FINAL

Master Work Plan

22 NASWI (Site 57) PFAS Time-Critical Removal Action, Naval Air Station Whidbey Island, Outlying Landing Field Coupeville, Washington

Contract Number: N62470-18-D-7013
Task Order Number: N44255-22-F-4311

Prepared for:

Naval Facilities Engineering Systems Command Northwest
1101 Tautog Circle
Silverdale, WA 98315-1101

Prepared by:

CAPE-ER JV LLC
500 Pinnacle Court, Suite 100
Norcross, GA 30071

January 2024

Table of Contents

List of Tables

List of Figures

List of Appendices

Acronyms and Abbreviations

AFFF ..... aqueous film-forming foam
AMP ..... Archeological Monitoring Plan
APP/SSHP ..... Accident Prevention Plan/Site Health and Safety Plan
ASM ..... ASM Affiliates, Inc
ASTM ..... American Society for Testing and Materials
AWWA ..... American Water Works Association
BMP ..... Best Management Practice
CAPE-ER ..... CAPE-ER Joint Venture LLC
C&D ..... Construction and Demolition

CERCLA ..... Comprehensive Environmental Response, Compensation, and Liability Act
CESCL ..... Certified Erosion and Sediment Control Lead
COR ..... Contracting Officers Representative
CSBC ..... crushed surface base course
CTO ..... Contract Task Order
EPP/WMP ..... Environmental Protection Plan/Waste Management Plan
H&S ..... health and safety
HDPE ..... high-density polyethylene
HFPO-DA ..... hexafluoropropylene oxide-dimer acid
HMA ..... Hot Mix Asphalt
KO ..... Contracting Officer
LANT ..... Atlantic
LF ..... linear feet
LHA ..... lifetime health advisory
OLF ..... Outlying Landing Field
MWP ..... Master Work Plan
NASWI ..... Naval Air Station Whidbey Island
NAVFAC ..... Naval Facilities Engineering Systems Command
ng/L ..... nanograms per liter
NSF ..... National Science Foundation
NW ..... Northwest
PFAS ..... per- and polyfluoroalkyl substances
PFBS ..... perfluorobutanesulfonic acid
PFOA ..... perfluorooctanoic acid
PFOS ..... perfluorooctane sulfonate
PLS ..... Professional Land Surveyor
PM ..... Project Manager
PPE ..... personal protective equipment
PQCM ..... Project Quality Control Manager
PQCP ..... Project Quality Control Plan
PWS ..... Performance Work Statement
ROE ..... right of entry

RPBA.....reduced pressure backflow assembly
RPM..... Remedial Project Manager
SARA..... Superfund Amendments and Reauthorization Act
SDR..... standard dimension ratio
SOP..... standard operating procedure
SSHO..... Site Safety and Health Officer
SWPPP..... Storm Water Pollution Prevention Plan
TOC.....Town of Coupeville
T/PCP..... Traffic/Pedestrian Control Plan
USEPA.....United States Environmental Protection Agency
WA DOE..... Washington State Department of Ecology
WE..... work element
WSDOT .....Washington State Department of Transportation

Signature Sheet

This section provides a detailed listing of the individuals responsible for drafting, reviewing, implementing, and approving this Master Work Plan. Signature indicates approval of the document.

Prepared by: _____ Date: 13 December 2023

Colin Caviness PE, Senior Project Engineer, Cape Environmental Management Inc

Independent Technical Revie _____ Date: 24 January 2024

David L. Fortune PE, Senior Engineer/Regulatory Specialist, Cape Environmental Management Inc

Plan Approval: _____ Date: 18 January 2024

Gerald Karg, Project Manager, Cape Environmental Management Inc

1.0 Introduction

CAPE-ER Joint Venture LLC (CAPE-ER) was awarded the Naval Facilities Engineering Systems Command (NAVFAC) Northwest (NW) Contract Task Order (CTO) N44255-22-F-4311 on July 29, 2022, by NAVFAC Atlantic (LANT), under Contract N62470-18-D-7013, to perform construction activities to address the impact of per- and polyfluoroalkyl substances (PFAS) on drinking water wells for property owners located adjacent to Outlying Landing Field (OLF) Coupeville associated with Naval Air Station Whidbey Island (NASWI). The NASWI complex is located in Island County, Washington on Whidbey Island, and consists of Ault Field, OLF Coupeville, and Seaplane Base. Navy oversight of the work is provided by NAVFAC NW.

This Work Plan presents the technical approach and details associated with the removal action construction activities associated with drinking water as shown in the *Final Revised Design for the Construction of the Town of Coupeville Water Supply Improvements – [County Road] and [Private Road] Revisions* (CH2M Hill Inc., 2022).

1.1 Project Objectives and Scope

The objective of this task order is to complete the waterline construction and connections per the "Town of Coupeville's Water Supply Improvements" design specifications and drawings (CH2M Hill, Inc., 2019 and 2022) that were not completed under Contract N62470-16-D-9004, CTO N62470-18-F-4160. The period of performance to complete this CTO's objective is 36 months from the award date. The design specifications that are associated with installing the new water main on a County Road and a Private Road and service line connections on the Private Road are relevant to this CTO. All other design specifications are not relevant to this CTO. The objective of this task order also includes connecting other homes that may become impacted by PFAS above action levels, as appropriate, at the time of construction along the new water main.

The primary constraints to the start and execution of this project are the following:

- Securing easements on the Private Road (by the Town of Coupeville [TOC]),
- Securing rights of entry (ROEs) for service line construction and construction limits outside the easement boundaries (by the Navy),
- Scheduling the work with private property owners on the Private Road (by the Navy), and
- Completing the approved work plans (by CAPE-ER).

1.2 Regulatory Framework

This work is executed to complete the removal actions detailed in the *Action Memorandum: Town of Coupeville – Navy Water System Improvements Naval Air Station Whidbey Island, Outlying Landing Field, Coupeville, Washington* (United States Navy, 2018). These removal actions, once completed, are intended to achieve the Action Memorandum remedial goals. As such, this action is governed under the United States Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA). The Navy is the lead agency, under Executive Order 12580, for CERCLA actions at NASWI, and in accordance with Section 104 of CERCLA and SARA, the Navy is conducting this removal action.

In 2016, the United States Environmental Protection Agency (USEPA) issued lifetime drinking water health advisories for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) of 70 nanograms per liter (ng/L), individually or combined. The Department of the Navy is taking action to mitigate drinking water receptors impacted by PFOA and/or PFOS at concentrations above 70 ng/L. Actions outlined in the Final Action Memorandum were developed to achieve remedial goals which comply with the 2016 USEPA lifetime drinking water health advisories and with Department of the Navy policies.

On June 15, 2022, USEPA published new, final health advisory levels for perfluorobutanesulfonic acid (PFBS) and hexafluoropropylene oxide-dimer acid (HFPO-DA), 2000 ng/L and 10 ng/L, respectively, and new, interim health advisory levels for PFOA and PFOS of 0.004 ng/L and 0.02 ng/L, respectively. On March 14, 2023, the EPA proposed a draft regulatory drinking water standard for certain PFAS, including PFOA and PFOS. In response, the Department of Defense (DoD) has issued the following statement: "DoD respects and values the public comment process on this proposed nationwide drinking water rule and looks forward to the clarity that a final regulatory drinking water standard for PFAS will provide. In anticipation of the final standard that EPA expects to publish by the end of 2023, the DoD is assessing what actions DoD can take to be prepared to incorporate EPA's final regulatory standard into our current cleanup process, such as reviewing our existing data and conducting additional sampling where necessary. In addition, DoD will incorporate nationwide PFAS cleanup guidance, issued by EPA and applicable to all owners and operators under the federal cleanup law, as to when to provide alternate water when PFAS are present."

1.3 Site Location

OLF Coupeville is located 2 miles southeast of the TOC, Washington, in Island County, and is located on a broad plateau of Smith Prairie in central Whidbey Island at an elevation of approximately 195 feet above mean sea level. The paved runway is approximately 5,400 feet long and is bordered by grass maintained by mowing operations extending to the public roads. A runway safety area extends approximately 3,300 feet south of the runway footprint and is bordered by trees and residential parcels. The project site location is south of OLF Coupeville on a County Road and a Private Road, as shown in Figure 1-1 (Redacted) attached to this plan.

1.4 Site Background

OLF Coupeville was commissioned for use by the Navy in 1943 and provides support for day and night Field Carrier Landing Practice operations by the Navy for aircraft based out of NASWI. Such operations allow aviators and crew to fly in patterns as well as practice touch-and-go, simulating carrier landings and take-offs.

PFAS are found in aqueous film-forming foam (AFFF) compounds used in Navy firefighting activities. Although there is no available documentation that AFFF was used at the OLF Coupeville, PFAS have been detected in one on-base drinking-water supply well, on-base groundwater monitoring wells, eight off-base private drinking-water wells, and one of the TOC's primary off-base drinking-water source wells. A summary of the PFAS drinking-water investigations and CERCLA response actions near OLF Coupeville are provided in the CTO Performance Work Statement (PWS) as Appendix A to this plan.

2.0 Work Elements

This section describes the project scope of work, which includes the following four work elements (Wes):

- WE 1 – Project Management
- WE 2 – Preconstruction Activities
- WE 3 – Removal Action Construction
- WE 4 – Post Construction Deliverables

2.1 Work Element 1: Project Management

The CAPE-ER Project Manager (PM) is responsible for controlling all aspects of the project, including the project scope, project schedule, financials, and mitigation of risk throughout the course of the work. Controls are accomplished through the planning and reporting processes: Conducting work as presented in the Master Work Plan (MWP) with all associated component plans, detailed task management planning, and weekly review of the project budget and schedule.

As documents are submitted for review by the Navy and regulatory stakeholders, the PM will organize a meeting to discuss stakeholder comments. The PM will provide meeting minutes summarizing discussions, decisions, and action items.

2.1.1 Project Personnel and Roles

The project stakeholders include NAVFAC NW, NAVFAC LANT, Region 10 USEPA, the Washington State Department of Ecology (WA DOE), the TOC, and Jacobs Engineering (Engineer of Record). NAVFAC NW and NAVFAC LANT are responsible for the scope, review, and overall direction of this project, in addition to technical review. Jacobs Engineering is the Navy's Engineer of Record and primary oversight for this project. Jacobs Engineering will also review all work plans and submittals for this project and develop record drawings at the end of the project. The primary points of contact for the stakeholder entities and organizations are listed below in Table 2-1.

Table 2-1: Stakeholder Points of Contact

Agency/ Company	Title/Role	Name	Phone	Email
NAVFAC LANT	Contracting Officer (KO)	Mary Lassiter	(757) 322-4777	mary.e.lassiter6.civ@us.navy.mil
	NAVFAC LANT Contracting Officer's Representative (COR)	Pete Clifford	(757) 322-8307	peter.j.clifford.civ@us.navy.mil
NAVFAC NW	NAVFAC NW KO	Kim Gillette	(360) 396-0263	kimberly.a.gillette4.civ@us.navy.mil

Agency/ Company	Title/Role	Name	Phone	Email
	Remedial Project Manager (RPM) and CTO COR	Kendra Clubb	(509) 999-6843	kendra.r.clubb.civ@us.navy.mil
NAVFAC NW	Navy Technical Representative	Steve Skeehan	(253) 279-0212	steven.b.skeehan.civ@us.navy.mil
	Navy Technical Representative	Charlie Escola	(503) 201-5020	charles.r.escola.civ@us.navy.mil
NASWI	Installation Environmental Program Director	Laura Muhs	(360) 257-4025	laura.r.muhs@navy.mil
USEPA Region 10	RPM	Chan Pongkhamsing	(206) 553-1806	pongkhamsing.chan@epa.gov
Jacobs Engineering	PM	Jennifer Madsen, PE	360-888-0281	Jennifer.Madsen@jacobs.com
	Engineer of Record	Byrl Thompson, PE		Byrl.Thompson@jacobs.com
	Quality Assurance Oversite	TBD	TBD	TBD
TOC	Director of Public Works	Joe Grogan	541-840-9875	utilities1@townofcoupeville.org
CAPE-ER	PM	Evan LeBlanc	(504) 237-8389	eleblanc@cape-inc.com
	Site Superintendent (SS) / Site Safety and Health Officer (SSHO)	TBD	TBD	TBD
	Project Quality Control Manager (PQCM)	TBD	TBD	TBD
Washington Department of Ecology	Department of Ecology Point of Contact	Binod Chaudhary	(564) 669-3015	cbha461@ecy.wa.gov
Washington State Department of Health	State Department of Health Point of Contact	Steve Hulsman	(253) 395-6777	steve.hulsman@doh.wa.gov

2.1.2 Management, Schedule, and Cost Control

The Baseline Project Schedule, as shown in Figure 2-1, is to be updated as necessary to accurately track progress and budget. The PM will provide a progress report to the Navy monthly, detailing the schedule progress during the reporting period, a projection of work that will be completed during the subsequent reporting period, an updated schedule (if needed), and updated cost tracking.

2.1.3 Meeting and Project Coordination

The PM will coordinate meetings with the CTO COR in accordance with Table 2-2: Project Meeting Matrix.

Table 2-2: Project Meeting Matrix

WE	Meeting Type	Frequency	Location	Duration
1	Project Status Meetings	1 per week, or as needed	Virtual	30 minutes
2 and 4	Deliverable Meetings	1 per deliverable	Virtual	1 hour
3	Pre-Construction	1 before field work	Virtual or Coupeville, WA	2 hours
3	Weekly Contractor Quality Control Meetings	1 per week	Virtual or Coupeville, WA	1 hour

The PM will also schedule any additional meetings between the CTO COR and any other stakeholders or support personnel as necessary to properly coordinate work activities. Following any meetings with stakeholders, the PM will send minutes to stakeholders, highlighting action items. The meetings will include a safety moment, discussion of any variances or deficiencies noted through the construction quality control process, a summary of work performed, projection of work ahead, and discussion of any constraints on remaining work, including permits, material procurement, subcontractor availability, and stakeholder oversight activities.

The meetings will be held virtually using Microsoft Teams, with a call-in number provided, or in Coupeville, WA, depending on the nature of the meeting. For example, the Weekly Quality Control meetings during the fieldwork will be held in Coupeville for field personnel, with a Teams invite and call-in number for those in the office.

2.2 Work Element 2: Preconstruction Activities

Preconstruction Activities, WE 2, captures all of the reconnaissance, agreements, and planning required to be performed and completed for effectively completing the Removal Action Construction in an efficient and timely manner. The following sections describe these activities.

2.2.1 Preconstruction Site Visit

The PM and key project personnel will conduct a site visit to the project area to meet with the local authority representatives and to observe the sections of new watermain locations and the properties to receive service connections as part of the Preconstruction Activities. CAPE-ER's representatives will be accompanied by a Navy representative who will arrange the site visit. The

PM will provide a summary of the site visit, with sufficient detail to confirm the design, to the Navy no later than 7 working days after the visit.

2.2.2 Access Agreements and Water Service Connection Agreements

According to the CTO PWS, the TOC is obtaining all necessary easements on the Private Road for the water main construction. Also covered under these easements is a 1-year warranty period to be performed by CAPE-ER and future operation and maintenance of the water main to be performed by TOC. The Navy will obtain all necessary ROEs for service line construction and construction limits outside the TOC easement boundaries. CAPE-ER will assist the Navy with developing necessary figures and technical content for the ROEs. CAPE-ER will have all final access agreements in place prior to proceeding with WE 3 and will obtain all documentation from the TOC for the necessary water account setup, meter installation, and payment of initial fees on behalf of the residents.

2.2.3 Master Work Plan

As part of the Preconstruction Activities, this MWP was written to ensure that sufficient detail is provided to document the construction approach and complete the Removal Action Construction consistent with the CTO PWS, Final Revised Design Drawings (CH2M Hill Inc., 2022) included as Appendix B, Associated Final Design Specifications (CH2M Hill Inc., 2019) included as Appendix C, and the TOC Standard Plans – Water System included as Appendix D. The MWP includes the following component plans as sub-sections and appendices:

- Project Quality Control Plan (PQCP)
- Environmental Protection Plan/Waste Management Plan (EPP/WMP)
- Traffic/Pedestrian Control Plan (T/PCP)
- Archeological Monitoring Plan (AMP)
- Storm Water Pollution Prevention Plan (SWPPP)
- Water Main and Service Line Flushing and Disinfection Plan
- Accident Prevention Plan/Site Health and Safety Plan (APP/SSHP)

2.2.4 Construction Submittals

CAPE-ER will prepare construction submittals in accordance with the requirements of the Final Revised Design, associated Final Design Specifications, and the PQCP included as Appendix E. The PQCP contains a submittal register that identifies all of the applicable submittals with reference to their governing specification sections. Each submittal item also identifies the approving authority with a “G” for the Navy; “J” for Jacobs, the Navy’s Quality Assurance Contractor; and “T” for the TOC. Procedures for the construction submittals are detailed in the PQCP.

2.3 Work Element 3: Removal Action Construction

CAPE-ER will conduct the Removal Action Construction in accordance with the CTO PWS; the Final Revised Design; Associated Final Design Specifications; this Navy approved MWP; and all federal, state, and TOC requirements and regulations. The following paragraphs provide descriptions on how CAPE-ER and its subcontractors will complete each of these Removal Action Construction Activities.

All intrusive activities detailed in the following sections will be performed in accordance with the AMP in Section 6.0.

2.3.1 Mobilization and Site Preparation

CAPE-ER and the CTO stakeholders will determine, during the preconstruction site visit, the location of the contractor lay down area. The contractor lay down area will allow temporary storage of equipment and materials during the Removal Action Construction. CAPE-ER will provide two portable toilets located in the contractor lay down area as part of the temporary facilities.

CAPE-ER will subcontract a Professional Land Surveyor (PLS), registered in the state of Washington, to perform a pre-construction survey. The preconstruction survey will include confirming the existing conditions with the Final Revised Design, capturing all of the utilities identified in Section 2.3.2, Utility Clearance; delineate the limits of construction; and establish benchmarks in accordance with Specification Section 01 31 13, Project Coordination, Subsection 1.10, Reference Points and Surveys. Concurrent with the preconstruction survey, CAPE-ER will document the condition of all features within the limits of disturbance as a record of the as found state. Any feature with pre-existing damage or poor condition will be noted as such.

CAPE-ER will ensure traffic controls are set up in accordance with the T/PCP, as the majority of the remedial action construction activities will occur within or along the County and privately owned roadways. The T/PCP is provided as Section 5.0 of the MWP.

2.3.2 Utility Clearance

Prior to potholing or excavation activities, CAPE-ER's subcontractor will notify Washington 811 in accordance with Washington state law. Washington 811 is a communication center that provides notice to utility owners that potentially have underground utilities traversing the proposed drilling locations. Additionally, utilities will be located by a third-party utility locator. During construction, CAPE-ER will maintain all mark outs and protect all encountered utilities. Utility potholing will be performed as needed to locate and verify all of the marked-out utilities that cross the path of the water main and service branch trenches.

2.3.3 Erosion Control

Prior to any ground disturbing work, CAPE-ER's subcontractor will install straw wattles in accordance with Specification Section 01 57 13, Temporary Erosion and Sediment Control. The straw wattles will be regularly inspected by CAPE-ER's Certified Erosion and Sediment Control Lead (CESCL) in accordance with the project SWPPP, Section 7.0 of the MWP, and WA DOE requirements. The straw wattles will be maintained for the duration of ground disturbances and will be removed when the Engineer (Jacobs) determines that an erosion control Best Management Practice (BMP) is no longer required.

2.3.4 Clearing, Grubbing, and Stripping Topsoil

CAPE-ER's subcontractor will clear and grub, in accordance with Specification Section 31 10 00. Site clearing will consist of the areas required for the installation of the 10-inch water main, 2-inch

service branches, fire department turnaround, and infiltration gallery; grading of the 22-foot wide gravel road on the Private Road; and the compost amended soil areas as shown on the final revised design drawings. It is noted that two existing conifer trees will have to be cleared and their stumps grubbed for the fire department turn around feature. After grubbing, the topsoil will be stripped and stockpiled nearby for spreading back out as described in Section 2.3.11, Site Restoration.

2.3.5 Ten-Inch Water Main Installation

CAPE-ER and its subcontractor intend to open only the amount of trench that can be dug, have pipe installed, and be backfilled in a workday, which is expected to be 50 to 80 feet of trench. The water main installation will proceed along the County road and the Private Road in this manner, with the road surface being closed at the end of the day. In the event that the trench cannot be backfilled by the end of the day, metal trench plates will be installed over the section of open trench. The trench plates will be sized to extend a minimum of 1 foot on either side of the pavement opening. The trench plates used along the County Road will be properly secured and have the edges feathered with asphalt.

2.3.5.1 Trenching

CAPE-ER's subcontractor will tie-in the new waterline to the existing waterline along the County Road. Site crews will proceed to cut the asphalt with diamond-blade road saws. Asphalt will then be demolished from the tie-in area by an excavator and loaded onto a dump truck for transportation to the nearest asphalt recycling facility. Asphalt waste will be minimal and the tie-in area will be patched. The excavator will proceed to dig the trench to the depths as shown on the design drawings' profile view. Trench spoils will be placed adjacent to the trench or stockpiled for re-use. Due to the trenching being within the road prism and proximity to the pavement, structural fill material will be imported material consisting of 9-03.9(3) CSBC, CSTC, 9-0312(3) Gravel Backfill for Pipe Zone Bedding, 9-03.14(1) gravel Borrow, or 9-03.10 Gravel Base as listed in the Washington Department of Transportation Standard Specifications. If necessary, site crews will restore the road gravel shoulder with six inches of CSBC or CSTC (CSBC currently exists).

2.3.5.2 Pipe Installation

CAPE-ER's subcontractor will install a total of 2,483 linear feet (LF) of American Water Works Association (AWWA) C906 high-density polyethylene (HDPE) water main pipe along a County Road and a Private Road. The HDPE water main pipe will be a 10-inch Ductile Iron Pipe Size with a standard dimension ratio (SDR) of 11. The County Road will have 648 LF of water main installed in accordance with drawings C-308 and C-309. The Private Road will have 1,835 LF of water main installed in accordance with drawings C-309, C-310, C-311, and C-312. The water main pipe will be installed in accordance with Specification Section 33 05 01, with the primary means of joining pipe being a butt fusion weld by a qualified HDPE fusion machine operator. Electro-Fusion coupling may be used to make short section tie-ins for waterline piping.

The Navy currently has staged, at Fort Casey Water Treatment Plant, 500 LF of 10-inch HDPE pipe, SDR 11. This pipe was originally purchased under Contract N62470-16-9004, CTO N62470-18-F-4160

for use on the County Road. This pipe will be transported by CAPE-ER from the Fort Casey Water Treatment Plant and to the lay down area for use on the County Road.

The water main pipe will be installed as per TOC Standard Detail W-1 trench detail for HDPE pipe. The material to be used for the pipe bedding, haunching, and initial backfill will meet Washington State Department of Transportation (WSDOT) *Standard Specification* (WSDOT, 2023) 9-03.12(3), Gravel Backfill for Pipe Zone Bedding. All material will be compacted to a minimum of 95 percent compaction of the maximum compaction as determined by American Society for Testing and Materials (ASTM) D1557: Standard Test Methods for Laboratory Compaction of Soil Modified Effort.

2.3.5.3 Appurtenances

CAPE-ER's subcontractor will install the 10-inch AWWA C509 resilient-seated gate valves as shown in drawing C-309; blind flanges with thrust blocks as shown in drawings C-309 and C-312; three AWWA C502 dry barrel fire hydrant assemblies located in drawings C-309, C-311, and C-312; one Kupferle sample station as shown in drawing C-312; and all necessary fittings and other appurtenances as required by the TOC *Standard Plans and Specifications for Water Main Installation*.

2.3.5.4 Backfill

The trench spoils from the County Road can be reused as backfill at the County Road. Additionally, imported fill will be used for the top portion of the backfill area as explained in section 2.3.5.1. The trench spoils will also be transported by CAPE-ER's subcontractor to the Private Road for use in building up the road subgrade as described in Section 2.3.9, Grading Crushed Rock (Private Road). Trench spoils that will be reused as backfill for the road subgrade on the Private Road, will be placed in 6-inch lifts and compacted to a minimum of 95% of the maximum in-place density as determined by ASTM D1557. Compaction will be made using a trench roller, vibratory plate compactor, or jumping jack compactor as applicable to the trench conditions.

2.3.5.5 Testing and Disinfection

CAPE-ER's subcontractor will perform the water main hydrostatic testing, disinfection, and flushing in accordance with Section 8.0, Water Main and Service Line Flushing and Disinfection Plan, and TOC W-9. The hydrostatic testing, disinfection, and flushing will be completed after the water main is fully installed and backfilled. If a section of water main needs to be tested prior to the full line installation, it will be tested up to an isolation valve. CAPE-ER will notify the Navy, Jacobs, and the TOC for witnessing and documenting all water main testing performed. Copies of test records will be attached to the daily report for the day the record was received.

The new infiltration gallery at the east end of the Private Road, discussed in Section 2.3.7, will be used to capture and infiltrate testing and flushing water from the water main pipelines. All of the water flushed from the mains will be dechlorinated per TOC W-9. CAPE-ER will reference AWWA C655 Field Dechlorination for procedures.

2.3.6 Two-Inch Service Branch Installation

CAPE-ER's subcontractor will make the 2-inch service branch connections after the 10-inch water main installation is completed. Drawings C-409 and C-410 show three service branches, totaling approximately 1020 LF of 2-inch size AWWA C901 HDPE, to be installed to the identified locations. These service branches are to be installed in accordance with TOC W-10 and W-11. The path of the service branch may be shifted to account for unidentified utilities and maintain required separations (e.g., minimum separation between domestic supply and septic system lines as shown in TOC W-16). These shifts will be captured in the contractor Red Lines for incorporation into the CTO project records.

2.3.6.1 Trenching

CAPE-ER's subcontractor will install the service branch lines by a combination of open trenching dug by mechanical equipment such as a miniature excavator, a ride-on or walk-behind trencher, a trencher attachment for skid steer, hand tools, and trenchless technologies such as a horizontal directional drilled pneumatic mole. The method elected for the service branch trench installation will be based on observed field conditions taking into consideration obstacles and to minimize disturbance to the properties.

2.3.6.2 Pipe Installation

CAPE-ER's subcontractor will install National Science Foundation 61 (NSF-61) Drinking Water System Components rated 2-inch HDPE from 100-foot rolls to have the minimum amount of joints per line. The joints will be a butt fusion weld performed by a qualified HDPE fusion machine operator, with the potential for electro-fusion coupling as well. The existing well water supply line will be located, cut, and capped at the house. The new service branch will connect to the residence side of the existing line that remains and will be as close to the house as possible.

2.3.6.3 Appurtenances

The service branches will have double strap service saddles with a corporation stop installed at the water main tap. This will connect to the 5/8" x 3/4" displacement meter Sensus model IPERL, contained within a plastic meter box as shown in TOC W-10. The service branch will then connect to a reduced pressure backflow assembly (RPBA) per TOC W-17. After the RPBA, the service branch will connect to the residence's existing potable water line. All connections made will have the appropriate NSF-61-rated fittings required for the service branch to connect to the displacement meter, RPBA, and existing potable water line.

2.3.6.4 Backfill

The three service branches will be backfilled and compacted with the native soil removed from the trench for its installation. The backfill will be placed in 6-inch lifts and compacted to a minimum of 95% of the maximum in-place density as determined by ASTM D1557 and in accordance with Town of Coupeville standard plans and specifications for Water Main Installation. Compaction will be made using a trench roller, a vibratory plate compactor, or a jumping jack compactor as applicable to the trench conditions. Additionally, marker tape will be placed over laid pipe as per TOW standard

plans and specifications. After compaction, the trench area will be prepared for restoration as detailed in Section 2.3.11, Site Restoration.

2.3.6.5 Testing, Disinfection, and Flushing

The branch services lines will be tested, disinfected, and flushed in accordance with the TOC service line connection permit. These activities will be coordinated with the TOC. Upon receiving approval on the service connection permit, the water to the residence will be turned on. CAPE-ER will proceed to test all connections, faucets, and water supply points within and outside of each house. CAPE-ER will check that the water is functional in the house at the pressures designed, and the water in each home shall be flushed to ensure PFAS-impacted water has been removed from the home's pipes to the extent practical. According to the CAPE-ER's standard operating procedure (SOP) for flushing services lines, outlets should be flushed for between 10-30 minutes until air is purged from the lines and discolored/cloudy water dissipates (typically entrained air will give water a whitish, milky appearance; Appendix H). According to AWWA C651, *Disinfecting Water Mains*., the heavily chlorinated water shall be flushed from the main fittings, valves, and branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use (Appendix H). The home line flushing will be performed and documented in accordance with Section 8.0, Water Main and Service Line Flushing and Disinfection Plan.

The new infiltration gallery at the east end of the Private Road, discussed in Section 2.3.7, will be used to capture and infiltrate testing and flushing water from the service branches' water lines. The test and flush water will be pumped into a water truck for transportation over to the infiltration gallery for subsequent discharge and infiltration. All of the water flushed from the mains will be dechlorinated per TOC W-9. CAPE-ER will reference AWWA C655, Field Dechlorination, for procedures. Flushed water will not be tested for PFAS.

2.3.7 Infiltration Gallery

CAPE-ER's subcontractor will install a 250-foot-long infiltration gallery as shown in drawings C-312 and C-504. The installation of the infiltration gallery will be sequenced to allow for its use to catch the water main and service branch discharges from the hydrostatic testing and pipeline flushing.

2.3.7.1 Pre-Cast Catch Basin

A 4-foot diameter Washington State Department of Transportation (WSDOT) Type 2 Catch Basin with the necessary catch basin riser sections will be procured from a local pre-cast concrete manufacturer in accordance with Specification Section 33 44 13.13 Catch Basins. The catch basin will be placed on 6-inches of gravel backfill for pipe zone bedding, extending 12-inches beyond the catch basin, in accordance with WSDOT Standard Plan B-10.20-02 for Catch Basin Type 2 shown as Figure 2-2.

2.3.7.2 Infiltration Pipe

A 24-inch corrugated polyethylene perforated pipe in accordance with Specification Section 33 41 01 Storm Drain and Sanitary Sewer Piping and WSDOT *Standard Specification* 9-05.2(8), Type SP

(WSDOT, 2018), will be placed into the infiltration trench excavated to a depth of approximately 77-inches below the finished grade of the privately owned gravel road. The trench will be lined with geotextile fabric prior to being filled with gravel backfill for drains per WSDOT *Standard Specification* 9-03.12(4) (WSDOT, 2018).

2.3.7.3 Valley Gutter

A 12-foot-long, 6-foot-wide, 6-inch-thick cast-in-place concrete valley gutter will be placed by CAPE-ER's subcontractor. The valley gutter will be formed up and reinforced as shown in Section A of Detail D in drawing C-504. The valley gutter will be cast up to the catch basin cover, allowing for a smooth transition of waterflow from the gutter into the catch basin cover. The concrete will be procured from a local National Ready Mix Concrete Association batch plant and placed in accordance with Specification Section 03 30 00, Cast-In-Place Concrete.

2.3.8 Grading Asphalt Road (County Road)

CAPE-ER's subcontractor will begin repaving the tie in location on the County Road after the 10-inch water main has passed the hydrostatic test as discussed in Section 2.3.5.5. As the water main is installed, the trench will be filled in with import fill. After all of the intrusive road work is complete, the finish paving will be performed at the tie- in location. CAPE-ER's subcontractor will install new Hot Mix Asphalt (HMA) for the asphalt patch at the tie-in. The HMA will be a WSDOT Level 2 Hot Mix, HMA class ½", Performance Graded 64-22. The HMA will be installed in one 2-inch lift to match the existing asphalt pavement lines and grades. The asphalt mix and paving will be performed in accordance with Specification Section 32 12 16, Asphalt Paving and WSDOT, and Island County's Accommodations of Utilities provided in Appendix J

2.3.9 Grading Crushed Rock (Private Road)

CAPE-ER's subcontractor will regrade the Private Road, bringing its finished elevation grade to that shown in drawing C-505 and making it 22 feet wide as shown in drawings C-309, C-310, C-311, and C-312. Transition to the County Road and the driveways along the Private Road will be at a maximum slope of 5 percent and 10 percent respectively. Cuts or fills along the road will be performed at a maximum slope of 4:1. The Private Road will receive 6 inches of WSDOT-approved crushed surface base course (CSBC) for the new gravel surface as shown in drawing C-504, Detail 3. The Private Road grading will include the installation of a fire department turnaround near the east end of the Private Road. The turnaround will also receive 6 inches of CSBC for its gravel surface.

Three 10-foot-wide Engineered Dispersion areas totaling 6,250 square feet on the Private Road will be installed per WSDOT *Highway Runoff Manual* (WSDOT, 2019) Best Management Practice (BMP) FC.02. These areas will receive compost and amendments that will be incorporated into the soil to a depth of 8 inches. The compost will meet the requirements of WSDOT *Standard Specification* 9-14.4(8), Compost (WSDOT, 2018), and the amendments will be applied as determined by agricultural soil analysis results. The engineered dispersion areas will be seeded as part of Site Restoration activities described below in Section 2.3.11.

2.3.10 Well Decommissioning

CAPE-ER will subcontract a Washington State-licensed well driller to decommission or modify up to three PFAS impacted wells. Prior to well decommissioning, the Navy will confirm with the residents if they would like to keep their wells for non-potable water use. The Navy may also decide to use the wells for future groundwater monitoring. Based on the resident's and Navy's determination, CAPE-ER's well driller will decommission or convert the wells from potable water wells into non-potable water wells or groundwater monitoring wells. All modifications made to the wells will be performed in accordance with WA DOE regulations with the appropriate Notice of Intents filed with the WA DOE.

If the wells are to be decommissioned, the well driller will de-energize, disconnect, and remove the well pump and appurtenances with subsequent abandonment and sealing of the existing well. If the well is to remain for non-potable use, CAPE-ER will have its subcontractor modify the current plumbing to install an approved backflow preventer so that no portion of the existing well plumbing system will impact the residence's new drinking water plumbing from the TOC. If the well is to remain for future groundwater monitoring, the well driller will de-energize, disconnect, and remove the well pump and appurtenances and convert the well cap to a monitoring well in accordance with WA DOE monitoring well requirements.

2.3.11 Site Restoration

CAPE-ER's subcontractor will perform site restoration for returning all areas to their original conditions. All property damaged during the project will be repaired, restored, or replaced to as-found conditions, as noted during site mobilization. All CSBC and trench spoil stockpiles will be removed, and the area under the stockpiles will be restored to as-found conditions. All permanent grass areas will have the ground prepared for topsoil, amendments, and seed placement as required per Specification Section 32 92 00, Turf and Grasses.

2.3.12 Demobilization

CAPE-ER and its subcontractors will demobilize from the site once all of the removal action construction activities have been completed. All equipment and materials stored in the contractor lay down area will be removed. All temporary facilities, including portable toilets and waste dumpsters, will be collected by their service providers and taken away. Any disturbance to the contractor lay down area will be restored as described in Section 2.3.11. All areas associated with the removal action construction will be left in a condition satisfactory to the CTO stakeholders.

2.4 Work Element 4: Post Construction Deliverable

2.4.1 Post Construction Survey

A post construction survey will be performed by CAPE-ER's PLS. This survey will build upon all of the progress surveys performed during the removal action construction. This survey will capture all final as-built conditions in accordance with specification sections 01 31 131.10, 31 23 16 1.02.A and 32 12 163.04.F.4, and will be provided to the Navy, and Jacobs (QA contractor). Jacobs will produce

record drawings from the as-built survey documentation for inclusion into the Construction Completion Report.

2.4.2 Construction Completion Report

Following the completion of the Removal Action Construction, CAPE-ER will prepare a Construction Completion Report that will include the following:

- Brief description of completed work elements for each location
- As-built information
- Documentation of pre- and post-construction conditions
- Documentation of any project deviations, along with their associated rationale
- Records of all quality-control testing performed
- Waste disposal/recycling records

3.0 Project Quality Control Plan

A PQCP was prepared as a standalone plan in accordance with project Specification Section 01 45 16.13, Contractor Quality Control; the PWS for CTO N44255-22-F-4311; and the quality control requirements set forth in Contract N62470-18-D-7013 PWS Part 6.0, Quality Control. The PQCP is incorporated into the MWP by its inclusion as Appendix E.

4.0 Environmental Protection Plan/Waste Management Plan

This Environmental Protection Plan outlines the abatement, control, and mitigation measures to be used during the performance of field activities for protecting the environment.

4.1 Environmental Protection of Selected Features

CAPE and the NAVFAC NW RPM will conduct a site survey prior to the commencement of field activities. The survey will document the existing site conditions, identify the authorized work and staging areas, define access routes, and identify the resources to be protected within the authorized work areas. Based on existing site conditions and location, the following have been identified for potential protection during field activities:

- Natural, historical, and cultural resources
- Waste resources
- Dust control
- Noise levels
- Spill prevention
- Spill response and notification

4.1.1 Natural, Historical, and Cultural Resources

Currently, there are no known natural, historical, or cultural resources identified within the work area. However, there is a possibility of historical or cultural resources being unearthed during the removal action; therefore, an Archeological Monitoring Plan was developed for this project and is detailed in Section 6.0 and Appendix G.

4.1.2 Water Resources

Precautions will be taken to protect surface water and groundwater resources around the project site. CAPE-ER will properly handle fuels, oils, or other harmful materials both on and off the site premises. Special measures will be taken to prevent these materials from polluting surface water or groundwater, including using spill buckets and absorbents as needed.

4.1.3 Dust Control

Dust is a particulate material and a regulated pollutant that is generated by vegetation removal as well as wind or mechanical movement of soil. It is also a nuisance and potential safety hazard to the public through decreased visibility and air pollution. To prevent dust from accidentally traveling off site, the following measures will be taken to control the dust generated:

- On-site locations affected by dust due to the removal action construction will be visually monitored by CAPE-ER.

- When conditions require, on-site traffic/construction areas will be watered to reduce levels of dust. Intermittent watering, as deemed necessary by CAPE-ER, will occur in such situations as often as necessary to control visibility and air quality.
- All excess trench spoils along the roads will be directly loaded into trucks and stockpiled at the contractor lay down area.
- Stockpiles of trench spoils and imported materials will be kept at the optimum moisture to decrease dust from the handling of the material.
- Stockpiles will be kept covered by tarps or poly sheeting and secured with sandbags when not in use.
- Water will be applied as needed for dust suppression.
- Regular inspection and housekeeping of the work area will be performed to capture any dirt that may cause dust.

4.1.4 Excessive Noise Levels

Potential nuisance noise will be mitigated by limiting excavation and noisy equipment operation to weekdays and daylight hours, after 7:00 AM and before 6:00 PM. These days and times are to be confirmed and coordinated with the residents and the Navy. Hearing protection for on-site workers will follow the APP/SSHP guidance in Appendix I. It is not likely that the project work will produce nuisance noise levels. However, if significant noise is anticipated to occur due to site activities, CAPE-ER will control such activities as needed per Island County Municipal code 9.60 – Public Disturbance Noise Control, (Island County, 2022).

4.1.5 Spill Prevention

CAPE-ER does not plan to stage bulk hazardous materials on-site, including fuel. Site personnel will be made aware of proper equipment operating techniques and equipment inspection procedures to minimize the risk of a petroleum spill from equipment operation. To prevent an accidental release of liquids (e.g., fuel, hydraulic fluid, coolants), equipment will be inspected daily for signs of weakening hydraulic hoses and leakage. Proper absorbent and containment materials will be available in or near equipment containing fuels or other potential contaminants. Vehicles will be fueled off-site or over plastic sheeting or spill mat adsorbent materials to capture potential spills.

4.1.6 Spill Response and Notification

The most likely source of spills will be from fuel, oil, or hydraulic fluid. Although significant spills that would create an immediate danger are very unlikely, CAPE-ER and our subcontractors will be prepared to take quick action. Initial action will include containing the spill, ensuring the safety of nearby workers and the public, and notifying the Navy RPM. CAPE-ER will also notify emergency personnel immediately if there is a threat to the safety of workers or the public, or as directed by the Navy RPM in the event there is no immediate impact or threat to health or safety.

During the control phase, responders will organize the scene and mobilize equipment to control hazards and affect cleanup. If there is a potential danger to adjacent personnel, CAPE-ER will immediately verbally notify everyone in the vicinity of the hazard. Emergency response personnel

may initiate evacuation procedures, if appropriate. If there is an actual or potential fire, explosion, or personal injury, CAPE-ER will summon emergency responders by dialing 911.

4.2 Waste Management

The purpose of this Waste Management Plan is to provide guidelines for containment, handling, and disposal of waste generated during the removal action construction activities. Wastes will be containerized, stored, and disposed of in accordance with federal and state regulations. Other waste generated during field activities, including general landfill waste, will be removed off-site and appropriately disposed of. The types of waste anticipated from the field activities include:

- Used personal protective equipment (PPE).
- General landfill waste
- Construction and Demolition (C&D) debris.

4.2.1 Waste Handling, Staging, and Storage

The temporary staging and lay down areas will be confirmed, and environmental controls will be established. Erosion controls will be implemented using BMPs to prevent erosion from the excavation and stockpiles as described in the SWPPP, Section 7.0.

Excavated soil will be temporarily placed on the ground next to the piping trenches and covered with 6-mil plastic sheeting to prevent erosion. Soil excavated for piping trenches is assumed to be clean, native soil because there are no hazardous material sources in the trenching areas. Once pipelines are constructed, the soil will be placed back into the trench or used to build up the Private Road as described in Section 2.3.5.4 above.

Any stormwater that comes into contact with construction materials or open trenches will be pumped into a water truck and moved to a local gravel pit for infiltration.

4.2.2 Waste Characterization and Classification

Waste characterization is not anticipated for this project. In the event an unknown waste is generated, CAPE-ER will work with the Navy to provide a plan that describes the processes and controls for acquiring waste characterization data, including sampling, laboratory analysis, and data verification.

4.2.3 Waste Transportation and Disposal

No contaminated soil or Investigation Derived Waste is anticipated during this removal action. However, if contaminated soil and/or Investigation Derived Waste is generated during the removal action, the waste will be properly characterized and disposed of at an approved facility. If the waste contains CERCLA substances or pollutants, the waste proper disposal will require using a CERCLA-approved facility. Pending final approval of the profile by NAVFAC NW and in coordination with NASWI Waste Management personnel, a Washington-licensed waste hauler will transport and dispose of wastes at an approved facility that is also approved by NAVFAC NW. All waste transporters shall provide proper placards and labels and will carry approved bills of lading and other

transportation/disposal documentation as required by federal, state, and local regulations. Facility-signed manifests (if needed), bills of lading, weigh tickets, and other pertinent waste documentation will be provided to the Navy upon receipt. Copies of waste documentation will also be included in the final report.

