards; and
4. Other existing standards which result in local habitat protection (including but not limited to: local, state and federal wetland regulations, floodplain regulations, ESA, Clean Water Act, etc.).

Non-Regulatory (Voluntary and Incentives) Component:

1. Educational programs;
2. Guidelines for low-impact-development & green design;
3. Flexible development standards;
4. Technical assistance programs;
5. Local, state, federal and non-profit grant programs; and
6. Potential implementation of tax incentive programs

Ongoing Monitoring and Administration Component:

1. Adaptive management process;
2. Regional data coordination;
3. Continued TBNRCC functions:
   - Project coordination
   - Funding coordination;
4. CWS monitoring activities for NPDES permit compliance and stream health; and
5. HSP commitments to re-sample Watersheds 2000 RSAT inventory

The following sections elaborate on the above program components to explain their contribution to improvement of the environmental health of the Tualatin River Basin.

C. Revenue Program Component

CWS Capital Improvement Program (outlined in the Healthy Streams Plan)

The estimated overall cost of implementing all the elements of the Healthy Streams Plan is $95 million over the next twenty years. It is important to note that the community tree planting and the riparian corridor restoration and enhancement activities alone (representing less than 42% of the $95 million total program costs), are estimated to produce a total net environmental benefit valued at over twice the entire cost of the program. The implementation of the Healthy Streams Plan will be funded predominately by Surface Water Management (SWM) fees. Culvert upgrades and repairs may qualify for system development charge (SDC) and/or transportation funds use. Capital improvements will directly benefit in-stream, riparian corridor or upland habitat throughout the urban portion of the basin.

The SWM fees currently collected together with funds on hand are expected to cover program costs for several years. However, it is anticipated that a future SWM fee increase may be necessary to complete the twenty-year Plan. The surface water management program is currently funded at a very modest level relative to similar jurisdictions throughout the region and the state. Clean Water Services conducted a public values survey in which over ninety percent of respondents were willing to support a modest fee increase of $1 to $2 per month. Based upon recent estimates, implementation of a $1 per month per ESU (equivalent service unit) increase could generate more than $63 Million over twenty years.

All of the capital improvements identified in the HSP are projects designed to enhance riparian corridor conditions and/or improve stream health. These projects generate ongoing, appreciating benefits to water quality and aquatic habitat. The community tree planting projects will provide multiple benefits including water quality, in-stream and near stream habitat improvements, and community education and awareness.

To identify projects, policies and programs that will achieve the goals and objectives identified in this Goal 5 Program, the Partners relied upon the Healthy Streams watershed planning process. The GIS-based modeling tool RESTORE (OSU, 2004)—a spatially explicit decision support tool designed to assist watershed planners in restoration decision-making—was adapted to the Tualatin Basin by Clean Water Services and Oregon State University to identify multi-objective stream enhancement opportunities. The RESTORE model generated the locations of various project elements (preservation, flow restoration, etc.) based on a set of rules that governed which practices would be most effective under various site conditions. The model identified project elements totaling approximately 675[1] miles over the 338 miles studied (see **Table 8-1a**). (Note that many stream reaches have multiple project elements along the same mileage). From that initial opportunity list, the District used the guiding principles established by the Healthy Streams Project Advisory Committee to identify 45 miles of priority enhancement activities and six flow restoration projects over ten years. Additional enhancement activities will be identified as part of the five-year capital improvements programming process, as RESTORE is regularly updated. In addition, yearly performance targets were established for community based tree planting in each jurisdiction, with a goal of planting a total of a million trees over twenty years. At that rate, approximately 20 percent of the 338 miles of stream will be improved within the first ten years.

Table 8-1a: Potential Health Improvement Opportunities

Project Element	Approximate Number
Preservation (200' width / side of stream)	50 Miles
Flow Restoration	170 Miles
Re-vegetation (50' width / side of stream)	140 Miles
Large Wood Placement	230 Miles
Channel and Wetland Enhancements	40 Miles
In-Stream Pond Adjustments	5 Miles
Streamside Property Owner Education & Tree Planting	40 Miles
Total Project Element Miles	**675 Miles**

For the single objective projects of culvert upgrades/repair and stormwater outfall retrofit, Clean Water Services completed prioritization based on location, stream conditions, contributing land use, and other factors. There were 106 pre-1990 outfalls identified as part of the initial NPDES Stormwater permitting process; the 68 draining commercial, industrial, multifamily residential, and transportation areas were identified as a priority to retrofit. Yearly performance targets for the jurisdictions will generate a total of three to nine retrofits per year, with all 68 being treated by 2015. There were a total of 581 culverts identified as deficient for either conveyance, fish

[1] Represents total linear miles of stream corridor improvements.

passage, or both; a total of 383 were identified as priorities to address. Yearly performance targets for the jurisdictions will generate improvements of 20-24 culverts per year by 2015, with the remaining being completed by 2025. **Table 8-1b** identifies the structural improvement opportunities.

Table 8-1b: Potential Structural Improvement Opportunities

Project Element	Number of Facilities
Stormwater Pretreatment Retrofit	106 Facilities
Culvert Repair	581 Facilities
Total Project Facilities	**687 Facilities**

The scope of the projects identified for this program is very broad and covers all of the Regional Sites in the basin (refer to **Figure 8-1**, below). The projects generally target some form of stream corridor work for the majority of the riparian resource areas within the urban portion of the basin. The RESTORE model will be adjusted and updated over time to respond to new information on watershed conditions. This adaptive management approach allows the Partners to meet the needs of the basin by adjusting the project priorities to address changes in environmental conditions, while retaining the underlying goals and objectives of the planning process.

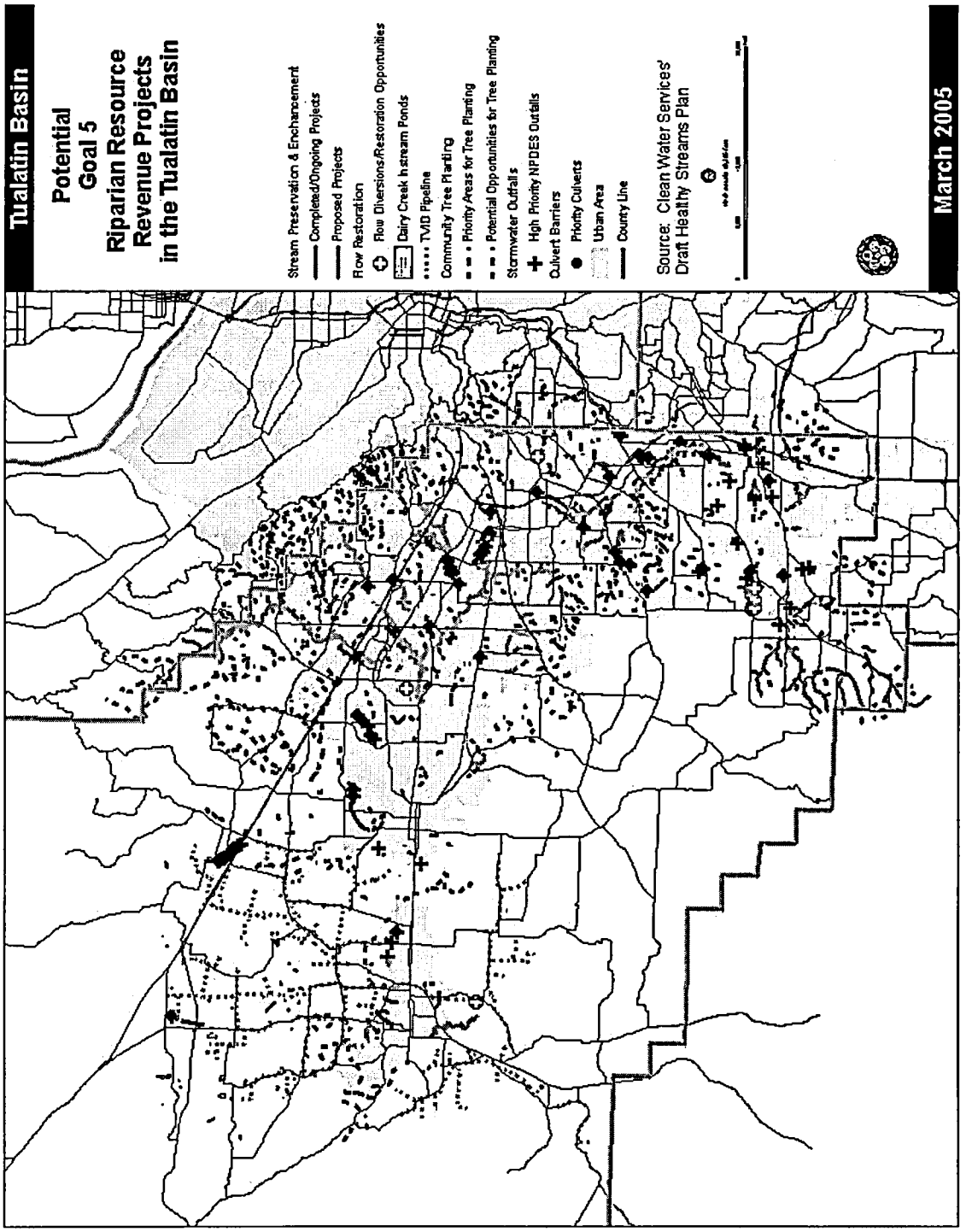


Figure 8-1: Stream Corridor Projects (identified by RESTORE model)

1

Healthy Streams Plan – Program Refinements

A strong impetus for creating the Tualatin Basin Approach was to coordinate the Goal 5 effort with Clean Water Services' (CWS) Healthy Streams Plan (HSP). The HSP is an updated watershed plan for the urban and urban fringe portions of the Tualatin Basin designed to meet the goals and requirements of the federal Clean Water Act and the Endangered Species Act. A major component of the HSP went into effect early in 2004, incorporating updated vegetated corridor requirements into the CWS Design and Construction Standards. Further refinements to Clean Water Services standards and practices related to stormwater management are currently being reviewed as an element of an update of the District's Stormwater Management Plan due to DEQ in May 2006. A broad array of policy and program refinements have also been incorporated in the draft HSP plan. These refinements are broken down into ten unique categories as shown below in **Table 8-2.** There are an average of 6 unique refinements in each of the categories and many of these have either direct or indirect benefits to environmental health in the basin, while others will benefit the administration and monitoring efforts.

Table 8-2: CWS Policy and Program Refinements

	Category / Description:
1	Stormwater Regulations
2	Local Land Use and Building Codes
3	Sensitive Areas and Vegetated Corridors Regulations
4	Operations and Maintenance of the Storm System
5	Inspection and Code Enforcement
6	Incentives
7	Public Education and Awareness
8	Monitoring Effectiveness and Implementation Progress
9	SWM Funding
10	Capital Project Implementation

Metro – Regional Bond Measure

The Partners support Metro's commitment to a regional bond measure designed to fund acquisition or protection of key habitat areas throughout the region. The Partners have locations for potential preservation identified as part of RESTORE and will refine the recommendations as part of the bond measure preparation process. Following successful passage of this measure, the Partners are prepared to assist in the acquisition process for important sites in the Tualatin River Basin. In combination with established park and open space sites, wetland and wildlife preserves, conservation easements, and other public and even privately held open space in the Basin, important habitat will be preserved and many species will be protected.

Other Funding Alternatives

A variety of grant and funding assistance opportunities are available to support habitat and water quality related improvements. In Oregon, these include (but are not limited to) the following:

- Federal Timber Safety Net Program – Title II
- DEQ – Non-point Source Pollution 319 grants
- The Nature Conservancy / PGE / Pacific Power – Salmon Habitat Fund
- Oregon Fish & Wildlife Office (U.S. FWS) – Greenspaces Program (w/ Metro)

- Oregon Fish & Wildlife Office (U.S. FWS) – Habitat Restoration and Conservation
- Oregon Watershed Enhancement Board (OWEB) – General Grant Program
- Oregon Watershed Enhancement Board (OWEB) – Small Grant Program
- Oregon Watershed Enhancement Board (OWEB) – Flexible Incentives Program (see ORS 541.381)
- Bureau of Land Management (BLM) – Local Watershed Projects
- USDA Conservation Reserve Enhancement Program (CREP)
- US EPA – Targeted Watershed Grant Awards

In addition to grant opportunities, the Basin Partners may choose to seek local bond funding for acquisition and/or protection of local sites that may not qualify for other funds.

D. Regulatory Program Components

CWS Design & Construction Standards

In order to meet stringent requirements of the Clean Water Act, as implemented by the state Department of Environmental Quality, Clean Water Services currently manages activities within and near all water resources (streams, wetlands, etc.) located in their service area. Generally, new development is "strictly limited" within Water Quality Sensitive Areas and Vegetated Corridors. The corridors along all sensitive areas average approximately 50 feet and may extend up to 200 feet depending on the resource type, drainage area, slope, and site conditions. Over 60 percent of identified Class I and Class II Riparian Habitat in the Tualatin River Basin are located within the vegetated corridor areas. Implementation of CWS' Design & Construction Standards provides for protection and/or enhancement of a high percentage of all riparian corridors in urban Washington County.

Existing Goal 5 Programs

Most jurisdictions in the basin have acknowledged Goal 5 Programs currently in place that provide resource protection. Many jurisdictions require protection of resources beyond those identified by Metro as regionally significant.

Existing Tree Protection Standards

Many jurisdictions in the basin include tree protection standards in their local development codes. Jurisdictions in the Basin that currently have some form of tree protection regulations include the cities of Beaverton, Durham, Forest Grove, Hillsboro, Lake Oswego, North Plains, Portland, Sherwood, Tigard, Tualatin and Washington County. Although the protection standards vary greatly among these jurisdictions, the cumulative effect of the regulations will play a positive role in maintaining overall environmental health in the Basin.

Other Relevant Standards and Regulations

Other federal, state and/or local programs that provide protection to Metro designated resources and/or function to meet the Basin goal of improving environmental health include: local wetland inventories and related protection standards, floodplain regulations that restrict development within the 100-year floodplain, Forest Practices Act – stream buffer requirements, USDA's Conservation Reserve Enhancement Program (CREP), and CWS Water Quality easements. As with the tree protection standards, the cumulative effects of these programs have a significant positive impact on environmental health in the Basin.

E. NON-REGULATORY (VOLUNTARY and INCENTIVE) COMPONENT

Educational Programs

The Partners have begun to identify a variety of educational tools that could be utilized to assist property owners and developers in understanding habitat values, protecting ecological functions and enhancing habitat. These tools may include publishing of newsletters or brochures, development of web sites or establishing partnerships with non-profit organizations (such as the National Arbor Day Foundation and Wetlands Conservancy), state and federal programs (such as those administered by ODFW and NMFS) education service districts, schools, park districts, libraries and community centers to provide classes on any of a number of key topics important to improving environmental health in the basin. These topics could include:

- design and construction of Low Impact Development projects
- the importance and value of trees and native vegetation
- drainage-reducing effective impervious area
- watershed ecology / environmentally friendly landscaping practices
- enhancing degraded stream corridors
- homeowners guide to the environment

Education is a fundamental element of all aspects of life, but only to the degree that learned skills are put into practice. Oregonians have a strong history of showing concern for the environment and it would be reasonable to expect that many (if not most) residents in the Tualatin Basin would be receptive to the education tools and programs if offered. In turn, it would be reasonable to expect that they would put the resulting knowledge to effective use with actions designed to improve environmental health.

Development of Low Impact Development & Green Design Guidelines

Land use planning in Oregon requires urban areas to maximize densities in order to preserve resource land and to provide for efficient use of infrastructure. Analyses conducted by Clean Water Services indicate that (unless mitigated), at current planned densities, the percentages of effective impervious area (EIA) within the UGB will be high enough to significantly alter basin hydrology and degrade in-stream habitat. While an overall decrease in EIA cannot practically be achieved, it can be mitigated, particularly through the application of environmentally sensitive development approaches categorized as LID. With the proposed basin program, LID techniques would be developed and encouraged in order to reduce the impacts of future development on stream health. The threshold for achieving this would be based on a performance standard set for each sub-watershed based on current and proposed future watershed conditions. New development may be required to manage storm water quantity as well as quality on site; this requirement would be established in Clean Water Services stormwater management program. Ongoing coordination activities with CWS will assure local implementation of the techniques incorporated in this program. The low-impact development standards discussed in Chapter 3 will assist in managing EIA throughout the basin. Use of LID/habitat sensitive approaches to development will be encouraged and supported throughout the basin, which in turn will support improvements to environmental health.

Best Management Practices

In addition to the Washington County BMPRO 2003 program described in Chapter 3, Clean Water Services and the cities implement an extensive program of stormwater management BMPs that include street sweeping, catch-basin and line cleaning, leaf pickup, stormwater facility maintenance, public education and awareness, erosion control, and source control. These program elements are part of the requirements of the NPDES Stormwater Permit under the Clean Water Act. By minimizing impacts to Goal 5 resources, these practices contribute to improving the environmental health of the Basin.

Technical Assistance

For property owners wanting to improve local wildlife habitat or just reduce total environmental impacts from buildings or other improvements on their land, partnerships with local non-profit organizations could be established to provide an array of free or low-cost services. Examples of potential services could include:

- landscaping and site design services;
- native plant sales (e.g. Tualatin Hills Park & Recreation District sales);
- team leadership for volunteer programs; and
- CWS Stream Makeover program – working with streamside property owners to plant trees and improve their creeks.

Every property owner taking advantage of these services would be directly contributing to improving both the environmental health for the sub-watershed in which they are located as well as the overall basin.

Tax Incentives

Existing state tax law supports two programs that could help to encourage landowners to protect important riparian areas and wildlife habitat. These include the Riparian Lands Tax Incentive Program and the Wildlife Habitat Conservation Management Program. These programs could be accommodated and promoted by Washington County. Education activities supported by the Healthy Streams Plan could be utilized to inform property owners of these programs and to encourage them to take advantage of the tax incentives.

In order to qualify for the tax reduction, a property owner must demonstrate that they meet the qualifications prescribed under the state program. Meeting those qualifications serves to demonstrate that steps have been taken which will lead to improvement of environmental conditions in the basin.

F. ADMINISTRATION, MONITORING AND ADAPTIVE MANAGEMENT

Administration

Continuation of the Goal 5 Steering Committee: As a key program element, the Steering Committee is proposing to continue to be involved in ongoing program management activities. These activities include continued coordination among the basin partners for all basin level environmental issues that may benefit from such involvement. The Steering Committee will continue to effectively frame and seek guidance on these issues from the TBNRCC.

Continuation of the TBNRCC: The Program includes a recommendation for continuing Tualatin Basin Natural Resources Coordinating Committee functions. A primary responsibility of the TBNRCC would be to review and recommend priorities for the capital improvements needed to improve environmental health in the basin. The TBNRCC would also be involved in coordination of funding for multi-jurisdictional projects in the basin as well as making policy decisions related to those projects.

Monitoring: In order to reasonably adapt to changing environmental conditions in the basin and to ultimately demonstrate that conditions are improving, it is important to document changes to site specific as well as overall basin-wide indicators over time.

Regional Data Coordination: As the coordinator for primary regional GIS data, Metro would be expected to continue historic practices of acquiring, developing and distributing data for lands that fall under the purview of the Regional Functional Plan. For Goal 5 resources and related Functional Plan Compliance standards, it is reasonable to expect that Metro will monitor vegetated land cover data as an important indicator in determining local environmental health. The Basin Partners will be coordinating acquisition of this data with Metro as part of their ongoing monitoring activities. As well, basin jurisdictions will continue to share local GIS data with Metro and others throughout the region.

CWS Monitoring Activities: Monitoring of watershed conditions within urban areas of the basin for water quality and stream health is an important element of the District's Integrated Water Resources Management Program (IWRM). The District monitors various combinations of water quality, flow, fish and macroinvertibrates, and physical stream channel conditions at numerous sites throughout the basin. This data is utilized today to monitor effectiveness of the District's programs and projects. It is expected that these monitoring activities will continue and that resulting data will be shared with all of the Basin Partners to assist with tracking environmental conditions both regionally and locally.

Future Stream Data Sampling: The District has indicated in the Healthy Streams Plan that re-sampling of the Watersheds 2000 inventory data should occur at reasonably regular intervals beginning in 2010. This data will be very valuable in determining the overall effectiveness of the Basin Goal 5 Program.

Adaptive Management: As discussed in Chapter 7 of this report, adaptive management will be incorporated into the program implementation process to determine where project funds can be most effectively spent in order to attain the goals to improve environmental health. Monitoring of environmental conditions will be utilized in an iterative process to test and adjust actions over time. Decisions to adjust program actions will be based upon inputs from the monitoring process which reveal changes in local or basin-wide conditions that may warrant adjustments. It is this ongoing monitoring and adjustment process that will assure that program funds and efforts are targeted to areas where they will be most effectively utilized. As well, the adaptive management process will help to assure that resources are targeted in a manner which yields the highest possible gains in environmental improvement.

G. Conclusion

The difference between the Tualatin Basin's Goal 5 Program and current regulations and plans is definable and clearly shows that this program will provide a significant improvement for the environment over the status quo. Committing to over $95 million in capital projects, policy and program refinements tied directly to environmental improvements, preserving up to 7,000 acres inside Vegetated Corridors, strictly limiting activities within water resource areas, developing low impact development guidelines and removing barriers to their utilization as well as educating property owners and developers in the utilization of these (and other) tools will greatly increase the level of natural resource protection and conservation over the standards in place when this process began. This program will result in measurable improvements to the environmental health of the eleven regional sites in the basin as well as the basin as a whole.

CHAPTER 7 PROGRAM IMPLEMENTATION, ADMINISTRATION & MONITORING

A. Introduction

As discussed in Chapter 1 and addressed in other parts of this report, the Basin Partners' Intergovernmental Agreement (IGA) with Metro both enables and commits them to the development of a Goal 5 Program designed to address the Metro inventory of regionally significant fish & wildlife habitat and to demonstrate that this Program will achieve a primary objective. This objective is to improve the environmental health in the eleven regional sites and the entire basin. Additionally, Metro Code requires that performance measures be used to evaluate the success and effectiveness of its functional plan to realize regional policies. As well, the National Marine Fisheries Service 4(d) rule calls for monitoring and evaluation. Chapters 1 through 6 of this report describe the structure and function of the proposed program. This chapter will describe how the Basin Partners propose to carry out this program in a manner designed to achieve it's primary objective and to fulfill future requirements related to monitoring and related activities designed to determine the effectiveness of the program's implementation.

The proposed program consists of four major components: revenue, regulation, a voluntary or non-regulatory component, and monitoring. The sections below describe the overall program implementation process, provide a general overview of the program administration process, and describe the development of a continuous monitoring process and adaptive management approach designed to assure program success.

B. Program Implementation

Following final TBNRCC adoption of the proposed program, the following four subsequent steps are anticipated. First, Metro is expected to incorporate the Basin Program into the regional fish & wildlife program. Second, Metro will send public notice of the intent to adopt this regional program and carry-out a public review process. Third, the final regional program will be adopted by the Metro Council, submitted to the state Department of Land Conservation and Development (DLCD) for state Goal 5 compliance review, and presented to the Land Conservation and Development Commission for Acknowledgement. Finally, for the fourth step, once Metro has adopted the Basin Program as an element of its Regional Functional Plan, the Basin Partners have agreed to begin amending local comprehensive plans and land use regulations and to complete implementation of the Basin Program within one year of Metro's action (or as otherwise described in the Basin-Metro IGA). [In the event that the Regional Program is remanded to Metro (LCDC Continuance Order) for amendment, the Basin Partners will work with Metro to resolve any issues related to the Basin element of the Regional Program.]

The general steps anticipated for implementation of the Basin Program include:

1. Development and adoption of local ordinances implementing the provisions of the Basin Program as incorporated in the Metro Urban Growth Management Functional Plan. This step includes provision of public notice(s) and holding public hearings and other public involvement activities as appropriate.

2. Development of a model Low Impact-Development (LID) ordinance for the basin providing tools designed to reduce environmental impacts of new development and removing barriers to their utilization. This step includes local adoption of LID guidelines.
3. Coordination with Clean Water Services for activities necessary for implementation of the Healthy Streams Action Plan (including all related capital projects as needed), as well as for local actions needed to support the updated Stormwater Management Plan.
4. Coordination with Metro on development of a regional bond measure supporting protection of regionally significant fish & wildlife habitat.
5. Coordination with CWS, Metro and others as necessary to develop and support the voluntary and educational components of the Basin Program.
6. Coordination with CWS, Metro and others as necessary to develop and support the monitoring and adaptive management components of the Basin Program.

C. Program Administration

Administration of the proposed basin program will involve continued coordination and cooperation among Partners to ensure the program objectives are achieved. This includes the following:

a) Cooperation in implementing the Healthy Streams and Stormwater Management Plan update

The primary elements of future activities to implement the Healthy Streams Action Plan and Stormwater Management Plan will be carried out among the Basin Partners under the guidance of Clean Water Services. It is anticipated that CWS staff (in cooperation with the other Basin Partners), will carry out the activities and projects incorporated in these plans and will assist in assuring that the goals of improving environmental health in the basin can be met.

b) Continuation of the Tualatin Basin Steering Committee

As a key program element, the Tualatin Basin Steering Committee is proposing to continue to be involved in ongoing program management activities. Project activities will be tracked and managed by SWM Teams developed as part of the HSP adaptive management process. These activities of the committee include continued coordination among the basin partners for all basin level environmental issues that may benefit from such involvement. The steering committee will continue to effectively frame and seek guidance on these issues from the TBNRCC.

c) Continuation of the TBNRCC

The Program includes a recommendation for continuing Tualatin Basin Natural Resources Coordinating Committee functions. A primary responsibility of the TBNRCC would be to review and recommend priorities for the capital improvements needed to improve environmental health in the basin. The TBNRCC would also be involved in coordination of funding for multi-jurisdictional projects in the basin as well as making policy decisions related to those projects.

D. Program Monitoring and Adaptive Management

Program monitoring and adaptive management are key activities necessary to assure that the commitments incorporated in the Basin Approach can be attained. Activities anticipated under this program element include:

The monitoring process: In order to monitor the effectiveness of the Basin Approach, the Partners are relying upon baseline conditions established and documented in 2000-2001 as part of the Watersheds 2000 planning activities. In addition to ongoing long-term monitoring activities for water quality and flow, it is anticipated that periodic monitoring of biological communities and physical habitat conditions will also be needed in order to provide adequate comparisons with baseline data and to determine the effectiveness of program activities. Clean Water Services commitments to continued monitoring of environmental conditions are incorporated in their Healthy Streams and Stormwater Management plans.

Adaptive Management: Adaptive management is generally described as the integration of design, management, and monitoring to systematically test assumptions in order learn and to adjust actions based on that learning until a set goal is attained. For purposes of the Basin Program, adaptive management will be incorporated into the program implementation process to determine where project funds can be most effectively spent in order to attain the goals to improve environmental health. The monitoring process described above will be utilized in an iterative process to test and adjust actions over time. Decisions to adjust program actions will be based upon inputs from the monitoring process which reveal changes in local or basin-wide conditions that warrant program adjustments.

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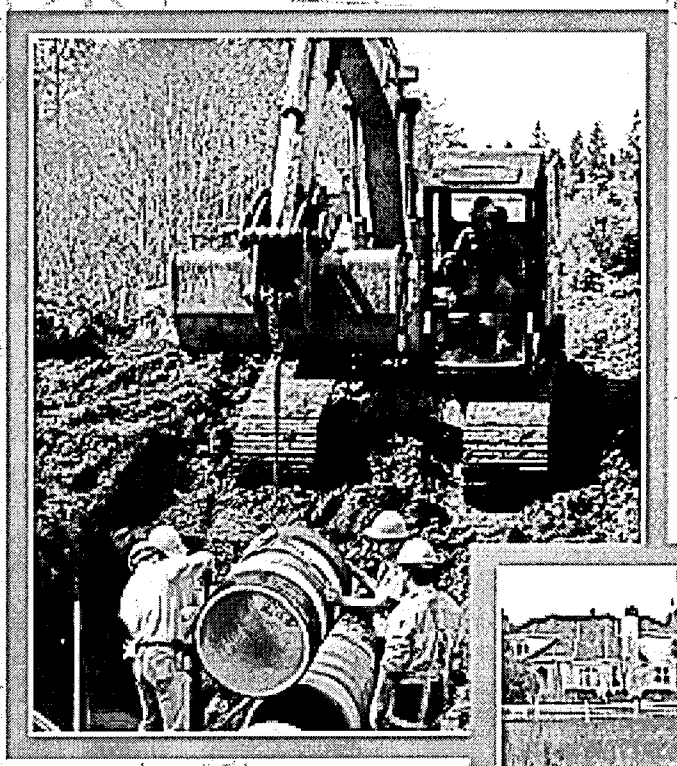
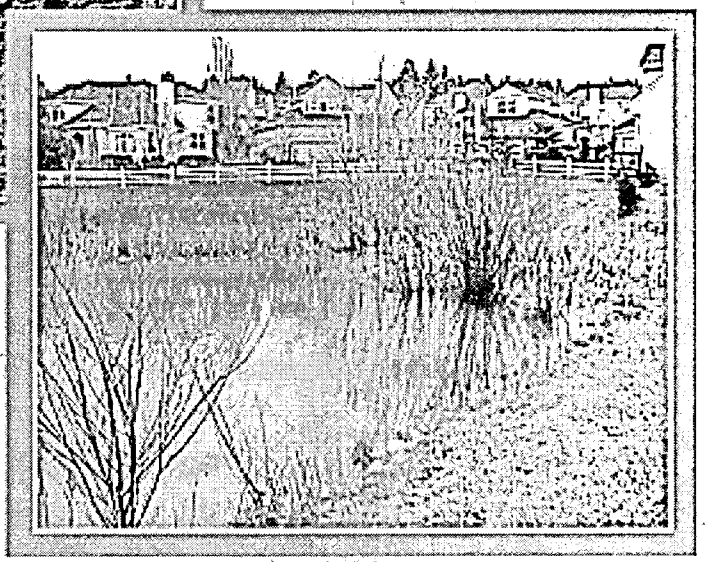
DESIGN AND CONSTRUCTION STANDARDS

for Sanitary Sewer and Surface Water Management





MARCH 2004

Clean Water Services
Our commitment is clear.

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Chapter 1

GENERAL CONSTRUCTION REQUIREMENTS AND ADMINISTRATIVE PROVISIONS

Chapter 1

GENERAL CONSTRUCTION REQUIREMENTS AND ADMINISTRATIVE PROVISIONS

1.01 Application of These Regulations

1.01.1 Except as provided otherwise in a specific section of these rules, these standards and regulations shall apply to all territory within the District. A city within the District may adopt more restrictive standards within the scope of this Resolution and Order, but may not adopt less restrictive standards.

1.01.2 Application of Chapter

The requirements and administrative provisions of this Chapter shall apply to the construction of all components of the District and City sanitary sewer and storm and surface water systems. Additionally, all requirements and provisions of this Chapter except Sections 1.04, Plan Submittal and 1.05, Easements shall apply to the construction of any building sewer or side sewer within the District and City boundaries.

1.02 Definitions

As used in this Resolution and Order, the words or abbreviations set forth below shall have the indicated meanings unless the context requires otherwise. The definitions set forth in Ordinance 27, as amended, shall also apply.

1.02.1 AASHTO

American Association of State Highway and Transportation Officials.

1.02.2 ANSI

American National Standard Institute.

1.02.3 Approved by District or City

See Chapter 2. 01.1.

1.02.4 ASTM

American Society of Testing and Materials.

1.02.5 AWWA

American Water Works Association.

1.02.6 Break in Slope

The transition point where a valley or river bank slope flattens and represents an historic geologic terrace of a stream or river. The point at which the grade extending from a break in slope, away from the stream or river, is less than 25%. Break in slope is also commonly referred to as top of ravine in steeply sloped headwater environments. Break in slope does not include minor surface anomalies that result from localized landslide slumps or site grading.

1.02.7 Building Sewer

That portion of the private sanitary sewer extending from a point five feet outside the established line of the building or structure (including any structural projection except eaves) to the public right-of-way or easement line.

1.02.8 Capital Improvement Plan

The Capital Improvement Plan adopted by the Clean Water Services Board of Directors, and any updates of the plan.

1.02.9 Construction Permit Agreement

An agreement signed by the owner containing all assurances deemed necessary by the District that all public improvements will be constructed in accordance to these standards and the approved project plans.

1.02.10 Contractor

The person designated by the District, City, or owner to do the work in question.

1.02.11 Conveyance System

The surface water conveyance system includes all portions of the surface water system, either natural or man-made, that transport storm and surface water runoff. The purpose of the conveyance system is to drain surface water from properties so as to provide protection to property and the environment. The sanitary sewer conveyance system includes all interceptor and main sewer pipe lines, force mains, pumping or lift facilities, manholes, and related facilities.

1.02.12 Culvert

A surface water drainage pipe crossing a road, driveway, or pathway which has no attached structures.

1.02.13 Designee

The entity designated by the District to conduct alternatives analysis activities, per District/City Inter-Governmental Agreement (IGA) and/or co-permitee status on the National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit issued by the Department of Environmental Quality.

1.02.14 Development

a. All human-induced changes to improved or unimproved real property, including:

1) Construction of structures requiring a building permit if such structures increase the impervious surface footprint on the real property;
2) Land division, including subdivisions, lot line adjustments, expedited land partitions and minor land partitions. "Land Division" does not include plats for the sole purpose of converting existing buildings to condominiums;
3) Drilling;
4) Site alterations resulting from surface mining or dredging;
5) Grading that would require an erosion control permit;
6) Construction of earthen berms;
7) Paving and roadway construction;
8) Excavating that would require an erosion control permit;
9) Clearing when it results in the removal of trees or native vegetation that would require a permit from the City/County or notification to the Oregon Department of Forestry;
10) Redevelopment; and
11) Construction of utility infrastructure.

b. The following activities are not included in the definition of development:

1) Farming activities when conducted in accordance with accepted farming practices as defined in ORS 30.930 or under the Tualatin River Subbasin Agricultural Water Quality Management Area Plan;
2) Construction on lots in subdivisions meeting the criteria of ORS 92.040(2);

3) Any development activity for which land use approvals have been issued pursuant to a land use application submitted to a land use authority on or before February 4, 2000 and deemed complete by the land use authority on or before March 15, 2000. Renewals or modifications of such land use approvals shall be required to conform to these regulations.

4) Measures to repair, maintain, or remove **existing** structures, facilities, roadways, driveways, accessory uses, or other development, provided such measures are consistent with District/City/County regulations, and do not encroach further into the Vegetated Corridor or Sensitive Area.

5) Interior modifications and vertical additions (additional stories) that do not modify the existing structure footprint or increase the building footprint impervious area of the site, provided such modifications or additions are consistent with District/City/County regulations and do not encroach further into the Vegetated Corridor or Sensitive Area.

6) Measures to replace within the existing footprint a structure(s) lost due to a catastrophic event such as fire, provided that such measures are consistent with District/ City/County regulations. Structures that are partly or wholly within a FEMA designated 100-year floodplain that are damaged beyond more than 50% of the value or proposed to be improved by more than 50% of their value, must be elevated or flood-proofed consistent with the National Flood Insurance Program participation requirements.

1.02.15 District or CWS

"District" or "CWS" means Clean Water Services and includes any representative or employee of the District authorized to act in its behalf.

1.02.16 District or City

When the term "District or City" is used in this Resolution and Order, either the District or a City, including its authorized representatives, may perform a task or duty specified within this Resolution and Order, provided that, a City may perform such task or duty only when:

a. There is an intergovernmental agreement in effect between the District and City assigning such authority to the City, and

b. The City action is within the boundary of that City, and

c. Said action is subject to the terms of such agreement and to the provisions of this Resolution and Order.

Where the term "District or City" is used, the District shall retain the ability to carry out a task or duty.

1.02.17 Drainage Ditch

a. Drainage ditches include:
   1) Roadside ditches that carry only storm water runoff from the adjacent road which may be mixed with unconcentrated flow from adjacent lots
   2) Constructed channels designed as part of the storm water infrastructure and drain directly from storm water facilities or storm pipe systems
   3) Agricultural or other manmade ditches that divert water away from the natural stream for the purpose of irrigation or livestock watering

b. Drainage ditches do not include historically altered streams or channels that convey surface water flows

1.02.18 Easement or Right-of-Way

A right of use on real property of another, entitling the District and City to construct, own and maintain a public sanitary sewer, pump station, storm system, and related facilities on, under and through the subject real property.

1.02.19 Edge of Sensitive Area

1. The top of the channel bank;
2. The two-yr 24 hour design storm elevation for the Tualatin River;
3. The delineated boundary of the wetland, per DSL / Corps procedures for wetland delineation;
4. The outside edge of spring emergence (measured as the area of saturation, hydric soil conditions, or channel formation, whichever is greatest);
5. The average high water mark for lakes, ponds, and in-stream impoundments;
6. For streams draining 10 to 50 acres where no defined channel exists, and where there are no other sensitive areas such as wetlands, the edge of the sensitive area shall be the centerline of the natural drainage swale.

1.02.20 Engineer

The person, firm, corporation, partnership, or association duly registered by the State of Oregon, which is providing engineering work on a project or construction covered by this Resolution and Order. If the person providing the engineering for the project is a District or City employee, then "engineer" expressly includes such employee.

1.02.21 Enhancement

Modification of a Sensitive Area or Vegetated Corridor to improve the resources ecological functions and values and improve its ability to protect the water resources.

1.02.22 Erosion

The movement of soil particles resulting from the flow or pressure from water, or wind, or from tracking by vehicles or foot traffic.

1.02.23 Floodplain

The land area identified and designated by the United States Army Corps of Engineers, the Oregon Division of State Lands, FEMA, or Washington County that has been or may be covered temporarily by water as a result of a storm event of identified frequency.

1.02.24 Floodway

The portion of a watercourse required for the passage or conveyance of a given storm event as identified and designated by the District pursuant to this Resolution and Order. The floodway shall include the channel of the watercourse and the adjacent floodplain that must be reserved in an unobstructed condition in order to discharge the base flood without increasing flood levels by more than one foot.

1.02.25 Floodway Fringe

The area of the flood plain, lying outside the floodway, which does not contribute appreciably to the passage of flood water, but serves as a retention area.

1.02.26 Frontage Length

A linear measure of the length of the development front, which is directly adjacent to the vegetated corridor.

1.02.27 General Processing Fee

A fee established in the District's Rates and Charges Resolution and Order.

1.02.28 Governmental Unit

Governmental unit includes:

a. The federal government and any of its departments, agencies, boards or commissions;

b. The government of the State of Oregon and any of its departments, agencies, boards or commissions;

c. Any city within the District's service district boundaries;

d. The cities of Portland and Lake Oswego;

e. Washington County;

f. Any school district;

g. Any municipal or public corporation or special district, as defined by ORS Chapter 198, which is created for the administration of public affairs, supported by public funds and governed by managers which derive their authority from a federal, state, or local governing body;

h. Any intergovernmental agency, department, council, or like entity created under ORS Chapter 190.

1.02.29 Hazardous Material(s)

"Hazardous material(s)" or "hazardous substance(s)" means any element or compound that, when it enters in or upon the water, presents an imminent and substantial danger to the public health or welfare or the environment, including but not limited to fish, animals, vegetation or any part of the natural habitat in which they are found. "Hazardous material or substance" includes but is not limited to a substance designated under 33 U.S.C. §1321 (b)(2)(A), any element, compound, mixture, solution or substance designated under 42 U.S.C. §9602, any hazardous waste having characteristics identified under or listed under 42 U.S.C. §6921, any toxic pollutant listed under 33 U.S.C. §1317 (a), any imminently hazardous chemical substance or mixture with respect to which the Administrator of the United States Environmental Protection Agency has taken action under 15 U.S.C. §2606, and any residue classified as a hazardous waste pursuant to ORS 466.020(3).

1.02.30 ICEA

Insulated Cable Engineers' Association.

1.02.31 Impervious Area

Pavement, maintained gravel areas, structures, public and private roadways, roofs, and other hard surfaces which are not specifically designed to allow water to infiltrate. Effective impervious area is not directly connected to the drainage system via piping.

1.02.32 Inspector/District Inspector

The person designated by the District or City to inspect the work.

1.02.33 Intermittent Flow

The flow in streams and springs that consistently do not have year-round water or saturated soil within their channel or swale in a year with wet to average precipitation patterns. Intermittent flow must occur with some degree of regularity and must be in a definite direction. Refer to Appendix C Table 1: Precipitation to determine wet, dry or average year precipitation levels. To be considered intermittent, the channel must meet one of the following criteria in a year with wet to average precipitation levels:

a) The channel must be dry without visible flow or standing water for a minimum of 30 consecutive days; or
b) The channel must not have saturated soil in the upper 12 inches.

1.02.34 Local Program

The portion of the sanitary sewerage system, or storm and surface water system, program of construction, operation, maintenance, and regulation within the District's service area which may be performed by the District, or by a City, County, or by intergovernmental agreement.

1.02.35 Mitigation

The reduction of adverse effects of a proposed project by considering, in the following order:

a. Avoiding the impact altogether by not taking a certain action or parts of an action;

b. Minimizing impacts by limiting the degree or magnitude of the action and its implementation;

c. Rectifying the impact by repairing, rehabilitating or restoring the affected environment;

d. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action by monitoring and taking appropriate corrective measures; and

e. Compensating for the impact by replacing or providing comparable sensitive areas or vegetated corridors.

1.02.36 NEMA

National Electrical Manufacturers' Association.

1.02.37 "Or Equal," "Or Approved Equal," "Or Equivalent"

These terms indicate that the "equal" product is the same or better than the product or standard named or prescribed in function, performance, reliability, quality, and general configuration.

Determination of the quality in reference to the project design requirements will be made by the District. Contractor shall not use such "equal" products without prior written approval of the District.

1.02.38 ORS

Oregon Revised Statutes

1.02.39 Outfall

A point where collected and concentrated surface and storm water runoff is discharged.

1.02.40 Owner or Property Owner

The person who is the legal record owner of the real property, or where there is a recorded land sale contract, the purchaser thereunder.

1.02.41 Perennial flow

The flow in streams and springs that have year-round water or saturated soil within the channel in a year with wet to average precipitation patterns. A stream will be considered perennial unless determined to be intermittent using one of the criteria outlined in 1.02.33.

1.02.42 Person

Any individual, firm, partnership, joint venture, association, social, fraternal, educational, religious or charitable organization, fraternity, sorority, joint stock company, corporation, estate, trust, business trust, receiver, trustee, syndicate, municipal corporation, district or political subdivision or any legal entity whatsoever.

1.02.43 Plans

The drawings and designs that specify construction details as prepared by the Engineer.

1.02.44 Post-Construction Erosion Control

Re-establishing groundcover or landscaping prior to the removal of temporary erosion control measures.

1.02.45 The Property or The Site

The subject real property on which development or permitted activity takes or is proposed to take place. For activity occurring on property other than that which the applicant owns or controls, the property or the site shall mean the land within limits of the permanent and temporary construction easements.

1.02.46 Public/District's Sanitary Sewer(s) and Storm and Surface Water System

The sanitary sewer and storm and surface water collection systems, within easements dedicated to the public or District/City, which are operated and under the jurisdiction of and maintained by the District and/or City.

1.02.47 Redevelopment

Redevelopment is any activity that alters existing improved impervious area on the subject property. Redevelopment includes, but is not limited to: the expansion of or change to an existing building footprint or structure; reconfiguration of existing roadways, driveways, or parking lots; and land disturbing activities related to structural or impervious area modifications.

1.02.48 Replacement Area

The mitigation area required to compensate for an encroachment into the Vegetated Corridor or Sensitive Area.

1.02.49 Roadways

Roadways include the driving surface, the structural embankment of the road surface, and associated drainage ditches. Roadways may or may not correspond to the road right-of-way.

1.02.50 Sensitive Area

a. Includes:

1) Existing and created wetlands;

2) Rivers, streams, and springs, whether flow is perennial or intermittent;

3) Natural lakes, ponds, and instream impoundments;

b. Does not include:

1) Storm water infrastructure;

2) A Vegetated Corridor (a buffer) adjacent to the Sensitive Area;

3) An off-stream recreational lake, wastewater treatment lagoon, fire pond or reservoir; or

4) Drainage Ditches.

1.02.51 Side Sewer and Side Storm

That portion of the private sanitary sewer or storm system extending from the public sanitary sewer or storm system main to the public right-of-way or easement line.

1.02.52 Spring

The point at which groundwater emerges and forms a channel or swale.

1.02.53 Stream

A surface concentration of flow in a channel or swale draining greater than 10 acres in which a flow of water occurs either perennially or intermittently.

1.02.54 Storm Water

Storm water is water that runs off only from impervious surfaces during rain events.

1.02.55 Storm Water Infrastructure

Any structure, feature, or drainage ditch that is designed, constructed, and maintained to collect and filter, convey, retain, or detain storm water run-off during and after a storm event for the purpose of water quality improvement or quantity management. It includes, but is not limited to, features such as constructed wetlands, water quality swales, landscaped retention areas, and detention ponds that are maintained as storm water quality or quantity control facilities.

1.02.56 Surface Water

Water that drains from the landscape via overland flow or ground water resurgence. Surface water flows can and often do include storm water runoff.

1.02.57 This Resolution and Order

"This Resolution and Order," "These Standards and Regulations" and similar terms mean this entire Resolution and Order adopted by the CWS Board of Directors, this Exhibit A, Chapters 1-12 and Appendices A-D.

1.02.58 UL

Underwriters' Laboratories, Inc.

1.02.59 User

The person responsible for discharge of storm water or wastewater into the District system, as further defined in Ordinance 27.

1.02.60 Vegetated Corridor

A corridor adjacent to a Sensitive Area that is preserved and maintained to protect the water quality functions of the water quality Sensitive Area.

1.02.61 Visible or Measurable Erosion

Visible or measurable erosion includes, but is not limited to:

a. Deposits of mud, dirt, sediment or similar material exceeding one-half cubic foot in volume on public or private streets, adjacent property, or into the storm and surface water system, either by direct deposit, dropping,

discharge, or as a result of the action of erosion.

b. Evidence of concentrated flows of water over bare soils; turbid or sediment laden flows; or evidence of on-site erosion such as rivulets on bare soil slopes, where the flow of water is not filtered or captured on the site using the techniques in Chapter 8.

c. Earth slides, mudflows, earth sloughing, or other earth movement, which leaves the property.

1.02.62 Water Quality Sensitive Area, or Sensitive Area

See "Sensitive Area" definition

1.02.63 Watercourse

A watercourse is a
a. channel
b. creek
c. stream
d. river
e. swale, or
f. storm drain pipe in which a flow of water occurs either perennially or intermittently.

1.02.64 Wetlands
Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Categories of wetlands include:

a. Created Wetlands
Those wetlands developed in an area previously identified as a non-wetland to replace, or mitigate wetland destruction or displacement. A created wetland shall be regulated and managed the same as an existing wetland.

b. Constructed Wetlands
Those wetlands developed as a storm water facility, subject to change and maintenance as such. These areas must be clearly defined or separated from existing or created wetlands. Constructed wetlands shall be regulated as created wetlands only if they serve as wetland mitigation.

c. Existing Jurisdictional Wetlands
Jurisdictional wetlands as determined by the Division of State Lands (DSL) or the US Army Corps of Engineers (COE).

1.02.65 Work

All labor necessary to produce the construction required by the approved construction plans, and all materials and equipment incorporated to complete construction.

1.03 Responsibilities of Property Owner

In addition to all requirements placed upon the Owner herein, whenever any requirement or obligation is imposed upon the Engineer, the Contractor or any other individual employed or supplied by the Owner in this Resolution and Order, such requirement or obligation is also expressly imposed upon the Owner of the property. The Owner's indemnification, contained in Section 1.08 below, expressly includes indemnification for any failure on the part of the Engineer, the contractor or any other employee to comply with this Resolution and Order.

All costs associated with the sanitary sewer or storm system construction, vegetated corridors, and erosion control pursuant to a Construction Permit Agreement including, but not limited to, repairs of defective work, shall be borne by the property owner.

1.04 Plan Submittal Requirements Within Cities Operating the Local Program

Construction plans for any proposed public sanitary or storm system or water quality or quantity facility to be located within a city operating a local program shall be prepared by an Engineer registered in Oregon and submitted to the appropriate city for review. The City shall submit one set of construction plans to CWS for review and approval. If the proposed public sanitary/storm system connects to a CWS system, the City shall submit two sets of plans to the District. CWS shall review the plans to assure conformance to these construction standards and return one set to the City. The City shall incorporate CWS's comments into the final approval of the construction plans.

1.05 Easements

The District and City shall determine what facilities shall be part of the publicly owned sanitary and surface water management system. Such facilities shall require an easement or dedication. Facilities shall include sanitary sewers, pump stations, storm sewer systems, sensitive areas and associated vegetated corridors, created and constructed wetlands, and water quality or quantity facilities. Access easements are required to all public water quality and quantity facilities that include outlet control structures and to manholes where required by the District or City. The Owner shall provide the District or City with the documents necessary to grant such easements.

1.06 Inspection Within Cities Operating the Local Program

The inspection of sanitary and storm sewer systems and water quality and quantity facilities within a City which operates a local program is the responsibility of that City. The City shall assure compliance with these construction standards. The District may inspect such facilities at its discretion in addition to the City inspection.

1.07 Right of Entry to Work

Representatives of the District and any federal, state, or local agencies having jurisdiction over any sanitary or storm and surface water work site, shall have right of entry to any and all portions of the work at reasonable times, and the Contractor shall cooperate in all respects with such agencies and shall provide proper facilities for access and inspection.

1.08 Indemnification

The Owner and other parties to a construction permit agreement shall indemnify and hold harmless the District and/or City, its officers and employees from and against all claims, demands, penalties, damages, losses, expenses, including attorneys' fees, and causes of action of any kind or character, including the cost of defense thereof, arising or alleged to have arisen 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 arisen out of or resulted from, in whole or in part, any act or omission of the Owner, its Engineer, its Contractor, its Safety Manager or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

1.09 Guarantee

The Owner shall furnish high quality equipment, supplies, and materials, and perform the work in accordance with these specifications. Any failure or omission of any District or City inspector to reject any defective equipment, supplies, materials, or work shall not be construed as an acceptance thereof nor release the Owner from his obligations hereunder. Upon notification of any deficiency by District or City, the Owner shall properly reconstruct or replace any defective equipment, supplies, materials, or work at his own expense at any time upon discovery of the defect during the period of construction and for the full guarantee period following acceptance of the work and indemnify District and City from any claims resulting therefrom. The Owner shall guarantee all materials and equipment furnished and work performed for a minimum period of one year from the date of formal written acceptance by the District or City. The Owner further warrants and guarantees for a minimum period of one year from the date of final acceptance of the system that the completed system is free from all defects due to faulty materials or workmanship and the Owner shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects.

1.10 Traffic Maintenance and Safety

The Contractor shall comply with all rules and regulations of the City, County, or State authorities regarding the closures of public streets or highways to use of public traffic. No public road shall be closed to the public except by express permission of the public agency responsible for the road. The Contractor shall conduct his operations so as to assure the least possible obstruction to traffic and normal commercial pursuits. The Contractor may be required to submit a traffic control plan to the appropriate jurisdiction for review and approval prior to beginning construction.

1.11 Protection of Property

The Contractor shall protect stored materials, cultivated trees and crops, and other items located adjacent to the proposed construction limits. Property owners affected by the construction shall be notified at least 48 hours in advance of the time construction begins. During construction, no person shall be without vehicular access to their residence or place of business for a period exceeding eight hours, unless the Contractor has made special arrangements in writing with the affected person.

1.12 Safety Requirements

The Owner and Contractor are responsible for the safety of the work and of all persons and property coming into contact with the work. The Contractor shall conduct the work in such a manner as to comply with all requirements of Occupational Safety and Health Administration, the Oregon Safe Employment Act and any other agency having authority over such matters. The Contractor shall minimize the possibility of accident or injury to workers and the general public. The Contractor shall conduct the work to provide all reasonable safeguards so as to protect public and private property. If the District or City inspector observes a violation of safety practices, the District or City inspector will inform the Contractor of the inspector's observation. The Contractor shall then immediately correct the violation. If the Contractor does not do so, the District or City shall notify the appropriate agency having jurisdiction. If, in the opinion of the District or City inspector, the safety violation is of a nature to present imminent danger to Contractor's workers or the general public, the District or City inspector may cause the construction work to stop until the safety violation is corrected. The District and City inspector's role is not one of supervision or safety management, but is one of overview only. Nothing contained in this section or elsewhere in this Resolution and Order shall be interpreted to obligate the District or City to act in any situation nor to shift the Owner's responsibility for safety compliance to the District or City. No responsibility for the safety or the work or for construction means, methods, techniques, sequences or procedures shall attach to the District or City by virtue of its action or inaction under this section.

1.13 Compliance with Applicable Laws

The Contractor shall keep fully informed of all local ordinances, as well as state and federal laws, which in any manner affect the work herein specified. The Contractor shall at all times comply with said ordinances, laws, and regulations, and protect and indemnify the District and/or City and its officers and agents against any claim or liability arising from or based on the violation of any such laws, ordinances, or regulations. All permits, licenses, and inspection fees necessary for execution and completion of the work shall be secured by the Owner or Contractor, except where specifically provided by the District or City.

1.14 Interference with District or City Sanitary Sewer or Storm System Prohibited

No person shall block, obstruct or interfere with any portion of the District or City sanitary sewer or storm system without approval of the District or City. This prohibition includes, but is not limited to, the obstruction of the flows from and to any point within the District sanitary sewer or storm system.

1.15 Inspection Warrants

The District or a City may apply to a court of competent jurisdiction for an inspection warrant pursuant to this section. The District or City may apply for such warrants whenever the District or City has requested of the property owner or his/her apparent agent access to any premises to ascertain information necessary to carry out the provisions of this Resolution and Order and such request has been denied. Information necessary to carry out these provisions shall include, but not be limited to, verification of owner-supplied data. An inspection warrant issued pursuant to this section is an order authorizing an inspection or investigation to be conducted at a designated place or property for the purpose of obtaining the above-described information.

1.16 Professional Engineering Submittals

The District requires strict compliance with Oregon Revised Statute 672 for Professional Engineers.

When required by this Resolution and Order all engineering plans, reports, calculations, and other technical submittals shall be prepared, sealed, and signed by a Professional Engineer currently registered in the State of Oregon. It is the Engineer's responsibility to become familiar with, and comply with all design and construction Standards as contained within this Resolution and Order and to review any proposed changes with the District prior to design, permit approval, or construction. District approval of engineered plans and other submittals does not in any way relieve the Engineer of responsibility to meet all requirements of the District or obligation to protect the life, health, safety, and property of the public. Except where alternative methods, materials or designs have been approved by the District under section 1.17, the Engineer shall be required to revise or supplement the design if the District determines that the full requirements of these

Standards have not been met.

1.17 Approval of Alternative Methods, Materials, or Designs

Alternate methods or materials not explicitly approved in these Standards will be considered for approval on the basis of the intent, objectives, and applications set forth in this Resolution and Order and other District rules and regulations. Any alternative must meet or exceed the minimum requirements set forth in these Standards. Those seeking such approvals shall make application in writing. Approval of any major or significant deviation or waiver from these Standards, as determined by the District, will be in written form.

The written application is to include the manufacturer's specifications, testing results, design drawings, calculations, maintenance and operation requirements, and other pertinent information. Request for approval of alternatives or waiver of a standard may be submitted with initial or subsequent plan submittals and shall include a written report with all pertinent information necessary to review, evaluate and approval the request. All requests will be reviewed and evaluated on a case-by-case basis.

Chapter 2

CWS ADMINISTRATIVE PROVISIONS

Chapter 2

CWS ADMINISTRATIVE PROVISIONS

2.01 Application of Chapter

The requirements and administrative provisions of this Chapter apply to the construction of any and all components of the CWS sanitary sewer and storm systems, and to all activities with the potential to cause erosion, within the unincorporated area of the CWS service district, and within the following Cities: Banks, Durham, Gaston, King City, and North Plains, and within any other City which formally adopts these requirements.

2.01.1 Interpretations of Provisions

The phrase "Approved by District or City" is intended to allow the District or City to interpret the provisions in question in a manner that will protect the public health and safety, be consistent with other applicable laws and other standards of the District, and will preserve the safe and reliable operation of the public sanitary sewer and storm and surface water systems. The phrase "as approved by District or City" shall allow a City to make the interpretation, subject to the limitations of Section 1.02.3. Where the context provides for approval by the District or City of an alternative or a waiver to the standards provided in this Resolution and Order, the term shall mean approval of an alternative method, material, or design which, based on an engineering judgment, meets the purpose of the standard, for the specific application and as provided in Section 1.17.

2.02 Pre-Development Site Certification and Assessment

Prior to undertaking any development or completing a land use application to the land use authority for development, as defined in Chapter 1, the Owner or the Owner's authorized agent shall submit a site certification, and if required, a natural resource assessment, for the Water Quality Sensitive Areas and Vegetated Corridors on or adjacent to the development site, to the District for review and concurrence in accordance with the requirements of Chapter 3, or receive a determination from the District that a Site Certification is not necessary.

2.02.1 Expiration of Site Certification

District Site Certification is valid for two years from the date of approval, or until the project's current land use approval expires, unless substantial construction has started and is continuing. After two years, if land use application has not been completed, or a Site Development Permit has not been issued and if substantial construction is not continuing, the plans must be resubmitted to the District for review and approval, and the District shall require an updated natural resource assessment to document current conditions of the Sensitive Area and Vegetated

corridor.

2.03 Permit Process

2.03.1 Criteria for Site Development Permit

No person shall undertake the construction of, or modification to, any facilities governed by these rules without first obtaining a Site Development Permit from the District. The Site Development Permit will not be issued until the owner or his authorized agent has satisfied the following requirements:

a. Submitted easements as required in Section 2.05;

b. Submitted required performance assurances as required in section 2.06;

c. Executed a Construction Permit Agreement which has been accepted by an authorized representative of the District and been approved by District Legal Counsel as required in Section 2.07;

d. Paid all required fees including plan review and inspection fees and systems development charges;

2.03.2 Criteria for Erosion Control Only Permit Submittals

a. Erosion Control Only permits may be issued on all or a portion of the site in advance of the Site Development Permit when application for an Erosion Control Permit is made separately from application for a Site Development Permit and all of the following conditions are met.

1. Three sets of folded plans, on 24" x 36" sheets, shall be submitted to the District or City for review. This plan set shall only include the title sheet, grading and Erosion Prevention and Sediment Control Plan, and related sheets. The plan shall be clearly marked for Erosion Control Only.

2. The grading and Erosion Prevention and Sediment Control Plan must show the methods and interim facilities to be constructed or used concurrently and to be operated during construction to control erosion. The grading and Erosion Prevention and Sediment Control Plan shall meet the requirements of Section 2.04.2.k. and shall be prepared using the techniques and methods contained and prescribed in the latest edition of the Erosion Prevention and Sediment Control Planning and Design Manual, together with the provisions of Chapter 8.

3. A preliminary site development plan shall have been submitted separately and have undergone initial review by the District or City for compliance with this Resolution and Order. The site development plan shall be of sufficient detail to determine that no major revisions are

required that may substantially affect grading, pipe alignments, water quality or quantity facilities, sensitive areas or vegetated corridor requirements.

4. All other agency (i.e., COE, DSL) permits must have been issued for the portion of the site or development for which the Erosion Control Only permit is being requested and a copy of these permits shall be provided to the District.

b. The District or City shall collect a fee to defray the costs to review plans, to administer, and enforce an erosion control program, inclusive of inspection services, in order to carry out the rules contained herein.

c. Erosion Control Permits

1. Except as noted in Section 2.03.2.c.3, no person shall cause any change to improved or unimproved real property that causes, will cause, or is likely to cause a temporary or permanent increase in the rate of soil erosion from the site without first obtaining a permit from the District or City and paying prescribed fees. Such changes to land shall include, but are not limited to, grading, excavating, filling, working of land, or stripping of soil or vegetation from land.

2. No jurisdiction shall issue a permit for construction, land development, grading, excavating, filling, or clearing of land without first verifying in writing that the District or City has issued an Erosion Control Permit covering such work, or the District or City has determined that no permit is required. No public agency or body shall undertake any public works project without first obtaining an Erosion Control Permit covering such work, or receiving a determination from the District or City that no permit is required.

3. No Erosion Control Permit (from the District or City) is required for the following:

a) For work of a minor nature provided all the following criteria are met:

(1) The land development does not require a development permit or approval from the local jurisdiction having land use decision authority, and

(2) No land development activity or disturbance of land surface occurs within 100 feet of a Sensitive Area,

and

(3) The slope of the site is less than 20 percent, and

(4) The work on the site involves the disturbance of less than 500 square feet of land surface, and

(5) The excavation, fill, or combination thereof involves less than 20 cubic yards of material.

b) Permits and approvals for land division, interior improvements to an existing structure, and other approvals for which there is no physical disturbance to the surface of the land.

c) Activities within the boundary of CWS that constitute accepted farming practices as defined in ORS 30.930 and 215.203.

d) Exception from the permit requirement does not exempt the property owner from the responsibilities of Section 8.03.2.

2.03.3 NPDES 1200-C Permit

Through an agreement with the Department of Environmental Quality (DEQ), the District acts as DEQ's agent in receiving registration applications for the General Permit 1200-C for the control of storm water associated with construction activities where required by DEQ. Persons who develop within the District boundary and who would be required to obtain a DEQ 1200-C permit shall submit the required 1200-C forms and fees, as applicable, to the District or City prior to obtaining the site development permit. The District shall review and forward the permit application to DEQ, who will formally issue the permit.

2.04 Requirements for Plan Approval

2.04.1 Initial Plan Submittal

The owner or the owner's authorized agent shall submit to the District for review and approval plans prepared by an Engineer registered in Oregon for the construction or modification of any public sanitary or storm system, stormwater facility, erosion control permit, or other facility covered by these rules.

2.04.2 Initial Plan Submittal Requirements

No submittal shall be considered complete until the following information is received and all the requirements of this section are met as determined by the District.

a. Non-refundable Plan Review Deposit, if applicable

b. Land Use Authority Conditions of Approval.

c. Four sets of folded plans on 24" X 36" sheets, or as otherwise approved by the District. Individual plan sets that exceed 20 pages may be rolled and stapled.

d. The following information shall be included on the first plan sheet:

1. Vicinity map sufficient in scope to locate the proposed development.
2. The proposed name of the development, the name and address of the owner and developer, the name and address of the engineer, and the land use authority case file number, on the lower right-hand quarter of the sheet.
3. A description that includes township, range, quarter section and tax lot numbers of the areas impacted by the development.
4. The total square footage of new and existing impervious area within the project area. This calculation shall be separated into the square footage:
    a. Within Public Right-of-Way;
    b. Within Private Right-of-Way; and
    c. On Private Property.
5. The total square footage of the vegetated corridor, if applicable.
6. Index of plan sheets.
7. For multi-phase projects, an overall map showing the limits of each phase.
8. Corps and/or DSL permit application number (if permit is required), and the project or permit application number(s) for any other federal, state or local entity, or wetland delineation. Copies of the permit applications shall be included with the submittal. A site development permit shall not be issued until CWS has received confirmation of the permit conditions from the permitting authority and reviewed the plans to determine if any changes are necessary as a result of the permit conditions.

e. Clear, readable plan and profile views of all proposed sanitary sewer lines, storm sewer and surface water systems, shall be provided. The plan and profile drawings shall meet the requirements outlined in 2.04.2.e.1-15, or as otherwise approved by the District. 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 District staff to gain approval for the deviation prior to submittal.

1. Sanitary sewer plan and profile information presented on separate sheets from the storm and surface water plan and profile information.
2. Plan and profile views displayed one over the other on the sheet.
3. Public and private lines and facilities clearly marked on both the plan and profile view.
4. Existing sanitary manholes labeled with the designated CWS or City number.
5. The distance from the nearest existing manhole where a new manhole structure is constructed over an existing line, or where a main line connection is made to a trunk line.
6. Existing and proposed utilities shown on the plan view and utility crossings shown on the profile. Utilities other than sanitary and storm sewer shall be "ghosted".
7. A plan view scale no smaller than 1"= 50', and the profile view scale no smaller than 1"= 50' horizontal and 1"=10' vertical. Architectural scales shall not be used.
8. North arrow.
9. Type of backfill labeled on profile using CWS standard nomenclature.
10. All easements including the distance from the mainline to easement line.
11. Location of the low points of street grades and curb returns.
12. Drainage hazard areas and FEMA designated 100 year floodplains and floodways.
13. The stationing of each new main line section beginning at 0+00 or other even station (e.g., 1+00, 10+00, etc.) at the downstream terminus. In phased developments, previous stationing may be continued.
14. The edge of all Water Quality Sensitive Areas, as defined in Chapter 1.

15. The boundaries of the defined Vegetated Corridor.

f. The calculations for sizing of the sanitary and storm system submitted in a separate document.

g. If a water quantity or quality facility is required, a plan addressing the requirements shall be submitted which includes the design of a water quantity and/or quality facility including sizing calculations, access road design, landscaping and maintenance requirements, planting plan, plant list, and planting details. For privately maintained water quantity or quality facilities, a maintenance plan shall be submitted that identifies maintenance activities and frequency.

h. If vegetated corridor restoration is required in accordance with Chapter 3, a plan addressing the requirements shall be submitted which includes the following:

1. A plan view at no smaller than 1"=100' scale, showing the location and dimensions of the Vegetated Corridor.
2. Design information to meet the criteria of Chapter 3.

i. Planting plans, tabular plant counts, and landscaping and maintenance instructions for sensitive areas and buffers shall be illustrated separately from those for water quality facilities.

j. Details for all ditch grading including, restoration, erosion control measures and channel protection.

k. An Erosion Prevention and Sedimentation Control Plan which includes the following items at a minimum:

1. If submitted independently of the full project plans, a cover sheet with the proposed name of the development, the name and address of the owner and developer, the name and address of the engineer, and the land use authority case file number.
2. The total acreage of the site and the total acreage of the proposed disturbed area.
3. Site features as identified below.
    a. Existing topography for the site.
    b. Adjacent off-site drainage patterns indicated by arrows.
    c. Contours at 2-foot intervals. Where slopes exceed 15 percent, contours may be shown at 5-foot intervals.
    d. North arrow.

e. Existing and proposed structures for the project site.

f. Existing and proposed access location for the project site.

g. Existing project boundaries, rights-of-way, easements, and jurisdictional boundaries clearly identified by note or symbol or key.

h. Adjacent streets, including street names, and right-of-way boundaries.

i. Capacity and condition of existing drainage facilities, including roadside or other drainage ditches, that transport surface water onto, across, or from the project site.

j. Existing Sensitive Areas, Vegetated Corridors, and water quality and quantity facilities. For natural drainage features, show direction of flow, Drainage Hazard Areas, and the 100-year floodplain.

k. Clearing and grubbing limits.

l. Proposed ground contours.

m. For multi-phase projects, phasing of any erosion prevention and sedimentation control work clearly indicated on the plan.

n. Details of proposed erosion prevention and sediment control devices. When sedimentation ponds are proposed, at least one cross section detail shall be shown.

l. If alternative methods, materials, or designs other than those included within this Resolution and Order are proposed, a written report shall be submitted which includes design drawings, calculations, maintenance and operation requirements, and other pertinent information necessary to review and evaluate the proposal.

2.04.3 Timing for Plan Review

a. The District shall endeavor perform a completion check of the initial plan submittal for compliance with Section 2.04.2 within three working days following the day of receipt. Submittals which are not in substantial compliance with Section 2.04.2 will be returned without further review.

b. Upon acceptance of a complete plan submittal in compliance with Section 2.04.2, the District shall endeavor to approve, return for revision, or reject the plans within 15 working days following the day of receipt. If plans are rejected, the reasons shall be indicated in writing.

c. The District shall endeavor to approve, return for revision, or reject subsequent submittals within 10 working days.

2.04.4 Revised Plan Submittal and Approval

a. After the initial review pursuant to section 2.04.3 is completed, a set of plans with comments and/or revisions shown in red shall be returned to the Engineer. Two sets of revised construction plans addressing all comments made by the District shall then be submitted for approval. Upon approval of the plans, a minimum of four plan sets shall be provided to the District.

b. Upon approval of the plans, an engineer's cost estimate of construction, erosion control (EC), and landscaping details shall be submitted to the District for the calculation of bonds and fees. The cost estimate shall be itemized as follows:

1. Onsite Storm Sewer Improvements itemized for each pipe size and type
2. Offsite Storm Sewer Improvements itemized for each pipe size and type
3. Onsite Sanitary Sewer Improvements itemized for each pipe size and type
4. Offsite Sanitary Sewer Improvements itemized for each pipe size and type
5. Water Quantity/Quality Facility Construction itemized for the following:
   a) Excavation/Site Preparation
   b) Control Structures, piping and water quality manholes
   c) Fencing and maintenance access road costs
6. Water Quantity/Quality Facility Landscaping. This includes any landscaping in the treatment area or on the side slopes of the Water Quality facility along with any large trees planted solely to provide shade for the facility.
7. Restoration, Mitigation or Sensitive Area Landscaping
8. Erosion Control Installation and Maintenance
   a) Cost to install and maintain Erosion Control measures for the period of construction.
   b) If significant erosion control installation and maintenance costs are anticipated following construction due project size or duration, or if the erosion control plan will be amended due to changing site conditions or differing recovery times between areas, a separate estimate for Post Construction Erosion Control shall be provided.

c. District plan approval is valid for two years from the date of approval, or until the project's current land use approval expires, unless substantial construction has started and is continuing. After two years, if a Site

Development Permit has not been issued and if substantial construction is not continuing, the plans must be resubmitted to the District for review and approval, and the District shall require revisions so that the plans meet the current construction standards.

