KITSAP COUNTY

STANDARDS

FOR

SANITARY SEWER CONSTRUCTION

614 Division Street

Port Orchard, Washington 98366

(360) 337-5777

Last Revised: July 2025

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Definitions

- ANSI: American National Standards Institute
- ASTM: American Society for Testing and Materials
- ATS: Automatic Transfer Switch
- AWWA: American Water Works Association
- BHP: Brake Horsepower
- Building Sewer (Upper Lateral): That portion of a sanitary sewer line that will be constructed from the end of the side sewer to the residence or building in which the sewage originates.
- CB: Circuit Breaker
- CDF: Control Density Fill
- CSA: Canadian Standards Association
- Customer: Property owner or resident subscribing to sewer service.
- DCD: (Kitsap County) Department of Community Development
- Developer/Contractor: Land development company or contracted builder. Entity constructing improvements or responsible for constructing improvements to Kitsap County Standard.
- DFT: Dry Film Thickness
- DI: Ductile Iron
- DWV: Drain, Waste, Vent (Pipe)
- EPDM: Ethylene Propylene Diene Monomer (Rubber)
- ETL: Electrical Testing Laboratories
- FL: Flared (fitting) or Flanged
- Flexible pipe: PVC and HDPE will be considered flexible pipe unless defined otherwise herein.
- FM: Factory Manual
- Force Main: Pressurized pipe transmitting sewage from a lift station.
- FPS: Feet Per Second
- FRP: Fiberglass Reinforced Plastic
- GE: Groove End
- GFI: Ground Fault Interrupter
- GP: Grinder Pump
- GPM: Gallons Per Minute
- HDPE: High Density Polyethylene
- HOA: Hands-off-Automatic
- ICRI: International Concrete Repair Institute
- ID: Inner Diameter
- IEEE: Institute of Electrical & Electronic Engineers
- IPCEA: Insulated Power Conductor Engineering Association
- IPS: Individual Pump Station; a small, single pump station designed to provide service to a single residence or business.
- kW: Kilowatt
- LED: Light Emitting Diode
- NACE: National Association of Corrosion Engineers
- NEC: National Electrical Code
- NEMA: National Electrical Manufacturers Association
- NESC: National Electrical Safety Code

- NFPA: National Fire Protection Association
- NPT: National Pipe Thread
- O&M: Operations and Maintenance
- OD: Outer Diameter
- OSHA: Occupational Safety & Health Act
- PE: Plain End
- PLC: Programmable Logic Controller
- Plan: Prepared drawings and specifications stamped and sealed by a licensed Engineer.
- PSF: Pounds per Square Foot
- PSI: Pounds per Square Inch
- PVC: Polyvinyl Chloride
- Rigid Pipe: Ductile Iron or C900/C905 PVC will be considered rigid pipe.
- RTU: Radio Telemetry Unit
- SBR: Styrene-butadiene Rubber
- SDR: Standard Diameter Ratio
- Sewer Main: A gravity sewer that may have direct side sewer connections and receives flow from one or more other mains.
- Sewer Utility Division: Referred to as the County, other divisions named specifically
- Side Sewer (Lower Lateral): that portion of a sewer line that will be constructed between a main sewer line and the property line or easement line (whichever is further) of a residence or other building in which the sanitary sewage originates.
- SSFM: See definition for Force Main
- SSPC: Steel Structures Painting Council
- Standard Specifications: Current edition of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction
- TDH: Total Dynamic Head
- UL: Underwriters Laboratories
- UPC: Uniform Plumbing Code
- VFD: Variable Frequency Drive
- VSD: Variable Speed Drive
- WADOE: Washington Department of Ecology
- WSDOT: Washington State Department of Transportation

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Section 1: General Requirements

1.1 General

1.1.1 These Standards for Sanitary Sewer Construction (Standards) set forth minimum standards for the planning, design, and construction of sanitary sewer facilities in Kitsap County. Although these Standards are intended to apply to physical development within Kitsap County, the standards may not apply for all situations. Compliance with these Standards does not relieve the party responsible for the project of their duty to apply conservative and sound professional judgment. These standards are minimum standards and are intended to assist, but not substitute for, competent work by design professionals. The Kitsap County Public Works Sewer Utility Division, hereby referred to as "the County", may require more stringent requirements than would normally be required under these Standards due to special conditions and/or environmental constraints.

1.1.2 These Standards shall be used in conjunction with the Department of Ecology's most current version of "Criteria for Sewage Works Design." Since the following requirements are general and do not cover all possible situations, the County reserves the right to deviate from these standards if the County feels the project warrants such.