5.0 Traffic/Pedestrian Control Plan

A standalone T/PCP was developed by CAPE-ER's utility subcontractor. The T/PCP is in accordance with the requirements set forth in in the CTO PWS; Specification Section 01 50 00, Temporary Facilities and Control; and the Federal Highway Administration's *Manual on Uniform Traffic Control Devices for Streets and Highways* with WSDOT modifications. The T/PCP is incorporated into the MWP by its inclusion as Appendix F.

6.0 Archeological Monitoring Plan

Currently, there are no known natural, historical, or cultural resources identified within the work area. However, there is a possibility of historical or cultural resources being unearthed during the removal action; therefore, ASM Affiliates, Inc (ASM) will attend all trenching activities to confirm that no historical or cultural resources are disturbed. ASM has developed an AMP that describes how removal action construction will be monitored and will define processes for notifying the Navy and the state of any finds and mitigating project impacts.

Potential resources covered by this section that may trigger a site review or additional protections include human skeletal remains or burials, artifacts, shell, midden (a mound of shells, bones, or refuse), bone, charcoal, or other deposits. If such resources are found in the work area, work will be stopped and the NAVFAC Archeologist and RPM will be notified. Work will not resume in that area until authorization is provided by the Navy.

The AMP is incorporated into the MWP by its inclusion as Appendix G.

7.0 Storm Water Pollution Prevention Plan

National Pollutant Discharge Elimination System permits are required for stormwater discharges to surface waters from construction activities if stormwater from rain leaves the site through a "point source" and reaches surface waters either directly or through storm drainage. Under the WA DOE, a general permit typically applies to construction activities including clearing, grading, excavation, and materials or equipment staging and stockpiling that will disturb one or more acres of land. Because the planned area of disturbance is less than one acre in size (0.72 acres), a stormwater permit will not be required. Although the site is exempt from the requirement to prepare a SWPPP, a plan was prepared to designate stormwater exposure safeguards, including BMPs, to assure that site activities are protective of human health and the environment.

The following sections provide descriptions of the materials and methods to be used to control runoff and sediment loss during the proposed site activities.

7.1 Certified Erosion and Sediment Control Lead

CAPE-ER's subcontractor will have a Certified Erosion and Sediment Control Lead (CESCL) on site. The CESCL will have a current professional status as a CESCL from the WA DOE. The CESCL will also have a certification in construction site erosion and sediment control from a WA DOE approved course. It is the CESCL's responsibility to implement the SWPPP, including the installation of BMPs, inspecting BMPs for damage and proper function, directing BMP maintenance and repairs, updating the SWPPP to reflect current field conditions, and SWPPP closure at project completion. The CESCL will complete erosion and sediment control inspection forms as required by the SWPPP. The completed forms will be maintained on-site and available for inspection. Copies of the completed form will be provided to the Navy as an attachment to the contractor's daily report.

7.2 BMP Implementation

To the extent possible, excavation land disturbance activities will be scheduled outside of the rainy season; should schedule changes arise, excavation activities will avoid periods of forecasted rainfall. Monitoring of the weather forecast for rainfall will be conducted daily during field activities.

Stormwater BMPs (Section 7.6) will be put in place prior to disturbing natural vegetation as needed to maintain sediment controls. Land disturbance activities will be conducted in a manner that minimizes soil generation and disturbances to natural vegetation. Gravel-covered surfaces will be maintained to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

7.3 Good Housekeeping

The project will implement the following practices of good housekeeping:

1. Observe off-site areas for potential runoff activity, including stormwater discharge locations, drainage areas, conveyance systems, waste handling/disposal areas, and perimeter areas

impacted by off-site materials or stormwater run-on to determine housekeeping needs. Identified debris, waste, spills, tracked materials, or leaked materials shall be cleaned and properly disposed of.
2. Minimize or prevent material tracking.
3. Cover stored materials that can be readily mobilized by contact with stormwater.
4. Contain stored non-solid industrial materials or waste that can be transported or dispersed by the wind or contact with stormwater.
5. Prevent disposal of rinse/wash waters or industrial materials into the stormwater conveyance system.

7.4 Preventative Maintenance

Equipment and systems used outdoors will be inspected daily to detect leaks or identify conditions that may result in the development of leaks. Leaks that could impact the environment must be repaired prior to site work.

7.5 Spill and Leak Prevention and Response

Procedures and controls will be maintained to minimize spills and leaks. Equipment and materials for cleanup of spills shall be available on-site, and spills and leaks shall be cleaned up immediately and disposed of properly. On-site personnel will be trained to provide spill response. Refer to Sections 4.1.5 and 4.1.6 for spill prevention and spill response and notification, respectively.

7.6 Materials Handling and Waste Management

Materials management (also called materials handling) consists of implementing procedural and structural BMPs for the handling, storing, and use of construction materials that will not result in loss or waste during wet or dry weather. The objective is to prevent the release of waste materials into stormwater runoff or discharges through proper management. Materials will be stored in a covered location, if possible.

Trench spoils will be stockpiled adjacent to the trench. At the end of each day, trench spoils will be returned to the trench or will be stockpiled for use as fill on the County Road and the Private Road.

Trash disposal containers will be removed from the site at the end of each workday.

7.7 Erosion and Sediment Controls

Erosion and sediment controls are effective in reduction or elimination of sediment-related pollutants in stormwater discharges and authorized non-stormwater discharges from the site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

7.7.1 Erosion Control

Soil stabilization, also referred to as erosion control, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in stormwater runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

This project will implement the following practices for effective temporary and final erosion control during construction to:

1. Preserve existing vegetation when feasible (e.g., in areas not being excavated).
2. Place the temporary soil stockpiles on plastic sheeting, and cover stockpiles with plastic sheeting.
3. Manage stockpiles to limit the volume of excavated soil stockpiled during rain events and off hours by backfilling trenches before the end of each workday.
4. Apply temporary erosion controls, such as silt fencing or fiber rolls as needed around soil piles and excavation areas; in addition, the excavation will be sloped to contain stormwater run-on.
5. Implement temporary erosion control measures such as plastic sheeting or water application for wind erosion (dust) control at regular intervals.
6. Stabilize non-active areas as soon as feasible after the cessation of construction activities by revegetation through seeding and mulching, or hydroseeding with a binder material.

Sufficient erosion control materials will be maintained on-site to allow implementation as described in this plan. This includes implementation requirements for active areas and non-active areas that require deployment before the onset of rain.

BMPs will be deployed in a sequence to follow the progress of site activities. As the locations of soil disturbance change, erosion and sedimentation controls will be adjusted accordingly to control stormwater runoff at the down-gradient perimeter. Scheduling will be conducted to avoid rain events, if possible. Vegetation will be preserved in areas not excavated.

7.7.2 Sediment Controls

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water. Sediment controls including straw wattles and fiber rolls will be implemented and maintained in excavation and soil pile areas to prevent sediment loss as needed. Silt fences, if used, will be entrenched and attached to supporting poles and placed around the planned excavation and stockpiling areas. Similarly, fiber rolls, if used, will be firmly attached to the soil surface using stakes or sandbags. The remainder of the site is relatively flat, and minimal sediment loss is expected during wet or dry weather.

8.0 Water Main and Service Line Flushing and Disinfection Plan

CAPE-ER will perform the water main and service line disinfection in accordance with the TOC *Standard Plans and Specifications for Water Main Installation,* Section 4, Disinfection; TOC Standard Detail W-9; and AWWA C651, *Disinfecting Water Mains*. CAPE-ER will perform the service line flushing in accordance with CAPE-ER's SOP for flushing service lines. Procedure excerpts from the AWWA C651 and CAPE-ER's SOP for flushing service lines are combined to make the Water Main and Service Line Flushing and Disinfection Plan which is incorporated into the MWP by its inclusion as Appendix H.

9.0 Accident Prevention Plan/Site Health and Safety Plan

CAPE-ER has developed a site-specific APP/SSHP in accordance with the latest edition of the United States Army Corps of Engineers EM 385-1-1 Safety and Health Requirements Manual. Site operations will adhere to the health and safety (H&S) policies and procedures set forth in the APP/SSHP. Specific Activity Hazard Analyses for anticipated site activities are incorporated into the APP/SSHP. Site personnel will complete the training requirements listed in Section 5.1 of the APP/SSHP prior to beginning work on the site. It is anticipated that Level D PPE, consisting of regular work clothes, steel-toed and steel-shank safety boots, hardhats, safety glasses, hearing protection, high-visibility reflective vests, and hand protection (as appropriate) will be required. The designated SSHO will monitor site H&S and determine if site conditions require an increased level of personal protection. H&S-related issues, such as non-compliance incidents, will be documented by the SSHO and immediately remedied. The corrective action will be documented in the daily production report. The APP/SSHP is incorporated into the MWP by its inclusion as Appendix I.

10.0 References

CH2M Hill, Inc. 2022. *Final Revised Design for the Construction of the Town of Coupeville Water Supply Improvements – County Road and Private Road revisions.* Prepared for the U.S. Navy. February.

CH2M Hill, Inc. 2019. *Final Design for the Construction of the Town of Coupeville Water Supply Improvements Volume 1-3*. Prepared for the U.S. Navy. March.

Federal Highway Administration, U.S. Department of Transportation. 2022. *Manual on Uniform Traffic Control Devices for Streets and Highways.* July.

Island County. 2022. *Municipal Code 9.60 – Public Disturbance Noise Control*. May.

Town of Coupeville (TOC). 2017. *Standard Plans and Specifications for Water Main Installation*. December.

United States Army Corps of Engineers. 2014. *Safety and Health Requirements Engineer Manual: EM 385-1-1*. November 30.

United States Navy. 2018. *Action Memorandum: Town of Coupeville – Navy Water System Improvements Naval Air Station Whidbey Island, Outlying Landing Field, Coupeville, Washington*. July.

Washington State Department of Transportation (WSDOT). 2019. *Highway Runoff Manual M31-16.05*. April.

WSDOT. 2018. *Standard Specifications for Road, Bridge, and Municipal Construction M 41-10.*

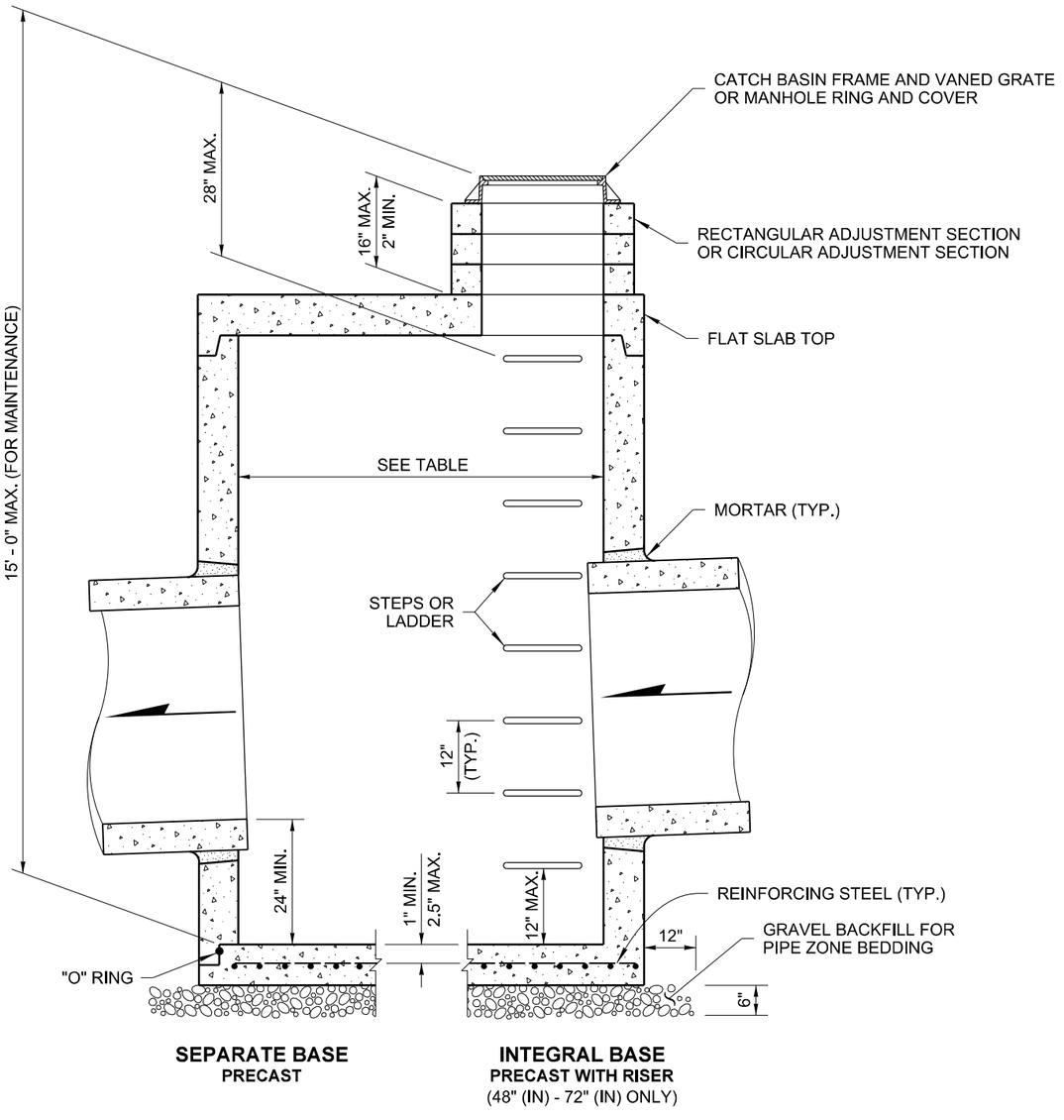
Figures

Figure 1-1 Project Site Location (Redacted)

Figure 2-1 Baseline Project Schedule (Redacted)

Figure 2-2 WSDOT Standard Plan B-10.20-02 for Catch Basin Type 2

DRAWN BY: FERN LIDDELL



SEPARATE BASE
PRECAST

INTEGRAL BASE
PRECAST WITH RISER
(48" (IN) - 72" (IN) ONLY)

NOTES

1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. The rectangular frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
4. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3.**

CATCH BASIN DIMENSIONS

CATCH BASIN DIAMETER	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"
72"	6"	8"	60"	12"
84"	8"	12"	72"	12"
96"	8"	12"	84"	12"
120"	10"	12"	96"	12"
144"	12"	12"	108"	12"

PIPE ALLOWANCES

CATCH BASIN DIAMETER	PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER				
	CONCRETE	ALL METAL	CPSSP ① PP ④	SOLID WALL PVC ②	PROFILE WALL PVC ③
48"	24"	30"	24"	30"	30"
54"	30"	36"	30"	36"	36"
60"	36"	42"	36"	42"	42"
72"	42"	54"	42"	48"	48"
84"	54"	60"	54"	48"	48"
96"	60"	72"	60"	48"	48"
120"	66"	84"	60"	48"	48"
144"	78"	96"	60"	48"	48"

① Corrugated Polyethylene Storm Sewer Pipe
(See **Standard Specification Section 9-05.20)**
② (See **Standard Specification Section 9-05.12(1))**
③ (See **Standard Specification Section 9-05.12(2))**
④ Polypropylene Pipe (See **Standard Specification Section 9-05.24)**

JULIE HEILMAN
STATE OF WASHINGTON
41819
REGISTERED
PROFESSIONAL ENGINEER

Heilman, Julie
Feb 20 2018 12:49 PM
cosign

CATCH BASIN TYPE 2

STANDARD PLAN B-10.20-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Mar 2 2018 10:01 AM
cosign

STATE DESIGN ENGINEER
Washington State Department of Transportation

SUPPLEMENTAL TO STANDARD PLAN
B-10.20-02

Modify the Standard Plan as follows:

Notes:

1. When a grate is specified, the grate shall be a rectangular herringbone grate per WSDOT B-30.50-03.

2. Catch Basin Type 2 diameter shall be 54" for Catch Basin depths up to 8'. For depths greater than 8', the diameter shall be 60".

3. Steps shall be polypropylene.

4. Following backfill, vacuum test 50% of the Catch Basins, but not less than one, per the requirements stated in Supplement to Sanitary Sewer Standard Plan B-15.20-01.

5. Tracer wire shall be installed along the top of all pipe entering the structure, then up the wall and attached with a 3' long coil of slack at the top inside of the structure.

6. The top of the Type 2 Catch Basin shall be adjusted to grade following paving.

Appendices

Appendix A: Performance Work Statement with Q&A (Redacted)

Appendix B: Final Revised Design Drawings (Redacted)

Appendix C: Associated Design Specifications (Redacted)

Appendix D: TOC Standard Plans and Specifications for Water Main Installation

TOWN OF COUPEVILLE

4 NE SEVENTH STREET
P. O. Box 725
Coupeville, WA 98239

STANDARD PLANS AND SPECIFICATIONS FOR WATER MAIN INSTALLATION

Latest revision: December 2017

STANDARD SPECIFICATION FOR WATER MAIN INSTALLATION

1. General:

These specifications cover the minimum standards for the installation of 2 to 12-inch diameter water mains complete with valve, fittings, fire hydrants, appurtenances, etc. These specifications include minimum material specifications for bedding and backfill, pipe valves, fire hydrants and other associated items.

These specifications shall be used in conjunction with the contract documents provided by the Town, and with the other portions of the Project Report (if issued) containing these specifications. These specifications and accompanying drawings were prepared assuming the work would be done by Town staff, or under the inspection of a contractor by the Town's Public Works Superintendent having knowledge of the existing plant, equipment, and underground utilities.

Where American Water Works Association Standards (AWWA), American Society for Testing Materials Standards (ASTM), Washington State Department of Transportation Standard Specifications for Road, Bridges and Municipal Construction, current edition (WSDOT Std. Specifications) or other standards are referenced within, any further statement of requirements is for the purpose of either highlighting important details of the Standards or to impose more stringent requirements. Where references to these standards are made hereinafter, the latest published edition of the standards shall be assumed unless otherwise stated.

No substitution for the material specified herein or in the engineering drawings shall be made without prior approval of the Town. No change of the water main alignment, water main diameter, etc. shown on the engineering drawings may be made without the prior approval of the Town.

Where a manufacturer's product is specified by name and model, the intent is to:

a) Establish a minimum standard where either a AWWA Standard is not available, or where the standard of performance exceeding AWWA Standards is desired,

b) Conform to existing products in the distribution system or to provide inventory uniformity for the purpose of maintenance.

The approval of alternate materials to those specified by manufacturer's name and model, as a "approved equal" shall be at the sole discretion of the Town.

Within these specifications, "Engineer's approval" shall be issued by the Town's Public Works Superintendent.

The "Engineer's Inspection" may be delegated to the Town's Public Works Superintendent.

2. Materials:

Water Mains - Unless otherwise specified in the drawings, all water mains 4, 6, 8, 10 and 12-inch diameter shall be HDPE pressure pipe conforming to the following specifications. All "yard" piping at the reservoir site, or into or under a building or other structural foundation, shall be ductile iron.

HDPE Mains - Unless otherwise specified in the drawings, all HDPE water mains and fittings shall conform to the following American Water Works Association (A.W.W.A.) Standard:

> C906-99 "Polyethylene (PE) Pressure Pipe and Fittings, 4 inch (100 mm) through 63 inch (1,575 mm), for Water Distribution and Transmission".
>
> C901-96 ""Polyethylene (PE) Pressure Pipe and Tubing, ½-inch (13 mm) through 3 inch (76 mm), for Water Service".

All HDPE water mains shall have an outside diameter compatible with ductile iron pipe in accordance with A.W.W.A. C-906, Table 3, unless otherwise approved by the Engineer.

HDPE pipe shall be either:

> JM Eagle High Density Polyethylene pipe SDR 11, 160 p.s.i. minimum pressure class for water installation.
>
> Or Equal

Pipe 3-inch and larger shall be supplied in straight lengths.

For pipe installed above ground over embankments, the minimum pressure class shall be 200 psi (SDR 9). The Contractor shall obtain verification from the HDPE pipe manufacturer that the pipe thickness (SDR) supplied provides adequate strength to support the weight of the completed main (pipe plus water plus insulation plus tape wrap). The pipe thickness shall be increased as required to provide adequate tensile strength for the conditions of installation.

If ductile iron or PVC is approved by the Town Engineer the following applies:

All ductile iron pipe shall be class 50 single cement lined, with "Tyton" or mechanical joints, conforming to the following AWWA Standards:

- C104 "Cement Mortar-Lining for Ductile-Iron Pipe and Fittings for Water"
- C111 "Rubber-Gasket Joints for Ductile-Iron and Grey-Iron Pressure Pipe and Fittings"
- C151 "Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand Lined

Molds, for Water and Other Liquids"

Ductile iron pipe with screwed flanges, welded restraining rings, or EBAA IRON or similar restraining glands and/or flange adapters shall be minimum thickness class 53, except that EBAA IRON "MEGALUG" and "MEGAFLANGE" restraint may be used on class 50 ductile iron.

Unless otherwise approved by the Town, polyethylene encasement shall be installed on all ductile iron pipe, valves and fittings and shall conform to the latest version of the following AWWA Standard:

- C105 "Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids"

All polyvinyl chloride (PVC) pressure pipe shall be pressure class 150 conforming to AWWA Standard:

- C900 "Polyvinyl Chloride (PVC) Pressure Pipe, 4-Inch Through 12-Inch for Water"

All 2-inch through and including 3-inch mains (e.g., supply pipe from well), shall be high density polyethylene (HDPE) pressure pipe, class 200, unless otherwise approved by the Town Engineer. J.M. Eagle or Engineer approved equal.

Fittings - All fittings 4-inch and larger shall be single cement lined ductile iron or grey iron conforming to the following AWWA Standards:

- C104 "Cement Mortar-Lining for Ductile-Iron Pipe and Fittings for Water"
- C110 "Ductile-Iron and Grey-Iron Fittings, 3-Inch Through 48-Inch, for Water and Other Liquids"
- C111 "Rubber-Gasket Joints for Ductile-Iron and Grey-Iron Pressure Pipe and Fittings"
- C153 "Compact Fittings for Water Service"

Valves - All valves 4 through 12-inch in diameter shall conform to the following AWWA Standards:

- C509 "Resilient-Seated Gate Valves for Water and Sewerage Systems"
- C111 "Rubber-Gasket Joints for Ductile-Iron and Grey-Iron Pressure Pipe and Fittings"

Fire Hydrants - All fire hydrants shall be dry barrel, compression type conforming to AWWA Standard C502 "Dry-Barrel Fire Hydrants", with 4.5" pumper port and two 2.5" outlets, 6" inlet, and 1 3/16" pentagon operating nut. . A Storz adaptor shall be provided on the pumper port only if required by the Town and requested by the local fire department.

Service Pipe - All 3/4 to 2-inch water service pipes shall be pressure class 200 psi, copper tubing size polyethylene, PE 3406 resin, conforming to the following AWWA

Standard:

- C901 "Polyethylene (PE) Pressure Pipe and Tubing, 1/2-Inch Through 3-Inch. for Water Service"

All water services larger than 2-inch shall conform to the standards for water mains in Section 2.1 above.

Brass Fittings - All miscellaneous fittings shall be brass conforming to the following AWWA Standard:

- C800-89 "Underground Service Line Valves and Fittings"

No steel or galvanized fittings shall be used.

Fittings shall be of the compression type as manufactured by Mueller, Decatur, Illinois, series 110 Compression Connections; or by Ford Meter Box Co., Wabash, Indiana, Pack Joint Coupling series. The coupling shall be supplied with stainless steel tube liner where required by the manufacturer, and shall be compatible with polyethylene service pipe thickness and diameter (see para. 2.5, above).

Curb stops, where used for blow offs, air valves, etc., shall be o-ring type as manufactured by Mueller, Decatur, Illinois, series Mark II Oriseal c/w tee head, or Engineer approved equal.

Branch connections, where used on a dual service line (two customers supplied from one service connection) shall be 1 x 3/4 x 3/4 inch "Y" style c/w compression fittings (specified as above) as manufactured by Mueller, Decatur, Illinois, series Mark II Oriseal c/w tee head, or Engineer approved equal.

Meter setters shall incorporate compression inlet and outlet fittings, upstream angle ball valve as manufactured by Ford Meter Box Co., Wabash, Indiana, or Engineer approved equal, and outlet fitting with an angle pattern residential dual check valve backflow preventer, complying with ASSE Standard 1024, as manufactured by Watts Regulators Co., Lawrence, MA, Series LF7 or Engineer approved equal.

Valve Boxes - All valve boxes shall be cast iron slip type with bottom flange and "WATER" cover as manufactured by East Jordan, East Jordan, MI or Engineer approved equal.

Backflow Prevention Assemblies - Backflow prevention assemblies shall be State Department of Health approved, and University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC FCCCHR) approved.

State and USC FCCCHR approval is not required where residential dual check valve backflow preventers are installed with water meters as a voluntary means (i.e., where backflow prevention is not a requirement) of providing premise isolation.

Marking Tape - Marking tape for PVC mains and polyethylene services shall be of the

detectable type (with metallic foil laminate) with plastic jacket, 6-inch wide, blue color with wording "WATER LINE", as manufactured by Calpico, San Francisco, CA, or Engineer approved equal.

Tracer Wire – Where required by the Town for PVC mains and polyethylene services, in addition to the marking tape, a 12-gage stranded wire with THHN or THWN insulation shall be taped to all polyethylene services every 5 feet with 2 inch X 10 mil poly tape. Splices are allowed only at pipe branches, and must be of an approved underground type. The detector wire shall terminate at the top or each valve or meter box. Detector wire shall be strapped to the PVC main every 5 feet with 2" wide by 10 mil thickness poly tape.

Air Release Valves - Unless otherwise specified in the Drawings, all air valves shall be 3/4-inch simple lever air release type, as manufactured by Valve-Matic, Elmhurst, Illinois, Model 22, or Engineer approved equal. . Air release/vacuum valves will conform to the latest version of the following AWWA specification:

C512 "Air release, Air/Vacuum and Combination Air Valves"

Meter Boxes - Unless otherwise specified in the Drawings, water meter boxes shall be plastic body and cover, as manufactured by Carson Model 1419 or 1324 (corresponding to meter size) or Engineer approved equal. The meter box shall be of adequate size to accommodate both the meter and meter setter, also the dual check valve backflow preventer.

Water Meters - Water meters to single family residential customers shall be 5/8 x 3/4 inch displacement type, SENSUS iPERL, calibrated in cubic feet, as manufactured by Sensus Technologies, Uniontown, PA meeting AWWA Standard C700, or Town approved equal.

Service Saddles - Service saddles shall be furnished with a ductile iron body and IPS standard tapping, with a neoprene or Buna-N rubber gasket cemented in place. Saddles shall be double strap for all connections (saddles required for all service sizes), as manufactured by Ford Meter Box Company, or Engineer approved equal.

Control Cable - With the new water mains, should the Town elect to install new control cable to a reservoirs or well site, the cable shall be 8 wire #14 Type PTN direct burial control cable, laid continuously, without buried splices. All control cable shall be installed in 2-inch electrical conduit with pull boxes spaced not greater than 1,000 feet.

Valve Marker Post – Where required by the Town and/or shown on the installation drawings, valve marker posts shall be 42-inch high reinforced concrete as manufactured by Fog Tite or Town approved equal.

Hydrant Guard Posts - Where required by the Town and/or shown on the installation drawings, hydrant guard posts shall be 72-inch high, 9-inch diameter reinforced concrete as manufactured by Fog Tite or Town approved equal.

Water Sample Stations – Water sample stations shall be "Eclipse No. 88" as manufactured by Kupferle Foundry Company, St. Louis, Missouri.

Blow-offs Assemblies - Where required by the Town and/or shown on the installation drawings, blow-offs shall be "MainGuard #7600" Blow-Off Hydrants as manufactured by Kupferle Foundry Company, St. Louis, Missouri.

3. Installation:

General - Unless otherwise specified in the Drawings or in these specifications, water mains shall be installed in accordance with the manufacturer's printed specifications, to AWWA Standards and with *Standard Specifications for Road, Bridge and Municipal Construction,* current edition prepared by WSDOT. References to *"Section", "Paragraphs",* or *"Divisions"* indicated by number hereinafter pertain to these WSDOT *Standard Specifications.*

Trenching/Backfill - Trenching, foundation, bedding and backfilling for water mains and incidental piping shall conform to WSDOT Std. Specif. *Section 7-09*, except that backfill for flexible pipe ("initial backfill" in the detail) shall be extended 12 inches over the crown of the pipe.

The requirements for bedding and backfill for HDPE, ductile iron and PVC pipe are summarized in the Drawings, attached hereto.

Unless otherwise specifically approved by the Engineer, only imported material conforming to *Section 9-03.12* shall be used for bedding (layer under the pipe), haunching (layer to spring line) and initial backfill.

Native material may be approved by the Engineer if it fully complies with WSDOT Std. Specif. *Section 9-03.12(3).* PVC pipe shall be considered "Flexible pipe" with respect to this section. Where a request for use of native material is made by the Contractor, the material shall be evaluated prior to use by a qualified material testing lab and certified that it meets the requirements of the above referenced WSDOT Sections. The Engineer may require periodic testing to ensure continuing material conformance. The cost of all such testing shall be borne by the Contractor.

In County right of way, where water mains or services are laid under pavement or in the road shoulder backfill above the initial backfill shall conform to *Section 7-9.3(9), Section 7-9.3(10), Section 7-9.3(11)* and *Section 9-03.12.* In other areas native material may be used above the initial backfill. In ditches, the backfill shall comply with any additional requirements imposed by County, such as the use of quarry stone for erosion control.

Unless otherwise specified in the Drawings all water main excavations shall be made by open cut. All trenches shall be excavated to true and smooth bottom grades in accordance with the lines given in the Drawings. The trench bottom shall provide uniform bearing and support for each length of pipe.

Bell holes shall be excavated to the extent necessary to permit accurate work in making and inspecting the joints. The banks of the trenches shall be kept as nearly vertical as soil conditions will permit, and where required to control trench width or to protect adjacent structures, the trench shall be sheeted and braced.

Care shall be taken not to excavate below the depth specified, unless to remove unsuitable materials. Excavation below the grade of the pipe shall be backfilled with select backfill material and compacted as specified herein.

Thermal Fusion of Joints - Thermal (butt) fusion of joints shall be done by the HDPE pipe manufacturer's staff or manufacturer trained and approved contractor.

Flanged Assemblies – HDPE pipe connections to valves and ductile iron fittings shall be by butt fused flange adapter on stub end to pipe, with steel pipe slip flange. Assembly in the field of long sections of pipe may be joined by two butt fused flanged adapters with slip flanges.

Thermal Expansion - Thermal expansion of HDPE pipe (neglecting soil restraint) is approximately 1.4 inches per 100 feet per 10° F temperature change. For buried mains, a minimum water temperature change of 20° F should be anticipated. Connection to existing slip-on joint PVC or ductile iron pipe shall be at a gate valve, installed with a support anchor block as shown in the Town's "Standard Specifications - Water Main Installation", plan W-4 "Gate Valve Detail".

Where the HDPE pipe cannot be installed with "snaking" or with curvature to accommodate thermal expansion between valves and fittings, a flanged restrained joint expansion sleeve, EBAA Iron "Ex-Tend" or equal, shall be provided for each 200 feet of HDPE pipe or as otherwise shown on the accompanying project drawings.

Pipe Laying - Except as noted below, water mains and services shall be laid in accordance with the procedures outlined in WSDOT Std. Specif. *Section 7-09.*

Water mains shall be laid to provide minimum cover of three feet. The depth of the water main may be increased as necessary to pass under other utilities, culverts, etc. Whenever possible, grade changes for passing other utilities shall be made by gradually varying trench depth.

Unless otherwise approved by the Engineer, water mains shall be laid with at least 10 foot horizontal and 18 inch vertical separation from sanitary or storm sewer, and 3 foot horizontal and 12 inch vertical separation from all other utilities.

Where the water main crosses a sanitary or storm sewer, but cannot be laid within a minimum 18-inch vertical separation,

a) One 18 foot length of water pipe shall be laid so joints are equal distance from the sewer, and
b) The sewer pipe shall be either replaced with ductile iron pipe with joints equally spaced from the water pipe or encased in concrete.

Where the water main must be installed below the sewer, the water main shall be installed with a minimum 18 inch vertical separation and the sewer pipe replaced with ductile iron pipe as detailed in (b), above.

Ductile iron water mains shall be installed in accordance with AWWA Standard

- C600-87 "Installation of Ductile Iron Water Mains and Their Appurtenances"

PVC water mains shall be installed in accordance with the Uni-Bell Plastic Pipe Association's publication "Handbook of PVC Pipe", **except as noted below**, where more stringent requirements are specified.

PVC pipe shall be laid on a cushion of sand bedding. The cushion shall be spread on the bottom of the trench prior to pipe laying and carefully raked to the correct grade. Before final raking of the bedding it shall be tamped by either hand or mechanical means to a compaction of not les than 95 percent of Modified Procter Density. After laying of PVC pipe, sand haunching shall be placed to the spring line of the pipe and tamped by either hand or mechanical means to a compaction of not less than 95 percent of Modified Procter Density. (The installation of haunching is not required for ductile iron pipe.) An initial backfill of sand shall be placed to a minimum height of 12-inches above the pipe. Initial backfill shall be placed in a maximum of 12-inch layers and compacted to not less than 95 percent of Modified Procter Density.

All PVC pipe shall be installed without deflection at the pipe joint of more than 2 degrees, or 80 percent of the maximum allowable by the pipe manufacturer, whichever is the lesser. **All PVC pipe shall be installed without bending of the pipe lengths.** All additional changes in both horizontal and vertical alignment shall be made by the deflection of mechanical joints (M.J.) at fittings; additional M.J. sleeves shall be installed as necessary.

Ductile iron pipe joint deflection shall be limited to 4 degrees (80 percent of maximum allowable under AWWA C600).

On road curves, either short lengths of pipe or mechanical joint sleeves shall be used as needed to limit the pipe joint deflection to within the above noted values. Short lengths and/or fittings shall be utilized on curves of radius less than 280 feet for ductile iron pipe, and 570 feet for PVC pipe.

All HDPE and PVC pipe and polyethylene services shall be installed with detectable marking (warning) tape installed one foot above the PVC pipe or PE service and brought up to the surface within all valve boxes and fire hydrants.

Unless otherwise specified in the Drawings, all cast iron or ductile iron fittings used on HDPE and AWWA C-900 PVC pipe shall have mechanical joint ends.

Where more than one pipe is installed in a trench, special care shall be taken to provide adequate bedding at and below the spring of the larger pipe. Provide a minimum of 4-inch clearance between pipes.

Where an electrical telemetry cable is also installed in the trench, the cable shall be installed at the spring line elevation of the largest pipe.

All buried galvanized steel pipe fittings, and all exposed steel pipe or ductile iron pipe threads shall be tightly wrapped with two layers of PVC tape.

Thrust Blocks - All thrust blocks shall be capable of resisting the thrust created from the application of a 225 psi hydrostatic test pressure (i.e., 1.5 times the rated working pressure of the water main material). The minimum bearing area and placement of thrust blocks shall conform to the Drawings, attached hereto.

All concrete thrust blocks, fitting support, etc., shall be Class 3000 per WSDOT Std. Specif. *Section 6-02.3(2)B.*

Fire Hydrants - Fire hydrants shall be installed in accordance with the Drawings, attached hereto.

Blow-offs - Blow offs shall be installed in accordance with the Drawings, attached hereto.

Service Tapping - The tapping of a water main under pressure ("wet" tapping) shall only be done by a Contractor approved by the Engineer. The "wet" tapping of PVC or Asbestos Cement pipe shall only be done after the Town has partly closed the mains isolating valves to reduce flooding damage should the pipe rupture during tapping.

Service connections 3/4 to 2-inch in diameter shall be installed in accordance with the Drawings, attached hereto. Services shorter than 60 feet in length shall be installed without splices.

Details of service connections over 2-inch in diameter shall be shown in the Drawings for the water main installation or site servicing.

Water Meters - Meters 3/4 to 2-inch in diameter shall be installed in accordance with the Drawings, attached hereto.

Installation details for meters larger than 2-inch in diameter shall be shown on the Drawings for the water main installation or site servicing. Meters shall be installed with isolating valves and bypass in accordance with the Drawings, attached hereto.

Backflow Prevention Assemblies - All backflow prevention assemblies shall be installed in accordance with the recommendations outlined in *Cross Connection Control Manual, Accepted Procedures and Practices,* December 2012 or latest edition thereof, published by the Pacific Northwest Section, American Water Works Association.

Installation details for backflow prevention assemblies larger than 2-inch in diameter shall be shown on the Drawings for the water main installation or site servicing.

Air Release Valves - All air valves shall be vented above ground level to prevent the backflow of groundwater. The air valve shall be installed in accordance with the Drawings, attached hereto.

4. Disinfection:

All new mains and repaired portions or, or extensions to, existing mains shall be disinfected in accordance with:

- AWWA Standard C651-86 "Disinfecting Water Mains"

The placing of calcium hypochlorite granules in each pipe section during laying, as outlined in Section 5.1 "Tablet Method" of AWWA Standard C651, without the additional placement of calcium hypochlorite tablets, shall be done only on mains and services less than 100 feet in length, unless otherwise approved by the Engineer.

Where water is encountered in the trench, care shall be taken to insure that no water or other deleterious materials enter the pipe at any time. Under all conditions, care shall be taken in handling pipe and appurtenances to ensure that no deleterious materials enter the pipe, fittings, valves, etc. Special care shall be taken during the installation to ensure that dirt or other foreign matter does not enter a push-on or mechanical joint of a pipe, valve, fitting, etc.

During the laying of a water main, should dirt or other foreign material enter any pipe, fitting, valve, etc., the main shall be removed, cleaned and re-laid. Should sewage enter a main or portion thereof, the main or portion thereof, shall be rejected and all pipe, fittings, valves, etc. discarded.

All water supplied from the existing water system or other approved potable supply shall be connected to the new main through a State of Washington Department of Health "APPROVED" double check valve assembly (DCVA). Such DCVA shall be tested immediately prior to its use by a State Certified backflow prevention assembly tester to verify that it meets State performance requirements. The Contractor shall submit a copy of the tester's test report to the Engineer prior to use of DCVA.

Existing service shall not be transferred to a new water main until a satisfactory bacteriological test report is obtained for the new construction and approval is given by the Engineer.

The final connection to the existing system shall not be made until specifically authorized by the Engineer. Such authorization shall not be made until a satisfactory bacteriological test report is obtained by the Engineer.

All water main components used to make the final closure between the existing and new water main shall be disinfected immediately prior to the installation in accordance with Section 9.2 of AWWA Standard C651.

All equipment used to supply water for water main flushing and disinfection, e.g., standpipe, portable pumps, hose, etc., shall disinfected immediately prior to use in accordance with Section 9.2 of AWWA Standard C651.

5. Leakage and Hydrostatic Pressure Test:

Except as noted below, all water mains (HDPE, ductile iron or polyvinyl chloride (PVC) pressure pipe) shall be subject to a hydrostatic pressure test and leakage test in accordance with the following AWWA Standard:

- C600-87 "Installation of Ductile Iron Water Mains and Their Appurtenances"

All equipment used by the Contractor for the hydrostatic pressure test and leakage test shall have prior approval of the Engineer.

The test pressure shall be 225 psi (i.e., 1.5 times the rated working pressure of the water main material) applied at the lowest point in the pipeline. The duration of the hydrostatic pressure test shall be 2 hours, during which time the hydrostatic pressure shall not vary by more than 5 psi.

Where in the opinion of the Engineer a 2 hour pressure test is impractical, the duration of the test may be reduced to 15 minutes, as specified in WSDOT Std. Specif. *Section 7-09.3 (23),* provided no leakage is detected, (i.e., no loss of pressure). Should leakage occur, the test duration shall be 2 hours.

The leakage test shall be performed only after the Engineer's acceptance of the hydrostatic pressure test. The completion of the pressure test without loss of pressure (i.e., without the need for makeup water), shall be considered as completion of the leakage test.

No water main installation shall be accepted if the leakage is greater than that determined by the formula:

$$L = \frac{SD\,[P]^{0.5}}{266{,}400}$$

where

L = allowable leakage, in gallons per hour
S = total length of main tested, in feet
D = nominal diameter of the main, in inches
P = test pressure during leakage test, in psi

The leakage test pressure shall be applied at the location of the hydrostatic pressure test and shall be the same pressure and duration as the hydrostatic pressure test.

For acceptance of the new water main installation, any visible leakage detected shall be repaired regardless of the allowable leakage specified above.

6. Pavement Repair and Surface Restoration:

General - All existing asphalt and Portland cement concrete pavement, gravel or crushed rock surface treatments, sidewalks, curbs, gutters, and landscaped surfaces cut or damaged by the installation of sub-surface facilities shall be restored with like materials to original levels, flush, well bonded to adjacent sound material along neat, continuous straight or curved joint lines. Where indicated in the Drawings or required by the Engineer for dust or erosion control, or reasons of safety, temporary surface treatments shall be provided.

Materials - Materials used and methods of construction shall be as shown in the Drawings and details as specified in WSDOT Std. Specif. *Division 9.*

7. List of Standard Drawings:

The following attached drawings shall be used in conjunction with these Standard Specifications:

W-1	Trench Details
W-2	Thrust Block Details
W-3A	Fire Hydrant Details - Road Shoulder
W-3B	Fire Hydrant Details – Behind Road Ditch
W-4	Gate Valve Details
W-5	Blow-off Assembly Details
W-6A	Air Release Valve Assembly Details - Vault
W-6B	Air Release Valve Assembly Details – Hot Box
W-7	Casing Pipe Details
W-8	Curbside Water Sample Station Details
W-9	Flushing, Disinfection & Pressure Test Details
W-10	Residential Service Details
W-11	Residential Service Connection Details
W-12	Commercial Service Connection Details
W-13	Easement Located Meter Details
W-14	Bank of 3 to 6 Meter Details
W-15	Compound Meter Details
W-16	Sewer Separation Details
W-17	0.75" & 1" RPBA Details
W-18	1.5" & 2" RPBA Details
W-19	0.75" & 1" DCVA Details
W-20	Fire Line DCDA Details
W-21	Hydrant RPBA Details
W-22	DCVA & RPBA Application Details
W-23	Erosion Control – Street R-O-W Details
W-24	Erosion Control – Filter Fence & Straw Bale Details

W-25	Utility Control Details - Hydrants
W-26	Utility Control Details – Street Cross-sections
W-27	Cathodic Protection – Anode Placement
W-28	Cathodic Protection – Test Points
E-1 & E-2	Erosion Control

8. Engineer's Inspection:

Pursuant to WAC 246-290-040, the Town/Contractor shall be aware of the requirements for Engineer's inspection and certification of the work and completion of the Department of Health forms "Construction Report for Public Water System Projects" and "Pressure, Leakage and Bacteriological Test Results". Where a specific phase of the work is to be inspected by the Engineer, as noted in these specifications, in the contract documents accompanying these specifications, and/or in the accompanying "Inspection Requirements – Water", the Town/Contractor shall ensure that the work remains accessible until the Engineer's inspection is complete.