2.04.5 Notification of Start of Construction

The Owner or his designee shall notify the District at least two working days in advance of starting construction on any project covered by these rules.

2.04.6 Post-Approval Plan Modifications

When modification of the approved plan is requested by the owner, three sets of plans showing the revisions shall be submitted to the District for approval. No construction of the modified section can commence until these revised plans are approved. Plan review fees for modification of the approved plans will be charged at the District's established plan review rates.

2.05 Easements

2.05.1 Timing of Requirement

Off-site easements shall be granted to the District on an instrument approved by District Legal Counsel prior to the issuance of the Site Development Permit. On-site easements shall be granted to the District and shown on the final plat before plat approval and recording.

2.05.2 Dimensions of Easements

Easements for single lines shall be a minimum of fifteen feet wide unless otherwise approved by the District. Easements for multiple lines shall be a minimum of twenty feet wide. When a pipe will be "deadheaded", the easement shall extend a minimum of five feet past the end of the structure. Access easements suitable to provide access for the maintenance vehicles and equipment used by the District or City are required for all public water quality and quantity facilities that include outlet control structures. Access easements shall be provided to manholes, where required by the District or City.

2.06 Performance Assurances

2.06.1 Performance Assurance Requirement

a. Performance assurances shall be required for work authorized by the District to ensure quality and completeness of the project and shall be submitted by the Owner as a performance assurance for such work. Assurances should be in the form of a letter of commitment, performance

bond or cash deposit in form and substance satisfactory to the District.

b. If the Contractor provides the performance assurance for the project, both the Contractor and Owner are required to execute the Construction Permit Agreement required by Chapter 2.07.

c. The District will require submission of certificates of insurance in form and substance satisfactory to the District by the Owner and/or the Contractor prior to the permitting of any project under these rules.

2.06.2 Performance Assurance Amount and Duration

Except as may be allowed in Chapter 2.06.3, the amount of the performance assurance shall be as identified in Table 2-1. Modifications to plans approved by the District may require an increase in the performance bond amount.

Table 2-1
Performance Assurances

Type of Performance Assurance	Purpose	Amount	Required	Duration and Conditions for Release
1. Performance Assurance (if development is to be platted prior to completion of construction or if no plat is required)	Ensures that all public facilities and all public or private water quality and quantity facilities are built in accordance with terms and conditions of development permit	• 100% of the cost to construct all public sanitary and storm sewer systems; PLUS • 100% of the cost to construct all public or private water quality and water quality facilities, including landscaping; PLUS • 100% of cost to install Erosion Control; PLUS • 100% of the costs related to vegetated corridor	Prior to issuance of a site development permit	• Released upon completion of all terms and conditions of the Site Development Permit, EC Plan, Construction Permit Agreement; and • Completion and acceptance of the public sanitary and storm sewer systems, water quality and water quantity facilities, and vegetated corridor restoration

Type of Performance Assurance	Purpose	Amount	Required	Duration and Conditions for Release
		restoration		• NO Partial Releases
2. Performance Assurance (if development will not be platted prior to completion of construction)	Ensures that all public facilities and all public or private water quality and quantity facilities are built in accordance with terms and conditions of development permit	• 100% of the cost to construct all OFFSITE public sanitary and storm sewer systems; PLUS • 100% of the cost to construct all public or private water quality and water quantity facilities; PLUS • 100% of the cost to install Erosion Control; PLUS • 100% of the costs related to vegetated corridor restoration; PLUS • 10% of the cost to construct all ONSITE public sanitary and storm sewer systems	Prior to issuance of a site development permit	• Released upon completion of all terms and conditions of the Site Development Permit, EC Plan, Construction Permit Agreement; and • Completion and acceptance of the public sanitary and storm sewer systems, water quality and water quantity facilities, and vegetated corridor restoration • NO Partial Releases are allowed
3. As Built	Insures completion of as-built drawings in accordance with Section 2.09	• $2000 or 1% of cost of construction of the sanitary and storm systems and the water quality/quantity facility, whichever is greater	• Prior to issuance of site development permit	Released upon completion and acceptance of as-built drawings in accordance with Section 2.09

Type of Performance Assurance	Purpose	Amount	Required	Duration and Conditions for Release
4. Vegetated Corridor, water quality and water quantity facility landscaping performance assurance	Insures completion of vegetated corridor restoration and water quality and water quantity facility landscaping in accordance with Chapter 3	100% of the costs related to vegetated corridor restoration and water quality and quantity facility landscaping	• Prior to issuance of site development permit	Released upon completion and acceptance of vegetated corridor restoration and water quality and water quantity facility landscaping

2.06.3 Performance Assurance Exemptions

The District may, at its discretion, exempt a project of a governmental unit from the performance assurance requirements of Sections 2.06.2 when the governmental unit provides a letter of intent and commitment, satisfactory to the District, to complete the project in accordance with the District approved construction plans.

2.06.4 Performance Assurance Release

The District shall release its interest in public facility performance assurances and any additional performance assurances when a project meets the criteria for construction completion set out in Section 2.08. No partial releases of performance assurances will be given.

2.07 Construction Permit Agreement

A construction permit agreement, in a form approved by District Legal Counsel, shall be fully executed by the Owner and submitted to the District prior to the issuance of the Site Development Permit.

2.08 Project Construction Phase Completion and Acceptance

2.08.1 The construction phase of a project is complete when all of the following criteria are met, where applicable:

a. All components of the sanitary and storm sewer systems have been constructed, tested, and accepted by the District according to the standards described in this Resolution and Order.

b. Water quantity and/or water quality facilities have been constructed, landscaped, and accepted by the District.

c. Vegetated corridors have been established, restored, and enhanced in accordance with the requirements of Chapter 3 of these rules.

d. Post construction erosion control measures as determined by the District have been installed and accepted by the District.

e. As built drawings have been submitted and accepted by the District.

f. Maintenance Assurances have been submitted and accepted by the District.

2.08.2 Substantial Completion

A project shall be deemed substantially complete, and eligible for issuance of sanitary and storm water connection permits, when all the requirements of 2.08.1 are met, with the following exceptions:

a. Construction and testing is completed on those portions of the public sanitary and storm sewer systems required for the systems to function, with the exception of final manhole frame and lid grouting and manhole testing.

b. Water quality and/or water quantity facilities have been constructed according to the approved plans and protected from erosion. The facility vegetation is either established or a planting schedule has been accepted by the District. The planting schedule must include the name of the contractor who will be performing the landscaping work and a date of completion that shall not be more than 120 days from Substantial Completion. As a condition of acceptance of the planting schedule, the District may limit the number of connection permits able to be obtained until the landscaping has been completed. If landscaping has not been completed and accepted within 120 days, no additional sanitary or storm water connection permits shall be issued and no inspections shall be performed until landscaping work has been completed.

c. Vegetated corridors have been established, restored, and enhanced according to the approved plans and protected from erosion. New vegetation is either established or a planting schedule has been accepted by the District. The planting schedule must include the name of the contractor who will be performing the landscaping work and a date of completion that shall not be more than 120 days from Substantial

Completion. As a condition of acceptance of the planting schedule, the District may limit the number of connection permits able to be obtained until the landscaping has been completed. If landscaping has not been completed and accepted within 120 days, no additional sanitary or storm water connection permits shall be issued and no inspections shall be performed until landscaping work has been completed.

e. An as-built performance assurance, in accordance with Table 2-1 has been submitted.

f. A post construction erosion control performance assurance, in accordance with Table 2-1, has been submitted.

2.09 As-Built Drawings

The Owner or Engineer shall submit a full set of reproducible as-built drawings of the project, stamped and signed by the Engineer of Record and in a form acceptable to the District. The as-built drawings shall accurately represent the constructed project as determined by a post-construction survey. As-Built survey notes may be required by the District if a discrepancy is noted between the submitted As-Built drawings and the District inspection notes.

2.10 Maintenance Assurance

2.10.1 Maintenance Assurance Requirement

Maintenance Assurances shall be required for work to ensure post construction quality in accordance with Table 2-2. Assurances shall be in the form of a letter of commitment, bond, or cash deposit in form and substance satisfactory to the District.

2.10.2 Maintenance Assurance Exemptions

Upon request, the District may exempt a project of a governmental unit from the requirements of Section 2.10.

2.10.3 Maintenance Assurance Amount and Duration

Except as allowed in 2.10.2, the amount and duration of the maintenance assurance shall be as identified in Table 2-2.

Table 2-2
Maintenance Assurances

Type of Maintenance Assurance	Purpose	Amount	Required	Duration and Conditions for Release
1. Maintenance Assurance	Ensures correction of defects in materials and workmanship after initial construction	• 10% of the cost of construct all public sanitary and storm sewer systems; PLUS • 100% of the cost to construct all public or private water quality and quantity facilities	• Prior to Release of Performance Assurance	• Released one year after completion and acceptance of construction; and • After correction of all defects identified during the maintenance assurance period
2. Landscaping Maintenance Assurance	Ensures correction of any landscaping defects after initial installation	• 100% of the cost to install all required landscaping; PLUS • 100% of the cost to maintain the landscaping for a period of 2 years	• Prior to Release of Performance Assurance	• Released two years after acceptance of landscaping providing 80% of landscaping is established and healthy
3. Post Construction Erosion Control	Ensures maintenance and effectiveness of EC measures after construction	• 100% of cost to install and maintain post construction erosion control for one year	• Prior to Release of Performance Assurance; and • Prior to issuance of connection permits	• Released one year after completion and acceptance of construction

2.11 Maintenance Period Inspection and Completion

2.11.1 Infrastructure Inspection for One Year Warranty

The District shall perform a visual and video inspection of the gravity storm and sanitary conveyance systems during the one-year warranty period and identify any defects in the systems. The owner shall correct any defects identified prior to conclusion of the one-year warranty period. The maintenance assurance shall not be released until all defects have been corrected and inspected.

2.11.2 Landscaping Inspection for Warranty

a. The District shall inspect the condition of the water quality/quantity facility and Vegetated Corridor landscaping periodically throughout the two-year maintenance period. The District shall provide an interim inspection report to the Owner with a specific summary of any deficiencies. Failure of the District to provide the interim report shall not release the Owner from their responsibility to provide established landscaping at the end of the two-year landscaping maintenance period.

b. If at any time during the warranty period the landscaping falls below 80% survival of trees and shrubs, or 90% aerial coverage by herbaceous plants, or if the amount of undesirable vegetation cover including target non-native species exceeds 10%, the Owner shall remove undesirable vegetation and reinstall all deficient planting at the next appropriate planting opportunity. The two-year maintenance period shall begin again from the date of replanting.

2.11.3 Warranty Period Completion

The one year warranty period shall be complete when all the requirements of Section 2.08.1 have been met, the one-year maintenance assurance period, including any extensions, has expired on all elements of the project, and any repairs required during the maintenance period have been completed and accepted.

2.12 General Administrative Rules

2.12.1 Additional Permits

Nothing in these standards alleviates the need for the Owner to obtain and comply with all required local, special district, state or federal permits. Any required permits for the project issued by other jurisdictions, including but not limited to the Oregon Division of State Lands and the US Army Corps of Engineers, shall be maintained on site and available to District Inspectors upon request.

2.12.2 District Inspection

a. A District 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 approved plans and the requirements of this Resolution and Order. The purpose of these inspections is to monitor compliance with District construction standards and the inspections are for the benefit of the District.

b. The District does not provide the primary inspection for the project, and only provides a level of inspection necessary to monitor the quality of work being performed by others. The Owner retains primary responsibility for project inspection. The District's role in making inspections is not supervisory and CWS has no responsibility, by virtue of such inspections, for any construction means, methods, or techniques, or compliance with safety requirements, all of which remain the sole responsibility of the Contractor.

2.12.3 Change in Plans/Standards

The District shall have the right to require changes in the plans or in standards contained herein in order to protect the public interest or the normal operations of the District. Such changes shall be required at the sole discretion of the District and may include, but are not limited to, the allowance of new or different materials or products that are equivalent to or better than the product specified in the approved plans.

2.12.4 Guaranty

If the Owner, after notice of defective work, fails within thirty days to proceed to comply with the terms of Section 1.09, the District may have the defects corrected. The Owner's surety or issuer of the performance or maintenance assurances under Section 2.06 and Section 2.10 shall be liable for all expenses incurred, provided, however, that in case of an emergency where, in the opinion of the District, delay would cause serious loss or damage, repairs may be made without notice being given to the Owner, and the Owner and the Owner's surety shall be jointly and severally liable for the cost thereof.

2.12.5 District Maps/Plans Not Guaranteed

The District may provide property owners, engineers, contractors and other members of the public with information from District maps, "as-built" plans, etc. The District does not guarantee and shall not be liable for the accuracy of the measurements, locations or other information on such maps and plans.

2.13 Technical Guidance Documents

The District may develop Technical Guidance documents to provide assistance in compliance with this Resolution and Order. The District shall review the Technical Guidance documents on an annual basis. Review may occur more frequently in order to comply with new laws, regulations, or permit requirements, to correct deficiencies or to respond to changes in technology.

The District may solicit review of the Technical Guidance documents and any revisions by the interested public. Revisions shall become effective upon approval by the General Manager and Director of Conveyance.

Chapter 3

STANDARD DESIGN REQUIREMENTS FOR STORM AND SURFACE WATER AND VEGETATED CORRIDORS

Chapter 3

STANDARD DESIGN REQUIREMENTS FOR STORM AND SURFACE WATER AND VEGETATED CORRIDORS

3.00 Introduction

The purpose of this chapter is to outline design requirements for storm and surface water management. The provisions of this chapter are intended to prevent or reduce adverse impacts to the drainage system and water resources of the Tualatin River Basin. In combination with other state, federal, and local laws and ordinances, these requirements are intended to protect the beneficial uses of waters within the Tualatin River Basin and within the District.

3.01 Application and Interpretation of Chapter

The provisions of this chapter shall apply to storm and surface water systems within the District and City jurisdiction. Interpretations of such provisions and their application in specific circumstances shall be made by the District and City. Any City operating a local program may adopt stricter design specifications within its jurisdiction than the specifications stated in this chapter. No person shall undertake development activities within the District's jurisdiction without first obtaining a Storm Water Connection Permit from the District or its designee pursuant to Ordinance 27 and these rules, or receiving a written determination from the District that no Storm Water Connection Permit is required. Applicants may apply for permits as single project or as part of a master planned activity.

3.02 Sensitive Area and Vegetated Corridor Standards

3.02.1 Service Provider Letter and Permits Required

a. In order to determine if the proposed activity will require a service provider letter, the applicant may apply for a Prescreening Site Assessment. If no Water Quality Sensitive Areas appear to exist on or within 200 feet of the site, then no further site assessment or service provider letter is required. The Prescreening Site Assessment does not eliminate the need to evaluate and protect Water Quality Sensitive Areas if they are subsequently discovered on, or within 200 feet of, the site.

b. Prior to land use application or issuance of building permit for a development activity as defined in section 1.02.14, the Applicant shall secure a service provider letter from the District or its designee, which specifies the conditions and requirements associated with Vegetated Corridors and Sensitive Areas necessary for the District to issue a Storm Water Connection Permit pursuant to Ordinance 27 and these rules and regulations. If allowed by the land use jurisdiction, applicant may begin

the land use permit application process and secure the service provider letter prior to completing the land use permit application.

c. In order to secure a service provider letter from the District, the applicant shall perform a Natural Resource Assessment in accordance with Section 3.02.2. The applicant shall perform a Tier 1, 2 or 3 Alternatives Analysis pursuant to Section 3.02.6 if the proposed site plan can not meet the standards outlined Sections 3.02.3 and 3.02.4.

d. No person shall perform construction without first obtaining a Storm Water Connection Permit from the District or its designee as required pursuant to Ordinance 27, Section 4.B. The Storm Water Connection Permit shall be issued upon District approval of final construction plans showing that all of the applicable conditions from the service provider letter have been met. The Applicant must obtain and comply with all permits and approvals required under applicable local, state and federal law.

e. Exceptions to the process outlined in 3.02.1.a-d include:

1) For lot line adjustments that are not part of a land use or building permit application, and that do not result in any physical development, the Applicant shall complete a Prescreening Site Assessment. If Sensitive Areas appear to exist on or within 200 feet of the site, then further site assessment may be required. The lot line adjustment shall be reviewed by the District / City/ County to ensure the proposed configuration of the lots retain buildable status. Vegetated Corridor conditions shall not apply to the lot line adjustment approval process, but may apply to subsequent land use or development applications on the subject property.

2) For redevelopment, the standards in Section 3.02 shall apply only when the activity alters 10% or more of existing improved impervious area within 100 feet of the Sensitive Area. The process outlined in 3.02.1.a-d shall be followed.

3.02.2 Natural Resources Assessment Required

a. Prior to completion of a land use permit application or building permit issuance for development activity as defined in section 1.02.14, the Applicant shall provide a Natural Resource Assessment for any Sensitive Areas and Vegetated Corridors in accordance with Appendix C: Natural Resource Assessments. The Assessment shall consist of a reconnaissance and site certification. When Sensitive Areas are found to be present, the Applicant shall delineate the Sensitive Areas and determine the width and condition of the Vegetated Corridor. For qualifying projects, the

Applicant may perform a Simplified Site Assessment as described in Appendix C.

b. The Applicant shall measure the Vegetated Corridor as shown in Figure 3.2 and further outlined in Appendix C: Natural Resource Assessments. A minimum of three slope measurements along the Sensitive Area, spaced at no more than 100-foot increments, shall be made for each property for which development is proposed. The District may require additional measurements for sites with highly variable topography. The Applicant shall determine existing corridor conditions per Table 3.2 and Appendix C: Natural Resource Assessments and clearly mark them on scaled plans. The Applicant shall provide photos of the site conditions with the plans.

3.02.3 Sensitive Areas

a. Extent of Sensitive Areas

1) The Applicant shall determine the extent of the Sensitive Area using the methods outlined in Appendix C: Natural Resource Assessments.

2) Local land use codes may require additional natural resource analysis.

b. Requirements and Conditions Within Sensitive Areas

1) No person shall erect any structure, conduct any development or construction activities, establish or maintain any garden or lawn, clear native vegetation, remove non-native invasive vegetation other than with an integrated vegetation management approach, store uncontained hazardous materials, dump or dispose of materials of any kind (including pet waste), or conduct other activities within a Sensitive Area that may negatively impact water quality, except as allowed in 3.02.3.b.2.

2) The following activities are allowed within a Sensitive Area when impact is minimized through choice of mode, sizing, and placement:

a. Maintenance practices and enhancement activities, as defined or permitted by the DSL or COE, are allowed within the Sensitive Area per criteria set forth by DSL and/or COE.

b. Development within the Sensitive Area shall be allowed if the required permits are issued, when necessary, by the DSL and/or the COE.

c. On-site relocation of intermittent streams that drain less than 50 acres and have a perpendicular land slope of less than 25%, provided that the pre-existing discharge point off the site is maintained.

d. As approved by the District or its designee through an alternatives analysis set out in Section 3.02.6 of these rules, the activities listed in Section 3.02.4.b.2), 3), and 4). within Water Quality Sensitive Areas that are not regulated by DSL and the COE.

3) Mitigation shall be required per the DSL and COE rules and regulations or as determined by the District for areas or activities not regulated by COE or DSL.

3.02.4 Vegetated Corridors

a. Extent of Vegetated Corridors

1) The Vegetated Corridor may range from 15 to 200 feet wide, measured horizontally, from the defined boundaries of the Sensitive Area, except where approval has been granted by the District or City/County to modify the width of a portion of the corridor in accordance with section 3.02.4.a.2). Table 3.1 documents the Vegetated Corridor Widths and Figure 3.1 illustrates the requirement.

2) Modifications to the required Vegetated Corridor widths are allowed via averaging or reduction for Corridor areas certified by the District or Designee to be in marginal or degraded condition. Modifications are not allowed for Corridor areas certified by the District to be in good condition. Averaging shall be considered prior to reduction and cannot be used in conjunction with reduction.

a. The maximum encroachment allowed for averaging at a project site is 20% of the frontage length of the Vegetated Corridor by no more than 20% of the required width. The area of encroachment must be replaced at a 1:1 ratio. The replacement area must be incorporated into the remaining Vegetated Corridor on the project site and meet the "Good Corridor Condition" standards as defined in Table 3.2, regardless of its distance from the Sensitive Area.

b. If the Vegetated Corridor extends 125 feet or more from the boundary of the Sensitive Area, and Vegetated Corridor averaging is not practicable, the maximum encroachment allowed for reduction at a project site is 20% of the required Vegetated Corridor width. A stamped geotechnical report confirming that slope stability can be maintained with the reduced setback is

required. The remaining Vegetated Corridor shall be enhanced to meet the "Good Corridor Condition" standards as defined in Table 3.2.

c. When the slope is greater than 25% and the Vegetated Corridor extends 35 feet beyond the break in slope, the outer boundary of the Vegetated Corridor may be reduced from 35 feet to 15 feet beyond the break in slope, as long as the resulting Vegetated Corridor is no less than 50 feet beyond the edge of the Sensitive Area. This reduction is allowed only if a stamped geotechnical report confirms that slope stability can be maintained with the reduced setback from the break in slope.

3) If trees or native vegetation have been cleared from the Vegetated Corridor or Sensitive Area prior to applying for development and without District/City/County approval, the maximum Vegetated Corridor widths for the resource type and pre-existing site condition will apply. Mitigation and enhancement of the entire impacted Sensitive Area and/or Vegetated Corridor will be required for the full extent of the Sensitive Area and/or Vegetated Corridor in the impacted area. The following mitigation requirements shall apply to sites where native vegetation has been removed from Vegetated Corridors or Sensitive Areas without prior authorization:

   a. Trees removed shall be replaced with a number of trees equal to the caliper divided by the largest size reasonably available, for a 1:1 replacement by caliper size. Tree density for the plant community shall meet or exceed the good corridor condition standard outlined in Table 3.2 and Appendix D, Table 1.

   b. Shrub and herbaceous material replacement shall meet the good corridor condition standard outlined in Table 3.2 and per Appendix D, Table 1: Plant Communities for Revegetation.

4) The requirements of 3.02.4.a.3 do not apply to:

   a. The removal of "hazard" trees if they threaten a structure or public area. Hazard trees shall be topped and standing trunks retained, if possible.

   b. Vegetated Corridors or Sensitive Areas in which clearing occurred prior to February 22, 2000.

5) The Vegetated Corridor shall not be required to extend beyond an existing building or improved roadway separating the proposed development from the Sensitive Area. For the purposes of this section,

an "improved roadway" shall be gravel or paved, a minimum of 12-feet in width, and actively used for vehicular traffic. The building or roadway must remain as part of the proposed development and not planned for future demolition.

6) If the proposed activity is redevelopment and alters 10% or more of existing improved impervious area within 100 feet of the Sensitive Area, then a 25-foot Vegetated Corridor for streams, springs and wetlands, and a 50-foot Vegetated Corridor for the Tualatin River shall apply per Table 3.1. Vegetated Corridor averaging is permitted per 3.02.4.a.2.a and shall exclude any existing building footprint area already encroaching into the Vegetated Corridor. Exceptions to the Vegetated Corridor requirement on redevelopment sites include:

   a. Redevelopment of a single family residence is exempt, unless redevelopment is changing use (to commercial/ multifamily/ industrial, etc), or proposing to encroach further into the Vegetated Corridor.

   b. Redevelopment of an existing impervious area fully separated from the resource by a building (i.e. building divides the activity from the Sensitive Area) are exempt.

   c. Properties with pre-existing Vegetated Corridors or setbacks averaging at least 25 feet from streams and 50 feet for the Tualatin River, may maintain the pre-existing Vegetated Corridor width. Enhancement of existing Vegetated Corridor to good condition is required, if not already in good condition.

   d. Properties bordering wetlands at least 25 feet from stream may utilize the wetlands as the Vegetated Corridor. Enhancement of wetlands to a good condition for a width of 25 feet towards the stream is required, if not already in good condition.

b. Requirements and Conditions within a Vegetated Corridor

   1) No person shall erect any structure, conduct any development or construction activities, establish or maintain any garden or lawn, clear native vegetation, remove non-native invasive vegetation other than with an integrated vegetation management approach, store uncontained hazardous materials, dump or dispose of materials of any kind (including pet waste), or conduct other activities within a Vegetated Corridor which may negatively impact water quality, except as allowed in Section 3.02.4.b.2) and 3).

2) Upon review and approval by the District or Designee and other appropriate regulatory authorities, the following activities are allowed within a Vegetated Corridor when impact is minimized through choice of mode, sizing and placement.

a. Roads, pedestrian or bike paths crossing the Vegetated Corridor from one side to the other in order to provide access to the Sensitive Area or across the Sensitive Area;

b. Utility/service provider infrastructure construction (i.e. storm drainage, sanitary sewer, service laterals, outfalls, water, phone, gas, cable, etc.) Infrastructure construction shall not remove native trees greater than 6" dbh.

c. Stormwater facilities planted with appropriate native vegetation. Storm water facilities may encroach into the Vegetated Corridor in accordance with the Vegetated Corridor averaging or reduction allowances set out in Section 3.02.4.a.2); they may be integrated within a Vegetated Corridor of an intermittent stream draining less than 50 acres and having a slope less than 25%. Refer to Appendices B and D for design criteria and guidance.

d. An access way, path, or sidewalk (referred to as "path" henceforth) 10 feet or less in width. When the path is greater than 3 feet in width, the square footage of the excess path width shall be mitigated at a 1:1 ratio by enhancing additional Vegetated Corridor to a good condition. The following conditions apply to all paths:

1) The path shall avoid the Vegetated Corridor where possible.
2) The path shall be located in the outermost 40% of the Vegetated Corridor boundary as it runs near or parallel to the Sensitive Area.
3) Paths shall be constructed so as to minimize disturbance to existing vegetation and maintain slope stability;.

e. Grading for the purpose of enhancing the Vegetated Corridor;

f. Grading for purposes other than enhancement may occur under the following conditions:

1) The vegetated corridor condition is degraded,

2) The proposed grading is consistent with native ground,
3) The proposed grading does not result in the removal of native vegetation, and
4) The graded slopes are no more than 4H:1V;

g. Other uses, not listed in a) through f) above, as approved by the District or its Designee through an alternatives analysis process as described in Section 3.02.6.

3) District review for Vegetated Corridors is not required for the following activities. Other regulating jurisdictions may require review and approval.

a. Activities excluded from the definition of development in Section 1.02.14.b;

b. Enhancement of the riparian corridors for water quality or quantity benefits, and aquatic habitat;

4) Mitigation for negative impacts to the Vegetated Corridor and/or enhancement of the Vegetated Corridor to a "good" condition, as defined in Table 3.2, is required for activities identified in Section 3.02.4.b.2) and Chapter 12. Replacement mitigation, if required shall be at a 1:1 ratio or greater. Refer to Appendix D: Landscape Requirements for revegetation requirements.

5) When impact to Sensitive Areas is permitted by DSL and COE:

a. The Vegetated Corridor impact area shall be calculated based on the site conditions as they exist prior to the proposed impact and mitigated at a minimum 1:1 ratio either on site or in association with the required DSL / COE mitigation.

b. If Payment to Provide is approved by DSL for Sensitive Area impact, then Applicant shall provide a 1:1 replacement of the Vegetated Corridor as mitigation for impacted area or apply for Vegetated Corridor Payment to Provide. Applicant may pay a Vegetated Corridor Payment to Provide to the District, per the District's Rates and Charges Ordinance. The Payment will be assigned to an enhancement project within the subwatershed in which the impact occurs.

6) Wetlands may not be filled in order to create, expand, or eliminate a Vegetated Corridor.

3.02.5 General Requirements for Sensitive Areas and Vegetated Corridors

a. Prior to any site clearing, grading or construction, the Applicant shall survey, stake, and demarcate with standard orange construction fencing or equivalent the outer boundary of the combined Sensitive Area and Vegetated Corridor per approved plan. During construction the outer boundary of the combined Sensitive Area and Vegetated Corridor shall remain fenced and undisturbed except as allowed in Section 3.02.4.b and per approved plans.

b. For any development which creates multiple parcels or lots intended for separate ownership, the Sensitive Area and Vegetated Corridor shall be contained in a separate tract. The first 50 feet of Vegetated Corridor on intermittent streams draining 10-100 acres shall be contained in a separate tract; the remainder may be placed in an easement. The District, City, or County may also require that the Sensitive Area and Vegetated Corridor be signed, fenced, or otherwise physically set apart from parcels that will be developed. Signage for Sensitive Areas shall meet the requirements of Standard Detail No. 275. Signs may also be available for purchase from the District.

c. The District or City/County may require an easement over the Sensitive Area and Vegetated Corridor for surface and storm water management in order to prevent the owner of the Sensitive Area and Vegetated Corridor from carrying out activities and uses inconsistent with the purpose of the corridor and any easements therein.

d. The Applicant shall protect and enhance the Sensitive Area and Vegetated Corridor in accordance with the requirements listed in Table 3.2 and Appendix D: Landscape Requirements, per approved plans. For Vegetated Corridors 50 feet and greater in width, the Applicant shall enhance the first 50 feet closest to the Sensitive Area to meet or exceed "good" corridor condition as defined in Table 3.2. For Vegetated Corridors less than 50 feet wide, the Applicant shall enhance the entire corridor to meet or exceed "good" corridor condition as defined in Table 3.2.

e. The Applicant shall adequately protect drainage ditches that drain surface water systems or storm water infrastructure from erosion and, to the extent possible, integrate the appearance of such ditches into the Sensitive Area and Vegetated Corridor through the use of native vegetation and rock/wood placement.

3.02.6 Alternatives Analysis

a. The Applicant shall conduct an Alternatives Analysis if the proposed site plan can not meet the standards outlined in Section 3.02.4 and 3.02.5. In conducting the Alternatives Analysis:

1) The Applicant shall prepare the Submittal Requirements outlined in this section for the type of encroachment proposed;

2) The Applicant shall participate in one or more meetings with the District and City or County to negotiate the Vegetated Corridor encroachment and mitigation;

b. The District shall review the alternatives analysis pursuant to the Criteria for Acceptance as outlined in this section for the type of encroachment proposed; and

c. The District or its designee shall prepare a service provider letter documenting the results of the alternatives analysis and District's requirements necessary to comply with water quality protection.

d. Tier 1 Alternatives Analysis: For marginal or degraded Vegetated Corridors with encroachment up to 40% of the length by 30% of the width:

1) Submittal requirements

a. Natural Resource Assessment performed pursuant to Appendix C: Natural Resource Assessments and Section 3.02.2 of these rules.

b. Site Plan showing entire site with encroachment area and calculations of Vegetated Corridor encroachment and mitigation areas/plan.

c. Description of why the encroachment is needed.

2) Criteria for Acceptance

a. Encroachment area is mitigated by at least a 1:1 ratio on site.

b. Enhancement of the replacement area if not already in good condition, and either the remaining Vegetated Corridor on the project site or the first 50 feet of width closest to the resource, whichever is less, to a "good" corridor condition per Table 3.2 and Appendix D: Landscape Requirements.

c. District or its designee's Storm Water Connection Permit is likely to be issued based on proposed plans.

d. Location of development and site planning minimize incursion into the Vegetated Corridor; and

e. There is no practicable alternative to the location of the development that will not disturb the Sensitive Area or Vegetated Corridor.

c. Tier 2 Alternatives Analysis: For any good Vegetated Corridor encroachment or marginal/degraded Vegetated Corridor with encroachment greater than 40% of the length by 30% of the width and for activities listed in Section 3.02.4.b.2) which are proposed to occur within the Water Quality Sensitive Area.

1) Submittal requirements

a. Natural Resource Assessment performed pursuant to Appendix C: Natural Resource Assessments and Section 3.02.2 of these rules.

b. Site Plan showing entire site with encroachment area and calculations of water quality Sensitive Area and/or Vegetated Corridor encroachment and mitigation areas.

c. Description of why the encroachment is needed; and

d. Functional Analysis Report; see Appendix C 4.2.f.2

2) Criteria for Acceptance

a. Encroachment area is mitigated by a 1:1 ratio or greater and is located either on-site or off-site along the same stream or its watershed;

b. The mitigation protects the functions and values of the Sensitive Area and Vegetated Corridor;

c. Enhancement of the replacement area if not already in good condition, and either the remaining Vegetated Corridor on the project site or the first 50 feet of width closest to the resource, whichever is less, to a "good" corridor condition per Table 3.2 and Appendix D: Landscape Requirements;

d. A District or its designee's Storm Water Connection Permit is likely to be issued based on proposed plans;

e. Location and site planning minimizes encroachment into the Vegetated Corridor;

f. There is no practicable alternative to the requested development which will not disturb the Sensitive Area or Vegetated Corridor;

g. There are public benefits of the encroachments; and

h. If the application of these Vegetated Corridor regulations results in a lot being unbuildable the Vegetated Corridor shall be reduced to assure the lot will be buildable while still providing for the maximum Vegetated Corridor to the greatest extent practicable.

f. Tier 3 Alternatives Analysis: For Vegetated Corridors with pre-existing encroachment (Redevelopment as defined in Section 1.02.46):

1) Submittal requirements

a. Natural Resource Assessment performed pursuant to Appendix C: Natural Resource Assessments and Section 3.02.2 of these rules.

b. Site Plan showing entire site with encroachment area (including existing and proposed areas) and calculations of Vegetated Corridor encroachment and mitigation areas/plan if applicable.

c. Description of why the encroachment is needed under proposed redevelopment plan.

2) Criteria for Acceptance

a. Encroachment area is mitigated by at least a 1:1 ratio on site or off-site, or a Payment to Provide for Vegetated Corridor mitigation is applied.

b. Enhancement of the remaining Vegetated Corridor on the project site or the first 50 feet of width closest to the resource, whichever is less, to a "good" corridor condition per Table 3.2 and Appendix D: Landscape Requirements.

c. District or its designee's Storm Water Connection Permit is likely to be issued based on proposed plans.

d. Location of the redevelopment and site planning minimize incursion into the Vegetated Corridor; and

e. There is no practicable alternative to the location of the redevelopment that will not disturb the Sensitive Area or Vegetated Corridor.

3.02.7 Tables and Figures

Table 3.1 Vegetated Corridor Widths

Sensitive Area Definition*	Land Slope Perpendicular to Sensitive Area	Width of Vegetated Corridor per Side
Figure 3.1 - Graphic 1		
• Streams with intermittent flow draining:		
• 10 to <50 acres	< 25%	15 feet
• ≥50 to 100 acres		25 feet
• Existing or created wetlands < 0.5 acre	<25%	25 feet
Figure 3.1 - Graphic 2		
• Existing or created wetlands ≥ 0.5 acre • Streams with perennial flow • Springs with perennial flow • Streams with intermittent flow draining >100 acres • Natural lakes, ponds, and in-stream impoundments	<25%	50 feet
Figure 3.1 - Graphic 3		
• Tualatin River	<25%	125 feet
Figure 3.1 - Graphic 4		
• Springs with intermittent flow	≥ 25%	15 feet
• Existing or created wetlands • Tualatin River • Streams with perennial flow • Streams with intermittent flow draining >100 acres • Springs with perennial flow • Natural lakes, ponds, and in-stream impoundments	≥25%	Variable from 50-200 ft**
Figure 3.1 - Graphic 5		
• Streams with intermittent flow draining 10-100 acres	≥25%	Variable from 50-200 ft***
Figure 3.1 – Graphic 6		
• Redevelopment sites adjacent to Water Quality Sensitive Areas other than the Tualatin River	<25%	25 feet
• Redevelopment sites adjacent to the Tualatin River	<25%	50 feet

* See Chapter 1: Definitions for Sensitive Area, Intermittent and Perennial Flow

** Measured in 25-foot increments from the edge of the Sensitive Area to the break in slope (i.e. <25%). Add 35 feet past the break in slope to determine the Vegetated Corridor width, not to exceed 200 feet. For land divisions, the entire Vegetated Corridor must be contained in a tract.

*** Measured in 25-foot increments from the edge of the Sensitive Area to the break in slope (i.e. <25%). Add 35 feet past the break in slope to determine the Vegetated Corridor width, not to exceed 200 feet. For land divisions, the first 50 feet closest to Sensitive Area must be placed in a tract; remaining area may be contained in easement.

Figure 3.1 Vegetated Corridor Width

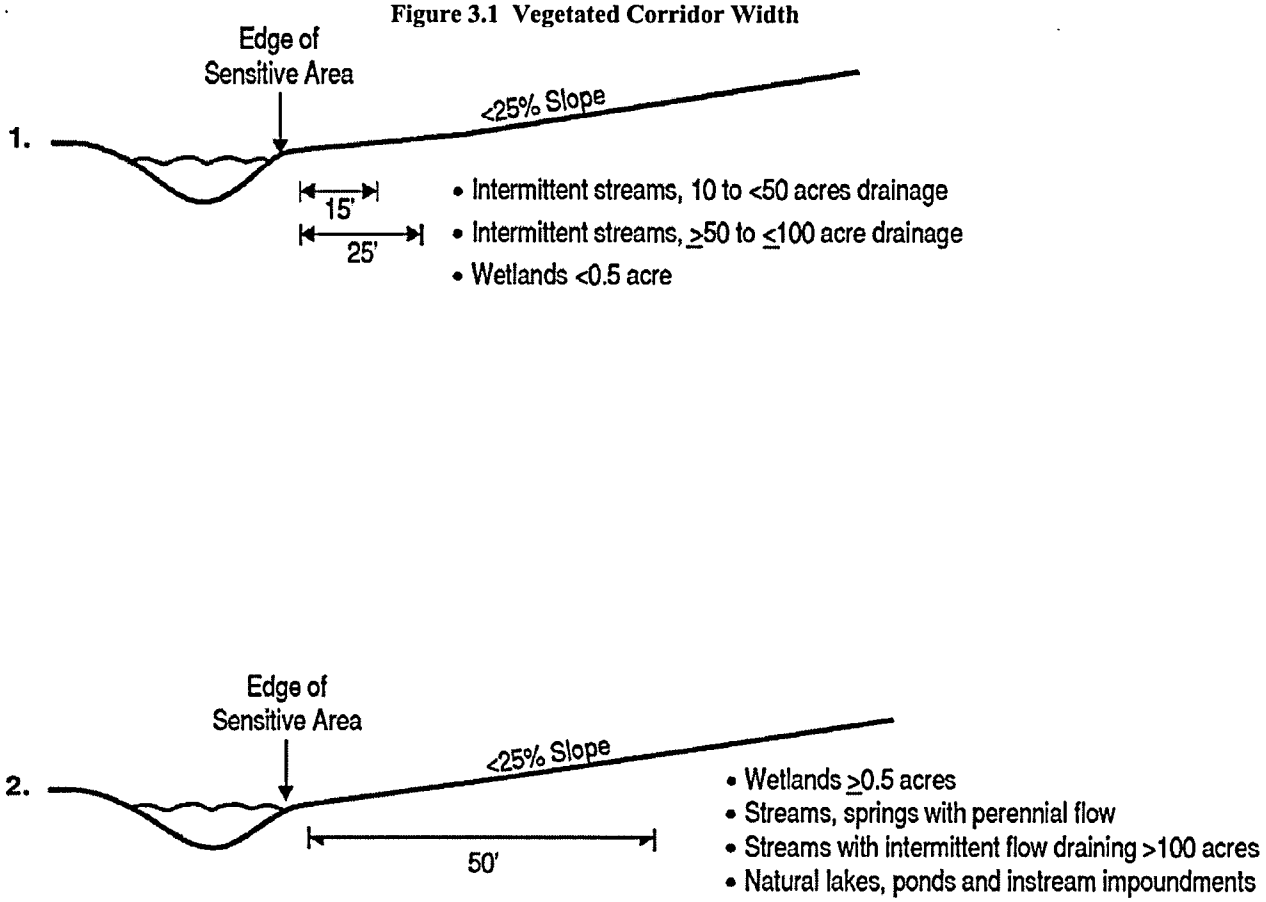
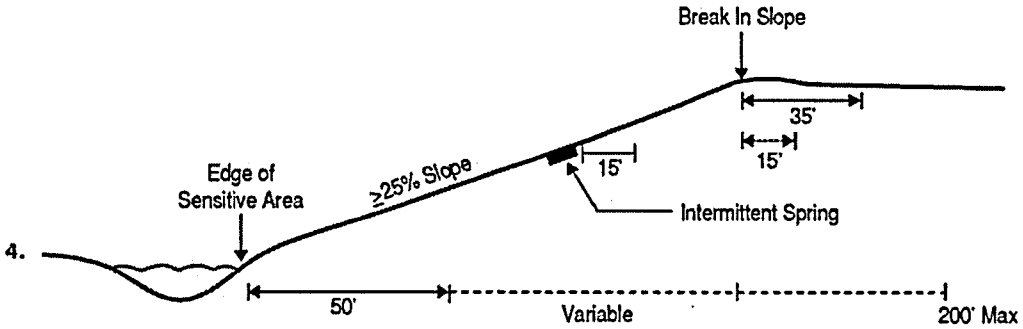
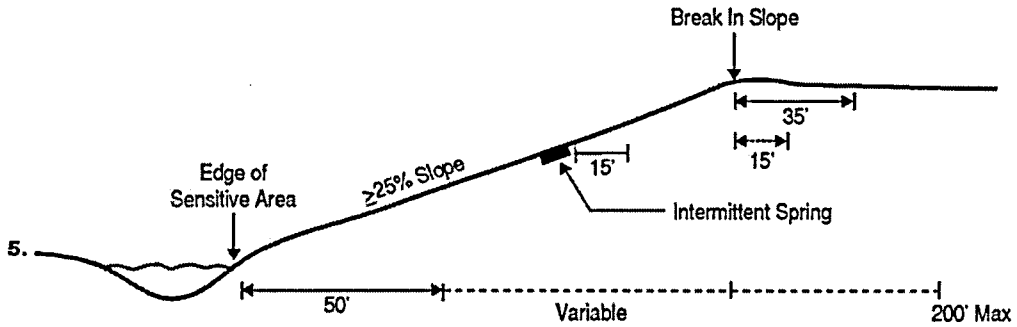


Figure 3.1 (continued)

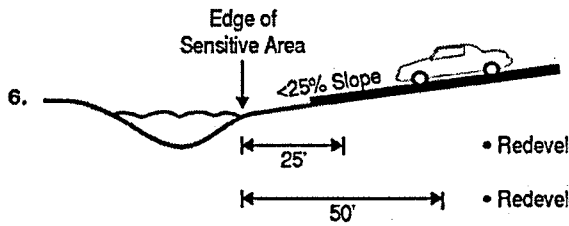


- Wetlands
- Tualatin River, streams, springs with perennial flow
- Streams with intermittent flow draining > 100 acres
- Natural lakes, ponds and instream impoundments



- Streams with intermittent flow draining 10 to 100 acres.

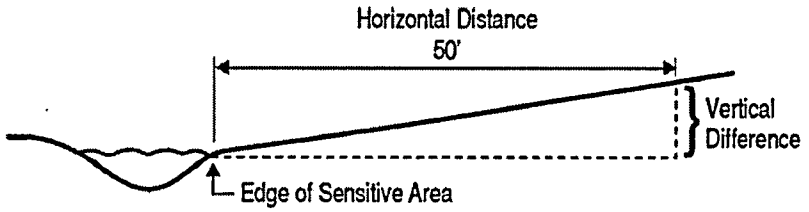
  First 50' in tract and remaining area in easement (easement limits tree/vegetation removal, no staging, grading, stockpiling)



- Redevelopment sites on streams, springs, wetlands, lakes, ponds
- Redevelopment sites on Tualatin River

Figure 3.2 Vegetated Corridor Measurement Methodology

1) Measure 50 feet horizontally from the Edge of the Sensitive Area (see Table 3.1).



2) Determine the slope
(Vertical difference/Horizontal distance) * 100 = percent slope

3) If slope is < 25%, apply the vegetated corridor per Table 3.1

(a) If stream or spring is intermittent, measure the drainage area from the upstream drainage point of the development determine appropriate width application. The width of the Vegetated Corridor may widen as it proceeds downstream, if the drainage acreage increases past the various acreage cut-off points outlined in Table 3.1.

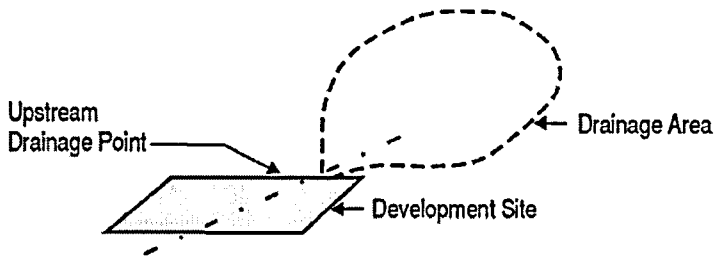
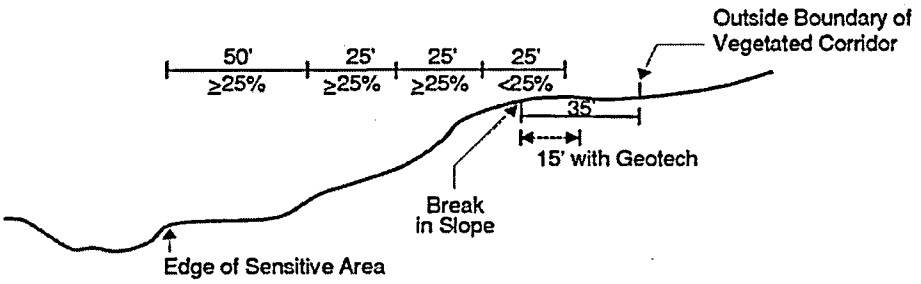


Figure 3.2 Vegetated Corridor Measurement Methodology (cont'd)

4) If the slope is > 25%, measure another 25 feet horizontally and perpendicular to the starting point up the slope until *either*:

   (a) A slope is encountered that is less than 25%. In this case, determine the break in slope and add an additional 35 feet to mark the outside boundary of the Vegetated Corridor; *or*



   (b) 200 feet is reached (all slope measurements >25%).

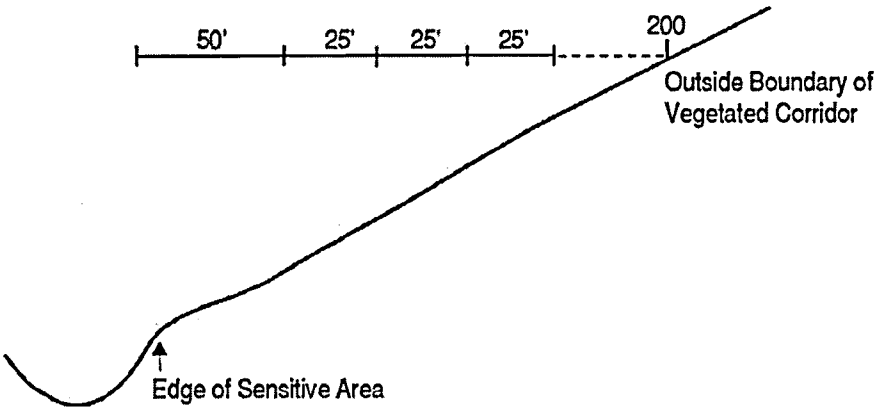


Table 3.2 Vegetated Corridor Standards

Vegetated Corridor Condition Definition[1]	Requirements of Vegetated Corridor Protection, Enhancement, and/or Mitigation
Good Corridor Condition • Combination of native trees, shrubs, and groundcover covering greater than 80% of the area and greater than 50% tree canopy exists (areal measure)	• Provide certification, per Appendix C: Natural Resource Assessments, to District or City/County that the vegetated corridor meets condition criteria. • Remove any invasive non-native species[2] within the corridor by hand and revegetate cleared area using low impact methods.[3] • If impact is to occur, provide District or City/County with a native plant revegetation plan appropriate to the site conditions developed by an ecologist/biologist or landscape architect to restore condition. See Appendix D: Landscape Requirements. • Revegetate impacted area per approved plan to re-establish "good" corridor conditions
Marginal Corridor Condition • Combination of native trees, shrubs, and groundcover covering 50%-80% of the area and 26-50% tree canopy exists (areal measure) (Enhancement up to "good" corridor condition required regardless of planned impact)	• Provide certification, per Appendix C: Natural Resource Assessments, to District or City/County that the vegetated corridor meets condition criteria. • Remove any invasive non-native species within the corridor by hand or mechanically with small equipment, to minimize damage to existing native vegetation.[2] • Provide District or City/County with a native plant revegetation plan appropriate to the site conditions developed by an ecologist/biologist or landscape architect to restore to a good corridor condition. See Appendix D: Landscape Requirements. • Vegetate corridor to establish "good" corridor conditions
Degraded Corridor Condition • Combination of native trees, shrubs, and groundcover covering is less than 50% of the area and less than 25% tree canopy exists (areal measure) (Enhancement up to "good" corridor condition required regardless of planned impact)	• Provide certification, per Appendix C: Natural Resource Assessments, to District or City/County that the vegetated corridor meets condition criteria. • Remove any invasive non-native species within the corridor by hand or mechanically.[2] • Provide District or City/County with a native plant revegetation plan appropriate to the site conditions developed by an ecologist/biologist or landscape architect to restore to a good corridor condition. See Appendix D: Landscape Requirements. • Vegetate Corridor to establish "good" corridor conditions

[1] When a single plant community type contains multiple condition characteristics, the higher quality condition shall prevail

[2] See Appendix C for plant lists and references.

[3] Refer to Integrated Vegetation Management Guidelines for appropriate methodology

Figure 3.3 Vegetated Corridor Averaging Example

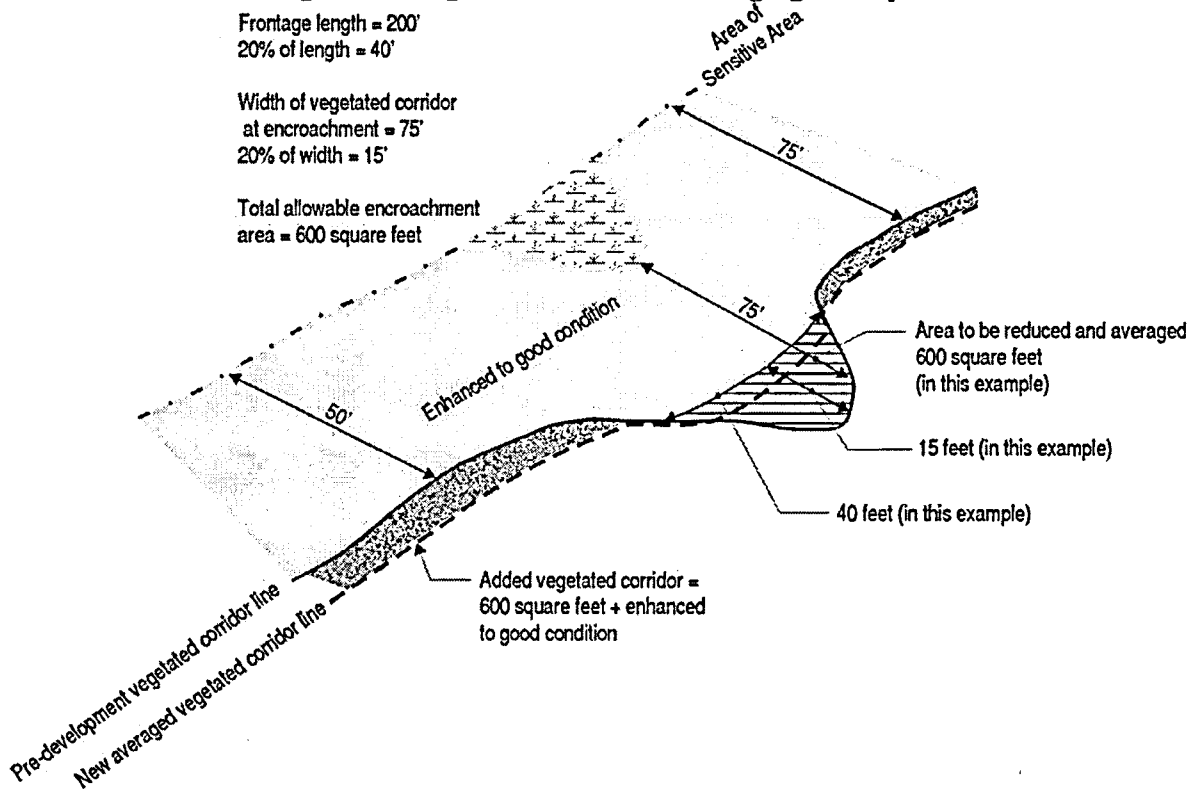
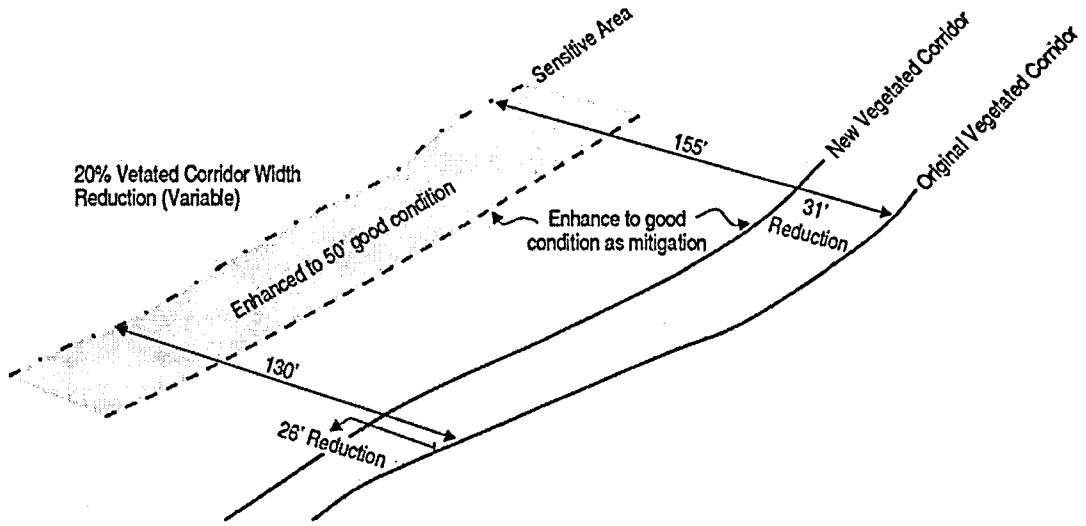


Figure 3.4 Vegetated Corridor Reduction Example



3.02.8 Enforcement

Failure to comply with any provision of Section 3.02 or with any term of a Storm Water Connection Permit shall be deemed a violation of this ordinance and subject to enforcement action pursuant to applicable District and City Ordinance and Resolutions and Orders, including all implementing rules and regulations.

3.03 Storm Water System: Engineering

3.03.1 General Provisions

All stormwater system elements (including, but not limited to conveyance systems, water quality facilities, water quantity facilities) shall be designed and constructed in accordance with all applicable rules and regulations of the District, and any District interpretations thereof including those set out in the Appendices and applicable technical guidance manuals, and with all applicable federal, state and local statues and rules.

3.03.2 Extension of Public Storm Sewer Systems

Public storm sewer systems shall be extended to the most distant upstream parcel boundary(s) to accommodate current and future storm flows entering the property, unless otherwise approved by the District or City. Except as otherwise provided, the extension of the public stormwater systems to serve any parcel or tract of land shall be done by and at the expense of the Property Owner or applicant. The District or City may require that a storm pipeline that serves or may serve more than one property be a public system.

3.03.3 Surveying

The Owner's Engineer or Surveyor shall be responsible for establishing the location of the storm sewer system by means of construction stakes offset along the center lines prior to commencement of construction.

3.03.4 Railroad Crossings

Crossing of railroad rights-of-way shall be done in a manner that conforms to the requirements of the railroad having jurisdiction. If any bonds and/or certificates of insurance protection are required, they shall be furnished by the Contractor or Owner to the railroad company concerned naming the District or City as an additional insured.

Actual permits or easements for such crossings shall be obtained by the Owner and all the terms for such permits or easements shall be met by the Owner and

Contractor.

3.04 Hydrologic Analysis

The hydrologic analysis shall be consistent with Appendix A: Hydrology and Hydraulics. The engineer may use various computer models or formulas for the hydrograph analysis but the District may verify the design flows and volumes based on King County's SBUH program "HYD" or as alternatively identified in Appendix A: Hydrology and Hydraulics.

3.05 Hydraulic Analysis

3.05.1 General

The method of hydraulic calculations shall be subject to District and/or City approval and shall be consistent with the CWS Appendix A: Hydrology and Hydraulics.

3.05.2 System Design Considerations

Site development improvement projects shall address on-site and off-site drainage concerns, both upstream and downstream of a project, including but not limited to the following:

a. Modifications to the existing on-site storm drainage facilities shall not restrict flows creating backwater onto off-site property to levels greater than the existing situation unless approved by the impacted off-site property owners and the District or City. The off-site property owner(s) shall agree to and sign a permanent 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 District or City.

b. Storm drainage facilities shall be designed and constructed to accommodate all future full build-out flows generated from upstream property based upon the most recent approved County Comprehensive Land Use Plan and upon the most recent and technically accurate watershed model information available from the District, or other data as approved by the District.

c. The design of storm drainage facilities shall analyze the impact of restrictions downstream of the project site, in accordance with Section 3:05.3. Downstream restrictions that create on-site backwater may be required to be removed by the developer, at the District's discretion, or the on-site backwater shall be addressed in the design of the development's storm system. The removal of downstream obstructions shall not be allowed if this removal creates downstream capacity problems.

d. If the projected increase in surface water runoff leaving a proposed development will cause or contribute to damage from flooding to existing buildings or dwellings, the downstream stormwater system shall be enlarged to relieve the identified flooding condition prior to development, or the developer must construct an on-site detention facility.

3.05.3 Review of Downstream System

a. For each development constructing new impervious surface of more than 5,000 square feet, or collecting and discharging more than 5,000 square feet of impervious area, the design engineer shall submit documentation, for review by the District, of the downstream capacity of any existing storm facilities impacted by the proposed development, except for the construction of a detached single family dwelling or duplex. The design engineer must perform a capacity and condition analysis of the drainage system downstream of the development.

1) The analysis shall extend downstream to a point in the drainage system where the additional flow from the proposed development site constitutes 10 percent or less of the total tributary drainage flow.

2) If the additional flow from the proposed development drops to less than 10 percent of the total tributary drainage flow then the analysis will continue for the lesser of:

a) One-quarter (1/4) of a mile;
or
b) Until the additional flow constitutes less than 5 percent of the total tributary drainage flow.

b. When the downstream analysis does not continue for at least one-quarter (1/4) mile, the design engineer will provide a stamped Certification of Investigation that states the design engineer has visually investigated the downstream system for at least one-quarter (1/4) mile downstream and is aware of no observable downstream impacts to structures.

3.05.4 Conveyance System Hydraulic Standards

The conveyance system shall be designed to convey and contain at least the peak runoff for the 25-year design storm. Structures for proposed pipe systems must be demonstrated to provide a minimum of 1.0 foot of freeboard between the hydraulic grade line and the top of the structure or finish grade above pipe for 25-year post development peak rate of runoff. Design surcharge in pipe systems shall not be allowed if it will cause flooding in portions of a habitable structure,

including below-floor crawl spaces, or otherwise create a hazard or danger to the health and safety of the public.

The 25-year design shall be supplemented with an overland conveyance component demonstrating how a 100-year event will be accommodated. This overland component shall not be allowed to flow through or inundate an existing building. Flows in streets during the 25-year event shall not run deeper than 4 inches against the curb or extend more than two feet into the travel lane.

Open channel systems shall be designed for minimum one foot freeboard from bank full provided no structures are impacted by the design water surface elevation.

3.05.5 Catch Basin System Standards

a. Standard Catch Basin System: All catch basins shall be sumped. The main storm line shall not pass through any catch basins or sumped manholes unless approved by the District. No more than three catch basins may be connected in series before connecting to the main storm line. A ditch inlet or field inlet may be connected directly to the end of the main storm line.

b. Series Catch Basin System: Unsumped catch basins are allowed, provided a sumped manhole is constructed below the unsumped catch basins before the flow enters the main storm line. No more than three unsumped catch basins may be constructed above a sumped manhole. The main storm line may not pass through the catch basins or sumped manholes. No ditch inlet or field inlet may be part of a series of unsumped catch basins.

c. Flow-through Catch Basin System: This system is allowed within an arterial or major collector road, provided the main line storm pipe has a design velocity of at least three (3) feet per second. Unsumped catch basins, ditch inlets, and field inlets which are properly channelized are allowed to connect directly to the main storm line. An adequately sized water quality manhole is required at the downstream end of the flow-through system.

3.06 Storm Manhole and Pipe Design Standards

3.06.1 Application

For pipe systems which convey flows from or through water quality sensitive areas; a local representative of Oregon Department of Fish and Wildlife (ODFW) or other applicable state or federal agency shall be contacted to determine if fish passage is required and to identify site specific design criteria. All culverts shall be designed for fish passage in accordance with ODFW guidance for Fish Passage

unless otherwise exempted by ODFW and the District/City.

3.06.2 Manhole Design

a. Manholes shall be provided at least every 500 feet, at every grade change, and at every change in alignment. Unless an exception is approved by the District, City or County, manhole lids shall have a minimum of 12 inches of clearance from the edge of a curb and/or gutter and shall not be in a wheel path of the traveled way.

b. All manholes shall be a minimum of 48 inches in diameter.

c. All piped inside drop manholes with 12-inch or larger pipe shall be a minimum of 60 inches in diameter.

d. Detail(s) shall be submitted with the plans where pipes into or out of a manhole are larger than 24 inches or where more than four mainline connections are made. There shall be a minimum of 8 inches of unperforated wall separating the cut-outs or break-outs for the individual pipe connections.

e. Connections to an existing manhole, elevation of the existing ledge, location of steps, and elevations of existing inlets and outlets shall be submitted with the plans.

f. All manhole bases shall be properly channelized. No more than three side laterals are allowed to be connected to a manhole unless an exception is approved by the District or City. There shall be a minimum of 8 inches of unperforated wall separating the cut-outs or break-outs for the individual pipe connections.

g. A Curb Inlet Manhole or Modified Curb Inlet Manhole per Standard Details may be used in lieu of a manhole required by Section 3.06.2, when approved as part of a flow-through system. Standard inlets will not be allowed in lieu of manholes in any system.

h. Pipes entering manholes may have a maximum free fall of 4 feet as measured to the invert of the manhole base.

i. Permanent Clean Outs shall not be allowed in storm sewer systems. Temporary Clean Outs will be evaluated on a case-by-case basis.

3.06.3 Water Quality Manholes

Water Quality Manhole design shall be consistent with Appendix B: Water Quality and Quantity Facility Design.

3.06.4 Pipe Size

a. The design size shall be based on hydraulic calculations provided by the design engineer. The minimum diameter of public storm pipe is identified below.

1) Pipe from catch basins to the main line in the public right-of-way shall be nominal 10-inch diameter.

2) Main line pipe shall be a minimum nominal 12-inch diameter. Where there is no requirement to extend the pipe for adjacent development, the main line pipe diameter may be nominal 10-inch diameter for the furthest upstream section, provided that a 10-inch pipe is adequate for flow.

3) Storm pipes located out of a public street right-of-way, with no requirement to be extended, and with roof drains and/or area drains connected, shall be a minimum 8-inch diameter pipe.

3.06.5 Location of Pipe

a. When storm drain pipes are located within a local public street right-of-way with curbs, the storm pipe shall be located between the curbs but not closer than five feet to either curb unless an exception is approved by the District or City.

b. Storm pipes may be located behind and parallel to the curb on collector streets and arterial streets with the approval of the District or City.

c. Storm pipes in easements shall be located in the center of the easement unless an exception is approved by the District or City. The centerline of a storm pipe shall be at least five feet from an easement side line.

d. The minimum separation distance between storm pipe alignments and other utilities shall be 5 feet (clear). If vertical separation between utilities is greater than 3 feet, additional horizontal spacing may be required to allow for maintenance access.

3.06.6 Distance Between Structures

a. For 8-inch and larger pipe, the maximum distance between manholes, excluding cleanouts, shall be 500 feet.

b. The maximum distance between area drains and catch basins shall be 250 feet.

3.06.7 Alignment

Public storm pipe shall be laid on a straight alignment and at uniform grade.

3.06.8 Grade

Storm lines shall have sufficient slope to maintain a minimum flow velocity of 2.5 feet per second when flowing full, except that storm lines in flow-through systems shall have a minimum flow velocity of 3 feet per second.

3.06.9 Steep Slopes

Storm pipes on slopes in excess of 20 percent shall be secured with approved anchor walls, see Standard Details.

3.06.10 Pipe Cover

Minimum pipe cover shall be in compliance with this section unless an exception is approved by the District, City, or County.

In paved areas or areas anticipated to receive vehicular traffic, pipe cover shall be measured from the top of the paved surface (finish grade) to the upper surface of the pipe barrel. The pipe bell shall not intrude into the subbase. In areas without pavement or vehicular traffic, pipe cover shall be measured from finish grade to the upper surface of the pipe barrel. Minimum cover requirements are contained in the following table:

Type of Pipe	Paved Areas(in)	Unpaved Areas (in)
Non-reinforced Pipe	48	36
RCP Class III	30	18
RCP Class IV	24	12
RCP Class V	18	6
AWWA C900	24	12
AWWA C905	24	12
Ductile Iron	18	6

3.06.11 Headwalls

Pipe headwalls or other approved end protection shall be required where pipe material other than concrete or ductile iron is exposed in the design of an outlet or inlet pipe or where required to stabilize slope. Details of all headwalls and end protection shall be included in the construction drawings.

3.06.12 Trash Racks/Debris Barriers

If trash racks/debris barriers are required by the District/City for pipe or culvert systems, the Engineer shall submit the trash/rock/debris barrier system design to the District/City for approval.

3.07 Inlet Design Standards

3.07.1 Inlet and Catch Basin Capacity

All inlets and catch basins shall be designed to accept a 10-year storm event. Grates shall, as far as practical, be designed to avoid failure due to accumulation of debris.

3.07.2 Design Criteria

a. Precast and poured in place catch basins, and gutter inlets are allowed.

b. All catch basins shall be constructed with an 18-inch minimum sump unless part of a series catch basin system or a flow-through catch basin system and approved by the District under Section 3.05.5.

c. A main storm line shall not pass through a sumped catch basin.

d. The spacing of catch basins shall be determined by the capacity of each catch basin to pass a 10-year storm event. Where finish street grade is greater than or equal to five percent, catch basin spacing shall not exceed 300 feet. In addition, catch basin shall be provided just prior to curb returns on streets with a centerline gradient of three percent or more and a street gutter drainage run of 100 feet or more.

e. Catch basins, except for CG-48 shall be a maximum depth of 5 feet from the top of grate to the lowest pipe invert elevation.

f. The maximum length of pipeline between the inlet and a mainline structure shall be 40 feet for 10-inch pipe and 60 feet for 12-inch pipe unless additional length is required to cross the street right-of-way.

g. Tee connections may only be used in street rights-of-way if the

jurisdiction having authority over the street approves them.

h. Inlet grates or tops shall be cast with "Dump No Waste" in accordance with the Standard Details.

3.07.3 Area Drains and Ditch Inlets

a. The standard Area Drain and Ditch Inlet shall be as shown in Standard Details, unless an exception is approved by the District.

b. Area drains in rear or side yards shall not be sumped and shall be properly channelized. Ditch inlets shall be equipped with an 18-inch sump unless part of a flow through system approved in accordance with Section 3.05.5.

c. A main storm line shall not pass through an area drain or ditch inlet.

d. Area drains or ditch inlets may be located at the upper terminus of a main storm line, may connect to the main storm line at a manhole, or may connect to the main storm line through a tee with a lateral no longer than 10 feet.

3.08 Constructed Channel Design Standards

3.08.1 Application

This section shall apply to open channels constructed to convey runoff to the existing public storm and surface water conveyance system. This section does not apply to design or construction of new roadside ditches or work within existing stream channels.