1.1.3 It is the policy of the County that the Developer extend any sanitary sewer improvements to the most distant end of abutting and interior Right of Way or easements unless it is determined by the County, according to its rules and policies, that extension of the sanitary sewer will not be necessary. Developers owning corner property must extend the wastewater system to the far ends of both corners of the property unless it is determined by the County, in its sole discretion, that said extension of the system is not necessary. The wastewater system must be extended to the far end of the development at depths, whenever possible, that enable the County to provide gravity service to upstream properties.

1.1.4 Sewer extensions must provide adequate capacity to allow for the future expansion of the system in conformity with the County's comprehensive planning or future needs as determined by the County. Properties which propose Lift Stations may be required to install expanded storage capacity in their designs for future upstream connections.

1.1.5 All sewer mains and other facilities must be installed in public Right of Way or in recorded utility easements dedicated to the County. The developer or the developer's engineer must check with the County prior to beginning the design of the extension to determine if there is a preferred main location. Utility mains and other facilities installed outside of dedicated Right of Way and required easements, will remain privately owned and maintained by the common property ownership. Some exclusions to this policy may be granted on a case-by-case basis at the discretion of the County.

1.1.6 The County will not inherit, own, or operate septic systems.

1.1.7 Systems constructed in private roadways or within commercial and residential private property will not be dedicated to the County and will remain under private ownership.

1.1.8 Connections to existing sewer mains shall not be made without first receiving all issued permits from Kitsap County. Work shall not be started until all traffic control, materials, equipment, and labor necessary to properly complete the work are assembled on the site. A physical copy of the Permit authorizing such work must be on site at all times. Once work is started on a connection, it must proceed continuously, without interruption, and as rapidly as

possible until complete. No shut-off of sewers will be permitted overnight, over weekends, or during weeks with holidays without prior coordinated bypass efforts authorized by the County. Contractors shall acquaint themselves with all aspects of existing systems prior to starting construction on new sewers. Pertinent information concerning existing systems may be obtained from Kitsap County personnel and may be verified from Kitsap County records. Existing sewer mains, services and other utilities must be located by Contractors prior to beginning work so that they may be properly protected and maintained in service during construction.

1.1.9 When an existing structure is removed and a new structure is constructed, a permit is required, and any existing side sewer that does not meet the current requirements of the County must be replaced.

1.1.10 The licensed Contractor shall be responsible for complying with all requirements (written standard and details) of the County related to sewer construction, for any and all actions or omissions of the Contractor's employees, and for any damage done to existing improvements and utilities encountered during any excavation. If the County must respond to Contractor-caused damages, the contractor will be liable for all costs and expenses incurred.

1.1.11 The Kitsap County Sewer Utility is not responsible for inspection or plan review of building side sewers which extend from the cleanout located at the property line, to the connected structure. For structures connected to a County-owned main within dedicated easements, the County will not be responsible for inspection or plan review of building side sewers which extend from the cleanout at the easement edge to the structure. A cleanout must be located at the edge of property, or easement line. Reference Department of Community Development (DCD) guidelines for requirements for side sewer installations beyond the cleanout at the property line.

1.1.12 Any deviations from the standards and requirements set forth in this document will be at risk of removal and re-installation at the discretion of, and at no cost to, the County.

1.2 Submittals

1.2.1 Whenever a property owner, individual, business, corporation, or other entity desires to connect to the County's sanitary sewer system, certain application materials will be required to be submitted with the first Plan submittal. In order to coordinate the review of Construction Plans for all projects in Kitsap County, the Department of Public Works has implemented a standard procedure for plan submittals in conjunction with the DCD. Please consult with DCD prior to making application.

1.3 Drawing Requirements

1.3.1 Record drawings are required for all construction projects conducted in Kitsap County prior to Acceptance by the County.

1. All Record drawings must be signed/stamped and dated by a State of Washington Registered Engineer or Surveyor.
2. Each sheet of the Record Drawing Plans must include the following statement along with the engineer's professional stamp, signed and dated, located at the bottom right-hand corner of the sheet when possible: "These plans are Record Drawings and the shown information accurately reflects existing field conditions as of this date: _____."

3. The Record Drawing Plans should consist of the design plans submitted, approved, and permitted for the construction project. The information shown must reflect the actual construction completed under the permit including all deviations from the design plans. All changes must be annotated with a cross-out and/or a cloud. This information shall be provided by the engineer of record.
4. Record drawings must be drawn on clean sheets and submitted to the County. Redlined copies may be acceptable for some projects.
5. Electronic drawings shall be submitted in two formats: Adobe PDF and AutoCAD. Adobe PDF files shall be scalable and properly labeled with project and drawing names. CAD files shall include pipeline profiles and styles included for future GIS integration.
6. The sewer utility shall be shown on separate sheets with detailed information. In addition, a composite with all utilities shown together, without detailed information, and focusing on utility crossings is required.