In general, the following Engineer's inspections shall be scheduled:

- Start of construction to evaluate construction practice.
- During disinfection and pressure testing.

APPROVED MATERIALS LIST
WATER

Other manufacturers may apply to the Town for pre-approval of materials. The purpose of this Approved Materials List is to establish uniformity in materials to facilitate maintenance and repairs. The pre-approval of materials is at the sole discretion of the Town.

Service Saddles	3/4"Ø & 1"Ø - ROMAC 202S or FORD FS202, Painted Saddle with double SS Strap (minimum 2" wide)
	1 1/2"Ø to 2"Ø - ROMAC 202S Painted Saddle with double SS Straps (minimum 2" wide each strap) or FORD FS 202, SS Band (minimum 4" wide band)

In corrosive areas, Town may require epoxy or nylon coated saddles.

For HDPE pipe, Town shall specify tapping saddle and tapping method on water connection permit.

Corporation Stops	3/4"Ø & 1"Ø - FORD F1100 CTS Pack Joint
	1 1/2"Ø & 2"Ø - FORD FB1100 CTS Pack Joint
Couplings	3/4"Ø to 2"Ø - FORD brass pack joint
	2 1/2"Ø and larger - ROMAC 501
Meter Stops-Setters	3/4"Ø - FORD VBH 72-12W
	1"Ø - FORD VBH 74-12W
	1 1/2"Ø - FORD VBH 66-12B x meter
	2"Ø - FORD VBH 77-12B x meter
Water Meters	5/8" x 3/4"Ø – displacement type, SENSUS model iPERL, with touch-read and registration in cubic feet, with TouchRead® System and Smart Point 520M.

Single-family residential meters shall be supplied and installed by the Town.

3/4-inch and larger shall be of a size and type specified by the Town for each individual application.

Meter Boxes Boulevard Installation	3/4"Ø - CARSON Ser. 1419 with flushed covered lid with 3" AMR

Meter Boxes Boulevard Installation	1"Ø - CARSON Ser. 1324 with reader lid 1 1/2"Ø - CARSON Ser. 1730 with reader lid 2"Ø - CARSON Ser. 1730 with reader lid
Meter Boxes Sidewalk Installation	3/4" to 2"Ø - UTILITY VAULT #3030-B c/w #3030-P Cover
Tracer Tape	3" LINEGUARD Type III or TERRA-TAPE Reinforced Sentry Line, blue color, marked "WATER", detectable.

The tapping of water mains under pressure (wet tap) shall be done only by contractors pre-approved by the Town. The pre-approved contractor shall supply and install the tapping sleeve and tapping valve. The following are pre-approved contractors:

SPEERS TAPS
PO Box 1135
Carnation, WA 98014
425-485-4764

Puget Sound Tapping Services LLC
PO Box 601
2808 Old Hartford Rd
Lake Stevens, WA 98258
425-508-4082

Fire Hydrants	Mueller® Centurion 250™ The hydrants shall be equipped with a 4.5-inch pumper port (National Standard Thread, 5.75-inch O.D., 4 threads per inch) and two 2.5-inch outlets (National Standard Thread, 3.0625-inch O.D., 7.5 threads per inch), 6-inch inlet, and 1-3/16-inch pentagon operating nut, counter-clockwise opening. Must include a Storz adapter.

INSPECTION REQUIREMENTS
WATER

1. Scope

The following inspection requirements refer specifically to the inspection by the Town for the purpose of approval and/or acceptance of the works related to new subdivisions and other extension or improvements of infrastructure by developers. The Town may also utilize these inspection requirements other capital improvement projects.

The inspection shall be by a Town employed inspector and/or professional engineer. Inspection by the Town's representatives shall not relieve the developer of his (or her) sole responsibility to comply with Town standard plans and specifications, and the other requirements imposed by the Town through Development Regulations, Ordinances, and project related agreements, or by the State of Washington and other government authorities having jurisdiction.

In the context of this document, "Inspector" shall mean the Town's Public Works Superintendent or other Town employed technician designated for day-to-day on-site inspection of the works; "Building Inspector" shall mean the Town's Building Official; "Engineer" shall refer to the professional engineer employed by the Town to perform the duties of the Town Engineer.

At least one week prior to the start of the construction activities, a pre-construction meeting shall be held with Town's Public Works Superintendent, the developer's representative(s), and contractor(s) to discuss the information contained herein.

2. Notification

A daily construction schedule shall be submitted to the Town (Attn. Public Works Superintendent) a minimum of one-week prior to start of the construction activities. Updates to the project schedule shall be submitted weekly; the absence of the submission of an updated schedule shall imply no change in schedule.

For the specific inspection requirements listed below, the developer's representative shall give 24 hours verbal notice to the Town's Public Works Superintendent to confirm that the works will be ready for inspection.

In addition, the developer's representative shall arrange for all work required to be inspected by the Building Inspector to be accessible according to the published work schedule of the Building Inspector.

3. Inspections

Inspector

a) Inspect material delivered to site to verify that it complies with Town standards, and the contractor submittals previously approved by the Town,

b) Inspect construction procedures at the start of main laying, and thereafter at a frequency the Town deems appropriate,

c) Before backfilling, inspect the specific installation of all fittings, valves, hydrants, service connections and blow-offs and air release valves, including the thrust blocks therefore,

d) In company with the Engineer (as noted below), witness the pressure test, leakage test, flushing and disinfection of the water main; collect all bacteriological samples, measure the levels of chlorination at the beginning and end of the retention period,

NOTE: Unless otherwise specifically approved by the Engineer prior to the start of the project, all water mains shall be disinfected by the continuous feed method.

e) Verify the use of an Approved double check valve assembly or reduced pressure backflow assembly for the filling of the water main for the purpose of the pressure and leakage test, disinfection, etc., and verify by the acceptance of a Backflow Assembly Test Report from a current WA Department of Health certified Backflow Assembly Tester that the backflow prevention assembly has been tested within the last one year period and certified as meeting the WA D.O.H. operating requirements.

f) Inspect the transfer of existing service connections,

g) In all areas of concern about the acceptance of the compaction of bedding and backfill, specify the locations of compaction tests to be made by a materials testing lab approved by the Town; where specific locations are not given, compaction tests shall be requested on each run of main at intervals of not greater than 250 feet, the location to be selected at random by the materials testing lab technician, and

h) And inspect other such related activities

i) Coordinate with the Public Works Superintendent to inspect erosion control measures for construction activities, such as installation of temporary collection sumps, filter fabric fence, quarry spalls at construction entrance, etc.,

j) Inspect condition and cleanliness of Town streets used by vehicles entering and leaving construction site.

Engineer

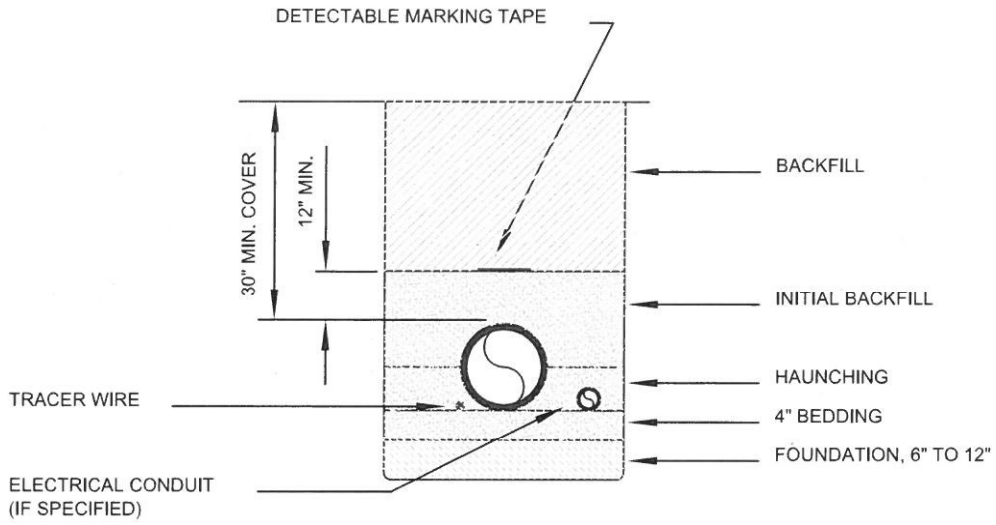
k) For the purpose of certification of the work to the WA Department of Health (WAC 246-290-040), inspect construction during active main laying to verify compliance with the [Town's] standard plans and specifications, and

l) For the purpose of certification of the work to the WA Department of Health (WAC 246-290-040), in company with the Inspector, witness the pressure test, leakage test, and disinfection of the water main.

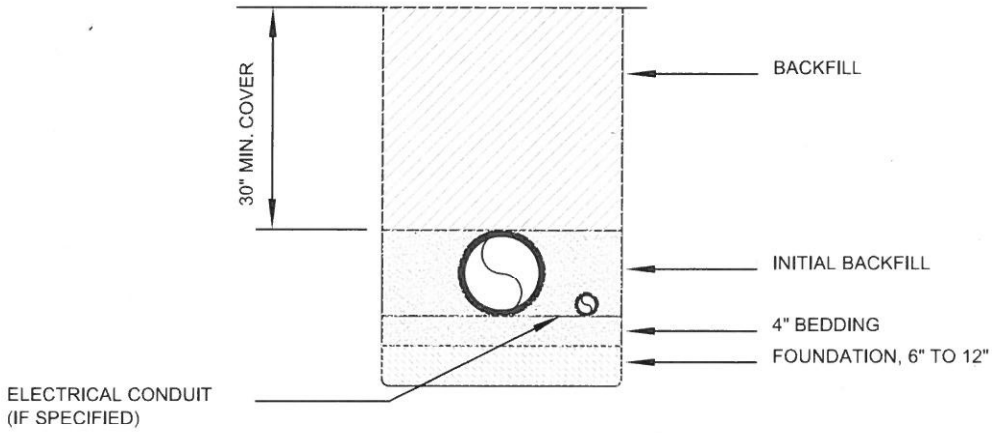
At the Engineer's discretion, the above two tasks may be delegated to the Inspector.

TOWN OF COUPEVILLE
STANDARD PLANS - WATER SYSTEM

W-1	TRENCH DETAILS
W-2	THRUST BLOCK DETAILS
W-3A	FIRE HYDRANT DETAILS - ROAD SHOULDER
W-3B	FIRE HYDRANT DETAILS - BEHIND ROAD DITCH
W-4	GATE VALVE DETAILS
W-5	BLOW-OFF ASSEMBLY DETAILS
W-6A	AIR RELEASE VALVE ASSEMBLY DETAILS - VAULT
W-6B	AIR RELEASE VALVE ASSEMBLY DETAILS - HOT BOX
W-7	CASING PIPE DETAILS
W-8	CURBSIDE WATER SAMPLE STATION DETAILS
W-9	FLUSHING DISINFECTION & PRESSURE TEST DETAILS
W-10	RESIDENTIAL SERVICE DETAILS
W-11	RESIDENTIAL SERVICE CONNECTION DETAILS
W-12	COMMERCIAL SERVICE CONNECTION DETAILS
W-13	EASEMENT LOCATED METER DETAILS
W-14	BANK OF 3 TO 6 METER DETAILS
W-15	COMPOUND METER DETAILS
W-16	SEWER SEPARATION DETAILS
W-17	0.75" & 1" RPBA DETAILSW-18 1.5" & 2" RPBA DETAILS
W-19	0.75" & 1" DCVA DETAILS
W-20	FIRE LINE DCDA DETAILS
W-21	HYDRANT RPBA DETAILS
W-22	DCVA & RPBA APPLICATION DETAILS
W-23	EROSION CONTROL - STREET R-O-W DETAILS
W-24	EROSION CONTROL - FILTER FENCE & STRAW BALE DETAILS
W-25	UTILITY CONTROL DETAILS - HYDRANTS
W-26	UTILITY CONTROL DETAILS - STREET CROSS-SECTIONS
W-27	CATHODIC PROTECTION - ANODE PLACEMENT
W-28	CATHODIC PROTECTION - TEST POINTS



TRENCH DETAILS, PVC & HDPE PIPE



TRENCH DETAILS, DUCTILE IRON PIPE

NOTES:

1) SEE TOWN OF COUPEVILLE "STANDARD PLANS & SPECIFICATIONS FOR WATER MAIN INSTALLATION" FOR TRENCHING, FOUNDATION, BEDDING AND BACKFILL REQUIREMENTS.

2) ONLY IMPORTED MATERIAL SHALL BE USED FOR BEDDING, HAUNCHING AND INITIAL BACKFILL OF PVC PIPE UNLESS OTHERWISE APPROVED BY PUBLIC WORKS DIRECTOR.

3) FOUNDATION MATERIAL IS INTENDED ONLY FOR OVER CUT OR UNSUITABLE NATIVE MATERIAL REPLACEMENT.

4) MINIMUM TRENCH WIDTH SHALL BE NOMINAL PIPE DIAMETER PLUS 7 INCHES EACH SIDE. UNLESS OTHERWISE APPROVED BY PUBLIC WORKS DIRECTOR.

5) WITHIN THE TOWN LIMITS, TRENCH BACKFILL UNDER PAVEMENT, ROAD SHOULDERS AND SIDEWALKS SHALL BE CONTROL DENSITY FILL (CDF). THE CDF SHALL BE A BATCH PLANT MIX OF SAND WITH 1 TO 2 SACKS OF PORTLAND CEMENT PER CUBIC YARD.

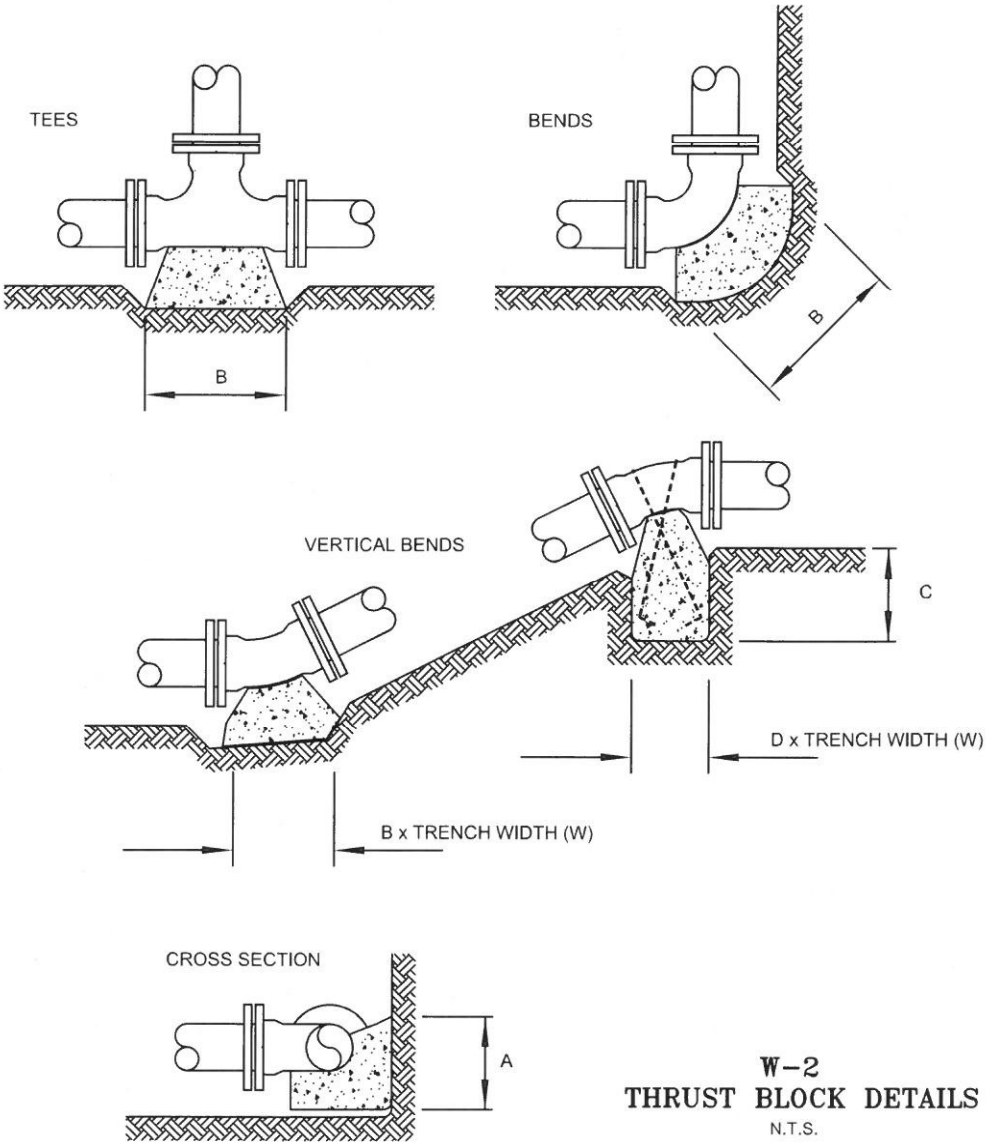
6) WITHIN COUNTY RIGHTS-OF-WAY, TRENCH BACKFILL UNDER PAVEMENT, ROAD SHOULDERS AND SIDEWALKS SHALL BE IN ACCORDANCE WITH CONDITIONS SPECIFIED IN COUNTY'S ROAD PERMIT.

REVISED OCT. 2017

Date: Dec. 08	Scale: N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN TRENCH DETAILS	Plan # W-1
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			

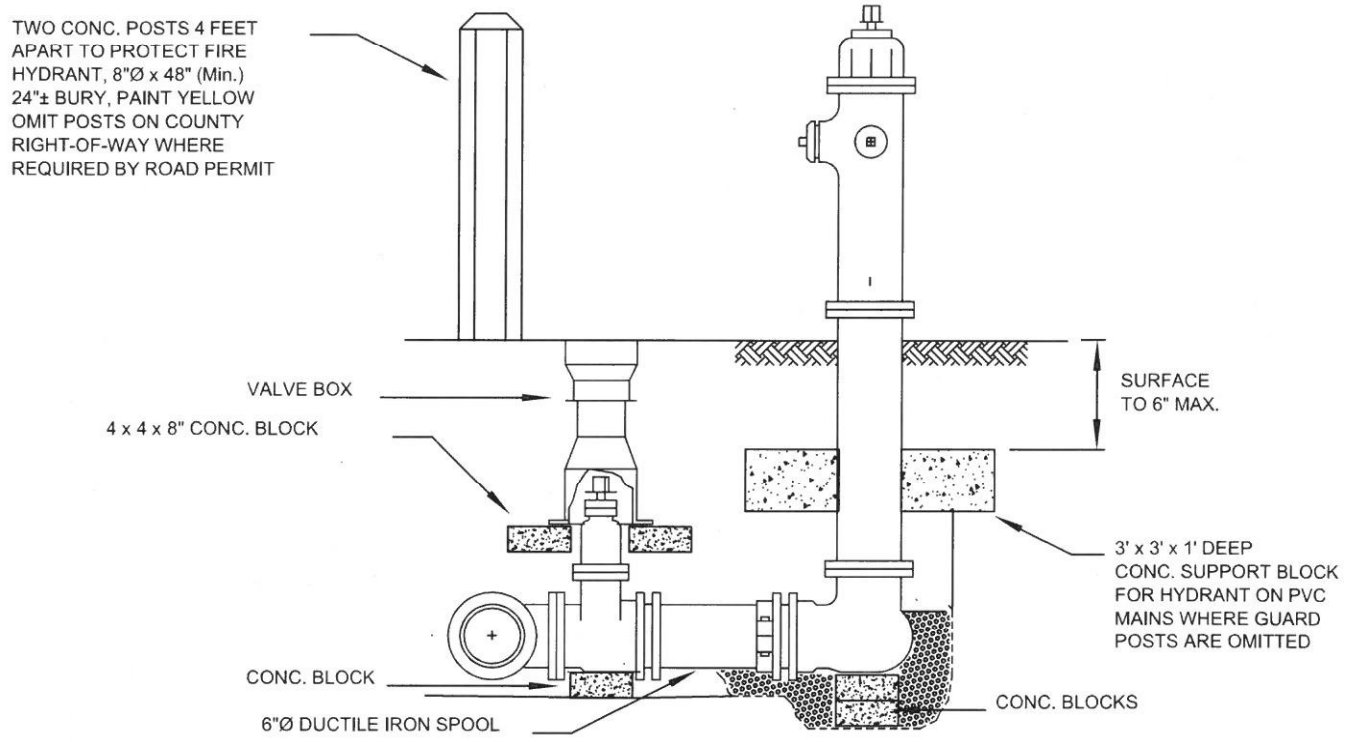
BEARING AREA (SQ. FT.) FOR HORIZONTAL THRUST, BASED ON 225 PSI TEST PRESSURE & 2,000 PSF SOIL BEARING	2"Ø & 3"Ø	4"Ø	6"Ø	8"Ø	10"Ø	12"Ø
TEES, CAP & PLUG (A x B)	1.5	2.5	5.0	8.5	13.5	19.0
90° BEND (A x B)	2.0	3.0	7.0	12.0	19.0	27.0
45° BEND (A x B)	1.0	2.0	4.0	6.5	10.5	15.0
22.5° BEND (A x B)	1.0	1.0	2.0	3.5	5.5	7.5
11.25° BEND (A x B) & FRT.. BEND DOWNWARD	1.0	1.0	1.0	2.0	3.0	4.0
FITTING WEIGHT SUPPORT FOR PVC PIPE		1.0	1.0	1.0	1.0	1.0
VOLUME-WEIGHT (CU. YDS.) FOR VERTICAL THRUST						
11.25° BEND (C x D x W)		2.0	4.0	7.0	11.0	15.0

ALL CONCRETE BLOCKS SHALL BE POURED AGAINST DRY, UNDISTURBED EARTH. KEEP CONCRETE CLEAR OF JOINTS GLANDS AND ACCESSORIES. FOR TIE DOWN VERTICAL BENDS AND VALVES, USE 3/4"Ø STAINLESS STEEL RODS, 2 PER FITTING OR VALVE. BEARING AREA / VOLUME IN TABLE INCLUDES 1.5 SAFETY FACTOR.



W-2
THRUST BLOCK DETAILS
N.T.S.

Date: Dec. 08	Scale: N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN THRUST BLOCK DETAILS	Plan # W-2
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



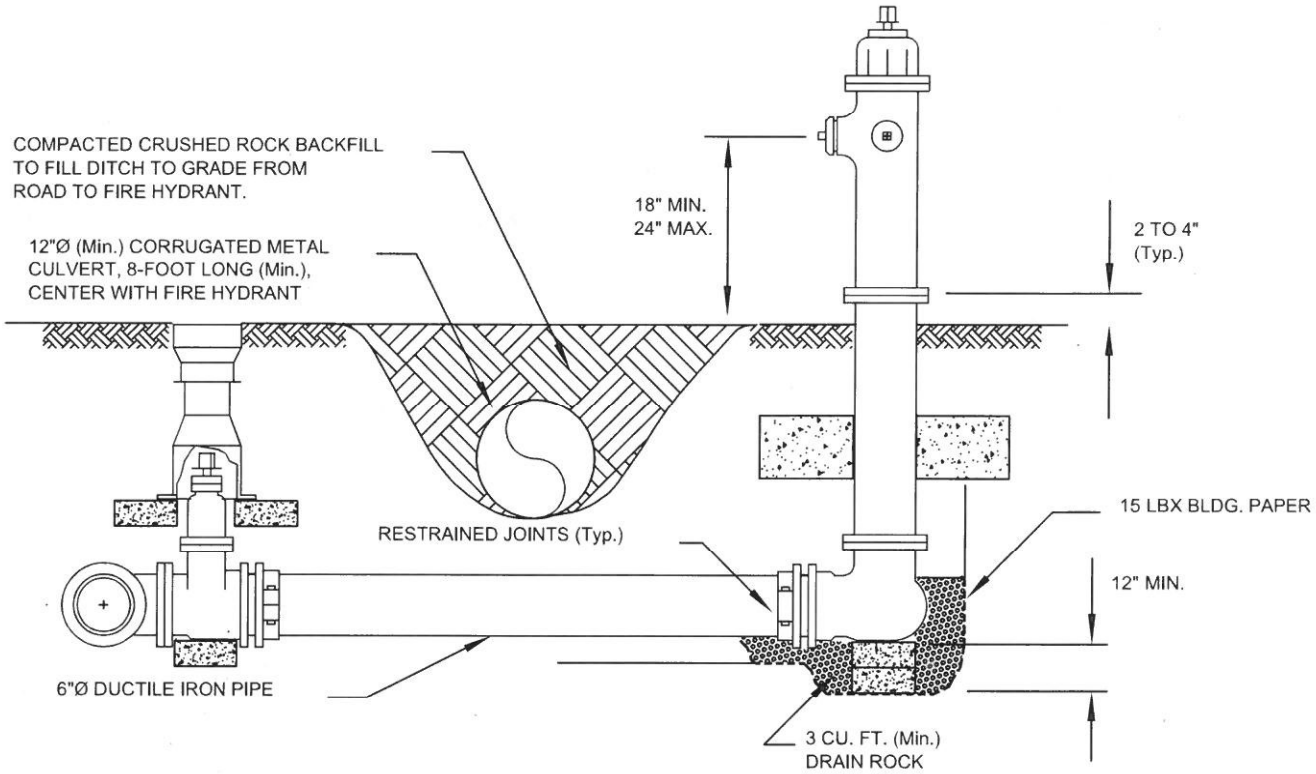
SEE DRAWING W-3B FOR ADDITIONAL DETAILS

CONFIRM SIZE AND THREAD WITH TOWN'S APPROVED MATERIALS LIST BEFORE PURCHASE.

INSTALL HYDRANT PLUMB.

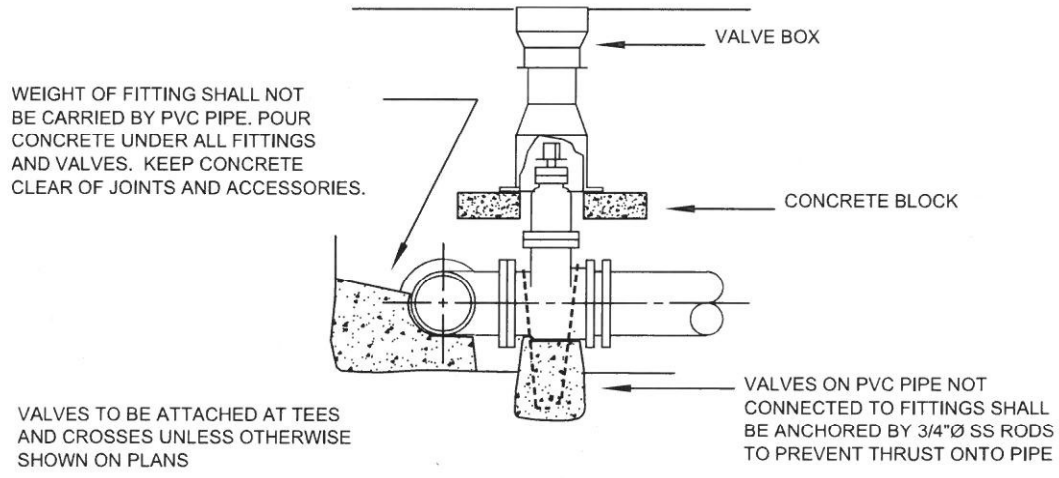
Latest revision: 6/22/2010

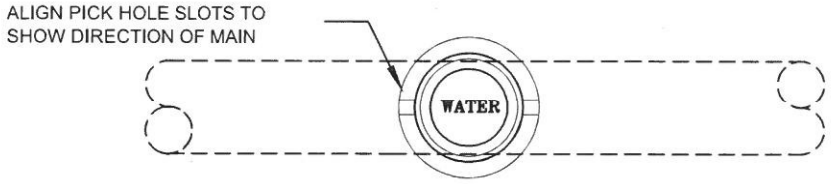
Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN FIRE HYDRANT DETAILS – ROAD SHOULDER	Plan # W-3A
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



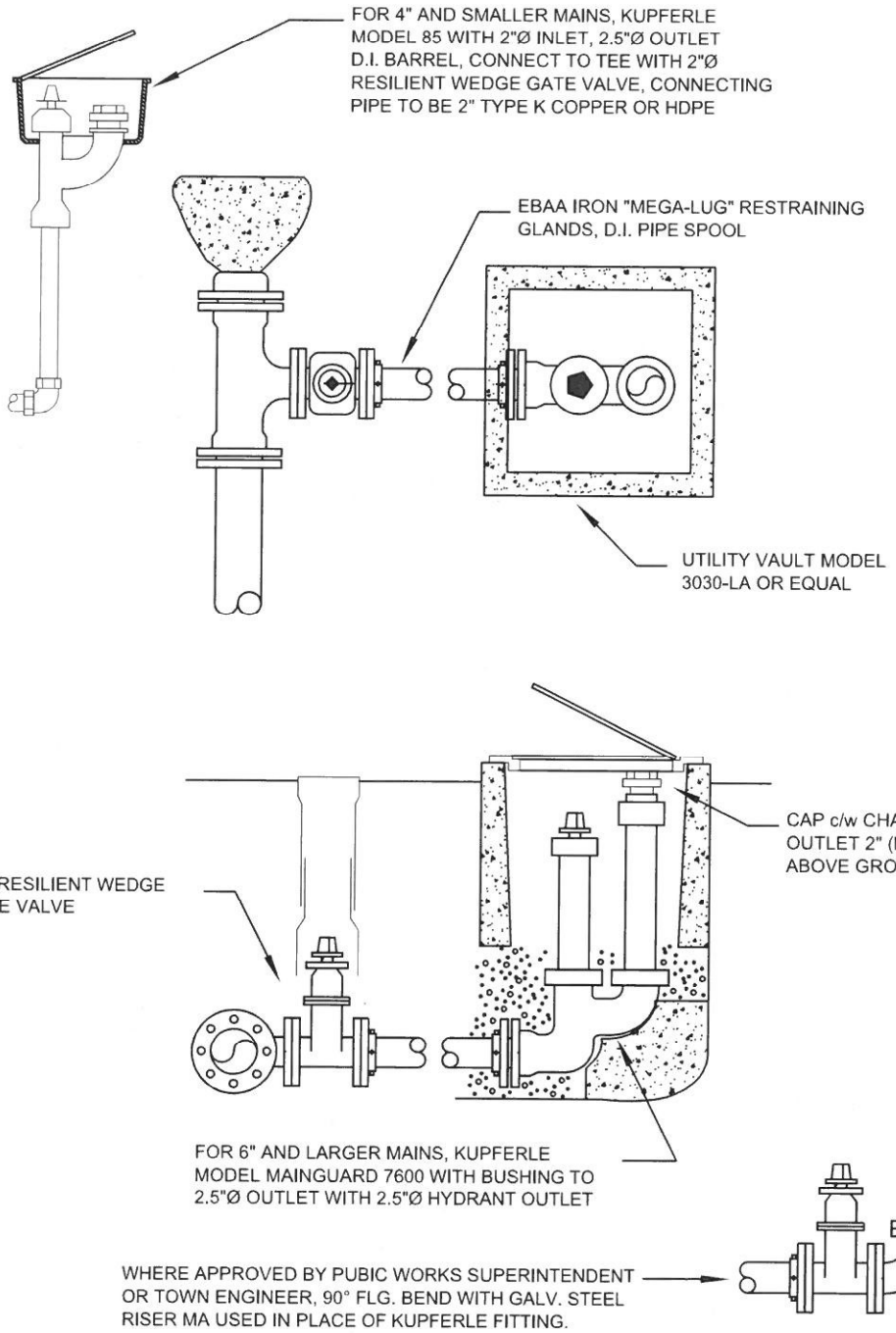
SEE DRAWING W-3A FOR ADDITIONAL DETAILS

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN FIRE HYDRANT DETAILS – BEHIND ROAD DITCH	Plan # W-3B
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



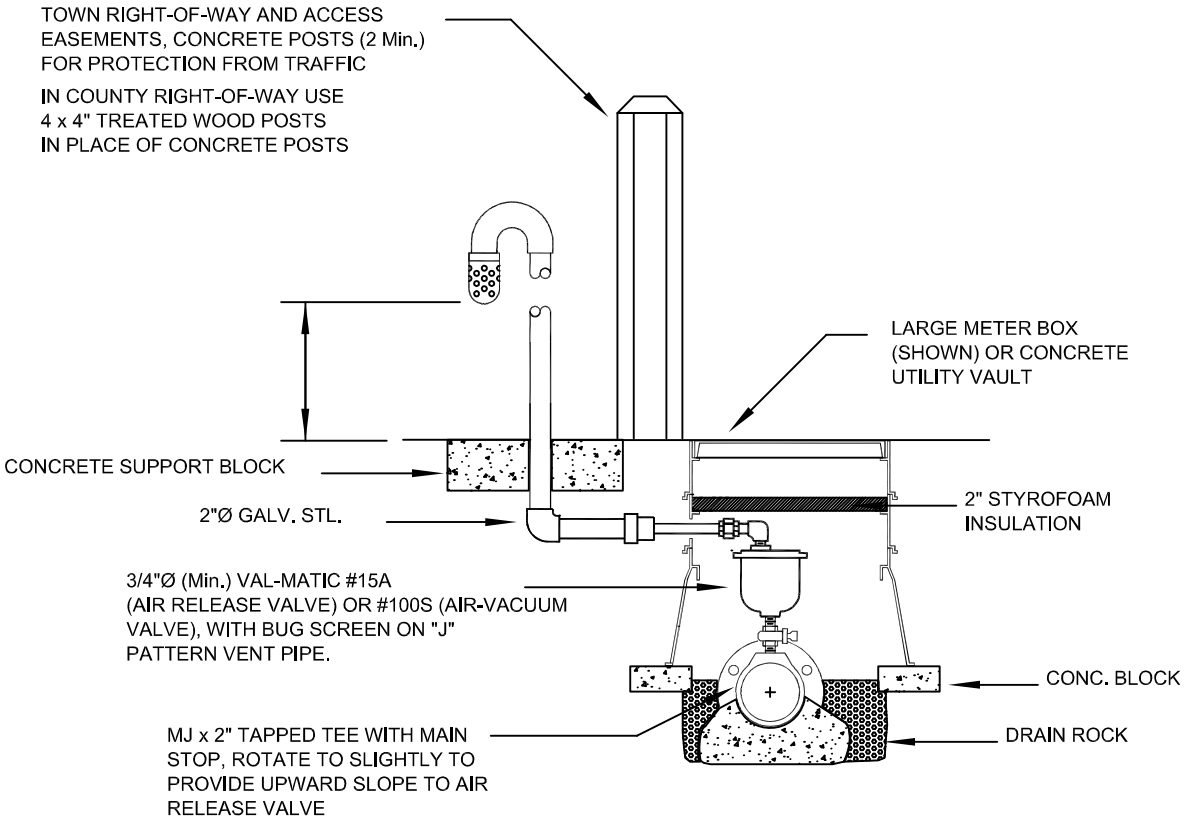


Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN GATE VALVE DETAILS	**Plan #** **W–4**
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



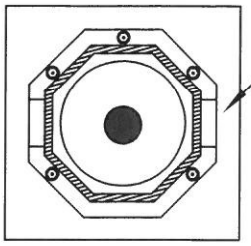
REVISED OCT. 2017

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN BLOW-OFF ASSEMBLY DETAILS	Plan # W-5
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			

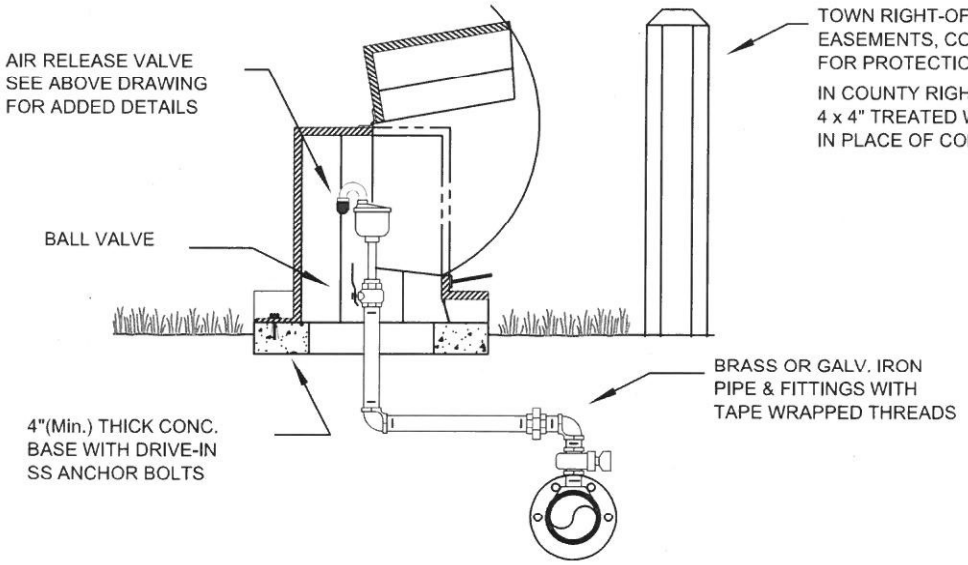


REVISED FEB. 2018

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN AIR RELEASE VALVE ASSEMBLY DETAILS – VAULT	**Plan #** W–6A
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			

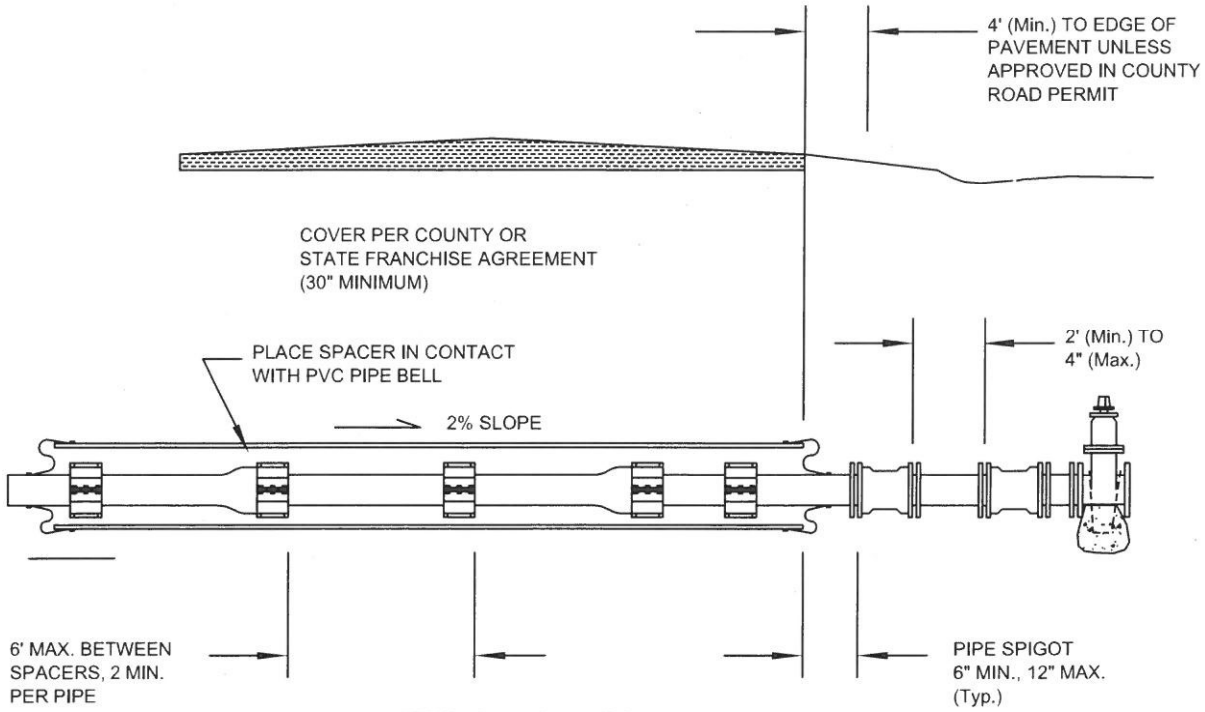


"VENT GUARD" BY HOT BOX, FOAM INSULATED FIBERGLASS ENCLOSURE WITH DRAINAGE OUTLETS, LOCKABLE LID, MODEL #1824, COLOR DARK BLUE UNLESS OTHERWISE SPECIFIED BY OWNER

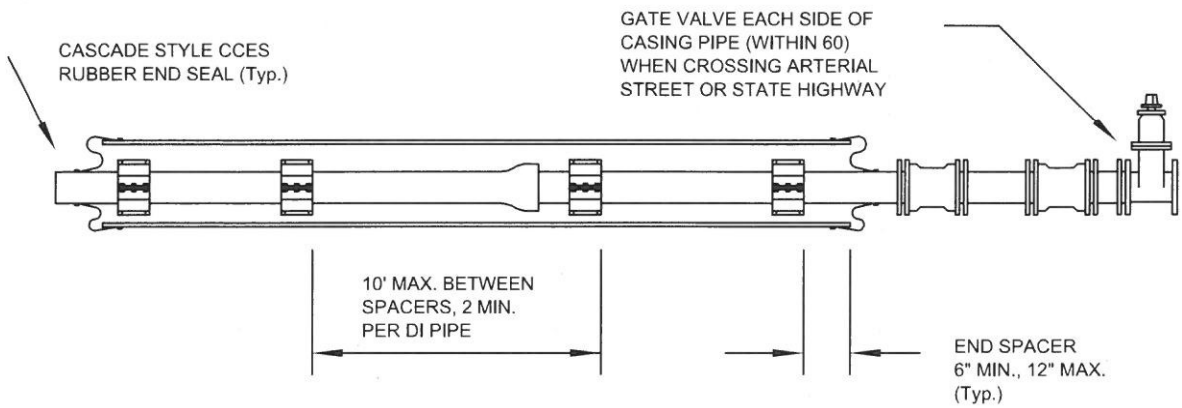


Latest revision: 6/22/2010

Date: Dec. 08	Scale: N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN AIR RELEASE VALVE ASSEMBLY DETAILS – HOT BOX	Plan # W-6B
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



PVC Carrier Pipe



Ductile Iron Carrier Pipe

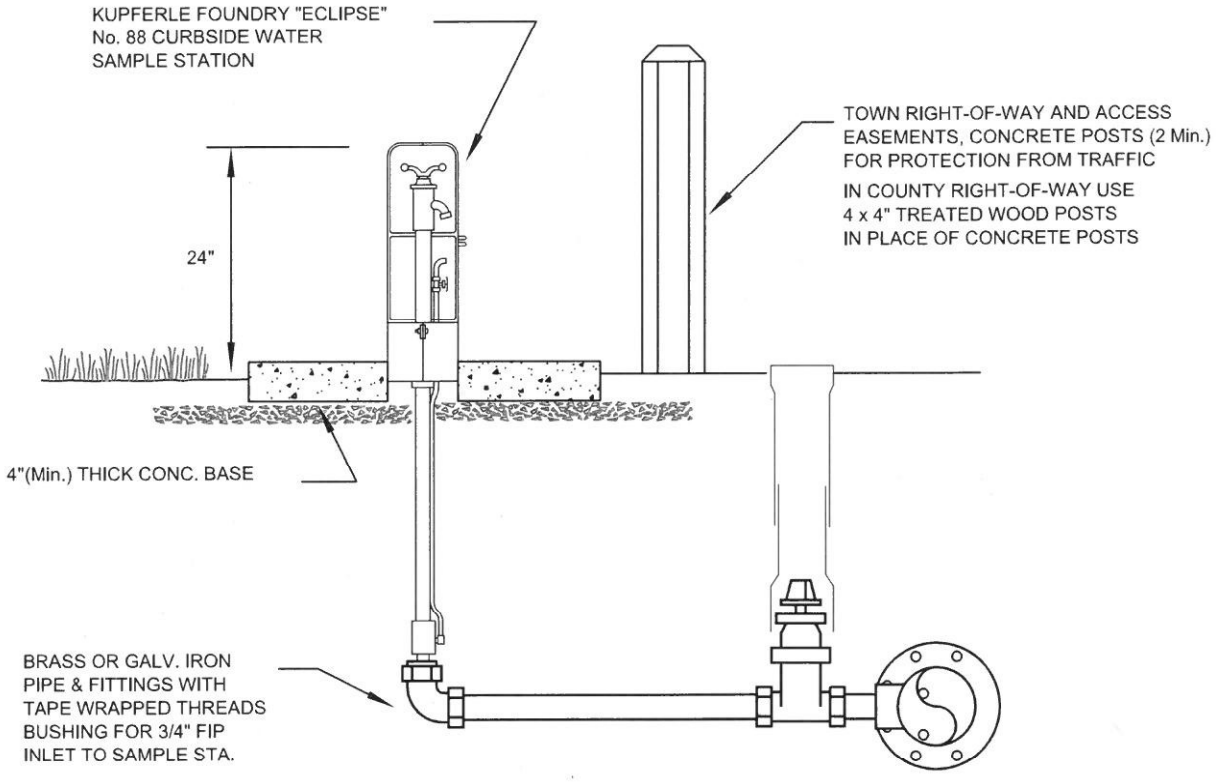
FOR JACKED INSTALLATIONS, USE 1/4" (Min.) WALL, 16" OD, STRAIGHT SEAM, ASTM A-135 STEEL PIPE JOINED BY BUTT WELDING.