Development which re-grades existing roadside ditches or constructs new roadside ditches shall meet Washington County Uniform Road Improvement Design Standards and applicable City regulations.

3.08.2 Channel Design

a. Channel Design shall be in accordance with Appendix A: Hydrology and Hydraulics.

b. Vegetation-lined channels shall be used whenever practicable as determined by the District or City. Rock-lined channels shall be used only where a vegetative lining will not provide adequate protection from erosion.

c. Constructed open channels shall be sized to pass the required flows without causing erosion and shall have side slopes no steeper than 2H:1V.

d. No protruding pipes, culverts or other structures, which reduce or hinder the flow characteristics of the channel, will be allowed. Channels and connections shall be designed to prevent scouring. All pipe connections shall match side slopes and incorporate a headwall.

3.09 Culvert Design Standards

3.09.1 Application

This section shall apply to culverts placed across streams and drainageways. Culverts pass water under or through obstructions.

For culverts with diameters of 36 inch or greater or for driveway culverts which are part of a roadside ditch system, the County or City is the jurisdictional District, and their road design standards shall apply.

Culverts within FEMA floodplains shall be reviewed and approved by the local FEMA designated authority.

For culverts which convey flows from or through water quality sensitive areas; a local representative of Oregon Department of Fish and Wildlife (ODFW) or other applicable state or federal agency shall be contacted to determine if fish passage is required and to identify site specific design criteria. All culverts shall be designed for fish passage in accordance with ODFW guidance for Fish Passage unless otherwise exempted by ODFW and the District/City.

3.09.2 Hydraulic Design

Culverts will be designed to safely pass the 25-year flow.

3.09.2.1 Headwater

a. For new culverts 18 inches in diameter or less, the maximum allowable design storm event headwater elevation (measured from the inlet invert) shall not exceed two times the pipe diameter or three times the pipe diameter with a seepage collar unless an exception is approved by the District / City.

b. For new culverts larger than 18 inches in diameter the maximum allowable design storm event headwater elevation (measured from the inlet invert) shall not exceed 1.5 times the pipe diameter unless an exception is approved by the District or the City.

c. The maximum headwater elevation of a design storm event for new culverts shall be at least one-foot lower than the road or

parking lot sub-grade.

3.09.2.2 Inlet

For culverts 18 inches in diameter and larger, the embankment around the culvert inlet shall be protected from erosion by lining around inlet with rock or other protection. The lining shall extend upstream from the culvert a minimum of five feet and shall be as high as the designed headwater elevation.

3.09.2.3 Outlets

For culverts 12 inches in diameter and larger, the receiving channel of the outlet shall be protected from erosion by rock lining, bio-engineering, or other District or City approved energy dissipater.

3.09.2.4 Inlet Control Analysis

The headwater depth for pipes under inlet control shall be determined using the nomographs contained in Appendix A: Hydrology and Hydraulics, the ODOT Hydraulics Manual, or a modeling methodology consistent with FHWA's HY8.

3.09.2.5 Outlet Control Analysis

The headwater depth for pipes under outlet control shall be determined using the nomographs contained in Appendix A: Hydrology and Hydraulics, the ODOT Hydraulics Manual, or a modeling methodology consistent with FHWA's HY8.

3.10 Outfall Design Standards

Outfalls shall be above the mean low water level unless an exception is approved by the District or City.

All outfalls shall be provided with a rock splash pad or other approved erosion control measure. Rock protection at outfalls shall be designed in accordance with the guidelines in Appendix A: Hydrology and Hydraulics, unless exceptions are approved by the District or City. Mechanisms, which reduce velocity prior to discharge from an outfall, are encouraged.

Engineered energy dissipaters, including but not limited to, stilling basins, drop pools, hydraulic jump basins, baffled aprons, and bucket aprons, are required for outfalls with velocity at design flow greater than 10-feet per second. These shall be designed using published references such as Hydraulic Design of Energy Dissipaters for Culverts and Channels published by the Federal Highway Administration of the United States

Department of Transportation, the ODOT Hydraulics Manual and others. Design reference shall be cited on the construction plan submittal.

3.11 Water Quantity Facility Design Standards

3.11.1 Mitigation Requirement for Quantity

Each new development must incorporate techniques for mitigating its impacts on the public stormwater system. The District shall determine which of the following techniques may be used to satisfy this mitigation requirement.

a. Construction of permanent on-site stormwater quantity detention facilities designed in accordance with Appendix B: Water Quality & Quantity Facility Design; or

b. Enlargement or improvement of the downstream conveyance system in accordance with Appendix B: Water Quality & Quantity Facility Design; or

c. Payment of a Storm and Surface Water Management System Development Charge (SWM SDC), as provided in CWS Ordinance 28, which includes a water quantity component to meet these requirements.

3.11.2 Criteria for Requiring On-Site Detention

a. If the on-site facility is required to be constructed, the development shall be eligible for a credit against SWM SDC fees, as provided in District Ordinance and Rules.

b. On-site facilities shall be constructed when any of the following conditions exist:

1) There is an identified downstream deficiency, and detention rather than conveyance system enlargement is determined to be the more effective solution.

2) There is an identified regional detention site within the boundary of the development.

3) There is a site within the boundary of the development, which would qualify as a regional detention site under criteria or capital plan adopted by the District.

4) Water quantity facilities are required by District adopted watershed management plans or adopted subbasin master plans.

3.11.3 Water Quantity Facility Design Criteria

a. All water quantity facilities shall be designed in accordance with District guidance documents and be consistent with Appendix B: Water Quality and Quantity Facility Design.

b. When required, stormwater quantity on-site detention facilities shall be designed to capture runoff so the post-development runoff rates from the site do not exceed the pre-development runoff rates from the site, based on a 2 through 25-year, 24-hour return storm. Specifically, the 2, 10, and 25-year post development runoff rates will not exceed their respective 2, 10, and 25-year pre-development runoff rates; unless other criteria are identified in an adopted watershed management plan or subbasin master plan.

c. When required because of an identified downstream deficiency, stormwater quantity on-site detention facilities shall be designed such that the peak runoff rates will not exceed pre-development rates for the specific range of storms which cause the downstream deficiency.

d. Construction of on-site detention shall not be allowed as an option if such a detention facility would have an adverse effect upon receiving waters in the basin or subbasin in the event of flooding, or would increase the likelihood or severity of flooding problems downstream of the site.

3.11.4 Water Quantity Facility Design Standards

All water quantity facilities shall be designed in accordance with Appendix B: Water Quality and Quantity Facility Design.

3.12 Water Quality Facility Design Standards

a. Purpose

Owners of new development and other activities which create new impervious surfaces or increase the amount of stormwater runoff or pollution leaving the site are required to construct or fund permanent water quality facilities to reduce contaminants entering the storm and surface water system.

b. Criteria for Requiring Construction of a Water Quality Facility

1) A water quality facility shall be constructed on-site unless, in the judgment of the District or City, any of the following conditions exist:

a) The site topography or soils makes it impractical, or ineffective to construct an on-site facility;

b) The site is small, and the loss of area for the on-site facility would preclude the effective development.

c) There is a more efficient and effective regional site within the subbasin that was designed to incorporate the development or is in the near vicinity with the capacity to treat the site.

d) The development is for the construction of one or two family (duplex) dwellings on an existing lot of record.

2) If construction of an on-site facility is not required, the owner of the development shall pay a System Development Charge in accordance with District Rules and Regulations. The System Development Charge shall be calculated on an equivalent basis of constructing the minimum Standard Water Quality Swale.

c. Design Standards

1) The stormwater quality facilities shall be designed to remove 65 percent of the total phosphorous from the runoff from 100 percent of the newly constructed impervious surfaces.

2) The phosphorous removal efficiency specifies only the design requirements and is not intended as a basis for performance evaluation or compliance determination of the stormwater quality control facility installed or constructed pursuant to this Chapter.

3) If an onsite water quality facility cannot be constructed to treat the runoff from the development's impervious surface, then with District or City approval, an on- or off-site water quality facility may be designed to treat runoff from an equivalent area of adjacent untreated impervious surfaces.

4) 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. If an off-line facility is not feasible, additional capacity may be required for upstream flow.

5) Discharges to sensitive areas shall maintain the hydroperiod and 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 critical to downstream water quality sensitive areas into other catchments will not be permitted unless addressed in the applicant's Service Provider Letter.

6) The stormwater quality facilities shall be designed for a dry weather storm event totaling 0.36 inches of precipitation falling in 4 hours with an average storm return period of 96 hours.

7) Water quality facilities shall be constructed as part of the subdivision public improvements.

8) Other design options for meeting this section may be considered by the District for approval.

9) All water quality facilities shall be designed in accordance with Appendix B: Water Quality and Quantity Facility Design.

d. Impervious Area Used In Design

1) For single family and duplex residential subdivisions, stormwater quality facilities shall be sized for all impervious area created by the subdivision and for all existing impervious area proposed to remain on site, including all existing and proposed residences on individual lots at the rate of 2640-square feet of impervious surface area per dwelling unit.

2) For all developments other than single family and duplex, including rowhouses and condominiums, the sizing of stormwater quality facilities shall be based on the impervious area created by the development and for all existing impervious area proposed to remain on site, including structures and all roads and impervious areas. Impervious surfaces shall be determined based upon building permits, construction plans, or other appropriate methods of measurement deemed reliable by District and/or City.

3) The District encourages design initiatives that reduce effective impervious area. In developments other than single family and duplex, a decrease in the size of the water quality facility may be possible.

3.13 Flood Management Design Standards

a. Purpose

The purpose of these standards is to reduce the risk of flooding, prevent or reduce the risk to human life and property, and maintain the functions and values of floodplains, such as allowing for the storage and conveyance of stream flows through existing and natural flood conveyance systems.

b. Flood Management Areas Defined

Flood management areas shall include, but are not limited to, the following:

1) Land identified within the 100 year floodplain and floodway as shown on the Federal Emergency Management Agency Flood Insurance maps

2) Land identified in updated flood studies or any other authoritative data documenting flood elevations as approved by the District or City/County

Applicants shall use the most recent and technically accurate watershed model information available from the District, or other updated data as approved by the District, to determine flood areas.

Notwithstanding any other provision of these rules, the area within the town center of the City of Tualatin, more particularly described in Attachment 1, which is by this reference incorporated herein, is not subject to the Flood Management Design Standards set out in Section 3.13 of these rules.

c. Design Criteria

The standards that apply to the flood management areas apply in addition to local, state, and federal restrictions governing floodplains and flood hazard areas.

1) All fill placed in a floodplain shall be balanced with an equal amount of soil material removal and shall not decrease floodplain storage capacity at any stage of a flood (2, 25, or 100-yr event). No net fill in any floodplain is allowed except when all of the following conditions are met:

(a) when an area has received special protection from floodplain improvement projects which either lower the floodplain, or otherwise protect affected properties;

(b) where the exceptions comply with adopted master plans, watershed management plans, or subbasin plans, if any; and

(c) When all required permits and approvals have been obtained in

compliance with FEMA rules and other local, state, and federal laws regarding fill in floodplains.

2) Large areas may not be excavated in order to gain a small amount of fill in a floodplain. Excavation areas shall not exceed the fill areas by more than 50 percent of the square footage, unless approved by the District.

3) Any excavation dug below the winter "low water" elevation shall not count toward compensating for fill since these areas would be full of water in the winter and not available to hold storm water following a rain. Winter "low water" elevation is defined as the water surface elevation during the winter when it has not rained for at least three days, and the flows resulting from storms have receded. This elevation may be determined from records, studies, or field observation. Any fill placed above the 100-year floodplain will not count towards the fill volume.

4) The excavated area must be designed to drain if it is an area identified to be dry in the summer, e.g., if it is used for a park or mowed in the summer. Excavated areas identified to remain wet in the summer, such as a constructed wetland, shall be designed not to drain. For areas that are to drain, the lowest elevation shall be at least 6 inches above the winter "low water" elevation, and sloped to drain. One percent slopes will be allowed in areas less than 1000 sq. ft.

5) Excavation to balance a fill shall be located on the same parcel as the fill unless it is not reasonable or practicable to do so. In such cases, the excavation shall be in the same drainage basin, within points of constriction on the conveyance system, if any, as near as practical to the fill site, and shall be constructed as a part of the same development project.

6) Short term parking (motor vehicles remain parked for less than 18 hours per day) in the floodplain may be located at an elevation of no more than one foot below the ten year floodplain so long as the parking facilities do not occur in a Water Quality Sensitive Area or vegetated corridor. Long term parking (motor vehicles remain parked for greater than 18 hours without being moved) in the floodplain may be located at an elevation of no more than one foot below the 100 year floodplain so long as the parking facilities do not occur in a Water Quality Sensitive Area or Vegetated Corridor.

7) Temporary fills permitted during construction shall be removed upon completion of construction prior to the close of the in-stream work window as defined by Oregon Department of Fish and Wildlife or other local, state or federal authority.

8) Excavation and fill required for the construction of detention facilities or other facilities, such as levees, shall be specifically designed to reduce or mitigate flood impacts. Levees shall not be used to create vacant buildable land.

9) Excavation and fill required to restore or enhance floodplains, riparian areas, wetlands, uplands, and streams, including but not limited to the planting of vegetation and daylighting existing storm pipes, shall be permitted as long as the design complies with applicable federal, state and local standards.

10) The floodplain may not be modified to increase water velocities such that stream bank erosion will be increased, unless the stream banks are protected to prevent the increased erosion.

11) Uncontained areas of hazardous materials are prohibited within flood management areas.

12) Existing nonconforming uses are allowed to continue in the flood management area. Existing nonconforming uses may be modified with approval from the District or City/County.

13) Any proposed work within or modification to a floodway must be certified by an Oregon Registered Professional Engineer as to how it conforms to these standards and all other local, state, and FEMA regulations.

14) For streams, creeks, rivers and other watercourses where the floodway has not been identified, the entire floodplain shall be treated as a floodway unless a study has been prepared by an Oregon Registered Professional Engineer and approved by the District/City/County to define the floodway limits for a stream section.

strip, trapped catch basin, or other methods as approved by the District/City.

b. Proprietary Pre-Treatment Devices

1. The use of proprietary pre-treatment devices are permitted on a case by case basis with approval by the District or City

2. The devices will be sized in accordance with the manufacturer's recommendations; however, the minimum treatment flow must be the water quality flow.

3. Technical submittals from the manufacturer are required, including hydraulic design criteria, particulate removal efficiency, and maintenance requirements and schedule.

2.3 Water Quality Manholes

a. Hydraulic Criteria:

1. Minimum Design Flow: Water Quality Flow
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 CWS Standard Drawing No. 515 or an equivalent detail approved by the District/City.
2. Minimum Manhole Diameter: 60-inch
3. Maximum size of incoming pipe: 18-inch
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 wall and the interior outlet structure.
7. Orient access to structure in a clear zone.

2.4 Walls in Water Quality Facilities

a. Walls are not allowed in the treatment areas of any water quality facility.

b. Walls that are 4 feet or higher or that are periodically inundated must meet all of the following criteria:

1) Be approved by a licensed structural or geotechnical engineer;
2) The District shall not have maintenance responsibility for the wall. The party responsible for maintenance of the walls within the tract shall be clearly documented on the plat or in alternate form as approved by the District.

3.0 WATER QUALITY TREATMENT FACILITES

3.1 Vegetated Swale

a. Hydraulic Design Criteria:

1. Design Flow: Water Quality Flow
2. Minimum Hydraulic Residence Time: 9 minutes
3. Maximum Water Design Depth: 0.5-feet
4. Minimum Freeboard: 1.0-foot (for facilities not protected from high flows)
5. Manning "n" Value: 0.24
6. Maximum Velocity: 2.0-fps based on 25-year flow

b. Design Criteria:

1. Provide an energy dissipater at the entrance to swale, with a minimum length of 4-feet. It will be designed to reduce velocities and spread the flow across the treatment cross section.
2. The use of intermediate flow spreaders maybe required.
3. Minimum Length: 100-feet
4. Minimum Slope: 0.5-percent
5. Minimum Bottom Width: 2-foot
6. Maximum Treatment Depth (measured from top of gravel): 0.5-feet
7. Maximum Side Slope:
   a) In Treatment Area: 4H:1V
   b) Above Treatment Area: 2.5H:1V
8. The treatment area shall have 2"-¾" river run rock placed 2.5 to 3 inches deep on high density jute or coconut matting over 12 inches of topsoil or base stabilization method as approved by the

District/City. 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.

9. Provide an approved outlet structure for all flows.

10. Where swales wrap 180-degrees forming parallel channels, freeboard must be provided between each of the parallel channels. A 1-foot (above ground surface) wall may be used above the treatment area to provide freeboard while enabling a narrower system. As an alternative, a soil-based berm may be used. The berm shall have a minimum top width of 1 foot and 2.5:1 side slopes.

11. Where swales are designed with ditch inlets and outlet structures and design of maintenance access to such structures may be difficult due to swale location, swales may be designed as flow-through facilities with unsumped structures. Maintenance access to one end of the facility will still be required.

3.2 Extended Dry Basin

a. Hydraulic Design Criteria:

1. Permanent Pool Depth: 0.4-feet

2. Permanent pool is to cover the entire bottom of the basin.

3. Minimum Water Quality Detention Volume: 1.0 x Water Quality Volume (WQV)

4. Water Quality Drawdown Time: 48 hours

5. Orifice Size: USE: $D = 24 * [(Q/ (C[2gH]^{0.5}) / \pi]^{0.5}$

Where: *D (in) = diameter of orifice*

*Q(cfs) = WQV(cf) /(48*60*60)*

C = 0.62

H(ft) = 2/3 x temporary detention height to centerline of orifice.

6. Maximum Depth of Water Quality Pool (not including Permanent Pool): 4-feet or as limited by issuing jurisdiction.

7. Provide an emergency spillway sized to pass the 100-year storm event or an approved hydraulic equivalent. Emergency spillway to be located in existing soils when feasible and armored with riprap or other approved erosion protection extending to the toe of the embankment.

b. Design Criteria:

1. 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.
2. Inlet and outlet structures shall be designed to avoid direct flow between structures without receiving treatment (i.e. short circuiting of flow).
3. Minimum Bottom Width: 4-feet
4. Maximum Side Slopes in Basin Treatment Area: 3H:1V
5. Minimum Freeboard: 1-foot from 25-year design water surface elevation.
6. The treatment area shall have high density jute or coconut matting over 12 inches of topsoil or base stabilization method as approved by the District/City. If required by the District, 2"-¾" river run rock shall be placed 2.5 to 3 inches deep in areas where sustained flow is anticipated to occur. Extend river rock (if required), 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
7. Provide an approved outlet structure for all flows.
8. The Engineer shall certify that the pond storm sewer design is in compliance with Chapter 3 of this Resolution and Order and that at normal design water surface that the upstream storm sewer will not be in a surcharged condition for longer than 24 hours

3.3 Constructed Water Quality Wetland

a. Hydraulic Design Criteria:

1. Permanent Pool Volume: 0.55 x Water Quality Volume (WQV)
2. Water Quality Detention Volume: 1.0 x Water Quality Volume (WQV)
3. Water Quality Drawdown Time: 48 hours
4. Orifice Size: USE: $D = 24 * [(Q/ (C[2gH]0.5) / \pi] 0.5$

Where: *D (in) = diameter of orifice*
*Q(cfs) = WQV(cf) /(48*60*60)*
C = 0.62

H(ft) = 2/3 x temporary detention height to centerline of orifice.

5. Maximum Depth of Permanent Pool: 2.5-feet or as limited by issuing jurisdiction
6. Maximum velocity through the wetland should average less than 0.01-fps for the water quality flow. Design should distribute flows uniformly across the wetland.
7. Provide an emergency spillway sized to pass the 100-year storm event or an approved hydraulic equivalent. Emergency spillway to be located in existing soils when feasible and armored with riprap or other approved erosion protection extending to the toe of the embankment.
8. Provide for a basin de-watering system with a 24-hour maximum drawdown time.

b. Design Criteria:

1. 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.
2. Permanent pool depth to be spatially varied throughout wetland.
3. Provide a perimeter zone 10 to 20-feet wide, which is inundated during storm events.
4. Maximum Side Slopes for Wetland Planting: 5H:1V
5. Maximum Side Slopes for Non-Wetland Planting: 3H:1V
6. Overexcavate by a minimum of 20-percent to allow for sediment deposition.
7. Minimum Freeboard: 1-foot from 25-year design water surface elevation.
8. Provide an approved outlet structure for all flows.

3.4 Other Water Quality Treatment Facilities

The use of other forms of water quality treatment is allowed with the approval of the District or City. However, the applicant must provide evidence of the ability of the facility to meet the District's performance criteria and long term maintenance requirements.

Grass swales will not be allowed.

4.0 WATER QUANTITY FACILITY DESIGN

4.1 Hydraulic Design Criteria:

a. Detention design shall be assessed by dynamic flow routing through the basin. Documentation of the proposed design shall be included in the drainage report. Acceptable analysis programs include:

1. HYD;
2. HEC-1;
3. HEC-HMS;
4. SWMM;
5. HYDRA;
6. Others as approved.

b. Peak runoff rates shall not exceed pre-development rates for the specific range of storms.

c. 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. Vortex valve discharge control should be considered to optimize effective pond volume.

d. Provide an emergency spillway sized to pass the 100-year storm event or an approved hydraulic equivalent. Emergency spillway to be located in existing soils when feasible and armored with riprap or other approved erosion protection extending to the toe of the embankment.

4.2 Design Criteria:

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

b. Interior side slopes up to the Maximum Water Surface: 3H:1V

c. If interior slopes need to be mowed – maximum side slope: 4H:1V

d. Maximum Exterior Side Slopes: 2H:1V, unless analyzed for stability by a geotechnical engineer.

e. Over excavate by a minimum of 20-percent to allow for sediment deposition.

f. Minimum Freeboard: 1-foot from 25-year design water surface elevation.

g. Provide an approved outlet structure for all flows.

h. Certain situations require use of multiple orifice plates to achieve desired outflow rates. Standard Detail No. 544 provides an alternative second structure to Standard Detail No. 545.

4.3 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 will be vegetated to a maximum side slope of 3:1.

b. Walls that are 4 feet or higher must meet all of the following criteria:

1) Be approved by a licensed structural or geotechnical engineer;

2) The District shall not have maintenance responsibility for the wall. The party responsible for maintenance of the walls within the water quantity tract or easement shall be clearly documented on the plat or in alternate form as approved by the District.

APPENDIX C:
NATURAL RESOURCE ASSESSMENTS

1.0 INTRODUCTION

This Appendix presents methodologies for determining the location, size, and condition of Sensitive Areas, Vegetated Corridors, and steep slopes in project areas, as well as the definitions and data required for these determinations. The most current versions of the following maps shall be a reference for performing the assessment and analysis.

1) Clean Water Services Prescreen Maps

2) The National Wetlands Inventory Maps

3) District Stream and Drainage Maps

4) Locally adopted studies or maps, including but not limited to Local Wetland Inventory maps, NRCS Soil Survey Map

2.0 PERSONS QUALIFIED TO PERFORM ASSESSMENTS

a. The property owner or an authorized representative of the property owner may complete the Sensitive Area Assessment and certification.

b. Sensitive Area Assessments should be conducted by a professional familiar with wetland and other natural resource assessments.

c. The Simplified Site Assessment outlined in Section 4.1 need not be professionally prepared, but should accurately and clearly show the required information.

d. The District may reject any Sensitive Area Assessment or Simplified Site Assessment that does not meet generally accepted standards of quality.

e. The geotechnical analysis, if required, shall be conducted by a professional engineering geologist or geotechnical engineer who will stamp the required report.

3.0 SCOPE OF ASSESSMENT

a. Sensitive Areas and their Vegetated Corridors generally do not follow property boundaries. To ensure that the Sensitive Areas are provided with proper protections, the assessment requires investigation extending 200 feet onto the adjoining properties.

b. The applicant shall attempt to gain site access to adjacent properties from the property owner or an authorized representative of the property owner. If property owner/authorized representative denies access the applicant shall use off-site delineation methods including use of mapping information, aerial photographs for the area, and visual observation from the property boundary to perform the assessment.

4.0 ASSESSMENT METHOD

4.1 Simplified Site Assessment Method

a. The Simplified Site Assessment Method applies only to development which is not likely to adversely impact the Water Quality Sensitive Area and which meets all of the following criteria:

1. Adds less than 500 square feet of impervious surface;
2. Does not encroach closer to the Sensitive Area than existing development on the property; and
3. Is not located on a slope greater than 25%.

b. Prior to submitting a land use application or obtaining a building permit, the applicant shall submit the following information to the District for review.

1. Written description of the site and proposed activity, including:
   a. Landscape setting, topography, land uses and site alterations
   b. Description of proposed development activity
   c. General description of the Sensitive Area and Vegetated Corridor

2. Site plan of the entire property, including the following:
   a. Property lines and dimensions
   b. Location of proposed development activity
   c. Existing and proposed conditions for property and surrounding area within 200'
   d. Location and dimensions of roads, driveways, utilities, parking areas, and building footprints
   e. Location and dimensions of yards and/or cultivated areas
   f. Locations of existing Sensitive Areas (streams, ponds, wetlands, etc.), Storm Water Infrastructure and drainage ditches

g. Locations, boundaries, and conditions of the Vegetated Corridors including plant communities, contours, data points and notation of slopes greater than 25%
h. Site plan shall be at a scale of one inch equals 50 feet or less (1"=50')

3. Photographs of the site, labeled and keyed to the site plan.

4. Sensitive Area Certification Form

4.2 Standard Site Assessment Method

a. The Standard Site Assessment Method shall be used for development activities not meeting the criteria of 4.1.a.

b. **Step 1:** Conduct a reconnaissance of the project area and complete the Sensitive Area Certification Form.

1. Determine the presence or absence of Water Quality Sensitive Areas on site or within 200 feet on adjacent property as defined in Chapter 3 of CWS' Design and Construction Standards.

2. If no Water Quality Sensitive Areas are discovered, then submit Sensitive Areas Certification Form along with supporting documentation of existing conditions.

3. If Sensitive Areas are found, continue to Step 2.

c. **Step 2:** Delineate the boundaries of the Sensitive Area.

1. Wetlands:

a) Delineate boundaries using the methods described in the 1987 US Army Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1 from the Waterways Experiment Station is available at: http://www.wes.army.mil/el/wetlands/pdfs/wlman87.pdf

b) Survey and map all wetland boundaries on the site base map.

2. Intermittent and/or perennial streams:

a) Identify whether the stream is perennial or intermittent, as defined in Chapter 1. Samples to identify intermittent flow shall be representative of the project reach. Streams are considered perennial until proven intermittent with adequate research and field documentation (photos, field data), following District methodology as outlined below. Applicants are advised to notify the District before conducting intermittent stream determinations. The District will attempt to provide assistance in this process for verification and will continually update the District Intermittent Streams Maps.

Once a stream has been determined to be intermittent, the District shall add the information to the Intermittent Stream Map. Stream segments upstream of an intermittent determination shall be assumed and mapped to be intermittent. The District reserves the right to request site specific information to field verify status, and update Intermittent Stream maps as appropriate.

Field investigation for intermittent stream determinations is most appropriately done during the dry season, i.e. July 1-October 30. If the applicant attempts to make a determination of intermittence during the wet season, the applicant should consider all other available data (historic photos, data, reports, eyewitness accounts, etc.). The District shall review the available data and, if approved, the intermittent determination shall be considered <u>preliminary</u> until status can be definitively confirmed through one of the field methodologies described below.

A stream shall be determined to be intermittent through one of the following methods:

<u>Method 1</u>
The stream channel is dry (without visible flow or standing water) for a period of 30 consecutive days during a year with wet to average precipitation patterns[1]. This method requires a minimum of two samples per 100 feet of stream length, collected at the beginning and end of the 30 day period, with supporting data (including maps with photos keyed to each sample location), indicating that the stream is dry. During a year with a dry precipitation pattern, all sampling must be completed prior to August 15.

[1] See Table 1: Precipitation for Use in Determining Perennial and Intermittent Flow Status.

If standing water is present at the first site visit, Method 2 shall be used, or the applicant must wait until the project reach is completely dry to start the 30 day sampling period.

Method 2

The channel must not have saturated[2] soil in the upper 12 inches, during a year with wet to average precipitation patterns. This method requires representative samples (one per 100 feet of stream length) on only one date. Samples shall include supporting data (including soil texture, level of saturation, and maps with photos keyed to each sample location). During a year with a dry precipitation pattern, all sampling must be completed prior to August 15.

b) For all intermittent and/or perennial streams with defined channels, delineate Sensitive Area boundaries by identifying the top of bank of the defined channel, or the water surface elevation of a 2-year, 24-hour design storm event.

c) For all streams without defined channels, delineate Sensitive Area boundaries by identifying the surface elevation of a 2-year 24-hour design storm event. If determining the surface elevation of a 2-year, 24-hour design storm event is not possible, then the outside edge of the stream Sensitive Area is determined by identifying the areal extent of:

1) Soil saturation within the upper twelve inches of the surface;

2) Water marks on fixed objects (vegetation, buildings, etc.);

3) Drift lines (deposited waterborne twigs, litter, etc.); or;

4) Waterborne sediment deposits on the soil surface or fixed objects (vegetation, buildings, etc.);

5) Use the indicator that provides the greatest areal cover.

d) For streams draining 10 to 50 acres without a defined channel, and where there are no other Sensitive Areas such as

[2] Saturated: a condition in which all voids (pores) between soil particles are filled with water.

wetlands, the edge of the Sensitive Area shall be the centerline of the natural drainage swale.

Table 1: Precipitation for Use in Determining Perennial and Intermittent Flow Status

Portland Airport	Average Monthly	10th Percentile (Dry Year)	90th Percentile (Wet Year)
JAN	5.4	2.0	8.5
FEB	4.3	1.7	7.7
MAR	3.7	1.9	5.6
APR	2.4	1.0	3.8
MAY	2.2	0.9	3.7
JUN	1.5	0.4	2.8
JUL	0.6	0.0	1.2
AUG	0.9	0.0	2.1
SEP	1.6	0.1	3.5
OCT	3.1	1.2	5.4
NOV	5.5	2.2	9.3
DEC	5.9	2.6	9.4
ANNUAL	36.9	29.9	43.9

Precipitation values from the National Weather Service web page. Daily and monthly data are available at http://www.wrh.noaa.gov/Portland/climate/

- 10th and 90th percentile are calculated using statistical analysis on all historical data available for the gage site at the Portland Airport (1938 - 2001). If other long-term rain data is used, provide location and statistical analysis with submittal

To determine status of the precipitation levels, review the previous Water Year (October 1 – September 30) to date. For determinations conducted during the month of October, use the previous complete Water Year to determine precipitation levels.

2. Springs:

   a) For springs with defined channels, delineate Sensitive Area boundaries by identifying the top of the bank of the defined channel. Determine the outside edge of the spring emergence by the extent of:

      1) Soil saturation within the upper twelve inches of the surface;

2) Water marks on fixed objects (vegetation, buildings, etc.);

3) Drift lines (deposited waterborne twigs, litter, etc.); or

4) Waterborne sediment deposits on the soil surface or fixed objects (vegetation, buildings, etc.);

5) Use the indicator that provides the greatest areal cover.

b) Survey and map all Sensitive Area boundaries on site base map.

3. Natural lakes, ponds, or in-stream impoundments:

a) Delineate the outside edge of the Sensitive Area boundary by identifying the areal extent of:

1) Shoreline vegetation;

2) Water marks on fixed objects (vegetation, structures, etc.);

3) Drift lines (deposited waterborne twigs, litter, etc.); or

4) Waterborne sediment deposits on the soil surface or fixed objects (vegetation, buildings, etc.);

5) Use the indicator that provides the greatest areal cover.

b) Survey and map all Sensitive Area boundaries on site base map.

d. **Step 3:** Determine the Vegetated Corridor width for each Sensitive Area identified.

1. Follow procedures outlined in Chapter 3 of the Standards for determining Vegetated Corridor width.

2. Stake, survey, and map the boundaries of the Sensitive Areas and the Vegetated Corridors on the project site and adjacent properties within 200' of the property line on the base map.

e. **Step 4:** Determine the existing Vegetated Corridor condition.

1. Identify the plant community types present in Vegetated Corridor.

a) Traverse the Vegetated Corridor in order to determine the number and area covered by each plant community present. A plant community is defined as a grouping of plants that often occur together growing in a uniform habitat.

b) Sketch the location of each plant community on a base map.

2. Select representative sample points.

a) A representative sample point is an area within a plant community in which the visually determined characteristics best represent the plant community as a whole.

b) Mark the location of the sample point(s) on the base map.

c) Establish at least one sample point per acre per community type. All communities must be sampled.

3. Characterize each plant community type.

a) At the sample point, visually determine and document the area covered by all species providing greater than 5 percent cover within the plot boundary.

b) Use a 10-foot radius plot for herbs (non-woody vegetation) and a 30-foot radius plot for woody vegetation.

c) Plot boundaries may be adjusted to ensure that only one plant community is represented in a plot.

4. Determine cover by native species, invasive species, and noxious species.

   a) For each community type, determine the cover provided by both native species and by invasive species and noxious species.

   b) Average the cover estimates for communities with more than one sample plot.

   c) Native species as listed in the most current version of Metro or local Native Plant List, whichever is more comprehensive.

   d) Noxious species are those found in the most current version of Oregon Department of Agriculture Noxious Weed List and Portland Plant List.

   e) Invasive species are limited to Himalayan or evergreen blackberry (*Rubus discolor, lacinatus*), reed canarygrass (*Phalaris arundinacea*), teasel (*Dipsacus fullonum*), Canada or bull thistle (*Cirsium sp.*), Scotch broom (*Cytsus scoparius*), purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Polygonium cuspidatum*), morning glory (*Convolvulus sp.*), giant hogweed (*Heracleum mantegazzianum*), English ivy (*Hedra helix*), nightshade (*Solanum* sp.), and clematis (*Clematis ligusticifolia* and *C. vitabla*)

5. Determine existing Vegetated Corridor condition for each plant community.

   For each community determine if the Vegetated Corridor within that community is in Good, Marginal, or Degraded Condition as per the Standards (Chapter 3, Table 3.2).

   b) If more than one condition (good, marginal, or degraded) exists within a Vegetated Corridor, indicate the condition of each plant community within the Vegetated Corridor on the site base map.

   c) Transfer results to base map.

   d) Example of a Vegetated Corridor condition assessment:

A one-acre Vegetated Corridor has two community types: Community A, a Douglas fir forest covering about 90 percent of the corridor; and Community B, a Himalayan blackberry dominated community over the remaining 10 percent, as described in the following table.

Community A (90% of Corridor)	Cover		Community B (10% of Corridor)	Cover
Douglas Fir*	70		Oregon White Oak*	10
Vine Maple*	10		Himalayan Blackberry**	50
Sword Fern*	10		Common Strawberry*	35
English Ivy **	5		Tall Fescue	45
Perennial Ryegrass	20			
% Cover by Natives	90		% Cover by Natives	45
% Tree Canopy	70		% Tree Canopy	10
% Invasive/Noxious	5		% Invasive/Noxious	50

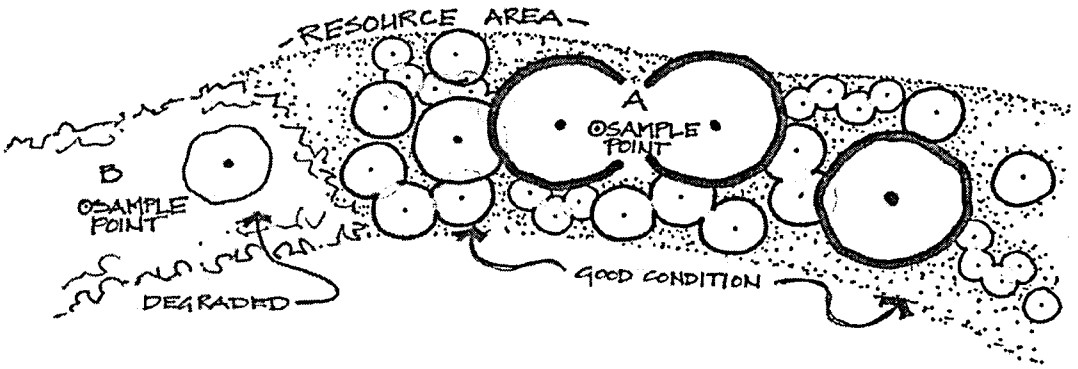
* = Native species ** = Invasive species or noxious weed

- Vegetated Corridor Condition Community A:

  1) Greater than 80 percent cover by native trees, shrubs, and groundcovers;
  2) Greater than 50 percent tree canopy cover;
  3) Less than 10 percent cover by invasive species and noxious weeds;
  4) Vegetated Corridor Condition = Good.

- Vegetated Corridor Condition Community B:

  1) Less than 50 percent cover by native trees, shrubs, and groundcovers;
  2) Less than 25 percent tree canopy cover;
  3) Greater than 10 percent cover by invasive species and noxious weeds;
  4) Vegetated Corridor Condition = Degraded.



f. **Step 5:** Additional Assessments

1. If development is proposed closer than 35' from the break in slope at the top of ravine, a geotechnical analysis is required. The geologist or geotechnical engineer shall provide a stamped report containing:

   a) Description and map of soil type and erodibility conditions of the slope.

   b) Documentation of evidence of potential historic slope movement, if any.

   c) Limits of impact to the slope necessary for it to remain stable.

   d) Estimation of weight that can be applied to the top of a slope and remain stable.

   e) Other relevant information deemed appropriate to include.

2. If a Tier 2 Alternatives Analysis is proposed, a functional assessment is required. The report shall be prepared using methodology outlined in Oregon Division of State Lands Hydrogeomorphic (HGM) approach of assessment for wetland and riparian functions.

g. **Step 6:** Prepare the Natural Resources Assessments Report

1. Draft a report documenting the site and adjacent property Sensitive Area, Vegetated Corridor condition, and slope.

2. Include a description of each plant community.

3. Include copies of written data assessment forms for Vegetated Corridor analysis and wetland delineation and show on the base map.

4. Include a base map site plan for the entire property in the report and photos of representative features on site and adjacent property. The site plan shall include the following:

   a) Property lines and dimensions

b) Location of proposed development activity

c) Existing and proposed conditions for property and surrounding area within 200'

d) Location and dimensions of roads, driveways, utilities, parking areas, and building footprints

e) Location and dimensions of yards and/or cultivated areas

f) Locations, boundaries, and conditions of existing Sensitive Areas (streams, ponds, wetlands, etc), Storm Water Infrastructure, and drainage ditches

g) Locations, boundaries, and conditions of the Vegetated Corridors including plant communities, contours, data points and notation of slopes greater than 25%

h) Site plan shall be at a scale of one inch equals 50 feet or less (1"=50')

Clean Water Services
Our commitment is clear.

Sensitive Areas Certification Form

Property Owner

Name

Address

City/State/Zip

Telephone	Fax

E-mail

Authorized Agent

Name

Address

City/State/Zip

Telephone	Fax

E-mail

Project Location

Street, road, or other descriptive location

Legal Description:

Quarter	Section	Township	Range
In or near (city or town)	County	Tax Map #	Tax Lot #
Waterway	River Mile	Latitude	Longitude

Adjacent Property Information:

Street, road, or other descriptive location

Legal Description:

Quarter	Section	Township	Range
In or near (city or town)	County	Tax Map #	Tax Lot #
Waterway	River Mile	Latitude	Longitude

An on-site, Water Quality Sensitive Area reconnaissance was completed on:

Date	By	Title	Company

A. Existence of Water Quality Sensitive Areas

As defined in CWS's Design and Construction Standards, Water Quality Sensitive Areas:
☐ do ☐ do not exist on site (check appropriate box).

☐ do ☐ do not exist within 200 feet on adjacent properties, or ☐ unable to evaluate adjacent property (check appropriate box).

- If Water Quality Sensitive Areas exist, complete Section B below.
- If Water Quality Sensitive Areas do not exist, skip Section B, sign this form and submit to CWS with plan approval package.

B. Types of Water Quality Sensitive Areas

The type(s) of Water Quality Sensitive Area(s) that occur on site or within 200 feet on adjacent properties are (check all that apply):

☐ wetland(s) ☐ spring(s) ☐ intermittent stream(s) ☐ perennial stream(s) ☐ ponds

Sign this form and submit to CWS with plan approval package and one (1) copy of:

- Natural Resources Assessment Report that includes:
  - Wetland Delineation Report per DSL / Corps reporting requirements (if wetlands present).
  - Vegetated Corridor documentation, including a base map and photographs showing the surveyed location of all Sensitive Areas, Vegetated Corridors, and Vegetated Corridor condition.

I certify that I am familiar with the information contained in this document, and to the best of my knowledge and belief, this information is true, complete, and accurate.

Property Owner:

Print/Type Name	Print/Type Title
Signature	Date

APPENDIX D:
LANDSCAPE REQUIREMENTS

1.0 INTRODUCTION

1.1 Jurisdiction

Clean Water Services (District) recognizes the importance of the water quality Sensitive Areas, Vegetated Corridors, and Storm Water Infrastructure that, along with the Tualatin River, fall under its jurisdiction. To improve water quality and preserve aquatic species, and meet the intent of both the federal Clean Water and the Endangered Species Acts, the District developed the following requirements for landscape management.

Most Sensitive Areas are also regulated by the Division of State Lands (DSL) and the U.S. Army Corps of Engineers (Corps). In the event of permitted mitigation, planting plans for these areas shall follow DSL and Corps guidelines and approved plans. Vegetated Corridors and Storm Water Facilities are regulated by the District 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 District.

1.2 Professional Assistance

Revegetation in Sensitive Areas, Vegetated Corridors and Storm Water Infrastructure should facilitate succession toward low maintenance native 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 ORS671.310 through 671.459.

Non-native, invasive plant management and wildlife damage management strategies are provided in Clean Water Services *Integrated Vegetation and Animal Management (IVAM) Guidance*. Especially challenging management situations may require assistance from a landscape maintenance contractor or a wildlife biologist.

2.0 REVEGETATION METHODS

Successful revegetation is critical to the proper function of Sensitive Areas, Vegetated Corridors and Storm Water Infrastructure 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 revegetation projects in these areas. This document guides design decisions to promote successful planting efforts, while allowing flexibility to address opportunities and constraints at each

site. When developing revegetation plans, four major components shall be addressed: hydrology, soils, plant materials, and maintenance.

Document the following steps in preparing the landscape plan:

Step 1: Assess Hydrologic and Hydraulic Conditions

a) Determine the frequency and duration of water inundation (including appropriate elevations) of the revegetation area. Watershed hydrology and hydraulic models for major streams are available from the District. In some cases, current site conditions (i.e. wetland presence) will suffice. For Storm Water Infrastructure, 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 revegetation 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:
   - Wet (standing or flowing water/nearly constant saturation; anaerobic soils)
   - Moist (periodically saturated; anaerobic and/or aerobic soils)
   - Dry (infrequent inundation/saturation, if any; aerobic soils)

c) Identify and map wet, moist and dry planting zones.

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 Storm Water 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 Vegetated Corridors vary greatly.

b) For upland sites with at least one foot of native topsoil, but containing a non-native, invasive seed bank or plants, remove the undesirable plants, roots, and seeds (*see IVAM Guidance*) prior to planting.

c) For upland sites with less than one foot of topsoil and invasive, non-native seed bank or plants that have become established, remove the undesirable plants, roots, and seeds (*see IVAM Guidance*) prior to adding topsoil. The sub-grade in these areas shall be tilled to a depth of at least four inches and at least 12 inches of clean compost-amended topsoil shall be added. In the event of floodplain grading, over-excavation of the sub-grade shall occur to ensure that the 12 inches of topsoil can be applied without impacting surface water elevations. The compost-amended topsoil shall have the

following characteristics to ensure a good growing medium for the selected plants:

- Texture – material passes through one-inch screen
- Fertility – 35% organic matter

d) For wet areas in Sensitive Areas and Storm Water Infrastructure, the soil conditions shall be hydric or the grading designed to hold sufficient water to promote hydric soil formation. For some bulb and tubers, the addition of organic muck soil will improve plant establishment.

e) Where necessary for erosion control or organic matter enhancement, additional leaf compost may be placed uniformly on topsoil. (Refer to *Erosion Prevention and Sediment Control Planning and Design Manual, December 2000.)* 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 when using native plants.

Step 3: Identify Plants to be Preserved, Select Revegetation 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 Vegetated Corridors 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. A detailed list of common native plant community types appropriate for planting Sensitive Areas, Vegetated Corridors and Storm Water Infrastructure is provided in Table 1. Upon approval from the District, limited use of non-invasive non-native plants may be permitted in highly urbanized settings such as regional town centers. 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 that are less than four feet tall.

c) Quantities: Trees shall be planted at 10 feet on-center; shrubs shall be planted at four feet on-center. See Table 1 for on-center requirements for herbaceous species. The following equations shall be used to calculate planting densities on a per acre basis.

- Total number of trees per acre = area in square feet x 0.01
- Total number of shrubs per acre = area in square feet x 0.05
- Groundcover = plant and seed to achieve 100% areal coverage

d) Placement: Plant placement shall be consistent with the form of the naturally occurring plant community. Trees and shrubs shall be placed in singles or clusters of the same species to provide a natural planting scheme. The grouping size and plant quantity is dependant on the species being planted, their respective sizes, and on the size of the revegetation area. Overseeding of the revegetation area shall occur with native seed mixes appropriate to the plant community and hydrologic zone in which it is being applied (see Table 1: Plant Communities for Revegetation). The plant placement and seeding shall promote maximum vegetative cover to reduce the area available for weed establishment.

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

a) Timing: Plantings shall be installed between February 1 and May 1 or between October 1 and November 15. When plantings must be installed outside these times, additional measures may be needed to ensure survival and shall be specified on the plans.

b) Erosion Control: 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, either 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 (min. 1/4" square holes)) may be used to stabilize slopes and channels. Fabrics such as burlap may also be used to hold plant plugs in place and to discourage floating upon inundation. No plastic mesh that can entangle wildlife shall be permitted. Consult Clean Water Services' *Erosion Prevention and Sediment Control Planning and Design Manual (December 2000)* for additional information.

c) Mulching: 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 include those 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.

d) Plant Protection from Wildlife: Depending on site conditions, appropriate measures shall be taken to limit wildlife-related damage (*see IVAM Guidance*).

e) Irrigation: Unless site hydrology is currently adequate, a District/City approved irrigation system or other water practice (i.e., polymer, plus watering) shall be installed and used during the three-year plant establishment period. Watering shall be provided at a rate of at least one inch per week between June 15 and October 15.

f) Access: Maintenance access for plant maintenance shall be provided for Sensitive Areas and Vegetated Corridors via a five-foot easement or shared boundary with Storm Water Infrastructure. Storm Water Infrastructure access requirements are provided in Appendix B: *Water Quality and Quantity Facility Design.*

Step 5: Determine Plant Monitoring and Maintenance Requirements

a) Monitoring: Site visits in the spring and fall will likely be necessary to assess the status of the plantings, irrigation, mulching, etc. and to avoid failure of revegetation effort.

b) Weed Control: The removal of non-native, invasive weeds shall be necessary throughout the maintenance period, or until a healthy stand of desirable vegetation is established (*see IVAM Guidance*).

c) Plant Replacement and Preservation: Installed plants that fail to meet the acceptance criteria (see Chapter 2) shall be replaced during the maintenance period. Prior to replacement, the cause of loss (wildlife damage, poor plant stock, etc.) shall be documented, corrected and the plants replaced.

Step 6: Prepare Construction Documents and Specifications

The construction documents and specifications shall include:

a) Sensitive Area boundaries and Vegetated Corridor boundaries
b) 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 revegetation area
c) Planting plan and specifications:
    i. planting table that documents the common name, scientific name, distribution (zone and spacing), condition and size of plantings,
    ii. installation methods for plant materials,

iii. mulching,
iv. plant tagging for identification,
v. plant protection, and
vi. seeding methods, rates, and areas

d) Irrigation plan and specifications, including identification of water source, watering timing and frequency, and maintenance of the system

e) 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 three year monitoring period

f) Access points for installation and maintenance including vehicle access if available

g) Standard drawing details (north arrow, scale bar, property boundaries, project name, drawing date, name of designer and property owner).

Table 1: Plant Communities for Revegetation

Plant Commiunities	Minimum Species Composition	Plant Category	Water Requirements	Light Requirements	Minimum Rooting Size	Minimum Plant Height	On Center / Seeding Rate[1]	Spacing Format[2]
Riparian Forest (RF)								
Red alder (Alnus rubra)	⊙	Tree	Moist	Sun	1 gal	3'	10'	Single
Western red cedar (Thuja plicata)	⊙	Tree	Moist	Shade	2 gal	2'	10'	Single
Western hemlock (Tsuga heterophylla)	⊙	Tree	Moist	Part	2 gal	2'	10'	Single
Red elderberry (Sambucus racemosa)	⊙	Shrub	Moist	Part	1 gal	1.5'	4-5'	Single
Black twinberry (Lonicera involcrata)		Shrub	Moist	Part	1 gal	1.5'	4-5'	Single
Highbush cranberry (Viburnum edule)		Shrub	Moist	Part	1 gal	1.5'	4-5'	Single
Red-osier dogwood (Cornus stoniferia)	⊙	Shrub	Wet	Part	1 gal	2'	4-5'	Cluster
Indian plum (Oemleris cerasiformis)	⊙	Shrub	Moist	Shade	2 gal	2'	4-5'	Cluster
Swamp rose (Rosa pisocarpa)		Shrub	Moist	Part	1 gal	1.5'	4-5'	Cluster
Pacific ninebark (Pysocarpus capitatus)		Shrub	Moist	Shade	1 gal	2'	4-5'	Single
Snowberry (Symphoricarpos albus)	⊙	Shrub	Dry	Part	1 gal	1.5'	4-5'	Cluster
Salmonberry (Rubus spectabilis)	⊙	Shrub	Moist	Shade	1 gal	1.5'	4-5'	Cluster
Stinky currant (Ribes viscosissimum)		Shrub	Moist	Part	1 gal	1.5'	4-5'	Single
Maidenhair fern (Adiatum pedatum)		Herb	Moist	Shade	4"	na	Variable	Cluster
Lady fern (Athyrium filix-femina)		Herb	Moist	Shade	1 gal	na	Variable	Cluster
Skunk cabbage (Lysichiton americaum)		Herb	Wet	Shade	bulbs	na	Variable	Cluster
False lily-of-the-valley (Maianthemum dilatatum)		Herb	Moist	Shade	bulbs, 4"	na	Variable	Cluster
Candy Flower (Claytonia sibirica)		Herb	Moist	Shade	4"	na	Variable	Cluster
Miners Lettuce (Monita perfoliata)		Herb	Moist	Shade	4"	na	Variable	Cluster
Stream violet (Viola glabella)		Herb	Moist	Shade	4"	na	Variable	Cluster
Youth-on-age (Tolmiea menziesii)		Herb	Moist	Shade	4"	na	Variable	Cluster
Insideout flower (Vancouveria hexandra)		Herb	Moist	Shade	4"	na	Variable	Cluster
Dewey's sedge (Carex deweyana)		Herb	Dry	Shade	plugs, 4"	4"	Variable	Mass
Hair bentgrass (Agrostis scabra)		Grass	Moist	Part	seed	na	2 lbs pls	Mass
Oregon bentgrass (Agrostis oregonensis)	⊙	Grass	Dry	Part	seed	na	2 lbs pls	Mass
Tall manna-grass (Glyceria elata)	⊙	Grass	Moist	Part	seed	na	8 lbs pls	Mass

Table 1: Plant Communities for Revegetation

Plant Commiunities	Minimum Species Composition	Plant Category	Water Requirements	Light Requirements	Minimum Rooting Size	Minimum Plant Height	On Center / Seeding Rate[1]	Spacing Format[2]
Upland Forest (UF)								
Red alder (Alnus rubra)	⊙	Tree	Moist	Sun	1 gal	3'	10'	Single
Big leaf maple (Acer macrophyllum)	⊙	Tree	Dry	Sun	2gal	3'	10'	Single
Douglas Fir (Pseudotsuga menziesii)	⊙	Tree	Dry	Sun	2gal	3'	10'	Single
Grand fir (Abies grandis)	⊙	Tree	Dry	Sun	2 gal	2'	10'	Single
Pacific yew (Taxus brevifolia)		Tree	Moist	Shade	2 gal	2'	10'	Single
Cascara (Rhamnus purshiana)		Tree	Dry	Part	2 gal	2'	10'	Single
Pacific dogwood (Cornus nattallii)		Tree	Moist	Shade	1 gal	2'	10'	Single
Bitter cherry (Prunus emarginata)		Tree	Moist	Part	2 gal	2'	10'	Single
Vine Maple (Acer circinatum)	⊙	Tree	Moist	Part	2 gal	2'	4-5'	Single
Oceanspray (Holodiscus discolor)	⊙	Shrub	Dry	Sun	1 gal	1.5'	4-5'	Single
Red elderberry (Sambucus racemosa)	⊙	Shrub	Moist	Part	1 gal	1.5'	4-5'	Single
Red flowering currant (Ribes sanguineum)	⊙	Shrub	Dry	Sun	1 gal	1.5'	4-5'	Cluster
Cascade Oregon Grape (Mahonia nervosa)		Shrub	Moist	Part	1 gal	4"	4-5'	Cluster
Tall Oregon Grape (Mahonia aquifolium)		Shrub	Dry	Sun	1 gal	6"	4-5'	Single
Red huckleberry (Vaccinium parvifolium)		Shrub	Moist	Shade	1 gal	1.5'	4-5'	Cluster
Thimbleberry (Rubus pariflorus)		Shrub	Moist	Shade	1 gal	1.5'	4-5'	Cluster
Snowberry (symphoricarpos albus)	⊙	Shrub	Dry	Part	1 gal	1.5'	4-5'	Cluster
Woods Rose (Rosa woodsii)	⊙	Shrub	Dry	Part	1 gal	1.5'	4-5'	Cluster
Serviceberry (Almelanchier alnifolia)		Shrub	Dry	Part	2 gal	2'	4-5'	Single
Sword fern (Polystichum munitum)		Shrub	Moist	Shade	2 gal	na	4-5'	Cluster
Deer fern (Blechnum spicant)		Herb	Moist	Shade	1 gal	na	Variable	Cluster
Orange honeysuckle (Lonicera ciliosa)		Herb	Moist	Shade	2 gal	na	Variable	Single
Salal (Gaultheria shallon)		Herb	Moist	Part	1 gal	4"	Variable	Cluster
Wood strawberry (Fragaria vesca)		Herb	Moist	Shade	4"	na	Variable	Cluster
Western trillium (Trillium ovatum)		Herb	Moist	Shade	4"	na	Variable	Cluster
Saxifrage (Mitella spp)		Herb	Moist	Shade	1 gal	na	Variable	Cluster
Red columbine (Aquilegia formosa)		Herb	Dry	Part	4"	na	Variable	Cluster
Solomon's seal (Solomon smilacina)		Herb	Moist	Shade	4"	na	Variable	Cluster
Native California brome (Bromus carinatus)	⊙	Grass	Dry	Sun	seed	na	10 lbs pls	Mass
Blue Wildrye (Elymus glaucus)	⊙	Grass	Dry	Part	seed	na	10 lbs pls	Mass

Table 1: Plant Communities for Revegetation

Plant Commiunities	Minimum Species Composition	Plant Category	Water Requirements	Light Requirements	Minimum Rooting Size	Minimum Plant Height	On Center / Seeding Rate[1]	Spacing Format[2]
Oak Woodland / Savanna (OW)								
Oregon white oak (Quercus garryana)	⊙	Tree	Dry	Sun	2 gal	2'	10'	Single
Pacific madrone (Arbutus menziesii)	⊙	Tree	Dry	Sun	2 gal	2'	10'	Single
Snowberry (Symphoricarpos albus)	⊙	Shrub	Dry	Part	1 gal	1.5'	4-5'	Cluster
Serviceberry (Almelanchier alnifolia)	⊙	Shrub	Dry	Part	1 gal	2'	4-5'	Single
Oceanspray (Holodiscus discolor)	⊙	Shrub	Dry	Sun	1 gal	1.5'	4-5'	Cluster
Nootka rose (Rosa nutkana)		Shrub	Moist	Sun	1 gal	1.5'	4-5'	Cluster
Cascade Oregon grape (Mahonia nervosa)		Herb	Moist	Part	1 gal	4"	Variable	Cluster
Blue wild-rye (Elymus glacus)	⊙	Grass	Dry	Part	seed	na	10 lbs pls	Mass
Native California brome (Bromus carinatus)	⊙	Grass	Dry	Sun	seed	na	10 lbs pls	Mass
Ash Forested Wetland (FW)								
Oregon Ash (Fraxinus latifolia)	⊙	Tree	Moist	Part	2 gal	3'	10'	Single
Pacific Ninebark (Physocarpus capitatus)	⊙	Shrub	Moist	Shade	2 gal	2'	4-5'	Single
Red-osier dogwood (Cornus stolonifera)	⊙	Shrub	Wet	Part	1 gal	2'	4-5'	Cluster
Snowberry (Symphoricarpus albus)	⊙	Shrub	Dry	Part	1gal	1.5'	4-5'	Cluster
Slough sedge (Carex obnupta)	⊙	Herb	Moist	Part	plugs	6"	Variable	Mass
Corn lily (Ceratrum californicum)		Herb	Wet	Shade	bulbs	na	Variable	Cluster
Candy flower (Claytonia sibirica)		Herb	Moist	Shade	4"	na	Variable	Cluster
Miners lettuce (Montia perfoliata)		Herb	Moist	Shade	4"	na	Variable	Cluster
Dewey's sedge (Carex deweyana)		Herb	Dry	Shade	plugs	4"	Variable	Mass
Small fruited bulrush (Scirpus microcarpus)		Herb	Wet	Sun	plugs	4"	Variable	Mass
Tall mannagrass (Glyceria elata)	⊙	Grass	Moist	Shade	seed	na	10 lbs pls	Mass

Table 1: Plant Communities for Revegetation

Plant Commiunities	Minimum Species Composition	Plant Category	Water Requirements	Light Requirements	Minimum Rooting Size	Minimum Plant Height	On Center / Seeding Rate[1]	Spacing Format[2]
Shrub / Scrub Wetland (SS)								
Pacific willow (Salix lasiandra)	⊙	Tree	Wet	Sun	1 gal	3'	10'	Single
Sitka willow ((Salix sitchensis)		Tree	Moist	Sun	1 gal	3'	10'	Cluster
Douglas hawthorne (Crataegus douglasii)		Tree	Moist	Part	2 gal	2'	10'	Cluster
Pacific Crabapple (Malus fusca)	⊙	Tree	Moist	Part	2 gal	2'	10'	Cluster
Scouler willow (Salix scouleriana)	⊙	Shrub	Moist	Sun	1 gal	3'	4-5'	Cluster
Red-osier dogwood (Cornus stoloniferia)	⊙	Shrub	Wet	Part	1 gal	2'	4-5'	Cluster
Clustered rose (Rosa pisocarpa)		Shrub	Wet	Part	1 gal	1.5'	4-5'	Cluster
Douglas spirea (Spirea douglasii)	⊙	Shrub	Wet	Sun	1 gal	1.5'	4-5'	Cluster
Nodding beggartick (Bidens cernua)		Herb	Wet	Sun	1 gal	1.5'	Variable	Cluster
Spreading rush (Juncus patens)		Herb	Moist	Part	plugs	6"	Variable	Mass
Western manna-grass (Glyceria occidentalis)	⊙	Grass	Wet	Sun	seed	na	8 lbs pls	Mass
Emergent Marsh (EM)								
Nodding beggartick (Bidens cernua)	⊙	Herb	Moist	Sun	1 gal	1.5'	Variable	Cluster
Hardstem bulrush (Scirpus accutus)		Herb	Wet	Sun	plugs	1.5'	Variable	Cluster
Small-fruited bulrush (Scirpus microcarpus)	⊙	Herb	Wet	Sun	plugs	6"	Variable	Mass
Creeping spike rush (Eleocharis palustris)	⊙	Herb	Wet	Sun	seed, plugs	4"	Variable	Mass
Wapato (Sagittaria latifolia)		Herb	Wet	Sun	bulbs	na	Variable	Cluster
American water plantain (Alisma plantago-aquatica)		Herb	Wet	Sun	bulbs	na	Variable	Cluster
Soft stemmed bulrush (Scirpus taberaemontani)		Herb	Wet	Sun	plugs	1.5'	Variable	Cluster
American brooklime (Veronica americana)		Herb	Wet	Sun	plugs	na	Variable	Cluster
Marsh speedwell (Veronica scutellata)		Herb	Wet	Sun	plugs	na	Variable	Cluster
American sloughgrass (Beckmannia syzigachne)	⊙	Grass	Wet	Sun	seed, plugs	na	16 lbs pls	Mass
Western manna-grass (Glyceria occidentalis)	⊙	Grass	Wet	Sun	seed	na	8 lbs pls	Mass

Table 1: Plant Communities for Revegetation

Plant Commiunities	Minimum Species Composition	Plant Category	Water Requirements	Light Requirements	Minimum Rooting Size	Minimum Plant Height	On Center / Seeding Rate[1]	Spacing Format[2]
Storm Water Facility (SWF)								
Oregon Ash (Fraxinus latifolia)		Tree	Moist	Part	2 gal	3'	10'	Single
Red alder (Alnus rubra)	⊙	Tree	Moist	Sun	1 gal	3'	10'	Single
Douglas Fir (Pseudotsuga menziesii)	⊙	Tree	Dry	Sun	2gal	3'	10'	Single
Vine Maple (Acer circinatum)	⊙	Tree	Moist	Part	2 gal	2'	4-5'	Single
Pacific willow (Salix lasiandra)		Tree	Wet	Sun	1 gal	3'	10'	Single
Sitka willow ((Salix sitchensis)		Tree	Moist	Sun	1 gal	3'	10'	Cluster
Pacific dogwood (Cornus nattallii)		Tree	Moist	Shade	1 gal	2'	10'	Single
Bitter cherry (Prunus emarginata)		Tree	Moist	Part	2 gal	2'	10'	Single
Scouler willow (Salix scouleriana)		Shrub	Moist	Sun	1 gal	3'	4-5'	Cluster
Red-osier dogwood (Cornus stoloniferia)	⊙	Shrub	Wet	Part	1 gal	2'	4-5'	Cluster
Pacific ninebark (Pysocarpus capitatus)		Shrub	Moist	Shade	1 gal	2'	4-5'	Single
Oceanspray (Holodiscus discolor)	⊙	Shrub	Dry	Sun	1 gal	1.5'	4-5'	Single
Serviceberry (Almelanchier alnifolia)	⊙	Shrub	Dry	Part	1 gal	2'	4-5'	Single
Nootka rose (Rosa nutkana)		Shrub	Moist	Sun	1 gal	1.5'	4-5'	Cluster
Snowberry (Symphoricarpus albus)	⊙	Shrub	Dry	Part	1gal	1.5'	4-5'	Cluster
Native rose (Rosa pisocarpa or gymnocarpa)		Shrub	Wet	Part	1 gal	1.5'	4-5'	Cluster
Douglas spirea (Spirea douglasii)	⊙	Shrub	Wet	Sun	1 gal	1.5'	4-5'	Cluster
Red flowering currant (Ribes sanguineum)	⊙	Shrub	Dry	Sun	1 gal	1.5'	4-5'	Cluster
Nodding beggartick (Bidens cernua)		Herb	Wet	Sun	1 gal	1.5'	Variable	Cluster
Spreading rush (Juncus patens)		Herb	Moist	Part	plugs	6"	Variable	Mass
Small-fruited bulrush (Scirpus microcarpus)		Herb	Wet	Sun	plugs	6"	Variable	Mass
Creeping spike rush (Eleocharis palustris)		Herb	Wet	Sun	seed, plugs	4"	Variable	Mass
Slough sedge (Carex obnupta)	⊙	Herb	Moist	Part	plugs	6"	Variable	Mass
Toad rush (Juncus bufonius)*		Herb	Dry	Sun	seed, plugs	4"	Variable	Mass
Rossi Sedge (Carex rossi)*		Herb	Moist	Sun	plugs	4"	Variable	Mass
NW Native Wildflower mix		Herb	Mix	Sun	seed	na	10 lbs pls	Mass
Oregon Bentgrass (Agrostis oregonesis)*	⊙	Grass	Dry	Sun	seed	na	8 lbs pls	Mass
Idaho bentgrass (Agrostis idahoensis)*		Grass	Dry	Sun	seed	na	8 lbs pls	Mass
Western manna-grass (Glyceria occidentalis)		Grass	Wet	Sun	seed	na	8 lbs pls	Mass

[1] Seeding rate: pure live seed (pls) pounds per acre
Tree spacing = sq footage x 0.01; Shrub spacing = sq footage x 0.05; Groundcover = 100% areal cover.
Square footage is based on the total site or facility size.

[2] Single= distribute throughout planting area. Cluster = group 3 to 7 plants in same area with herb or grass in between.
Mass = plant densely to form a single stand of that species in a given area.

APPENDIX E
STANDARD DETAILS

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APPENDIX E
STANDARD DETAILS (cont'd)

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STANDARD DETAILS (cont'd)

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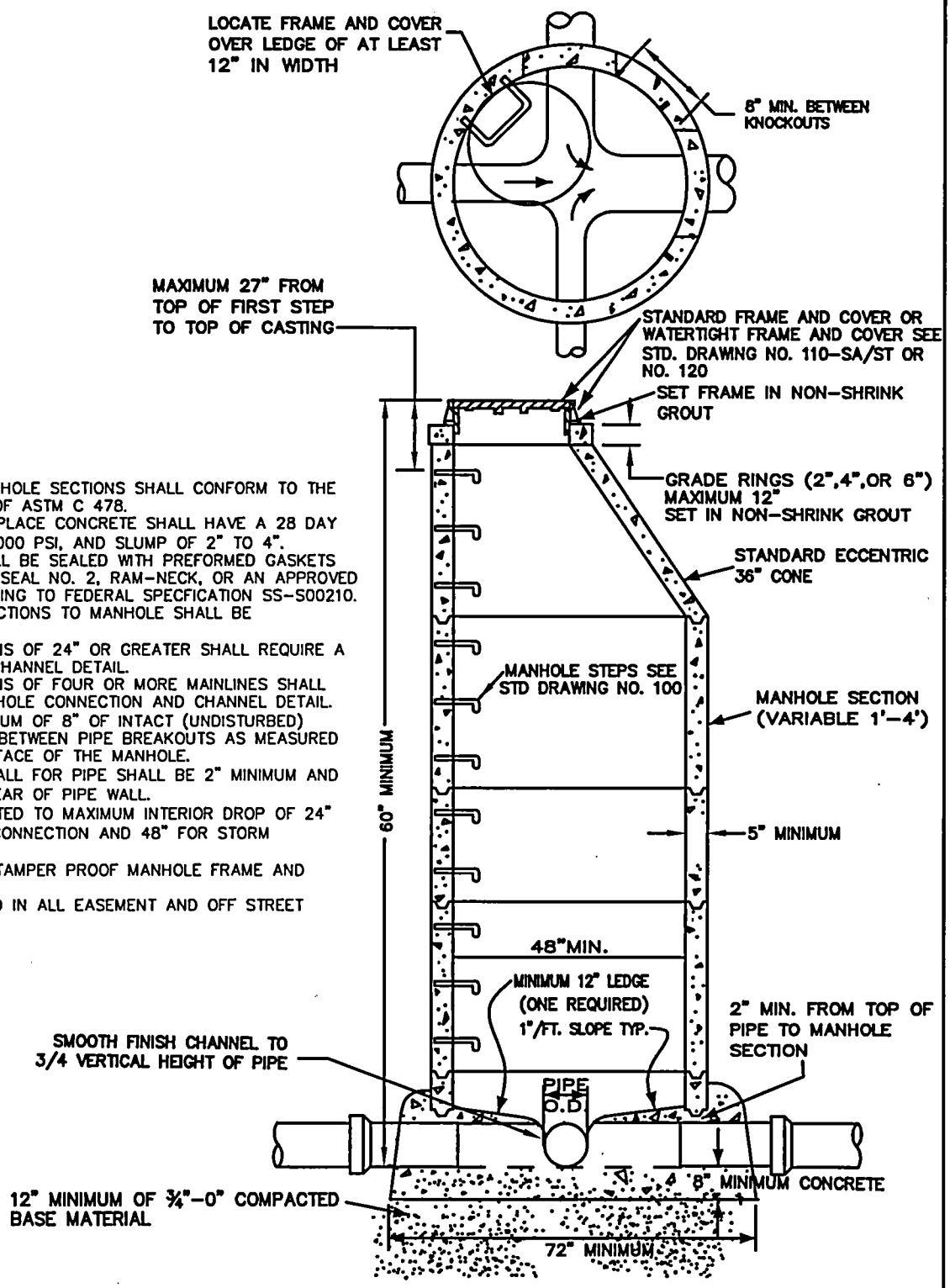

NOTES:

1. ALL PECAST MANHOLE SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C 478.
2. ALL POURED IN PLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 PSI, AND SLUMP OF 2" TO 4".
3. ALL JOINTS SHALL BE SEALED WITH PREFORMED GASKETS SUCH AS KENT-SEAL NO. 2, RAM-NECK, OR AN APPROVED EQUAL CONFORMING TO FEDERAL SPECFICATION SS-S00210.
4. ALL PIPE CONNECTIONS TO MANHOLE SHALL BE WATERTIGHT.
5. PIPE CONNECTIONS OF 24" OR GREATER SHALL REQUIRE A MANHOLE AND CHANNEL DETAIL.
6. PIPE CONNECTIONS OF FOUR OR MORE MAINLINES SHALL REQUIRE A MANHOLE CONNECTION AND CHANNEL DETAIL.
7. PROVIDE A MINIMUM OF 8" OF INTACT (UNDISTURBED) MANHOLE WALL BETWEEN PIPE BREAKOUTS AS MEASURED ON THE INSIDE FACE OF THE MANHOLE.
8. BREAKOUT OF WALL FOR PIPE SHALL BE 2" MINIMUM AND 4" MAXIMUM CLEAR OF PIPE WALL.
9. THIS DETAIL LIMITED TO MAXIMUM INTERIOR DROP OF 24" FOR SANITARY CONNECTION AND 48" FOR STORM CONNECTION.
10. WATERTIGHT / TAMPER PROOF MANHOLE FRAME AND COVER SHALL BE USED IN ALL EASEMENT AND OFF STREET AREAS.