1.4 Siting Considerations

1.4.1 Siting of gravity sewer mains, manholes, and force mains shall be restricted to the public County Right of Way and/or easements dedicated for this utility. Due to the depth of this type of utility, the pipe shall be located as close as possible to the center of the Right of Way, with manholes located in the center of the traveled lane.

1.4.2 Connections to sewers within WSDOT highway Right of Way will not be permitted, unless petitioned to and approved by the County. Cost will not typically be a consideration during review of the petition.

1.5 Easements

1.5.1 The required minimum easement widths centered on the sewer main shall be as follows:

1. 15 feet wide easement for standard sewer depths up to 10 feet below ground surface.
2. 20 feet wide easement for sewer depths between 10 and 15 feet below ground surface.
3. For sewer depths greater than 15 feet below ground surface, easement width shall be determined by the County on a case-by-case basis.

1.6 Developer Responsibilities

1.6.1 General

1.6.1.1 The Developer must complete the proposed sanitary sewer construction in accordance with the approved construction drawings, details, specifications, state requirements, and local regulatory requirements.

1.6.1.2 The Developer shall provide all materials, labor, and equipment necessary to shore trenches to protect the work, existing property, utilities, pavement, etc., and to provide safe work conditions in the trench. The Developer may elect to use any combination of shoring and overbreak, tunneling, boring, sliding trench shield, or other method of accomplishing the work consistent with applicable local, state, and federal safety codes.

1.6.2 Site Work

1.6.2.1 The Developer shall furnish, install, and operate all necessary equipment to keep excavations above the foundation level free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property or nuisance to the public. Sufficient pumping equipment in good working condition shall be available at all times for emergencies, including power outages, and shall have competent workers for the operation of the pumping equipment available at all times. Equipment shall be refueled by the Developer prior to weekends, holidays, or any work stoppage longer than 1 day. Kitsap County reserves the right to take any/all corrective action during equipment failure or emergency and bill the developer for all costs incurred.

1.6.2.2 All existing sewer lines must be kept in service at all times. Provisions shall be made for disposal of sewage flows if any existing sewers are damaged. The Developer must repair damage to existing sewers to a condition equal to or better than their condition prior to the damage, which may include full replacement if necessary. Water accumulating during construction shall be removed from the new sewers but shall not be permitted to enter the existing system. The Developer shall be responsible for flushing out and cleaning any existing sewers into which gravel, rocks, or other debris has entered as a result of the work and must repair lift stations or other facilities damaged by the work at the Developer's expense.

1.6.2.3 All upstream lines must be completely cleaned and successfully tested, prior to connection to existing mainline sewer systems. County staff must be present to witness connection. Rechanneling of the existing manhole may be required.

1.6.2.4 Excavation for a precast concrete wet well shall be sufficient to leave at least 1-foot of clearance between the wet well outer surface and the earth bank. Excavation for a cast in place concrete wet well must allow sufficient space for formwork.

1.6.3 Materials and Equipment

1.6.3.1 The material manufacturer or fabricator shall furnish appropriate certification, based on manufacturer's routine quality control tests, that the materials meet the requirements of the pertinent specifications. The Developer must provide submittals to the County on all materials to be used including pipe, fittings, valves, and associated appurtenances; pump performance curves indicating pump efficiency, horsepower, and head capacity relationships; structural details including manhole, vault, and wet well wall thickness and reinforcing; and all mechanical and electrical details for pump stations.

1.7 Blockages

1.7.1 General

1.7.1.1 If there is a blockage, it is the customer's responsibility to report it to the Department of Public Works at (360) 337-5777 during regular business hours (Monday-Friday from 8:00 AM-4:00 PM). Call 911 for urgent or after hour problems.

- If no cleanout is present at the Right of Way, easement edge, or Property line, it is the customer's responsibility to prove to Public Works that the blockage is in the Right of Way, easement, or past the property line and within the public Right of Way. The County will not enter onto private property or into residences to assist

with locating efforts. Rodding companies may be able clear the line. If attempts to clear the line are unsuccessful, accurate electronic locates, both where the blockage exists and where the sanitary sewer lateral meets the Right of Way, must be performed and clearly marked.

1.7.1.2 If a blockage is determined to be within the public Right of Way, the County will respond accordingly. The customer will then be required to construct a cleanout at the Property Line.

Section 2: Sewer Pipe Design

2.1 Design Considerations

2.1.1 Any extension of the Kitsap County sanitary sewer system must be completed in accordance with the applicable forms and agreements.