FOR OPEN CUT INSTALLATION, USE CORRUGATED STEEL PIPE OR OTHER ISLAND COUNTY APPROVED CASING MATERIAL, BACKFILL WITH CONTROL DENSITY FILL (CDF)

FOR SEWER CROSSING, INSTALL DUCTILE IRON PIPE WITH ENDS 10-FEET (Horiz.) CLEAR OF CROSSING

CASING PIPES ARE REQUIRED FOR ALL WATER MAINS CROSSING ISLAND COUNTY ROADS.

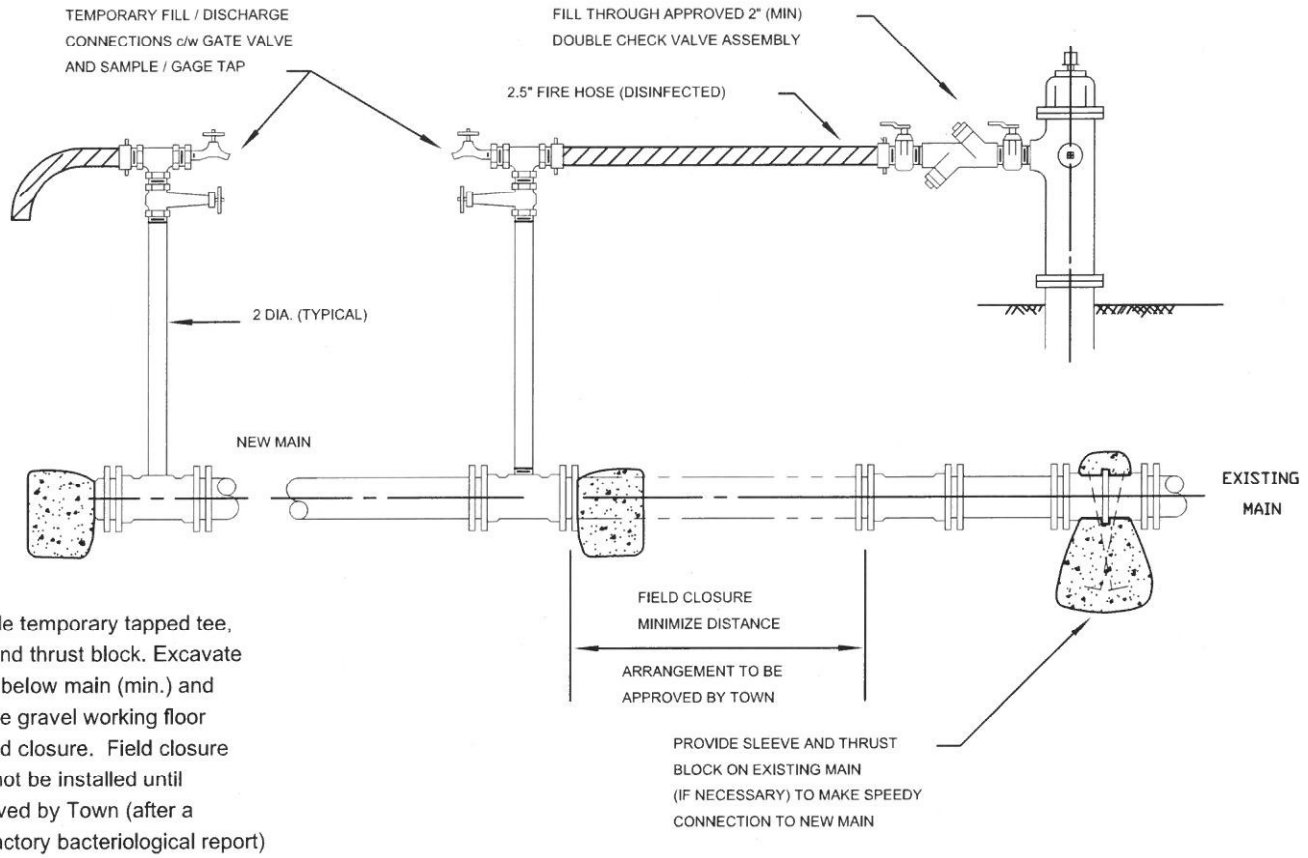
Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN CASING PIPE DETAILS	Plan # W-7
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



CURBSIDE WATER SAMPLE STATION DETAILS

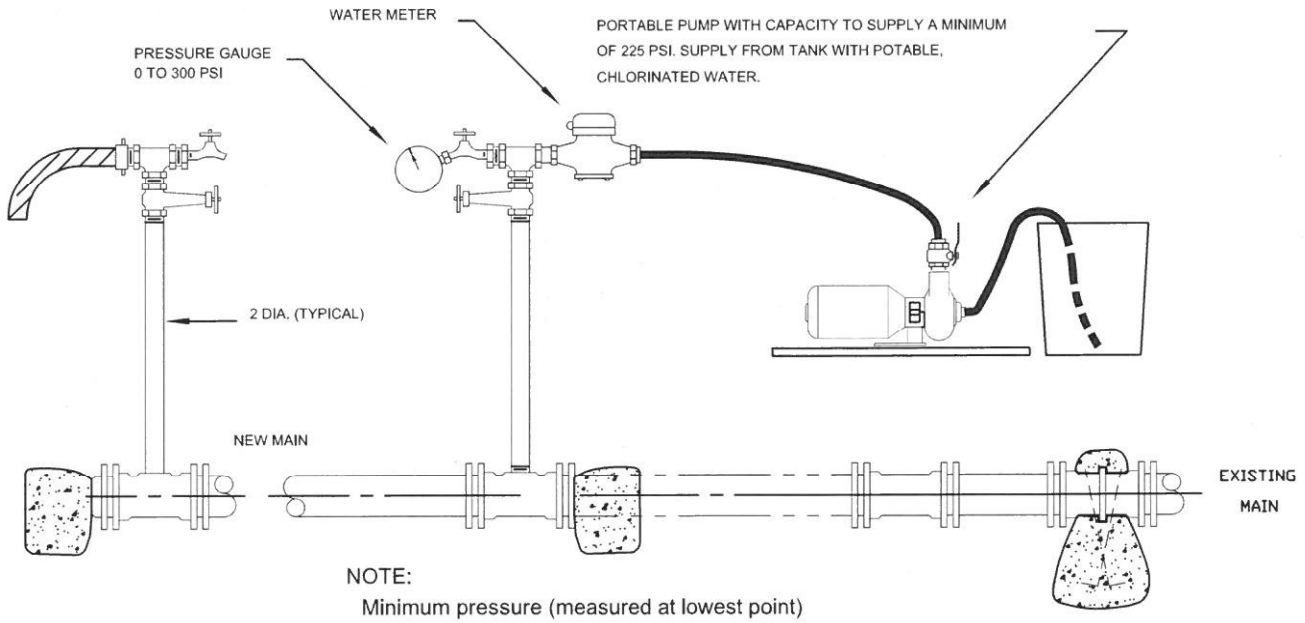
Latest revision: 6/22/2010

Date: Dec. 08	Scale: N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN CURBSIDE WATER SAMPLE STATION DETAILS	Plan # W-8
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



NOTE:

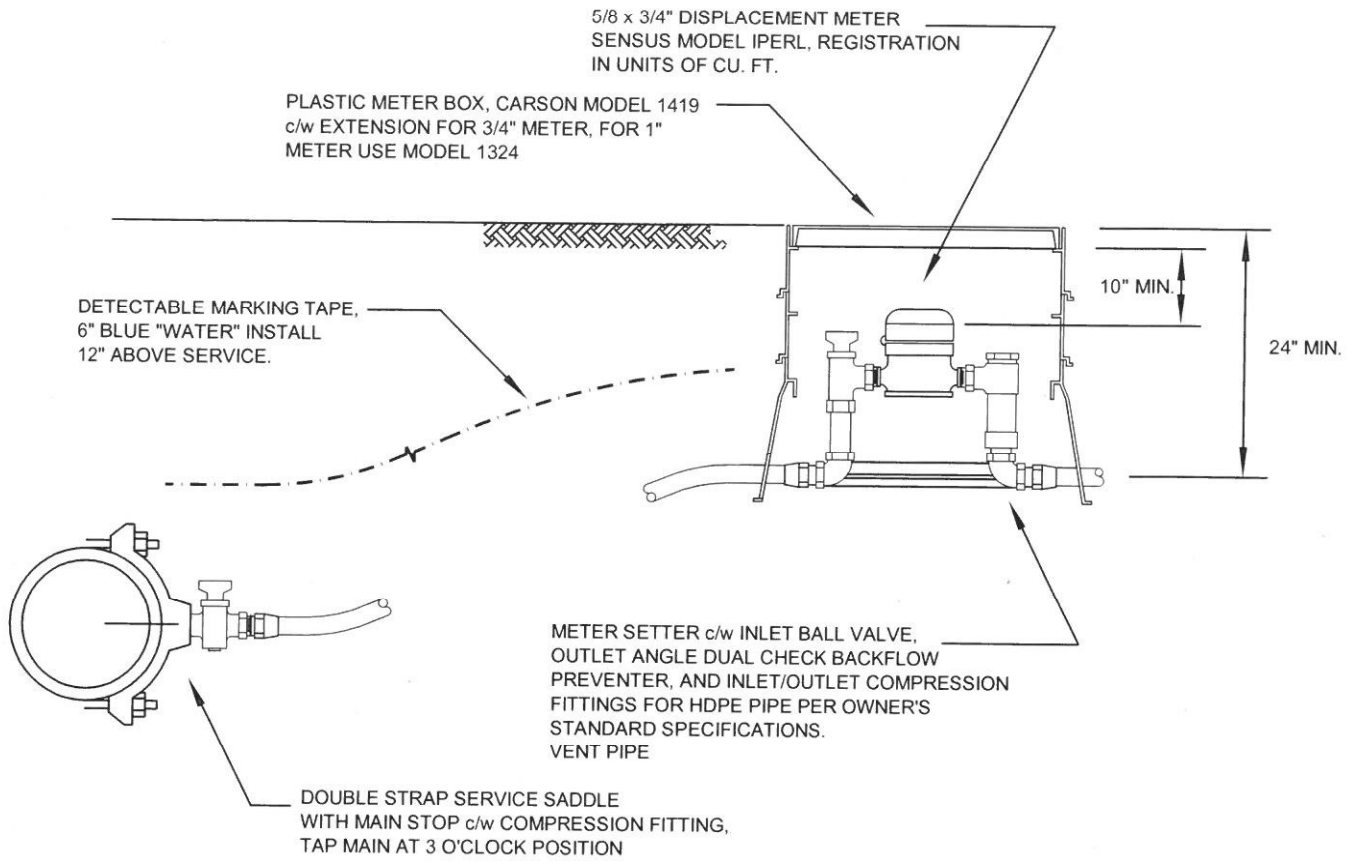
Provide temporary tapped tee, plug and thrust block. Excavate 1 foot below main (min.) and provide gravel working floor for field closure. Field closure shall not be installed until approved by Town (after a satisfactory bacteriological report) Minimum chlorine level after 24 hour retention shall be 25 mg/L. De-chlorinate all water flushed from mains.

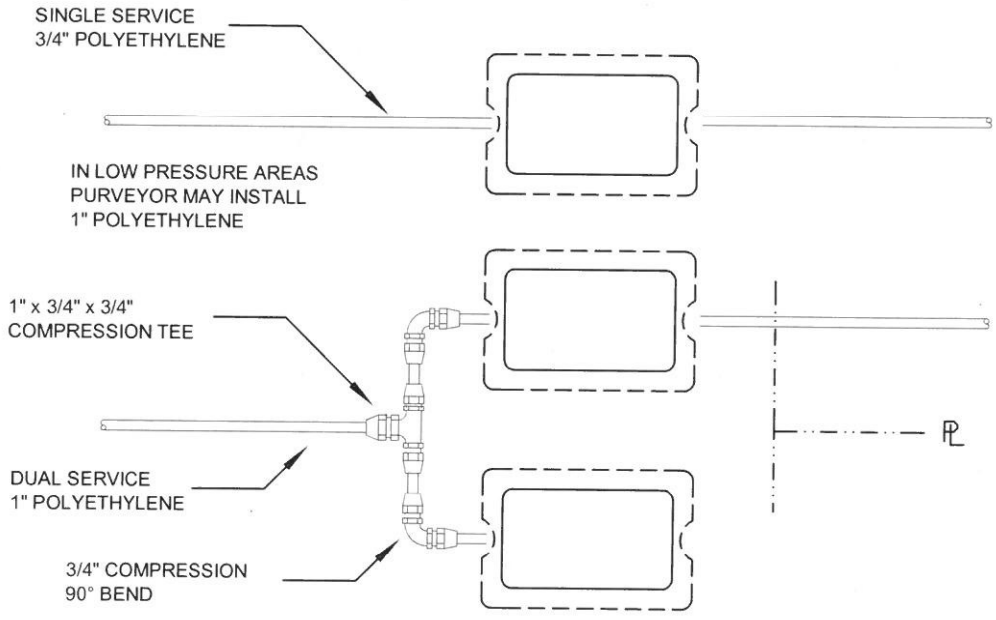


NOTE:

Minimum pressure (measured at lowest point) shall be 225 psi. Pressure shall be maintained for minimum of 2 hours with less than 10 psi drop in pressure and less than 1 gallon of makeup water.

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN FLUSHING, DISINFECTION & PRESSURE TEST DETAILS	Plan # W-9
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			

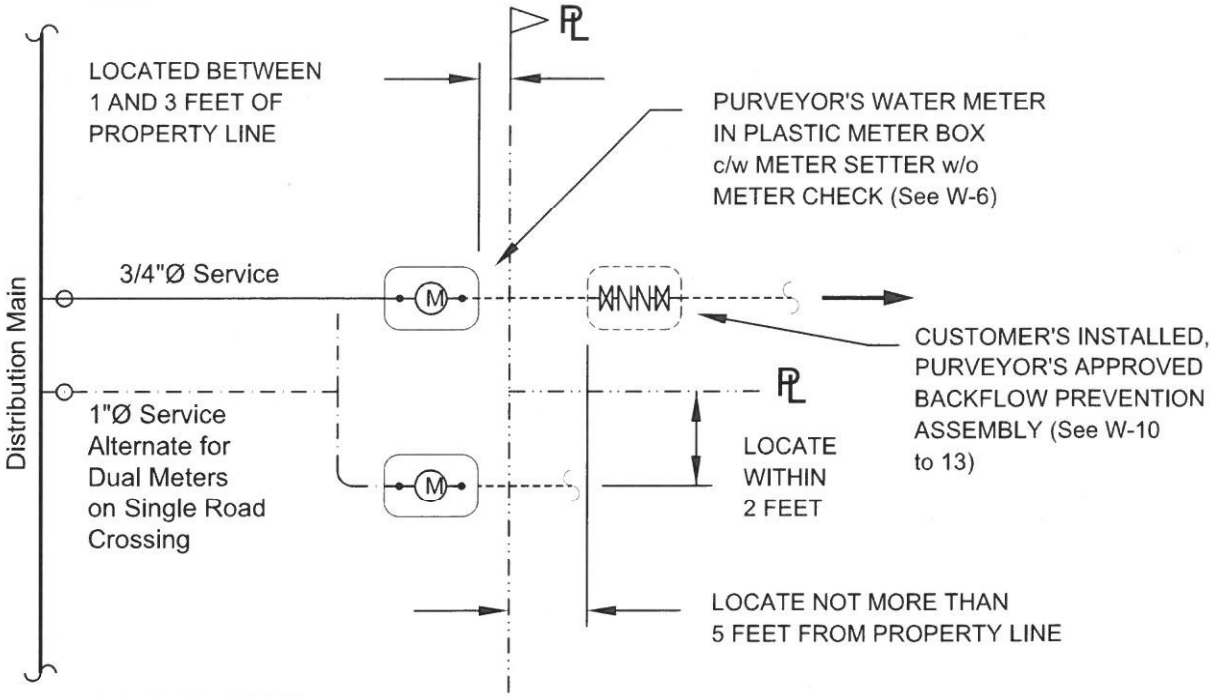




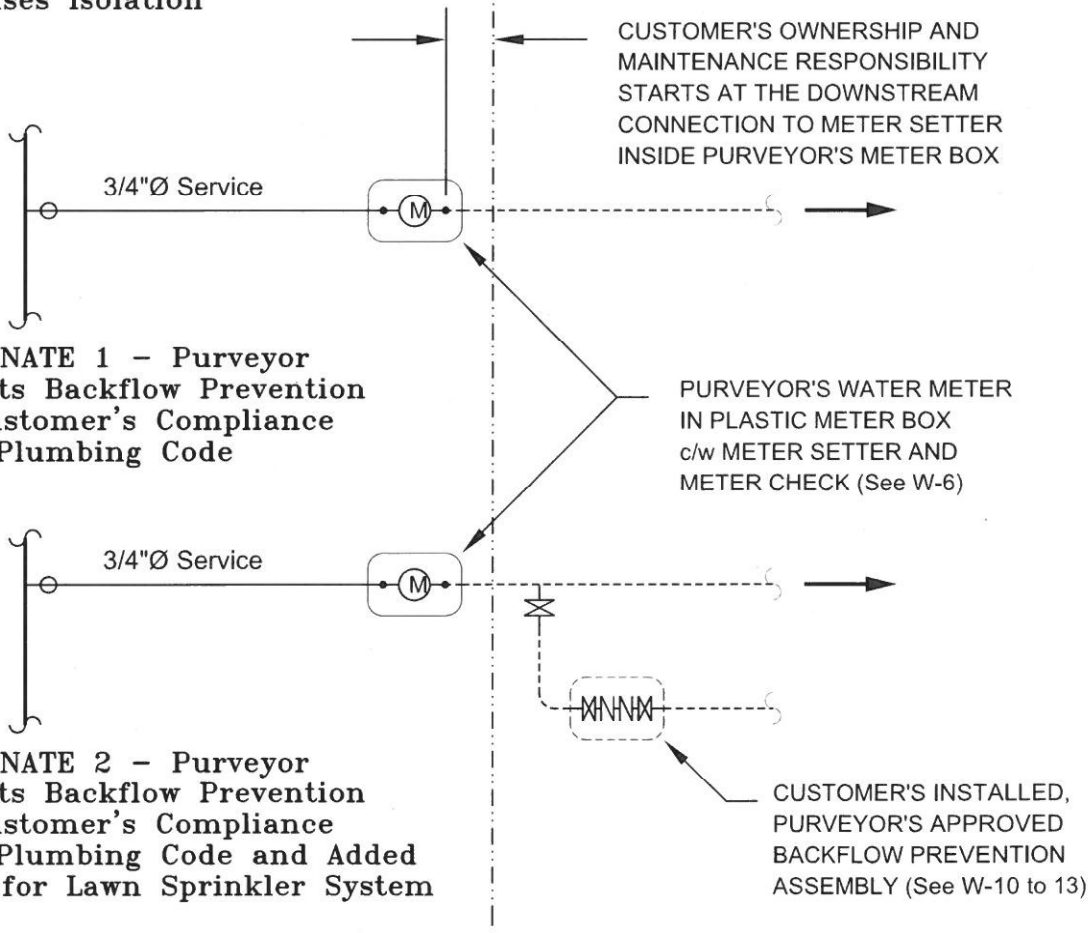
ON ROAD CROSSING, PURVEYOR
MAY INSTALL SINGLE 1"Ø SERVICE
WITH TWO METER BOXES AT PROPERTY
LINE BETWEEN CUSTOMERS

REVISED OCT. 2017

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN RESIDENTIAL SERVICE DETAILS	Plan # W–10
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



STANDARD INSTALLATION
Premises Isolation

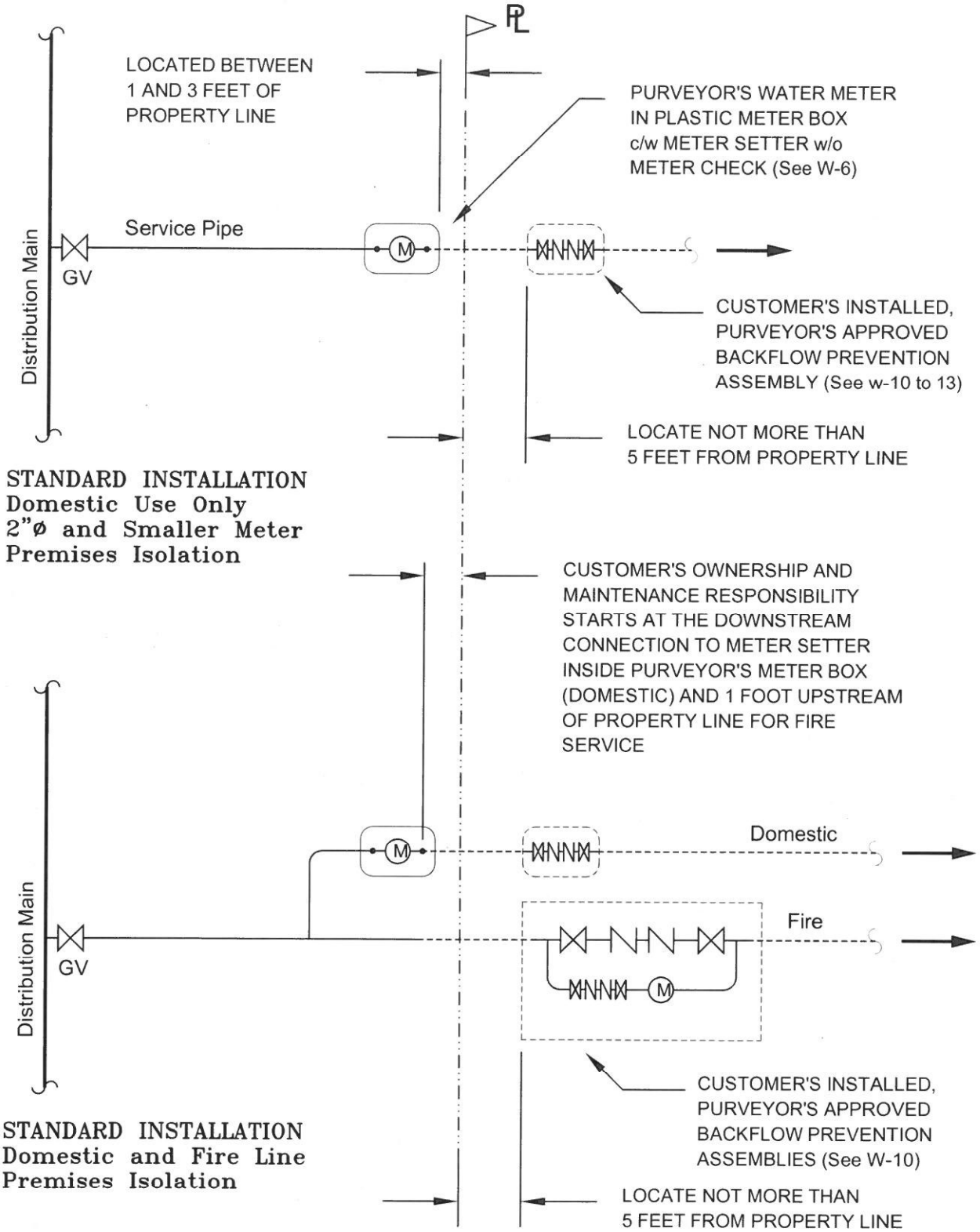


ALTERNATE 1 – Purveyor Accepts Backflow Prevention by Customer's Compliance with Plumbing Code

ALTERNATE 2 – Purveyor Accepts Backflow Prevention by Customer's Compliance with Plumbing Code and Added DCVA for Lawn Sprinkler System

Note: Purveyor's distribution main and service pipe shall not be used as ground for Customer's electrical system.

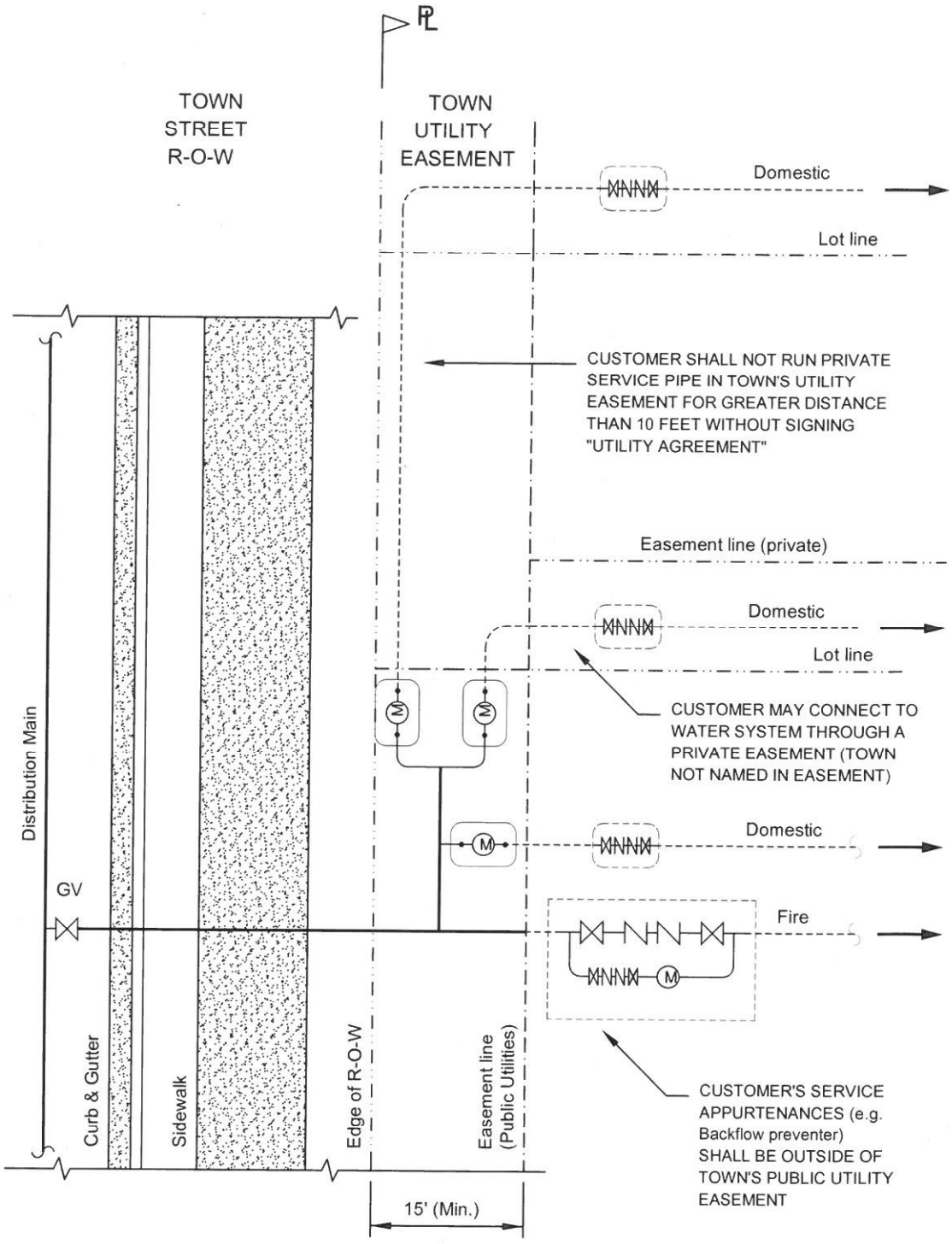
Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN RESIDENTIAL SERVICE CONNECTION DETAILS	Plan # W-11
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



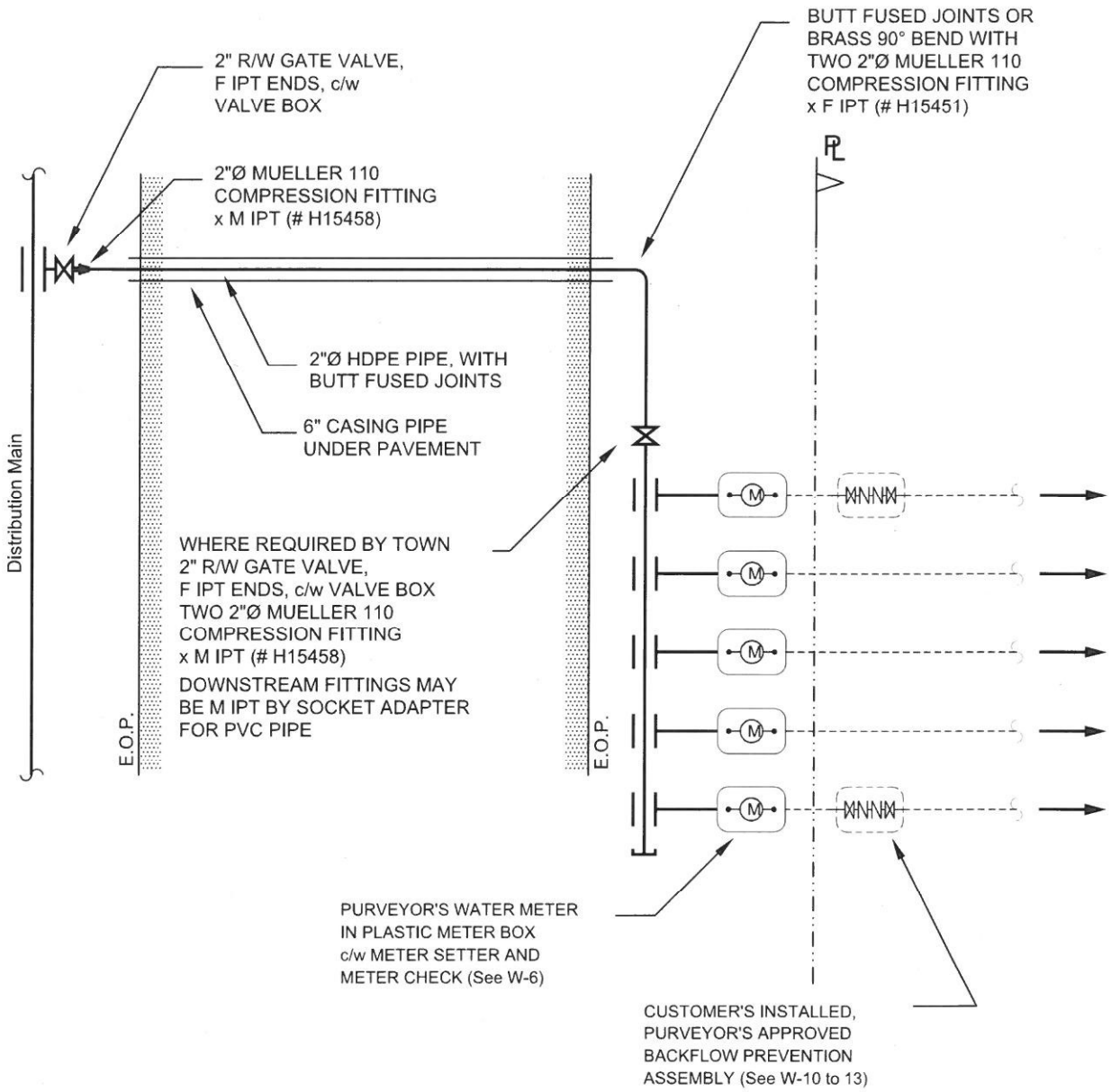
Note: The category "Commercial Customer" shall include all non-single family or duplex residential customers.

Domestic and fire line backflow assemblies may be installed in building per Purveyor approved service agreement.

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN COMMERCIAL SERVICE CONNECTION DETAILS	Plan # W-12
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



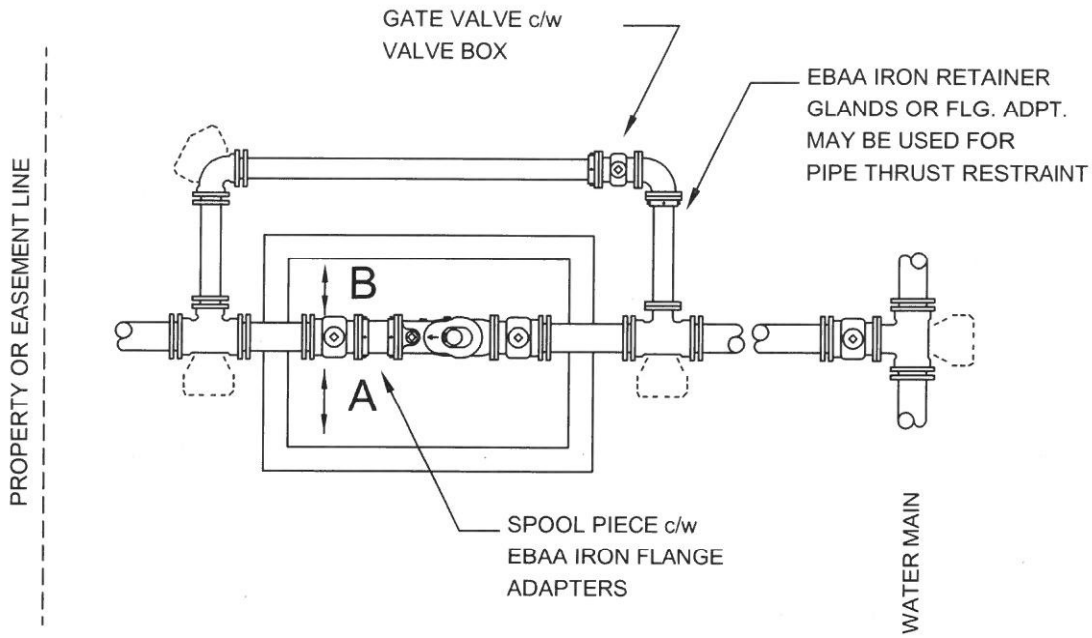
Date: Dec. 08	Scale: N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN EASEMENT LOCATED METER DETAILS	Plan # W-13
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			

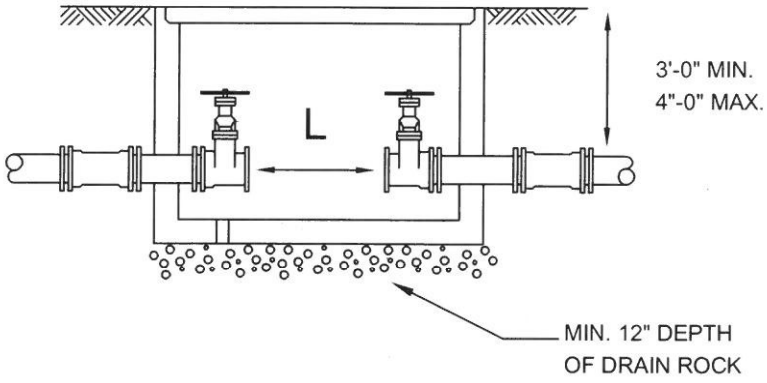


NOTES:

BANK OF METERS TO BE INSTALLED ONLY WHERE 2"Ø COMMON HDPE PIPE IS INSTALLED TO CROSS STREET TO AVOID MULTIPLE PAVEMENT CUTS OR JACKED CASINGS FOR EACH SERVICE.

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN BANK OF 3 TO 6 METER DETAILS	Plan # W-14
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



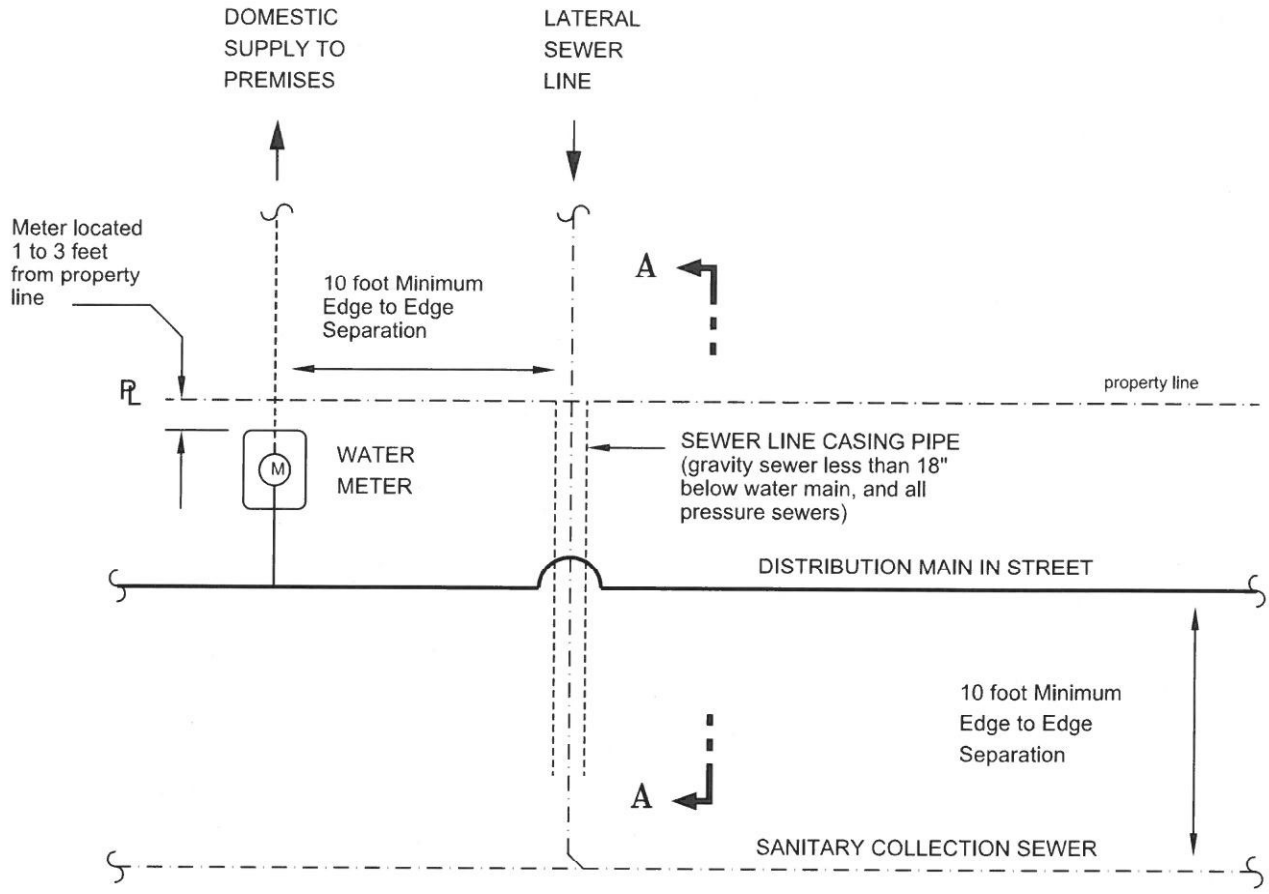


SERVICE SIZE	COMP. METER SIZE	MIN. BY-PASS SIZE	MIN. CLEARANCE L	A	B	HEIGHT FROM FLOOR TO ℄ PIPE
4" - 8"	3"	3"	25"	18"	12"	17" MIN/ 24" MAX
4" - 8"	4"	3"	28"	18"	12"	17" MIN/ 24" MAX
6" - 8"	6"	4"	32"	18"	12"	19" MIN/ 24" MAX
8"	8"	6"	SEE NOTE	18"	12"	20" MIN/ 24" MAX

NOTES:
1) The dimensions for meter and spool length (L) are based on SENSUS (OMNI 2) compound meters. For 8-inch meter size consult Town on meter make and size.
2) Vaults shall be UTILITY VAULT CO. Style 575 LA or Town approved equal

REVISED OCT. 2017

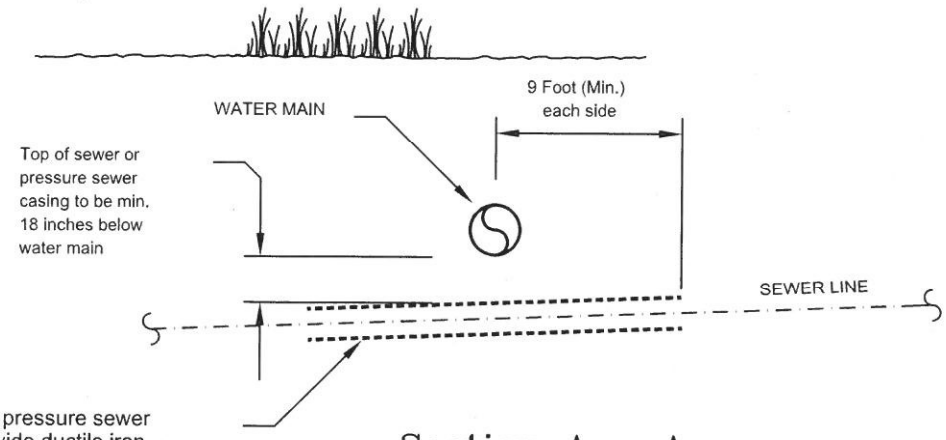
Date: Dec. 08	Scale: N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN COMPOUND METER DETAILS	Plan # W-15
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



Notes:

GRAVITY SEWER LATERAL SHALL BE INSTALLED 18-INCHES BELOW WATER MAIN UNESS OTHERWISE APPROVED BY TOWN.