STANDARD MANHOLE

DRAWING NO. 010

REVISED 02-03

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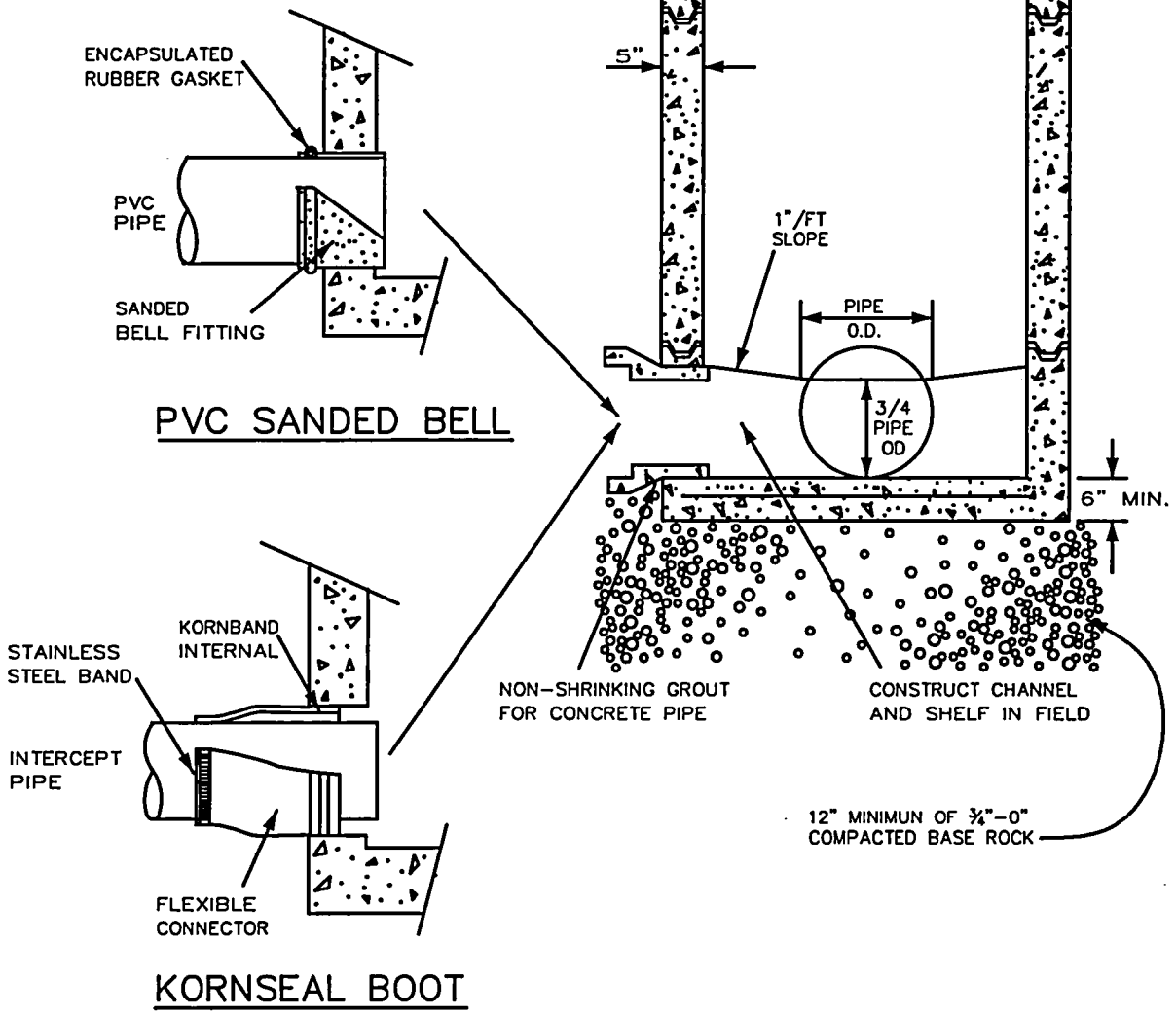
NOTES:
ALL PRECAST MANHOLE SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478 AND APPLICABLE PROVISIONS OF STANDARD DRAWING NO. 010.



PRECAST CONCRETE MANHOLE BASE

DRAWING NO. 020

REVISED 02-03

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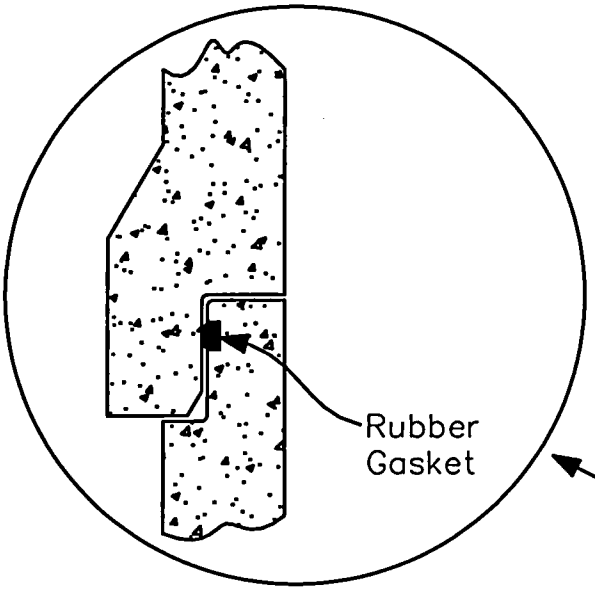
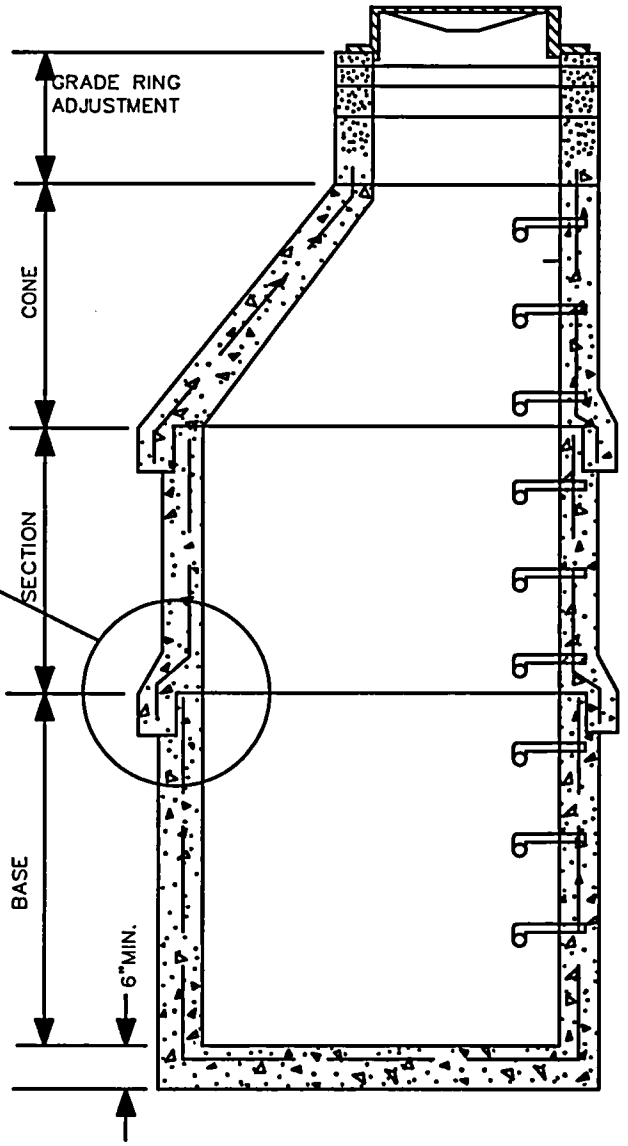
NOTES:

1. ALL MANHOLE SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478 AND APPLICABLE PROVISIONS OF STANDARD MANHOLE, DRAWING NO. 010.
2. ALL JOINTS AND RUBBER GASKETS SHALL COMFORM TO THE REQUIREMENTS OF ASTM C-443.



JOINT DETAIL WILL VARY BY MANUFACTURER



PRECAST RUBBER GASKET MANHOLE

DRAWING NO. 030

REVISED 02-03

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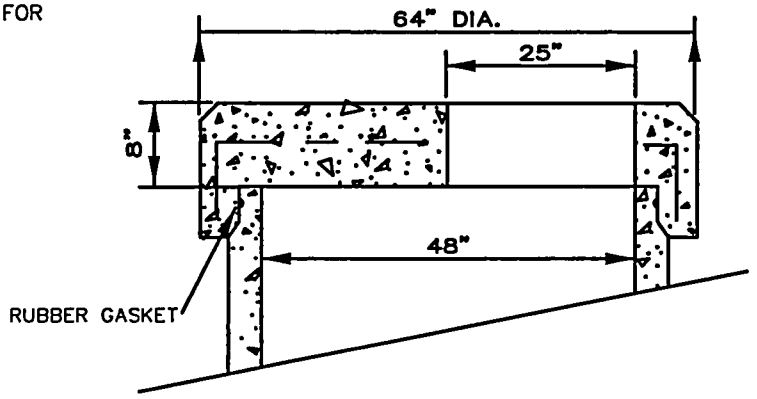
NOTES:
1. ALL JOINTS AND RUBBER GASKETS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-433.
2. ALL MANHOLE SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478 AND APPLICABLE PROVISIONS OF STANDARD MANHOLE, DRAWING NO. 010.
3. STEPS REQUIRED ON FLAT TOP MANHOLES DEEPER THAN 48".
4. PROVIDE CENTER OPENING FLATOP FOR MANHOLE DEPTHS LESS THAN 36".

RUBBER GASKET FLAT TOP (OPTIONAL)

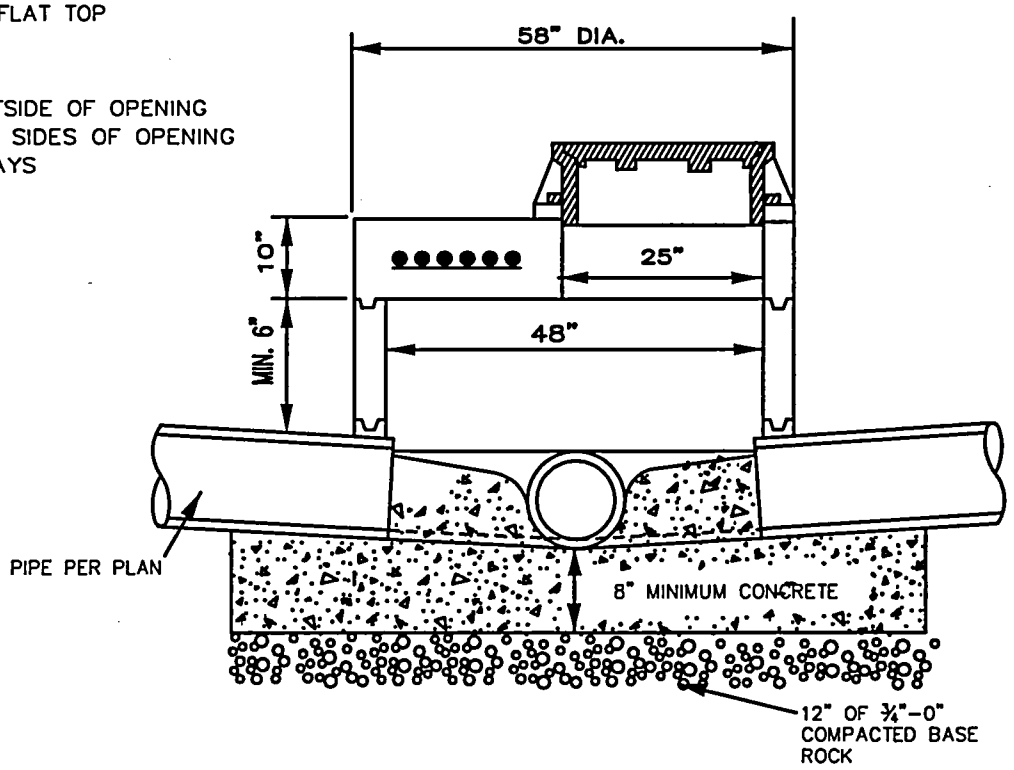


RUBBER GASKET FLAT TOP REINFORCEMENT

OR

STANDARD MANHOLE FLAT TOP REINFORCEMENT

#6 BAR AROUND OUTSIDE OF OPENING
#6 DIAGONALS BOTH SIDES OF OPENING
#6 6" O.C. BOTH WAYS



SHALLOW FLAT TOP MANHOLE

DRAWING NO. 040

REVISED 02-03

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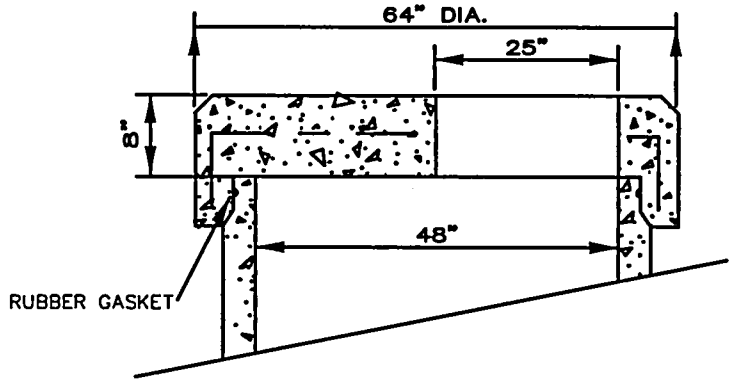
NOTES:
1. ALL JOINTS AND RUBBER GASKETS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-433.
2. ALL MANHOLE SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478 AND APPLICABLE PROVISIONS OF STANDARD MANHOLE, DRAWING NO. 010.
3. STEPS REQUIRED ON FLAT TOP MANHOLES DEEPER THAN 48".

RUBBER GASKET FLAT TOP (OPTIONAL)

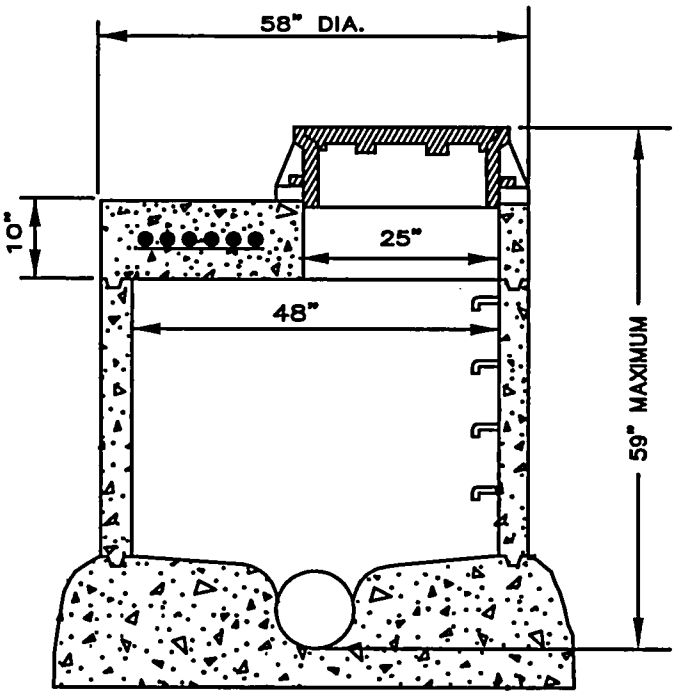


RUBBER GASKET FLAT TOP REINFORCEMENT

OR

STANDARD MANHOLE FLAT TOP REINFORCEMENT

#6 BAR AROUND OUTSIDE OF OPENING
#6 DIAGONALS BOTH SIDES OF OPENING
#6 6" O.C. BOTH WAYS



FLAT TOP MANHOLE

DRAWING NO. 050

REVISED 02-03

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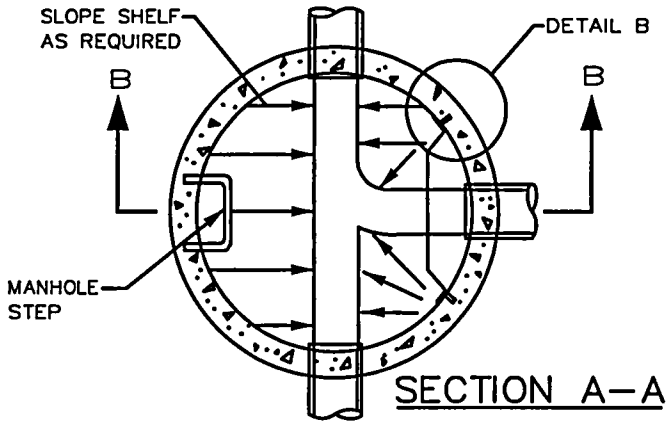
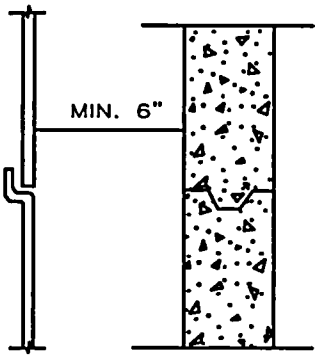


SECTION A–A



DETAIL A
(PARTITION LOCATION)

ALL MANHOLE SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478 AND APPLICABLE PROVISIONS OF STD. DRAWING NO. 010

ONLY ONE DROP ALLOWED PER MANHOLE

CABLE OR CHAIN FASTENED AT SAME ELEVATION AS FIRST STEP

DEFLECTION PLATE (DETAIL C)

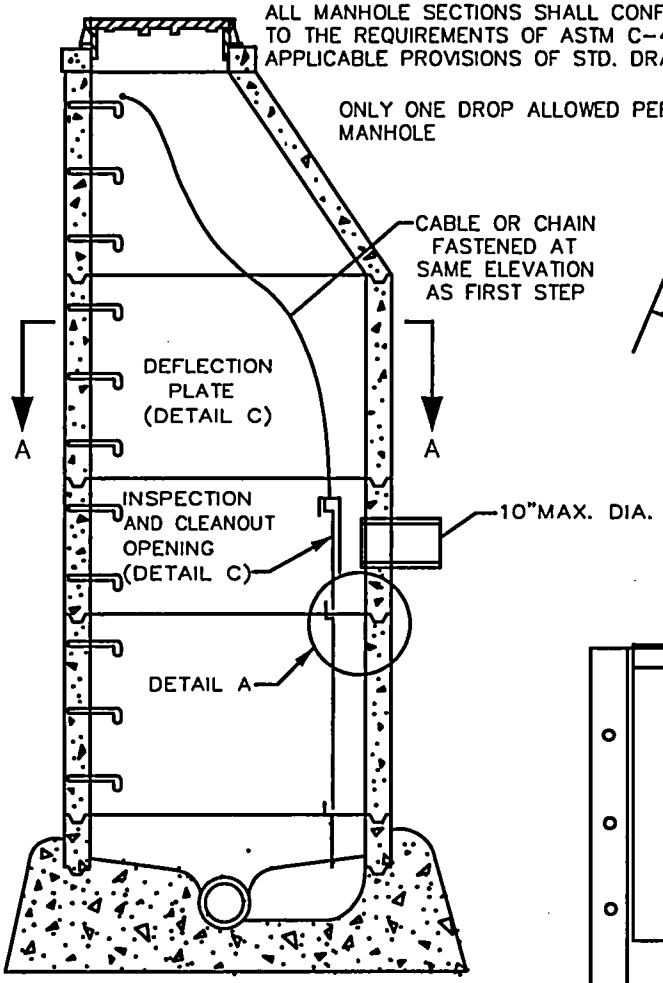
A

A

INSPECTION AND CLEANOUT OPENING (DETAIL C)

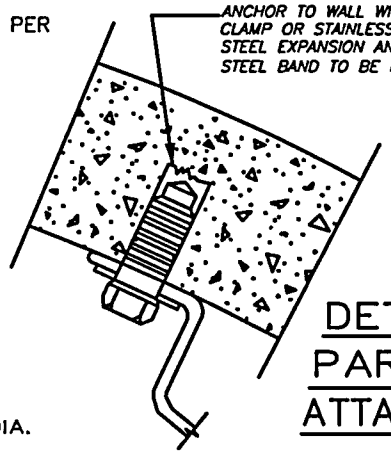
10"MAX. DIA.

DETAIL A



SECTION B–B

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

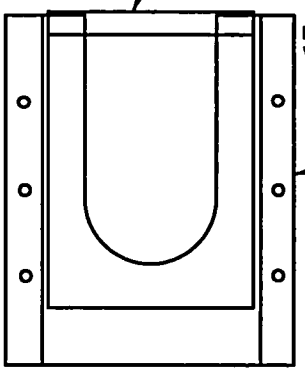


DETAIL B
PARTITION
ATTACHMENT

REMOVABLE DEFLECTION PLATE (MIN. 12" WIDTH) MATERIAL: STAINLESS STEEL, FIBERGLASS PLATE OR HDPE.

INSIDE DROP BOWL IS AN ALTERNATE WHEN INSTALLED AS APPROVED.

STAINLESS STEEL OR HDPE PARTITION: TOP PARTITION TO BE CUT SO THAT BOTTOM OF CUT MATCHES THE INVERT OF THE INCOMING PIPE. THE RADIUS OF THE CUT SHOULD MATCH THAT OF THE PIPE.



DETAIL C

INSIDE DROP MANHOLE

DRAWING NO. 070

REVISED 02-03

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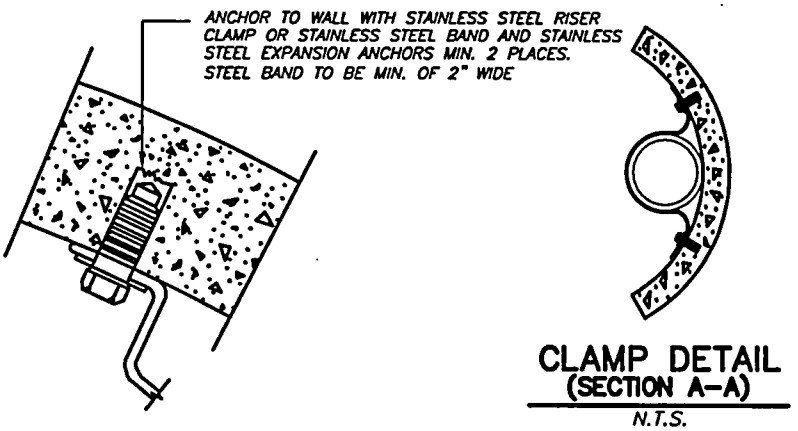
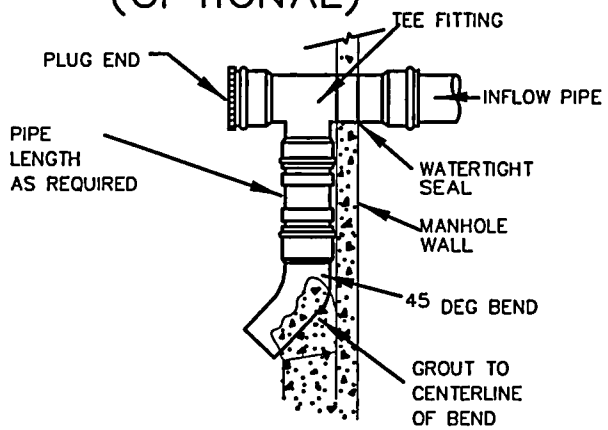
NOTES:

1. ALL MANHOLE 48" RISER SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478 AND APPLICABLE PROVISIONS OF STD. MANHOLE DRAWING NO. 010.
2. MAXIMUM FREE FALL FOR INSIDE DROP PIPE: SHALL BE 24" FOR SANITARY AND 48" FOR STORM; FROM FLOW LINE OF PIPE INVERT TO TOP OF SHELF.
3. INSIDE DROP PIPE TO EXTEND A MINIMUM OF 1" BEYOND SHELF.



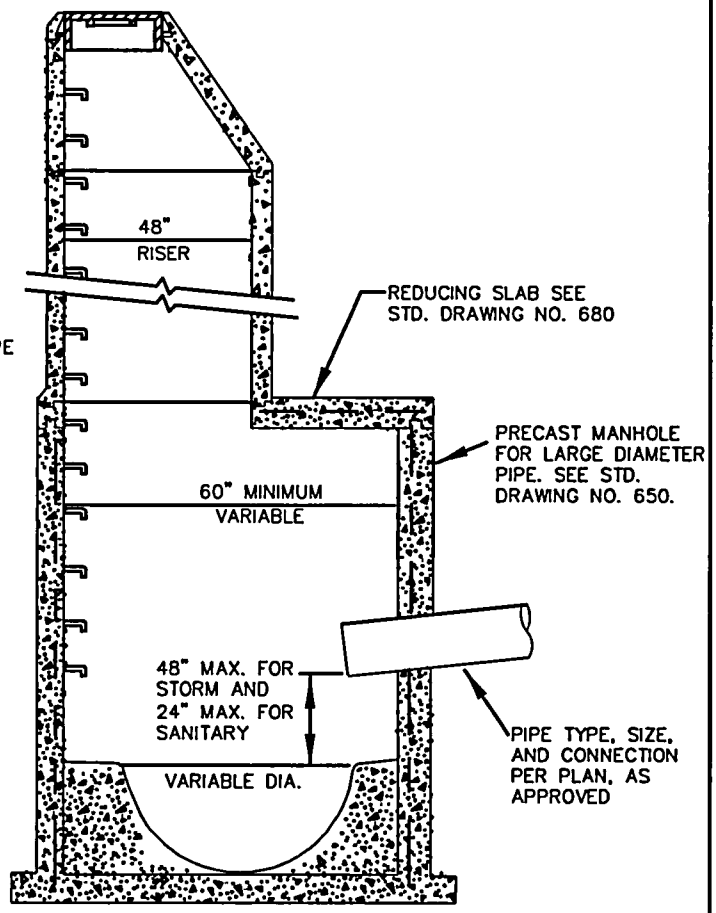
CLAMP DETAIL
(SECTION A-A)
N.T.S.

MECHANICAL INSIDE DROP (OPTIONAL)



NOTES:

1. PIPE AND FITTINGS SHALL BE SAME SIZE AS INFLOW PIPE TO MANHOLE.
2. PIPE AND FITTINGS FOR DROP ASSEMBLY SHALL BE: DUCTILE IRON ANSI A21.50-1, AWWA C150-1, AWWA C-900 OR PVC ASTM 3034 SDR 35.



INSIDE DROP FOR LARGE-DIAMETER PIPE

DRAWING NO. 080

REVISED 02-03

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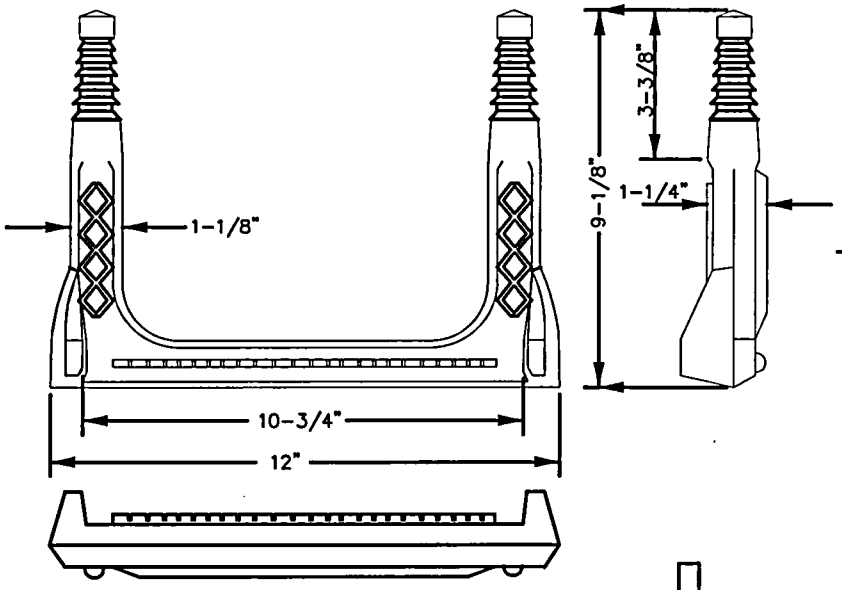
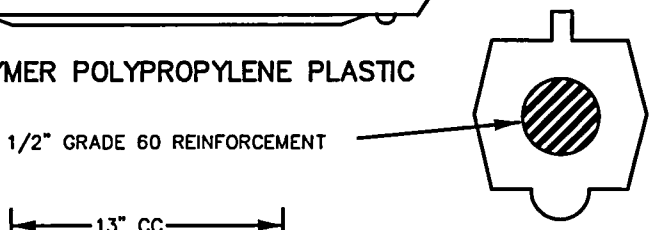
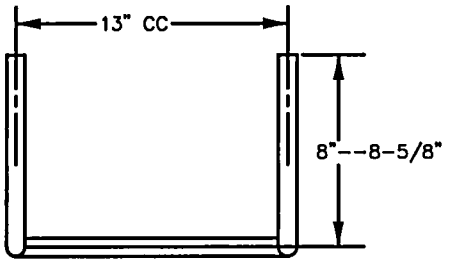
NOTES:

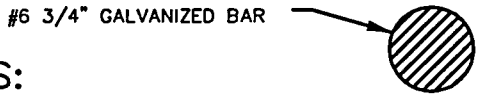
1. ALL STEPS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478.
2. MANHOLE STEPS MUST BE TIGHT AND FIRMLY EMBEDDED.
3. ALL STEPS WITHIN A MANHOLE SHALL BE OF THE SAME DESIGN, TYPE, AND SIZE. (MIXING OF UNMATCHED STEPS IS NOT PERMITTED).

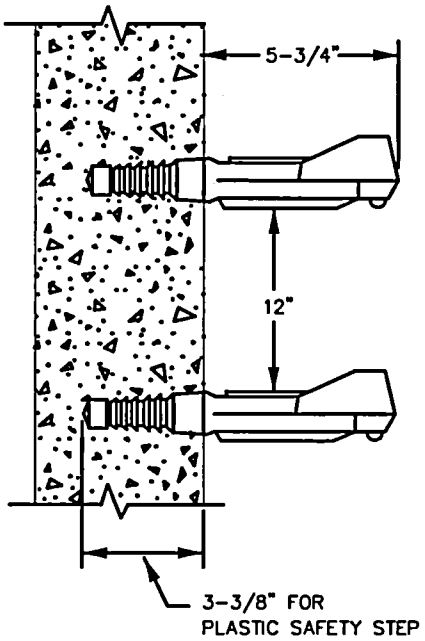


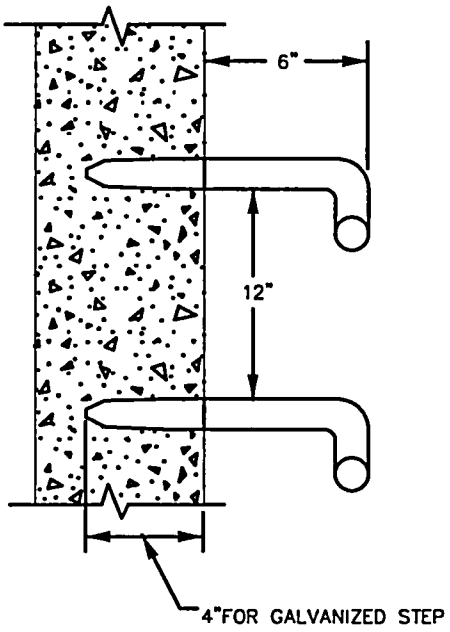
COPOLYMER POLYPROPYLENE PLASTIC











MATERIALS:

GALVANIZED:

#6 (3/4" DIA.) GALVANIZED DEFORMED REINFORCING BAR. REINFORCING BAR CONFORMING WITH ASTM A-615 GRADE 40. GALVANIZED CONFORMING WITH ASTM A-123.

PLASTIC:

MUST CONFORM WITH ASTM C-478.
STEEL REINFORCING BAR MINIMUM 1/2" GRADE 60. MEETING REQUIREMENTS OF ASTM A615 ENCAPSULATED WITH INJECTION MOLDED COPOLYMER POLYPROPYLENE WITH SERRATED SURFACES.

MANHOLE STEP

DRAWING NO. 100

REVISED 02-03

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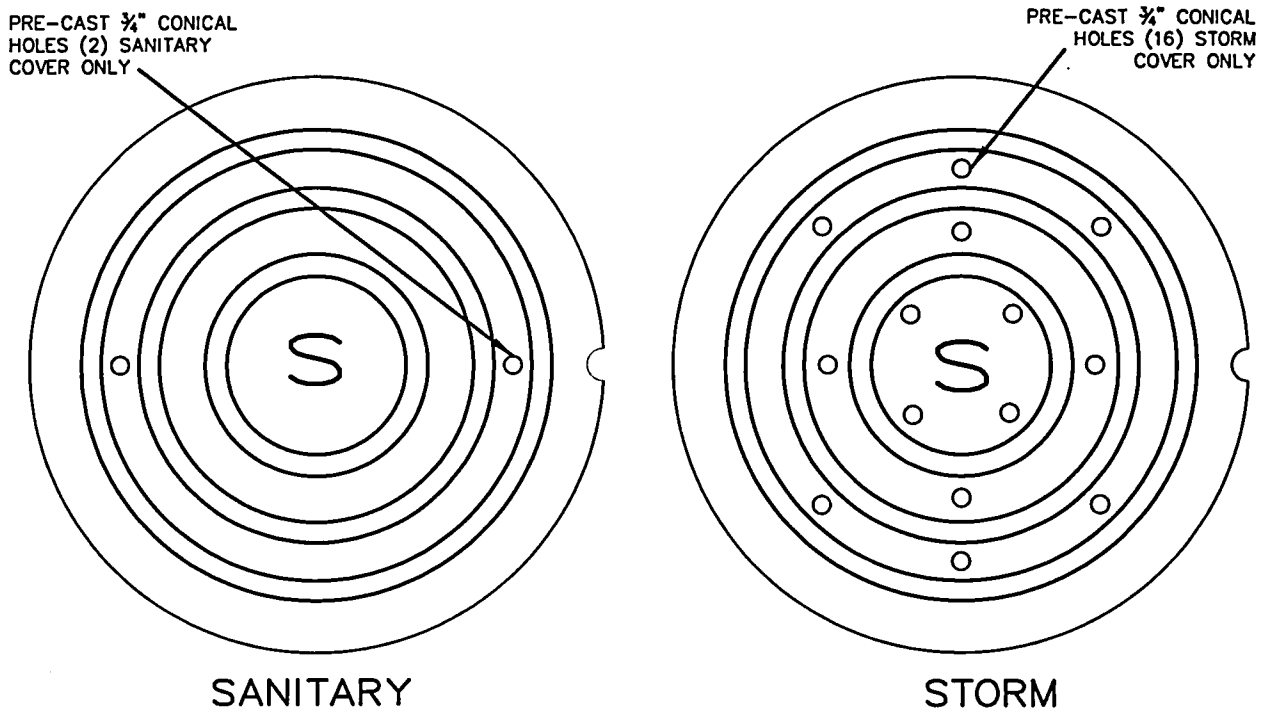

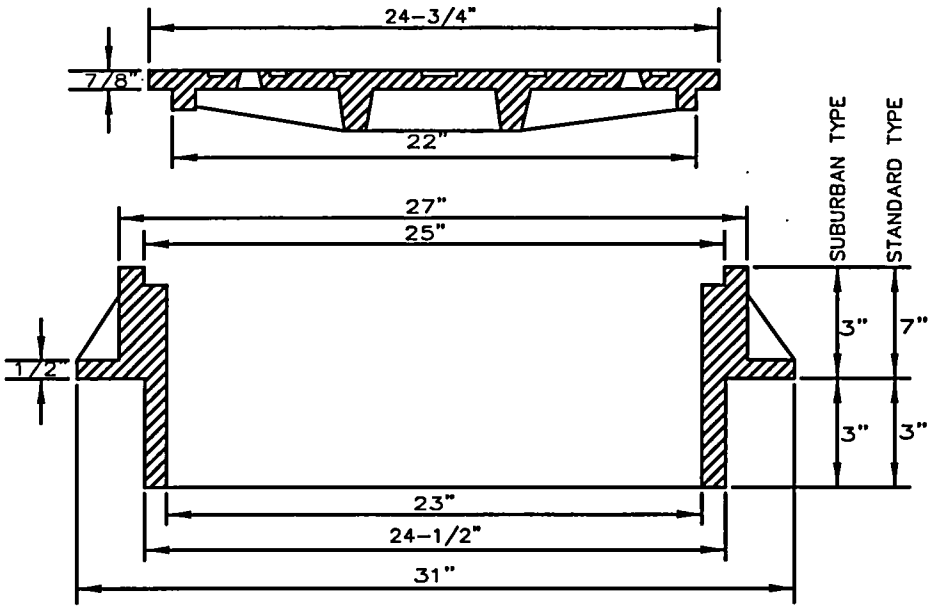

NOTES:
1. SUBURBAN TYPE NOT FOR USE IN TRAFFIC AREAS OF COLLECTOR AND ARTERIAL STREETS
2. COVER AND FRAME SHALL BE GRAY CAST IRON ASTM A-48 CLASS 30.
3. COVER AND FRAME TO BE MACHINED TO A TRUE BEARING ALL AROUND.
4. NOTCH LID FOR LIFTING HOOK.

SUBURBAN AND STANDARD MANHOLE FRAME AND COVER

DRAWING NO. 110-SA/ST

REVISED 02-03

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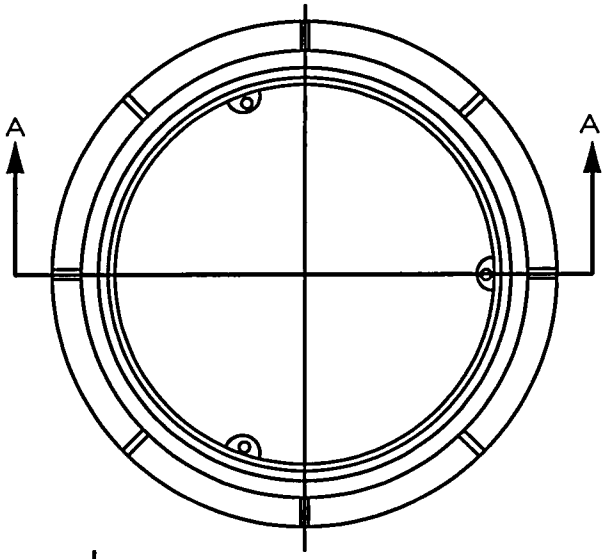
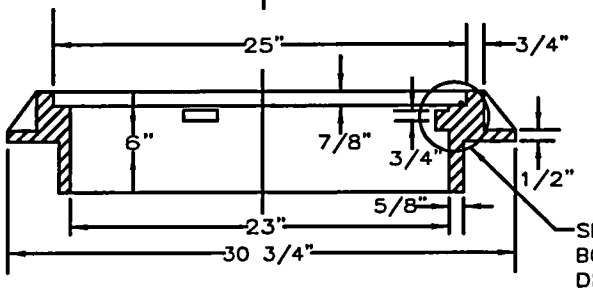
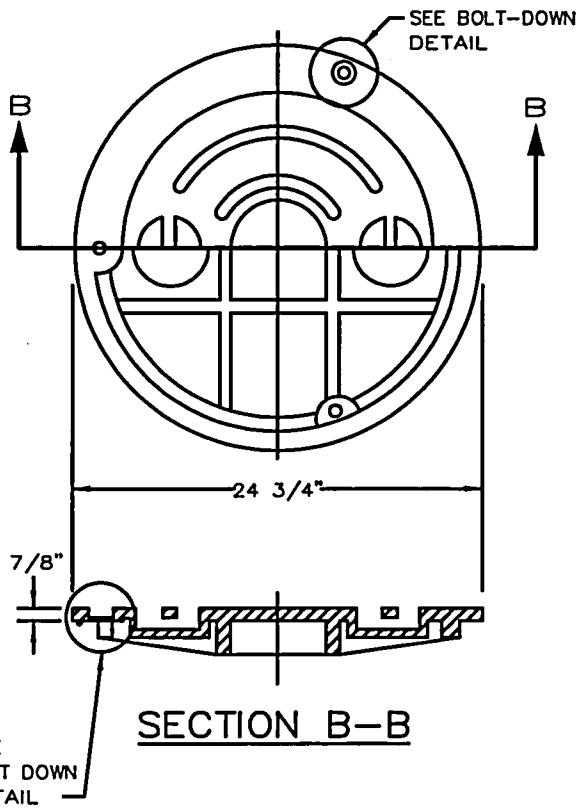
WATERTIGHT MANHOLE RING





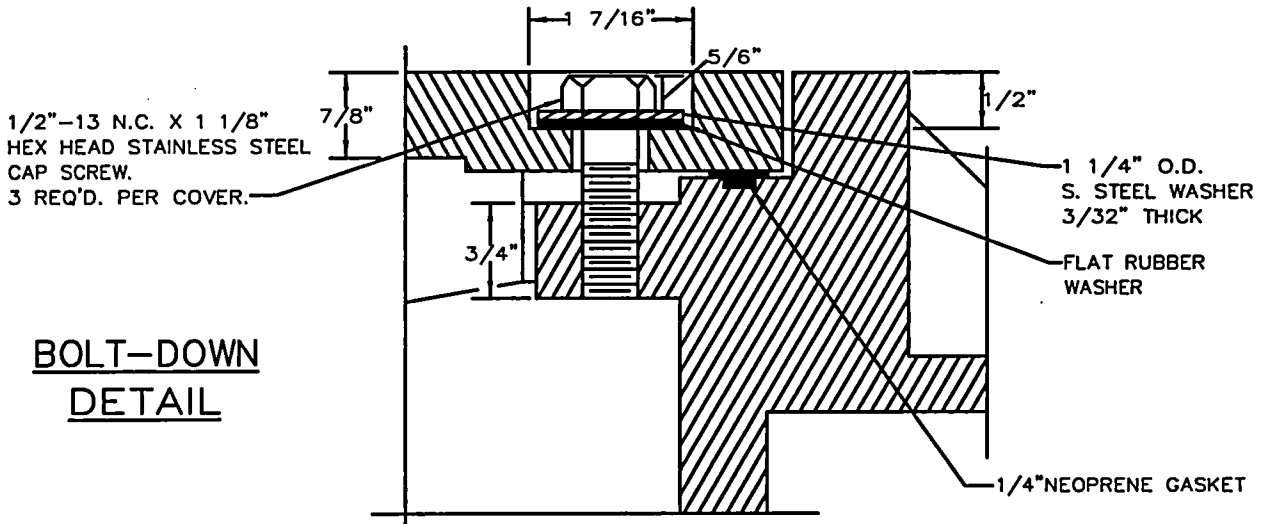
SECTION A–A

3–BOLT DOWN COVER



SECTION B–B

NOTE:
WATERTIGHT/TAMPER PROOF MANHOLE FRAME AND COVER SHALL BE USED IN ALL EASEMENT AND OFF STREET AREAS.



BOLT–DOWN DETAIL

NOTE: COVER AND FRAME SHALL BE OF GRAY CAST IRON A.S.T.M. A–48 CLASS 30.
TAMPER PROOF (REMOVE GASKETS)

WATERTIGHT MANHOLE FRAME AND COVER

DRAWING NO. 120

REVISED 02–03

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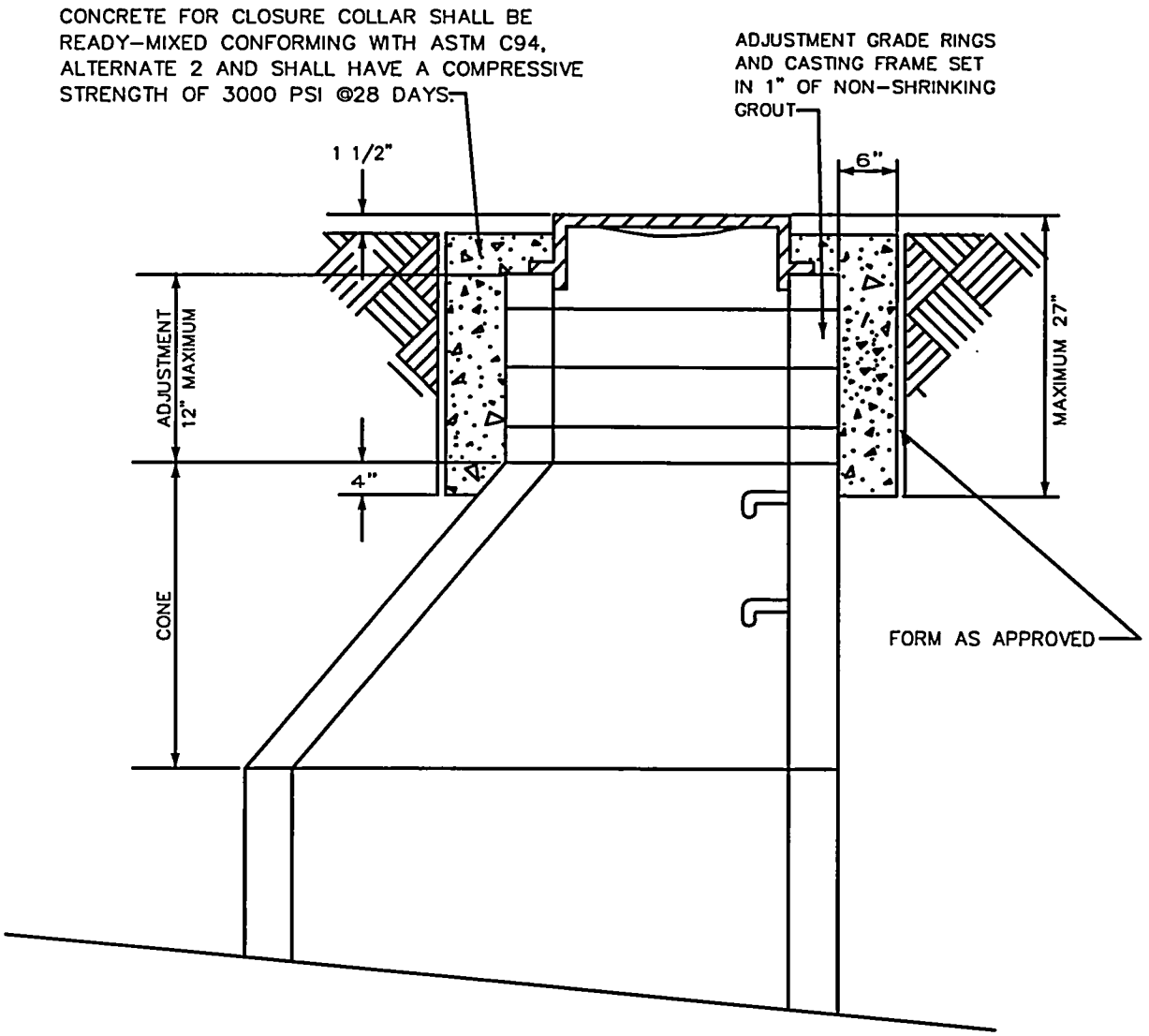

CONCRETE MANHOLE CLOSURE COLLAR

DRAWING NO. 130

REVISED 02-03

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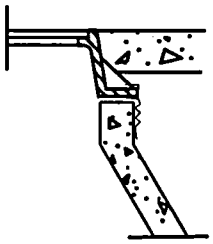
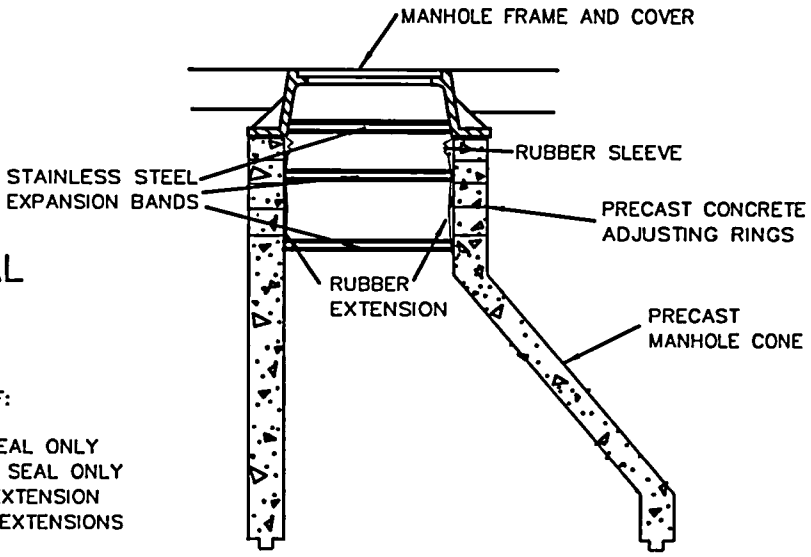


NARROW EXTERNAL RUBBER SEAL

TO SPAN CHIMNEY HEIGHTS OF:

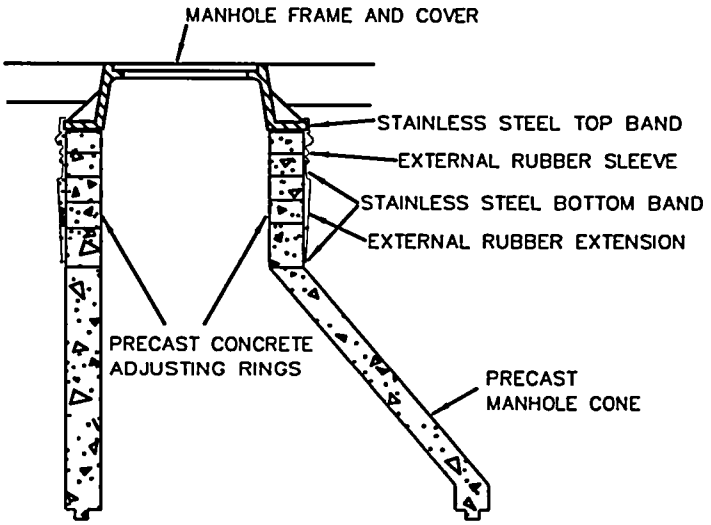
0–3"	–	NARROW (6") SEAL ONLY
OVER 3" – 6 1/2"	–	STANDARD (9") SEAL ONLY
OVER 6 1/2" – 12"	–	STD. SEAL + EXTENSION
OVER 12"	–	SEAL + MULT. EXTENSIONS



INTERNAL MANHOLE CHIMNEY SEAL

NOTES:

1. SLEEVES AND EXTENSIONS SHALL HAVE A MINIMUM OF 3/16" THICKNESS.
2. RUBBER SHALL BE EXTRUDED HIGH GRADE COMPOUND CONFORMING TO ASTM C–923.
3. BANDS SHALL BE FABRICATED FROM 16 GAUGE STAINLESS STEEL CONFORMING TO ASTM A–240, TYPE 304.
4. NUTS AND BOLTS SHALL BE STAINLESS STEEL CONFORMING TO ASTM F–593 AND 594, TYPE 304.
5. ALL GRADE RING AND CASTING FRAME SHALL BE SET IN NON–SHRINKING GROUT.
6. PRECAST MANHOLE SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C–478, AND APPLICABLE PROVISIONS OF STANDARD MANHOLE DRAWING NO. 010.



TO SPAN CHIMNEY HEIGHTS OF:

0–4 1/2"	–	CHIMNEY SEAL ONLY
OVER 4 1/2" – 9"	–	SEAL + 7" EXTENSION
OVER 9"– 12"	–	SEAL + 10" EXTENSION
OVER 12"	–	SEAL + MULT. EXTENSIONS

EXTERNAL MANHOLE CHIMNEY SEAL

MANHOLE CHIMNEY SEAL

DRAWING NO. 140

REVISED 02–03

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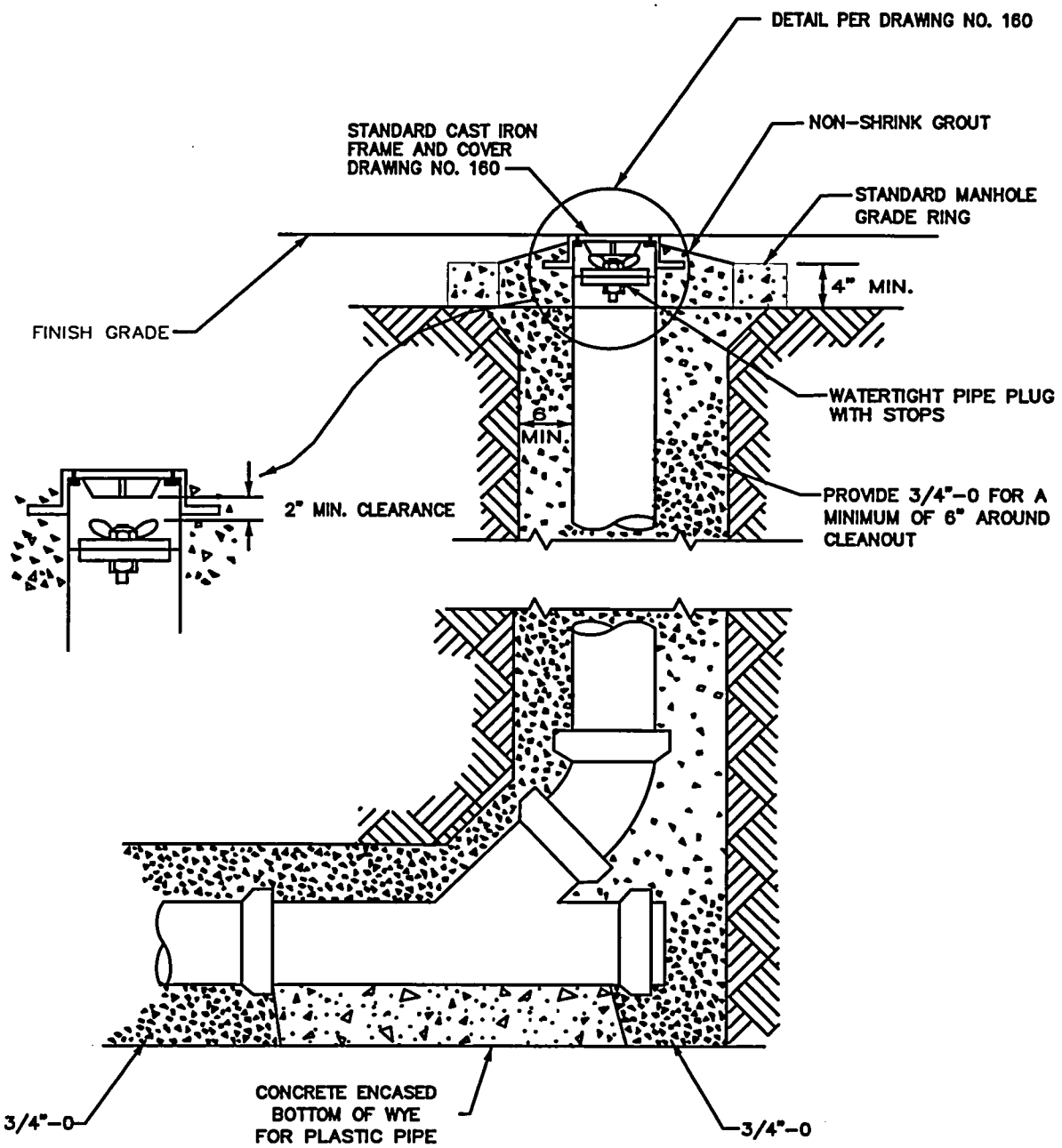

NOTE: CONCRETE ENCASE ENTIRE WYE SECTION AND 45° BEND IF CONCRETE PIPE

STANDARD CLEANOUT

DRAWING NO. 150

REVISED 02-03

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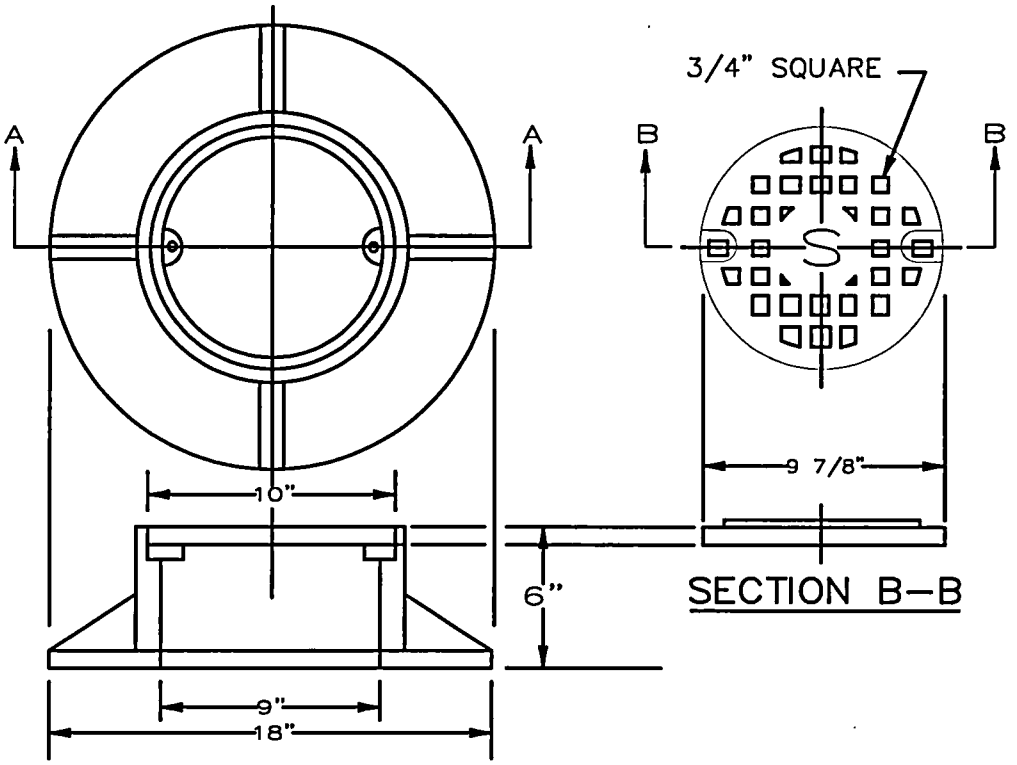
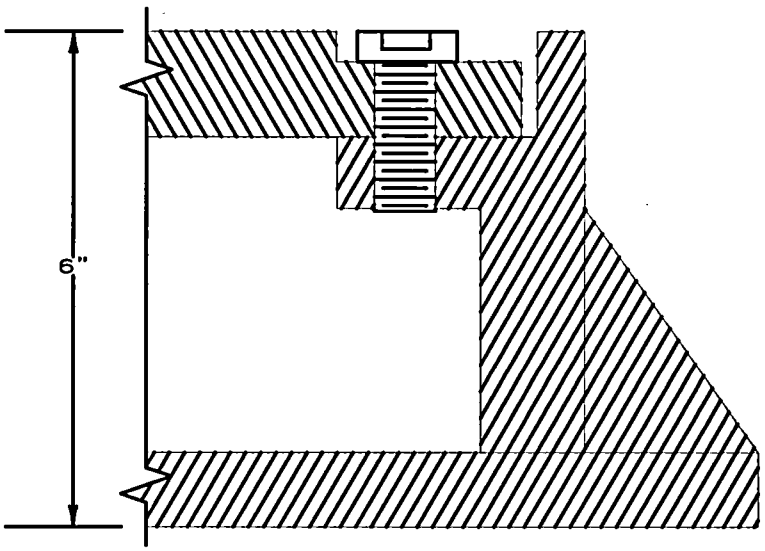


SECTION A–A

SECTION B–B

NOTES:
1. ½" ALLEN HEAD BOLTS 1" LONG RECESSED.
2. ALL PERMANANT CLEANOUTS TO HAVE BOLT DOWN COVERS.
3. MATERIAL SHALL BE GRAY CASTIRON, ASTM A–48, CLASS 30.

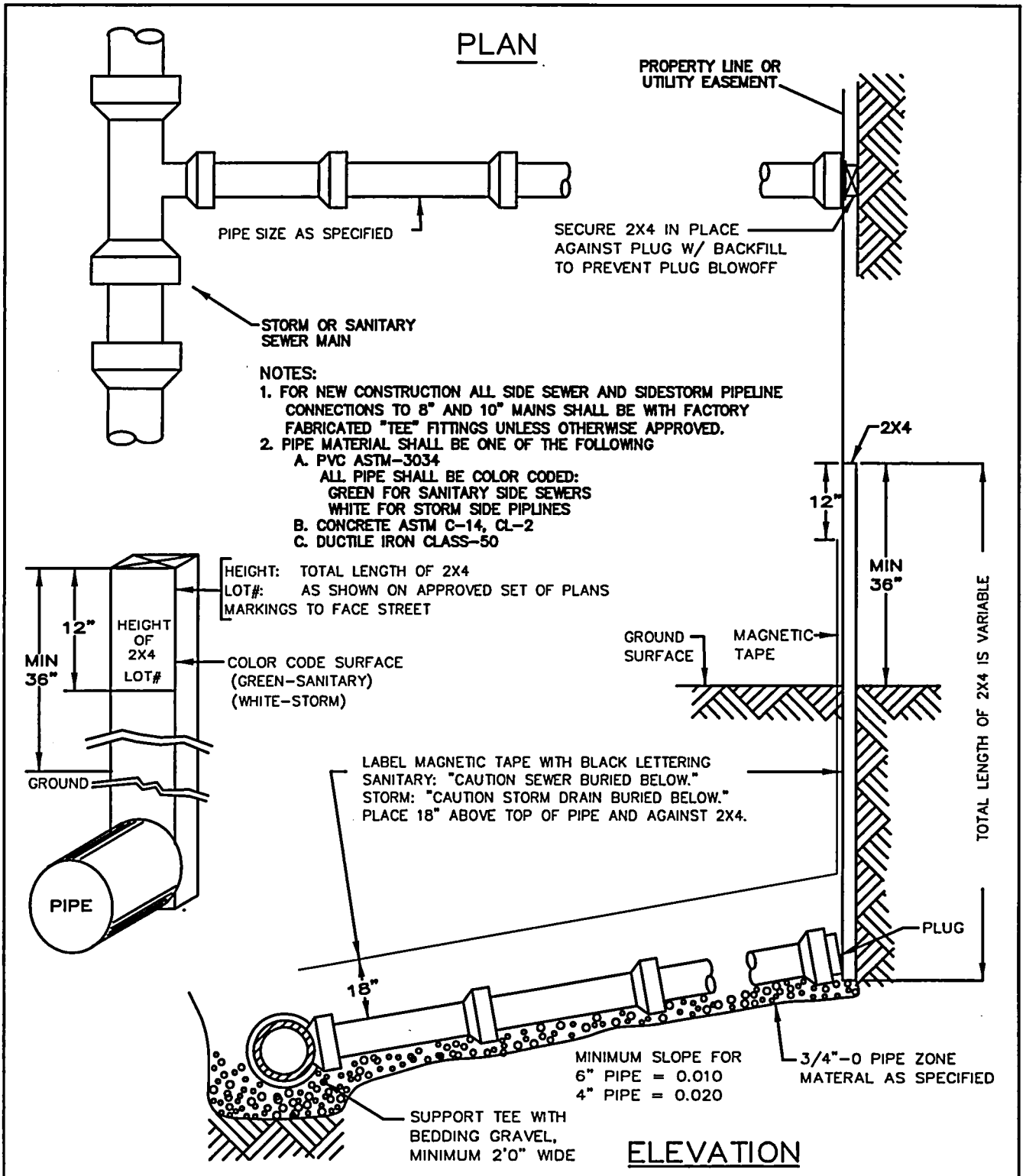


DETAIL

CLEANOUT FRAME AND COVER

DRAWING NO. 160

REVISED 02–03

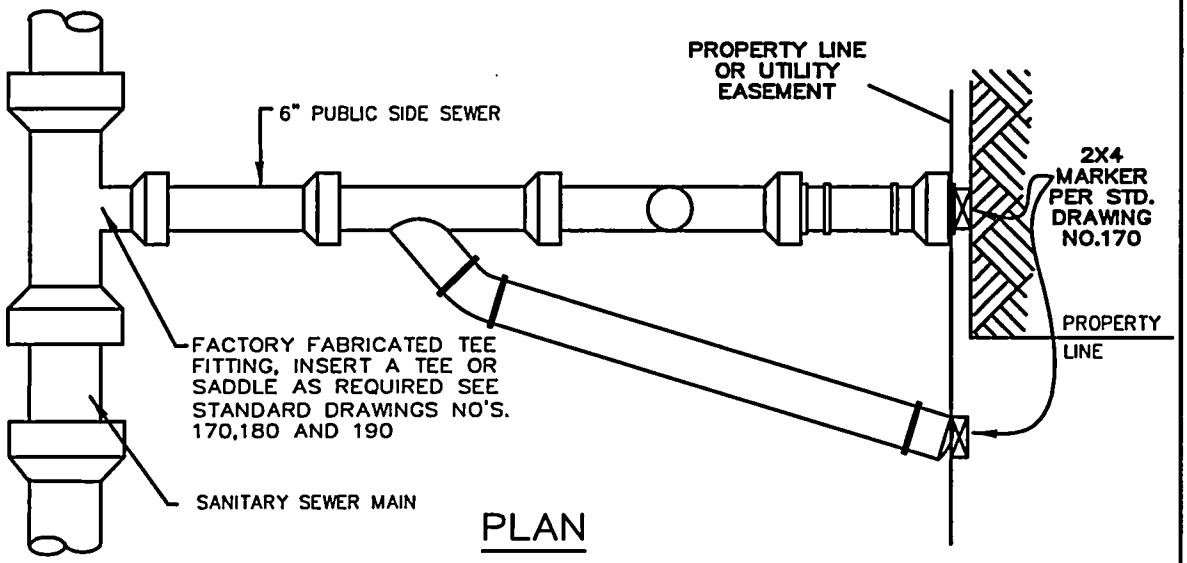


SIDE SEWER / SIDE STORM PIPELINE

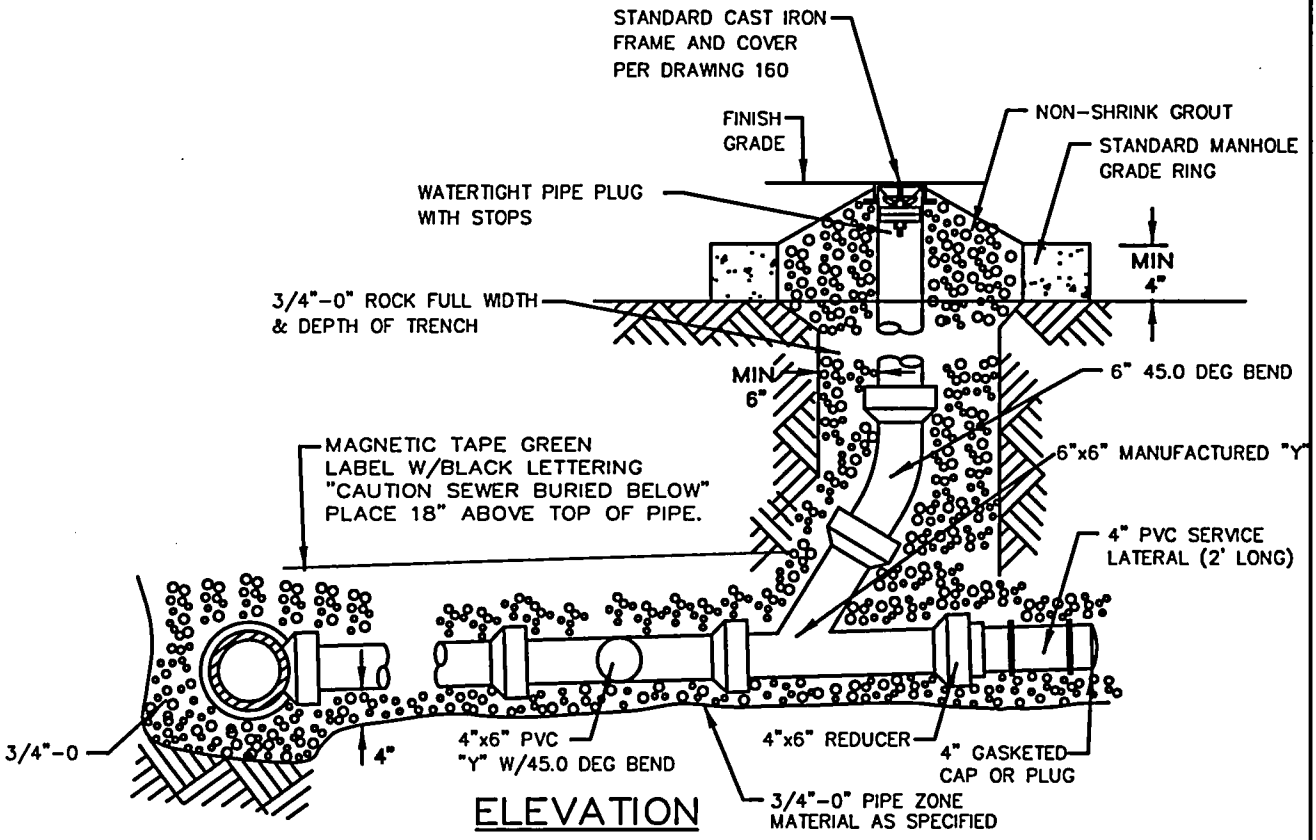
DRAWING NO. 170

REVISED 02-03

Clean Water Services
Our commitment is clear.