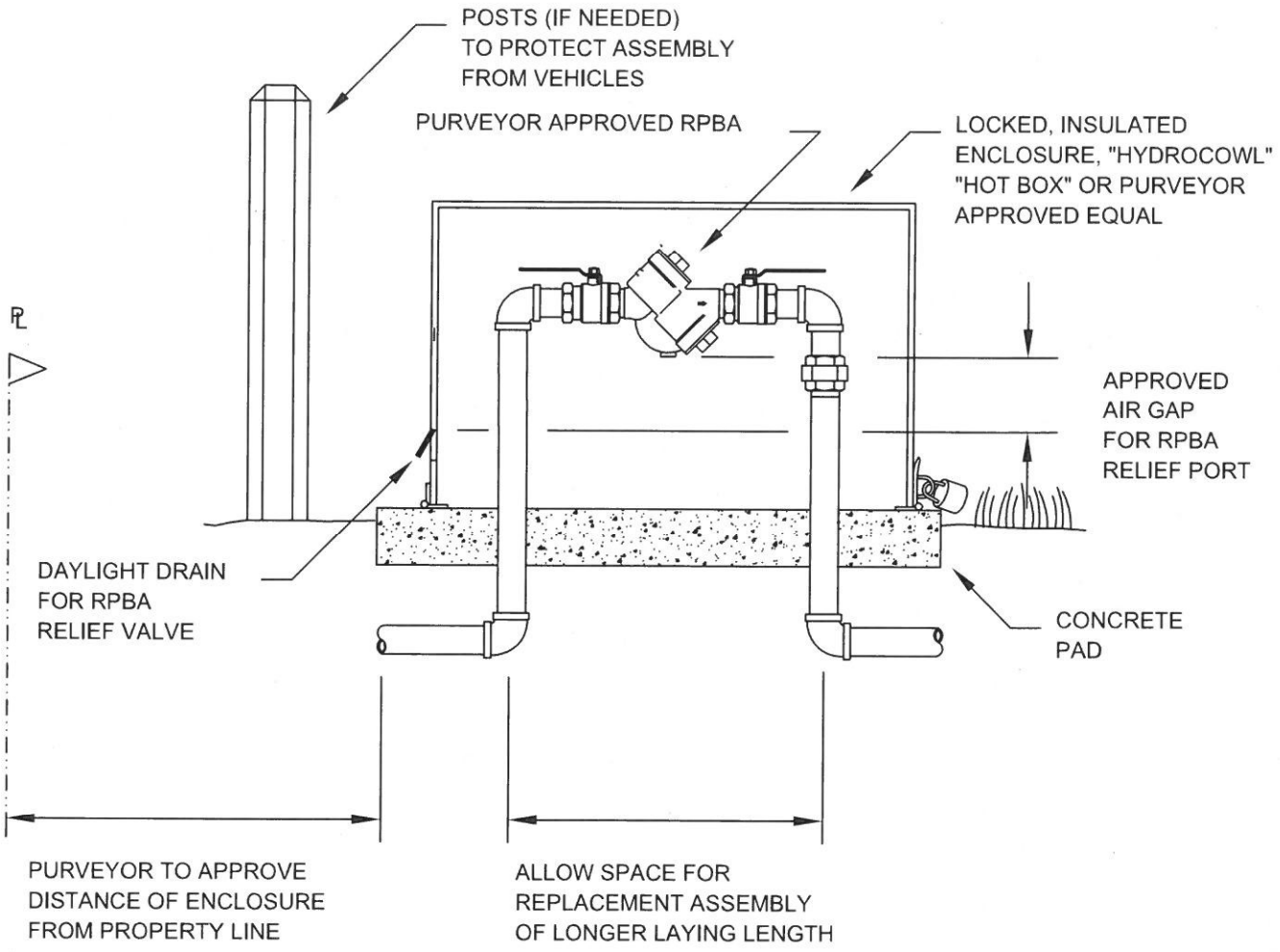
PRESSURE SEWER LATERAL AND PRESSURE COLLECTION SEWER SHALL BE INSTALLED IN DUCTILE IRON CASING PIPE 18-INCHES BELOW WATER MAIN.



Section A – A

Latest revision: 6/03/2011

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN SEWER SEPARATION DETAILS	Plan # W-16
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



NOTES:

INSTALLATION TO COMPLY WITH:

- MANUFACTURER'S RECOMMENDATIONS, AND
- USC FCCCHR ASSEMBLY APPROVAL CONDITIONS, AND
- CURRENT EDITION OF PNWS-AWWA "CROSS CONNECTION CONTROL MANUAL"

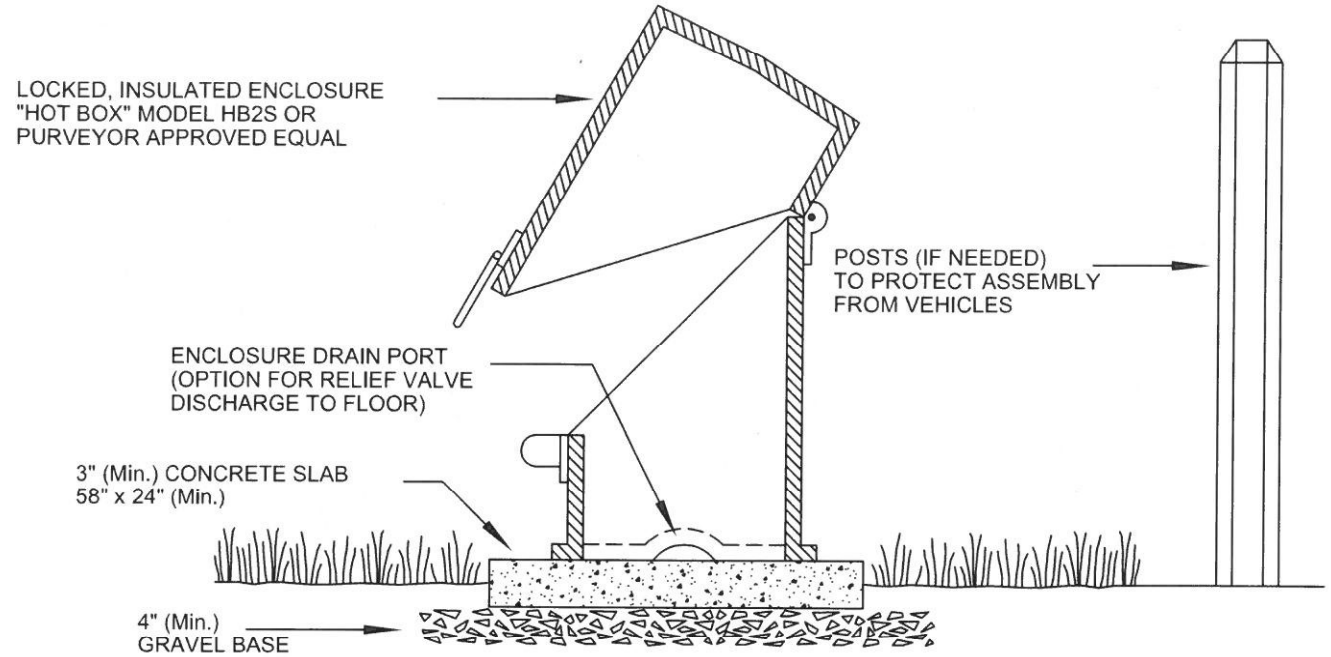
IN ADDITION TO ENCLOSURE INSULATION,

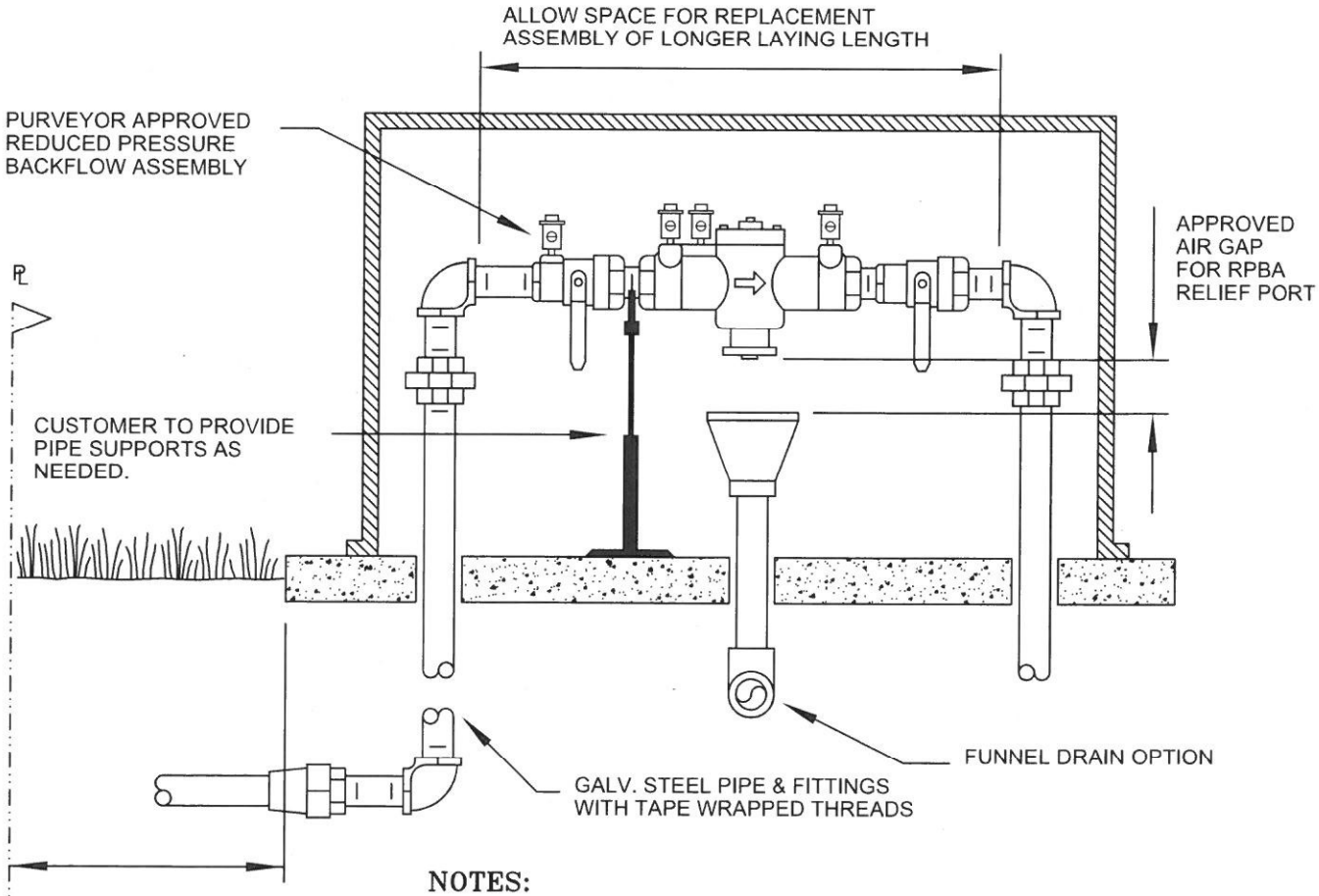
- PROVIDE CLOSED CELL PIPE INSULATION, AND
- WRAP RPBA WITH FIBERGLASS PIPE WRAP, AND
- INSTALL CONBRACO FREEZE PROTECTION VALVE
  34° F THERMAL ACTUATOR ON DOWNSTREAM TEST COCK.

OWNER MAY ALSO PROVIDE ELECTRIC HEAT IN ENCLOSURE OR HEAT TRACE WIRE.

REVISED OCT. 2017

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN 0.75" & 1" RPBA DETAILS	Plan # W-17
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



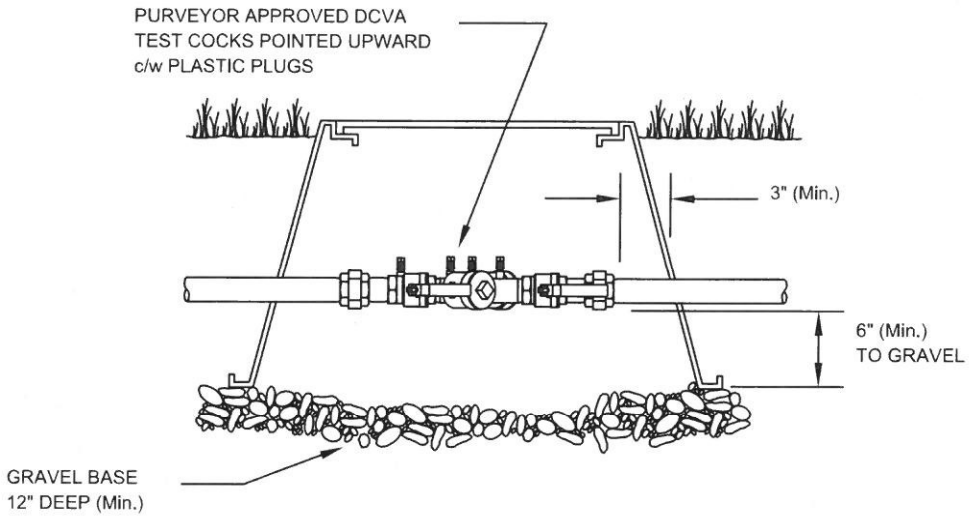


NOTES:

IN ADDITION TO ENCLOSURE INSULATION, PROVIDE CLOSED CELL PIPE INSULATION, AND WRAP RPBA WITH FIBERGLASS PIPE WRAP. PROVIDE ELECTRICAL HEAT TAPE OR INSTALL "CONBRACO" FREEZE PROTECTION VALVE, 34° F THERMAL ACTUALTOR ON DOWNSTREAM TEST COCK.

REVISED OCT. 2017

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN 1.5" & 2" RPBA DETAILS	Plan # W-18
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



SERVICE ISOLATION / LAWN IRRIGATION
METER BOX ENCLOSURE INSTALLATION
DOUBLE CHECK VALVE ASSEMBLY

N.T.S.

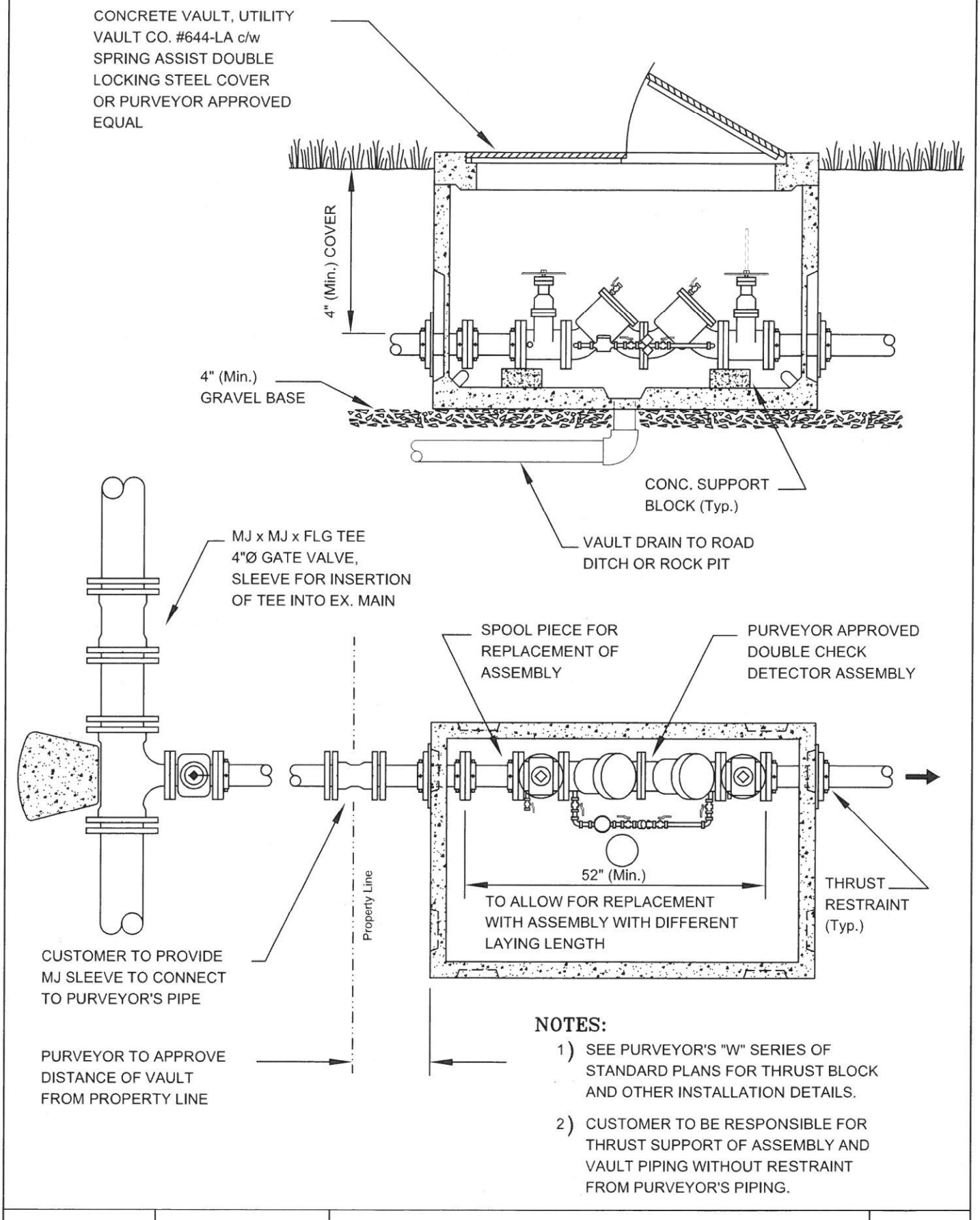
Note:

All installations to comply with assembly manufacturer's recommendations,
AND the USC FCCCHR Assembly Approval, AND the Current Edition of the
PNWS-AWWA `CROSS CONNECTION CONTROL MANUAL', whichever more stringent.

Double check valve assembly may be installed in above-ground "Hot Box"

REVISED OCT. 2017

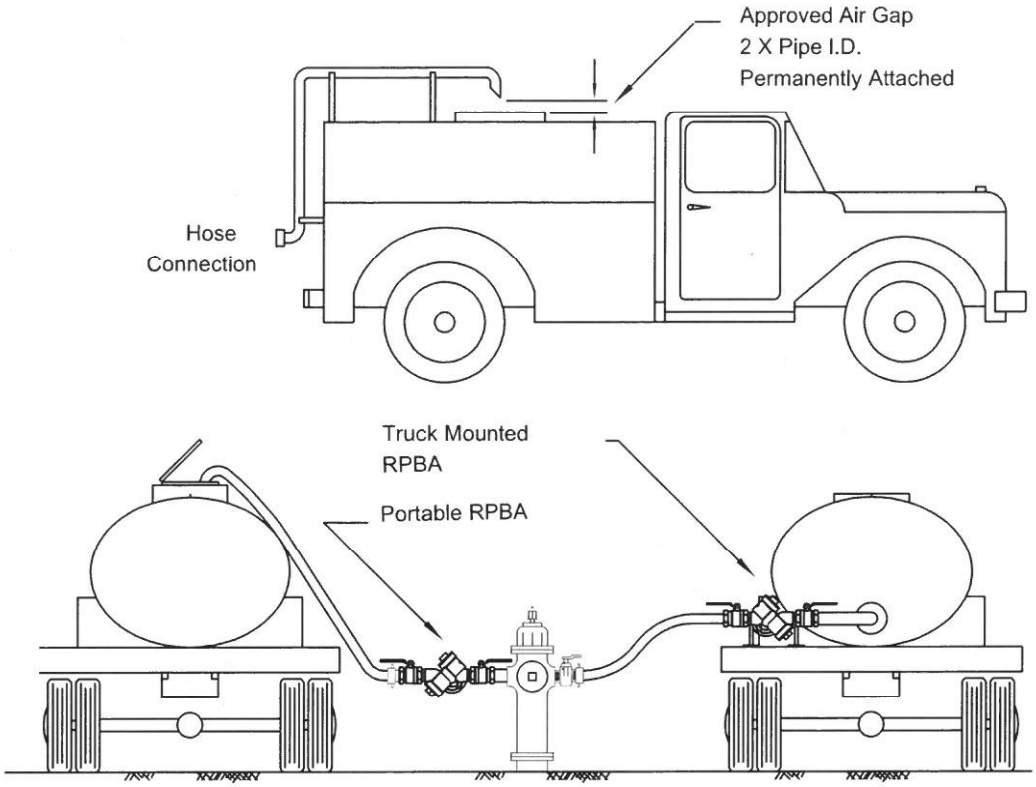
Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN 0.75" & 1" DCVA DETAILS	Plan # W-19
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



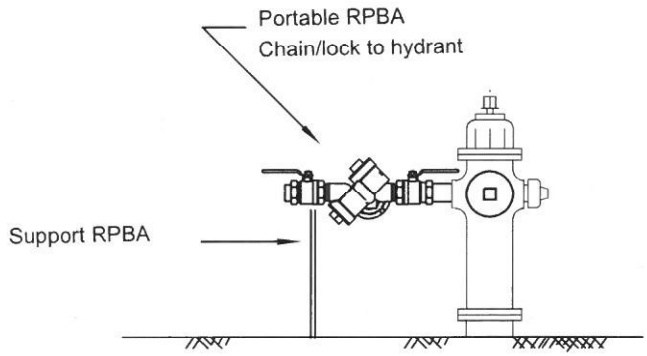
NOTES:

1) SEE PURVEYOR'S "W" SERIES OF STANDARD PLANS FOR THRUST BLOCK AND OTHER INSTALLATION DETAILS.
2) CUSTOMER TO BE RESPONSIBLE FOR THRUST SUPPORT OF ASSEMBLY AND VAULT PIPING WITHOUT RESTRAINT FROM PURVEYOR'S PIPING.

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN FIRE LINE DCDA DETAILS	Plan # W-20
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



Water Tanker Trucks



NOTES:

Construction water is not allowed for sewer related work: all water to be supplied by water tank trucks (see above).

RPBA to be tested by BAT before installation, when moved, or every two months (minimum).

Hydrant to be full open to ensure drain port is closed tight.

RPBA to be Purveyor approved.

Construction hydrant meter may also be required.

Construction Work on Street R-O-W

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN HYDRANT RPBA DETAILS	Plan # W-21
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			

BACKFLOW PREVENTER REQUIRED FOR PREMISES (SERVICE) ISOLATION

COMMERCIAL CUSTOMERS

CATEGORY OF PREMISES INCLUDES ALL CUSTOMERS OTHER THAN SINGLE-FAMILY AND DUPLEX RESIDENCES.

Category of Customer / Water Use	Assembly
AGRICULTURAL (FARMS AND DAIRIES)	RPBA
BEVERAGE BOTTLING PLANTS, BREWERIES	RPBA
CAR WASHES	RPBA
CHEMICAL PLANTS	RPBA
LAUNDRIES AND DRY CLEANERS	RPBA
PREMISES WHERE BOTH RECLAIMED WATER & POTABLE WATER ARE PROVIDED	RPBA
FILM PROCESSING FACILITIES	RPBA
FOOD PROCESSING PLANTS, CANNERIES, SLAUGHTER HOUSES, RENDERING PLANTS	RPBA
HOSPITALS, MEDICAL CENTERS, NURSING HOMES, VETERINARY, MEDICAL AND DENTAL CLINICS, AND BLOOD PLASMA CENTERS	RPBA
IRRIGATION SYSTEMS WITH CHEMICAL ADDITION	RPBA
LABORATORIES	RPBA
METAL PLATING INDUSTRIES	RPBA
MORTUARIES	RPBA
PETROLEUM PROCESSING OR STORAGE PLANTS	RPBA
PIERS AND DOCKS	RPBA
WASTEWATER OR STORMWATER PUMPING STATIONS, WASTEWATER TREATMENT PLANTS	RPBA + AG
PREMISES WITH AN AUXILIARY WATER SUPPLY (CONNECTED OR UNCONNECTED)	RPBA
PREMISES WITH COMPLEX PIPING AND/OR PIPING POTENTIALLY SUBJECT TO CHANGE	RPBA
FIRE SPRINKLER SYSTEMS OR DEDICATED FIRE LINES WITH CHEMICAL ADDITION	RPDA
FIRE SPRINKLER SYSTEMS OR DEDICATED FIRE LINES WITHOUT CHEMICAL ADDITION	DCDA
ALL COMMERCIAL CUSTOMERS WITH FOOD PREPARATION (e.g. Cafe)	RPBA
ALL OTHER COMMERCIAL SERVICES	DCVA

RESIDENTIAL CUSTOMERS

CATEGORY OF PREMISES INCLUDES SINGLE-FAMILY AND DUPLEX RESIDENCES.

Category of Water Use Includes	Assembly
UNDERGROUND LAWN SPRINKLER SYSTEM	DCVA
SOLAR HEATING SYSTEM	DCVA
FIRE SPRINKLER SYSTEM OTHER THAN FLOW-THROUGH TYPE	DCVA
PRIVATE WELL (CONNECTED OR NOT CONNECTED TO PLUMBING)	RPBA
GRAY WATER SYSTEM (CISTERNS) OR OTHER AUXILIARY SUPPLY	RPBA
LIVESTOCK WATERING, STORMWATER CISTERNS w/o PUMPS FOR IRRIGATION/LIVESTOCK	DCVA
WATER SUPPLY TO DOCK OR SMALL BOAT MOORAGE, SUBMERGED WATER LINES	RPBA
GRINDER PUMP (SEWAGE PUMPED TO OFF-SITE SEPTIC OR SEWER)	RPBA
WATER SOFTENER OR REVERSE OSMOSES TREATMENT SYSTEM	DCVA + AG

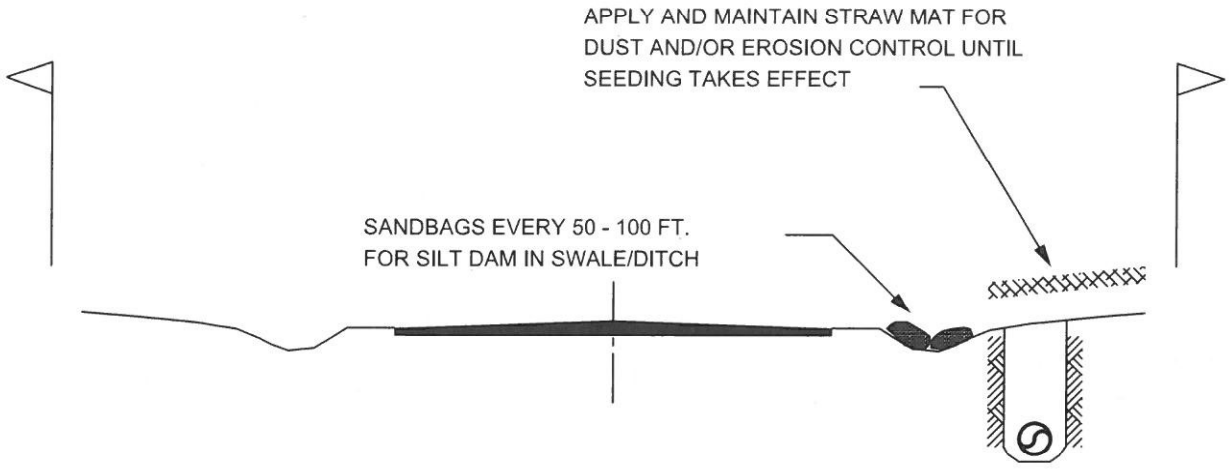
Abbrev.:

AG	Approved Air Gap per Plumbing Code in addition to RPBA/DCVA
RPBA	Reduced Pressure Backflow Assembly
RPDA	Reduced Pressure Detector Assembly
DCVA	Double Check Backflow Assembly
DCDA	Double Check Detector Assembly
DCV	Dual Check Valve device in purveyor's water meter setter.

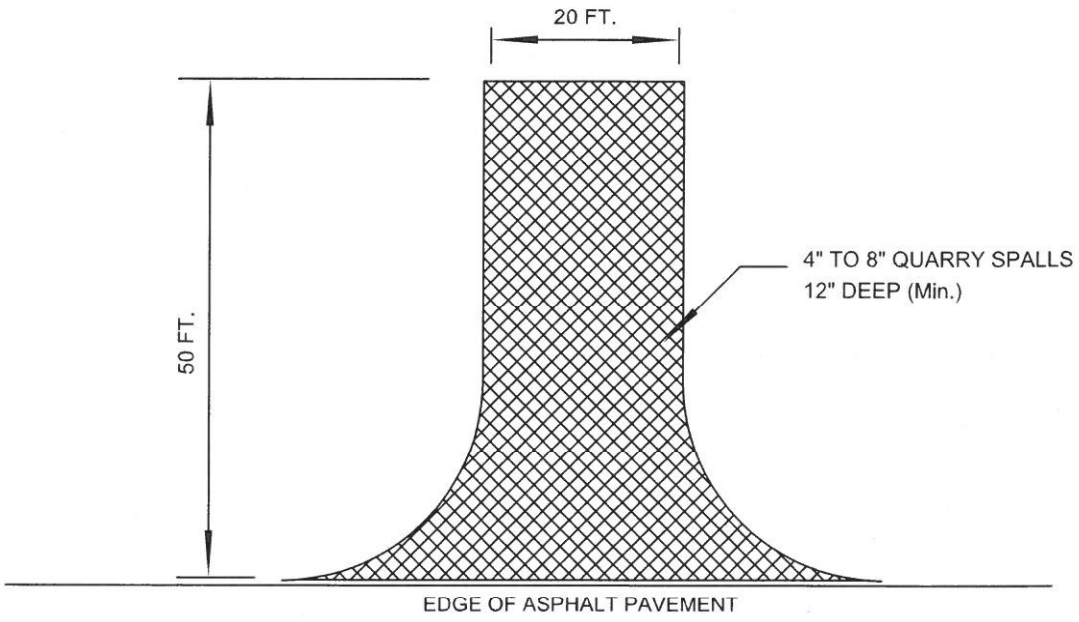
Notes:

1) For explanation of premises categories see PNWS-AWWA "CROSS CONNECTION CONTROL MANUAL", 1995 or latest edition thereof.
2) All assemblies, except DCV, are to be located as shown in W-11 to W-15, unless otherwise permitted in Service Agreement.

Date: Dec. 08	Scale: N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN DCVA & RPBA APPLICATION DETAILS	Plan # W-22
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



N.T.S.



GENERAL NOTES:

1) PROVIDE SANDBAGS IN SWALE/DITCH LINE FOR SILT DAM.
IF NEEDED, PROVIDE STRAW WATTLES OR SOCK OR FILTER FABRIC FENCE
TO PREVENT RUNOFF FROM BY-PASSING SILT DAMS.

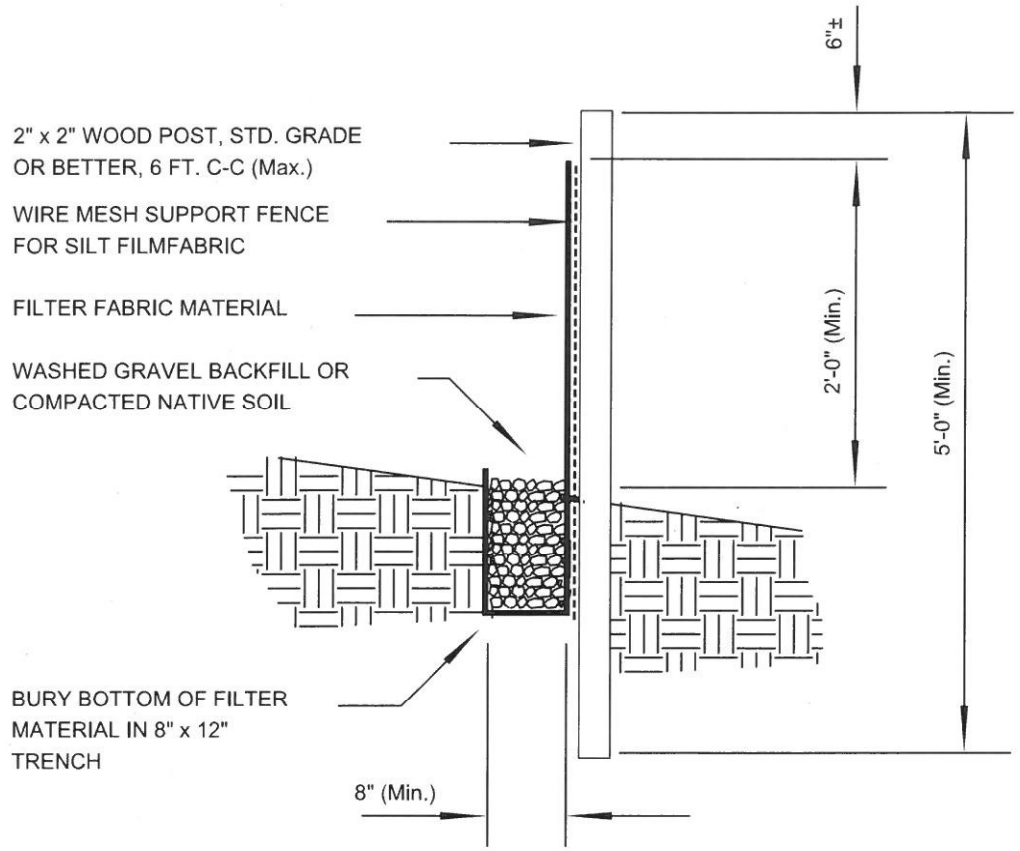
PROVIDE SANDBAGS IN DITCH LINE ON OPPOSITE SIDE OF ROAD
IF NEEDED, FOR CONTAINMENT OF EXCAVATION MATERIALS
WASHED OFF STREET SURFACE.

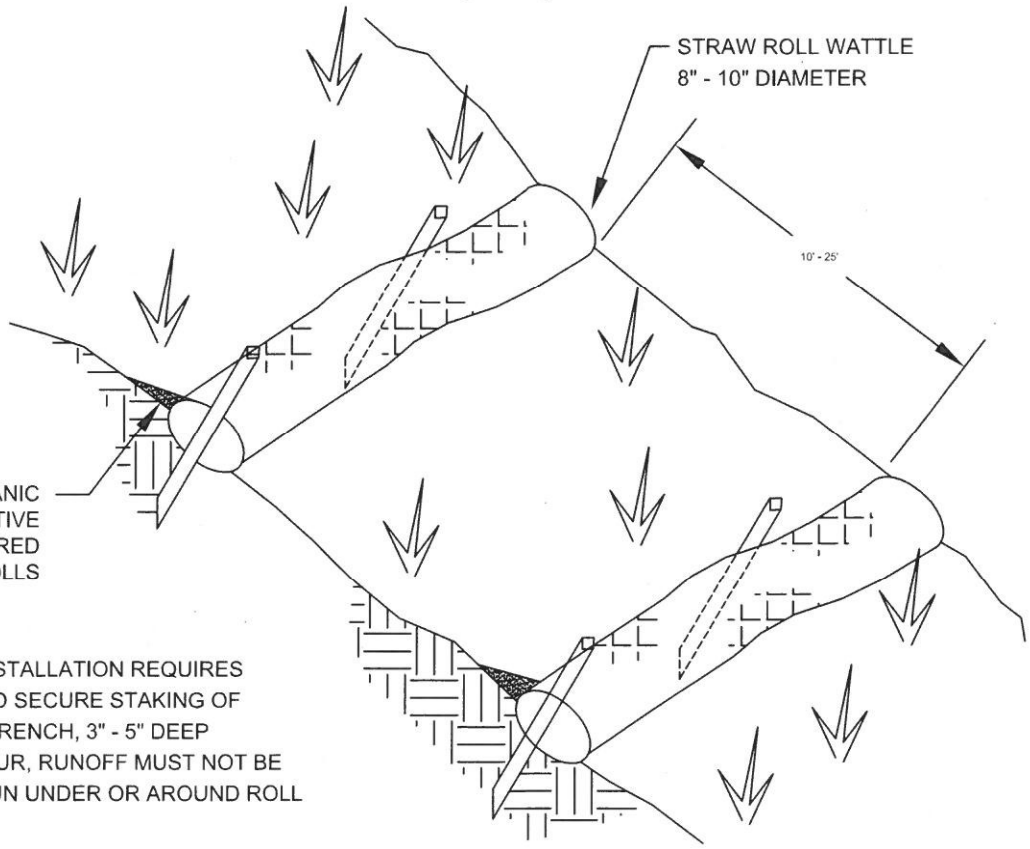
2) AT END OF EACH WORKING DAY, COMPLETE TRENCH BACKFILLING
AND SURFACE RESTORATION TO EXTENT POSSIBLE, LEAVING ONLY
PIPE END, FITTINGS FOR BLOCKING, ETC., EXPOSED.

REVISED OCT. 2017

3) SWEEP STREETS AT END OF EACH WORK DAY.

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN EROSION CONTROL - STREET R-O-W DETAILS	Plan # W-23
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			

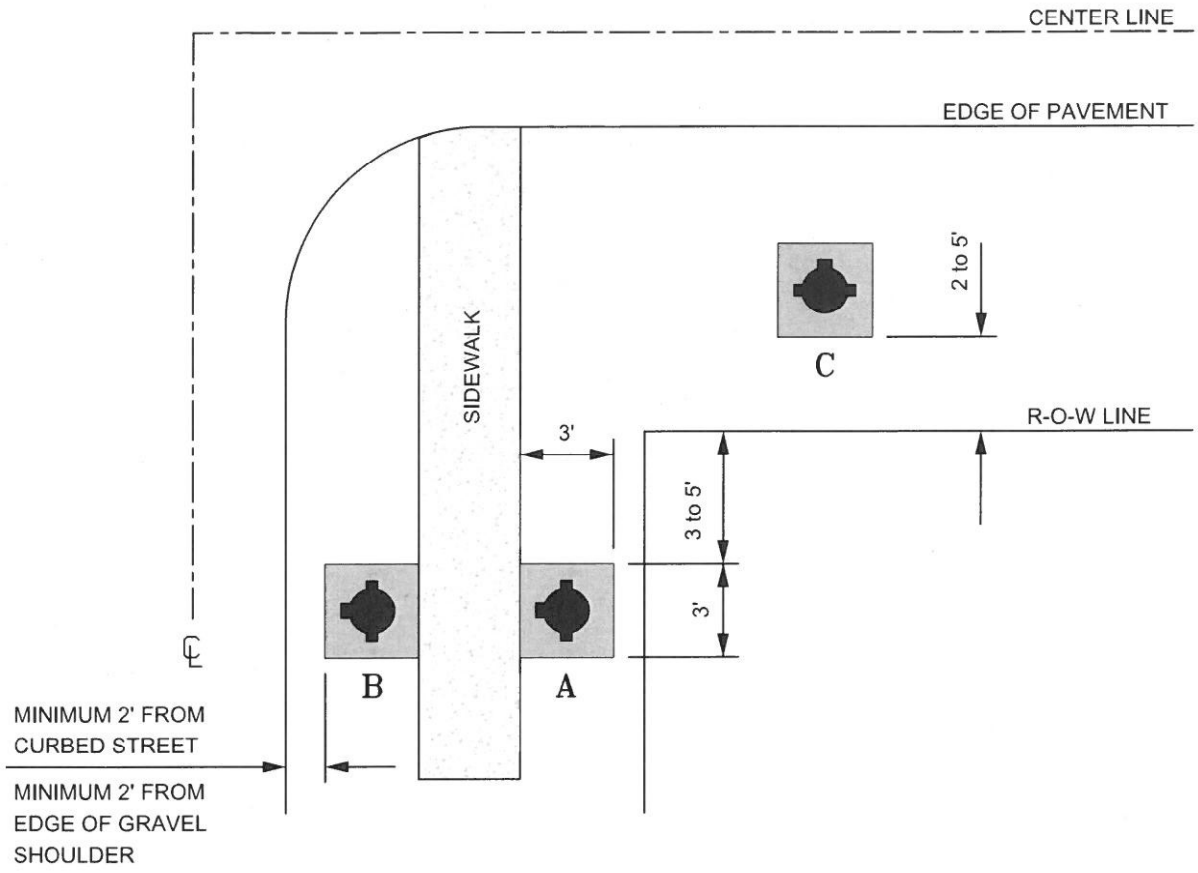




STRAW ROLL INSTALLATION REQUIRES PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 3" - 5" DEEP DUG ON CONTOUR, RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL

REVISED OCT. 2017

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN EROSION CONTROL – FILTER FENCE & STRAW BALE DETAILS	Plan # W-24
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



NOTES:

1) HYDRANT LOCATION TO BE SPECIFIED BY PUBLIC WORKS SUPERINTENDENT OR TOWN ENGINEER.

2) MAXIMUM HYDRANT SPACING SHALL BE:

OUT-OF-TOWN SERVICE AREA:

a) LOW DENSITY AND AGRICULTURAL AREAS: MAXIMUM 900 FEET BETWEEN HYDRANTS.

b) FOR ALL OTHER (HIGHER DENSITY) DEVELOPMENTS, AS REQUIRED BY THE COUNTY FOR SUBDIVISION OR DEVELOPMENT APPROVAL.

WITHIN TOWN LIMITS (Chapter 16.24.050(5) of Town Code, Development Regulations):

c) LOW DENSITY AND AGRICULTURAL AREAS: MAXIMUM 900 FEET BETWEEN HYDRANTS.

d) RESIDENTIAL AREAS: MAXIMUM 600 FEET.

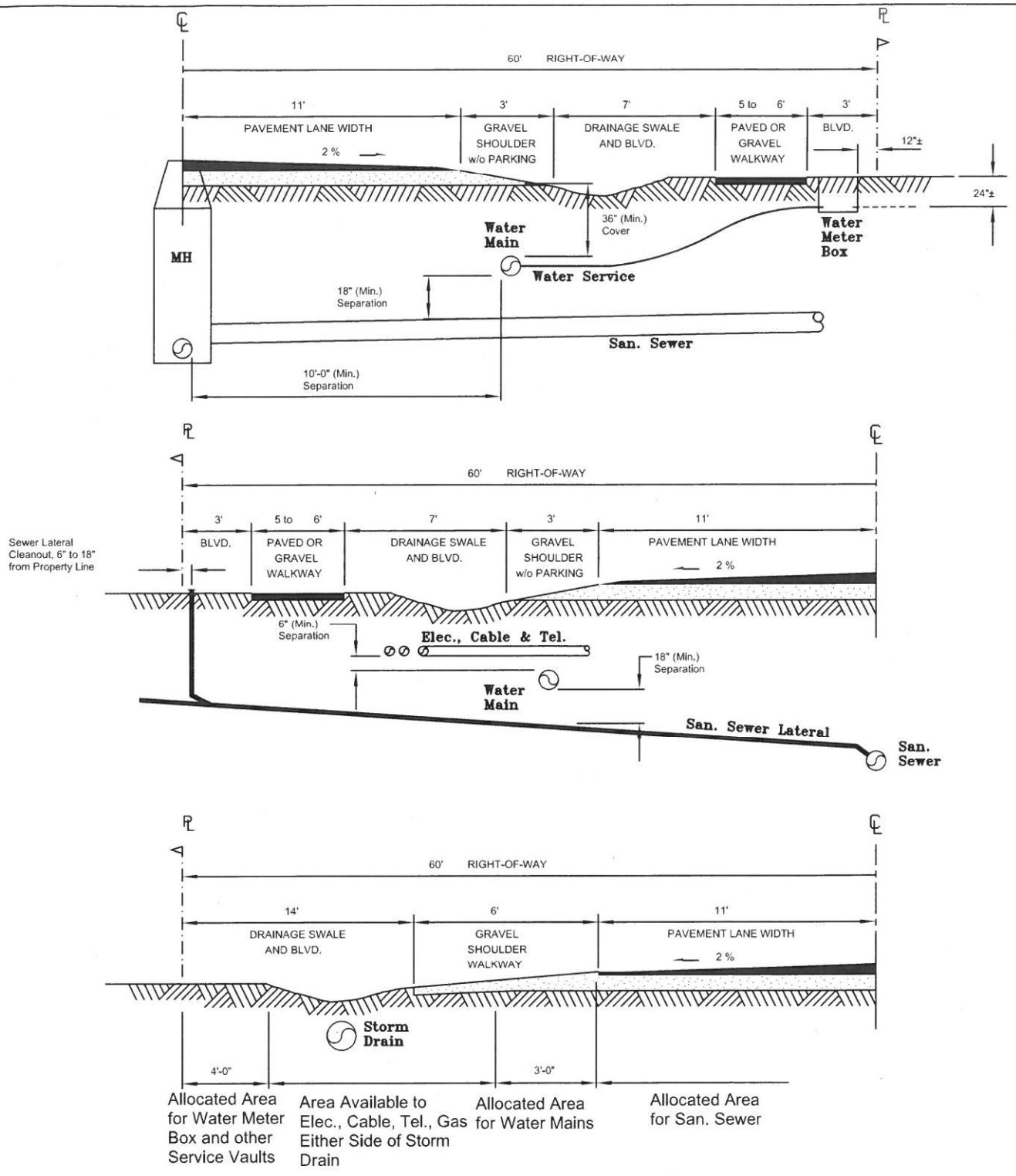
e) COMMERCIAL / INDUSTRIAL AREAS: AS REQUIRED BY FIRE MARSHAL BUT NOT TO EXCEED 300 FEET (schools, courthouse, hospital and other larger public buildings to be considered as commercial).

f) BUILDING OF WHICH ANY PORTION IS MORE THAN 150 FEET FROM THE PUBLIC WATER SUPPLY SHALL HAVE HYDRANTS LOCATED AS DIRECTED BY FIRE MARSHAL.

3) THE MAXIMUM HOSE LAY IN A LOW DENSITY AREA FROM A HYDRANT TO THE LAST CUSTOMER (e.g., for a cul-de-sac) SHALL BE 500 FEET.

REVISED OCT. 2017

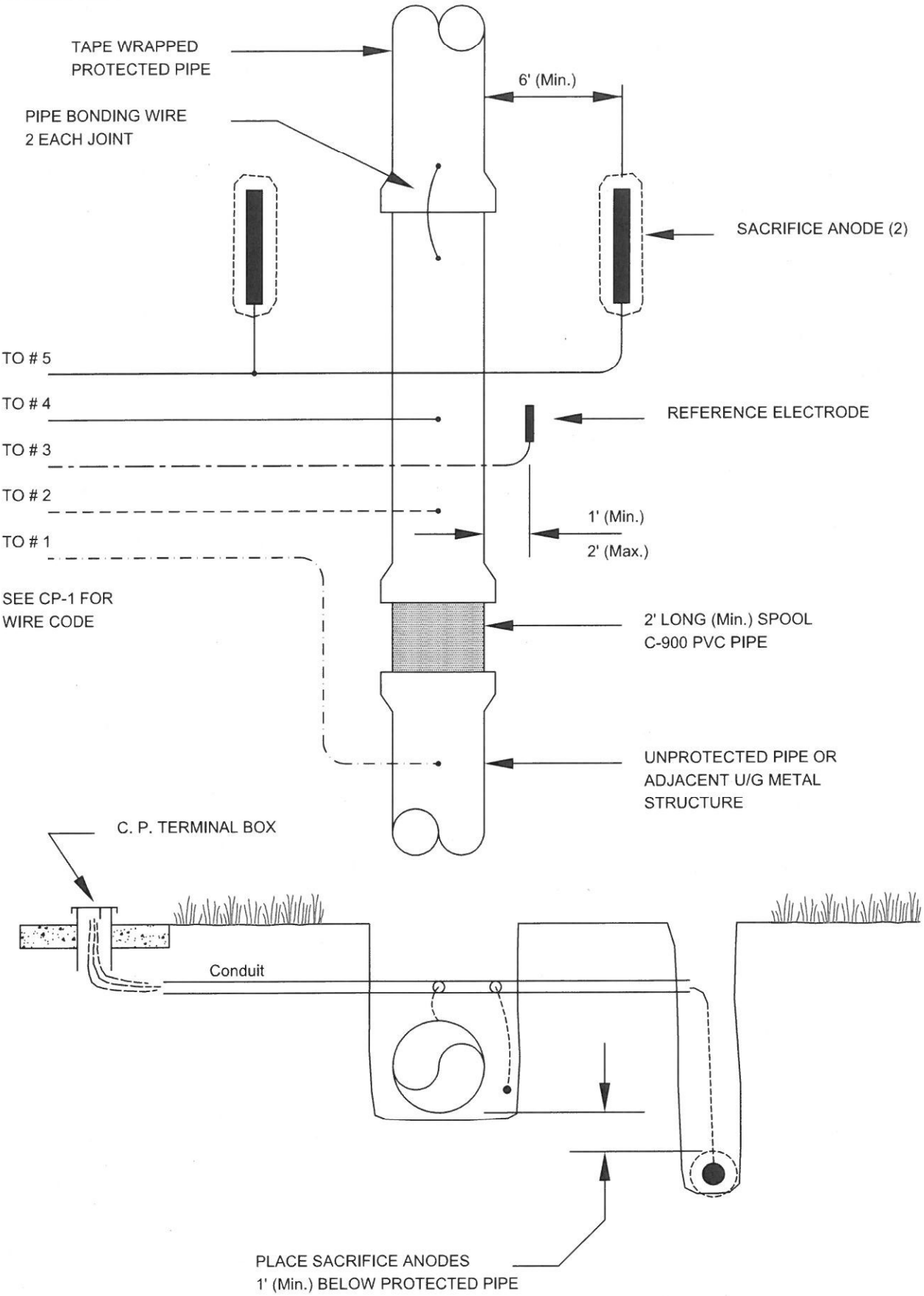
Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN UTILITY CONTROL DETAILS- HYDRANTS	Plan # W-25
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



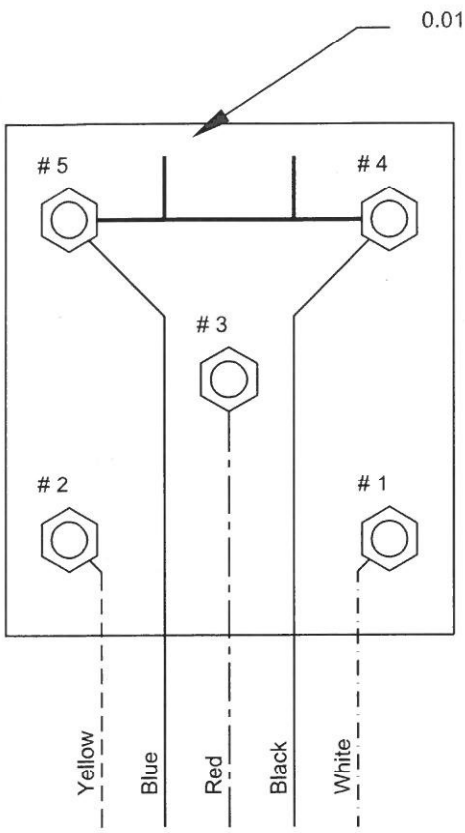
Residential Streets Utility Separation
New Subdivisions

REVISED OCT. 2017

Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN UTILITY CONTROL DETAILS – STREET CROSS-SECTIONS	Plan # W-26
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



Date: Dec. 08	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN CATHODIC PROTECTION – ANODE PLACEMENT	Plan # W-27
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			



SACRIFICE ANODE	BLUE	TERMINAL # 5
PROTECTED PIPE	BLACK	TERMINAL # 4
REFERENCE ANODE	RED	TERMINAL # 3
PROTECTED PIPE	YELLOW	TERMINAL # 2
FOREIGN STRUCTURE	WHITE	TERMINAL # 1

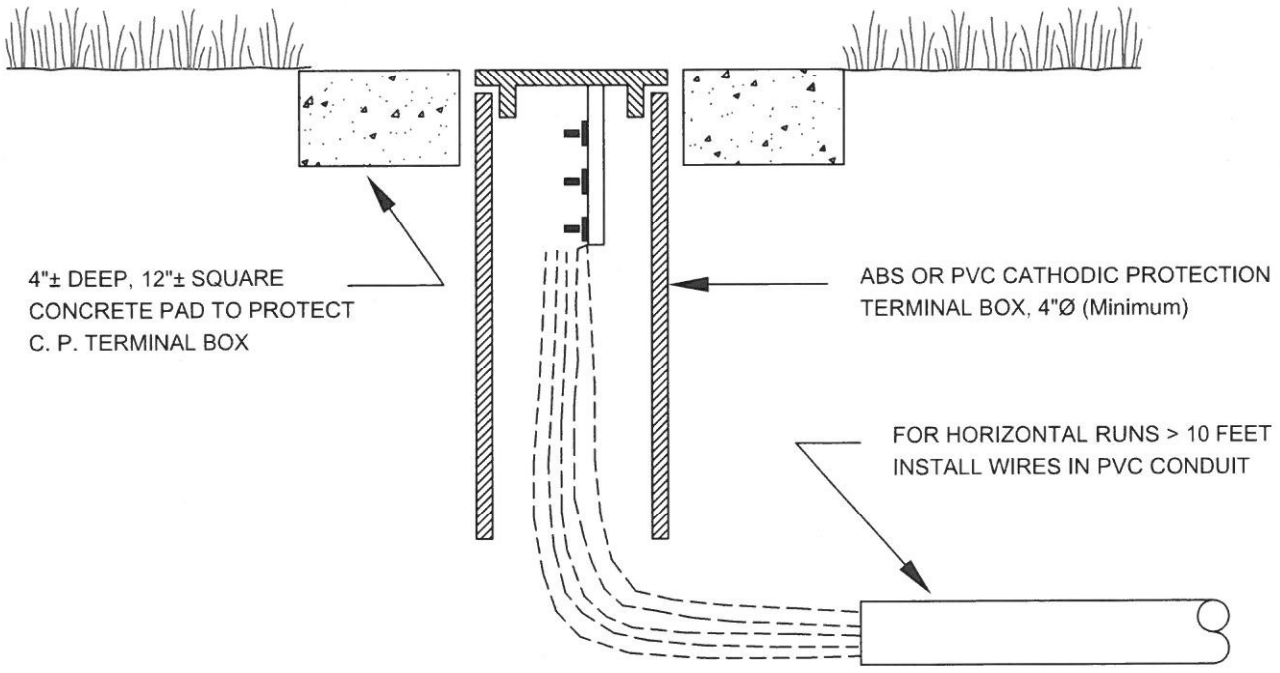
WIRE COLOR & TERMINAL CODE

NOTES:

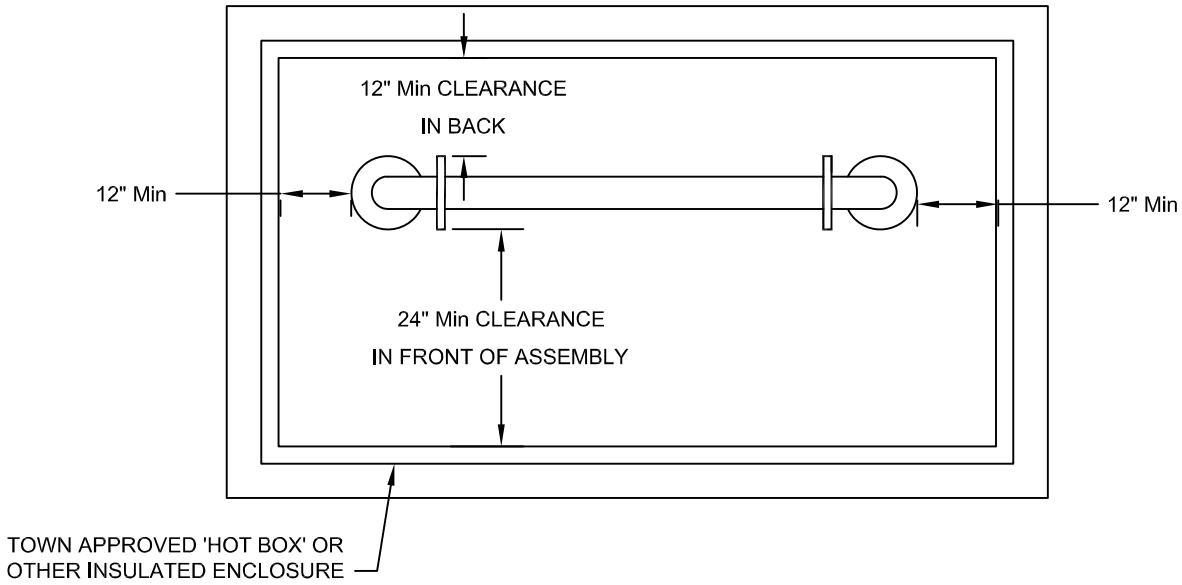
1) TERMINAL # 2 SHALL BE USED FOR OVER-THE-LINE POTENTIAL SURVEYS (CuSO4 electrode)

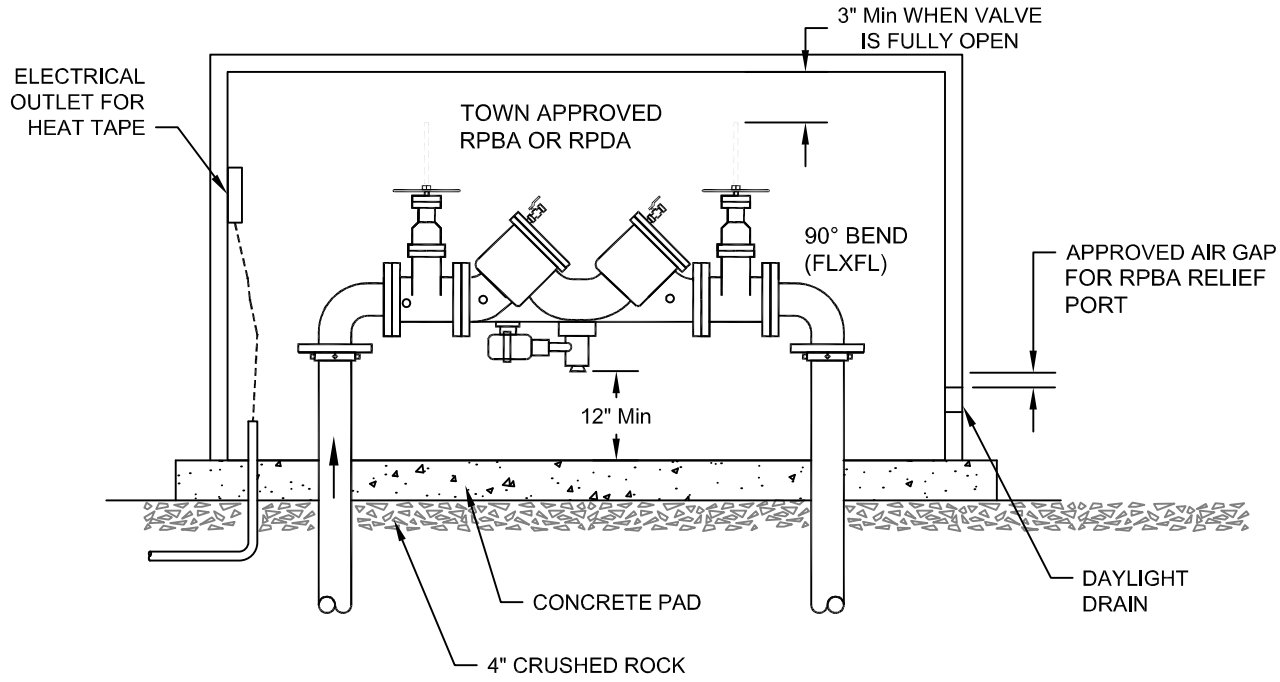
2) WIRE COLOR CODE APPLIES TO FIRST 5 FEET FROM TERMINAL

TEST POINT TERMINAL BOX



Date: Dec. 08	Scale: N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN CATHODIC PROTECTION – TEST POINTS	Plan # W–28
By: GEORGE BRATTON, P.E. CIVIL ENGINEER			





NOTES:

1) IN AREAS SUBJECT TO FLOODING, SUCH AS TIDAL FLOODING, DISCHARGE PORT MUST BE AT LEAST 2 FEET ABOVE ESTIMATED HIGH WATER MARK.
2) AN APPROVED AIR GAP IS 2 X PIPE DIAMETER, OR MINIMUM OF 1 INCH.
3) ALL PIPE AND FITTINGS TO BE DUCTILE IRON OR STEEL (SEE TOWN STANDARD SPECIFICATIONS).
4) WHERE SPOOL PIPE IS PLACED BETWEEN BEND AND ASSEMBLY, PROVIDE "STANDON" TYPE PIPE SUPPORT AT FLANGE, CONNECTED TO ASSEMBLY.
5) DRAIN TO BE SIZED TO HANDLE MAXIMUM DISCHARGE FROM ASSEMBLY, SEE MANUFACTURER'S LITERATURE.
6_ RPBA OR RPDA MUST BE PROVIDED AND INSTALLED AS A UNIT, NO MODIFICATIONS TO ANY PART OF THE ASSEMBLY ARE ALLOWED.
7) FREEZE PROTECTION IS THE RESPONSIBILITY OF THE OWNER AND SHALL NOT INTERFERE WITH THE OPERATION OF THE ASSEMBLY.

Date: Jan. 18	**Scale:** N.T.S.	TOWN OF COUPEVILLE STANDARD PLAN 3" and Larger RPBA/RPDA	Plan # W-29
By: KIMBERLY HINDS, P.E. CIVIL ENGINEER			

Appendix E: Project Quality Control Plan

Project Quality Control Plan

22 NASWI (Site 57) PFAS Time Critical Removal Action, Naval Air Station Whidbey Island, Outlying Landing Field Coupeville, Washington

Contract Number: N62470-18-D-7013
Task Order Number: N44255-22-F-4311

Prepared for:

Naval Facilities Engineering Systems Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Prepared by:

CAPE-ER JV LLC
500 Pinnacle Court, Suite 100
Norcross, GA 30071

January 2024

Table of Contents

List of Tables

List of Figures

List of Appendices

Acronyms and Abbreviations

AFFF ..... aqueous film-forming foam
AHA ..... activity hazard analysis
ASTM ..... American Society for Testing and Materials
APP ..... Accident Prevention Plan
CAPE-ER ..... CAPE-ER JV LLC
COR ..... Contracting Officer's Representative
CPR ..... Contractor Production Report
CTO ..... Contract Task Order
CQCR ..... Contractor Quality Control Report
CQM-C ..... Construction Quality Management for Contractors
DFOW ..... Definable Feature of Work
FCR ..... Field Change Request
GS ..... General Superintendent
H&S ..... health and safety
KO ..... Contracting Officer
MWP ..... Master Work Plan
NAS ..... network analysis schedule
NASWI ..... Naval Air Station Whidbey Island
NAVFAC ..... Naval Facilities Engineering Systems Command
NW ..... Northwest
OLF ..... Outlying Landing Field
OSHA ..... Occupational Safety and Health Administration
PDF ..... Portable Document File
PFAS ..... per- and polyfluoroalkyl substance
PGM ..... Program Manager
PM ..... Project Manager
PQC ..... Project Quality Control
PQCM ..... Project Quality Control Manager
PQCP ..... Project Quality Control Plan
PWS ..... Performance Work Statement
QA ..... Quality Assurance
QC ..... Quality Control
QCPGM ..... Quality Control Program Manager
QCS ..... Quality Control System
RFI ..... request for information
SBMACRAC .....
.....Small Business Multiple Award Contract for Environmental Remedial Services Contract
SHM ..... Safety and Health Manager
SOPs ..... standard operating procedures
SS ..... Site Superintendent
SSHO ..... Site Safety and Health Officer
SSHP ..... Site Safety and Health Plan

TOC .....Town of Coupeville
USACE .....United States Army Corp of Engineers

Signature Sheet

This section provides a detailed listing of the individuals responsible for drafting, reviewing, implementing, and approving this Project Quality Control Plan. Signature indicates approval of the document.

Prepared by:  Date: 13 December 2023

Colin Caviness PE, Senior Project Engineer, Cape Environmental Management Inc

Independent Technical Reviewer:  Date: 05 December 2023

Corinne Walker EIT, ASQ CQA, Quality Control Manager, Cape Environmental Management Inc

Plan Approval:  Date: 18 January 2024

Gerald Karg, Project Manager, Cape Environmental Management Inc

1.0 Introduction

This Project Quality Control Plan (PQCP) establishes a comprehensive Quality Control System (QCS) to be implemented by CAPE-ER JV LLC (CAPE-ER) for Task Order N44255-22-F-4311, to perform construction activities to mitigate the impact of per- and polyfluoroalkyl substance (PFAS) on drinking water wells for property owners located adjacent to Outlying Landing Field (OLF) Coupeville associated with Naval Air Station Whidbey Island (NASWI). The NASWI complex is located in Island County, Washington, on Whidbey Island, and consists of Ault Field, OLF Coupeville, and Seaplane Base. Navy oversight of the work is provided by Naval Facilities Engineering Systems Command (NAVFAC) Northwest (NW).

This PQCP has been prepared in accordance with Project Specification Section 01 45 16.13, Contractor Quality Control; the performance work statement (PWS) for Contract Task Order (CTO) N44255-22-F-4311; and the quality control requirements set forth in Contract N62470-18-D-7013, PWS, Part 6.0, Quality Control. The plan describes the construction activities and QCS that CAPE-ER will employ to ensure that construction activities comply with the requirements of the PWS. The PQCP identifies the personnel, procedures, instructions, records, and forms to be used in the Quality Control (QC) management of this project. The plan addresses each component of the QCS, including responsibility and authority, inspections, testing and sampling, and documentation and reporting.

The PQCP describes CAPE-ER's proposed procedures for inspections, monitoring, follow-up, and corrective actions for all phases of work. The information provided in this plan will ensure compliance with the quality and schedule goals and applicable statutory and regulatory requirements.

1.1 Site Location and Background

OLF Coupeville is a military airfield associated with NASWI. OLF is located 2 miles southeast of the Town of Coupeville (TOC), Washington, in Island County, and is located on a broad plateau of Smith Prairie in central Whidbey Island at an elevation of approximately 195 feet above mean sea level. The paved runway is approximately 5,400 feet long and is bordered by grass maintained by mowing operations extending to the public roads. A runway safety area extends approximately 3,300 feet south of the runway footprint and is bordered by trees and residential parcels. The project area is south of OLF Coupeville on a County Road and a privately owned road.

OLF Coupeville was commissioned for use by the Navy in 1943 and provides support for day and night Field Carrier Landing Practice operations by the Navy for aircraft based out of NASWI. Such operations allow aviators and crew to fly in patterns as well as practice touch-and-go, simulating carrier landings and take-offs. PFAS are found in aqueous film-forming foam (AFFF) compounds used in Navy firefighting activities. Although there is no available documentation that AFFF was used at OLF Coupeville, PFAS have been detected in one on-base drinking-water supply well, on-base groundwater monitoring wells, eight off-base private drinking-water wells, and one of the TOC's primary off-base drinking-water source wells.

1.2 Scope of Work

CAPE-ER will furnish all labor, materials, tools, supplies, services, equipment, project management, contract/procurement administration, etc., necessary to perform all work in accordance with the PWS. CAPE-ER will conduct all work in accordance with all pertinent state, local, and federal regulations and approved work plans. CAPE-ER's work areas and activities at the site will be available for inspection without announcement by the Navy, the Navy's Quality Assurance (QA) Contractor (Jacobs Engineering), Washington State regulatory agencies, Island County Public Works, and the TOC's representatives.

1.2.1 Removal Action Construction

CAPE-ER will conduct all work in accordance with the approved Master Work Plan (MWP), final revised design (CH2M Hill, Inc., 2022), and associated final design specifications (CH2M Hill, Inc., 2019). In addition to the requirements in the final design specifications and final revised design, CAPE-ER will:

- Perform underground utility clearance prior to initiating intrusive activities;
- Perform archeological monitoring during all ground intrusive activities;
- Minimize the time that excavations are open and secure the excavations at all times, including periods in which CAPE-ER personnel are not present;
- Provide necessary traffic and dust control;
- Coordinate with the TOC for the necessary water account setup, meter installations, and payment of initial fees on behalf of the residents;
- Complete the required service line connections to existing plumbing on private property;
- Install 10-inch water main with all valves and appurtenances
- Complete pressure testing, disinfection of water line, and microbial testing as per local, county, state, and federal requirements;
- Repave County Road;
- Install an infiltration gallery on Private Road
- Regrade Private Road as shown in the design drawings;
- Test and flush all connections, faucets, and water supply points within and outside of each house;
- Repair or upgrade existing plumbing as needed to handle volume and pressures of the new supply line;
- Decommission or modify up to three drinking water wells;
- Develop red-line markup drawings for post-construction record drawings;
- Perform a professional post-construction survey for each water main segment, all service lines, and any improvements installed as part of this work;
- Repair/replace all damaged walls, floors, ceilings, or any portion of the house and yard impacted during service line connection or testing;
- Keep the work areas clear of clutter and properly dispose all waste; and
- Repair all areas damaged by construction equipment, including the existing gravel road, re-seeding of grassy areas, planting of trees/shrubs, and repair of irrigation systems to pre-construction condition.

1.2.2 Construction Completion Report

CAPE-ER will prepare a Construction Completion Report that will include the following:

- Brief description of completed work elements for each location
- As-built information
- Documentation of pre- and post-construction conditions
- Documentation of any project deviations, along with their associated rationale
- Records of all QC testing performed
- Waste disposal/recycling records

1.3 Definable Features of Work

For the purposes of this PQCP, CAPE-ER has organized the major components of this project into three primary areas of work: General Conditions, Construction, and Site Restoration. These areas are further refined into Definable Features of Work (DFOWs) shown in Table 1-1, which provides details for each DFOW as to the area of work it belongs to and the relevant design drawings and specifications sections that govern each DFOW.

Table 1-1: Definable Features of Work

Area	DFOW	Relevant Specification	Relevant Drawings
General Conditions	Mobilization	01 50 00	C-001, C-101
	Land & Utility Surveying	01 31 13	C-101
	Erosion Controls	01 57 13	C-309, C-310, C-311, C-312; TOC W-24
	De-Mobilization	01 77 00	C-001
Construction	Utility Pot Holing	01 31 13	C-308, C-209, C-310, C-311, C-409, C-410
	Clearing & Grubbing	31 10 00	C-310, C-311, C-312, C-504
	Water Main Extension	03 30 00, 31 23 16, 31 23 23, 31 23 23.15, 33 05 01, 33 05 01.02, 33 05 01.10, 33 12 16, 33 12 19, 33 13 00	C-308, C-309, C-310, C-311, C-312; TOC W-1, W-2, W-3A, W-4, W-5, W-6a, W-8, W-9
	Infiltration Gallery	03 30 00, 31 23 23, 31 23 23.15, 33 05 13, 33 41 01, 33 44 13.13	C-312, C-504
	Service Line Installation	22 10 01, 22 30 00, 22 40 00, 33 12 13	C-409, C-410; TOC E-10, W-11, W-16, W-17
	Gravel Road Grading	31 23 13, 31 23 23	C-309, C-310, C-311, C-312, C-504, C-505, SD-101
	Well Decommission	02 41 00	C-409, C-410
Site Restoration	Topsoil and Seeding	32 92 00	C-310, C-311, C-312, C-504

	Asphalt Paving	32 11 23, 32 12 16, 32 17 23	C-308, C-309, SD-101

1.4 Notification of Changes

Once the client has approved the PQCP, any changes to the PQCP shall be at the direction and approval of the QC Program Manager (QCPGM) with concurrence of the Contracting Officer (KO) or CTO Contracting Officer's Representative (COR).

2.0 Project Organization and Responsibilities

2.1 General

CAPE-ER will have the responsibility and authority for development, modification, and implementation of the PQCP. The PQCP will be implemented independently of the oversight performed by NAVFAC representatives. All subcontractor personnel will adhere to the requirements of this plan through their respective quality organizations.

The following list includes personnel involved for this project:

- Program Manager (PGM): Chris Caviness, PE
- Project Manager (PM): Evan LeBlanc
- General Superintendent (GS): Randy Soucek
- Safety and Health Manager (SHM): Frank Garrett, CIH, CSP
- QCPGM: Corinne Walker, EIT, ASQ CQA
- Site Superintendent (SS): TBD
- Project Quality Control Manager (PQCM): TBD
- Site Safety and Health Officer (SSHO): TBD

2.2 Contractor Quality Control Management and Organization

An organizational chart showing the reporting relationship of personnel involved in this project is provided as Figure 2-1. The chart illustrates the lines of authority from the CAPE-ER PM through the project personnel and subcontractors.

The organizational structure of this project illustrates the project management organization, describes the responsibilities and authorities of key personnel, identifies the responsibilities of personnel to assess and implement the requirements established by the PQCP, and describes the reporting relationships and lines of communication and authority.

All Project QC personnel will have successfully completed the United States Army Corps of Engineers (USACE) Training Course and Construction Quality Management for Contractors (CQM-C), and will receive and review an adequate briefing on the site-specific PQCP prior to working at the site. Project QC personnel resumes performing on this project are provided in Appendix A. Also, current CQM-C certifications for both the QCPGM and the PQCM are included in Appendix A. Note that the government reserves the right to require CAPE-ER to make changes in this PQCP and operations, including removal of personnel, as necessary, to obtain the quality specified.

2.3 Responsibilities

The project responsibilities are described below, by role, for the previously identified individuals.

2.3.1 Program Manager

The PGM is the primary contact with the client and has direct access to the CAPE-ER Executive Sponsors. All PMs report to the PGM. The PGM acts as the final authority in the resolution of contract administrative and operational issues. The PGM consults and coordinates with client management on issues concerning overall contract performance. PGM duties and responsibilities include the following:

- Overall contract administration and all decisions on organizational structure, technical approach, work control, and quality-related issues
- Determination of contract priorities
- Execution of all agreements, contracts, proposals, and correspondence that obligate CAPE-ER
- Overall organization direction in accordance with the contract, company policies and programs, and applicable laws and regulations
- Evaluation of the performance of respective organizational elements, including review and evaluation of activities throughout the CTO performance period and initiating corrective actions, as needed.

2.3.2 Project Manager

The PM is responsible for the day-to-day management and direction of technical activities for the CTO. The PM interfaces with the COR concerning CTO performance. The PM has Project Authority over the CTO team member (e.g., SS, PQCM, and SSHO). The PM evaluates the performance of CTO team members, including the review and evaluation of activities during the task and, if needed, initiating corrective actions. The PM also prepares and tracks the budget and schedule for the CTO.

Success of the CTO will be measured by achievement of project quality objectives, goals, and safe completion of the project on schedule and within the established budget. The PM will work closely with the PQCM to communicate the quality requirements to the project staff. The PM will report directly to the PGM under the NAVFAC Small Business Multiple Award Contract for Environmental Remedial Services Contract (SBMACRAC).

2.3.3 General Superintendent

The GS is the direct supervisor of the SS and communicates with the SS to achieve project objectives in compliance with federal and state regulations and meet CAPE-ER's QC and Safety and Health Programs. Responsibilities of the GS include:

- Evaluate overall staffing needs to ensure the project is properly staffed and executed in accordance with contract requirements.
- Provide support to the PM and SS for project budgets and schedules.
- Provide the following technical support for the project:
    - Submittal review,
    - Drawing/specification interpretation support,
    - Schedule review/input, and
    - Work Plan input/review.

- Provide support to the PM and SS to ensure successful project startup.
- Support resolution of field execution challenges.
- Provide leadership, technical expertise and assistance to the CAPE-ER Project Staff.
- Support CAPE-ER's health and safety (H&S) team in the investigation of all safety and health incidents.
- Assist assigned SS in the field management of projects, subcontractors, budgets, and interface with QC and H&S programs.
- Ensure the assigned CAPE-ER SS execute their work in accordance with their responsibilities.

In the event that the SS is not able to perform their duties, the GS will act as an Alternate SS until the SS resumes their duties or another qualified person can be submitted and approved for this role.

2.3.4 Site Superintendent

The SS for CAPE-ER, will act as CAPE-ER's on-site representative and will report to the PM on project matters. The SS will coordinate and provide oversight of assigned project work site to meet contract quality, safety, schedule, and cost goals. The SS is responsible for the supervision and management of all site personnel and ensuring that all site activities are performed in compliance with local, state, and federal regulations. For this CTO, the SS will be dual hatting as the SSHO. Additional duties of the SS include:

- Execute field work in accordance with all safety, quality, schedule, and budget requirements set forth in the project documents.
- Interface with CAPE-ER's QC and H&S Programs to ensure the project is being performed in a manner consistent with CAPE-ER's QC Program and H&S Program, the Scope of Work, and all contract requirements.
- Ensure that all site work is performed in accordance with NAVFAC-accepted plans.
- Ensure all site personnel comply with all H&S requirements.
- Manage work package budgets.
- Schedule and direct subcontractors in accordance with executed subcontracts.
- Provide cost and schedule information to Project Controls and NAVFAC.
- Identify, document and track all rework to include notification to the PM and PQCM. Rework tracking to include labor, materials, liquidated damages, additional fees (delays to other subcontractors, permit extensions, etc.) and impact to schedule.
- Acquire needed supplies and services from outside vendors for the project.
- Attend project meetings as applicable.
- Maintain communication with the NAVFAC authorized representative.

2.3.5 Quality Control Program Manager

The QCPGM reports directly to CAPE-ER's Executive Sponsors and is responsible for developing, maintaining, and ensuring implementation of the QC program for the SBMACRAC Program. This responsibility includes stop work action(s) when deemed necessary. The QCPGM has the primary authority to resolve any disputes involving quality arising from a difference of opinion between personnel. The QCPGM may elevate disputes to progressively higher levels within the corporation or find appropriate technical and scientific support to resolve the issue. The QCPGM is the direct

supervisor of the PQCM and communicates with the PQCM to achieve project objectives in compliance with federal and state regulations and meet CAPE-ER's QC and H&S Programs. In the event that the PQCM is not able to perform their duties, the QCPGM will act as an Alternate PQCM until the PQCM resumes their duties or another qualified person can be submitted and approved for this role.

2.3.6 Project Quality Control Manager

The PQCM, also referenced as the Contractor Quality Control System Manager in the specifications, is responsible for the development, implementation, and management of the PQCP, including the coordination, performance, and execution of inspection and testing activities to ensure that the quality of the work meets or exceeds the project's contractual requirements and maintains an established standard of excellence. The PQCM reports to the PM and communicates with the QCPGM on project QC matters. The PQCM or accepted alternate must be on-site during construction activities. The responsibilities of the PQCM include:

- Interfacing with CAPE-ER's QC Programs to ensure the project is being performed in a manner consistent with CAPE-ER's QC Program.
- Management of the performance of all on-site and off-site inspections and testing.
- Evaluation of the results of the inspections and testing.
- Notification of the PM of acceptance or rejection of the work.
- Management of the documentation of all inspections and testing, and notifications to project management through Combined Contractor Production Report (CPR)/Contractor Quality Control Report (CQCR).
- Review of all required submittals relating to QC.
- Inspection of work in the field.
- Inspection and monitoring of off-site fabrication.
- Preparation and submission of requests for information (RFIs).
- Preparation and/or review of submittals.
- Coordination of three-phase inspections.
- Tracking and managing deficiencies.
- Maintaining the as-built drawings.
- Preparation and submission of letters of delegation to all other various Project Quality Control (PQC) representatives outlining duties, authorities, and responsibilities, as needed.

The PQCM will have the authority to suspend work that does not meet the standards established by the CTO specifications. Should modifications or revisions to the specifications relating to QC be required, the PQCM will prepare a request for modification to revisions and submit the request to the COR. If changes require a modification to scope or budget, the NAVFAC NW KO must approve the change. The PQCM will ensure that approval of the modification or revision is received before allowing the modifications to occur in the field.

2.3.7 Safety and Health Manager

The SHM for CAPE-ER will be responsible for the overall safety program. The SHM ensures all elements of the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) are implemented

and enforced. The SHM is the direct supervisor of the SSHO and communicates with the SSHO to achieve project objectives in compliance with federal and state regulations and meet CAPE-ER's QC and H&S Programs. In the event that the SSHO is not able to perform their duties, the SHM will act as an Alternate SSHO until the SSHO resumes their duties or another qualified person can be submitted and approved for this role.

2.3.8 Site Safety and Health Officer

The SSHO for CAPE-ER will implement the on-site safety program. The SSHO reports to the PM and communicates with the SHM on project H&S matters. The SSHO provides on-site H&S supervision and enforcement; site orientation safety briefings, activity hazard analysis (AHA) review, safety meetings, and safety training; site hazards and established H&S control measures; daily safety inspections; air monitoring and sampling; supervision of excavation, trenching, and/or confined space entry activities; investigation of incidents and report preparation; implementation of emergency response plans; and monitoring of proper selection and use of personal protective equipment. For this CTO, the SS will be dual hatting as the SSHO.

2.3.9 Site Personnel and Subcontractors

All site personnel and subcontractors will be required to adhere to the procedures set forth in this PQCP. The SS will be responsible for overall management and coordination of CAPE-ER's site personnel and subcontractors. The SS will ensure that they perform all aspects of the work in accordance with the MWP, which includes the APP/SSHP and this PQCP. The PQCM will be responsible for ensuring that site personnel and subcontractors perform all aspects of the work in accordance with this PQCP.

3.0 Inspection Testing and Monitoring

3.1 Inspections

To ensure that all construction activities comply with the requirements of the specifications, the PQCM will utilize the three phases of inspection, as described in the following sections. The three phases of inspection will be performed for all DFOWs listed in Table 1-1. All inspections shall be coordinated with the NAVFAC CTO COR or assigned NAVFAC NW Technical Point of Contact, the Jacobs QA Representative, the Island County Roads Inspector, and the TOC Inspector, as applicable. The Baseline Project Schedule, included as Figure 2-1 in the MWP, is used to assign network analysis schedule (NAS) activities to their governing DFOW. These connections will determine the three phases of inspection schedule. The planned preparatory and initial phase inspection dates are provided in Table 3-1.