PLAN



ELEVATION

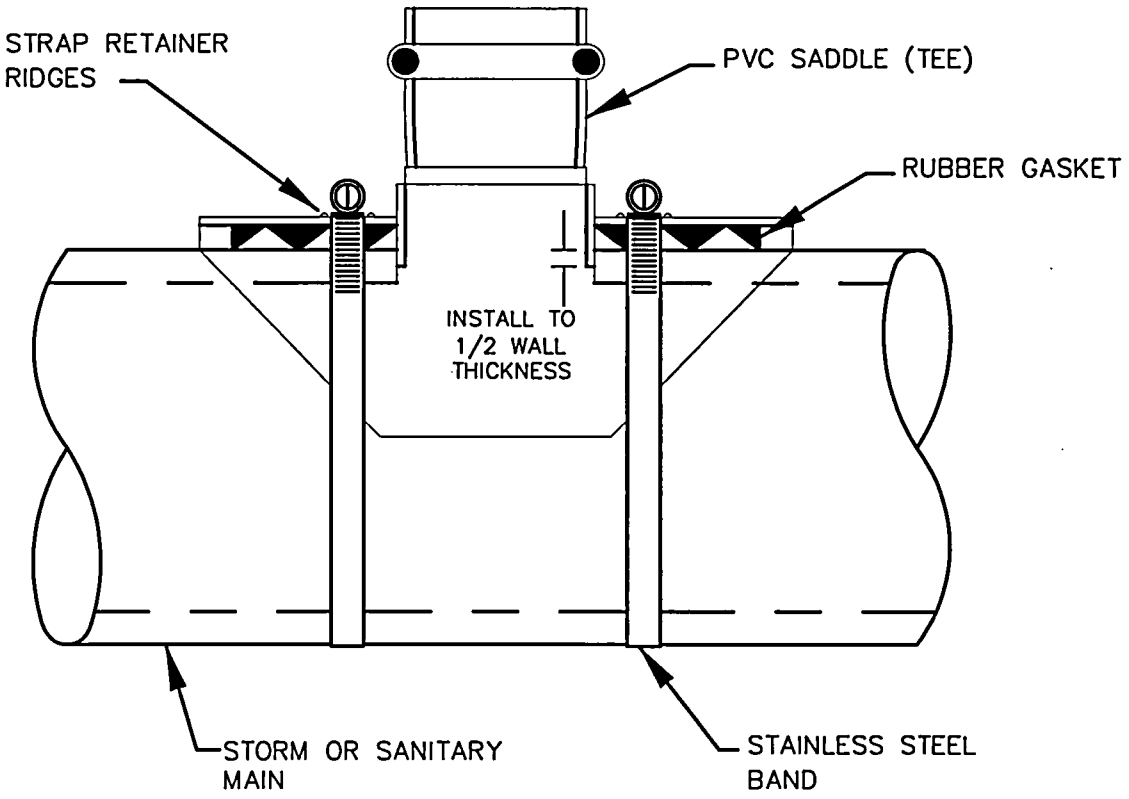
NOTES:
1. 2x4 SHALL BE INSTALLED AT THE END OF BOTH 4" SIDE SEWERS AND EXTENDED 3' ABOVE FINISH GRADE PER STD. DRAWING NO 170.
2. 6" PUBLIC SIDE SEWER SHALL BE LAID AT A MIN OF 0.60 PER 100 FEET.
3. DO NOT PLACE CLEANOUT IN PAVED STREET OR SIDEWALK AREA.
4. PIPE MATERIAL AND COLOR CODE PER STD. DRAWING NO. 170.

6" PUBLIC SIDE SEWER

DRAWING NO. 175

REVISED 02-03

Clean Water Services
Our commitment is clear.



NOTES:
1. INDEXED PVC GASKETED SADDLE SHALL CONFORM TO ASTM 3034 SDR35.
2. PVC COMPOUNDS SHALL CONFORM TO ASTM D1784 WITH CELL CLASS OF 12454-B/C OR 12364-C.
3. ALL ELASTOMERIC SEALS (RUBBER GASKETS) SHALL CONFORM TO ASTM F477.
4. INDEXED PVC GASKETED SADDLE SHALL BE INSTALLED WITH RUBBER GASKETS APPROVED FOR THE SEWER MAIN WALL CONFIGURATION (PROFILE OR SMOOTH WALL).
5. STAINLESS STEEL BANDS SHALL BE 300 SERIES, 9/16" BAND WIDTH, CADMIUM PLATED, CARBON STEEL, AND ATTACHED WITH HEX HEAD, SLOTTED SCREWS.
6. INSERTION HOLE SHALL BE CORE DRILLED.

INDEXED PVC GASKETED SADDLE

DRAWING NO. 180

REVISED 02-03

Clean Water Services
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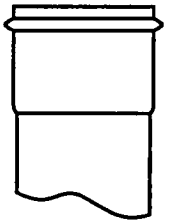
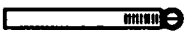
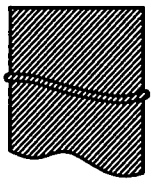


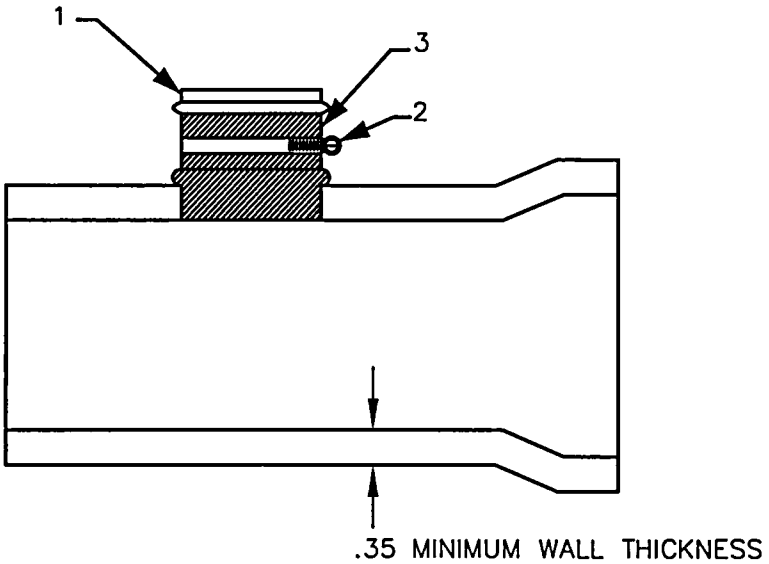
1. PVC HUB SHALL CONFORM TO ASTM 3034, SDR 35 DRIVE INTO CENTER OF RUBBER SLEEVE AFTER SLEEVE IS PLACED IN HOLE.



2. STAINLESS STEEL BAND SECURES UPPER HALF OF RUBBER SLEEVE TO THE PVC HUB. STAINLESS STEEL BAND SHALL BE 300 SERIES, 9/16" BAND WIDTH, CADMIUM PLATED CARBON STEEL, AND ATTACHED WITH HEX HEAD SLOTTED SCREW.



3. COMPLETE RUBBER SLEEVE INCLUDES A MOLDED SEGMENT THAT HOLDS IT IN PLACE.
4. INSERTA TEE SHALL BE USED ONLY IN SEWER MAINS 10" AND LARGER INSIDE DIAMETER (I.D.)
5. SEWER MAIN SHALL BE TWO SIZES (NOMINAL I.D.) LARGER THAN THE INSERTA TEE.



NOTE:
ALL INSERTA-TEE HOLES SHALL BE MACHINE DRILLED AND CORED.

INSERTA-TEE

DRAWING NO. 190

REVISED 02-03

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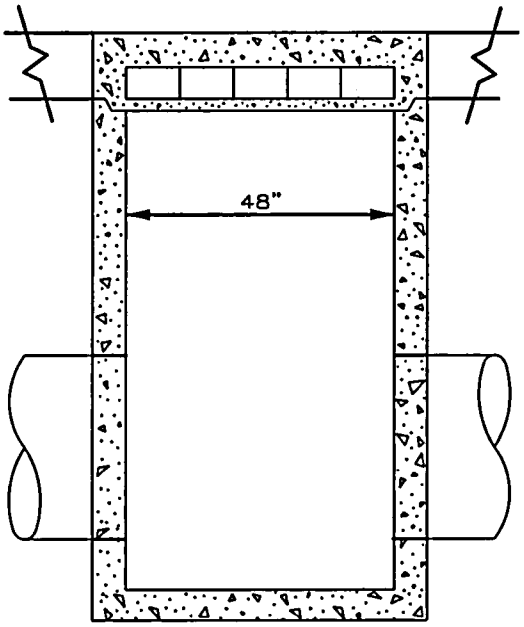
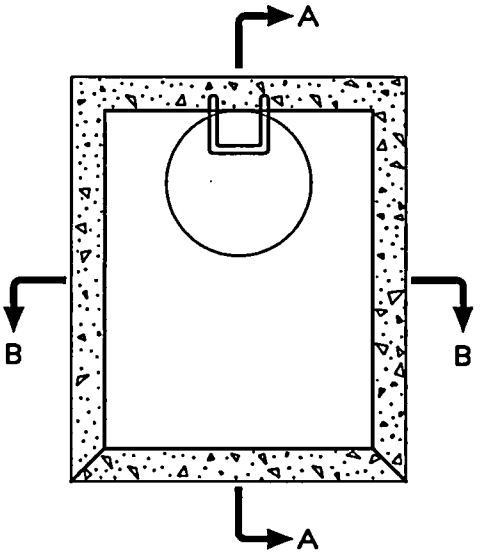
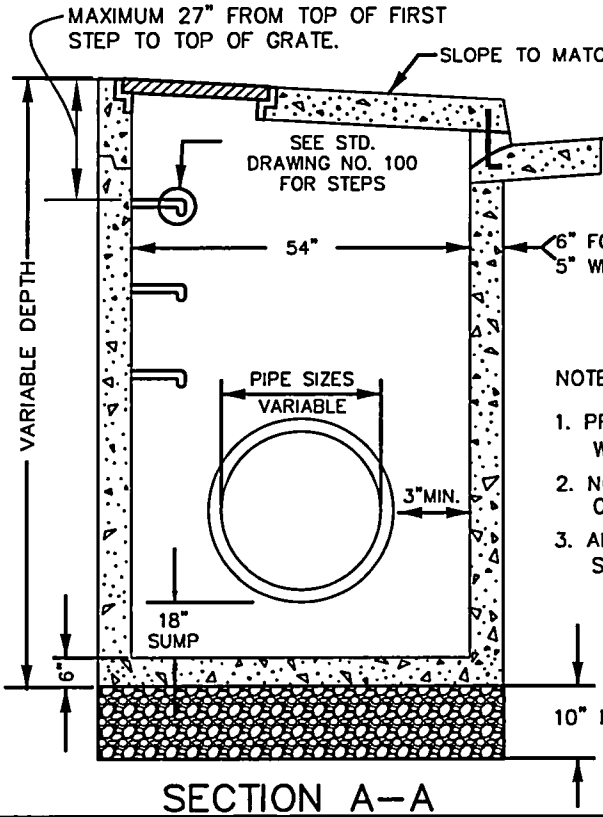


SECTION B–B

SEE STD. DRAWING NO. 200
FOR TOP SECTION DETAILS



PLAN VIEW



NOTES:

1. PRECAST CATCH BASIN SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C-478.
2. NON-SUMP INLET MANHOLE SHALL BE CHANNELED.
3. ALL POURED IN PLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 PSI. AND A SUMP OF 2" TO 4"

10" MINIMUM OF ¾" TO 0" COMPACTED BASE MATERIAL.

SECTION A–A

CURB INLET MANHOLE (CG–48 M.H.)

DRAWING NO. 195

REVISED 02–03

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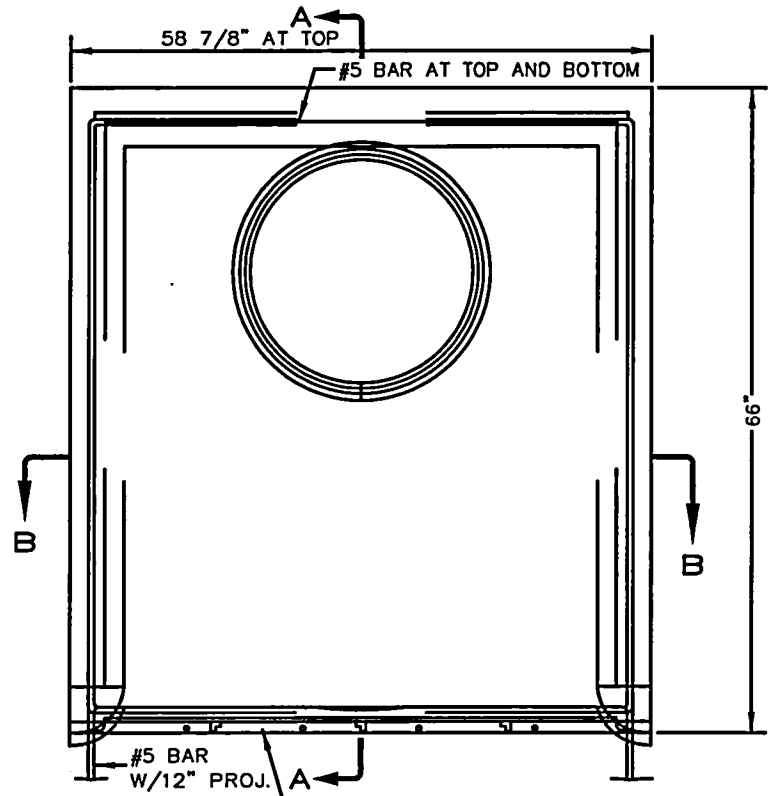
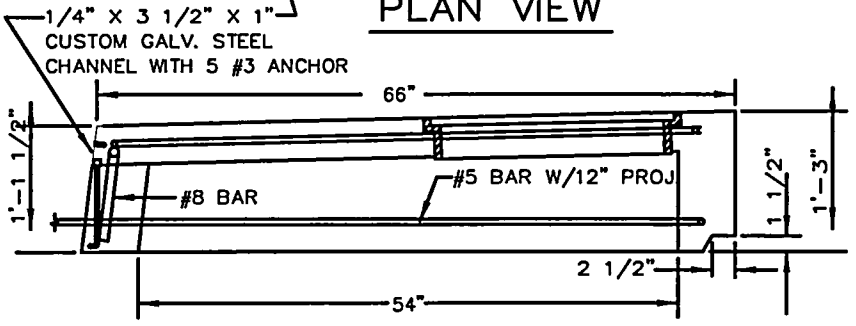
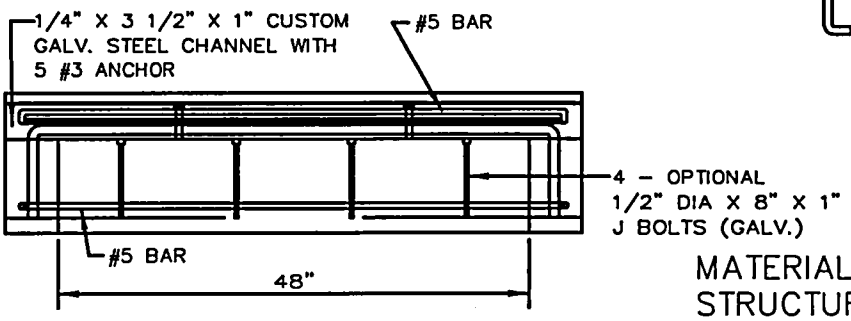


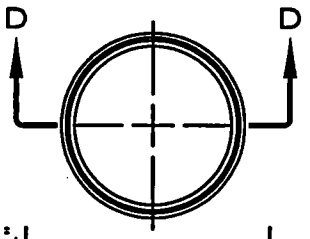
PLAN VIEW



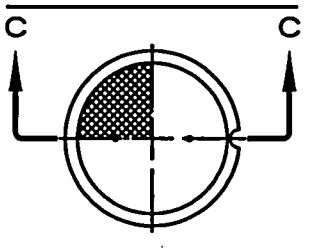
SECTION A–A



SECTION B–B

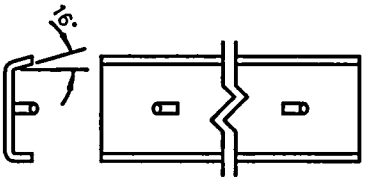


SECTION D–D



SECTION C–C

MANHOLE FRAME
AND COVER



CUSTOM STEEL
CHANNEL DETAIL

MATERIAL SHALL BE NEW
STRUCTURAL ASTM A–36
STEEL

TOP–CURB INLET MANHOLE AND MODIFIED CURB INLET MANHOLE (CG–48 M.H. AND MOD. CG–48 M.H.)

DRAWING NO. 200

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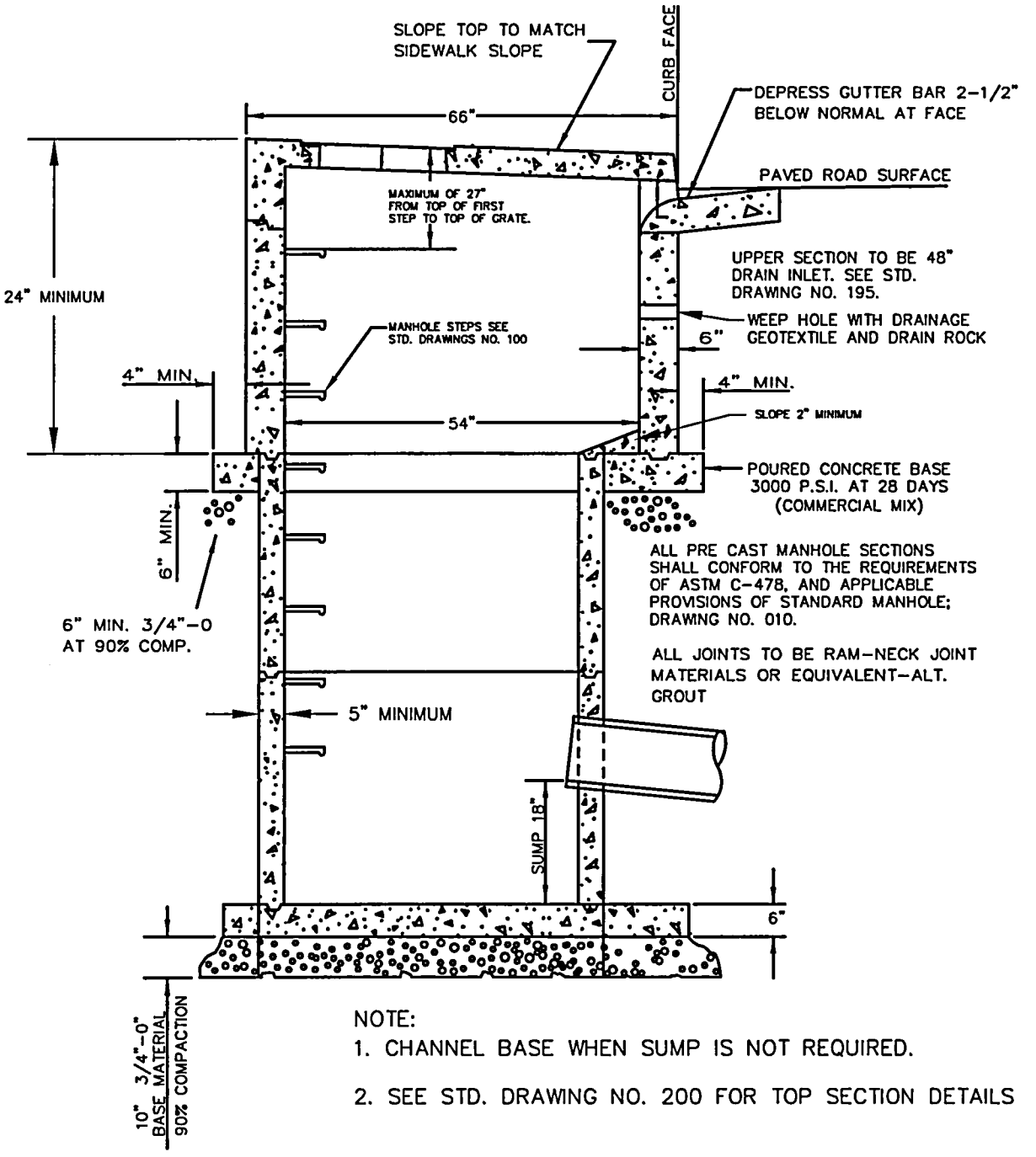

NOTE:

1. CHANNEL BASE WHEN SUMP IS NOT REQUIRED.
2. SEE STD. DRAWING NO. 200 FOR TOP SECTION DETAILS

APPROVED FOR USE BY WASHINGTON COUNTY ONLY.

MODIFIED CURB INLET MANHOLE (MOD.CG-48MH)

DRAWING NO. 205

REVISED 02-03

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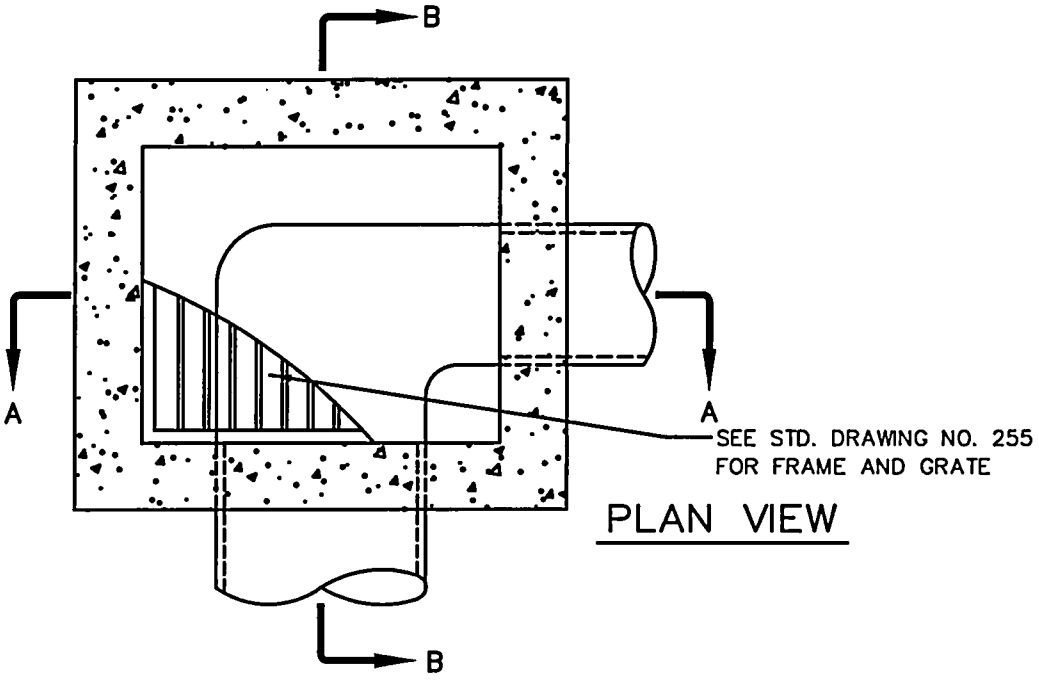
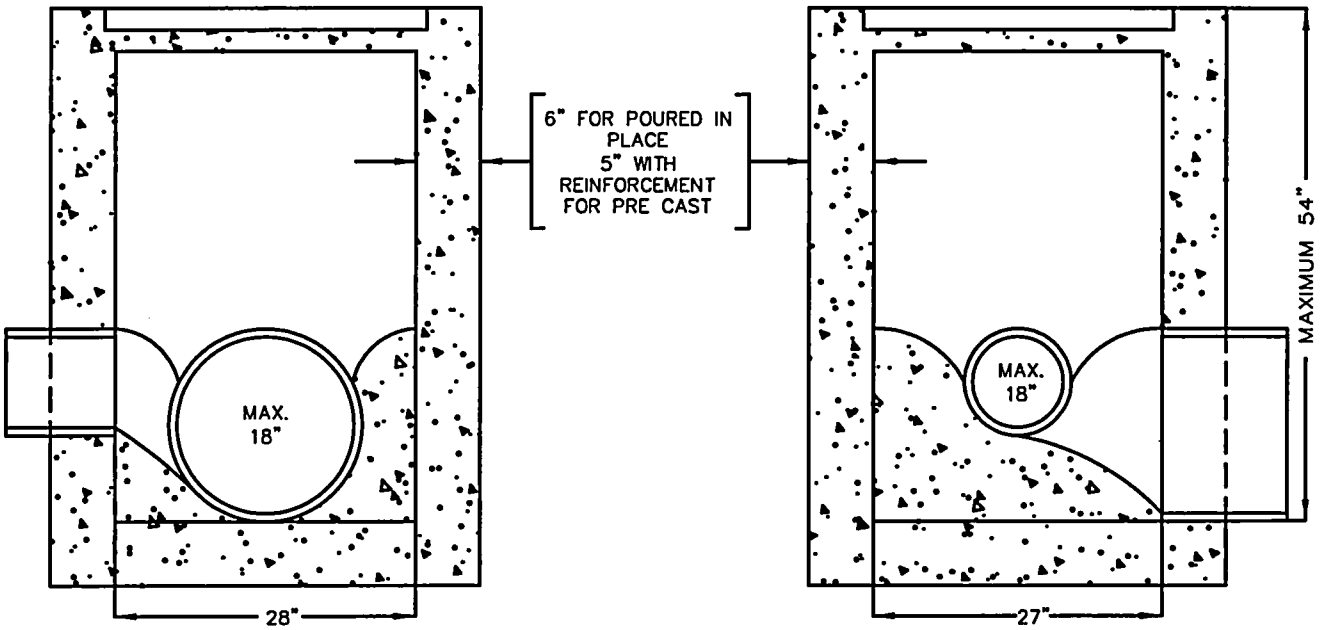


PLAN VIEW



SECTION A–A

SECTION B–B

NOTES:
1. ALL PRE CAST SECTIONS SHALL CONFORM TO REQUIREMENTS OF ASTM C-478.
2. INSTALL STRUCTURE ON MIN. OF 8" OF ¾"-0" COMPACTED BASE MATERIAL.
3. PRE CAST REINFORCEMENT SHALL BE REBAR MEETING ASTM A615 GRADE OR WELDED WIRE MEETING ASTM A497.
4. ALL POURED INPLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 P.S.I. AND A SLUMP OF 2" TO 4".
5. CHANNEL REQUIRED IN FLOW THROUGH APPLICATIONS, AS APPROVED. ALL OTHER APPLICATIONS REQUIRE AN 18" SUMP BELOW LOWEST PIPE INVERT.

AREA DRAIN TYPE II

DRAWING NO. 220

REVISED 02-03

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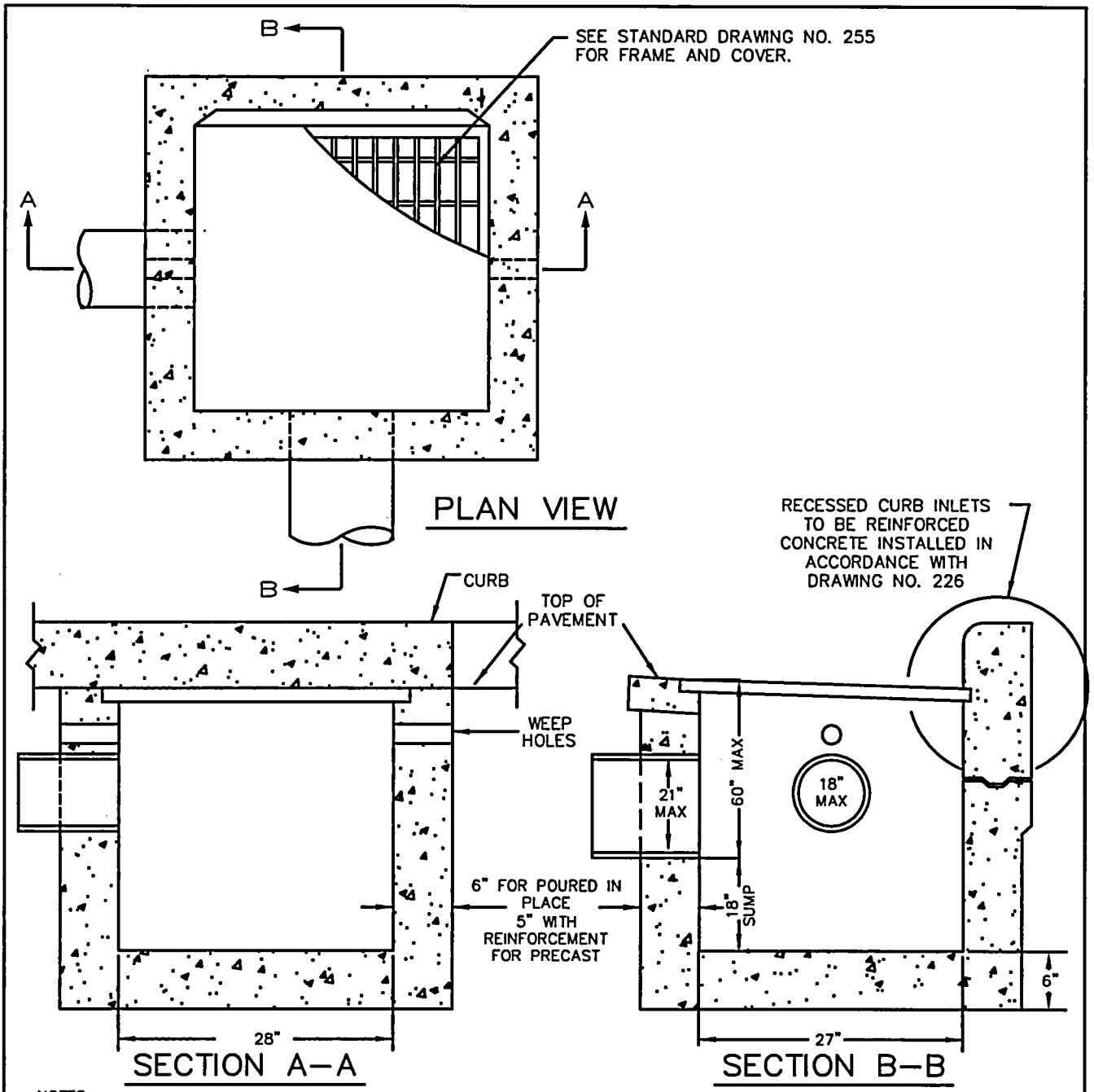

NOTES:

1. CATCH BASIN SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C-478.
2. INSTALL STEPS WHEN DISTANCE FROM TOP OF GRATE TO FLOWLINE OF PIPE IS GREATER THAN 48". SEE STANDARD DRAWING NO. 100. SET FIRST STEP 12" FROM TOP OF GRATE.
3. INSTALL STRUCTURE ON MINIMUM OF 8" OF ¾"-0" COMPACTED BASE MATERIAL.
4. REINFORCEMENT FOR PRECAST CATCH BASIN SHALL BE REBAR MEETING ASTM A-615 GRADE 60 OR WELDED WIRE MEETING ASTM A-497.
5. ALL POURED INPLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 P.S.I. AND A SLUMP OF 2" TO 4".
6. CHANNEL REQUIRED IN FLOW THROUGH APPLICATIONS, AS APPROVED. ALL OTHER APPLICATIONS REQUIRE AN 18" SUMP BELOW LOWEST PIPE INVERT.

GUTTER & CURB INLET CATCH BASIN (CG-2)

DRAWING NO. 225

REVISED 02-03

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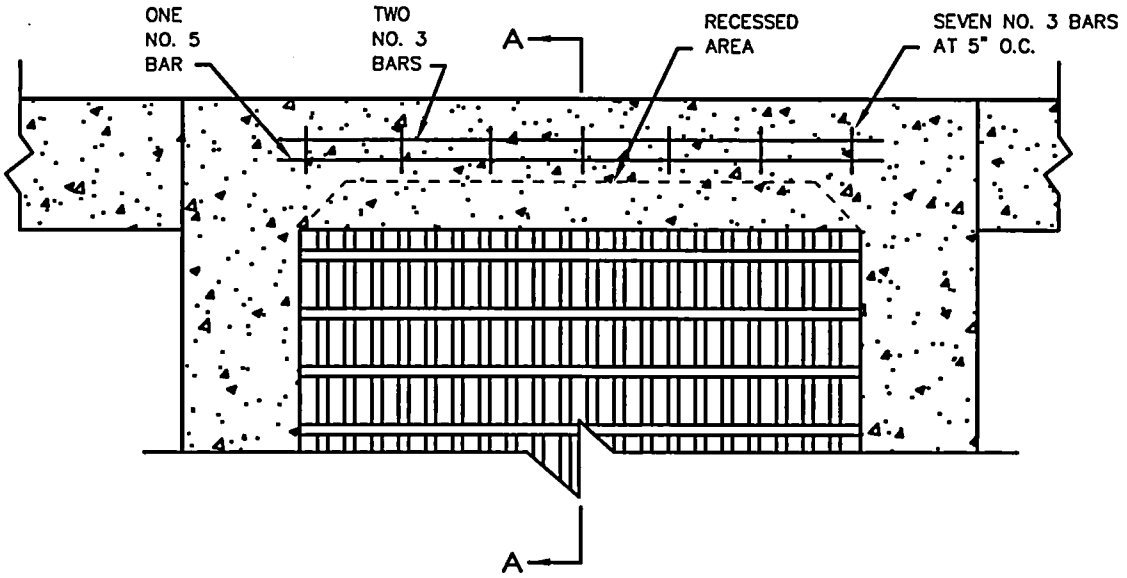
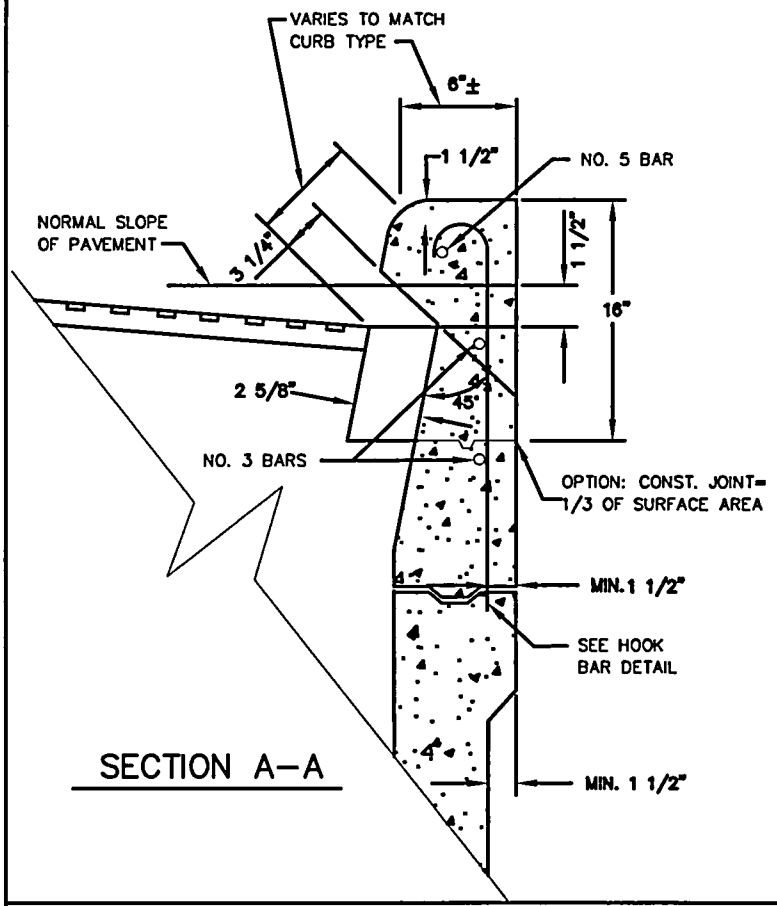
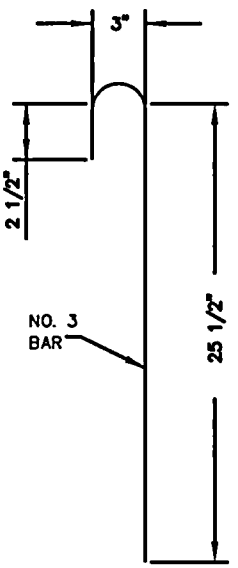


PLAN

SEE STD DRAWING NO. 255
FOR FRAME AND COVER.



SECTION A–A



HOOK BAR
DETAIL

GUTTER & CURB INLET CATCH BASIN (CG–2) REINFORCEMENT

DRAWING NO.226

REVISED 02–03

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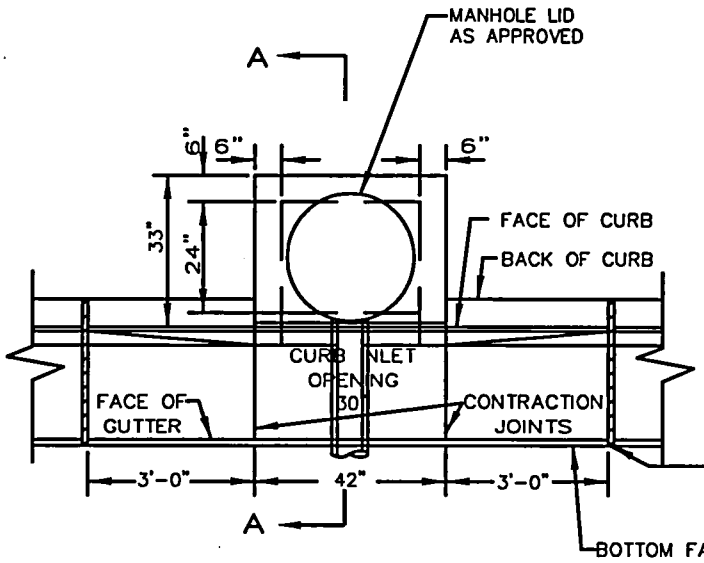
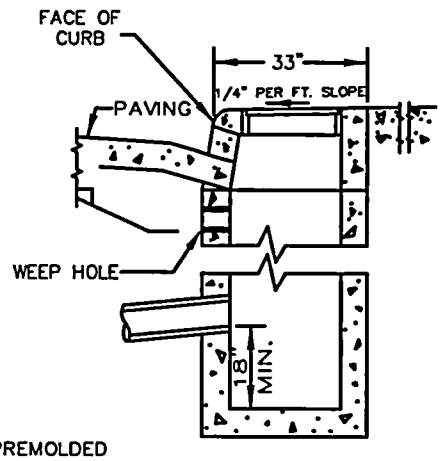
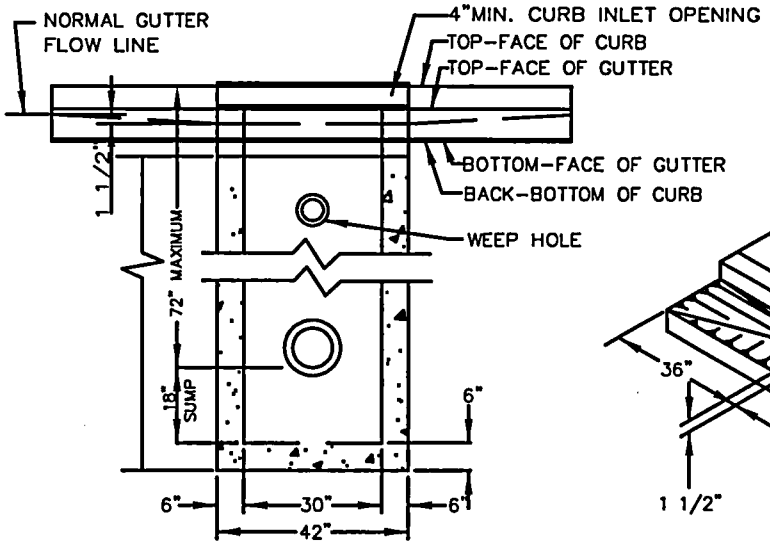


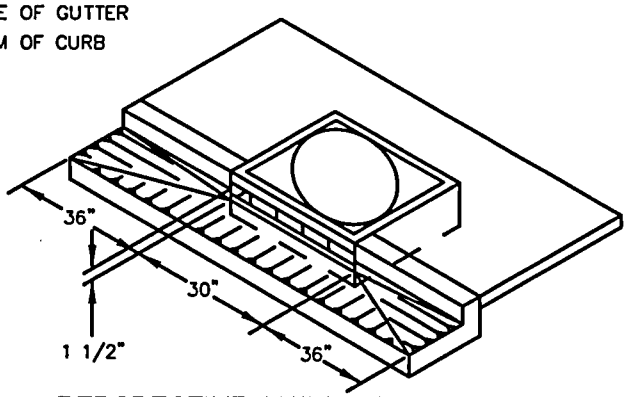
PLAN VIEW



SECTION A–A



FRONT VIEW



PERSPECTIVE VIEW SHOWING
DEPRESSED GUTTER AT CURB INLET

NOTES:
1. ALL FABRICATED METAL PARTS SHALL BE NEW STRUCTURAL, ASTM A–36 STEEL, AND BE HOT–DIPPED GALVANIZED AFTER FABRICATION.
2. ALL POURED IN PLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 P.S.I. AND A SLUMP OF 2" TO 4".
3. PRECAST CURB INLET IS PATTERNED AFTER WALT'S CONCRETE SPRINGFIELD, OR. CONCRETE CURB INLET PAT. NO. 4000953.
4. INSTALL STEPS WHEN DISTANCE FROM TOP OF LID TO FLOWLINE OF PIPE IS GREATER THAN 48" INCHES, SEE STD. DRAWING NO. 100. SET FIRST STEP 12" FROM TOP OF GRATE.
5. INSTALL STRUCTURE ON MINIMUM OF 8" OF ¾" TO 0" COMPACTED BASE MATERIAL.

INLET
CATCH BASIN (CG–30)

DRAWING NO. 230

REVISED 02–03

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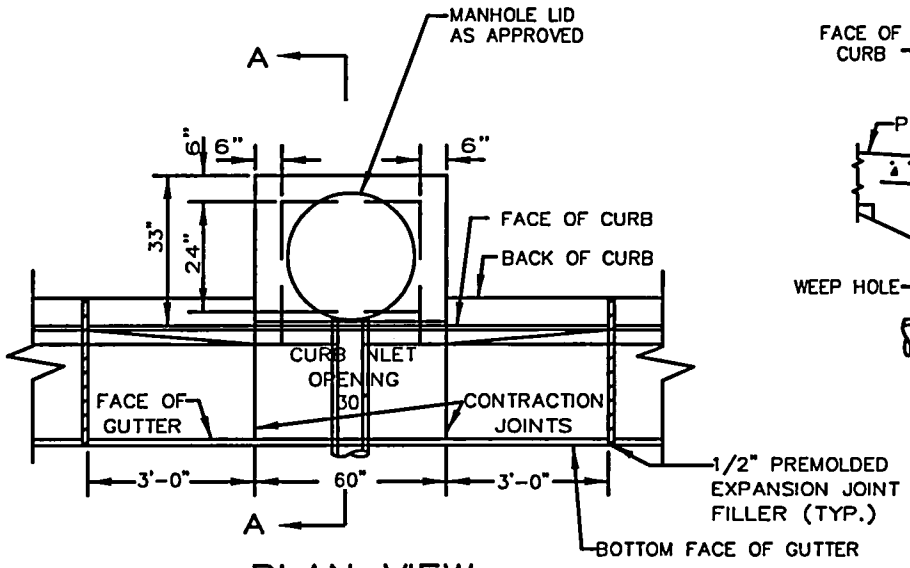
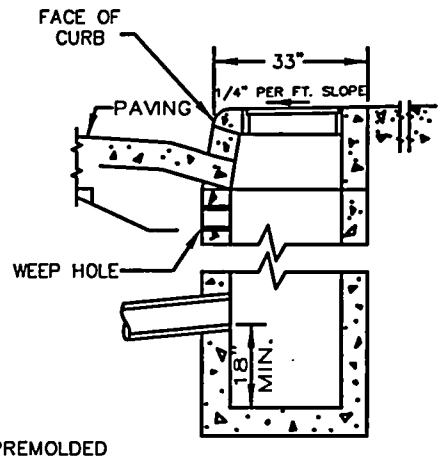
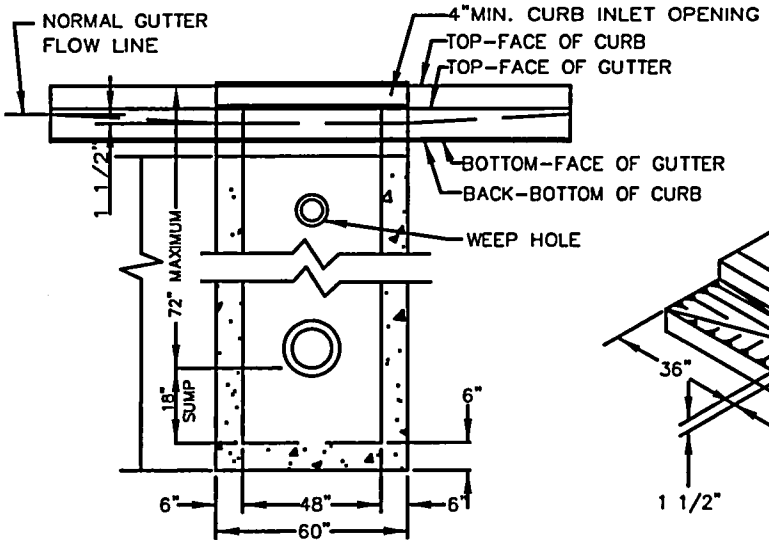


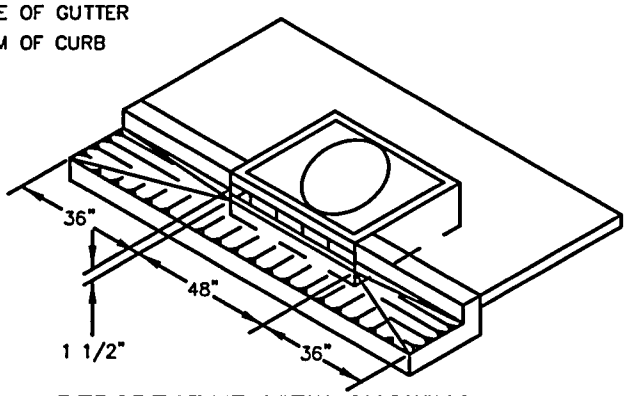
PLAN VIEW



SECTION A–A



FRONT VIEW



PERSPECTIVE VIEW SHOWING
DEPRESSED GUTTER AT CURB INLET

NOTES:
1. ALL FABRICATED METAL PARTS SHALL BE NEW STRUCTURAL, ASTM A–36 STEEL, AND BE HOT–DIPPED GALVANIZED AFTER FABRICATION.
2. ALL POURED IN PLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 P.S.I. AND A SLUMP OF 2" TO 4".
3. PRECAST CURB INLET IS PATTERNED AFTER WALT'S CONCRETE SPRINGFIELD, OR. CONCRETE CURB INLET PAT. NO. 4000953.
4. INSTALL STEPS WHEN DISTANCE FROM TOP OF LID TO FLOWLINE OF PIPE IS GREATER THAN 48" INCHES, SEE STD. DRAWING NO. 100. SET FIRST STEP 12" FROM TOP OF GRATE. AND ALIGN WITH LID OPENING.
5. INSTALL STRUCTURE ON MINIMUM OF 8" OF ¾" TO 0" COMPACTED BASE MATERIAL.

INLET
CATCH BASIN (CG–48)

DRAWING NO. 240

REVISED 02–03

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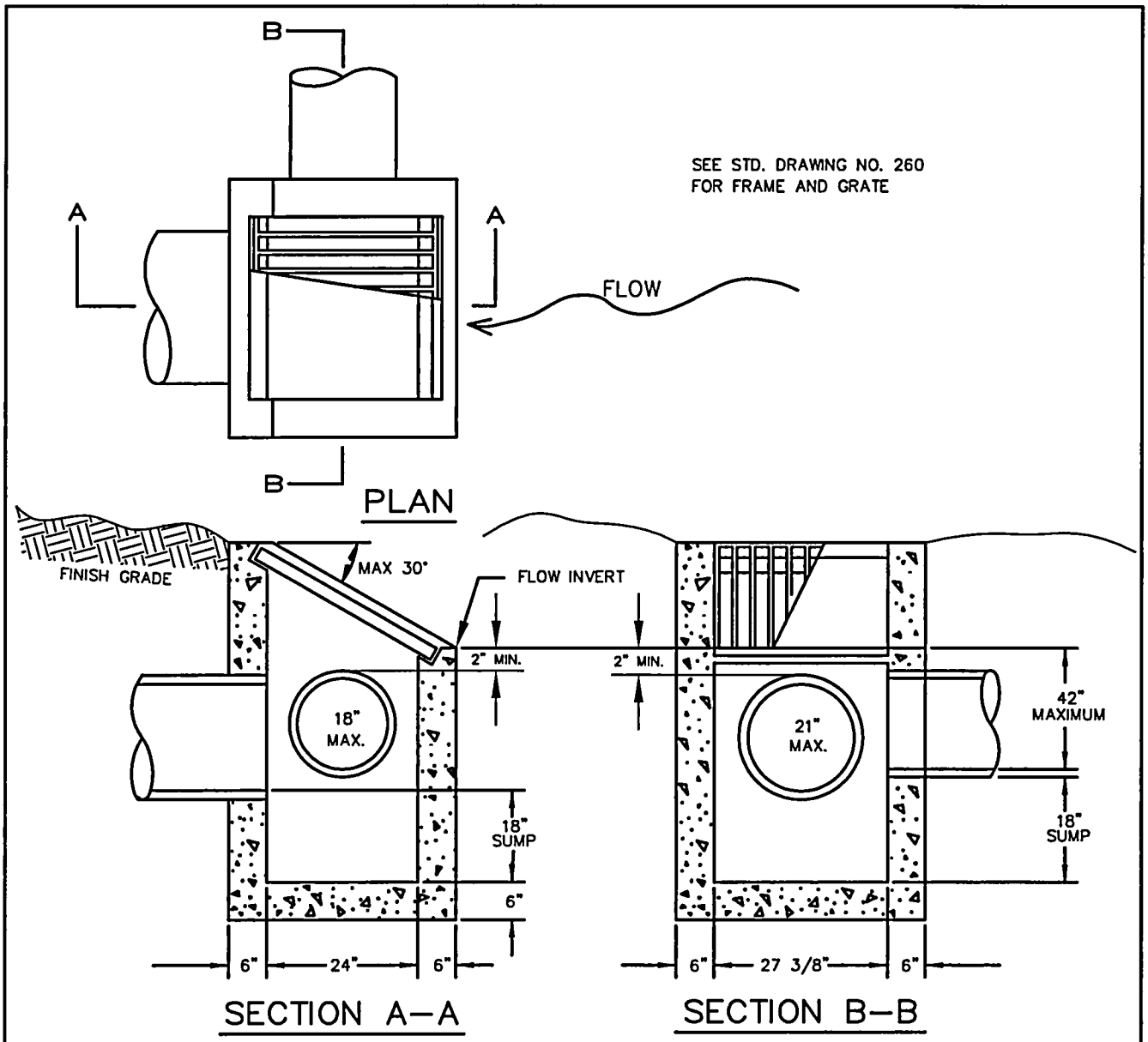

NOTES:
1. ALL PRE-CAST SECTIONS SHALL CONFORM TO REQUIREMENTS OF ASTM C-478.
2. INSTALL STRUCTURE ON MINIMUM OF 8" OF 3/4" - 0" COMPACTED BASE MATERIAL.
3. PRECAST REINFORCEMENT SHALL BE REBAR MEETING ASTM A615 GRADE 60 OR WELDED WIRE MEETING ASTM A497
4. ALL POURED IN PLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 PSI AND SLUMP OF 2"TO 4".

DITCH INLET

DRAWING NO. 250

REVISED 02-03

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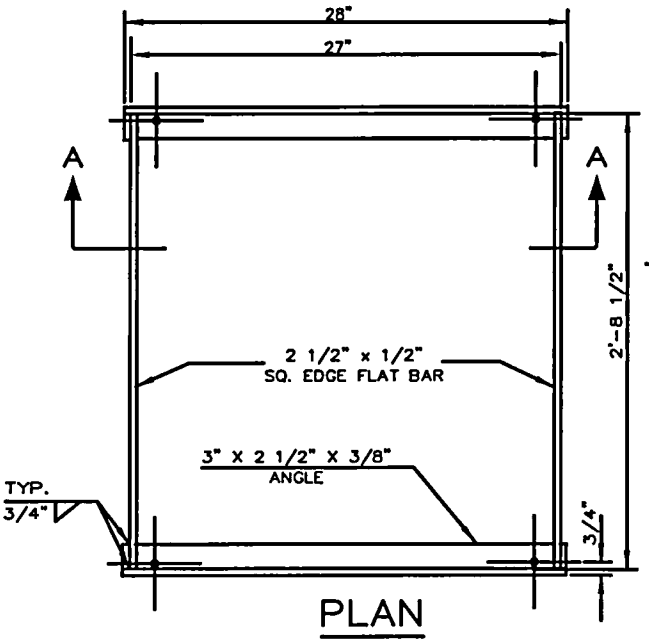
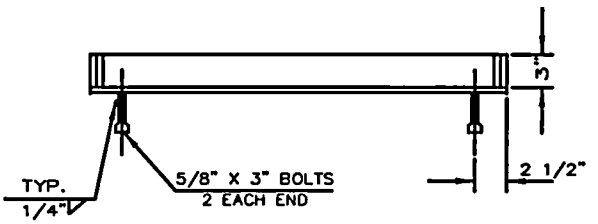
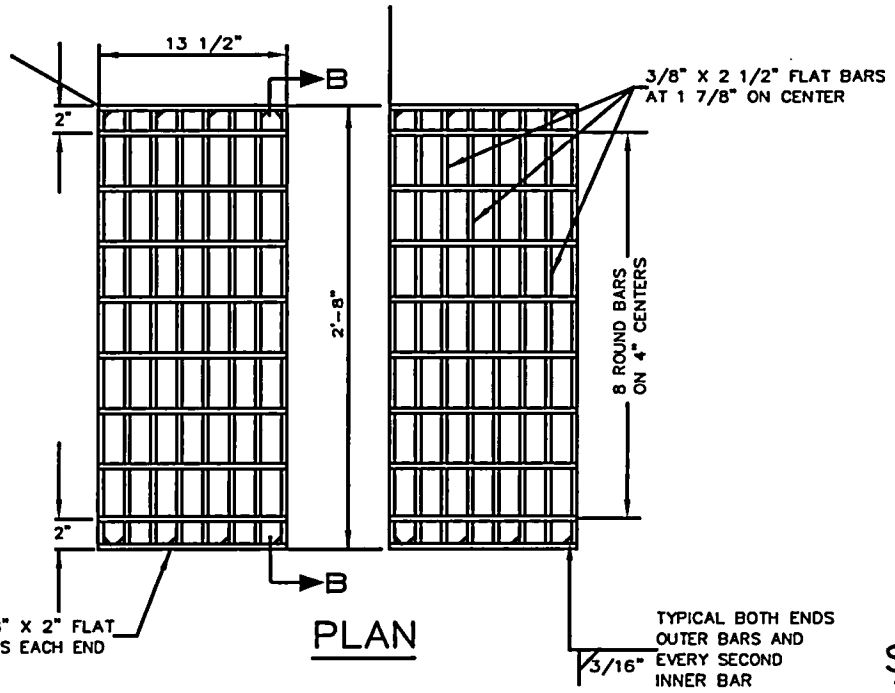


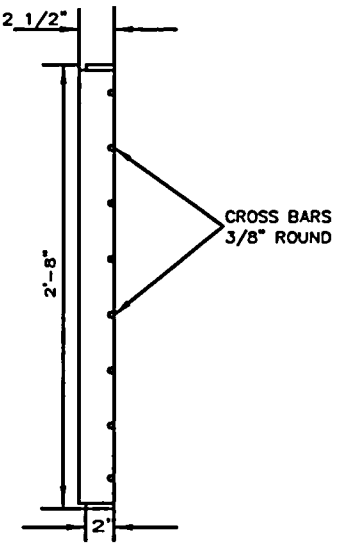
PLAN



SECTION A–A



PLAN



SECTION B–B

NOTE:
FRAME AND GRATE TO BE NEW STRUCTURAL ASTM A-36 FLAT BAR STEEL OR APPROVED EQUAL.
ADDITIONAL THICKNESS AND REINFORCEMENT SHALL BE REQUIRED FOR STATE HIGHWAY APPLICATIONS.

CATCH BASIN
FRAME AND GRATE (L–G2)

DRAWING NO. 255

REVISED 02–03

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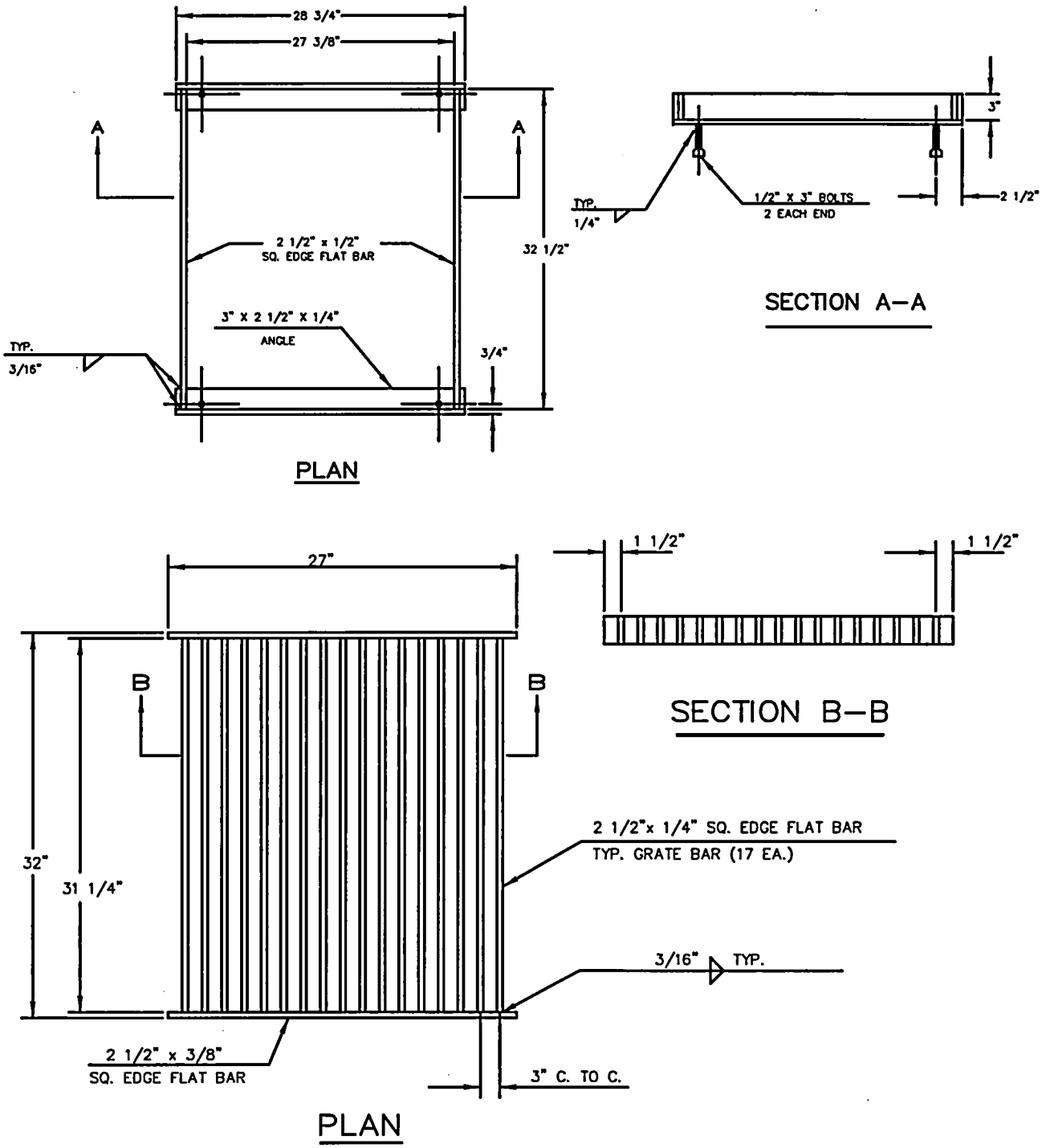

NOTE:
FRAME AND GRATE SHALL BE NEW STRUCTURAL ASTM A–36 FLAT BAR STEEL OR APPROVED EQUAL.

DITCH INLET FRAME AND GRATE

DRAWING NO. 260

REVISED 02–03

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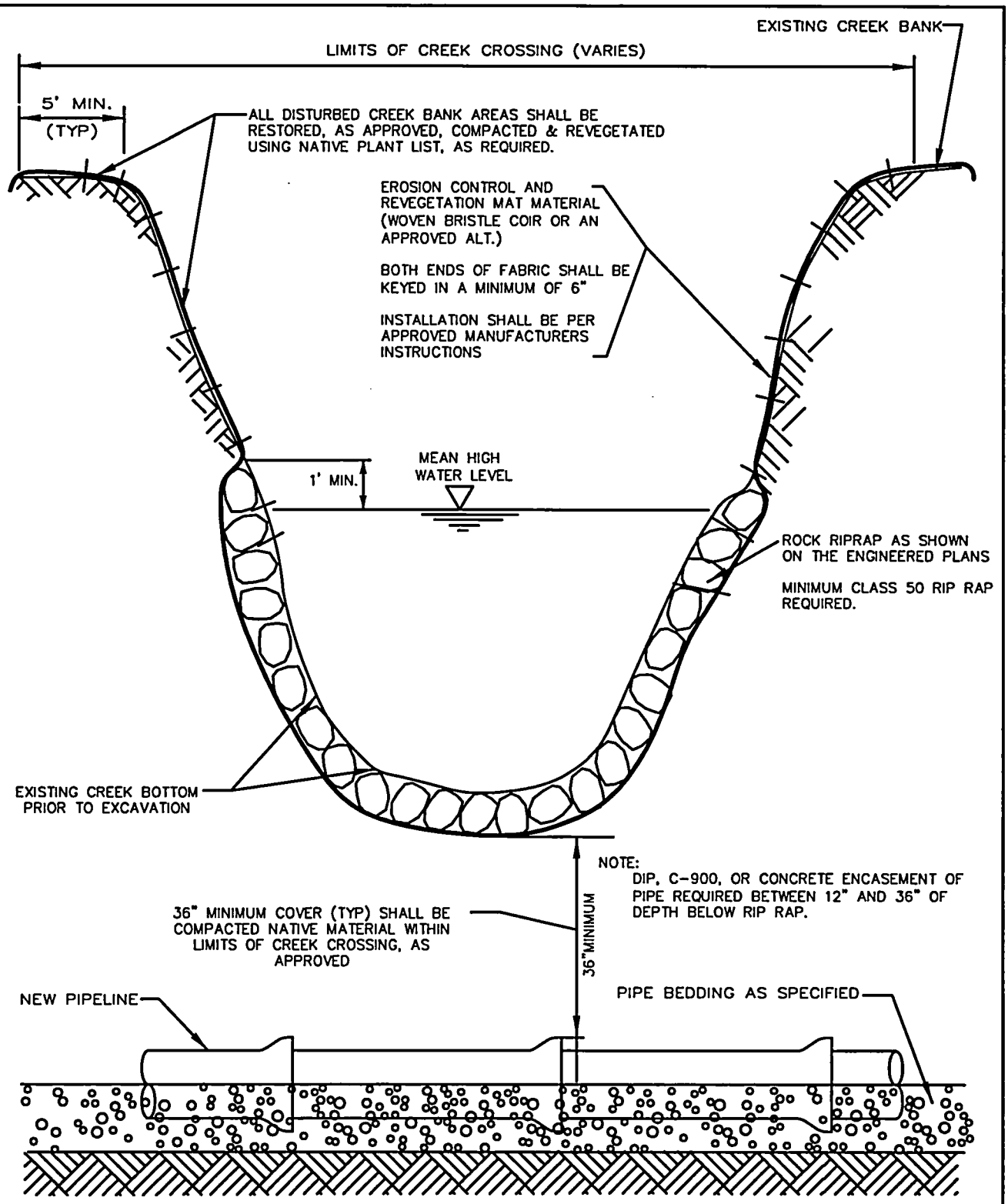

CREEK CROSSING RESTORATION

DRAWING NO. 270

REVISED 02-03

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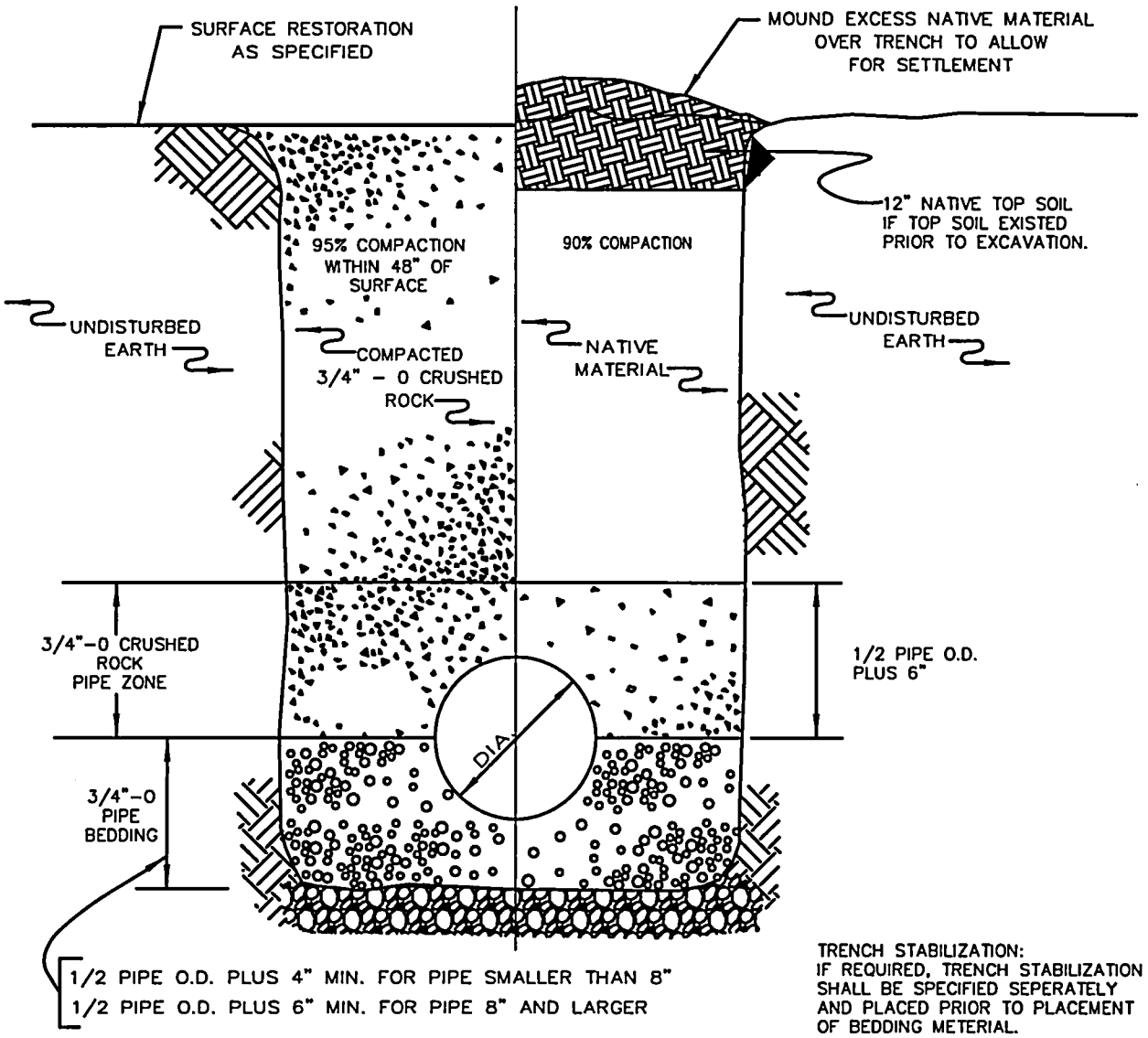
CLASS "B" CLASS "A"



TRENCH STABILIZATION:
IF REQUIRED, TRENCH STABILIZATION SHALL BE SPECIFIED SEPERATELY AND PLACED PRIOR TO PLACEMENT OF BEDDING METERIAL.