Table 3-1: Preparatory and Initial Inspection Schedule

DFOW	NAS Activity (Activity ID – Activity Name)	Preparatory Phase Inspection Date	Initial Phase Inspection Date
Mobilization	#36 – Mobilization	03/04/24	03/04/24
Land & Utility Surveying	#37 – Utility Clearance	03/04/24	03/04/24
Demobilization	#51 – Demobilization	05/19/24	05/20/24
Utility Pot Holing	#37 – Utility Clearance	03/04/24	03/04/24
Clearing & Grubbing	#38 – Site Preparation	03/04/24	03/05/24
Water Main Extension	#44 – 10” Water Main Installation and Testing	03/28/24	03/29/24
Infiltration Gallery	#46 – Infiltration Gallery	05/01/24	05/02/24
Service Line Installation	#45 – 2” Branch to Residence and Testing	04/25/24	04/26/24
Gravel Road Grading	#43 – Grading Crushed Rock	05/07/24	05/08/24
Well Decommission	#47 – Well Decommissioning	05/07/24	05/08/24
Topsoil and Seeding	#48 – Site Restoration	05/13/24	05/14/24
Asphalt Paving	#42 – Grading Road	05/09/24	05/10/24

3.1.1 Preparatory Phase Inspection

A preparatory phase inspection will be performed prior to the commencement of work on each DFOW. In some cases, multiple DFOWs may be covered in a single preparatory meeting. The preparatory phase will include:

- Reviewing each paragraph of applicable specifications, references, codes, and standards.
- A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field made available by CAPE-ER at the preparatory phase inspection. These copies shall be maintained in the field and available for use by government personnel until final acceptance of work.
- Reviewing contract drawings and plans.
- Reviewing all submittals to ensure compliance with contract documents.
- Checking to ensure that all materials and/or equipment have been tested, submitted, and approved.
- Reviewing provisions that have been made to provide required control inspection and testing.
- Examining the work area to ensure that all required preliminary work has been completed and is in compliance with the contract.
- Physically examining required materials, equipment, and sample work to ensure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- Reviewing appropriate AHAs to ensure that safety requirements are met per the APP.
- Discussing procedures for constructing the work, including repetitive deficiencies, and documenting construction tolerances and workmanship standards for that phase of work.
- Checking to ensure that the portion of the plan for the work to be performed has been approved by the CTO COR.
- Discussing the initial control phase.
- Notifying the CTO COR at least 2 working days (48 hours) in advance of beginning the preparatory control phase inspection meeting.

This phase will include a meeting conducted by the PQCM with the SS, other PQC personnel (as applicable), the foreman responsible for the DFOW, and the government representative(s). The results of the preparatory phase actions will be documented by separate minutes using the CAPE-ER Standard Form 320-13, Record of Preparatory and Initial Inspections, found in Appendix B, prepared by the PQCM and attached to the CQCR. CAPE-ER's PQCM will communicate to applicable workers the results of the preparatory phase inspection, to include materials, construction methods, workmanship standards, safety considerations and procedures, and preparatory phase inspection meeting minutes.

3.1.2 Initial Phase Inspection

The initial phase inspection will be performed at the beginning of a DFOW. The initial phase will include:

- Reviewing minutes of the preparatory phase inspection meeting.
- Checking the preliminary work to ensure that it is in compliance with contract requirements.
- Verifying full contract compliance and required control inspection and testing.

- Establishing a level of workmanship and verifying that it meets minimum acceptable workmanship standards, comparing with sample panels if appropriate.
- Resolving all differences.
- Checking safety, including compliance with and upgrading of the SSHP and AHAs.
- Reviewing the AHAs with each worker.
- Notifying the government at least 24 hours in advance of beginning the initial phase inspection.

This phase will include a meeting conducted by the PQCM and attended by the SS, other PQC personnel (as applicable), the foreman responsible for the DFOW, the work crew(s) for the appropriate DFOW, and the government representative(s). Separate minutes of this phase will be prepared by the PQCM using the CAPE-ER Standard Form 320-13, Record of Preparatory and Initial Inspections, found in Appendix B. The exact location of initial phase inspection will be indicated for future reference and comparison with follow-up phase inspections. The initial phase inspection will be repeated for each new crew to work on-site, as well as if work is resumed after a substantial period of work stoppage, or anytime acceptable specified quality standards are not being met.

3.1.3 Follow-Up Phase Inspection

The follow-up phase inspection will be performed routinely to ensure continuing compliance with contract requirements, including:

- Ensuring the work is in compliance with Contract requirements.
- Maintaining the quality of workmanship required.
- Ensuring that testing is performed by the approved laboratory.
- Ensuring that rework items are being corrected.
- Assuring manufacturers' representatives have performed necessary inspections if required and performed safety inspections.
- Documentation of the QC process, including CQCR, a narrative description of detailed QC inspection procedure, minutes of meetings, inspection results, corrective measures, etc., using the forms presented in Appendix B.

A record of the follow-up phase inspection will be included as part of the CQCR. A final follow-up inspection will be conducted, and any deficiencies corrected, prior to the commencement of a new DFOW.

3.1.4 Inspection of Delivered Materials

All materials delivered to the site will be inspected for conformance to the contract plans and specifications prior to being unloaded at the site by the PQCM. The material delivery date and acceptance of materials will be recorded in the CQCR on the date the material is received. Upon acceptance of these materials, the items will be unloaded and placed in an appropriate storage area. Materials subject to damage from wind/rain/sun will be placed indoors or under a protective covering. All materials will be placed on dunnage to avoid contact with the ground and the introduction of excess moisture. Quantities of the delivered materials will be verified against the delivery ticket during the unloading process, and any discrepancies will be resolved prior to the delivery truck's departure. The AHAs included in the APP/SSHP will be strictly followed during off-loading and movement of delivered materials.

3.1.5 Punch-Out Inspection

Near the completion of all work, or any increments thereof, the PQCM will conduct an inspection of the work and develop a "punch list" of items that do not conform to the approved drawings and specifications. The "punch list" will include an estimated date by which the deficiency will be corrected and will be included in the PQC documentation. The PQCM will make a second inspection to ascertain that all deficiencies have been corrected and, once complete, will notify the government that the project is ready for its Pre-Final Inspection. These inspections and any deficiency corrections required will be accomplished within the time stated for completion of the entire work or any particular increment thereof, if the project is divided into increments by separate completion dates.

3.1.6 Pre-Final Inspection

The PQCM will provide a copy of the initial "punch list" and note items that have been completed. The CTO COR or assigned NAVFAC NW Technical Point of Contact, Jacobs QA Representative, TOC Inspector, and Island County Inspector (if desired) will conduct a walk-through inspection, and the PQCM will develop a Pre-Final Punch List. All items will be addressed by CAPE-ER and notice of completion will be sent to the CTO COR so that a Final inspection can be scheduled.

3.1.7 Final Acceptance Inspection

The Final Acceptance Inspection will be formally scheduled by CAPE-ER based upon the results of the Pre-Final Inspection. Notice will be given to the CTO COR by CAPE-ER at least 2 days prior to the Final Acceptance Inspection that all Pre-Final Inspection items are complete and the project is ready for a Final Inspection. The PQCM, SS, CTO COR, Jacobs QA Representative, TOC Inspector, Island County Inspector (if desired) and other primary management personnel (as needed) will attend this inspection. If work is not acceptably complete, the PQCM will schedule a new final inspection.

3.2 Testing

Numerous industry standards and field QC tests will be used to ensure that materials, equipment, and field activities are in compliance with the requirements of the PWS, Design Drawings and associated specifications, and the PQCP. The PQCM will oversee and be responsible for the PQC Testing Program. Only accredited testing laboratories that meet the criteria of American Society for Testing and Materials (ASTM) D3740 and ASTM E329 will be used.

CAPE-ER will perform the following testing activities:

- Verify that testing procedures comply with contract requirements.
- Verify that facilities and testing equipment are available and comply with testing standards.
- Check test instrument calibration data against certified standards.
- Verify that recording forms and testing identification control number system, including all of the test documentation requirements, have been prepared.
- Record the results of all tests taken, both passing and failing, on the CQCR for the day taken. Results will include the specification paragraph reference, the location where tests were taken, and the sequential control number identifying the test.

A list of the testing requirements has been documented in the Testing and Inspection Plan and Log, included as Appendix C. Additional testing details will be provided during the preparatory inspection for a given DFOW with testing. Additional testing details will include test equipment, test procedures, and test-specific forms.

3.3 Standards

Analytical testing, materials of construction, and equipment supplied will conform to the following recognized standards, as appropriate: American Association of Laboratory Accreditation, American Association of State Highway and Transportation Officials program, ASTM, American Concrete Institute, American National Standards Institute, American Society of Mechanical Engineers, the American Water Works Association, U.S. Department of Commerce National Institute of Standards and Technology, American Society of Civil Engineers, International Organization for Standardization, Underwriters Laboratory, National Fire Protection Association, National Voluntary Laboratory Accreditation Program, the Society for Protective Coatings, the United States Environmental Protection Agency, and associated addenda. All testing used to verify conformance to specific standards will be performed using properly calibrated equipment and following recognized standard operating procedures (SOPs).

The need for additional testing will be determined by the PM and the PQCM, based on a detailed review of the quality of construction and test results. The testing performed by suppliers may be verified by additional testing by CAPE-ER if it is determined to be necessary based on the supplier's certification and material inspection.

3.4 Monitoring and Observations

The PQC monitoring, observation, and surveillance system will be coordinated with key construction steps under each DFOW and will include observation and documentation of all tests performed and documentation of all inspections under each of the three phases of the PQC system. The PQCM keeps a daily log in a bound field logbook to document observations of construction techniques and issues reports on the status of ongoing testing and analytical results and any other data relevant to the PQC effort. The daily log is used to support the CQCR and will be archived as part of project records.

The PQCM closely monitors the actual field testing, verifying proper procedure techniques, sample handling, and chain of custody, if required. The PQCM reports the results of testing, compares the results with the project requirements and, if acceptable, indicates that the work is acceptable and provides a timely authorization to proceed with subsequent work. If the contractor PQCM identifies that any part of the construction has deficiencies and/or does not meet the requirements of the base specifications and PWS, corrective actions will be implemented until control measures are found to be adequate by the PQCM and the NAVFAC onsite representative. Deficiencies and corrective actions will be recorded in on the CAPE-ER Standard Form 320-12, List of Outstanding Deficiencies, found in Appendix B.

4.0 Project Meetings

As required by job site events, the PQCM will conduct periodic meetings, including:

- Pre-construction, coordination, and mutual understanding meeting
- Three-phase inspection meetings (refer to Section 3.1)
- QC meetings

4.1 Pre-Construction, Coordination, and Mutual Understanding Meeting

The PQCM, CAPE-ER's project management personnel, NAVFAC representatives, QA contractor representatives, TOC's Director of Utilities, and key subcontractors will attend a pre-construction, coordination and mutual understanding meeting, as part of the pre-construction meeting discussed in the MWP, before initiation of the Removal Action Construction.

The coordination and mutual understanding meeting will be conducted prior to the start of site work to discuss the QC program required by the CTO. The purpose of the meeting is to develop a mutual understanding of the QC details including:

- Provide each organization with all relevant PQC documents.
- Discuss details of the above documents.
- Determine if changes are necessary based on site conditions.
- Review the responsibilities of each organization.
- Review the lines of authority and communication.
- Discuss the inspection program.
- Discuss the protocol and procedures for testing.
- Discuss the protocol and procedures for retesting.
- Review documentation requirements.
- Review documentation distribution and storage.
- Review work area security and safety.
- Document hazardous waste site safety training.

The minutes from the coordination and mutual understanding meeting will be prepared and signed by the PQCM and will be submitted to the CTO COR for review and signature.

4.2 Quality Control Meetings

CAPE-ER will host QC meetings, as required by the CTO COR on-site, with the SS responsible for upcoming work, to discuss PQC and construction issues. The meeting is anticipated to be conducted at the work site. The CTO COR, Jacobs QA Representative, and TOC's Director of Utilities may attend this meeting. The meeting should cover logistics, progress of work, volume of material imported/placed, monitoring reports, testing results, challenges/issues, resolution of identified issues, upcoming schedule, client input, etc. CAPE-ER will submit meeting minutes to document the items covered during the meeting. Meeting minutes will be submitted within 7 days of the meeting.

The meetings will be recorded in the CQCR. This meeting may be held in conjunction with other meetings (e.g., tailgate safety meetings, progress meetings).

At a minimum, the following shall be covered at each meeting:

- Minutes from the previous QC meeting
- Work or testing accomplished since the last QC meeting
- Rework items identified and/or completed since the last QC meeting
- Current schedule, work to be accomplished before the next QC meeting, and the documentation required
- Review of the status of submittals
- Coordination and/or notifications required for proposed work
- Completion dates for rework items
- Preparatory, initial, and follow-up phase inspections, and testing required
- Resolution of any QC/production issues with required documentation
- Revisions to the PQCP, such as changes in procedures

5.0 Reporting and Documentation

PQC records are the primary means of documenting and reporting construction quality and conformance to contract documents. This section outlines the general procedures to be followed for the identification, use, handling, filing, storage, and disposition of PQC records.

5.1 Contractor Production Reports

The SS is responsible for preparing and submitting a Daily CPR, found in Appendix B, documenting the activities and progress to the CTO COR the next working day after each calendar day that work was performed. The CPR will document work performed and results used to gauge progress and adherence to schedule and cost. The Daily CPR will be signed and dated by the SS and will document, at a minimum, the following:

- Date of report, report number, name of contractor, contract number, title and location of contract and task order, and SS present
- Weather conditions in the morning and afternoon, including maximum and minimum temperatures for the day
- A detailed list of the work performed for the reporting day including:
    - NAS activity reference
    - Description of the work performed and location
    - Employer, trade, quantity of personnel, and total work hours for the day
- The total workforce job hours for the day and cumulative hours from the start of construction
- A list of job safety actions taken and safety inspections conducted by NAS activity with indication that that safety requirements have been met
- Specific safety questions to be answered daily:
    - Was a job safety meeting conducted? If so, a copy of the job safety meeting minutes will be attached to the CPR.
    - Were there any lost-time accidents? If so, a copy of the completed Occupational Safety and Health Administration (OSHA) report will be attached to the CPR.
    - Was trenching, scaffolding, high-voltage electrical, or high work done? If so, a statement or checklist showing inspections performed will be attached to the CPR.
    - Was hazardous material or waste released into the environment? If so, a description of the incident and proposed actions will be attached to the CPR.
- A list of equipment and materials, by NAS activity, that were received and incorporated into the job
- A list of construction and plant equipment, by NAS activity, on the work site (The number of hours used, idle, and down for repair will be reported.)

Remarks shall be made, by NAS activity, regarding pertinent information including:

- Summary of work performed, providing volumes, rates, and/or results
- Directions received
- Problems encountered during activities

- Work progress and delays
- Conflicts or errors in the specifications
- Field changes
- Safety hazards encountered
- Instructions given and corrective actions taken
- Delays encountered
- Record of visitors to the work site
- Waste or material accumulated or transported offsite on a daily basis

5.2 Contractor Quality Control Report

The PQCM will prepare a CQCR, found in Appendix B, and combine it with the CPR for delivery to the CTO COR on the next working day after each calendar day that work was performed. Reports are prepared for each calendar day of work performed and for every 7 consecutive calendar days of no work.

The CQCR will provide an overview of QC activities performed each day, including those performed on subcontractor and supplier activities. The CQCR will present an accurate and complete picture of QC activities, document both conforming and deficient conditions, and will be precise, factual, legible, and objective. Copies of the supporting documentation, such as photo logs, checklists, inspection reports, test reports, chain-of-custody records, and manifests, will be attached. The report will include the following information, at a minimum:

- Control phase and the DFOW
- Results of preparatory, initial, and follow-up phase inspections; location of DFOW and names of personnel present; findings and measurements made to document adherence to project plans and specifications; and steps taken to correct non-conformances
- Results of the three phases of control for off-site work, if applicable, including actions taken
- Description of daily site work
- Type and location of tests performed and results of the tests
- Verbal instructions received from the CTO COR
- Submittal actions
- Inspection results of delivered equipment and materials
- List of rework items identified but not corrected by close of business
- Review of subcontractor data, calculations, or drawings
- Results of meetings or communication with vendors, NAVFAC personnel, regulators, or others related to the performance and quality of work
- Off-site surveillance of fabricated items
- Remarks containing pertinent information, including directions received, QC problem areas, deviations from the PQCP, construction deficiencies encountered, QC meetings held, acknowledgment that as-built drawings have been updated, corrective direction given by the PQCM/SSHO, and corrective action taken by CAPE
- CQCR certification

Each CQCR will be completed by the PQCM signing the following statement:

"On behalf of the contractor, I certify that this report is complete and correct, and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report."

5.3 Testing and Inspections Plan

A comprehensive testing and inspection plan, included as Appendix C, was developed from the associated design specifications (CH2M Hill, 2019). This plan lays out all of the PQC tests and inspections that are to be performed as dictated by the revised design drawings (CH2M Hill, 2022) and specifications, local codes, and other governing documents. The plan will provide reference to governing documents, NAS activity reference, title of the test or inspection, and a description of the test or inspection including the specified frequency. As tests are performed, the PQCM will record the following information on the testing plan and log:

- Date the test or inspection was conducted
- By whom the test or inspection was conducted
- Location of the test or inspection
- Date the test results were forwarded to the CTO COR and QA contractor
- Indication that an accredited or KO-approved testing laboratory was used

A copy of the updated testing plan and log will be attached to the last daily CQCR of each month.

The testing and inspection plan will be used to document and track test results. The testing and inspection plan will be updated regularly as test reports are received and attached to the last Daily CQCR of each month. CAPE-ER Standard Form 320-11, Field Testing Report, found in Appendix B, will be completed to record results for each test completed in the field. The field test report will be included as an attachment to the CQCR for that day.

All test results received by CAPE-ER will be provided to the CTO COR and QA contractor. Each test report will include a cover sheet that will have "CONFORMS" or "DOES NOT CONFORM" conspicuously stamped in large red letters for indication of the results conforming or not conforming to specification requirements. The test reports will be certified by the signature of the laboratory's authorized representative.

5.4 Field Change Request

A Field Change Request (FCR) is completed when changes in the project construction work or site conditions impacting previously approved plans are identified. The proposed or actual changes documented in the FCR will be reviewed by the responsible technical staff, SS, PQCM and PM. Upon resolution, each one signs the FCR, and the PM forwards the FCR to the CTO COR, QA contractor, and TOC's Director of Utilities for review and concurrence. All field changes that will impact the project cost, schedule, design, or PWS will result in a RFI or other approved document, such as concurrence letter, to the KO and CTO COR. These changes must be approved by the KO and CTO COR. Information provided in the FCR includes:

- A description of the needed change.
- The reason the change is necessary, including consequences of failing to implement the change.

- Identification of other work that will be affected by the change.

5.5 Request for Information

A Request for Information (RFI) will be generated when there is ambiguity within the Contract, incomplete information provided in the design drawings and specifications, issues in constructability, substitution or modification requests (request for variation), or an FCR that will result in an impact to the cost, schedule, design, or PWS. A copy of CAPE-ER's RFI Form is found in Appendix B. The RFI form will be prepared by the PQCM or a PQCM-designated CAPE-ER subject matter expert depending on the nature of the RFI. The RFI form will be reviewed, signed, and submitted by the CAPE-ER PM to the KO, CTO COR, or Engineer as determined in the Coordination and Mutual Understanding Meeting. Each RFI form will be completed with the following minimum information:

- Sequential RFI number (resubmissions will have an alphabetic suffix)
- Contract number, CTO number, CTO name
- Date submitted and date requested for RFI response
- Descriptive RFI title, providing reference to subject of the RFI
- Reference to associated NAS activities, design specifications, and drawings
- RFI nature, including priority, cost impact, schedule impact, and if it is on the critical path
- Reason for the RFI
- Detailed description of the issue behind the RFI
- List of supporting attachment and documents
- Information that is being requested
- CAPE-ER proposed solution

5.6 Submittals

Submittals are grouped into two classifications: action submittals and informational submittals. Action submittals require the Engineer, Navy, and/or TOC's approval and consist of shop drawings and samples. Informational submittals require the Engineer, Navy, and/or TOC's review and determination that the information is in accordance with the contract. Informational submittals consist of the following: certificates; construction photographs and video; closeout submittals; contractor-design data; manufacturer's instructions; operation and maintenance data; quality control documentation; schedules; special guarantee; statement of qualifications; submittals required by laws, regulations and governing agencies; test evaluation and inspection reports; testing and startup data; and training data.

5.6.1 Submittal Register

The Submittal Register, included as Appendix D, was developed from the Associated Final Design Specifications (CH2M Hill Inc. 2019). All items shown on the Submittal Register will be submitted to CH2M Hill as per Specification Section 01-30-00, Submittal Procedures, and per the procedures described below. The submittal register will be tracked, maintained, and submitted monthly to NAVFAC to document the periodic submittal register updates. The submittal register will associate each submittal item with a NAS activity in the baseline schedule. This will be used to develop the

submittal review schedule. The submittal schedule accounts for the 30 calendar days for the Engineer's review.

5.6.2 Submittal Requirements

At a minimum, all submittals will have the following identifying information on each submittal item:

- Contractor's stamp of approval
- Project title and location
- Construction contract number and contract task order
- Submittal number corresponding to the submittal register
- Section and part number of the specification section
- Submittal type
- Resubmission by the inclusion of an alphabetic suffix on the submittal number
- Name, address, and telephone number of the subcontractor, supplier, manufacturer, and any other second-tier contractor associated with the submittal
- Identification and description of a variation from the contract documents

The format for the electronic submittals will be as follows:

- Each electronic submittal will be in Adobe Acrobat Portable Document Format (PDF).
- Submittals that contain more than 10 pages in the file will contain internal bookmarking from an index page to major sections of the document.
- The submittal PDF file will be set to open "Bookmarks and Page" view.
- General information will be added to each PDF file, including title, subject, author, and keywords.
- The submittal files will be set up to print legibly at 8.5-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch.
- A new electronic file will be made for each resubmittal.

5.6.3 Submittal Procedures

The Transmittal of Contractor's Submittal form will be the cover page for all submittal items transmitted in a single PDF file. A copy of this form is found in Appendix B. Only submittals of the same specification section will be transmitted under a given Transmittal of Contractor's Submittal form.

All of the submittal files will be directed to CH2M Hill (Jacobs), Attn: Jennifer Madsen, and uploaded to the proper library on the CH2M Hill (Jacobs) project SharePoint site:

https://delivery.ch2m.com/projects/695610/SDC/default.aspx

The submittals will be uploaded to the project SharePoint site by the CAPE-ER PM, PQCM, or designated submittal processor. The submittals will be submitted according to the submittal schedule shown in the submittal register.

All of the submittal files will also be submitted to the CTO COR via DoD SAFE after a drop request is received from the CTO COR. The CTO COR will distribute the documents to the TOC or Island County staff, as appropriate.

5.6.4 Submittal Certifications

CAPE-ER will apply a submittal Certification Stamp, a copy of which is shown in Figure 5-1, to each submittal item. The submittal Certification Stamp will have the following information contained in it:

- Certification date
- Project name
- Submittal number
- Specification reference
- Statement certifying submittal has been reviewed, checked, and approved for compliance with contract documents
- CAPE-ER reviewer's signature, name, and title

5.6.5 Submittal Review Actions

5.6.5.1 Action Submittals Review Actions

Upon review of an Action Submittal, the Engineer will review, comment, stamp, and distribute as noted. One of four possible notations will be applied to the submittal indicating the results of the review. These notations are as follows:

- "1" indicates that the submittal is in general conformance with the Contract, and the submittal copies will be marked "No Exceptions Taken." CAPE-ER will be able to implement the work covered in the submittal.
- "2" indicates that the submittal requires limited corrections for conformance with the Contract, and the submittal copies will be marked "Make Corrections Noted." CAPE-ER will be able to implement the work covered in the submittal in accordance with the markings noted. Where submittal information is to be incorporated in Operation and Maintenance Data, a corrected copy shall be resubmitted. Otherwise, no further action is required.
- "3" indicates that the submittal is insufficient or contains incorrect data and that the comments require that the submittal be revised and resubmitted for conformance with the Contract. The submittal copies will be marked "Amend and Resubmit." CAPE-ER will not be able to implement the work covered by this submittal until it is revised, resubmitted, and provided with a review action of a "1" or "2."
- "4" indicates that the submittal is not in general conformance with the Contract, or is incomplete and will be marked "Rejected." CAPE-ER will not be able to implement the work covered by this submittal until it is revised, resubmitted, and provided with a review action of a "1" or "2." Submittals with a deviation or substitution that have not been clearly identified by CAPE-ER will fall under this review action.

5.6.5.2 Informational Submittal Review Actions

The Engineer, Navy, and/or TOC will review each informational submittal. If submittal does not conform with the Contract, it is considered unacceptable and will be returned with review comments to CAPE-ER requiring the informational submittal be revised and resubmitted.

5.7 As-Built Drawings

All data received throughout the course of the project regarding specific as-built information will be incorporated into the as-built drawings on a regular basis to accurately reflect in-the-field conditions. This data will be compiled and included in the final as-built drawings, which will be submitted upon completion of the project in accordance with Specifications Section 01 77 00. One set of the For Construction drawings will be marked up (redlined) by CAPE-ER to show all changes and maintained to document as-built conditions. In some cases, such as field changes or change orders, the drawing can simply be marked, directing the reader to other supporting documentation that explains the change(s). All redline changes will include a brief reference documenting the authorized change. As-built drawings will be maintained and available for government review at any time during construction. Jacobs (QA contractor) will produce record drawings from the redline as-built drawings for inclusion into the Construction Completion Report.

6.0 References

CH2M Hill, Inc. 2019. *Final Design for the Construction of the Town of Coupeville Water Supply Improvements Volume 1-3*. Prepared for the U.S. Navy. March.

CH2M Hill, Inc. 2022. *Final Revised Design for the Construction of the Town of Coupeville Water Supply Improvements – County Road and Private Road Revisions.* Prepared for the U.S. Navy. February.

Figures

Figure 2-1: Organizational Chart

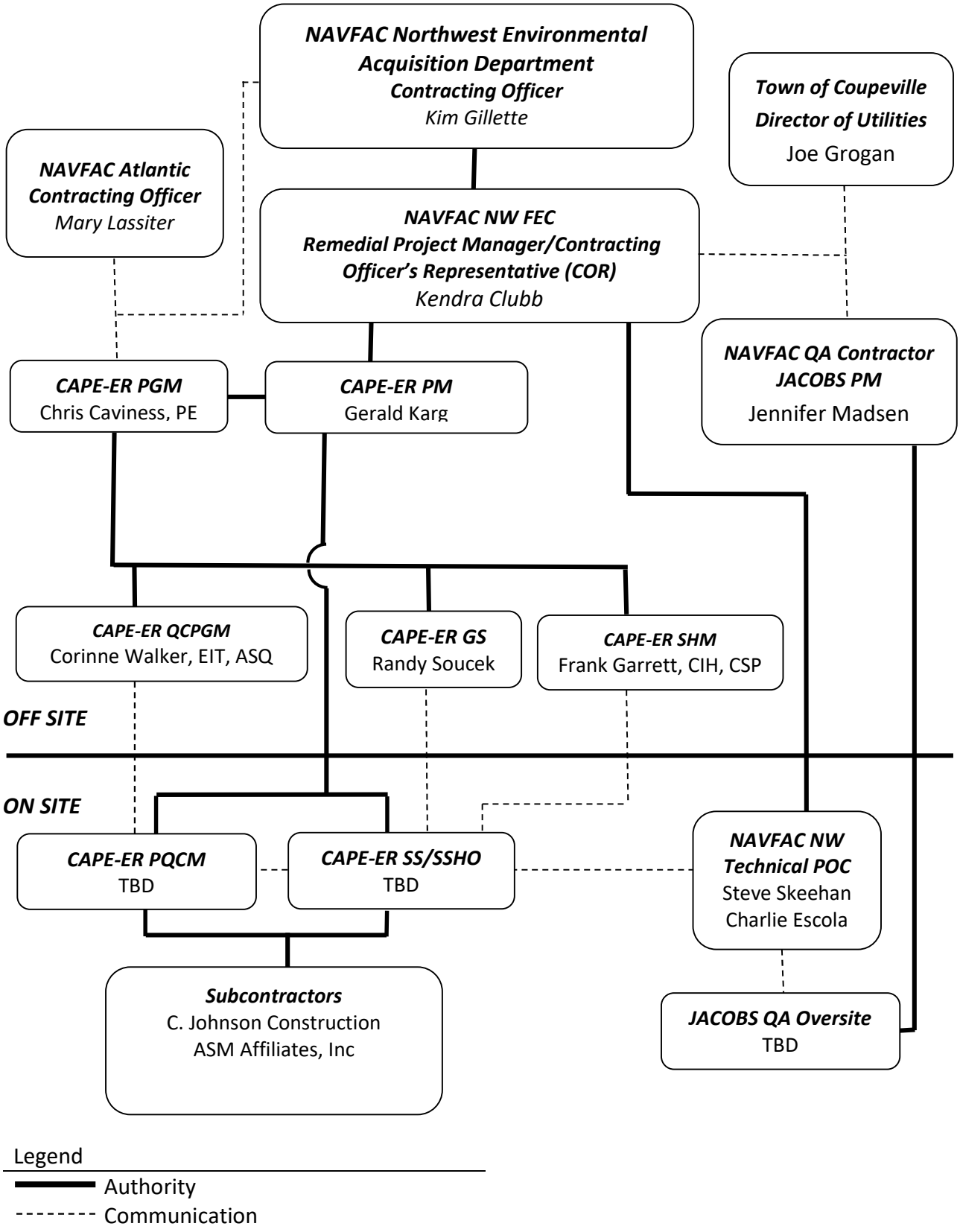


Figure 5-1: Submittal Certification Stamp

Appendices

Appendix A: Qualifications of Project QC Staff (Redacted)

Appendix B: Project QC Forms (Redacted)

Appendix C: Testing and Inspection Plan and Log (Redacted)

Appendix D: Submittal Register (Redacted)

Appendix F: Traffic/Pedestrian Control Plan (Redacted)

Appendix G: Archeological Monitoring Plan (Redacted)

Appendix H: Water Main and Service Line Flushing and Disinfection Plan

AWWA C-651 PROCEDURE EXCERPTS

Sec. 4.2 General Considerations for All Methods of Chlorination

4.2.1 General.

Four methods of chlorination are explained in this section: tablet, continuous feed, slug, and spray. The tablet method gives an initial chlorine dose of 25 mg/L; the continuous-feed method gives a 24-hr chlorine residual of not less than 10 mg/L; the slug method gives a 3-hr exposure of not less than 50 mg/L free chlorine; and the spray method gives a 30-min exposure of not less than 200 mg/L free chlorine. Caution should be used with highly chlorinated water when conducting hydrostatic pressure testing and with high-volume flushing of water.

4.2.2 Flushing.

Potable water shall be used for disinfection, hydrostatic pressure testing, and flushing. Drainage should take place away from the construction or work area. Adequate drainage must be provided during flushing. If applicable, the valve(s) isolating the main from existing system should be locked out and tagged out to prevent unintentional release of the elevated chlorine residual water used for disinfection.

4.2.3 Dechlorination.

When dechlorination is required, it is recommended that any high-velocity flushing be completed prior to disinfection. Dechlorination equipment may not be capable of handling high flows with high levels of chlorine.

Table 1 Weight of calcium hypochlorite granules to be placed at beginning of main and at each 500-ft (150-m) interval

Pipe Diameter (*d*)		Calcium Hypochlorite Granules	
in.	*(mm)*	*oz*	*(g)*
4	(100)	1.7	(48)
6	(150)	3.8	(108)
8	(200)	6.7	(190)
10	(250)	10.5	(298)
12	(300)	15.1	(428)
14 and larger	(350 and larger)	$D^2 \times 15.1$	$D^2 \times 428$

Where D is the inside pipe diameter, in feet $D = d/12$

Sec. 4.3 Tablet/Granule Method of Chlorination

4.3.1 Tablet method.

The tablet method consists of placing calcium hypo-chlorite granules or tablets in the water main during installation and then filling the main with potable water to create a chlorine solution. This method may be used only if the pipes and appurtenances are kept clean and dry during construction. Warning: This procedure must not be used on solvent-welded plastic or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

4.3.2 Placement of calcium hypochlorite granules during construction.

Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft (150-m) intervals. The quantity of granules at each location shall be as shown in Table 1.

4.3.3 Placement of calcium hypochlorite tablets during construction.

Calcium hypochlorite tablets (5-grams) shall be placed in the upstream end of each section of pipe to be disinfected, including branch lines. Also, at least one tablet shall be placed in each hydrant branch and in other appurtenances. The number of 5-g tablets required for each pipe section shall be 0.0012 d 2L rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe. Calcium hypochlorite tablets shall be attached by an adhesive meeting the requirements of NSF/ANSI 61. There shall be adhesive only on the broadside of the tablet attached to the surface of the pipe. Attach tablets inside and at the top of the main. If the tablets are attached before the pipe section is placed in

Table 2 Number of 5-g calcium hypochlorite tablets required for dose of 25 mg/L*

Pipe Diameter		Length of Pipe Section, *ft (m)*				
		13 (4.0) or less	18 (5.5)	20 (6.1)	30 (9.1)	40 (12.2)
in.	*(mm)*	Number of 5-g Calcium Hypochlorite Tablets				
4	(100)	1	1	1	1	1
6	(150)	1	1	1	2	2
8	(200)	1	2	2	3	4
10	(250)	2	3	3	4	5
12	(300)	3	4	4	6	7
16	(400)	4	6	7	10	13

*Based on 3.25-g available chlorine per tablet

the trench, their positions shall be marked on the pipe exterior to indicate that the pipe has been installed with the tablets at the top.

4.3.4 Filling and contact time.

When installation has been completed, the main shall be filled with water such that the full pipe velocity is no greater than 1 ft/sec (0.3 m/sec). Fill rate must be carefully controlled to ensure tablets do not come loose from pipe. Precautions shall be taken to ensure that air pockets are eliminated. As an optional procedure, if required by the purchaser, water used to fill the new main shall be supplied through a temporary connection that shall include an appropriate cross-connection control device, consistent with the degree of hazard, for backflow protection of the active distribution system (see Figure 1). The chlorinated water shall remain in the pipe for at least 24 hr. If the water temperature is less than 41°F (5°C), the water shall remain in the pipe for at least 48 hr. A detectable free chlorine residual (≥0.2 mg/L) shall be found at each sampling point after the 24- or 48-hr period.

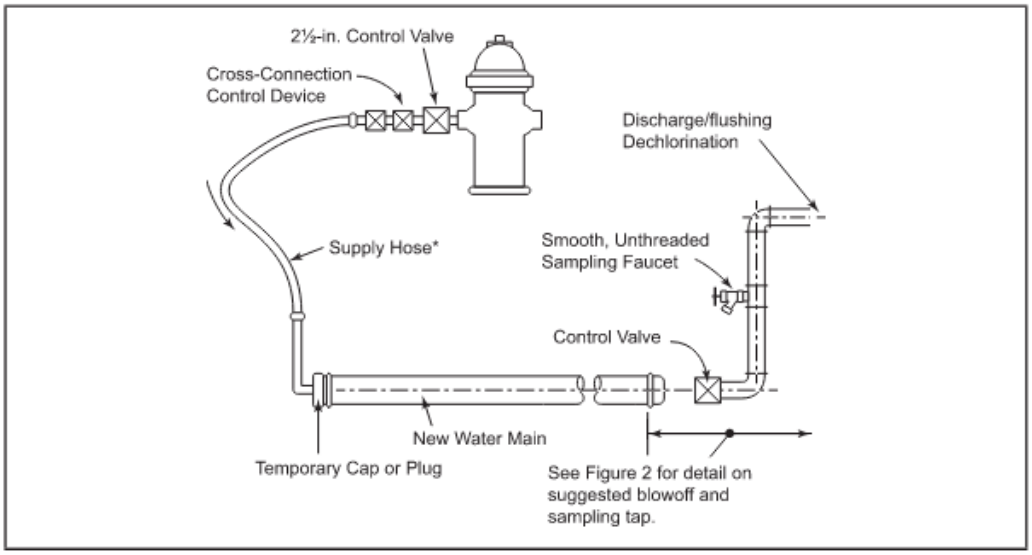
Sec. 4.4 Continuous-Feed Method of Chlorination

4.4.1 Continuous-feed method.

The continuous-feed method consists of completely filling the main with potable water, removing air pockets, then flushing the completed main to remove particulates, and refilling the main with potable water that has been chlorinated to 25 mg/L. After a 24-hr holding period in the main there shall be a free chlorine residual of not less than 10 mg/L.

4.4.2 Preliminary flushing.

Before the main is chlorinated, it shall be filled with potable water to eliminate air pockets and flushed to remove particulates. The flushing velocity in the main shall not be less than 3.0 ft/sec (0.91 m/sec) unless



NOTE: Figure 1 applies to pipes with diameters 4 in. (100 mm) through 12 in. (300 mm). Larger sizes must be handled on a case-by-case basis.

*Clean potable-water hose only. Size and number of taps per Table 3. This hose must be removed during the hydrostatic pressure test.

Figure 1 Suggested temporary flushing/testing connection

Table 3 Required flow and openings (either taps or hydrants) to flush pipelines at 3.0 ft/sec (0.91 m/sec) (40 psi [276 kPa] residual pressure in water main)*

Pipe Diameter		Flow Required to Produce 3.0 ft/sec (approx.) Velocity in Main		Size of Tap Used, *in. (mm)*			Number of Hydrant Outlets	
				1 (25)	1½ (38)	2 (51)		
in.	*(mm)*	*gpm*	*(L/sec)*	Number of Taps Required on Pipe†			2½-in. (64-mm)	4½-in. (114 mm)
4	(100)	120	(7.4)	1	—	—	1	1
6	(150)	260	(16.7)	—	1	—	1	1
8	(200)	470	(29.7)	—	2	—	1	1
10	(250)	730	(46.3)	—	3	2	1	1
12	(300)	1,060	(66.7)	—	—	3	2	1
16	(400)	1,880	(118.6)	—	—	5	2	1

*With a 40-psi (276-kPa) pressure in the main with the hydrant flowing to atmosphere, a 2½-in. (64-mm) hydrant outlet will discharge approximately 1,000 gpm (63.1 L/sec); and a 4½-in. (114-mm) hydrant outlet will discharge approximately 2,500 gpm (160 L/sec).

†Number of taps on pipe based on 3.0-ft/sec discharge through 5 ft (1.5 m) of galvanized iron (GI) pipe with one 90° elbow.

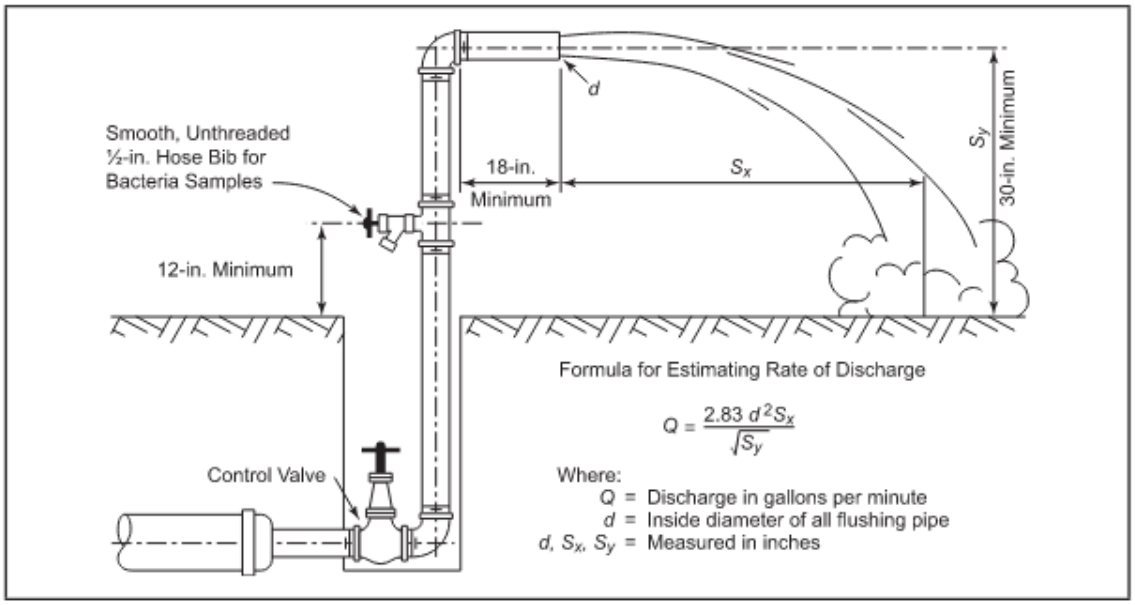
the purchaser determines that conditions do not permit the required flow to be dis-charged to waste. Table 3 shows the rates of flow required to produce a velocity of 3.0 ft/sec (0.91 m/sec) in commonly used sizes of pipe. (Note: flushing is no substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity, and pigging of the main, or other suitable method acceptable to the purchaser, may be required.) Where such flow rates are not possible, flushing at the maximum expected flow rate for the line for 2–3 volumes may be acceptable. For larger mains, pigging (or other suitable method acceptable to the purchaser) is an option in place of high velocity flushing. For 24-in. (600-mm) or larger diameter mains, an acceptable alternative to flushing is to broom-sweep the main, carefully removing sweepings prior to filling and chlorinating the main. Warning: OSHA requirements for confined space need to be addressed before entering a pipeline.

4.4.3 Procedure for chlorinating the main.

1. Potable water may be supplied from a temporary backflow-protected connection to the existing distribution system or other supply source approved by the purchaser. The cross-connection control device shall be consistent with the degree of hazard for backflow protection of the active distribution system (see Figure 1). The flow shall be at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated using a Pitot gauge in the discharge, measuring the time to fill a container of known volume, or measuring the trajectory of the discharge and using the formula shown in Figure 2. The main should undergo hydrostatic testing prior to disinfection.

2. At a point not more than 10 ft (3 m) downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. To ensure that an appropriate concentration is achieved, the free chlorine concentration shall be measured at regular time intervals in accordance with the procedures

described in Standard Methods for the Examination of Water and Wastewater or AWWA Manual M12, or using appropriate chlorine test kit (see appendix A). Table 4 gives the amount of chlorine required for each 100 ft (30.5 m) of pipe for various pipe diameters. Solutions with a minimum 1 percent chlorine concentration may be prepared with sodium hypochlorite or calcium hypochlorite. The latter solution requires 1 lb (454 g) of calcium hypochlorite in 8 gal (30.3 L) of water.



NOTE: This figure applies to pipes up to and including 8-in. (200-mm) diameter.

Figure 2 Suggested combination blowoff and sampling tap

Table 4 Chlorine required to produce an initial 25-mg/L concentration in 100 ft (30.5 m) of pipe by diameter

Pipe Diameter		100% Chlorine		1% Chlorine Solution	
in.	*(mm)*	*lb*	*(g)*	*gal*	*(L)*
4	(100)	0.013	(5.9)	0.16	(0.6)
6	(150)	0.030	(13.6)	0.36	(1.4)
8	(200)	0.054	(24.5)	0.65	(2.5)
10	(250)	0.085	(38.6)	1.02	(3.9)
12	(300)	0.120	(54.4)	1.44	(5.4)
16	(400)	0.217	(98.4)	2.60	(9.8)

3. Chlorine application shall not cease until the entire main is filled with chlorinated water. The chlorinated water shall be retained in the main for at least 24 hr, during which time valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. At the end of this 24-hr period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L of free chlorine.

4. Direct-feed chlorinators, which operate solely from gas pressure in a chlorine cylinder, shall not be used for the application of liquid chlorine (gas). (The danger of using direct-feed chlorinators is that water

pressure in the main can exceed gas pressure in the chlorine cylinder. This allows backflow of water into the cylinder, resulting in severe cylinder corrosion and the escape of chlorine gas.) The preferred equipment for applying liquid chlorine (gas) is a solution-feed, vacuum-operated chlorinator and a booster pump. The vacuum-operated chlorinator mixes the chlorine gas in solution water; the booster pump then injects the chlorine solution into the main to be disinfected. Hypochlorite solutions may be applied to the water main with a chemical-feed pump designed for feeding chlorine solutions. Feed lines shall be made of material capable of withstanding the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main.

Sec. 4.5 Slug Method of Chlorination

4.5.1 Slug method.

The slug method consists of completely filling the main to eliminate air pockets; flushing the main to remove particulates; then slowly flowing through the main a slug of water dosed with chlorine to a concentration of 100 mg/L. The slow rate of flow ensures that all parts of the main and its appurtenances will be exposed to the highly chlorinated water for a period of not less than 3 hr.

4.5.2 Preliminary flushing.

Same as Sec. 4.4.2.

4.5.3 Procedure for chlorinating the main.

1. Potable water may be supplied from a temporary backflow-protected connection to the existing distribution system or other supply source approved by the purchaser. The cross-connection control device shall be consistent with the degree of hazard for backflow protection of the active distribution system (see Figure 1). The flow shall be at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated using a Pitot gauge in the discharge, measuring the time to fill a container of known volume, or measuring the trajectory of the discharge and using the formula shown in Figure 2. The main should undergo hydrostatic testing prior to disinfection.

2. At a point not more than 10 ft (3 m) downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 100 mg/L free chlorine. To ensure that this concentration is achieved, the free chlorine concentration shall be measured at regular time intervals sufficient to guide the completion of the successful loading of the target chlorine concentration. The chlorine shall be applied continuously and for a sufficient period to develop a solid column, or slug, of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/L for at least 3 hr.

3. The free chlorine residual shall be measured in the slug as it moves through the main. If at any time it drops below 50 mg/L, the flow shall be stopped; chlorination equipment shall be relocated at the head of the slug; and, as flow resumes, chlorine shall be applied to restore the free chlorine in the slug to not less than 100 mg/L.

4. As chlorinated water flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

Sec. 4.6 Spray Disinfection for Large Transmission Lines

For very large transmission mains (where personnel or equipment may safely enter the pipe), spray disinfection may be an appropriate and efficient means of achieving disinfection. For this method, refer to ANSI/AWWA C652, Sec. 4.3.2 (Disinfection of Water Storage Facilities; Chlorination Method 2). In general, once pipe is cleaned, spray a 200-mg/L free chlorine solution on all surfaces. After 30 min, fill line and sample as described in Sec. 5.1.

Sec. 4.7 Basic Disinfection Procedure for New Mains

The basic disinfection procedure consists of

1. Inspecting materials to be used to ensure their integrity.

2. Preventing contaminating materials from entering the water main during storage, construction, or repair and noting potential contamination at the construction site.

3. Removing, by flushing or other means, those materials that may have entered the water main or appurtenances.

4. Preventing contamination of existing mains from cross-connection during flushing, pressure testing, and disinfection.

5. Pressure testing the water main to ensure the main meets the purchaser's allowable leakage rate. Hydrostatic pressure tests should be conducted with potable water.

6. Chlorinating and adequately documenting the process used for disinfection.

7. Flushing the chlorinated water from the main. Refer to ANSI/AWWA C655 Field Dechlorination for dechlorination procedures, if dechlorination is required.

8. Determining the bacteriological quality of water samples collected from the pipe by laboratory test after disinfection.

9. Final connecting of the newly disinfected water main to the active distribution system without sacrificing sanitary practices and conditions.

Sec. 4.8 Preventive and Corrective Measures During New Construction

4.8.1 General.

Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing these organisms. Therefore, the procedures of this section must be observed to ensure that a water main and its appurtenances have been thoroughly cleaned for the final disinfection by chlorination. Also, any connection of a new water main to the active distribution system before the receipt of satisfactory bacteriological samples may constitute a cross-connection. Therefore, the new main must be isolated until bacteriological tests described in Section 5 of this standard are satisfactorily completed.

4.8.2 Keeping pipe clean and dry.

The interiors of pipes, fittings, and valves shall be protected from contamination.

4.8.2.1 Openings.

Openings in the pipeline shall be closed with water-tight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Rodent-proof plugs may be used when watertight plugs are not practicable and when thorough cleaning will be performed by flushing or other means.

4.8.2.2 Stringing pipe.

Pipe delivered for construction shall be strung to minimize the entrance of foreign material.

4.8.2.3 Delays.

Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the lower the risk of contamination.

4.8.3 Joints.

Joints of pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is free of standing water and mud that may enter the pipe.

4.8.4 Packing materials.

Yarning or packing material shall consist of molded or tubular rubber rings, rope of treated paper, or other approved materials. Materials such as jute or hemp shall not be used. Packing material shall be handled in a manner that avoids contamination.

4.8.5 Sealing materials.

No contaminated material or any material capable of supporting growth of microorganisms shall be used for sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water meeting the requirements of NSF/ANSI 61 and shall not contribute odors. It shall be delivered to the job in closed containers and shall be kept clean and applied with dedicated clean applicators.

4.8.6 Cleaning and swabbing.

If dirt enters the pipe, it shall be removed and the interior pipe surface swabbed with a minimum 1 percent free chlorine disinfecting solution. If, in the opinion of the purchaser, the dirt remaining in the pipe will not be removed using the flushing operation, the interior of the pipe shall be cleaned using mechanical means, such as a hydraulically propelled foam pig (or other suitable device acceptable to the purchaser) in conjunction with the application of a minimum 1 percent free chlorine disinfecting solution. The cleaning method used shall not force mud or debris into the interior pipe-joint spaces and shall be acceptable to the purchaser.

4.8.7 Wet-trench construction.

If it is not possible to keep the pipe and fittings dry during installation, a scour flush at 3.0 ft/sec (0.91 m/sec) or greater for a minimum of three pipe volumes (see Table 3) followed by slug or continuous-feed chlorination and bacteria testing before release is required. For larger mains, pigging or other suitable method acceptable to the purchaser is an option in place of high-velocity flushing.

4.8.8 Flooding by storm or accident during construction.

If the main is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the main is clean. The section exposed to the floodwater shall then be filled with a chlorinated potable water that, at the end of a 24-hr holding period, will have a free chlorine residual of not less than 25 mg/L. The chlorinated water may then be drained or flushed from the main. If chemical contamination occurs, such as a hydraulic oil leak or petroleum product spill, the pipe sections exposed to the contamination should be replaced and not reused for potable water applications. After construction is completed, the main shall be dis-infectedusing the continuous-feed, slug, or spray methods.

4.8.9 Backflow protection (optional).*

As an optional procedure (if required by the purchaser), the new water main shall be kept isolated from the active distribution system using a physical separation (see Figure 1) until satisfactory bacterio-logical testing has been completed and the disinfection water flushed out. Water required to fill the new main for hydrostatic pressure testing, disinfection, and flushing shall be supplied through a temporary connection between the distribution system and the new main or other supply source approved by the purchaser.

The temporary connection shall include an appropriate cross-connection control device consistent with the degree of hazard (a double check valve assembly or a reduced pressure zone assembly) and shall be disconnected (physically separated) from the new main during the hydrostatic pressure test. It will be necessary to reestablish the temporary connection after completion of the hydrostatic pressure test to flush out the disinfectant water prior to final connection of the new main to the distribution system. Note: Exposure to high levels of chlorine or high pH can cause severe irritation to customers. Also, the chlorinated water can be high in disinfection by-products.

Sec. 4.9 Final Flushing for New Mains

4.9.1 Clearing the main of heavily chlorinated water.

After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or to prevent corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main fittings, valves, and branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use.

4.9.2 Disposing of heavily chlorinated water.

The environment to which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine (see ANSI/AWWA C655 for neutralizing chemicals). Where necessary, federal, state, local, or provincial regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

Sec. 4.10 Final Connections to Existing Mains

Water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological sample results received prior to permanent connections being made to the active

distribution system. Sanitary construction practices must be followed during installation of the final connection so that there is no contamination of the new or existing water main with foreign material or groundwater.

4.10.1 Connections equal to or less than one pipe length (generally ≤20 ft [6 m]).

The new pipe, fittings, and valve(s) required for the connection may be spray disinfected or swabbed with a minimum 1 percent solution of chlorine just before being installed, if the total length of the connection from the end of a new main to the existing main is equal to or less than 20 ft (6 m).

4.10.2 Connections greater than one pipe length (generally >20 ft [6 m]).

The pipe required for the connection must be set up aboveground, disinfected, and bacteriological samples taken, as described in Section 5, if the total length of the connection from the end of a new main to the existing main is greater than 20 ft (6 m). After satisfactory bacteriological sample results have been received for the predisinfected pipe, the pipe can be used in connecting the new main to the active distribution system. Between the time the satisfactory bacteriological sample results are received and the time that the connection piping is installed, the ends of the piping must be sealed with plastic wraps, watertight plugs, or caps.

Sec. 4.11 Disinfection Procedures When Cutting Into or Repairing Existing Pipe

4.11.1 General.

The planned, unplanned, or emergency repair of a water main or appurtenance (e.g., valve) is time sensitive—an important goal is to minimize the disruption of water service to customers. Nonetheless, the repair work needs to be accomplished using sanitary and safe procedures by well-trained crews with proper supervision and guidance. Refer to preventive and corrective measures described previously in Sec. 4.8.2, 4.8.3, 4.8.4, and 4.8.5. Follow all personal protection precautions when working with chlorine solutions.

4.11.2 Basic disinfection.

Work should follow basic disinfection and contamination prevention procedures:

1. Preventing contaminants from entering the existing pipe during the repair such as by maintaining positive pressure in the leaking pipe until the repair site on the pipe is fully exposed, by maintaining a dewatered trench, and by keeping all pipe materials being used in the repair in a clean and sanitary condition.

2. Inspecting and cleaning, followed by disinfection of spraying or swabbing with a minimum 1 percent chlorine solution:

- Exposed portions of existing pipe interior surfaces
- Pipe materials used in the repair
- Handheld materials and tools used to make the repair

3. As appropriate, advising affected customers to adequately flush their ser-vice lines upon return to service.

4.11.3 Selection of disinfection procedure.

The disinfection procedure selected should be determined by the conditions and severity of the main break. Many leaks or breaks can be repaired under controlled conditions without depressurizing the water main, such as when applying a clamp to a small crack or hole, thus preventing contaminants from entering the water system. In most other situations, the water main can be maintained pressurized until the break site is secured and the pipe is fully exposed. Some circumstances (e.g., severe erosion of the local environment or icing of the roadway) that impact public safety may require that water pressure be substantially reduced prior to exposing the pipe in the area of the leak. In some cases, situations become catastrophic where there is a pipe blowout and a loss of water pressure prior to shutdown, requiring disinfection procedures equivalent to those of a new main installation. The procedures described in

Sec. 4.11.3.1 through 4.11.3.3 describe the contamination risks and the associated disinfection and sampling requirements for different scenarios of pipeline repair. Specific situations not captured below need to be evaluated and the appropriate disinfection and sampling methods followed.

Note that the procedures explained in Sec. 4.11.3.1, 4.11.3.2, and 4.11.3.3 for distribution mains may need to be modified for large transmission mains. Large mains may need additional work (such as having a valve replaced or requiring a special order on a connection), may be out of service for more than a day, or may not be able to accommodate a scour flush. These modifications need to be made on a case-by-case basis but should still take into account the procedures outlined in ANSI/AW WA C651.

4.11.3.1 Controlled pipe repair without depressurization.

In this situation, activities are well controlled and a full shutdown is not needed, thus maintaining positive pressure to the area of shutdown and around the break site at all times. The repair site is exposed and the trench is adequately dewatered so that the repair site can be cleaned and disinfected by spraying or swabbing with a minimum 1 percent chlorine solution. The water main is then returned to service with flushing to obtain three volumes of water turnover, making sure that the flushed water is visually clear. No bacteriological testing is necessary. It is advisable to check for a typical system chlorine residual, and if not found, to continue flushing until residuals are restored to levels maintained in the distribution system by the water utility—if the system operates with a disinfectant residual.

4.11.3.2 Controlled pipe repair with depressurization after shutdown.

In this situation, after the repair site has been exposed and secured from trench soil/ water contamination, the water main is depressurized by a shutdown to complete the repair. The repair site should be cleaned and disinfected by spraying or swabbing with a minimum 1 percent chlorine solution. The water main is then returned to service with flushing to scour the pipe and obtain three volumes of water turn-over, making sure that the flushed water is visually clear. It is advisable to check for a typical system chlorine residual, and if not found, to continue flushing until residuals are restored to levels maintained in the distribution system by the water utility—if the system operates with a disinfectant residual. When the existing pipe has to be opened and the interior surfaces of the water system exposed to the environment, additional procedures need to be followed. The existing pipe should be inspected and cleaned with the help of flushing water into the trench, where possible, until the flush water runs visually clear. The repair site should be accessible and the trench adequately dewatered so that the repair site can be cleaned and disinfected by spraying or swabbing with a minimum 1 percent chlorine solution. Additionally, any

accessible upstream and downstream interior of the existing pipe should be disinfected by swabbing or spraying with a minimum 1 percent chlorine solution. If the repair requires a full pipe section replacement, the new pipe should be inspected, cleaned, and disinfected from both ends by swabbing with a minimum 1 percent chlorine solution. The water main may then be returned to service after flushing to scour the pipe and obtain three volumes of water turnover. The flushed water should run visually clear, have a measurable chlorine residual if the system operates with a residual, and be checked with bacteriological testing. The pipeline may be returned to service prior to obtaining bacteriological results.

4.11.3.3 Uncontrolled pipe break with a likelihood of water contamination or loss of sanitary conditions during repair.

In situations in which the existing main to be repaired could not be protected and kept free of contamination and there are obvious signs of contamination (e.g., muddy trench water flowing into the broken pipe and a leaking sewer pipe in the trench, or catastrophic pipe failure where pipe is open and there is a likelihood that contamination was drawn into the active system) or when a controlled repair situation turns into a situation in which the internal pipe and water have become contaminated, the procedures outlined in Sec. 4.3, 4.4, 4.5, or 4.6 should be followed where practical. These methods specify chlorine doses of 25–300 mg/L; however, such levels may present greater harm if the line or services cannot be reliably isolated or shut down and exposure of customers to high concentrations of chlorine cannot be controlled. Free chlorine residuals up to 4 mg/L (based on annual averages) are allowed by federal drinking water regulations; therefore this level is suggested as a minimum to be maintained for at least 16 hr in conjunction with flushing, coliform sampling, and associated customer education. Such situations require careful review and need to balance the public health risks of the pipeline failure as well as the repair process. Where practical and appropriate considering the risks of public exposure to high concentrations of chlorine, in addition to the procedures previously described in this standard, the section of pipe in which the break is located shall be isolated, all service connections shut off, and the section flushed and disinfected. If the slug chlorination method is employed, the dose may be increased to as much as 300 mg/L and the contact time reduced to as little as 15 min. After chlorination and repair, perform scour flushing at 3.0 ft/sec (0.91 m/sec) or greater for a minimum of three pipe volumes and continue until discolored water is not observed and the chlorine residual is restored to the levels maintained in the distribution system by the water utility. For larger-diameter pipe (12 in. and greater), if a water velocity of 3.0 ft/sec (0.91 m/sec) cannot be achieved, it is desirable to flush at the maximum flow for the main until three pipe volumes have been displaced before returning the main to service. The flushed water should run visually clear, and have typical system chlorine residual (if the system operates with a disinfectant residual). For very-large-diameter pipe (where personnel may safely enter the pipe), in lieu of flushing following disinfection, the interior of the pipe at the repair site may be cleaned by sweeping or high pressure wash using potable water before disinfection. Standing water and debris from the cleaning must be removed from the pipe prior to disinfection. The affected pipe shall be disinfected by swabbing or spraying with a minimum 1 percent chlorine solution. After following the appropriate methods above, prior to returning the pipe to service, the efficacy of the disinfection procedure shall be verified by testing for the absence of coliform bacteria. If allowed by local regulations, the pipeline may be returned to limited service prior to obtaining bacteriological results with proper notification of the affected customers.

4.11.4 Temporary service lines.

Temporary water service lines to customers during main repair activities shall be disinfected prior to use. Materials shall meet the NSF/ANSI 61 certification for potable water use. Disinfection should be accomplished by the procedures in Sec. 4.4 or 4.5 followed by scour flushing at 3.0 ft/sec (0.91 m/sec) or greater for a minimum of three pipe volumes (see Table 3), or until the water runs visually clear and preferably a measurable chlorine residual is restored.

SECTION 5: VERIFICATION

Sec. 5.1 Bacteriological Tests

5.1.1 Standard conditions for new mains.

It should be recognized that the primary means of ensuring the sanitary integrity of a main are the sanitary handling of materials, the practices during construction, and continual inspection of work. After disinfection and final flushing such that typical system chlorine residuals are present, if the system operates with a residual, samples shall be collected as follows:

5.1.1.1 For new mains, the purchaser has two options for the bacteriological testing for total coliform analysis.

Option A: Before approving a main for release, take an initial set of samples and then resample again after a minimum of 16 hr using the sampling site procedures outlined. Both sets of samples must pass for the main to be approved for release.

Option B: Before approving a main for release, let it sit for a minimum of 16 hr without any water use. Then collect, using the sampling site procedures outlined and without flushing the main, two sets of samples a minimum of 15 min apart while the sampling taps are left running. Both sets of samples must pass for the main to be approved for release. A set of samples includes all samples collected along the length of the pipeline, as described in Sec. 5.1.1.2.

5.1.1.2 For new mains, sets of samples shall be collected every 1,200 ft (370 m) of the new water main, plus one set from the end of the line and at least one from each branch greater than one pipe length.

5.1.1.3 If trench water has entered the new main during construction or if, in the opinion of the purchaser, excessive quantities of dirt or debris have entered the new main, bacteriological samples shall be taken at intervals of approximately 200 ft (61 m), and the sampling location shall be identified (see Sec. 5.1.3 for sampling location details). Samples shall be taken of water that has stood in the new main for at least 16 hr after final flushing has been completed.

5.1.1.4 A standard heterotrophic plate count (HPC) test may be required at the option of the purchaser because new mains do not typically contain coliform bacteria but often contain HPC bacteria. If sample results show HPC greater than 500 CFU/mL, flushing should resume and another set of HPC and coliform samples collected until no coliform are present and the HPC is less than 500 CFU/mL.

5.1.2 Standard conditions for repaired mains.

It should be recognized that the primary means of ensuring the sanitary integrity of a main are the sanitary handling of materials, the practices during repair work, and continual inspection of work. After disinfection and final flushing, samples shall be collected as follows:

5.1.2.1 For repaired mains that were depressurized and/or wholly or partially dewatered, one set of samples may be required, and depending upon the sanitary conditions, the line may be reactivated prior to the completion of bacteriological testing. Samples shall be collected downstream of the repair site and at intervals of approximately 200 ft (61 m) within the length of pipe that was shut down. If direction of flow is not known, samples shall be collected on either side of the repair site. Refer to Sec. 4.11.

5.1.2.2 For repaired mains that were maintained under pressurized conditions at all times, disinfection and/or testing may not be required. Refer to Sec. 4.11.3.

5.1.2.3 However, under either main repair scenario, it is advisable where possible to provide a scour flush to clear before the release of the repaired section.

5.1.3 Sampling procedure.

Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate, in accordance with Section 9060—Samples of Standard Methods for the Examination of Water and Wastewater. Hoses and fire hydrants are not recommended for the collection of samples that will be used to make decisions on the bacteriological quality of drinking water. How-ever, if no sampling port is available, cleaned fire hydrants that have been cleared of standing water and/or other sanitized sampling apparatus (i.e., sanitized tubing, hose, gooseneck, spigot) may be used with the understanding that they do not rep-resent optimum access to the water main for bacteriological sampling. A suggested combination blowoff and sampling tap used for mains up to and including 8-in. (200-mm) diameter is shown in Figure 2. There should be no water in the trench up to the connection for sampling. The sampling pipe must be dedicated and clean and disinfected and flushed prior to sampling. A corporation cock may be installed in the main with a copper-tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use and the corporation cock should be capped or taped for future reuse. If corporation cocks are placed at the 12 o'clock position, they may be struck more easily during future excavations.

5.1.4 Sample results.

Samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater and shall show the absence of coliform bacteria. In addition, it is recommended that samples be tested for acceptable aesthetic quality (e.g., chlorine residual, pH, alkalinity, specific conductance, turbidity). Levels should be as expected or typical for the water system. For new mains, a standard heterotrophic plate count test may be required at the option of the purchaser because new mains do not typically contain coliform bacteria but often contain HPC bacteria. If sample results show HPC greater than 500 CFU/mL, flushing should resume and another set of HPC and coliform samples collected until no coliform are present and the HPC is less than 500 CFU/mL.

5.1.5 Record of compliance. The record of compliance shall be the bacteriological test results certifying that the water sampled is free of coliform bacteria contamination.

5.1.6 Redisinfection.

If the initial disinfection fails to produce satisfactory bacteriological results, or if other results indicate unacceptable water quality, the main may be reflushed and shall be resampled. If check samples fail to

produce acceptable results, the main shall be rechlorinated by the continuous-feed or slug method until satisfactory results are obtained—that being acceptable samples taken as described in Sec. 5.1.1.1.

Note: In the case of new mains, high velocities in the adjacent existing system, resulting from flushing the new main, may disturb sediment that has accumulated in the existing mains. When check samples are taken, it is advisable to sample water entering the new main to determine if excessive turbidity is present that could be interfering with results.

Sec. 5.2 Optional Sampling and Testing

If a pipeline is not promptly returned to service, the situation should be evaluated to determine if the water quality may have been impacted and if additional testing is warranted. Test results should confirm that the water quality is appropriate for distribution. Although this assessment is unique for each system, parameters considered for testing include disinfectant residual, total coliform bacteria, HPC, turbidity, pH, alkalinity, total chlorine, odor, and specific conductance.

Table B.1 Amounts of chemicals required to produce various chlorine concentrations in 100,000 gal (378.5 m^3) of water*

Desired Chlorine Concentration in Water	Liquid Chlorine Required		Sodium Hypochlorite Required						Calcium Hypochlorite Required	
			5% Available Chlorine		10% Available Chlorine		15% Available Chlorine		65% Available Chlorine	
mg/L	*lb*	*(kg)*	*gal*	*(L)*	*gal*	*(L)*	*gal*	*(L)*	*lb*	*(kg)*
2	1.7	(0.77)	3.9	(14.7)	2.0	(7.6)	1.3	(4.9)	2.6	(1.18)
10	8.3	(3.76)	19.4	(73.4)	9.9	(37.5)	6.7	(25.4)	12.8	(5.81)
50	42.0	(19.05)	97.0	(367.2)	49.6	(187.8)	33.4	(126.4)	64.0	(29.03)

*Amounts of sodium hypochlorite are based on concentrations of available chlorine by volume. For either sodium hypochlorite or calcium hypochlorite, extended or improper storage of chemicals may have caused a loss of available chlorine.

Table B.2 Amounts of chemicals required to produce chlorine concentration of 200 mg/L in various volumes of water*

Volume of Water		Liquid Chlorine Required		Sodium Hypochlorite Required						Calcium Hypochlorite Required	
				5% Available Chlorine		10% Available Chlorine		15% Available Chlorine		65% Available Chlorine	
gal	*L*	*lb*	*(g)*	*gal*	*(L)*	*gal*	*(L)*	*gal*	*(L)*	*lb*	*(g)*
10	(37.9)	0.02	(9.1)	0.04	(0.15)	0.02	(0.08)	0.02	(0.08)	0.03	(13.6)
50	(189.3)	0.10	(45.4)	0.20	(0.76)	0.10	(0.38)	0.07	(0.26)	0.15	(68.0)
100	(378.5)	0.20	(90.7)	0.40	(1.51)	0.20	(0.76)	0.15	(0.57)	0.30	(136.1)
200	(757.1)	0.40	(181.4)	0.80	(3.03)	0.40	(1.51)	0.30	(1.14)	0.60	(272.2)

*Amounts of sodium hypochlorite are based on concentrations of available chlorine by volume. For either sodium hypochlorite or calcium hypochlorite, extended or improper storage of chemicals may have caused a loss of available chlorine.

STANDARD OPERATING PROCEDURE (SOP) FOR FLUSHING SERVICE LINES

References

American Water Works Association (AWWA), April 2020 – Notice on returning homes to service www.awwa.org/Resources-Tools/Resource-Topics/Coronavirus#10681543-shutoffs-and-return-to-service-guidance

AANSI/ASHRAE, 2019 – Standard 188-2018, Legionellosis: Risk Management for Building Water Systems https://www.ashrae.org

Centers for Disease Control and Prevention (CDC), April 2020 – Guidance for Building Water Systems https://www.cdc.gov/coronavirus/2019-ncov/php/building-water-system.html

Environmental Science, Policy & Research Institute (ESPRI), April 2020 – Building Water Quality and Coronavirus: Flushing Guidance for Periods of Low or No Use https://esprinstitute.org/coronavirus-building-flushing-guidance

U.S. Environmental Protection Agency (USEPA), May 2020 – Maintaining or Restoring Water Quality in Buildings with Low or No Use https://www.epa.gov/coronavirus/information-maintaining-or-restoring-water-quality-buildings-low-or-no-use

Water Research Foundation (WRF), May 2019 – Flushing Guidance for Premise Plumbing and Service Lines to Avoid or Address a Drinking Water Advisory www.waterrf.org/system/files/resource/2019-05/4572.pdf

Scope

This SOP provides the work instructions for flushing drinking water service lines installed from the meter to the residence. This procedure is based on information provided by American Water Works Association, the Environmental Science, Policy, and Research Institute, the Centers for Disease Control and Prevention, and the United States Environmental Protection Agency.

Procedure

The installer will perform the following steps to effectively flush the service line:

1. Initiate a Residential Flush documentation form, attached.
2. Inspect and map out the residence's water system, including location where water enters the residence and all water-related devices and connections (e.g. toilets, showers, irrigation systems, water heaters, water treatment devices, kitchen and bath faucets, ice machines, decorative fountains, hot tubs, pools, hose bibs, dishwashers, washing machines, etc.).
3. Remove, isolate or bypass devices like treatment units, cooling systems, irrigation systems, etc.
4. Take steps to prevent backflow or the siphoning of contaminants into plumbing (e.g., close valves separating irrigation systems from building plumbing, disconnect hoses attached to faucets, etc.).
5. Make sure that all drains are open to prevent flooding.

6. Organize flushing to maximize the flow of water. Open several outlets simultaneously to flush the service line and then flush outlets individually starting near where the water enters the facility.
7. Run water through all outlets (e.g., hose bibs, faucets, showerheads, flushometers, etc.), while removing aerators when possible. Typical durations in existing protocols range from 10 to 30 minutes for each outlet.
8. Flush the cold water lines first and then the hot water lines. Also make sure to drain and flush all systems or appliances that store water (e.g., hot water tanks). For small buildings, the hot water tank can be drained directly; otherwise, it can require up to 45 minutes to fully flush a typical 40-gallon hot water tank. You can detect if flushing was adequate when the hot water tap runs cold.
9. Flush until air is purged from lines and discolored/cloudy water dissipate (typically entrained air will give water a whitish, milky appearance).
10. For all point-of-use (POU) filters that have previously filtered the shallow groundwater, replace the POU filters, including the filters in refrigerators.
11. Ensure hot water storage tanks are set at temperatures that prevent the growth of Legionella bacteria (at least 120°F and ideally >140°F). Also, when applicable, follow all other Legionella prevention guidance that have been identified by CDC, such as decorative fountain cleaning, hot tub maintenance, and cooling tower maintenance (see CDC link, below).

These procedures will be documented on the attached Maintain records of flushing details, such as dates/times of flushing, approximate volume of water flushed, the sequence of flushing steps, and a list of appliances, tanks, and treatment systems that were cleaned/flushed. If another round of flushing is needed at a future date, records could help optimize the flushing process for your building.

DRINKING WATER SERVICE LINE FLUSHING FORM

Project: Client:

Date:

Address:

Calculate volume of water in service line:_____ gallons.

Diagram (can be line or plan) of Residence's Water System (SOP Step No. 1)

List devices that require isolation/bypass (treatment units/refrigerator/cooling system, irrigation, etc.):

1.	Confirm Isolated/bypassed (date/time):
2.	Confirm Isolated/bypassed (date/time):
3.	Confirm Isolated/bypassed (date/time):
4.	Confirm Isolated/bypassed (date/time):
5.	Confirm Isolated/bypassed (date/time):
6.	Confirm Isolated/bypassed (date/time):
7.	Confirm Isolated/bypassed (date/time):
8.	Confirm Isolated/bypassed (date/time):

Describe potential sources of backflow/siphoning, and for each source, describe steps taken to prevent backflow or siphoning. Include draining any water storage units, such as water heater:

Confirm all drains are open to prevent flooding (Date/Time confirmed): _____

Starting in Line 2, below, list locations of valves/outlets in order of flushing: nearest to farthest and cold before hot:

1. Volume of service line: gallons	Date/Time Flushed:	Duration:
2.	Date/Time Flushed:	Duration:
3.	Date/Time Flushed:	Duration:
4.	Date/Time Flushed:	Duration:
5.	Date/Time Flushed:	Duration:
6.	Date/Time Flushed:	Duration:
7.	Date/Time Flushed:	Duration:
8.	Date/Time Flushed:	Duration:
9.	Date/Time Flushed:	Duration:
10.	Date/Time Flushed:	Duration:
11.	Date/Time Flushed:	Duration:
12.	Date/Time Flushed:	Duration:
13.	Date/Time Flushed:	Duration:
14.	Date/Time Flushed:	Duration:

Record date and time each valve/outlet is flushed and the duration in minutes. Flush until air is purged from line and discolored/cloudy water dissipates.

List all point-of-use filters previously exposed to shallow groundwater and indicate when they were replaced:

1.	Date/Time Replaced:
2.	Date/Time Replaced:
3.	Date/Time Replaced:
4.	Date/Time Replaced:
5.	Date/Time Replaced:
6.	Date/Time Replaced:

Ensure hot water supply is set to temperature at least 120°F. Confirmed Date/Time:_____

Appendix I: Accident Prevention Plan/Site Safety and Health Plan (Redacted)

Appendix J: Island County's Accommodations of Utilities

Island County Accommodations of Utilities

1. Purpose:

The purpose of this document is to establish County administrative and procedural guidance needed to accommodate the installation and relocation of all above and below ground utilities which are located within the County road right-of-way.

Such accommodation of utilities shall place primary emphasis on road traffic operation and safety; utilities shall be accommodated in such a manner as not to materially degrade or adversely affect traffic operation, safety, and structural integrity of the roadway.

2. Definition of Terms

Unless otherwise stated, words and phrases used herein shall have the following meanings:

Appurtenance: Equipment and/or accessories which are a necessary part of an operating utility system or subsystem.

Backfill: replacement of excavated material with suitable material compacted as specified around and over a pipe, conduit, casing or gallery.

Bedding: replacement of excavated material with suitable material compacted as specified around and over a pipe conduit, casing or gallery.

Boring: grade and alignment-controlled mechanical or other method of installing a pipe or casing under a road without disturbing the surrounding medium.

Carrier: pipe directly enclosing a transmitted fluid or gas.

Casing: a larger pipe enclosing a carrier for the purpose of providing structural or other protection to the carrier and/or to allow for carrier replacement without re-excavation, jacking or boring.

Coating: protective material applied to the exterior of a pipe or conduit to prevent or reduce abrasion and/or corrosion damage.

Conduit: an enclosed tubular runway for protecting wires or cables.

Cover: depth to top of pipe, conduit, casing or gallery below the grade of a road or ditch.

Direct Burial: installation of a utility underground by means of plowing.

Ditch: a trench that has been dug in the earth, usually for drainage purposes.

Drain: appurtenances to discharge accumulated liquids from casings or other enclosures.

Emergency Repair: any sudden, unusual, unexpected occasion or occurrence by an Act of Nature or deterioration causing the failure of a utility line or structure that requires the immediate repair or replacement to avoid the destruction or failure of the traveled roadway structure posing a safety threat to the public.

Encasement: structural element surrounding a pipe or conduit for the purpose of preventing future physical damage to the pipe or conduit.

Franchise - occupancy and use document granted by the County required for occupancy of road rights-of-way in accordance with RCW 36.55 and RCW 80.32.

Gallery: underpass for two or more utility lines.

Manhole: an opening in an underground utility system into which workers or others may enter for the purpose of making installations, inspections, repairs, connections, cleaning and testing.

Pavement: the combination of subbase, base course, and surfacing placed on a subgrade to support the traffic load and distribute it to the subgrade.

Pipe: a structural tubular product designed, tested and produced for the transmittance of specific liquids and gases under specific conditions.

Plowing: direct burial of utility lines by means of a 'plow' type mechanism which furrows the ground, places the utility line at a predetermined depth in the furrow and closes the furrow in the ground.

Pressure: internal gage pressure in a pipe in pounds per square inch, gage (psig).

Private Lines: privately owned, operated and maintained utility facilities devoted exclusively to the use of the owner.

Restoration: all work necessary to replace, repair or otherwise restore the right-of-way and all features contained within to the same or equal condition as before any change or construction thereto.

Right-of-Way: a general term denoting public land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes.

Road (or Roadway): a general term denoting a street, road or other public way, including shoulders, designated for the purpose of vehicular traffic.

Road Cut: trenching across a roadway to install underground utility lines or to cut through a pavement surface to install valves or appurtenances.

Sleeve: short casing through a pier, wall or abutment of a highway structure.

Traffic Control: those activities necessary to safeguard the general public, as well as all workers, during the construction and maintenance of utility facilities within the right-of-way.

Trenched: installation of a utility in an open excavation.

Untrenched: installation of a utility without breaking the ground or pavement surface such as by jacking or boring.

Vent: - appurtenance to discharge gaseous contaminants from casings or other enclosures.

3. GENERAL CONDITIONS AND REQUIREMENTS

A. LOCATION

(1) Utility installations shall be located so as to minimize need for later adjustment to accommodate future roadway improvements and to permit access to servicing such installations with minimum interference to roadway traffic. Counties shall make available to utilities a copy of their six-year transportation improvement program (or capital facilities and transportation plan where required) in order to minimize both utility customer and road user inconvenience should future road improvements (on existing or new alignment) require adjustment or relocating of the utility facilities. Said utilities shall, within the limits of standard business practice, make available appropriate short and long range development plans to the County.

(2) Unless otherwise approved by the County, all above-ground utilities and their appurtenances as well as all above-ground appurtenances of below-ground utilities that may constitute a roadside obstacle for traffic using the road shall be located as close as practicable to the edge of the right-of-way line. If an appurtenance within the right-of-way would constitute an unacceptable roadside obstacle, said obstacle may be:

a.relocated to another place within the right-of-way,

b. converted to a·break-away design,

c. crash-protected,

d. relocated to another location off the road right-of-way, or

e. buried below the ground.

(3) Installations that are required for a road purpose, such as street lighting or traffic signals, are to be located and designed in accordance with this policy.

(4) Where existing facilities are in place, new facilities shall be compatible with the existing installations and conform to this policy as nearly as practicable.

B. DESIGN - GENERAL

(1) The GOVERNMENT or its contractors, or subcontractors, shall be responsible for the design of the utility facility being proposed. This responsibility shall include, in addition to the integrity of the proposed utility facility, provisions for public safety during the course of construction as well as full consideration of traffic safety and accident potential for the life of the installation.

(2) The County may review and approve the plans with respect to:

a. location,
b. the manner in which the utility facility is to be installed,
c. measures to be taken to preserve safe and free flow of traffic,
d. structural integrity of the roadway, bridge, or other structure,
e. ease of future road maintenance, and
f. appearance of the roadway.

(3) Provision shall be made for known or planned expansion of the utility facilities, particularly those located underground or attached to bridges or other structures within the right-of-way.

C. STANDARDS AND CODES

All utility installations shall be designed in accordance with the standards, codes and regulations applicable to the type of utility. The methods of installation and materials used shall conform to the codes and standards promulgated by government and by the industry. This shall also include any road design standards which the County shall deem necessary to provide adequate protection to the road, its safe operation, appearance and maintenance.

4. SPECIFIC REQUIREMENTS - UNDERGROUND UTILITIES

A. UNDERGROUND UTILITIES - LOCATION AND ALIGNMENT

(1) For all crossings the angle of crossing should be as near a right angle to the road centerline as practicable. However, lesser angles may be permitted based upon economic considerations of practical alternatives.

(2) Longitudinal installations shall run parallel to the roadway and lie as near as practicable to the highway right-of-way line. Installations which cannot be so installed will be allowed within the right-of-way, provided that:

a. the installation will not adversely affect the design, construction, stability, structural integrity, traffic safety or impede normal maintenance operations as pertains to roadway, shoulder, ditch lines and backslopes;

b. failure to allow such installation will create an undue hardship or financial burden upon the utility;

(3) where irregular shaped portions of the right-of-way extend beyond the normal right-of-way limits, a uniform alignment of facilities may be allowed; and

(4) preferred locations shall be as described in ICC 11.01 .080 Utilities a., b., and c. Nothing herein shall be construed to preclude the County Engineer from directing the installation of utilities to be placed in/at a specific location, depth or alignment in concurrence with Provision No. 4 GENERAL CONDITIONS AND REQUIREMENTS.

B. UNDERGROUND UTILITIES – COVER

(1) The grade of and resulting cover for an underground utility shall be in compliance with applicable federal, state and county requirements unless otherwise specified.

(2) The cover of the underground utility shall not be less than 36 inches (42 inches for fiber-optic cables) below the actual surface point of the installation within the road right-of-way including ditch bottoms, except that a lesser cover may be permitted where the utility is installed into solid rock.

(3) Where less than the minimum cover is made necessary to avoid obstacles, the utility shall either be rerouted or protected with a casing, concrete slab or other method acceptable to the County.

C. UNDERGROUND UTILITIES –INSTALLATION

Installations shall ensure safety of traffic and preservation of the roadway structure, and required construction shall, unless otherwise provided in the approved permit, be in accordance with the following controls.

(1) Road Cuts, trenched construction and backfill:

a. where the pavement must be removed, it first shall be cut in vertical (or undercut) continuous straight lines using appropriate procedures prescribed by the County;

b. trenches shall be cut to have vertical faces, where soil and depth conditions permit, with a maximum width of outside diameter of pipe plus 2 feet (shoring shall comply with Department of Labor and Industries Safety Code);

c. the pipe or carrier shall be installed and the trench backfilled in a manner assuring no deformation of the pipe likely to cause leakage and destruction of the structural integrity of the roadway structure (specific standards for trench backfill requirements regarding suitable materials and methods shall be provided by the County);

d. when trenching is approved on paved roads, the pavement shall be restored as required by the County; and

e. where possible, utilities should be placed in the same trench when trenching across County road surfaces is necessary. This will reduce the number of crossings and the adverse affects trenching tends to have on road surfaces.

(2) Untrenched construction may be required for pipelines crossing roads paved with asphalt concrete or cement concrete and for roads paved with bituminous surface treatment when directed by the County.

a. If sufficient right-of-way exists, the length of untrenched construction shall extend a minimum of 4 feet from the edges of pavement except that a lesser distance may be permitted by the County Engineer where conditions warrant.

b. Backfill over utility line breaks, unused holes, or abandoned casings shall be placed as directed by the County Engineer.

c. Water boring (jetting) under roadways shall not be permitted.

d. Carriers and conduit installed under a roadway may be physically located prior to pipeline installation.

D. UNDERGROUND UTILITIES - ONE CALL SYSTEM

Utility facilities shall be located and identified in accordance with Title 19 RCW. Chapter 19.122, sections 19.122.010 through 19.122.900 (Washington State One Call System).

5. AESTHETIC/SCENIC CONSIDERATIONS

A. Utility installations shall be designed and constructed to minimize any adverse effect on existing roadside amenities, natural or manmade. Special efforts shall be taken to minimize any negative impact on areas of scenic beauty (i.e., scenic strips, viewpoints, rest areas, recreation areas, public parks, or historic sites, etc.)

B. If the utility intends to use chemical sprays to control or kill weeds and brush, prior approval must be granted at least annually by the County. The County may limit or restrict the types, amounts, and timing of applications if a significant negative impact on the aesthetics of the area is anticipated, provided such limitations or restrictions are not in conflict with State law governing utility right-of-way maintenance.

C. Refuse and debris resulting from the installation or maintenance of the utility facilities shall be promptly removed once work is completed.

6. MISCELLANEOUS PROVISIONS

A. PRESERVATION, RESTORATION AND CLEANUP

(1) The size of any disturbed area necessary to install a utility shall be kept to a minimum.

(2) Restoration methods shall be in accordance with the specifications: of the County and/or a special provisions of the franchise, permit, or agreement.

(3) Unsatisfactory restoration work shall be promptly corrected by the utility.

B. TRAFFIC CONTROL AND PUBLIC SAFETY

(1) Traffic controls, including detours for all utility work, shall conform with the currently applicable "Manual on Uniform Traffic Control Devices for Streets and Highways."

(2) All construction and maintenance operations shall be planned to keep interference with traffic to an absolute minimum. On heavily traveled roads, construction operations interfering with traffic should not be scheduled during periods of peak traffic flow. Work shall be planned so that closure of intersecting streets, road approaches or other access points is held to a minimum.

C. EMERGENCY REPAIRS

(1) All utility facilities shall be kept in a good state of repair. The GOVERNMENT and its contractors, and their subcontractors will assess the situation no later than 48 hours after problem identified; however, the repair timeline will depend on the funding availability on the GOVERNMENT'S contract at the time the problem is identified. The GOVERNMENT will make every effort to rectify the problem in the timely fashion in accordance with the Anti-Deficiency Act (31 U.S.C. § 1341).

(2) If emergency repairs disturb the right-of-way, such repairs and any required restoration may be conducted in a timely fashion in accordance with the Anti-Deficiency Act (31 U.S.C. § 1341). Approval as to the manner of final restoration of the right-of-way shall be secured from the County in a timely fashion.