TRENCH BACKFILL DETAILS

DRAWING NO. 280

REVISED 02-03

Clean Water Services
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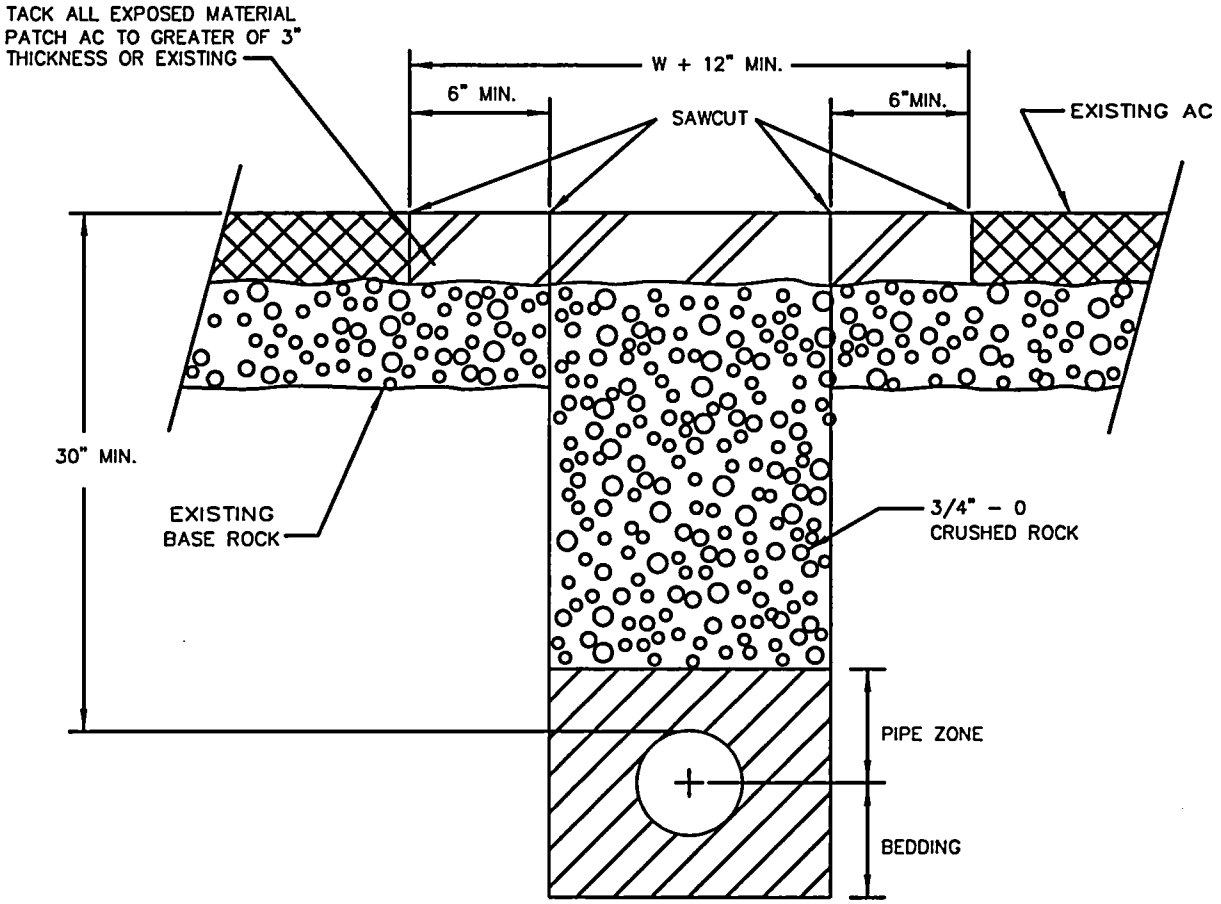

NOTE:
1. TEE CUT TO BE DONE AFTER EXCAVATION AND BACKFILL OF TRENCH.
2. SEE STD. DRAWING NO. 280 FOR BEDDING, PIPE ZONE, AND TRENCH BACKFILL.

T-CUT
ASPHALT DETAILS

DRAWING NO. 285

REVISED 02-03

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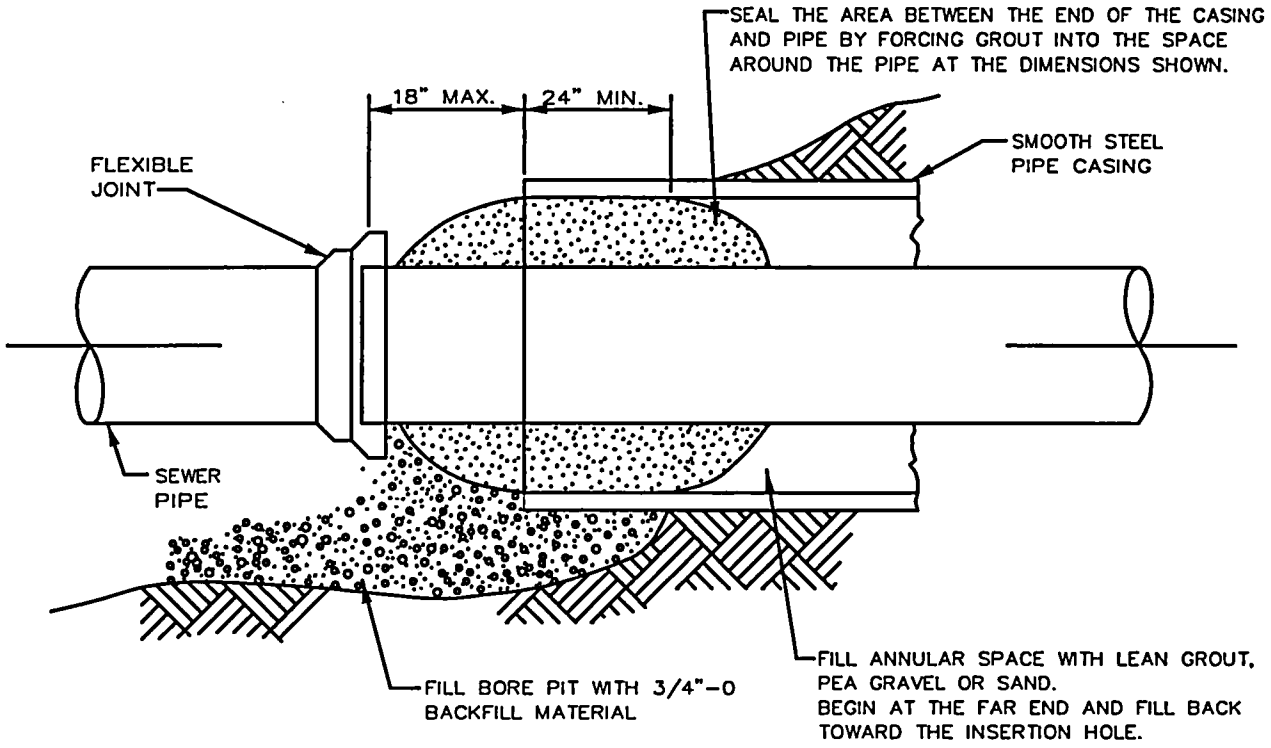
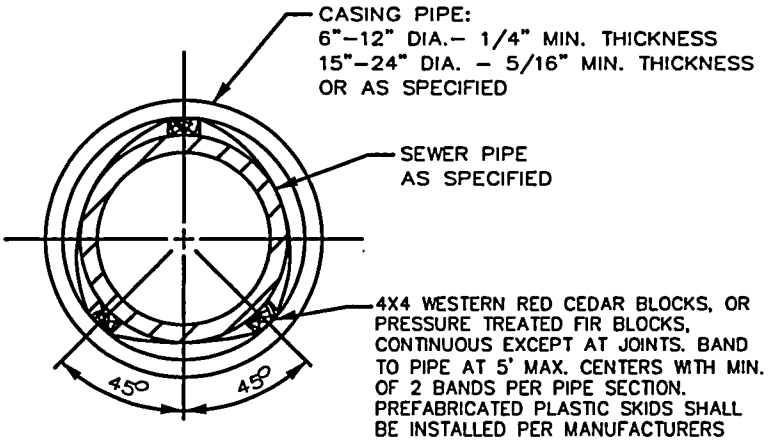


PIPE SEAL DETAIL



CASING SECTION

BORE DETAIL

DRAWING NO. 370

REVISED 02-03

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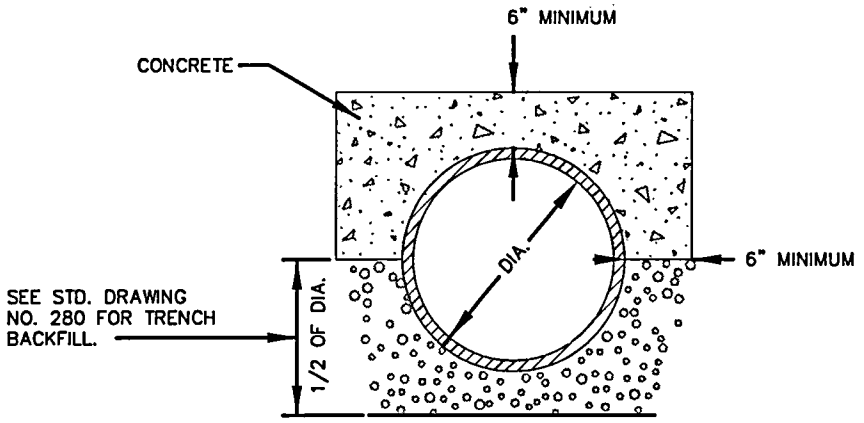
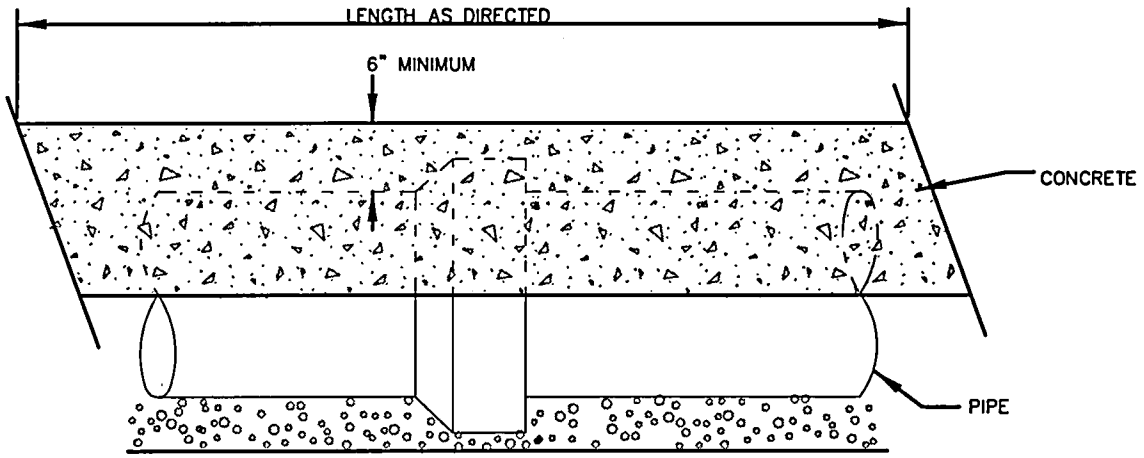


END VIEW

NOTE:
CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 PSI AND 2" TO 4" SLUMP.



SIDE VIEW

CONCRETE CAP

DRAWING NO. 371

REVISED 02-03

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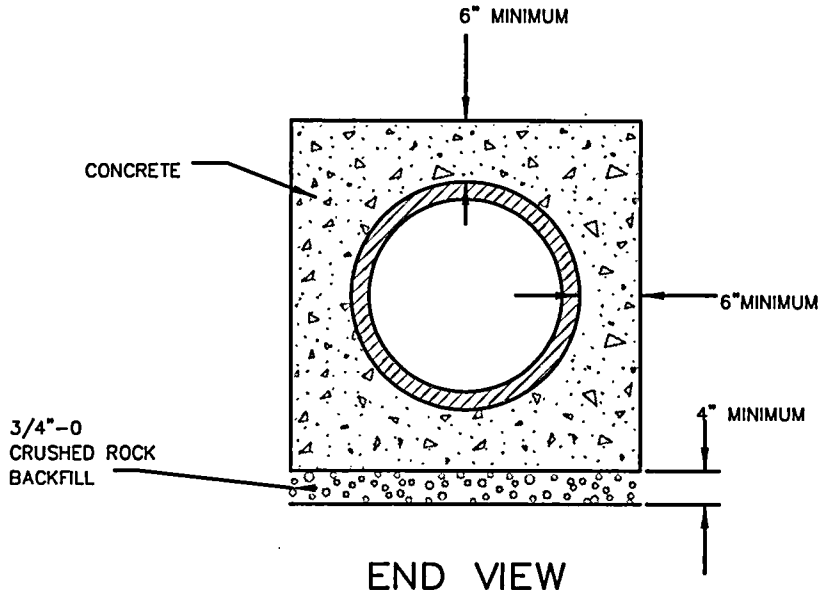
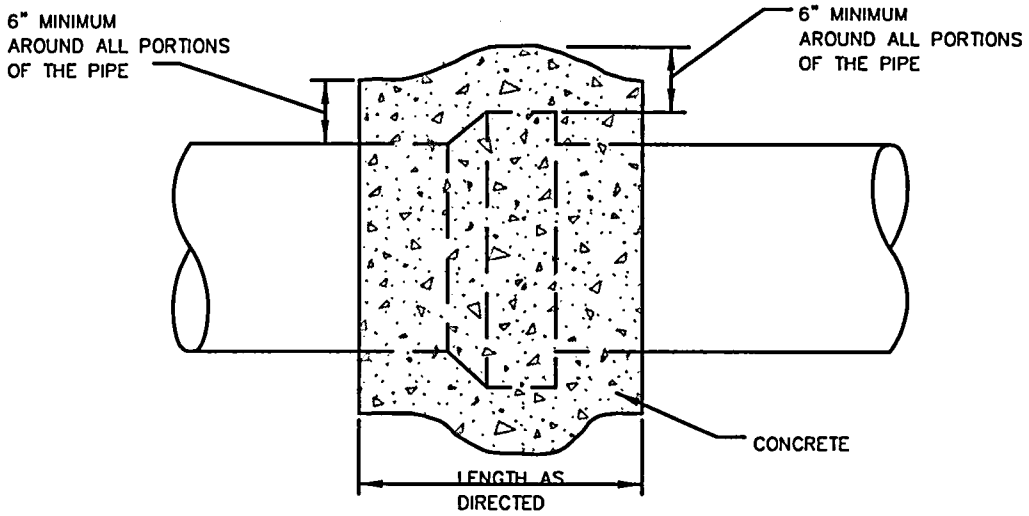


END VIEW



SIDE VIEW

NOTE:
CONCRETE SHALL HAVE A
28 DAY STREGTH OF 3000 PSI
AND, 2" TO 4" SLUMP.

CONCRETE ENCASEMENT/ CLOSURE COLLAR

DRAWING NO. 372

REVISED 02-03

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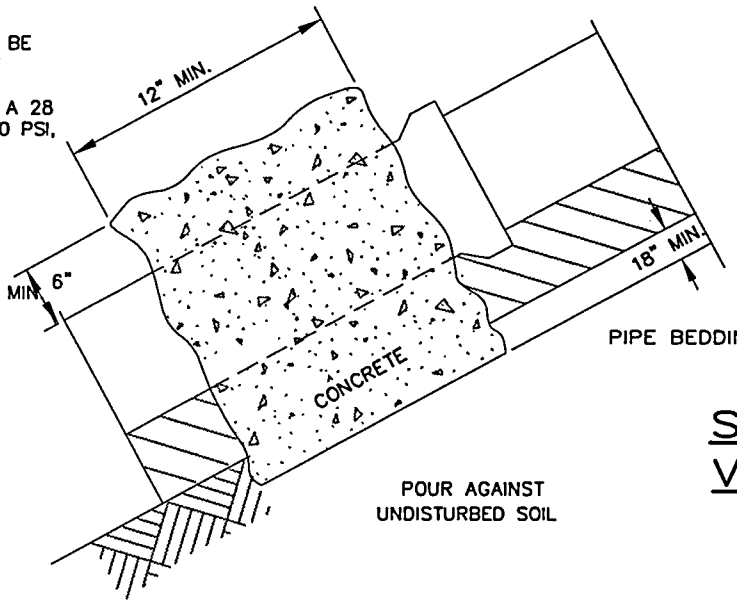
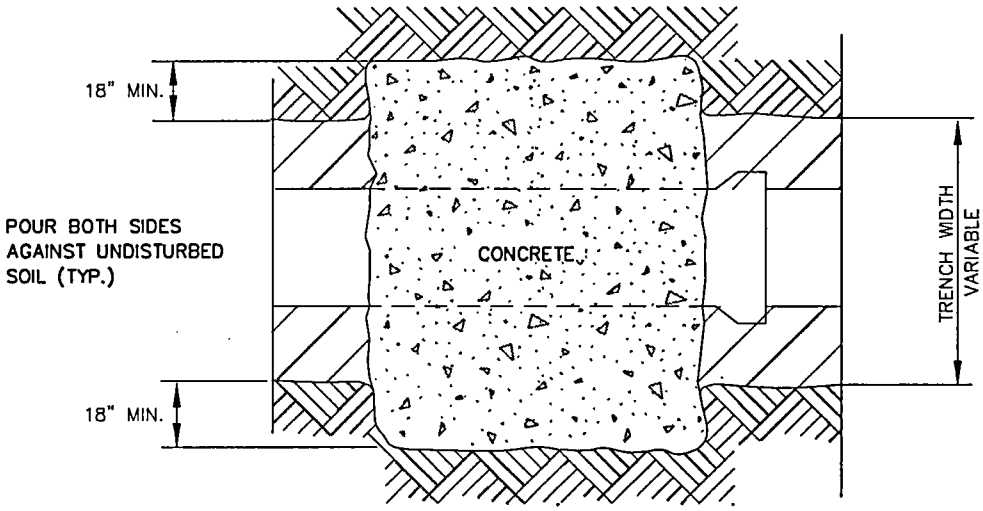
NOTE:
1. CONCRETE ANCHORS TO BE INSTALLED IMMEDIATELY DOWNHILL OF PIPEBELL.
2. CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 PSI, AND 2" TO 4" SLUMP.



SIDE VIEW



PLAN

SLOPE	MIN. ANCHOR SPACING CENTER TO CENTER
20% – 34%	35'
35% – 50%	25'
51% +	15' OR CONC. ENCASEMENT

ODOT "METAL PIPE SLOPE ANCHORS" DWG # RD 330 IS ACCEPTABLE ALTERNATIVE

ANCHOR WALL

DRAWING NO. 373

REVISED 02-03

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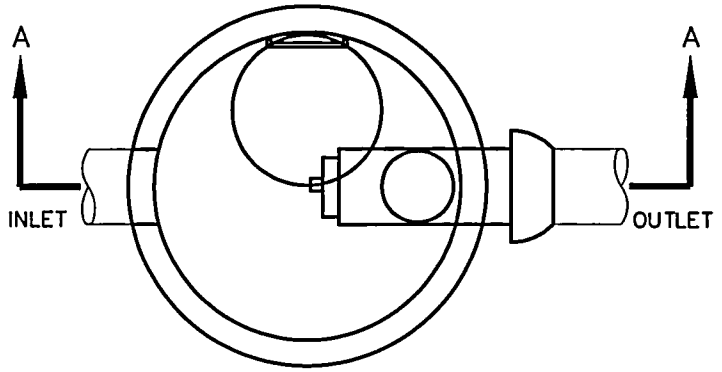


PLAN

NOTES:
1. ALL MANHOLE SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478 AND APPLICABLE PROVISIONS OF STD. MANHOLE DRAWING NO. 010
2. INLET AND OUTLET PIPE NOT TO EXCEED 18"DIA.
3. PROVIDE SPECIAL DETAIL FOR OUTLET FLOW CONTROL EXCEEDING 18" DIA.

SUMP VOLUME AVAILABLE

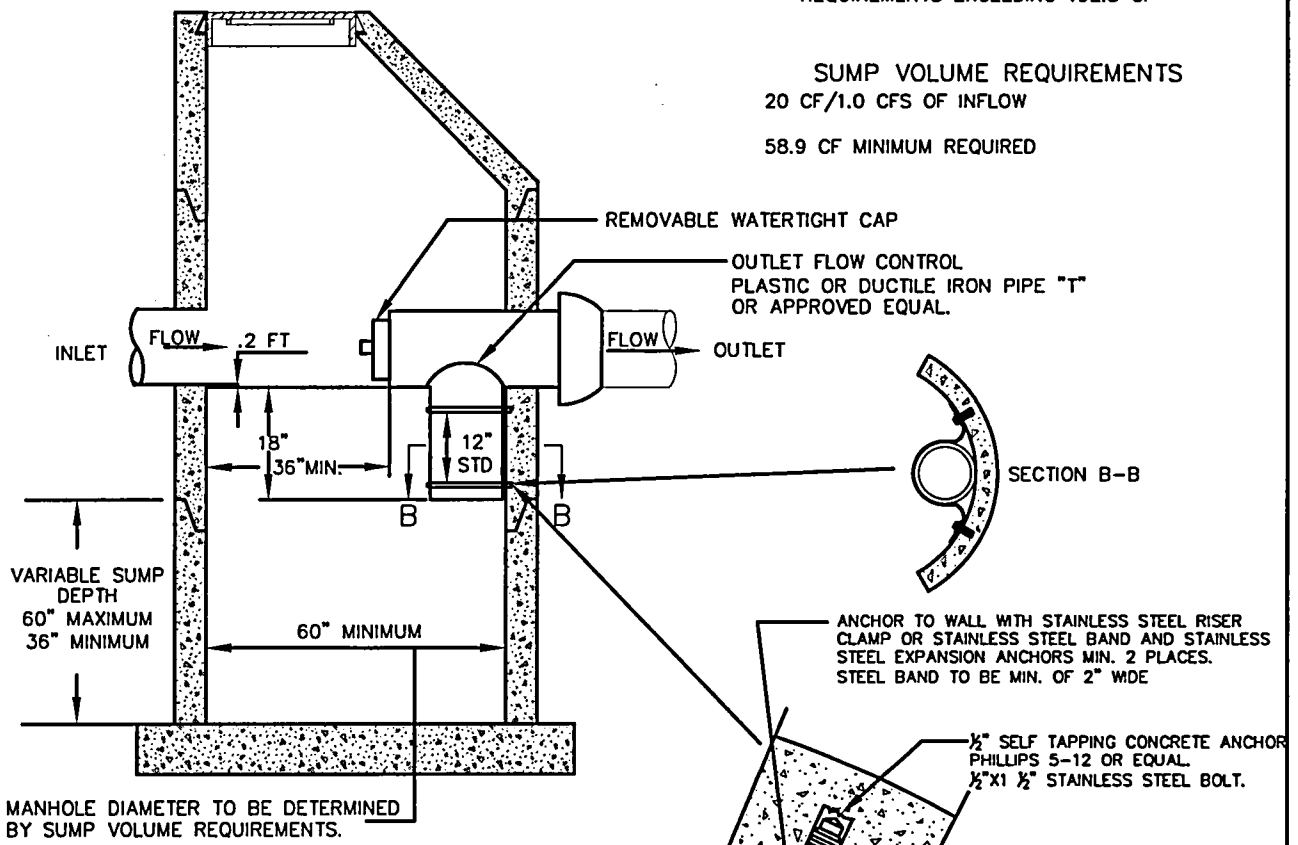
	MINIMUM	MAXIMUM
60" M.H.=	58.9 CF	98.1 CF
72" M.H.=	84.8 CF	141.3 CF
84" M.H.=	115.4 CF	192.3 CF

PROVIDE SPECIAL DETAIL FOR VOLUME REQUIREMENTS EXCEEDING 192.3 CF

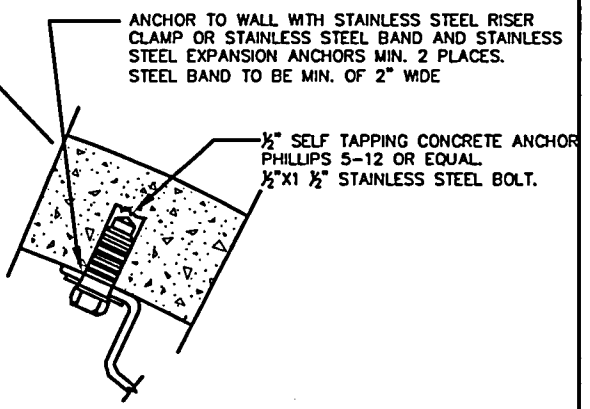
SUMP VOLUME REQUIREMENTS

20 CF/1.0 CFS OF INFLOW

58.9 CF MINIMUM REQUIRED



SECTION A-A



CLAMP DETAIL
(SECTION A-A)
N.T.S.

WATER QUALITY MANHOLE

DRAWING NO. 515

REVISED 09-03

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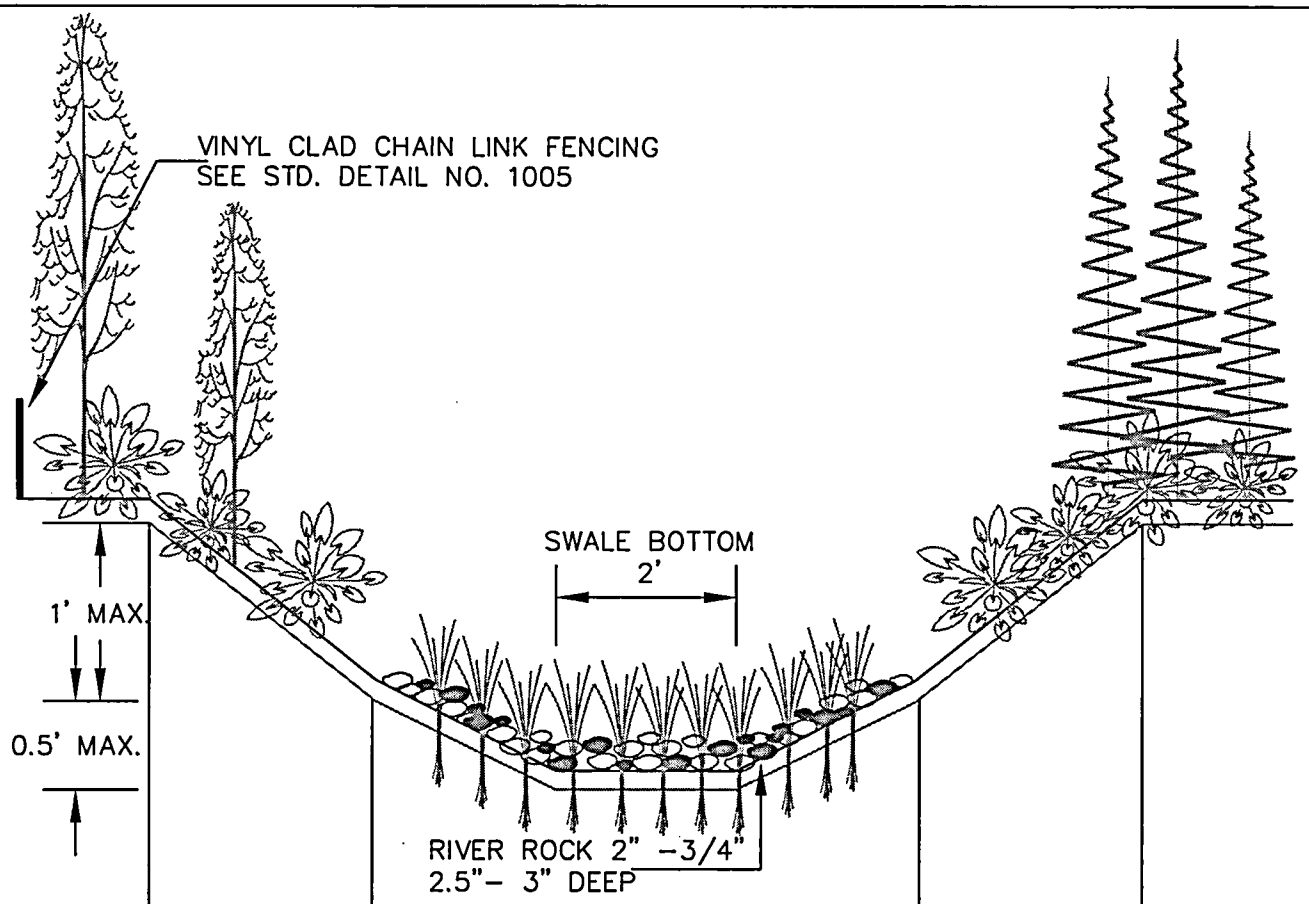
WATER QUALITY SWALE

DRAWING NO. 520

REVISED 12-03



SWALE AREA	FREEBOARD AREA	TREATMENT AREA 6' MINIMUM WIDTH	FREEBOARD AREA	BUFFER/MITIGATION AREA
EC MATTING	ECONOJUTE*	COCONUT FIBER OR GEOJUTE PLUS*	ECONOJUTE*	ECONOJUTE* (S> 20%)
SEED MIX	LOW GROW MIX	WET/MOIST MIX	LOWGROW MIX	UPLAND MIX
MAX. SLOPE	2.5:1	4:1	2.5:1	NA

* OR AS APPROVED

NOTES:

1. REFER TO APPENDIX D, CWS DESIGN & CONSTRUCTION STANDARDS, FOR LANDSCAPING REQUIREMENTS INCLUDING TREE PLACEMENT, TOPSOIL AND PLANTING SPECIFICATIONS.
2. PROVIDE IRRIGATION AS APPROVED BY CWS.
3. JUTE MATTING- GEOJUTE PLUS IN TREATMENT AREA, ECONOJUTE FOR ALL OTHER AREAS, OR SIMILIAR FABRICS. COCONUT FIBER IS ALSO ACCEPTABLE.
4. 12-INCHES OF TOPSOIL SHALL BE PLACED THROUGHOUT THE WATER QUALITY TRACT.

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CONSTRUCTION

1. Water Quality Swale shall be over-excavated and filled to final grade with 12-inch amended topsoil. Topsoil amendments shall be garden compost, not conventional fertilizer amendments.
2. A biodegradable Erosion Control Matting shall be placed over the topsoil throughout the swale cross section, fabric shall be held in place in accordance with the manufacturer's installation requirements. Anchor spacing shall be based on 3 fps flow over the fabric.
    a. Treatment area - high-density jute matting (Geojute Plus or other approved equal)
    b. All other areas - low-density jute matting (Econojute or other approved equal)
3. 2.5-3 inches of 2"-$\frac{3}{4}$" river run rock shall be placed over the matting evenly throughout the length and width of the swale.
4. Plant materials shall be placed in accordance with the plan and plant table as shown on approved plans.
5. The water quality swale treatment area plantings can be deemed "substantially complete" once active green growth has occurred to an average growth of 3" and plant density is an average of approx. 6 plants (minimum 1-inch plugs or equivalent) per square foot.
6. The facility shall be deemed acceptable to begin the maintenance period when plant growth and density matches the engineer's design as shown on the approved plans and all other requirements have been met. The engineer must certify the facility to be functional, in accordance with the approved plan design to begin the two-year maintenance period.

MAINTENANCE

1. The permittee is responsible for the maintenance of this facility for a minimum of two years following construction and acceptance of this facility per Chapter 2.
2. Irrigation is to be provided per separate irrigation plan as approved.
   Note: Irrigation needs are to be met using a temporary irrigation system with a timer during the dry season. Systems should be winterized during the wet season to assure longevity and guard against damage from freezing temperatures. Water source shall be as shown on the approved plans.
3. Engineer or Owners Representative is to visit and evaluate the site a minimum of twice annually (Spring and Fall). The landscaping shall be evaluated and replanted as necessary to ensure a minimum of 80% survival rate of the required vegetation and 90% aerial coverage. Non-native, invasive plant species shall be removed when occupying more than 20% of the site.
4. The facility shall be re-excavated and planted if siltation greater than 3 inches in depth occurs within the two-year maintenance period.

WATER QUALITY SWALE CONSTRUCTION & MAINTENANCE NOTES

DETAIL NO. 530

REVISED 12-03

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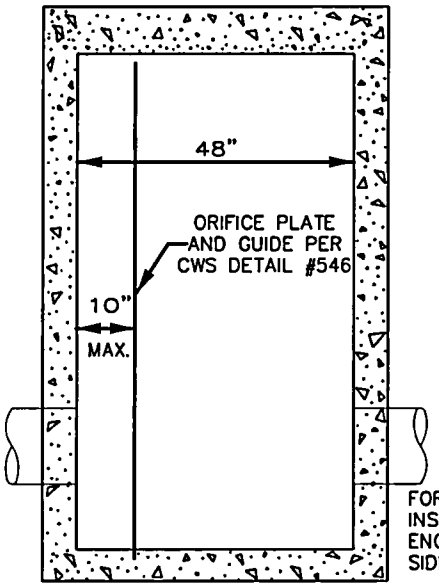
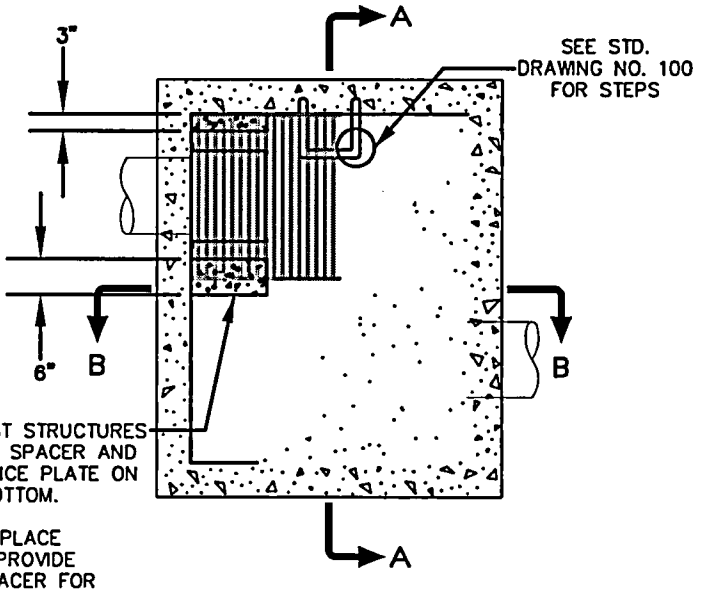
SEE STD. DRAWING NO. 200
FOR TOP SECTION DETAILS



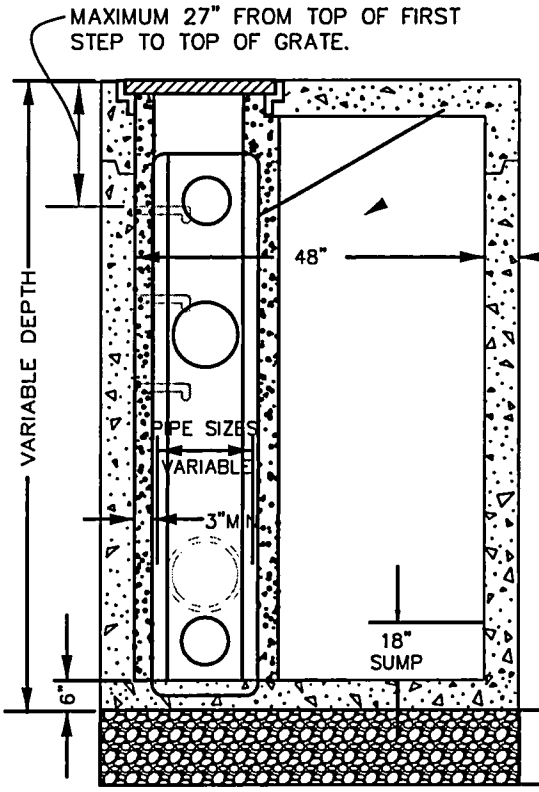
SECTION B–B



FOR PRE-CAST STRUCTURES INSTALL HDPE SPACER AND ENCLOSE ORIFICE PLATE ON SIDES AND BOTTOM.

FOR CAST IN PLACE STRUCTURES PROVIDE CONCRETE SPACER FOR MOUNTING FRAME.

PLAN VIEW



SECTION A–A

NOTES:

1. THIS IS AN ALTERNATE DESIGN FOR THE SECONDARY STRUCTURE IN OUTFLOW CONTROL STRUCTURE– CWS DETAIL #545
2. PRECAST CATCH BASIN SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C–478.
3. NON–SUMP INLET MANHOLE SHALL BE CHANNELED.
4. ALL POURED IN PLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 PSI. AND A SUMP OF 2" TO 4"
5. ORIFICE I.E. TO BE SHOWN ON PLAN SET. ORIFICE DESIGN TO BE OUTLINED IN DRAINAGE REPORT.

10" MINIMUM OF ¾" TO 0" COMPACTED BASE MATERIAL.

ALTERNATIVE OUTFLOW CONTROL STRUCTURE (MODIFIED CG–48 M.H.)

DRAWING NO. 544

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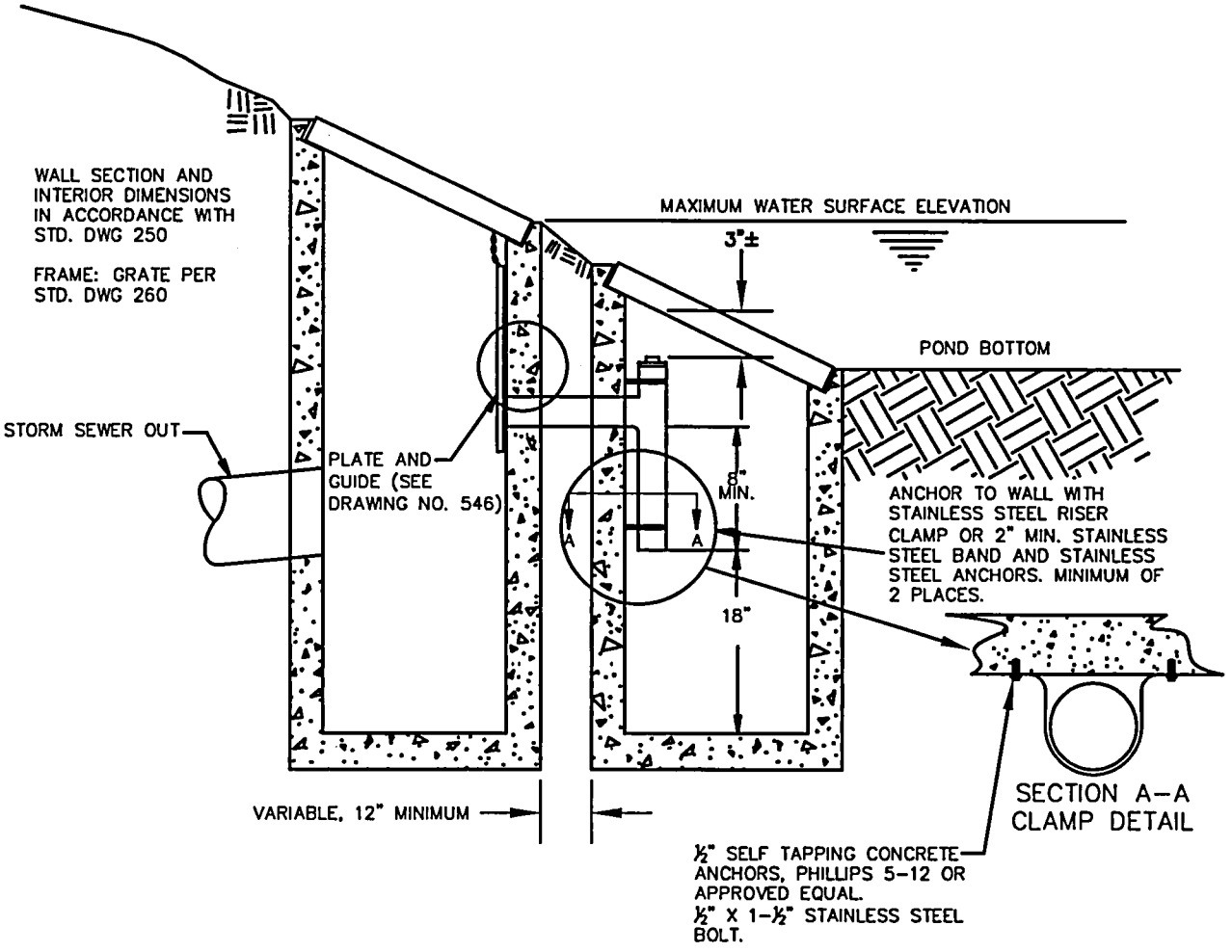

NOTES:

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. 259 DITCH INLET.
4. FRAME AND GRATE SHALL CONFORM TO STANDARD DRAWING NO. 260, DITCH INLET FRAME AND GRATE.
5. PLATE AND GUIDE SHALL BE SECURED FLUSH AGAINST WALL OF STRUCTURE AS APPROVED.

OUTFLOW CONTROL STRUCTURE

DRAWING NO. 545

REVISED 02-03

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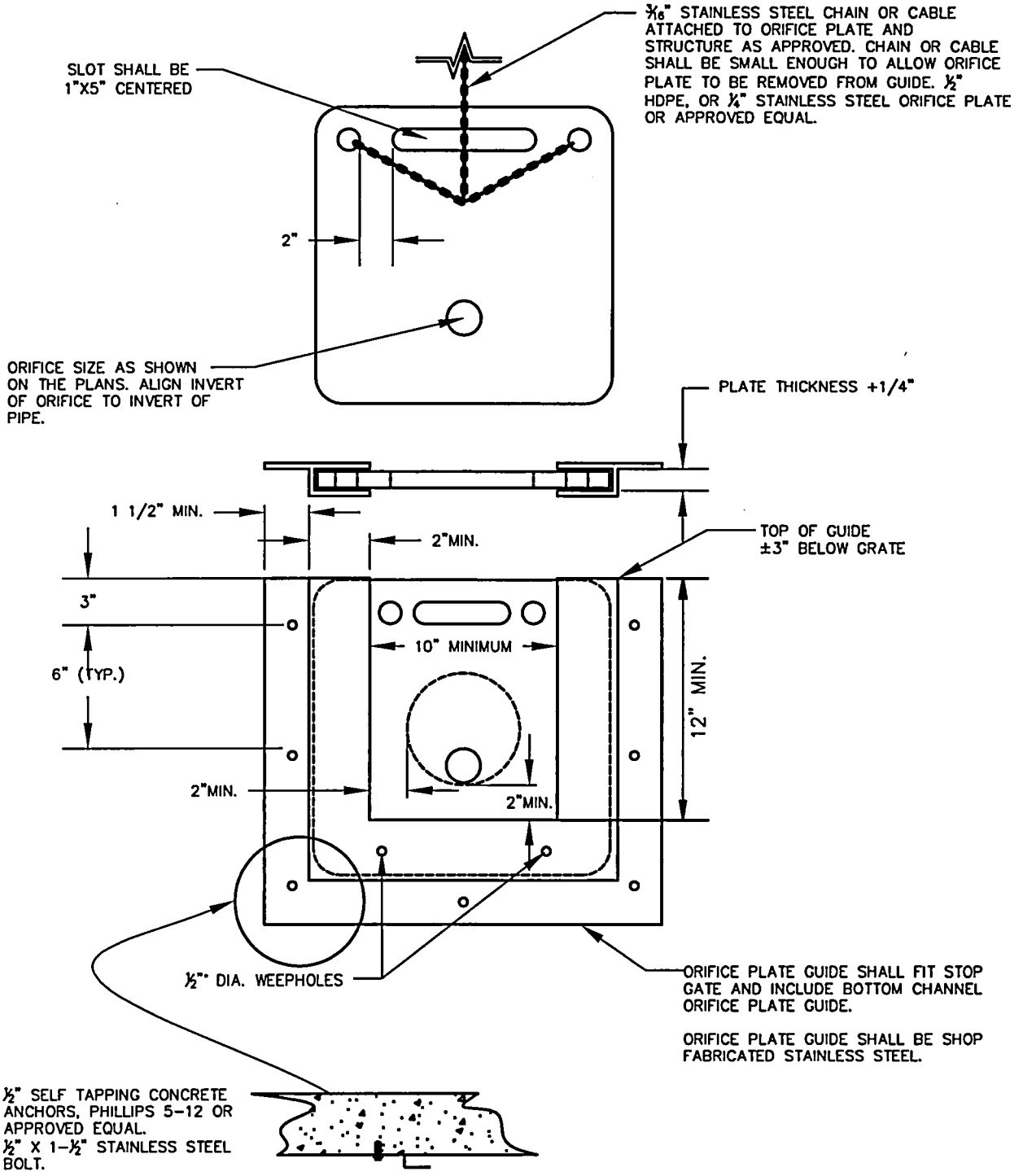

ORIFICE PLATE AND GUIDE

DRAWING NO. 546

REVISED 02-03

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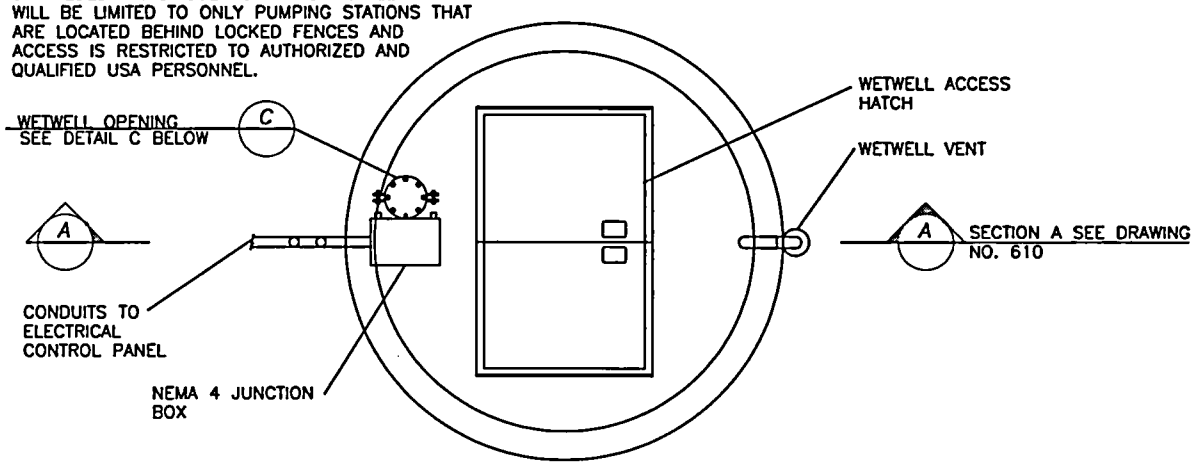
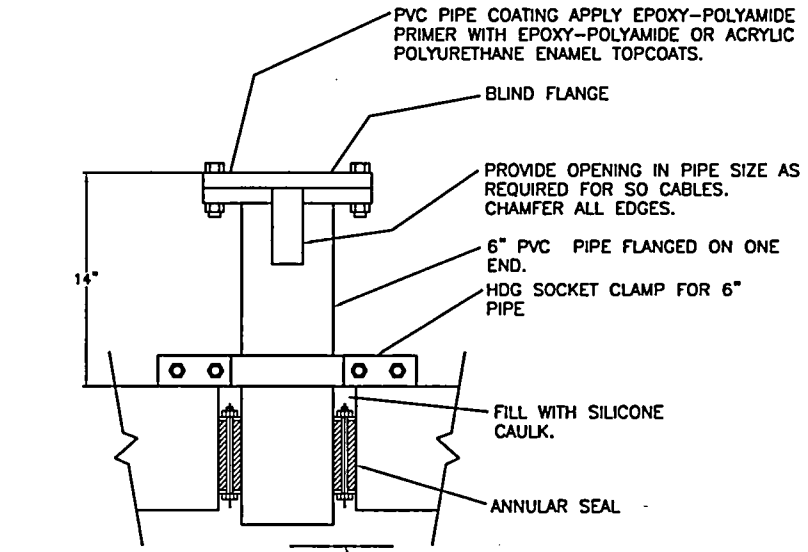
NOTES:
1) JUNCTION BOX SHALL BE LOCATED ENTIRELY OUTSIDE THE CONFINES OF THE CLASS 1, DIVISION 1 AREA OF THE WETWELL. WHERE AREAS OF AROUND THE PUMPING STATION ARE LOCATED OUTDOORS; THERE IS FREE MOVEMENT AND UNIMPEDED AIR CIRCULATION. THIS INSTALLATION WILL BE LIMITED TO ONLY PUMPING STATIONS THAT ARE LOCATED BEHIND LOCKED FENCES AND ACCESS IS RESTRICTED TO AUTHORIZED AND QUALIFIED USA PERSONNEL.



PUMPSTATION PLAN VIEW

NTS



WETWELL OPENING DETAIL C

C

NTS

FLOAT SWITCH PLAN AND DETAIL C

DRAWING NO. 600

REVISED 02-03

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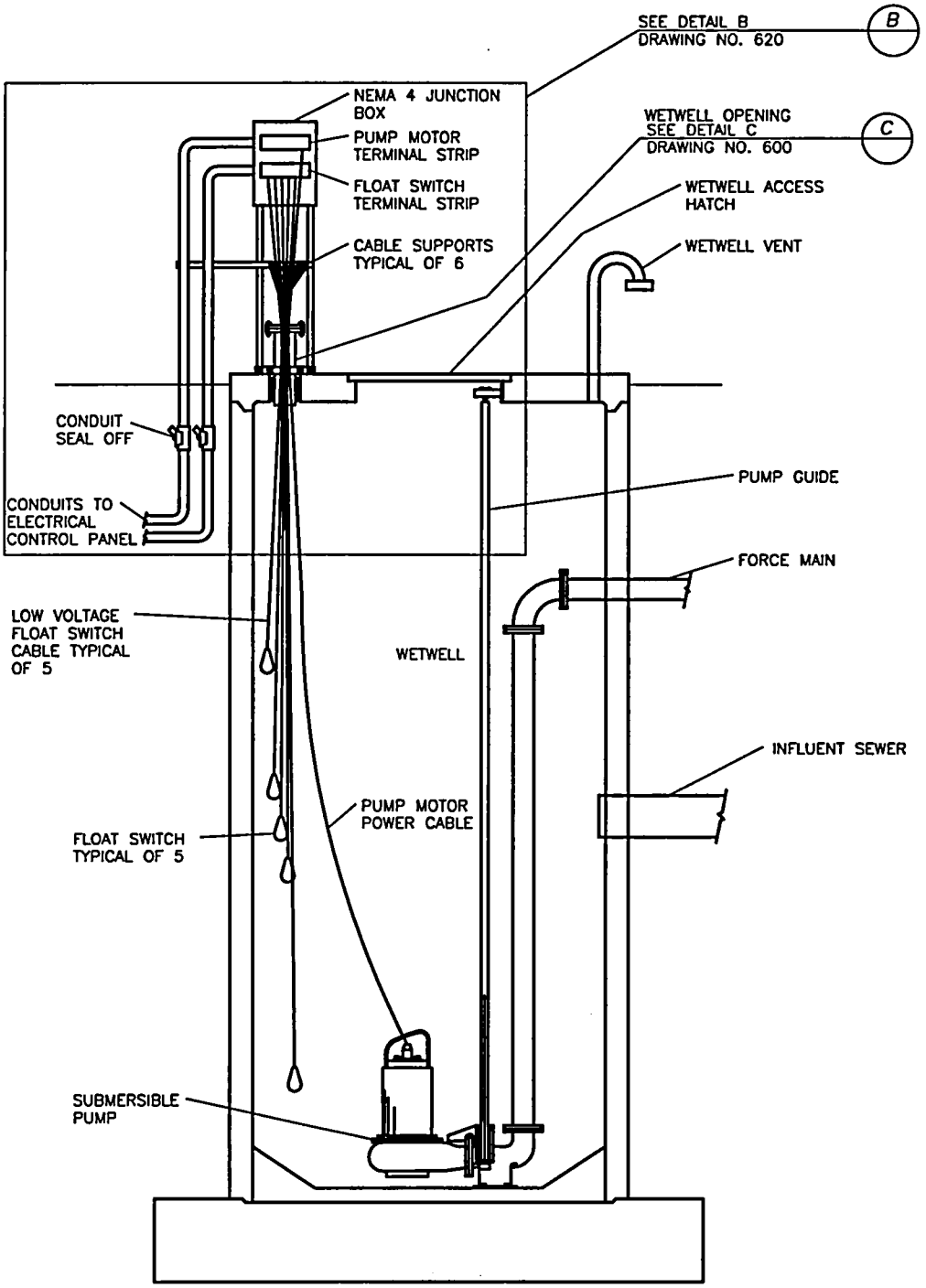

PUMPSTATION SECTION A (A)

NTS

FLOAT SWITCH SECTION A

DRAWING NO. 610

REVISED 02-03

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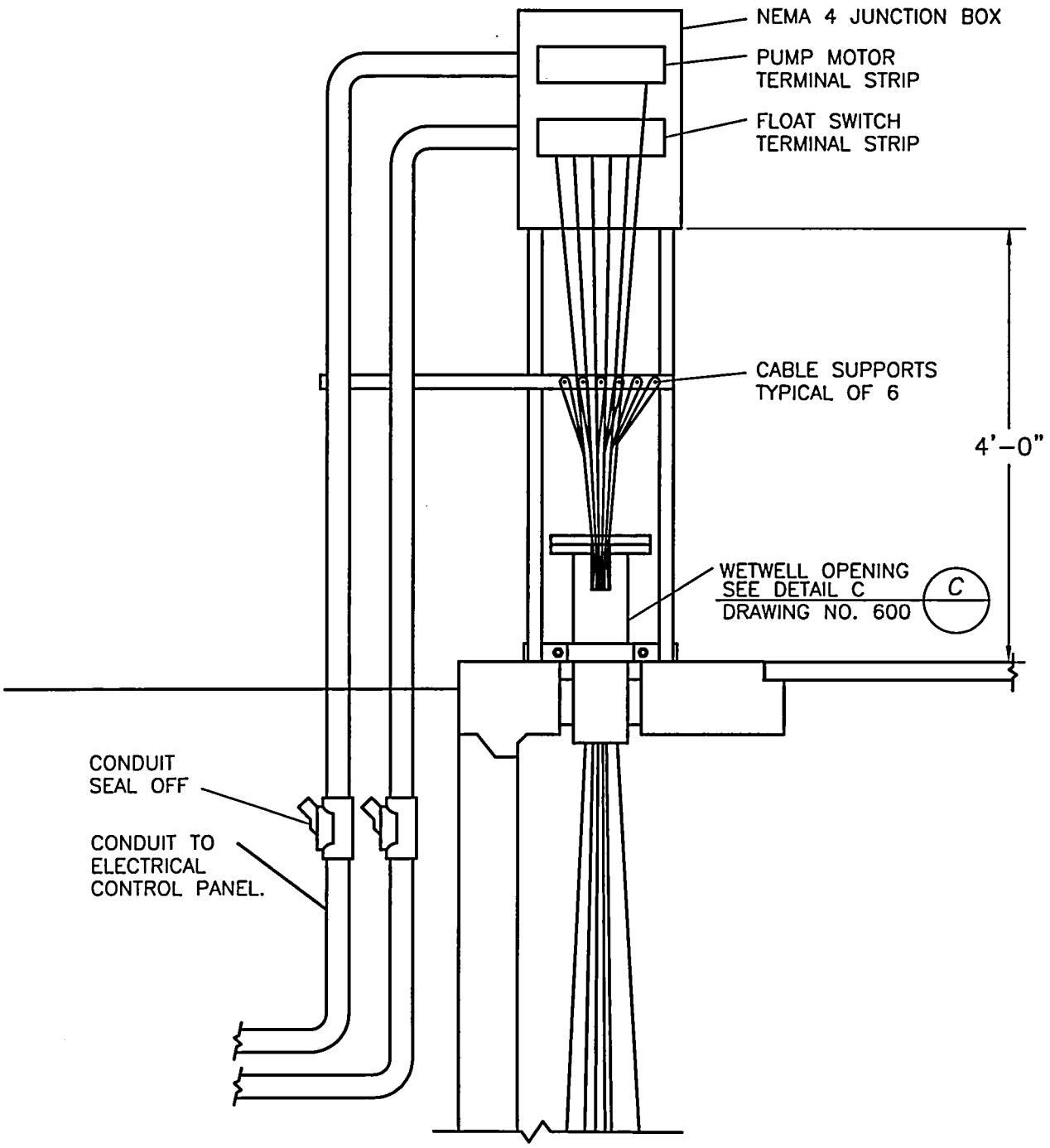

DETAIL B

NTS

B

FLOAT SWITCH DETAIL B

DRAWING NO. 620

REVISED 02-03

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Sample Design Data Table	
Basin Area	XX Acres
Equivalent Dwelling Units (EDU) Per Acre	XX EDU/AC
Persons Per EDU	XX
Population Equivalent	XX
Average Per Capita Flow	XX GPM
Infiltration And Inflow	XX GPM
Average Daily Flow (ADF)	XX GPM
Peak Hourly Flow	XX GPM
Pump Type	Description
Pump Horsepower	XX HP
Capacity Per Pump	XX GPM
Maximum Pump Starts Per Hour	XX
Wet Well Volume	XX GAL
Level Control Type	Ultrasonic or Float
Standby Power Generator	XX KW
Fuel Tank Capacity	XX GAL
Force Main Length	XX FT
Force Main Velocity At ADF	XX FPS
Average Detention Time At Average Daily Flow	XX MIN

SAMPLE DESIGN DATA TABLE

DRAWING NO. 630

REVISED 02-03

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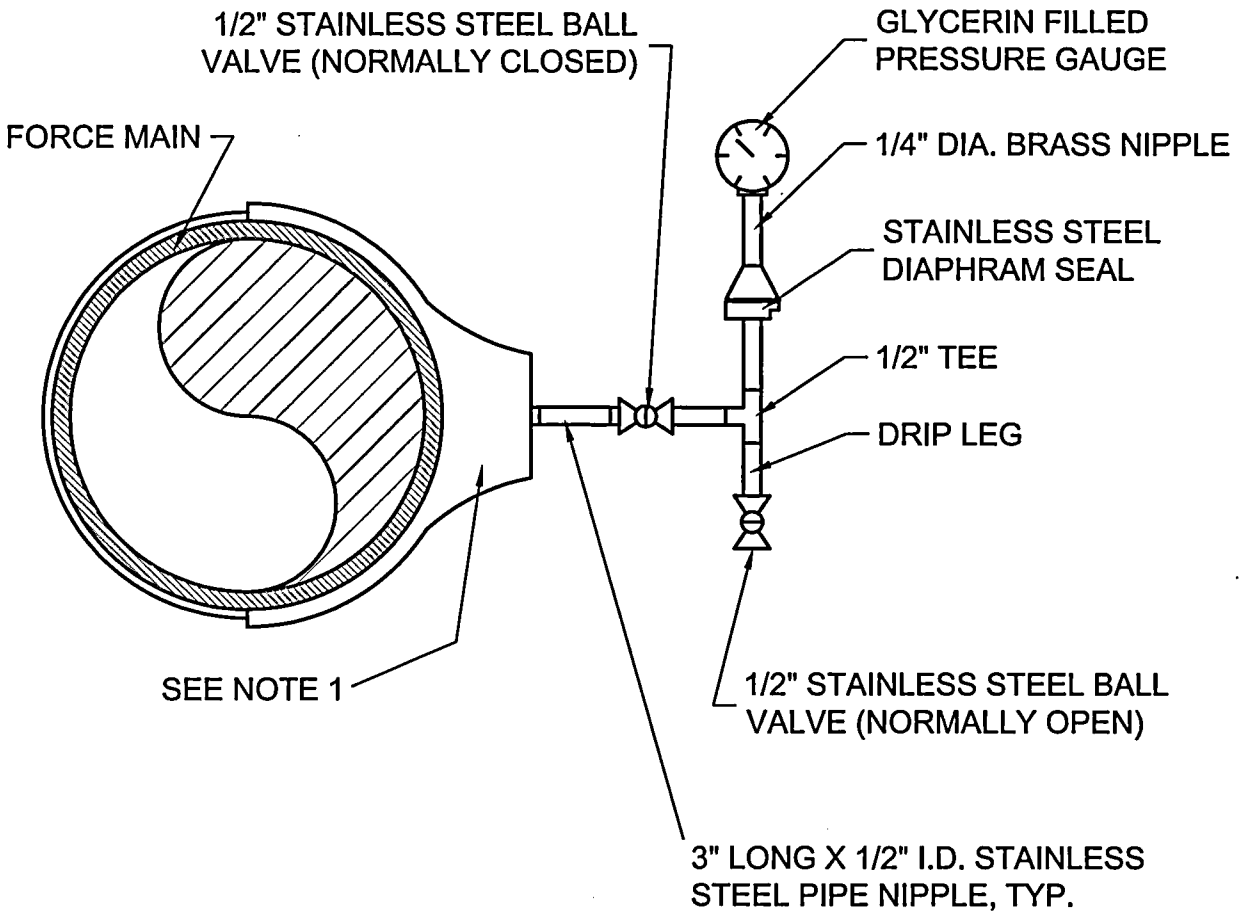
NOTES:

1) INSTALL GAUGES AS SHOWN ON 1/2" DOUBLE STRAP PIPE SADDLE.

2) ALL THREADED STAINLESS STEEL SCHEDULE 80.



FORCE MAIN PRESSURE GAUGE DETAIL

N.T.S.

FORCE MAIN PRESSURE GAUGE

DRAWING NO. 640

REVISED 02-03

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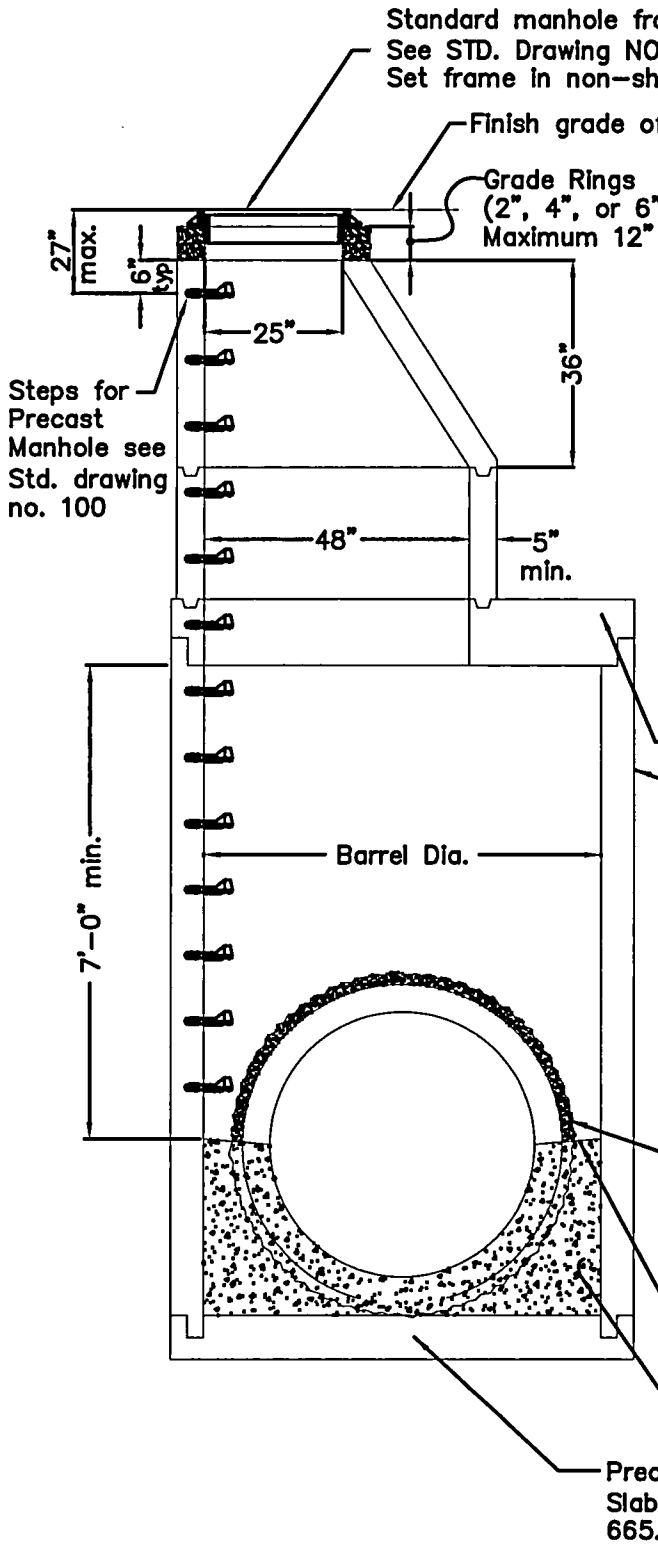

Notes:

1. All poured in place concrete shall have a 28 day ultimate strength of 4000 psi and a 2" to 4" slump.
2. All reinforcement shall have a minimum yield strength of 60,000 psi (Grade 60).
3. All precast joints shall be grouted or rubber gasketed.
4. Sections and cone shall be in accordance with ASTM C478.

Standard Top Slab see Std. Drawing No. 680

Standard Manhole Section(s) See Std. Drawing no. 670, and no. 675

MAXIMUM THROUGH PIPE SIZES

Barrel Dia.	Max. Pipe Dia.
60"	36"
72"	48"
84"	60"
96"	72"
108"	84"
120"	96"

Break out manhole wall 2" minimum, 4" maximum clear of pipe wall. Grout space with non-shrink grout and pour a 4" x 4" concrete collar around pipe connection.

Slope 1 12

Concrete Fill as Required.

Precast or Cast-in-place Standard Base Slab See Std. Drawing NO's. 660 and 665.

LARGE PRECAST CONCRETE MANHOLE

DRAWING NO. 650

REVISED 02-03

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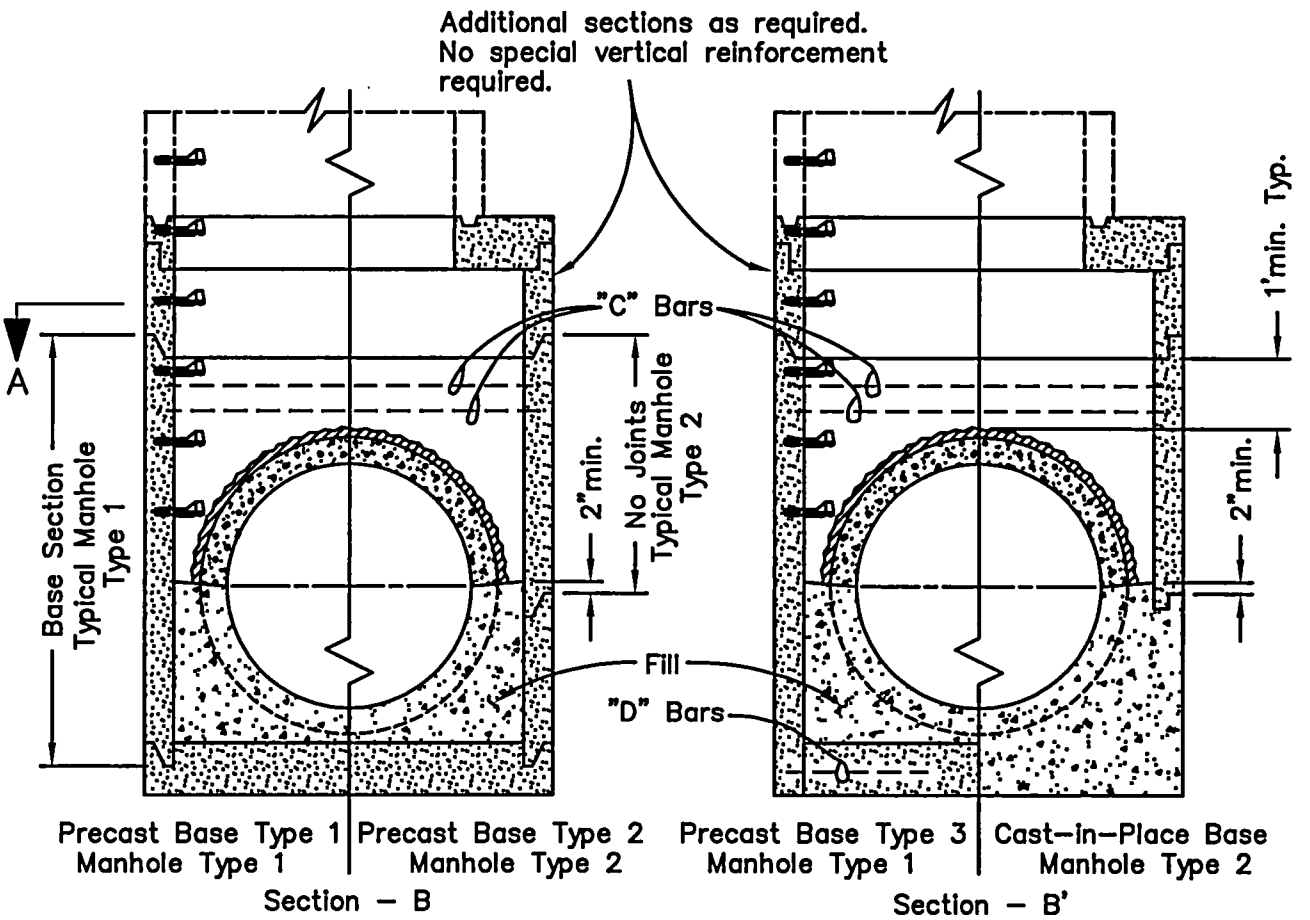

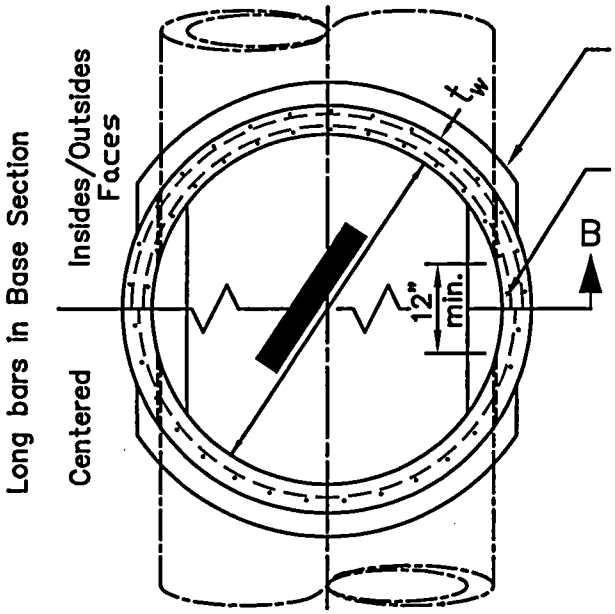

NOTES: (Manhole Bases & Base Sections)

1. Manhole Type 1 is continuous from bottom slab to 12" above pipe breakout.
2. Manhole Types 1 & 2 may have either precast or cast-in-place base.
3. Manhole sections shall be manufactured in accordance to the requirements shown on Std. drawing NO. 660 and 670.
4. Manhole Type 2 shall hove no joints between 1' above pipe breakout opening and 2" below pipe spring line.
5. Manhole sections shall be manufactured in accordance with ASTM C76 or C478 except longitudinal (vert.) steel shall meet or exceed that shown on Std. drawing NO. 670.

LARGE PRECAST CONCRETE MANHOLE - BASES

Drawing NO. 655

REVISED 02-03

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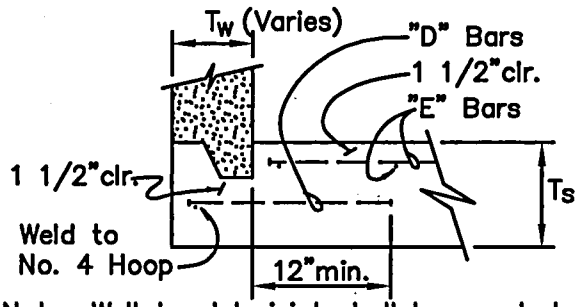
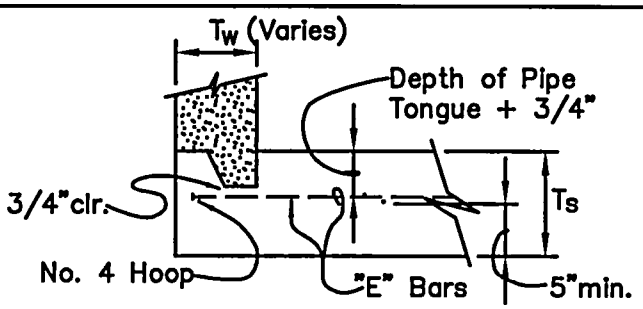


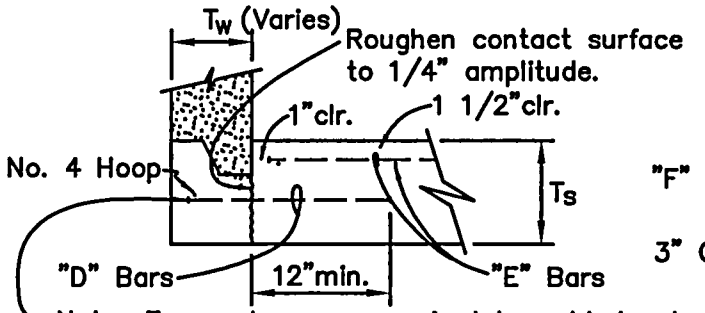
Note: Wall to slab joint shall be grouted when slab is cast separately.

PRECAST BASE SLAB TYPE 1**



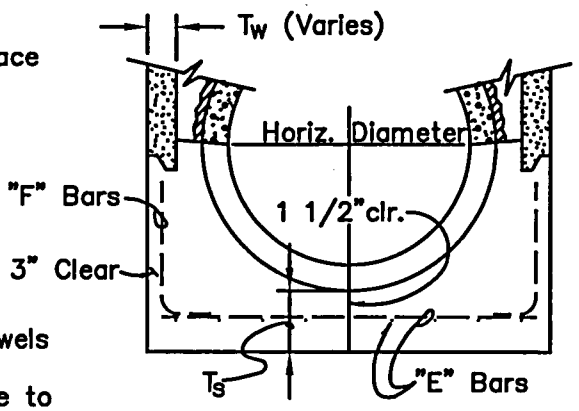
Note: Grout not required for slab cast in contact with manhole section.

PRECAST BASE SLAB TYPE 2**



Note: Expose hoop as required to weld dowels to hoop. Remove only enough concrete to accomplish weld. Patch before casting base to ensure no voids are present.

PRECAST BASE SLAB TYPE 3



CAST-IN-PLACE BASE
(OR PRECAST BASE TYPE 4)

SIZE		60"		72"		84"		96"	
Type	Depth*	0'–15'	15'–30'	0'–15'	15'–30'	0'–15'	15'–30'	0'–15'	15'–30'
1	T_S	8.0"	9.0"	8.0"	9.0"	9.0"	10.0"	9.0"	11.0"
	D Bars	#3 @ 12"	#3 @ 12"	#3 @ 12"	#4 @ 10"	#3 @ 10"	#4 @ 11"	#3 @ 9"	#4 @ 11"
	E Bars	#4 @ 12"	#4 @ 9"	#4 @ 9"	#4 @ 6"	#4 @ 8"	#5 @ 9"	#4 @ 7"	#5 @ 8"
2	T_S	11.0"	12.0"	11.0"	12.0"	12.0"	13.0"	12.0"	14.0"
	E Bars	#4 @ 12"	#4 @ 8"	#4 @ 9"	#5 @ 8"	#4" @ 7"	N0.5 @ 7"	#4 @ 5"	#5 @ 6"
3	T_S	7.0"	9.0"	7.0"	9.0"	8.0"	10.0"	9.0"	11.0"
	D Bars	#3 @ 12"	#3 @ 12"	#3 @ 12"	#4 @ 10"	#3 @ 10"	#4 @ 11"	#3 @ 9"	#4 @ 11"
	E Bars	#4 @ 12"	#4 @ 9"	#4 @ 9"	#4 @ 6"	#4 @ 8"	#5 @ 9"	#4" @ 7"	#5 @ 8"
4	T_S	7.0"	9.0"	7.0"	9.0"	8.0"	10.0"	9.0"	11.0"
	E Bars	#4 @ 12"	#4 @ 9"	#4 @ 9"	#4 @ 6"	#4 @ 8"	#5 @ 9"	#4" @ 7"	#5 @ 8"
	F Bars	#4 @ 12"	#4 @ 9"	#4 @ 9"	#4 @ 6"	#4 @ 8"	#5 @ 9"	#4" @ 7"	#5 @ 8"

*Invert to Street Grade
Concrete: f'_c =4,000 psi
Steel: f_y =Grade 60

**Fabricator required to cast lifting loops in base slab for handling Type 1 & 2 bases.

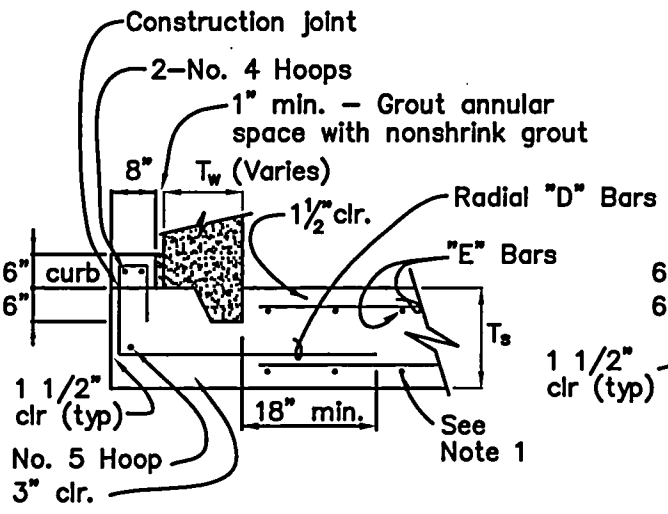
DDT 11/28/1999

LARGE PRECAST CONCRETE MANHOLE – TYPES

DRAWING NO.660

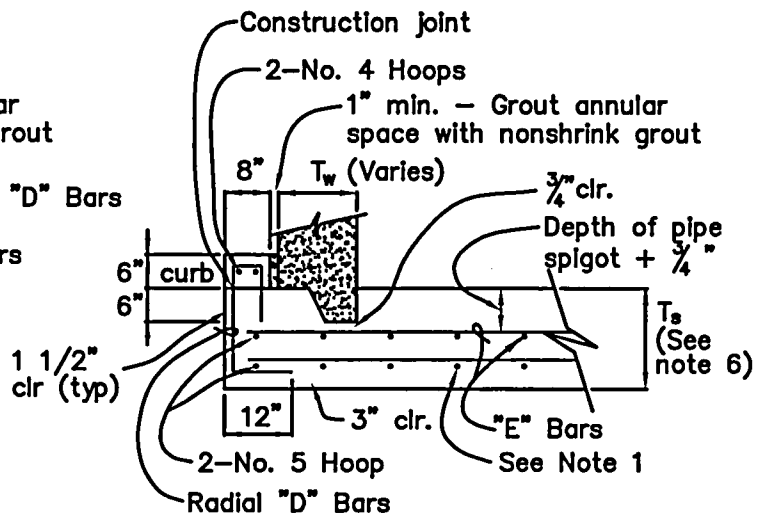
REVISED 02-03

Clean Water Services
Our commitment is clear.



PRECAST BASE SLAB TYPE 5

1. Add bottom mat of No. 3 bars each way at same spacing as top mat.
2. Wall to slab joint shall be field grouted.
3. Curb is continuous all around base slab.
4. If curb is not cast monolithic with base slab, provide construction joint as shown.



PRECAST OR CAST–IN–PLACE BASE SLAB TYPE 6

1. Add bottom mat of No. 3 bars each way at same spacing as top mat.
2. Wall to slab joint shall be field grouted. Grout is not required for slab cast in contact with manhole section.
3. Curb is continuous all around base slab.
4. If curb is not cast monolithic with base slab, provide construction joint as shown.
5. Base slab Type 6 may be precast or cast–in–place concrete.
6. Ts for base slab Type 6 assumes a 6 1/4" spigot depth. Adjust Ts for actual spigot depth.
7. Curb may be cast in place against riser pipe without grouting.

SIZE		108"		120"	
Type	Depth*	0'–15'	15'–30'	0'–15'	15'–30'
5	T_s	10"	12"	10"	12"
	"D" Bars	No.4 @ 12"	No.5 @ 12"	No.4 @ 12"	No.5 @ 12"
	"E" Bars	No.5 @ 12"	No.5 @ 12"	No.5 @ 12"	No.6 @ 12"
6	T_s	15.5"	17.5"	15.5"	17.5"
	"D" Bars	No.4 @ 12"	No.5 @ 12"	No.4 @ 12"	No.5 @ 12"
	"E" Bars	No.5 @ 12"	No.5 @ 12"	No.5 @ 12"	No.6 @ 12"

*Invert to Street Grade
Concrete: f'_c = 4,000 psi
Steel: Grade 60

LARGE PRECAST CONCRETE MANHOLE BASE SLABS

DRAWING NO. 665

REVISED 02–03

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60"ø Manhole Section

NOTE: MAX. LONG. BAR SPACING IS 12" C.–C.

	INVERT TO STREET GRADE	T_w =5.0"			T_w = 6.0"			T_w =6.75"		
		OUTSIDE	INSIDE	ON CTR.	OUTSIDE	INSIDE	ON CTR.	OUTSIDE	INSIDE	ON CTR.
TYPE 1	0 Ft to 15 Ft	0.16	0.15	0.24	0.16	0.09	0.20	0.13	0.08	0.17
	15 Ft to 30 Ft	0.32	0.18	0.53	0.25	0.19	0.42	0.22	0.16	0.36
TYPE 2	0 Ft to 15 Ft	0.17	0.15	0.28	0.19	0.09	0.22	0.16	0.08	0.20
	15 Ft to 30 Ft	0.37	0.18	0.63	0.28	0.19	0.48	0.24	0.16	0.42

'C' Bars–1 No. 4 hoop req'd. for less than 2'–0" clr. between blockout and top of section.

72"ø Manhole Section

NOTE: MAX. LONG. BAR SPACING IS 12" C.–C.

	INVERT TO STREET GRADE	T_w =6.0"			T_w = 7.0"			T_w =7.75"		
		OUTSIDE	INSIDE	ON CTR.	OUTSIDE	INSIDE	ON CTR.	OUTSIDE	INSIDE	ON CTR.
TYPE 1	0 Ft to 15 Ft	0.19	0.19	0.26	0.17	0.16	0.22	0.16	0.14	0.20
	15 Ft to 30 Ft	0.33	0.28	0.58	0.27	0.23	0.48	0.26	0.26	0.42
TYPE 2	0 Ft to 15 Ft	0.19	0.13	0.28	0.18	0.15	0.23	0.16	0.17	0.28
	15 Ft to 30 Ft	0.36	0.13	0.65	0.29	0.15	0.52	0.26	0.17	0.46

'C' Bars– 2 NO. 5 HOOPS 2" CLR. OF TOP OF MH BARREL, 2 NO. 3 HOOPS 2" CLR. OVER PIPE BLOCKOUTS } REQ'D. FOR LESS THAN 2'–0" CLR. BETWEEN BLOCKOUT AND TOP OF SECTION.

84"ø Manhole Section

NOTE: MAX. LONG. BAR SPACING IS 12" C.–C.

	INVERT TO STREET GRADE	T_w =7.0"			T_w = 8.0"			T_w =8.75"		
		OUTSIDE	INSIDE	ON CTR.	OUTSIDE	INSIDE	ON CTR.	OUTSIDE	INSIDE	ON CTR.
TYPE 1	0 Ft to 15 Ft	0.20	0.13	0.26	0.17	0.12	0.22	0.15	0.10	0.20
	15 Ft to 30 Ft	0.33	0.23	0.59	0.28	0.26	0.50	0.30	0.23	0.45
TYPE 2	0 Ft to 15 Ft	0.23	0.15	0.33	0.21	0.17	0.28	0.19	0.19	0.25
	15 Ft to 30 Ft	0.36	0.15	0.65	0.30	0.17	0.55	0.30	0.19	0.49

'C' Bars– 2 NO. 5 HOOPS 2" CLR. OF TOP OF MH BARREL, 2 NO. 3 HOOPS 2" CLR. OVER PIPE BLOCKOUTS } REQ'D. FOR LESS THAN 2'–0" CLR. BETWEEN BLOCKOUT AND TOP OF SECTION.

96"ø Manhole Section

NOTE: MAX. LONG. BAR SPACING IS 12" C.–C.

	INVERT TO STREET GRADE	T_w =8.0"			T_w = 9.0"			T_w =9.75"		
		OUTSIDE	INSIDE	ON CTR.	OUTSIDE	INSIDE	ON CTR.	OUTSIDE	INSIDE	ON CTR.
TYPE 1	0 Ft to 15 Ft	0.25	0.18	0.33	0.21	0.16	0.29	0.21	0.14	0.27
	15 Ft to 30 Ft	0.41	0.26	0.77	0.35	0.30	0.66	0.37	0.27	0.59
TYPE 2	0 Ft to 15 Ft	0.26	0.17	0.34	0.22	0.19	0.30	0.20	0.21	0.28
	15 Ft to 30 Ft	0.43	0.17	0.82	0.37	0.19	0.70	0.34	0.21	0.63

'C' Bars– 2 NO. 5 HOOPS 2" CLR. OF TOP OF MH BARREL, 2 NO. 3 HOOPS 2" CLR. OVER PIPE BLOCKOUTS } REQ'D. FOR LESS THAN 2'–0" CLR. BETWEEN BLOCKOUT AND TOP OF SECTION.

DDT 12/08/1999

PROVIDE MIN. LONGITUD. REINF. AS SHOWN, 1" CLR. OF INSIDE AND OUTSIDE FACES, OR AT CENTER OF WALL

AREAS ARE IN^2/FT OF CIRCUMFERENCE AND MAY BE WELDED WIRE FABRIC, BARS OR A COMBINATION OF BOTH.

LARGE PRECAST CONCRETE MANHOLE – LONG. BASE SECTION REINF.

DRAWING NO. 670

REVISED 02-03

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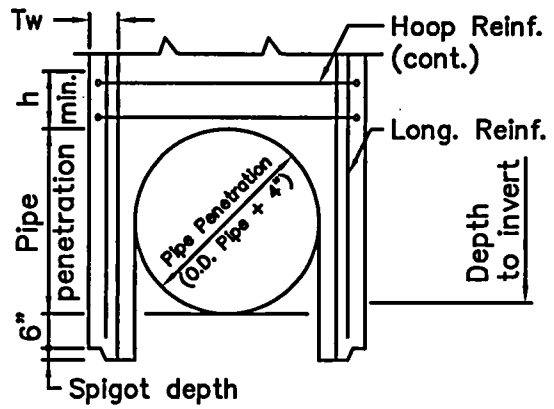
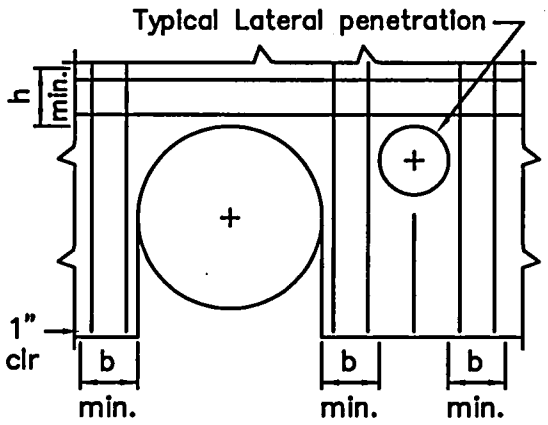


For Base Slab see 4-08-3A

MANHOLE BASE SECTION
ELEVATION



For Base Slab see 4-08-3A

PARTIAL MANHOLE BASE
SECTION ROLLOUT

Notes:

1. Manufacture manhole base section and risers above in conformance with ASTM C478 except as noted in specifications and herein. Lap length for hoop reinforcement in band "h" shall be 30 bar diameters and laps shall be staggered.
2. Steel reinforcement in bands "h" and "b" is in addition to that required by ASTM C478 and is shown in square inches per foot of band width. Bar spacing shall not exceed 6".
3. Manhole base sections shall have no joints below top of band "h".
4. Concrete: f'c = 4,000 psi
   Reinforcement steel: Grade 60
5. There shall be no penetrations in hoop band "h" above main line pipe penetrations or in longitudinal bands "b" next to both sides of all openings.
6. Additional longitudinal reinforcement area can be reduced 50% outside of "b" bands.
7. Thickness "Tw" is minimum manhole base section wall thickness for a given pipe diameter.
8. Do not backfill until concrete fill over the manhole base has achieved 90% of its compressive strength (4,000 psi). For shape of concrete fill see Std. Drawing NO. 650.
9. Provide 6"x6" concrete collar around pipe penetrations per Std. Drawing NO. 655.

MH Dia. (in)	Thickness Tw min. (in)	Band Width h=b min. (ft)	Depth to Invert max. (ft)	Inside Pipe Dia. (in)	Additional Reinforcement Required			
					Hoop Reinf. (h)		Long. Reinf. (b)	
					Outside Face (in^2/ft)	Inside Face (in^2/ft)	Outside Face (in^2/ft)	Inside Face (in^2/ft)
108	9	1.00	15	48 or less	.381	.381	.260	.260
108	9	1.25	15	54-60	.381	.381	.394	.394
108	10	1.75	15	66-84	.381	.381	.643	.643
108	11	1.00	30	48 or less	.790	.790	.432	.432
108	12	1.25	30	54-60	.790	.790	.576	.576
108	16	1.75	30	66-84	.790	.790	.773	.773
120	10	1.00	15	48 or less	.423	.423	.260	.260
120	10	1.50	15	54-72	.423	.423	.480	.480
120	11	2.00	15	78-96	.423	.423	.713	.713
120	11	1.00	30	48 or less	.880	.880	.432	.432
120	14	1.50	30	54-72	.880	.880	.677	.677
120	17	2.00	30	78-96	.880	.880	.991	.991

LARGE PRECAST CONCRETE MANHOLE
Base Section Reinforcement 108" & 120"

DRAWING NO. 675

REVISED 02-03

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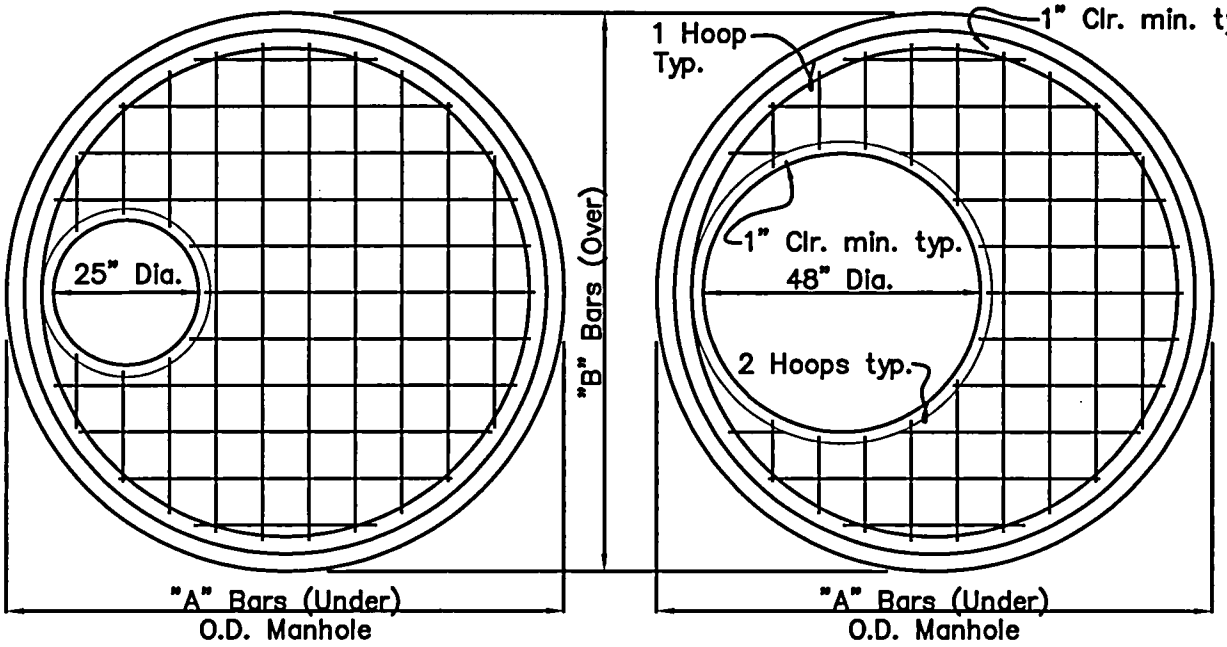
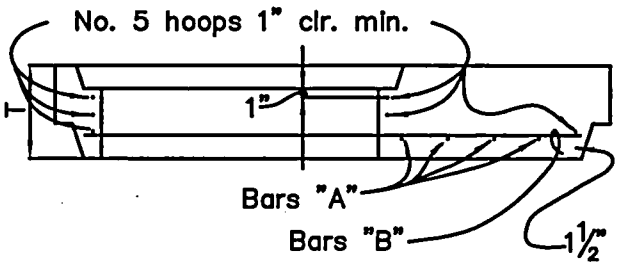


TOP SLAB "A" TOP SLAB "B"

NOTES:

1. All concrete shall have a 28 day ultimate compressive strength of 4,000 psi.
2. All reinforcement shall have a minimum yield strength of 60,000 psi, (Grade 60).
3. All lap splices shall be 24 bar diameters unless noted otherwise.
4. Add steps as required by Standard Drawing NO. 010



TOP SLAB TYPICAL SECTION

	TOP SLAB "A"			TOP SLAB "B"			TOP SLAB "B"		
	COVER DEPTH								
	6" to 12"			4'–0" to 7'–0"			7'–1" to 22'–0"		
Size	T	"A" Bars	"B" Bars	T	"A" Bars	"B" Bars	T	"A" Bars	"B" Bars
60"	8"	No.5 @ 7½"	No.5 @ 7½"	12"	No.5 @ 9"	No.5 @ 9"	12"	No.5 @ 9"	No.5 @ 9"
72"	10"	No.5 @ 7"	No.5 @ 7"	12"	No.5 @ 9"	No.5 @ 9"	12"	No.5 @ 7"	No.5 @ 7"
84"	11"	No.5 @ 7"	No.5 @ 7"	12"	No.5 @ 6"	No.5 @ 6"	12"	No.6 @ 6"	No.5 @ 7"
96"	12"	No.5 @ 6"	No.5 @ 6"	12"	No.5 @ 6"	No.5 @ 6"	14"	No.6 @ 6"	No.5 @ 6"
108"	N/A	N/A	N/A	12"	No.6 @ 8"	No.6 @ 8"	16"	No.7 @ 9"	No.7 @ 9"
120"	N/A	N/A	N/A	12"	No.6 @ 7"	No.6 @ 7"	16"	No.7 @ 8"	No.7 @ 8"

LARGE PRECAST CONCRETE MANHOLE
TOP SLABS

DRAWING NO. 680

REVISED 02-03

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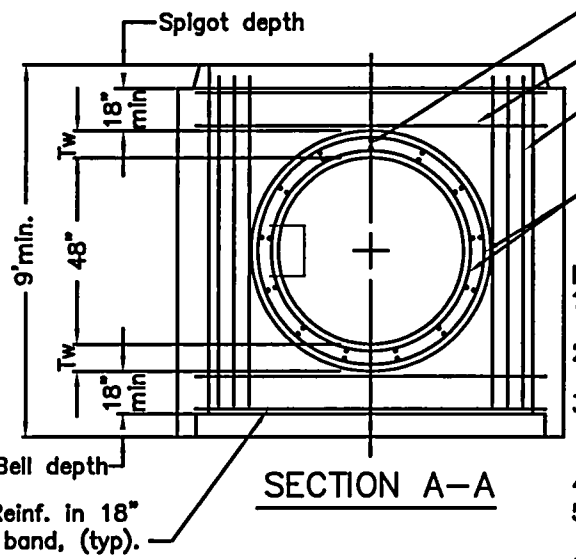
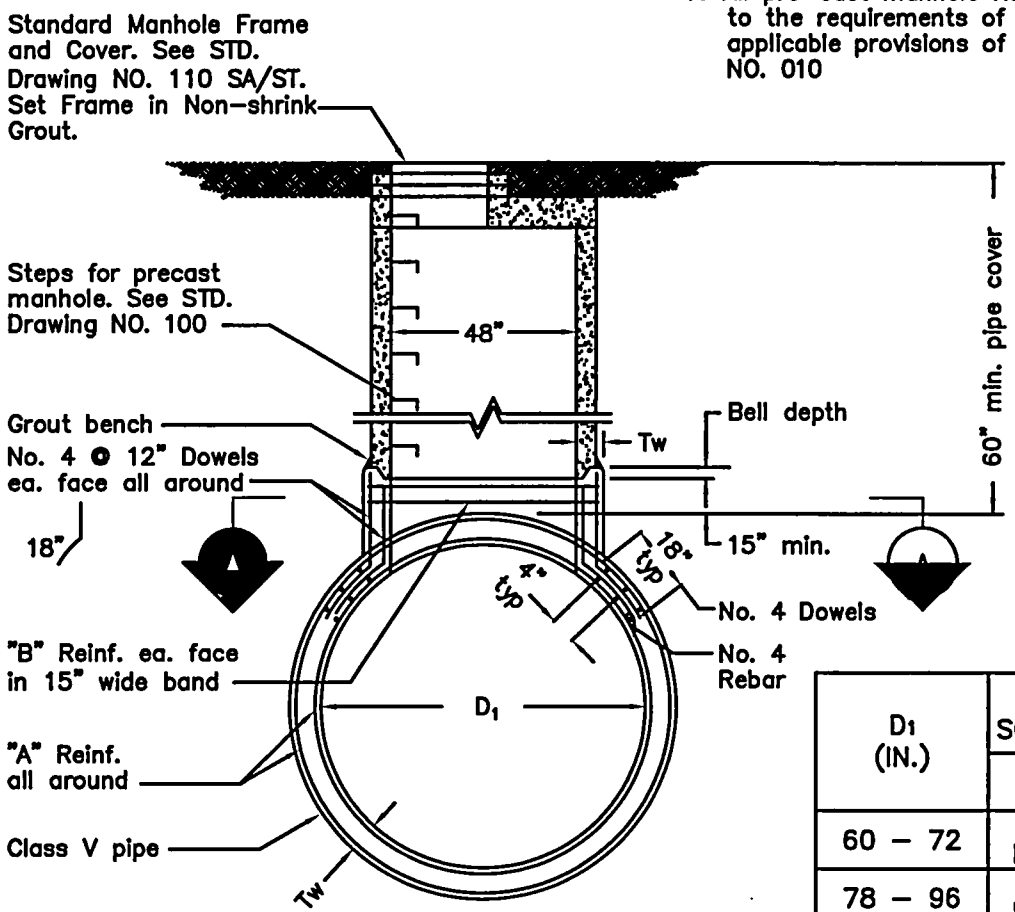


SECTION A-A

NOTES:
1. T-TOP Manhole as shown is for new pipline construction only.
2. T-TOP Manhole pipe section shall be Class V Pipe per ASTM C-76.
3. Reinforcement shown is in addition to that required for class V Pipe and is applied in both inside and outside faces.
4. Tw of riser = Tw of pipe but not less than 6".
5. Concrete f'c = 6000 psi Reinforcement Steel; Grade 60.
6. Maximum invert depth shall be 30'.
7. All pre-cast manhole riser sections shall comform to the requirements of ASTM C-478 and applicable provisions of standard manhole drawing NO. 010



CROSS SECTION

D1 (IN.)	ADDITIONAL REINF. SQUARE INCHES (TOTAL)	
	"A"	"B"
60 - 72	.177 EA. FACE	.511 EA. FACE
78 - 96	.224 EA. FACE	.584 EA. FACE
102 - 120	.265 EA. FACE	.658 EA. FACE

T-TOP MANHOLE WITH 48" RISER

DRAWING NO. 685

REVISED 02-03

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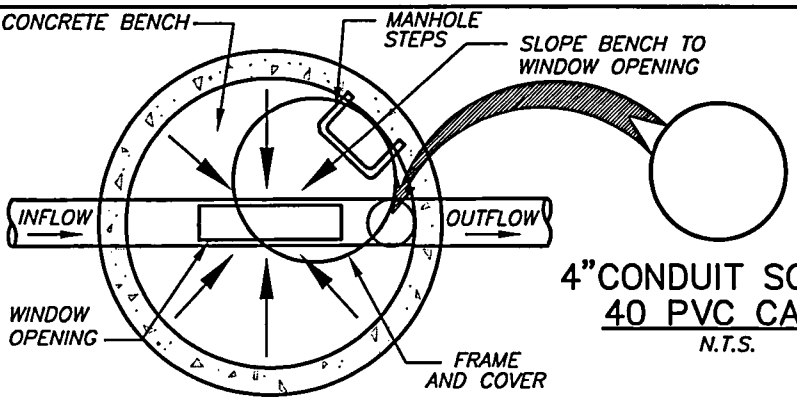
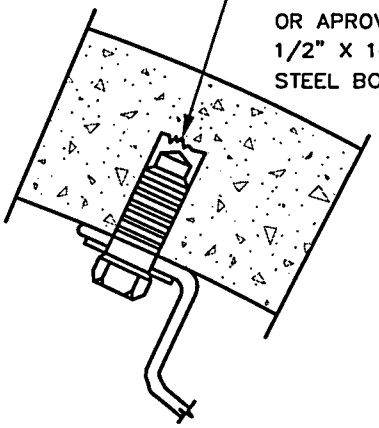


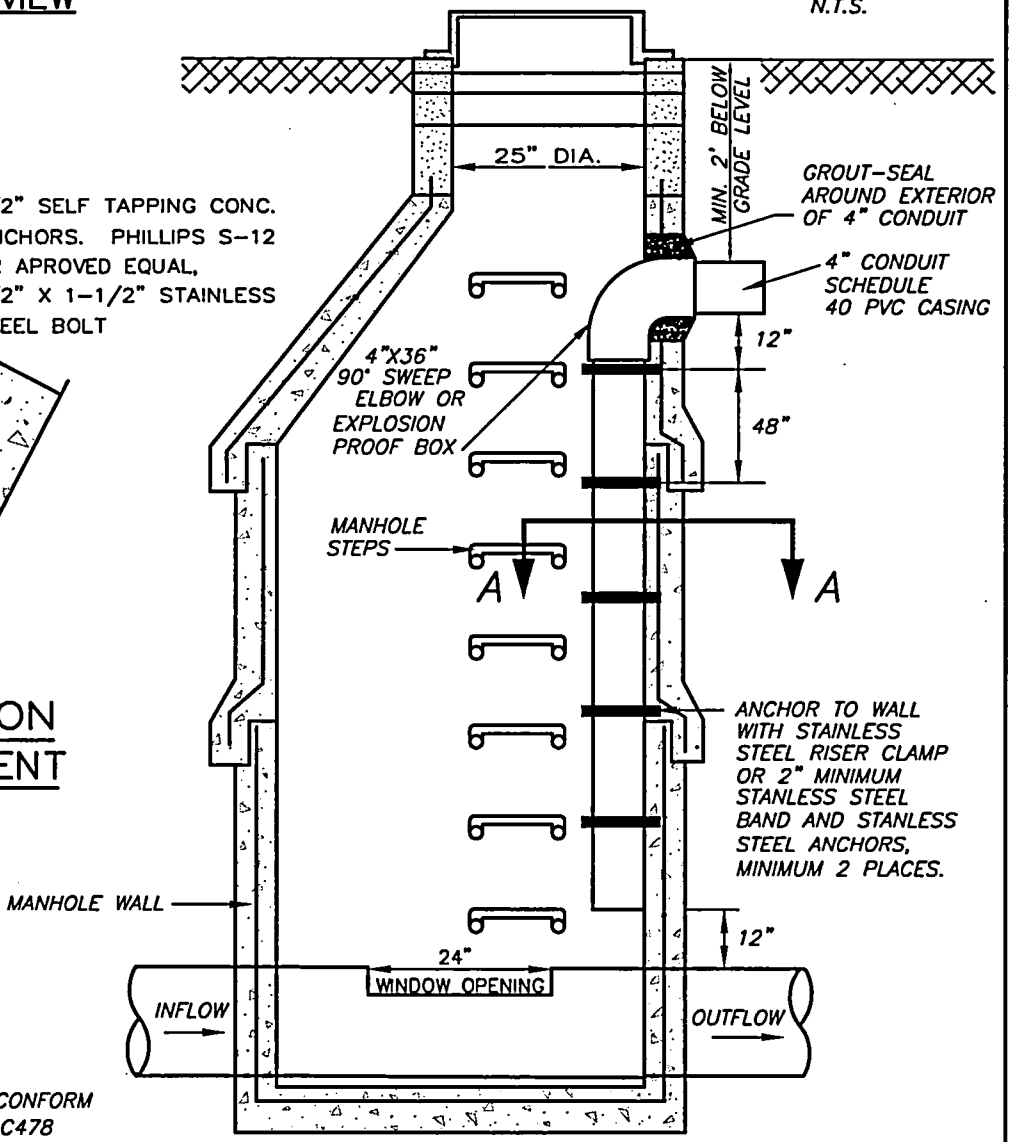
MANHOLE PLAN VIEW
N.T.S.

4"CONDUIT SCHEDULE 40 PVC CASING
N.T.S.

CLAMP DETAIL
(SECTION A–A)
N.T.S.



PARTITION ATTACHMENT



SECTION
N.T.S.

NOTES:
ALL MANHOLE SECTIONS SHALL CONFORM TO THE REQUIREMENT OF ASTM C478 AND APPLICABLE PROVISIONS OF STANDARD MANHOLE DRAWING NO. 010. AND NO. 030

SANITARY SEWER PERMANENT FLOW MONITOR DETAILS (MANHOLE CONDUIT INSTALLATION)

DRAWING NO. 695

REVISED 02-03

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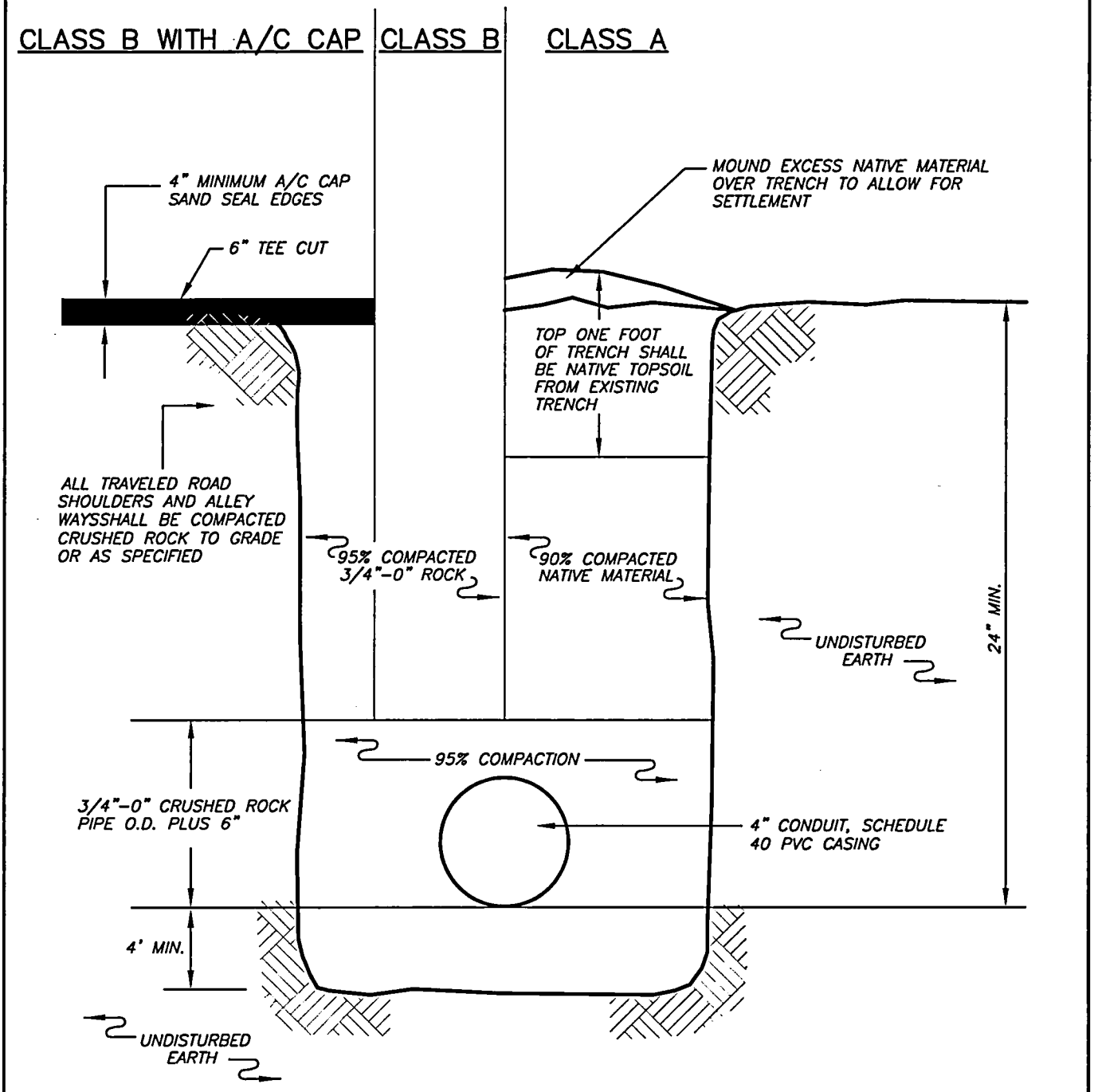

CONDUIT TRENCH BACKFILL DETAILS

DRAWING NO. 696

REVISED 02-03

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AIR TEST FORM

PROJECT: _____ DATE: _____

CONTRACTOR: _____ PROJ #: _____

TESTING COMPANY: _____ INSPECTOR: _____

DATE	LINE	DSMH #	USMH #	DIA. (IN.)	LENGTH (FT)	TIME (MIN:SEC)	START TEST	STOP TEST	PASS/FAIL

NOTE: All air tests will be performed in accordance with ASTM C924 and current Construction Standards Resolution and Order.

Inspectors Signature: _____

AIR TEST FORM

DRAWING NO. 700 REVISED 02-03

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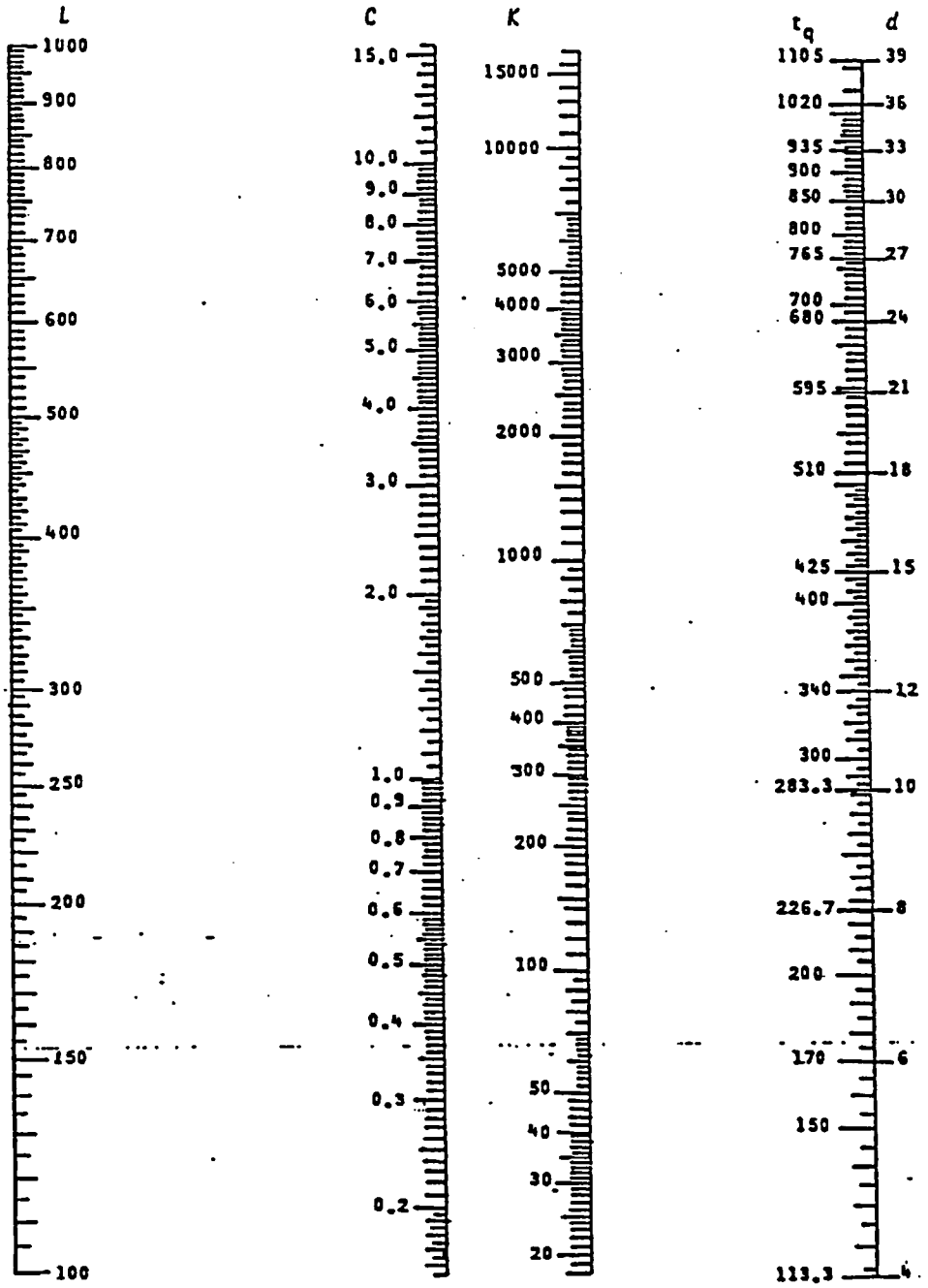

Fig. 1

NOMOGRAPH FOR THE SOLUTION OF $K = .011d^2L$, $C = .0003682dL$, $t_q = K \div C$

NOMOGRAPH

DRAWING NO. 705

REVISED 02–03

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MANHOLE VACUUM TEST

PROJECT: _____ DATE: _____

CONTRACTOR: _____ PROJ #: _____

TESTING COMPANY: _____ INSPECTOR: _____

DATE	MH#	SIZE	DEPTH	REQD. TIME	TIME		NOTES/COMMENTS
					START	END	

NOTE: All manhole vacuum tests will be conducted in accordance with ASTM and current Construction Standards Resolution and Order.

Inspectors Signature: _____

MANHOLE VACUUM TEST

DRAWING NO. 710 REVISED 02-03

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CLEAN WATER SERVICES OF WASHINGTON COUNTY

MANHOLE HYDROSTATIC TEST

PROJECT: _____ DATE: _____

CONTRACTOR: _____ PROJ #: _____

TESTING COMPANY _____ INSPECTOR _____

DATE	M.H. #	DEPTH	ALLOWABLE LOSS / HR.	ACTUAL LOSS / HR.	TIME		PASS / FAIL
					START	END	

COMMENTS:

NOTE: ALL MANHOLE HYDROSTATIC TEST WILL BE CONDUCTED IN ACCORDANCE WITH ASTM AND CURRENT CONSTRUCTION STANDARDS RESOLUTION ORDER, ALLOWABLE LEAKAGE SHALL NOT EXCEED 0.2 GALLONS PER HOUR PER FOOT OF HEAD MEASURED FROM INVERT TO TOP OF FRAME.

INSPECTORS SIGNATURE: _____

MANHOLE HYDROSTATIC TEST

DRAWING NO. 715 REVISED 02-03

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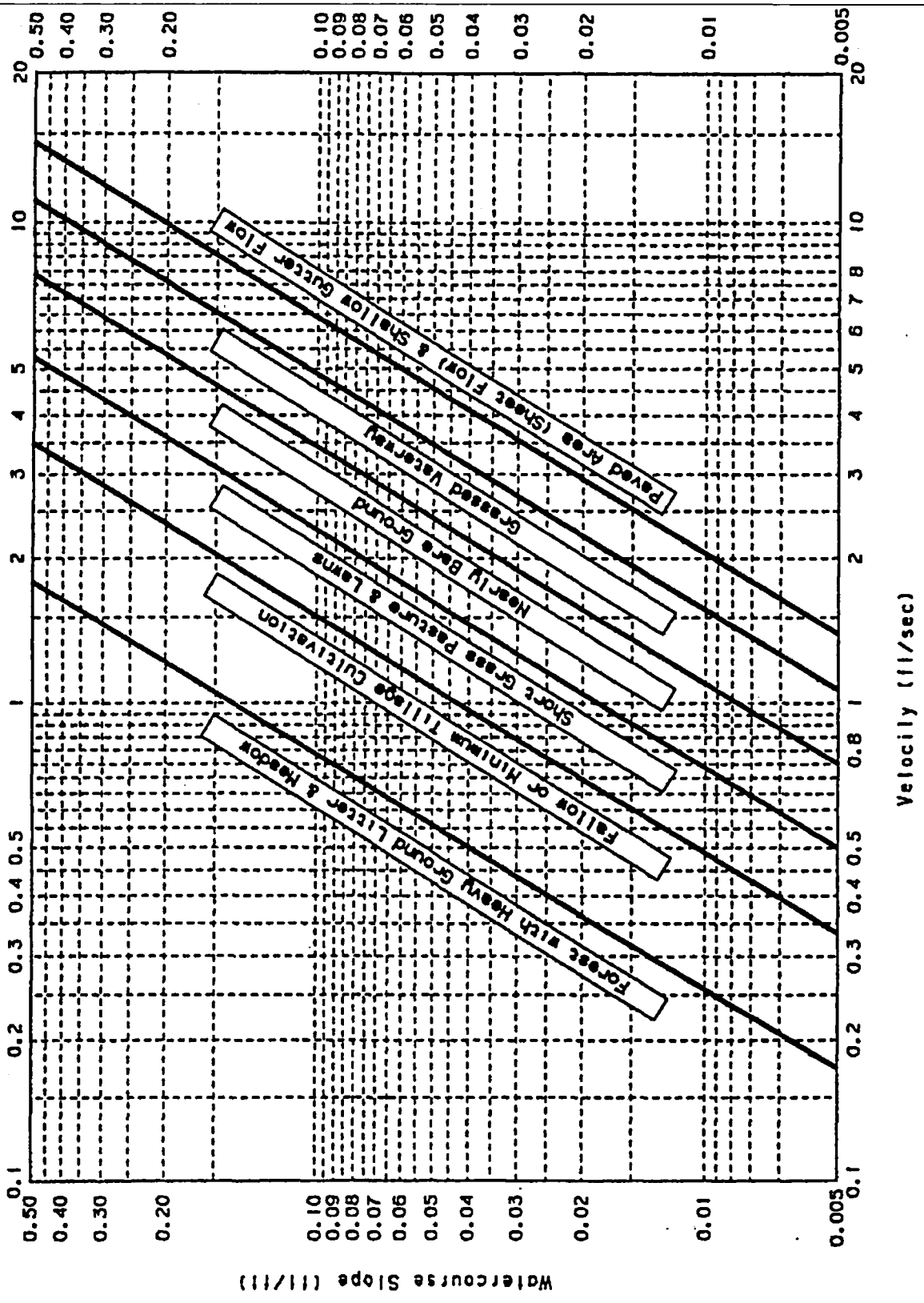

AVERAGE VELOCITIES FOR ESTIMATING TRAVEL TIME FOR OVERLAND FLOWS*

*For use with the Rational Method only; From Soil Conservation Service, Tech. Release No. 55, January 1975

DRAWING NO. 720

REVISED 02-03

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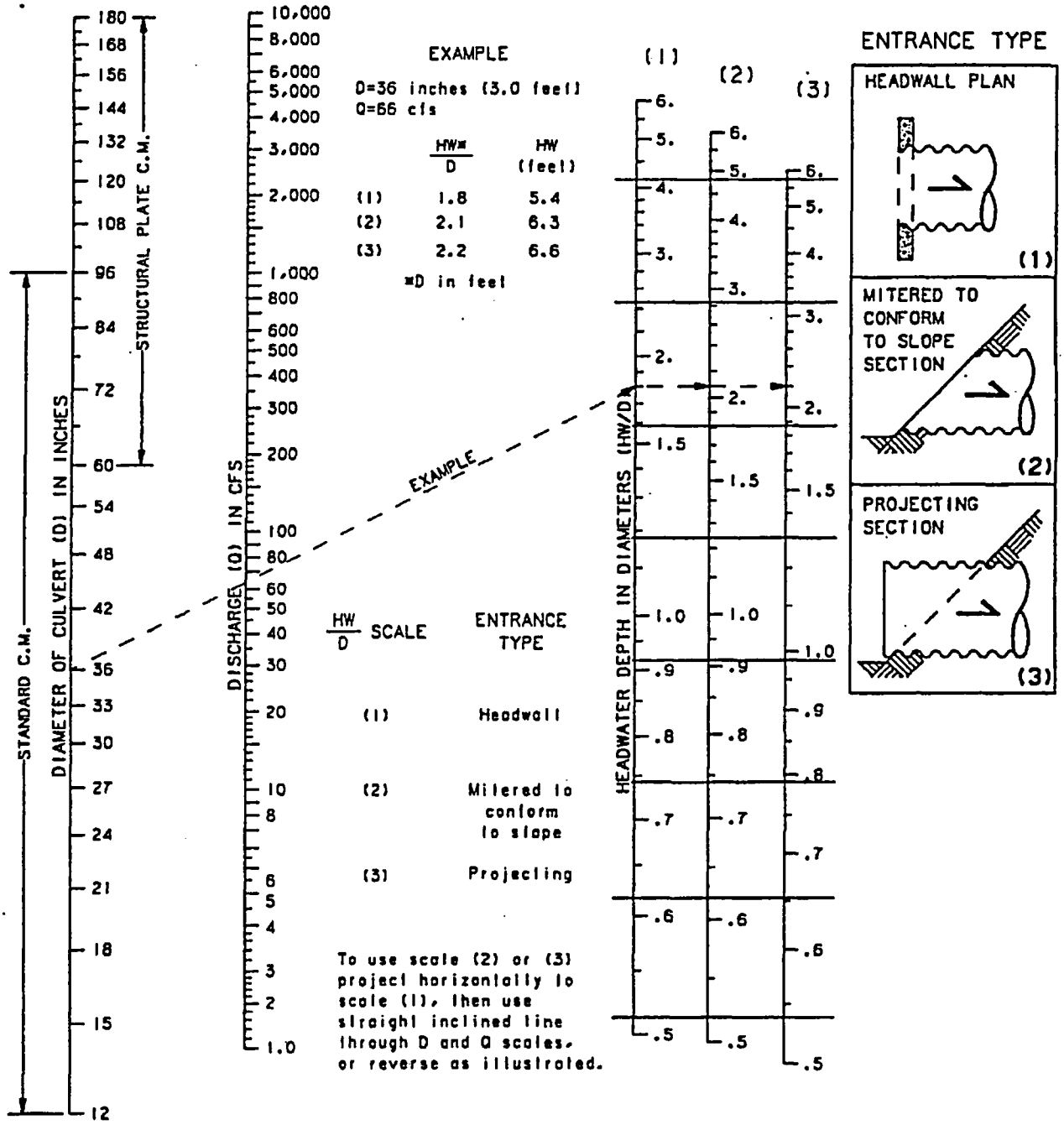

HEADWATER DEPTH FOR CORRUGATED PIPE W/INLET CONTROL

DRAWING NO. 725

REVISED 02-03

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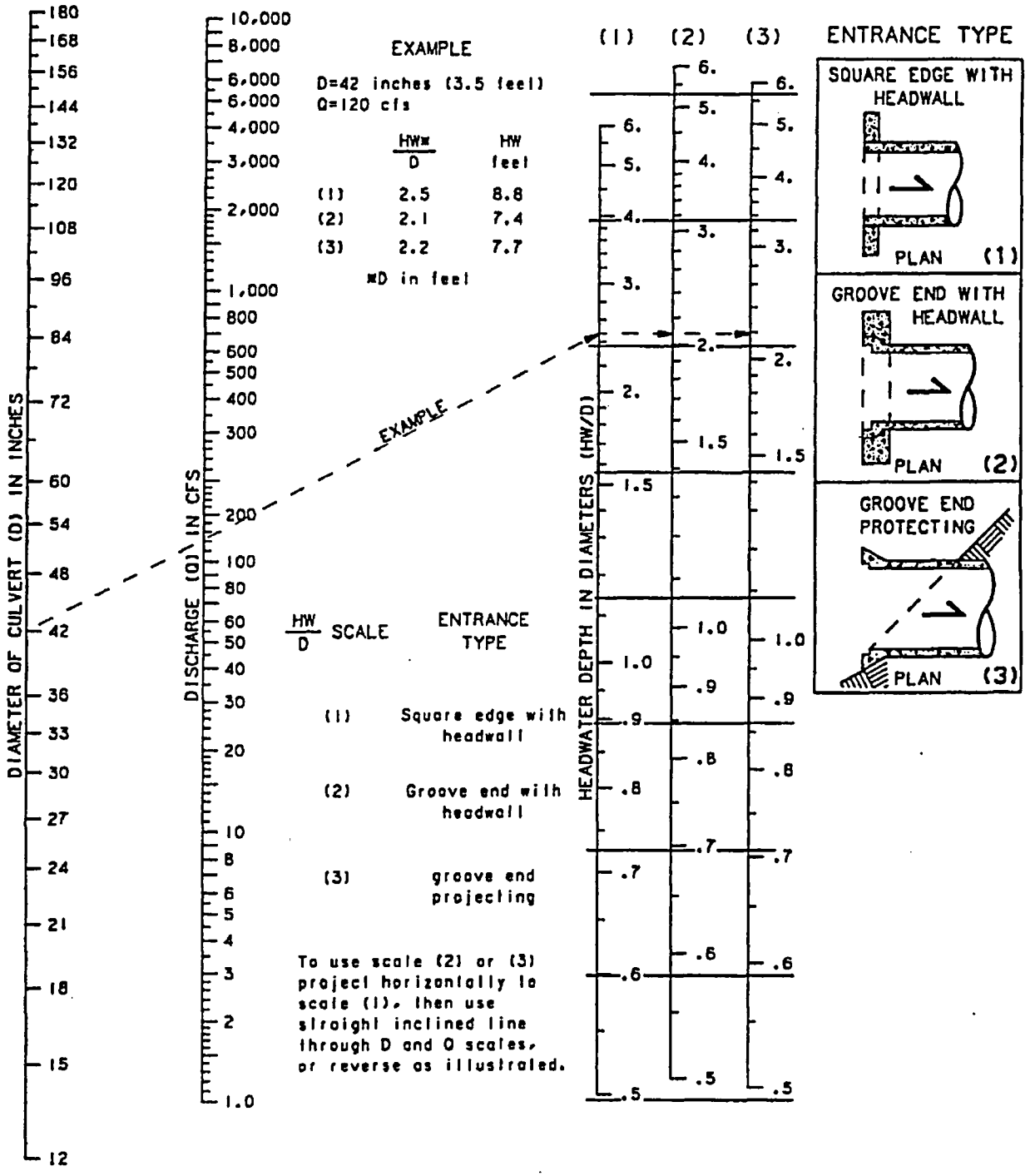

HEADWATER DEPTH FOR SMOOTH INTERIOR PIPE CULVERTS WITH INLET CONTROL

DRAWING NO. 730

REVISED 02-03

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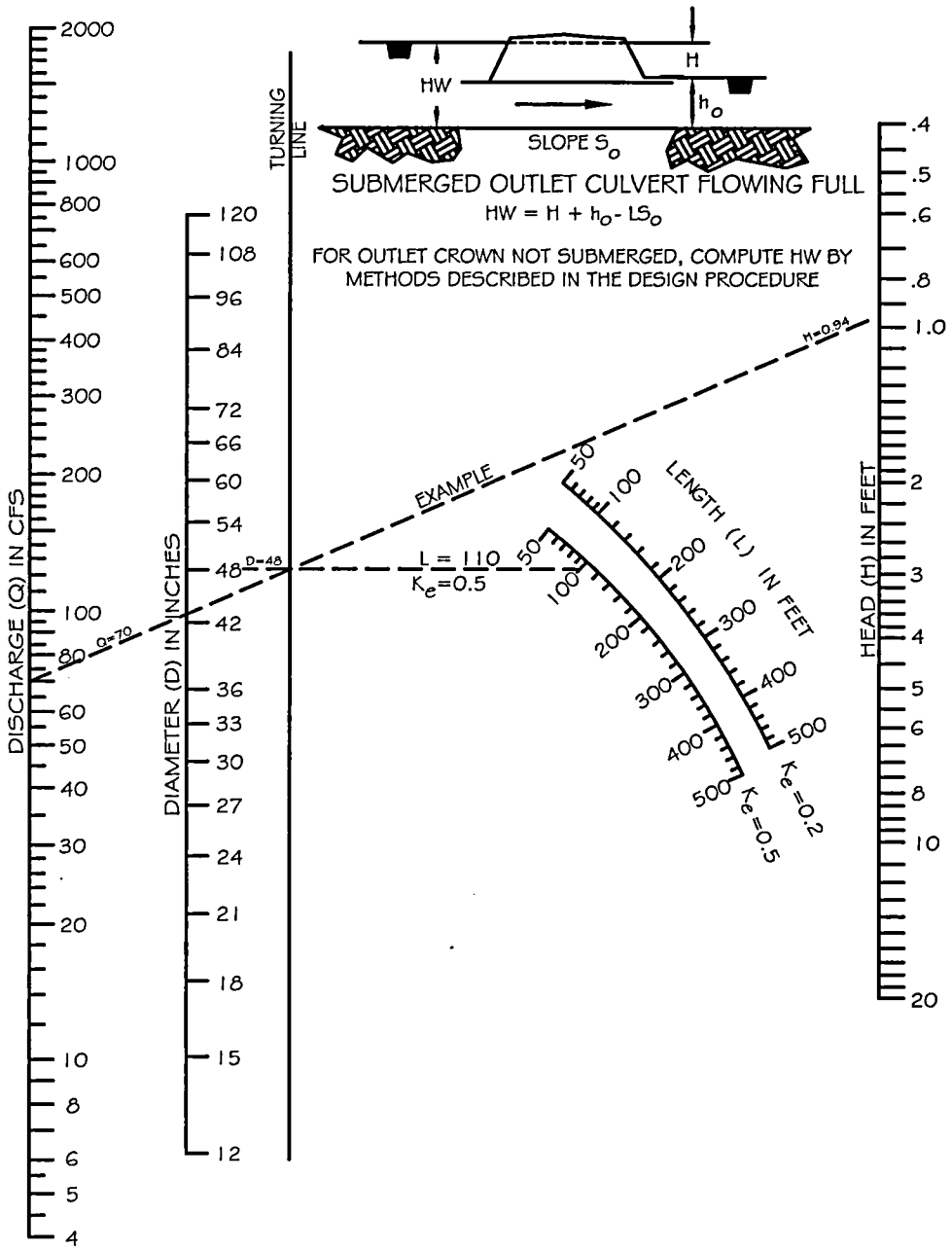

HEAD FOR CULVERTS (PIPE W / "N" = 0.012), FLOWING FULL WITH OUTLET CONTROL

DRAWING NO. 735

Clean Water Services
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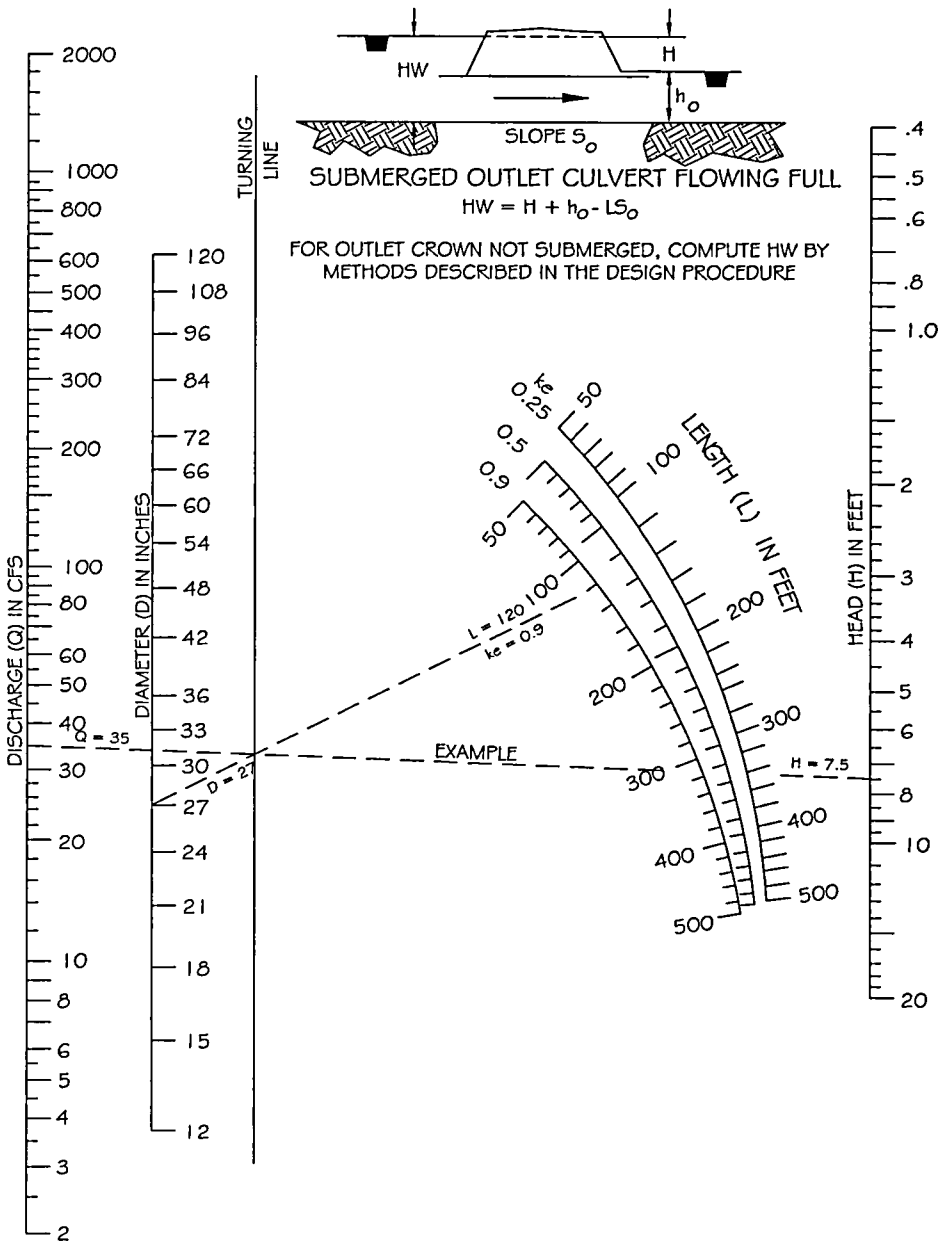

HEAD FOR CULVERTS (PIPE W / "N" = 0.024), FLOWING FULL WITH OUTLET CONTROL

Clean Water Services
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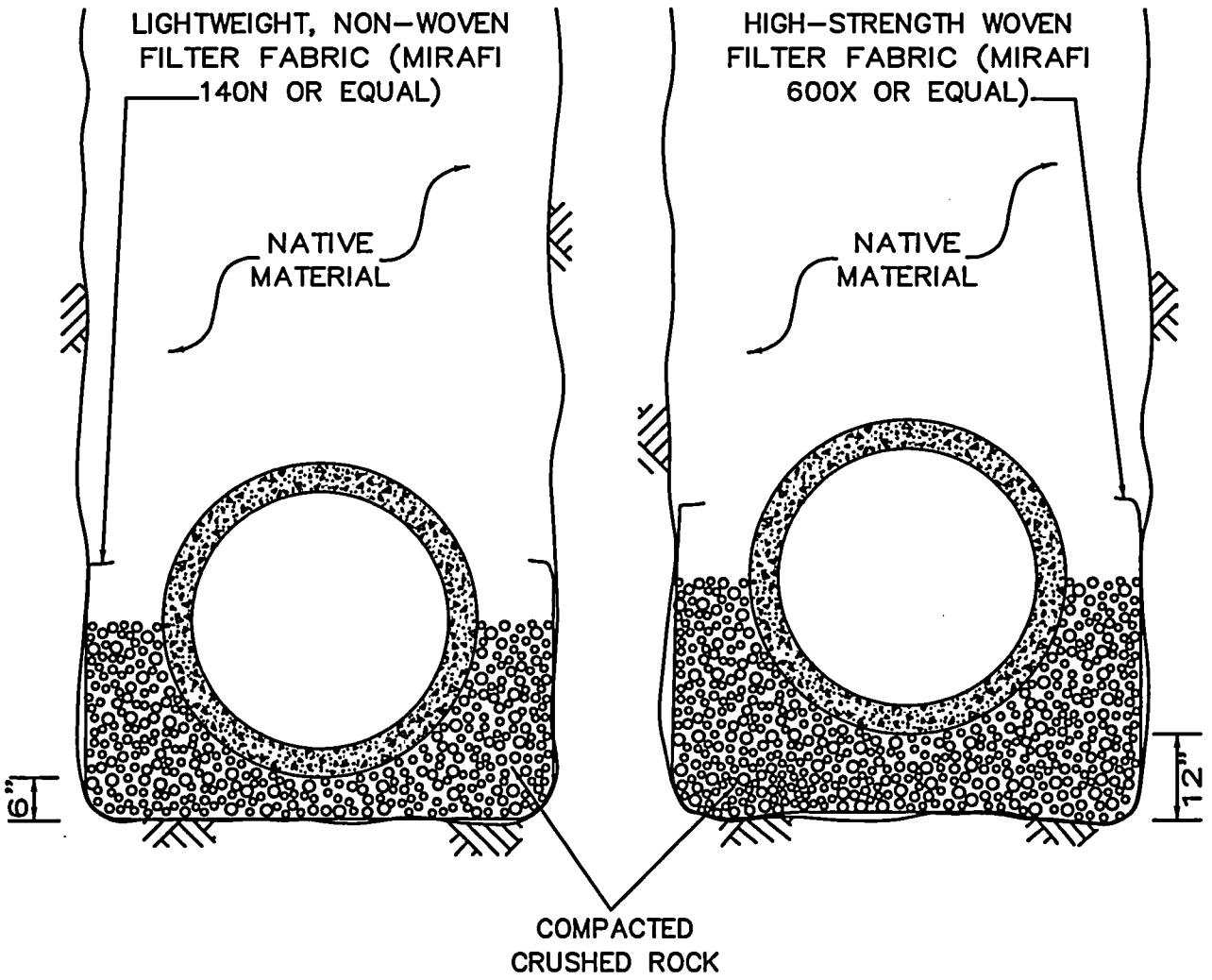
DRAWING NO. 740

TRENCH "A"

TRENCH "B"



GEOTEXTILE STABILIZATION

DRAWING NO. 1170

REVISED 02-03

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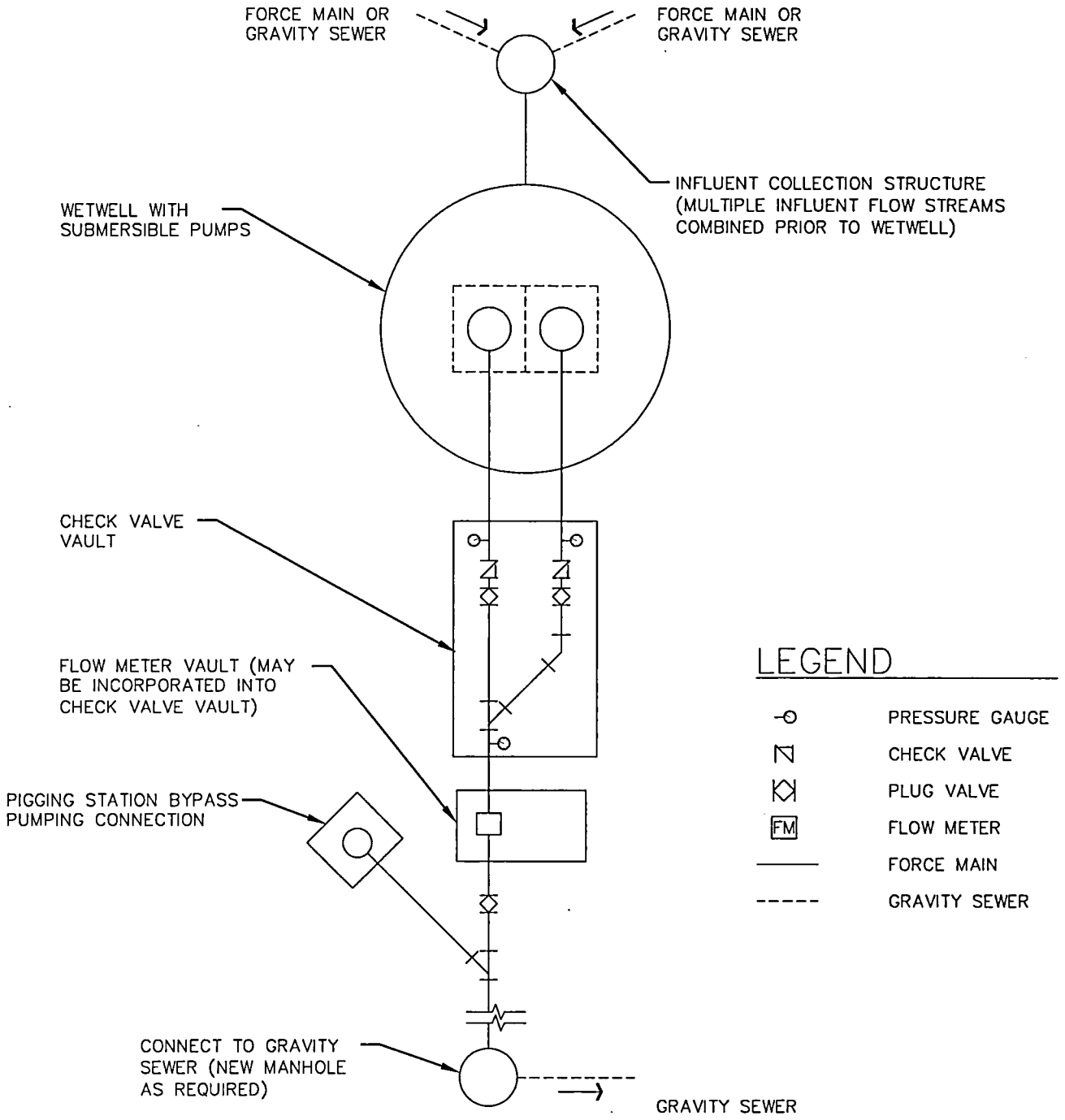

CONCEPTUAL SITE SCHEMATIC

DRAWING NO. 1003

REVISED 12-03

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CHAIN LINK FENCE AND GATE

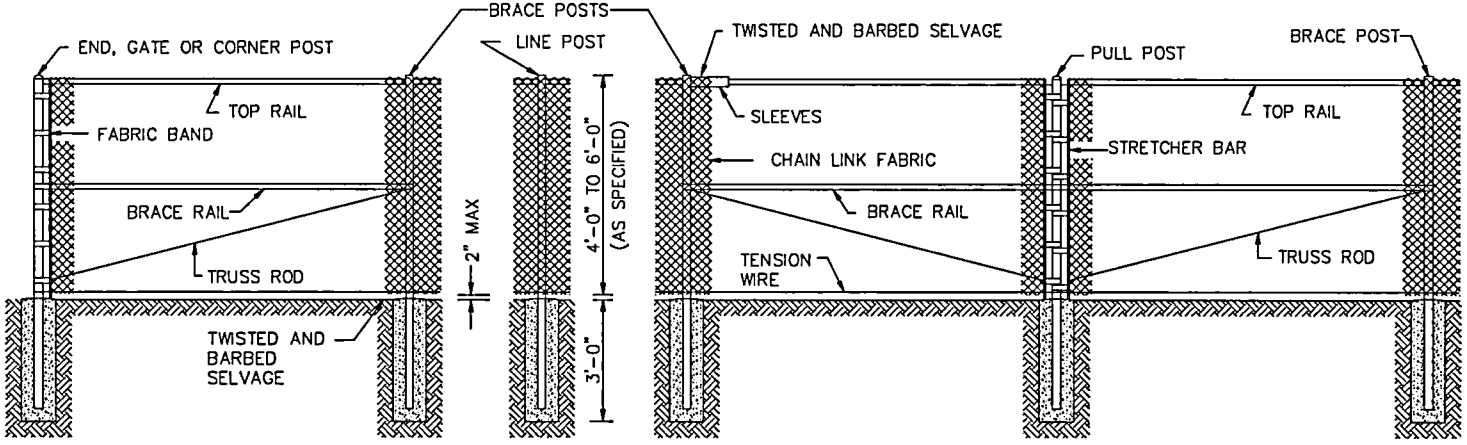
DRAWING NO. 1005

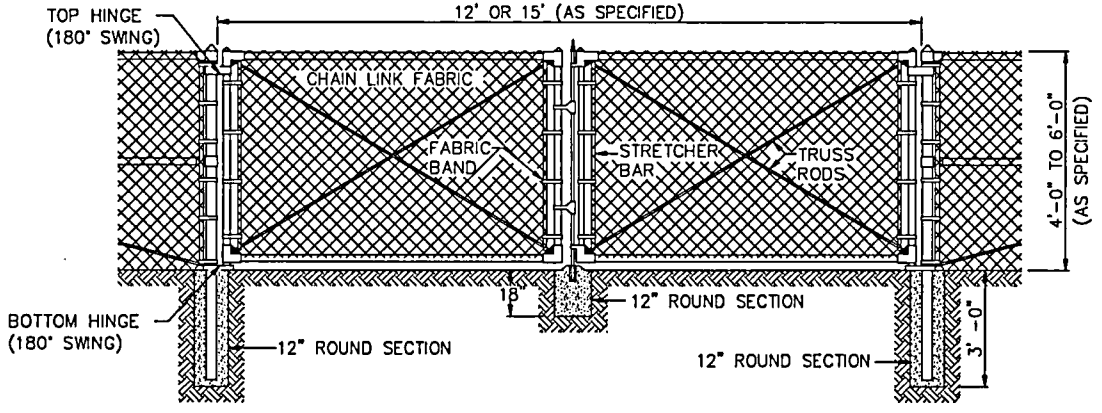
REVISED 12-03

MEMBER	NOMINAL DIA (IN)	MATERIAL	
BRACE RAIL	1.660	GALV TUBULAR STL	
GATE FRAME	2.00	GALV TUBULAR STL	
LINE POSTS	2.375	GALV TUBULAR STL	
END & CORNER POST	2.875	GALV TUBULAR STL	
CHAIN LINK FABRIC		9 GA. W/PVC COATING.	
	GATE OPENING (ft)	NOMINAL DIA (IN)	MATERIAL
GATE POST	12' OR 15'	4	GALV TUBULAR STL

NOTES:

1. ALL FITTINGS, FASTENERS, & AND FABRIC TIES SHALL BE HOT DIP GALV.
2. CONC SHALL BE MIN 2500 PSI @ 28 DAYS.
3. PROVIDE BRACE RAIL BETWEEN END POSTS AND LINE POSTS. LENGTHS AS REQ'D.
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 REQ'D.
6. PROVIDE SIGHT OBSCURING SLATS WITH ALL WASTEWATER PUMP STATIONS.
7. CENTER BRACE RAIL NOT REQUIRED WITH FENCE HEIGHT OF 5' OR LESS.





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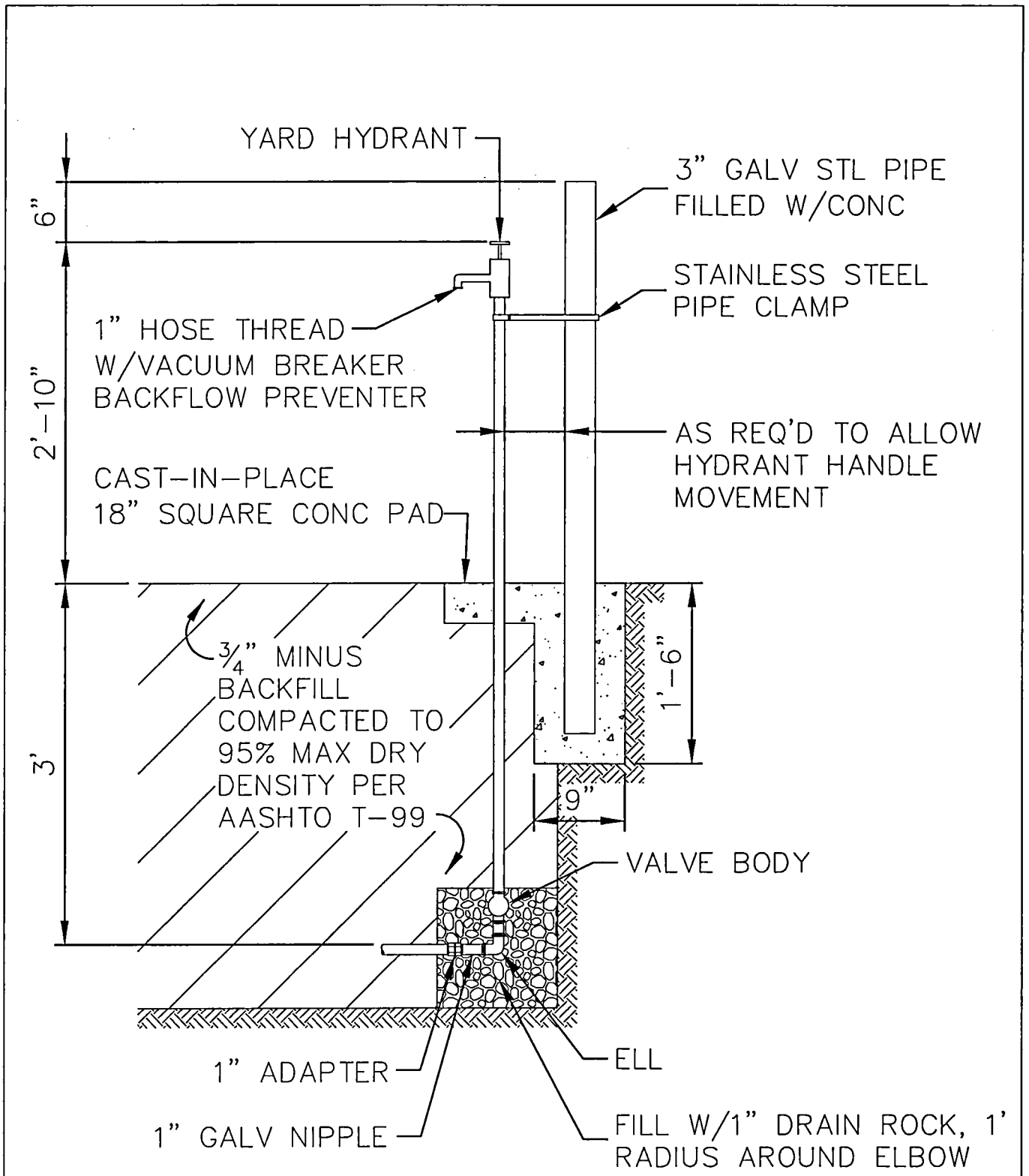

YARD HYDRANT

DRAWING NO. 1009

REVISED 12-03

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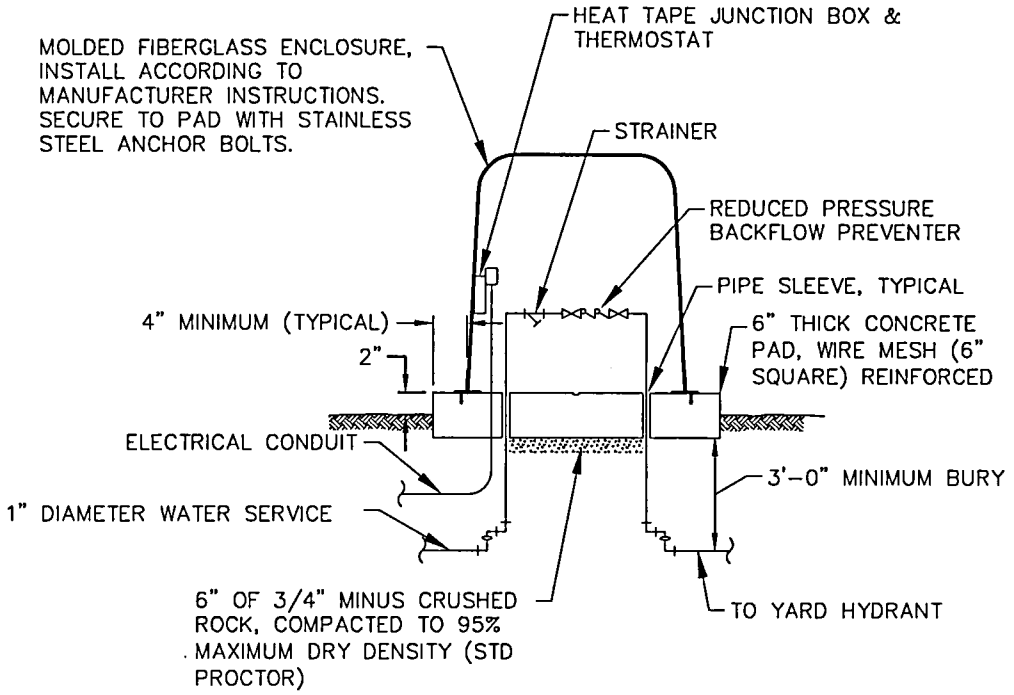

NOTE:

1. WRAP EXPOSED WATER PIPE WITH HEAT TAPE AND PVC COATED PIPE INSULATION.

REDUCED PRESSURE BACKFLOW PREVENTER

DRAWING NO. 1011

REVISED 12-03

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ELECTRICAL
ONE-LINE DIAGRAM

DRAWING NO. 1071

REVISED 12-03

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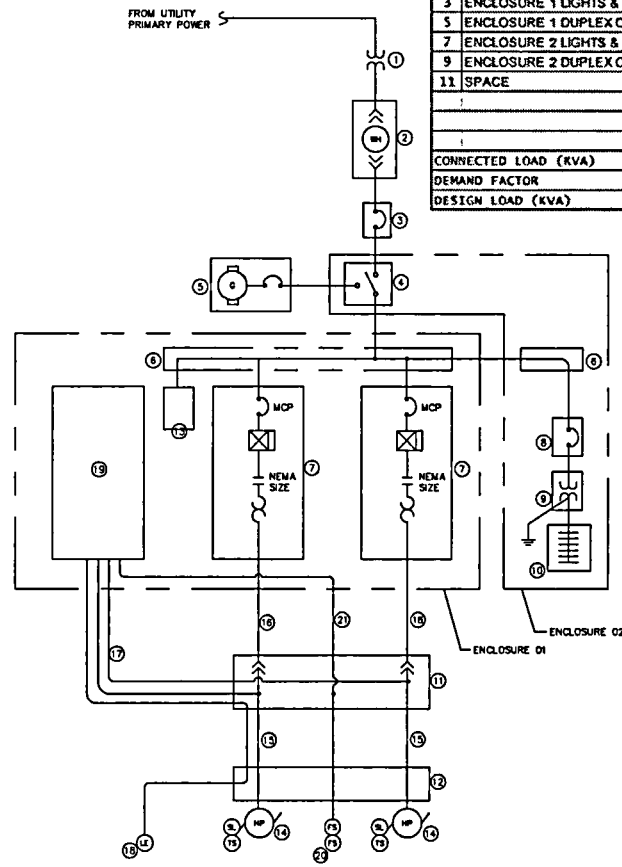
PANELBOARD NO:	LOAD CENTER												
VOLTAGE:	120/240	BUS RATING (A):			100			ENCLOSURE:	NEMA 1				
PHASE:	1	MAIN OC DEVICE:			60/2			MOUNTING:	SURFACE				
WIRE:	3+GND	INTERRUPTING RATING (KA):			10			LOCATION:	ENCLOSURE 1				
200% NEUTRAL:	NO	SERVICE ENTRANCE LABEL:			NO								

CKT NO.	DESCRIPTION	CONNECTED LOAD (VA) LTS	REC	MECH	MISC	OCP AMPS	P		OCP AMPS	P	CONNECTED LOAD (VA) LTS	REC	MECH	MISC	DESCRIPTION	CKT NO.
1	CONTROL POWER				600	20	1	A	20	1		360			WEATHER PROOF DUPLEX	2
3	ENCLOSURE 1 LIGHTS & HEATER	300				20	1	B	20	1		300			AUTO DIALER	4
5	ENCLOSURE 1 DUPLEX OUTLET		360			20	1	A	20	1				100	FLOW TRANSMITTER	6
7	ENCLOSURE 2 LIGHTS & HEATER	300				20	1	B	20	1				100	WETWELL LEVEL	8
9	ENCLOSURE 2 DUPLEX OUTLET		360			20	1	A	20	1				1,000	GENERATOR BATTERY CHARGER	10
11	SPACE					20	1	B	20	1				1,500	GENERATOR BLOCK HEATER	12

LOAD SUMMARY

	LTS	REC	MECH	MISC	SPARE	TOTAL			PHASE BALANCE	
CONNECTED LOAD (KVA)	0.6	1.4	0.0	3.3	---	5.3	240	LINE-TO-LINE VOLTS	PHASE A (KVA)	###
DEMAND FACTOR	1.25	NEC	1.00	1.00	20%	---	22	CONNECTED AMPS	PHASE B (KVA)	###
DESIGN LOAD (KVA)	0.8	1.4	0.0	3.3	1.1	6.5	27	DESIGN AMPS		



1 ONE-LINE DIAGRAM
SCALE: NTS

KEY NOTES:

ITEM	DESCRIPTIONS	COMMENTS
1	UTILITY XMFR POWER	480V, 3PHASE, 4W, 60HZ UNDERGROUND SECONDARY SERVICE
2	METER ENCLOSURE	PER UTILITY STANDARDS
3	MAIN SERVICE BREAKER	SUITABLE FOR SERVICE ENTRANCE
4	AUTOMATIC TRANSFER SWITCH	
5	STANDBY GENERATOR	PROVIDED WITH IN-LINE BREAKER
6	POWER DISTRIBUTION BLOCK	480V, 3PHASE
7	COMBINATION MOTOR STARTER PANEL	PROVIDED WITH AMMETER
8	DRY TYPE XMFR PRIMARY BREAKER	
9	DRY TYPE XMFR	MIN 3 KVA, 480V-120/240V, 1PH
10	LOAD CENTER	MIN 100AMPS, 120/240V, 1PH, 3W, 12 POLES
11	DISCONNECT AIR GAP J-BOX	AIR GAP JUNCTION BOX CONFIGURATION
12	UNDERGROUND CABLE TRENCH	
13	3-PHASE SECONDARY SURGE ARRESTOR	
14	PUMP SUBMERSIBLE MOTOR	MOTOR PROVIDED WITH MOTOR OVER TEMP AND SEAL LEAK
15	PUMP SUBMERSIBLE POWER AND CONTROL CABLES	SUPPLIED BY PUMP MFR
16	PUMP POWER WIRES	PROVIDE IN CONDUITS
17	PUMP CONTROL WIRES	PROVIDE IN CONDUITS
18	ULTRASONIC	CABLE BY MFR, NO SPLICE
19	PUMP CONTROL PANEL	
20	FLOATS	OVER FLOW AND HIGH LEVEL
21	FLOAT CONTROL WIRES	

LEGEND:

MTR	MOTOR
SL	SEAL LEAK
TS	MOTOR OVER TEMP SWITCH
MCP	MOTOR CIRCUIT PROTECTOR

DRAWING NO. 1072

ELECTRICAL
INTERIOR ENCLOSURE-01

REVISED 12-03

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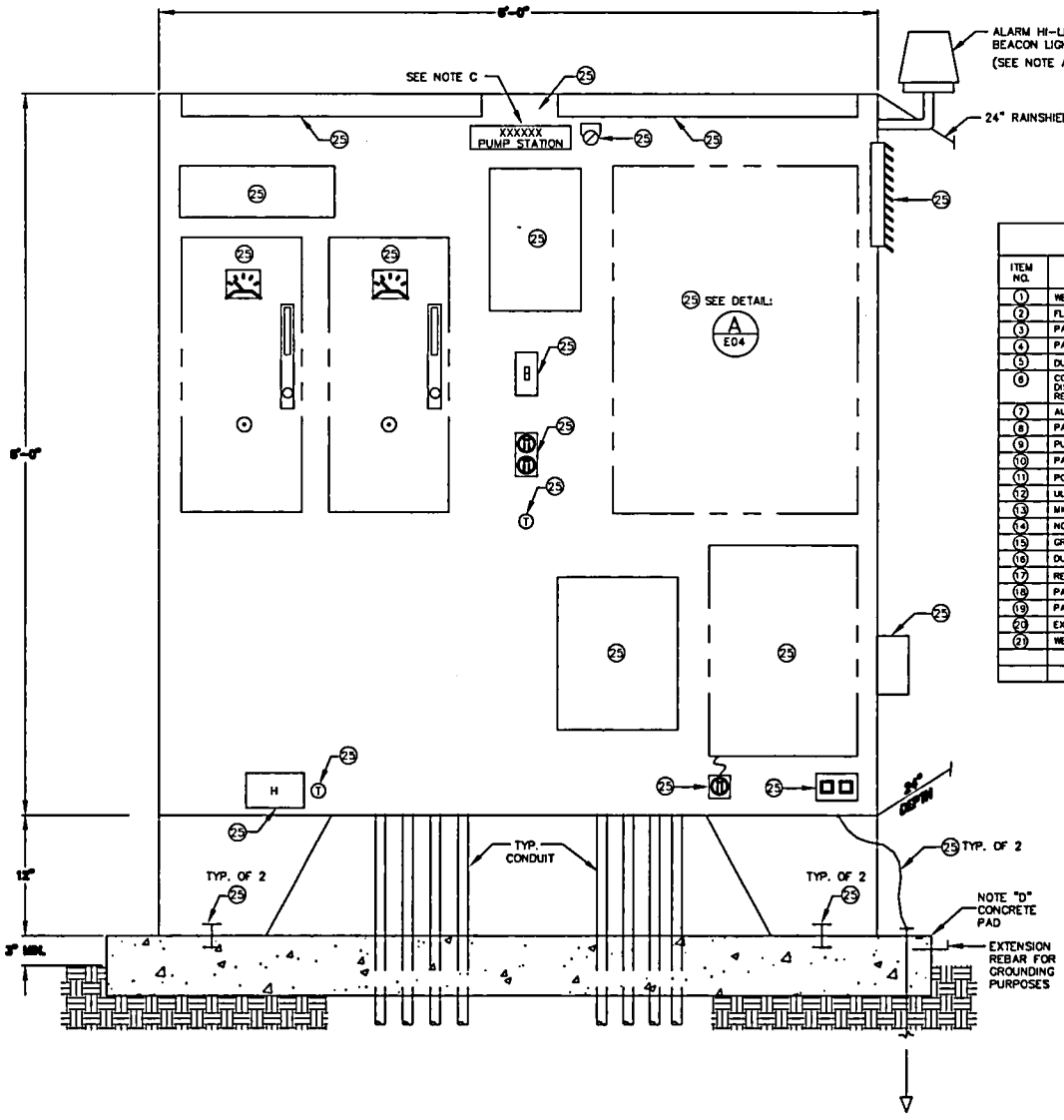

KEYED NOTES & COMMENTS:

ITEM NO.	DEVICE	COMMENTS
1	WEATHER PROOF ENCLOSURE	
2	FLOW TRANSMITTER	
3	PANEL HEATER	
4	PANEL HEATER THERMOSTAT	
5	DUPLEX TELEPHONE JACK	RADIO SHACK # 279-448
6	COMBINATION MOTOR STARTER, LOCKABLE DISCONNECT, AMMETER AND OVERLOAD RESET	
7	AUTO-DIALER	PROVIDED WITH POWER CORD
8	PANEL LIGHT ON/OFF	SWITCH ACTIVATED BY DOOR OPENING
9	PUMP CONTROL PANEL	
10	PANEL FLUORESCENT LIGHTS	
11	POWER DISTRIBUTION BLOCK	
12	ULTRASONIC CONTROLLER	
13	MINIMUM 1/2" ANCHOR BOLTS	STAINLESS STEEL
14	NOT USED	
15	GROUND RODS & GROUND WIRE, #1	
16	DUPLEX RECEPTACLE	
17	RECEPTACLE FOR AUTO-DIALER	
18	PANEL EXHAUST FAN WITH FILTER	
19	PANEL EXHAUST THERMOSTAT	
20	EXTERIOR POLE LIGHT SWITCH	
21	WEATHERPROOF DUPLEX OUTLET	

GENERAL NOTES

A HIGH LEVEL ALARM, EXTERIOR BEACON LIGHT MOUNTED ON TOP OF PANEL. MUST BE SEEN FROM STREET LEVEL. FIELD ADJUST HEIGHT AS REQUIRED.

B INTERIOR RACEWAY ROUTING BETWEEN PANELS WITHIN ENCLOSURES SHALL BE WELL COORDINATED AND SHALL BE RGS TYPE.

C PROVIDE DESIGNATED PUMPSTATION NAMEPLATE OUTSIDE ENCLOSURE i.e. XXXX PUMPSTATION.

D PAD DETAILS AND CONNECTION TO PAD SHOULD BE DESIGNED TO RESIST SEISMIC AND WIND LOADS. THE DETAILS SHOWN SHOULD BE CONSIDERED MINIMUMS.

DRAWING NO. 1073

ELECTRICAL
INTERIOR ENCLOSURE-02

REVISED 12-03

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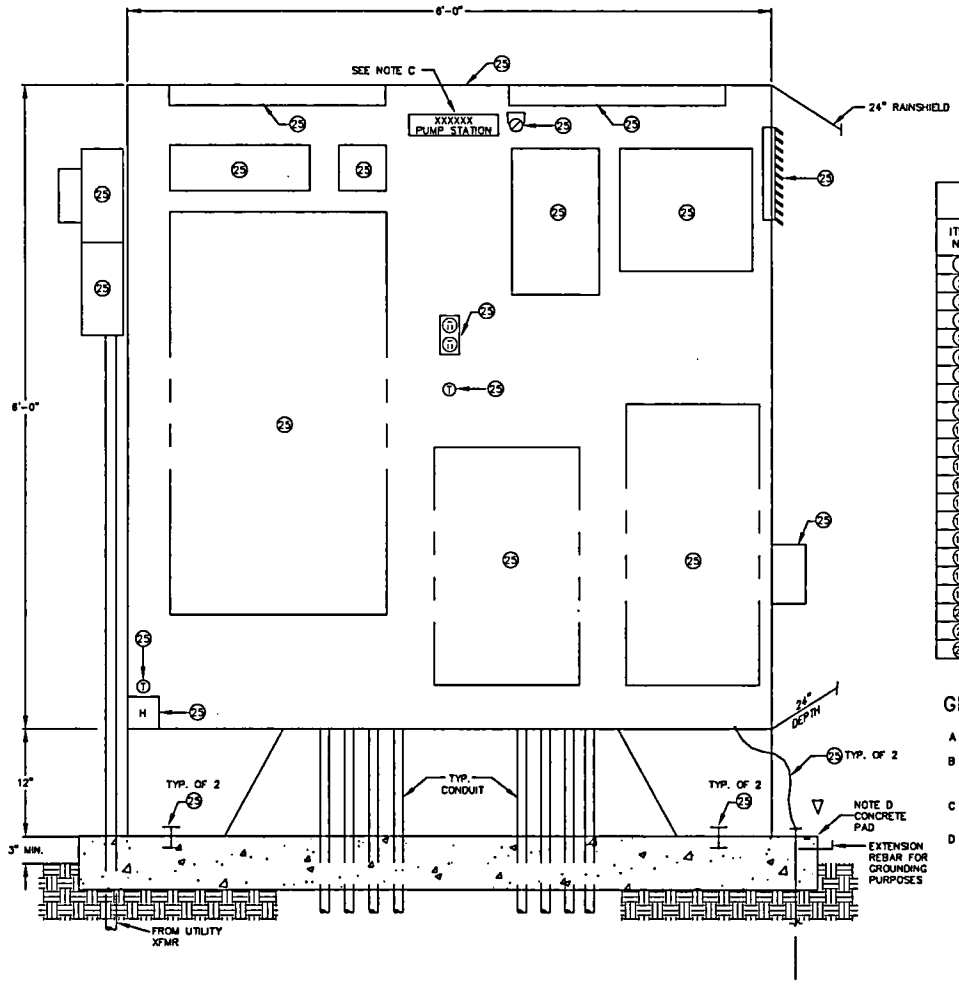

1 ELECTRICAL ENCLOSURE - 02
SCALE: 2"=1'-0" (SEE NOTE J)

KEYED NOTES & NAMEPLATE DESIGNATIONS:

ITEM NO.	DEVICE	NAMEPLATE
1	WEATHER PROOF ENCLOSURE	PUMP STATION XXXX
2	LOAD CENTER	LOAD CENTER
3	PANEL HEATER	
4	PANEL HEATER THERMOSTAT	
5	3-PHASE SECONDARY SURGE ARRESTOR	SURGE ARRESTOR
6	DRY TYPE XMFR PRIM BREAKER	DRY TYPE XMFR PRIM BREAKER
7	DRY TYPE XMFR	
8	O & M RACK	O & M RACK
9	DUPLEX RECEPTACLE	CIRCUIT XX
10	PANEL FLOURESCENT LIGHTS	
11	POWER DISTRIBUTION BLOCK	
12	AUTOMATIC TRANSFER SWITCH	AUTOMATIC TRANSFER SWITCH
13	WEATHERPROOF DUPLEX OUTLET	CIRCUIT XX
14	PANEL LIGHT ON/OFF	ACTIVATED BY DOOR OPENING
15	GROUND RODS & GROUND WIRE, #1	
16	NOT USED	
17	NOT USED	
18	PANEL EXHAUST FAN w/FILTER	
19	PANEL EXHAUST THERMOSTAT	
20	MINIMUM 1/2" ANCHOR BOLT	
21	"METER-MAN" POWER METER BASE PER PGE STANDARDS	
22		

GENERAL NOTES:

A NOT USED

B INTERIOR RACEWAY ROUTING BETWEEN PANELS WITHIN ENCLOSURES SHALL BE WELL COORDINATED AND SHAL BE RGS TYPE.

C PROVIDE DESIGNATED PUMP STATION NAMEPLATE OUTSIDE ENCLOSURE i.e. XXXX PUMP STATION.

D PAD DETAILS AND CONNECTION TO PAD SHOULD BE DESIGNED TO RESIST SEISMIC AND WIND LOADS. THE DETAILS SHOWN SHOULD BE CONSIDERED MINIMUMS.

ELECTRICAL
CONTROL PANEL DETAIL

DRAWING NO. 1074

REVISED 12-03

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36"X30"X8"
ENCLOSURE

33"X27
BACKPANEL

A PUMP SEQUENCE CONTROL PANEL (PSPC) – FRONT DETAIL
SCALE: NTS

SEE SHEET E02

KEYED NOTES & NAMEPLATE DESIGNATIONS (PSCP):

ITEM NO.	DEVICE	NAMEPLATE
1	PUMP SEQUENCE CONTROL PANEL	PUMP CONTROL PANEL
2	SELECTOR SWITCH	CONTROL POWER ON/OFF
3	GREEN LIGHT	CONTROL POWER ON
4	RUN TIME METER	–
5	–	PUMP 1
6	–	PUMP 2
7	RED LIGHT	RUNNING
8	SELECTOR SWITCH	H–O–A
9	ALTERNATOR SELECTOR SWITCH	LEAD SELECTOR PUMP1–ALT–PUMP2
10	AMBER LIGHT	SEAL LEAK
11	RESET PUSHBUTTON	OVER TEMP RESET
12	AMBER LIGHT	MOTOR OVER TEMP
13	RELAYS, 2 POLE	
14	RELAYS, 4 POLE	
15	TIMER, OFF DELAY	
16	TIMERS, ON DELAY	
17	ALTERNATING RELAY	
18	SEAL LEAK DETECTOR	
19	INTRINSICALLY SAFE RELAYS	
20	FLOAT SWITCHES, NO	
21	TERMINALS, PUMP SEQ CP WIRING	
22	TERMINALS, SEAL LEAK & OVERTEMP WIRING	
23	TERMINALS, INTRINSICALLY SAFE WIRING	
24	PUSHBUTTON, 1 N.O., 1 N.C.	
25	SELECTOR SWITCH, 2 POS, 1 N.O., 1 N.C.	HIGH LEVEL ALARM TEST
26	AMBER LIGHT	HIGH LEVEL BEACON ALARM ENABLE–DISABLE
		PUMP FAIL (OVERLOAD)

ELECTRICAL SEQUENCE CONTROL DIAGRAM

DRAWING NO. 1075

REVISED 12-03

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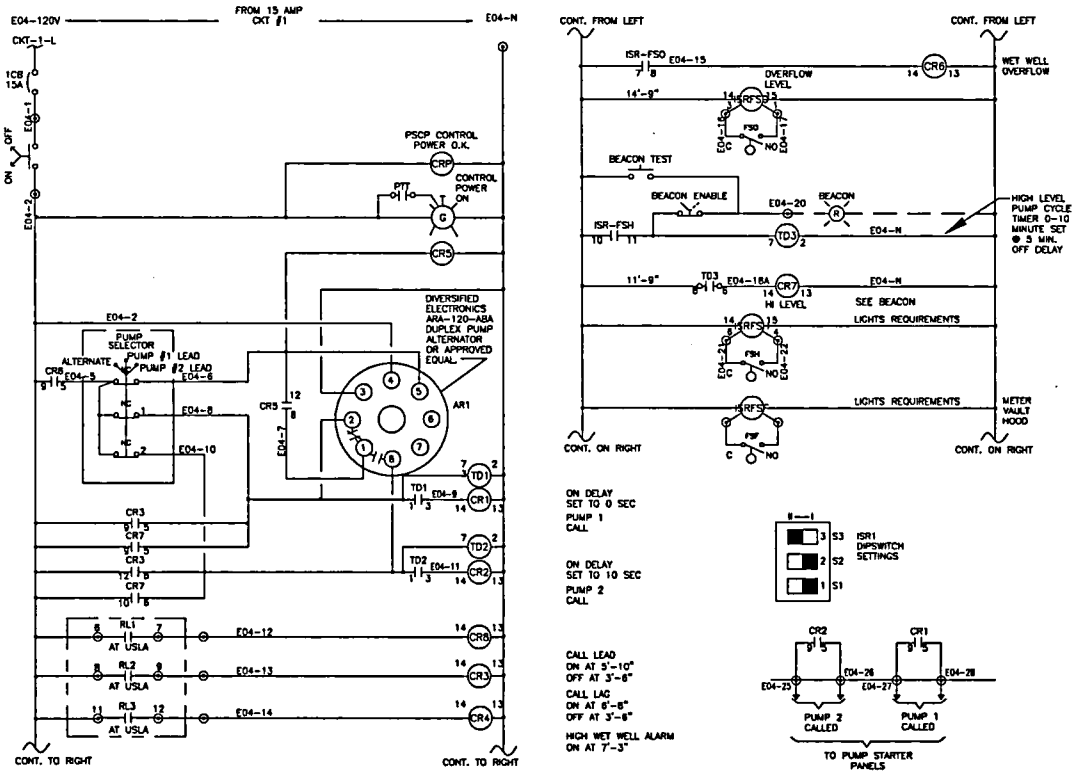
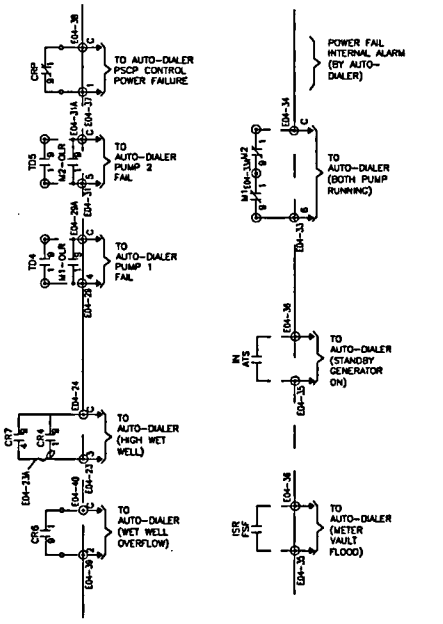


1 PUMP SEQUENCE CONTROL PANEL – CONTROL DIAGRAM (PSCP)

SCALE: NTS

KEYED NOTES:

① THIS IS REPRESENTATIVE OF PUMP TECH-WARRICK PUMP MONITOR UNIT FOR MOTOR SEAL LEAK DETECTION. CONTRACTOR IS RESPONSIBLE FOR INSTALLING THE UNIT PER THE PUMP MANUFACTURER'S RECOMMENDATIONS, AND TO PROVIDE ACCESSORIES AND CONNECTIONS TO PLACE THE ACTUAL PUMP FURNISHED INTO FULL OPERATION WITH LEAK PROTECTION. FIELD INSTALL UNIT IN STARTER PANEL.



2 AUTO DIALER INPUT

SCALE: NTS

ELECTRICAL PUMP CONTROL DIAGRAMS

DRAWING NO. 1076

REVISED 12-03

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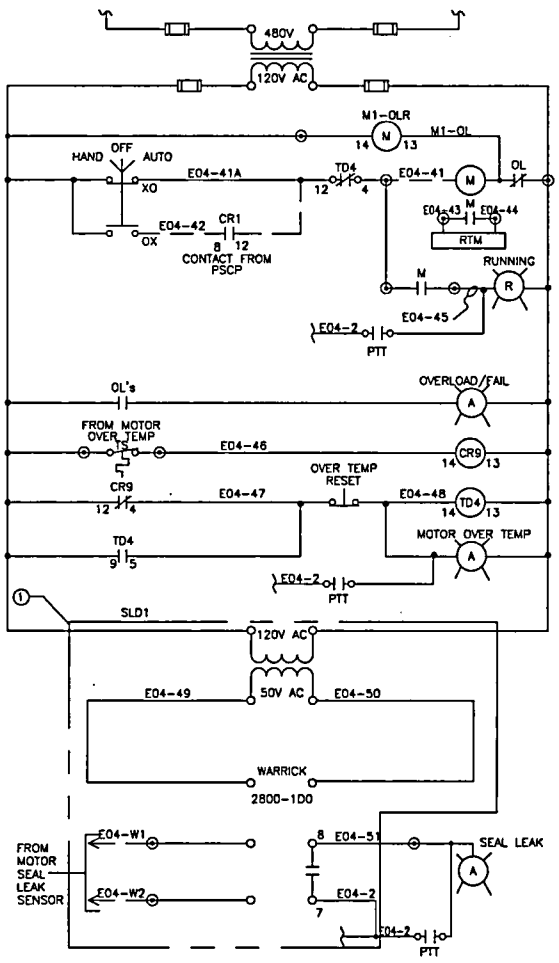
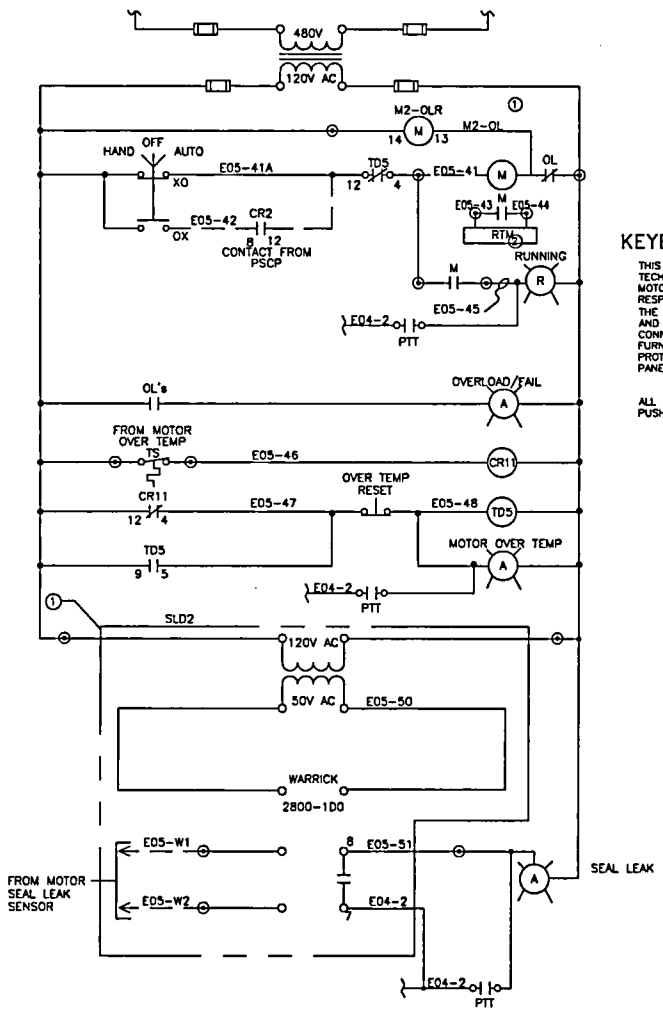


1 CONTROL DIAGRAM MOTOR STARTER SUBMERSIBLE PUMP #1

SCALE: NTS



2 CONTROL DIAGRAM MOTOR STARTER SUBMERSIBLE PUMP #2

SCALE: NTS

KEYED NOTES:

THIS IS REPRESENTATIVE OF PUMP TECH-WARRICK PUMP MONITOR UNIT FOR MOTOR SEAL LEAK DETECTION. CONTRACTOR IS RESPONSIBLE FOR INSTALLING THE UNIT PER THE PUMP MANUFACTURER'S RECOMMENDATIONS, AND TO PROVIDE ACCESSORIES AND CONNECTIONS TO PLACE THE ACTUAL PUMP FURNISHED INTO FULL OPERATION WITH LEAK PROTECTION. FIELD INSTALL UNIT IN STARTER PANEL.

ALL INDICATING PILOT LIGHTS SHALL BE PUSH-TO-TEST AND LED LAMP TYPE.

ELECTRICAL
ENCLOSURE RAINSHIELD
DETAIL REFERENCE

DRAWING NO. 1077

REVISED 12-03

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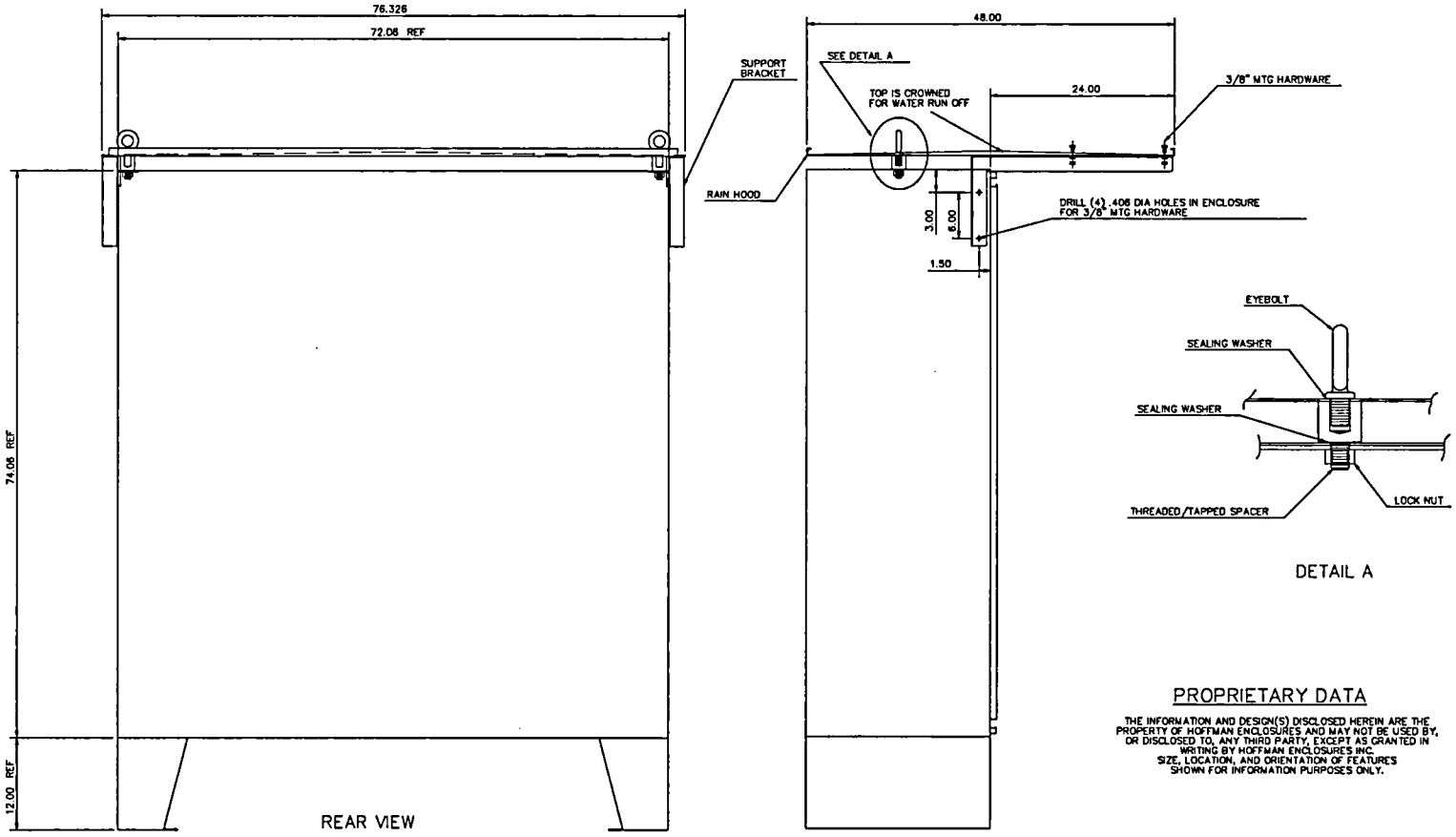
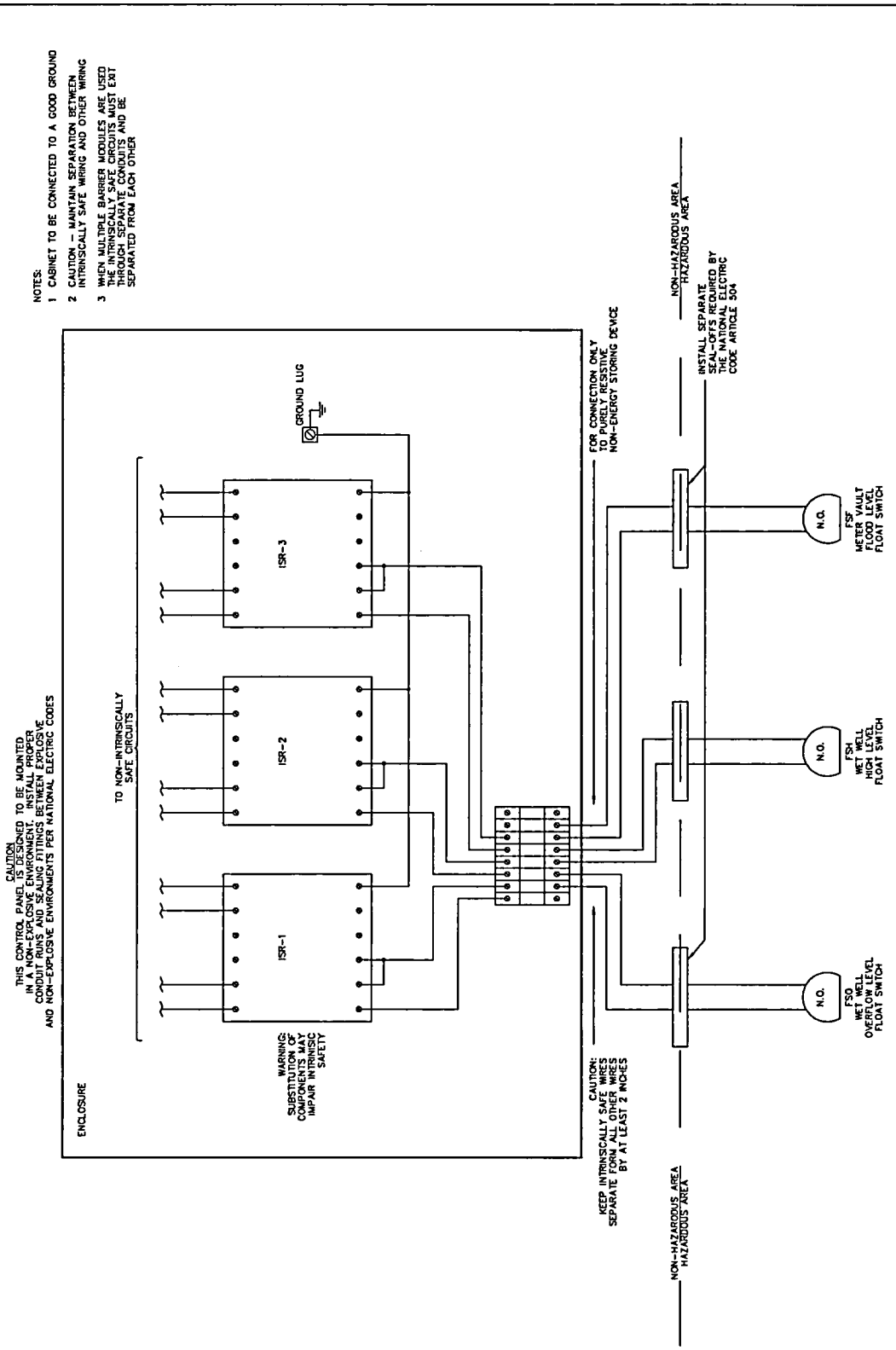


NOTES:

1. ENCLOSURE TO BE A HOFFMAN CUSTOM NEMA 3R A727224USSLPSPC ENCLOSURE WITH CUSTOM RAINHOOD AND CUSTOM L30 PADLOCKING HANDLE, SUPPORT BRACKETS, SPACERS & MTG HARDWARE.
2. DOORS NOT SHOWN.



ELECTRICAL INTRINSICALLY SAFE EXAMPLE DRAWING

DRAWING NO. 1078

REVISED 12-03

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ELECTRICAL
WETWELL LEVEL DETAIL

DRAWING NO. 1079

REVISED 12-03

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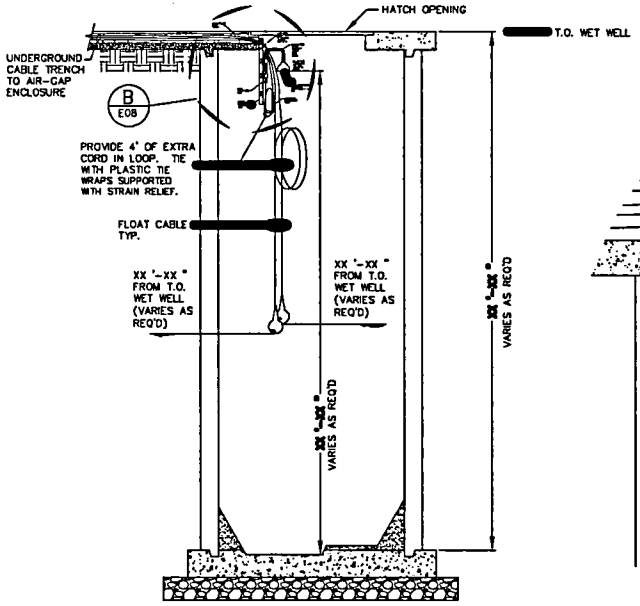
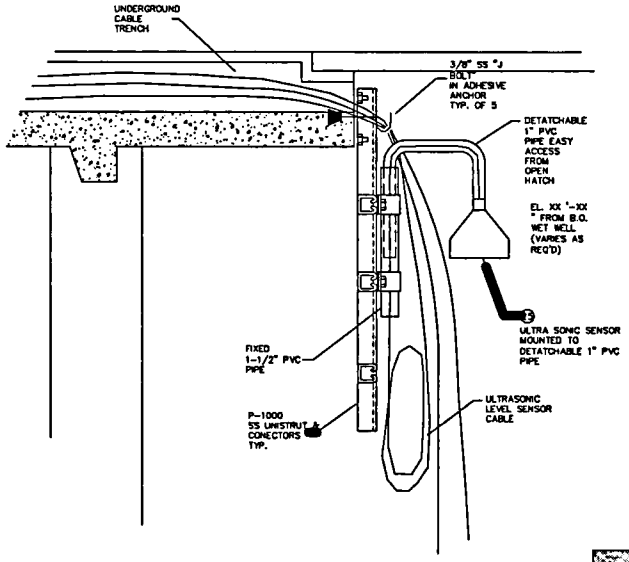


A WETWELL LEVEL DETAIL
SCALE: 1/2"=1'-0"



B SENSOR MOUNTING DETAIL
SCALE: 3"=1'-0"

KEYED NOTES:

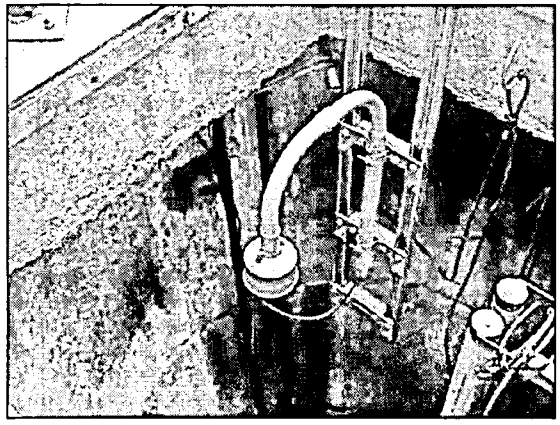
1. INSTALL ULTRASONIC SENSOR THAT CAN BE ACCESSIBLE AND REMOVEABLE FROM THE WETWELL ACCESS HATCH.

REFERENCE:

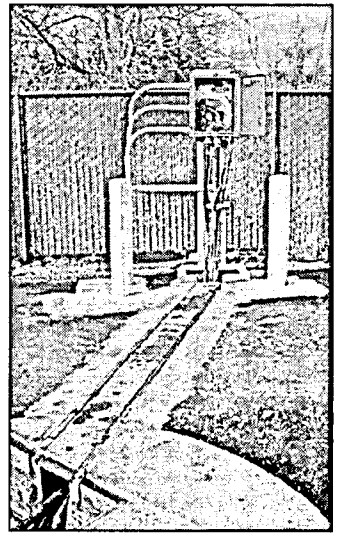
PUMP LEVEL OPERATING RANGE MUST BE PROGRAMMED IN ULTRASONIC TRANSMITTER (FROM BOTTOM OF WETWELL).

LEAD PUMP OFF: XX '-XX "
LAG PUMP OFF: XX '-XX "
LEAD PUMP ON: XX '-XX "
LAG PUMP ON: XX '-XX "
HI LEVEL ALARM: XX '- XX"

(FILL IN PUMP OPERATION ELEVATIONS AS REQ'D.)



C MOUNTED SENSOR
NTS

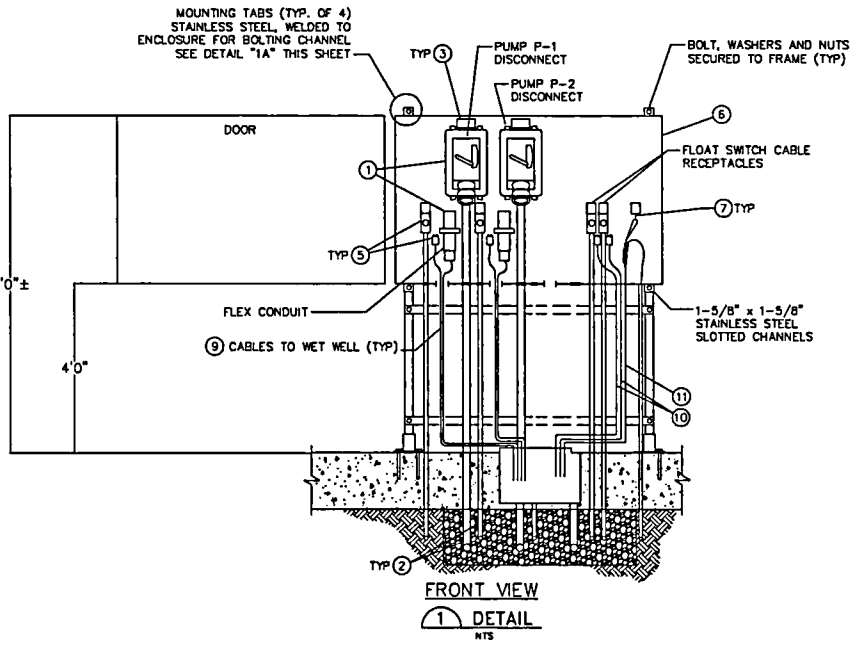


D CABLE TRENCH
NTS

ELECTRICAL
DISCONNECT AIR-GAP
JUNCTION BOX DETAILS

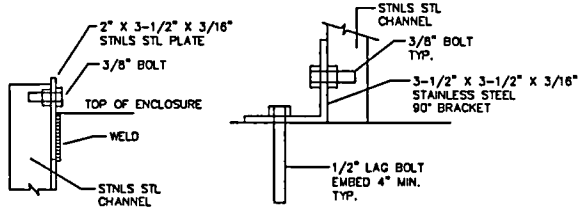
DRAWING NO. 1080

REVISED 12-03



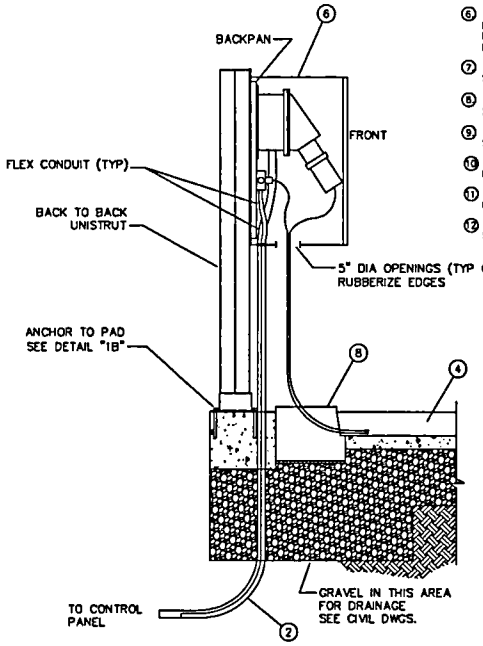
FRONT VIEW

(1) DETAIL
NTS



(1a) DETAIL
NTS

(1b) DETAIL
NTS



SIDE VIEW

(2) DETAIL
NTS

KEYED NOTES:

1. PIN & SLEEVE INTERLOCK. 480V, 3P, 4W. HUBBELL WITH MATCHING PLUG. (2 REQ'D)
2. CONDUITS TO STARTERS AND PUMP SEQUENCE CONTROL PANEL. NOTE POWER AND CONTROL CONDUCTORS IN SEPARATE CONDUITS. ROUTE CONDUITS DOWN INTO GROUND.
3. INSTALL EQUIPMENT NAME PLATES ABOVE EACH SWITCH AND RECEPTACLE.
4. CABLE CHANNEL TO WET WELL, SYNERTECH MOULDED PRODUCTS MODEL NO 68 PLASTIBETON CHANNEL SYSTEM COMPLETE WITH COVER AND SMC DIVIDER TO PARTITION POWER CABLES FROM INSTRUMENTATION CABLES. SEE CIVIL DWGS.
5. PROVIDE 3P, 4W, 20A, 125V SINGLE LOCKING RECEPTACLE IN CAST OUTLET BOX WITH WEATHERPROOF COVER. PROVIDE MATCHING PLUG ARROW-HART 8400 AND 8402 OR EQUAL.
6. 36"H X 36"W X 20"D (MIN), NEMA 3R STAINLESS ENCLOSURE WITH TWO (2) QUARTER TURN, PADLOCKABLE HANDLES ENCLOSURE BY FOUCH ELECTRIC MANUF. CO., (503) 284-1415.
7. PROVIDE J-HOOKS & KELLUMS GRIPS TO SUPPORT ALL FLEXIBLE CORDS.
8. CONCRETE HANDHOLE. 30"L X 24"W X 24"D. 2" THICK, MIN., WITH REINFORCING WIRE MESH.
9. VENDOR CABLES (POWER AND CONTROL) TO SUBMERSIBLE PUMPS LOCATED IN WET WELL.
10. VENDOR CALBES TO FLOAT SWITCHES MOUNTED IN WET WELL.
11. VENDOR CALBES TO ULTRASONIC LEVEL TRANSDUCER MOUNTED IN WET WELL.
12. ALL HARDWARE, FRAMEWORK, ETC., SHALL BE STAINLESS STEEL.

Clean Water Services

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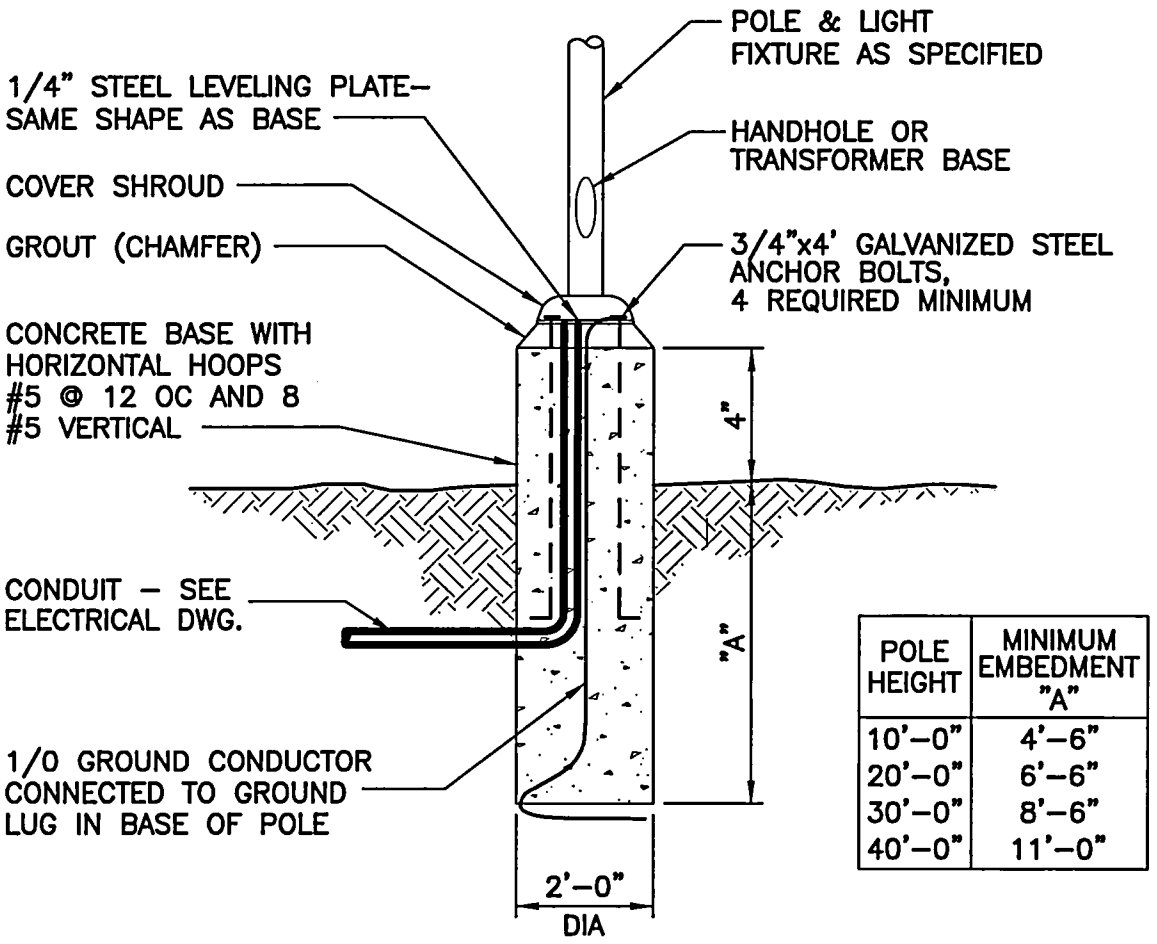

POLE HEIGHT	MINIMUM EMBEDMENT "A"
10'–0"	4'–6"
20'–0"	6'–6"
30'–0"	8'–6"
40'–0"	11'–0"

TYPICAL LIGHT POLE BASE

ELECTRICAL LIGHT POLE DETAIL

DRAWING NO. 1081

REVISED 12–03

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