2.1.2 In order to facilitate future sewer main extensions to adjacent properties, sewer main extensions located in the County Right of Way must be extended across the entire length of the abutting Right of Way. Sanitary sewer main extensions within a sub-development or plat, must be extended to the adjacent property line.

2.1.3 Gravity sewer mains must be designed with straight alignment between manholes.

2.1.4 Where a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. Pipeline sizes shall only be changed at manholes.

2.2 Pipe Design

2.2.1 General

2.2.1.1 The minimum gravity sewer main size shall be 8-inch diameter.

2.2.1.2 The minimum diameter for side sewer pipe size shall be 6-inches for a single residence, a commercial service, or multi-family service. Residential side sewers serving two residences may be a single 6-inch diameter side sewer to the property line, branching into two 4-inch diameter building sewers to the two residences.

2.2.1.3 The minimum force main diameter shall be 4-inches, except for grinder pump installations which shall have a minimum diameter of 1-1/4 inches.

2.2.1.4 The minimum depth of all gravity sewer mains shall be 4 feet, as measured from finish grade to top of pipe. In the Right of Way, the minimum force main depth shall be 4 feet as measured from finished grade to the top of the pipe. If the minimum depth cannot be maintained, ductile iron pipe and/or a casing will be required. Rigid pipe is required for all pipe depths exceeding 16 feet.

2.2.1.5 The minimum side sewer depth shall be 4 feet, as measured from finish grade to the top of pipe. The design and installation shall anticipate the crossing of other utilities in the Right of Way, with the side sewer typically crossing under these utilities. Side sewers unable to maintain depths of at least 4 feet will be required to be installed with higher class pipe materials.

2.2.2 Roughness Coefficient

Channel Surface	Manning Roughness Coefficient, n
Asbestos cement	0.011
Brass	0.011
Brick	0.015
Cast-iron, new	0.012
Concrete, steel forms	0.011
Concrete, wooden forms	0.015
Concrete, centrifugally spun	0.013
Copper	0.011
Corrugated metal	0.022
Galvanized Iron	0.016
Lead	0.011
Plastic	0.009
Steel - Coal-tar enamel	0.01
Steel - New unlined	0.011
Steel - Riveted	0.019
Wood stave	0.012

2.2.2.1 For pipe sizes and materials not shown, use a Manning's "n" value of 0.013 (regardless of pipe material) and full flow velocity of 2.0 fps to determine allowable minimum slope.

2.2.3 Slope (Minimum Velocity)

2.2.3.1 The minimum full flow velocity for gravity sanitary sewers shall be 2.0 fps. Velocity calculations must be submitted to the County by the Developer's Engineer, when requested. In no case will slopes less than the following minimum slopes be allowed for sewer mains:

Pipe Diameter	**Minimum Slope**
(inches)	(feet per 100 feet)
8	0.50
10	0.30
12	0.25
14	0.20
15 and greater	0.15

2.2.3.2 The minimum grade for a side sewer or building sewer shall be 2%. Special circumstances that may require consideration of grades less than 2% shall require the written approval of the County.

2.2.3.3 Sanitary sewer mains must be laid with uniform slope between manholes. Sewers on 20% slope or greater must be anchored securely with pipe anchors. Pipe anchors and spacing must conform to County Standard Detail PD-2.

2.2.3.4 At pumping capacity, the self-scouring flow velocity shall be between 3 to 7 fps. Optimum velocities for reducing maintenance costs and preventing the accumulation of solids ranges between 3.5 and 5 fps. Projects that result in velocities nearing or exceeding 7 fps will be required to reevaluate their proposal or alter pipe size.

2.2.3.5 Check dams per the County Standard Detail PD-3 must be placed along the pipe at intervals of 100 feet on sewer mains or force mains laid on slopes of 6.0% or greater. Check dam spacing shall be shown on the Plans.

2.2.3.6 Thrust blocks must be poured in place, per County Standard Detail PD-5. Concrete thrust blocks for force mains must be placed at bends, tees, dead ends, and crosses.

2.2.4 Separation Between Utilities

2.2.4.1 A minimum horizontal separation of 10 feet between sanitary sewers, reclaimed water lines, and any existing potable water lines, and a minimum vertical separation of 18 inches between the bottom of the drinking water line and the crown of the sewer shall be maintained. The distance shall be measured edge to edge (i.e., from the outer diameter of the pipes.) Reference Washington State Department of Ecology's Criteria for Sewage Works Design Sections G1-1.4D and C1-9.

2.2.4.2 Separation of utilities outside of the Right of Way on private property will be per Department of Community Development requirements.

2.2.4.3 **Horizontal Separation**: Basic separation guidelines apply to sanitary sewer lines of 24-inch diameter or less. Larger sewer lines may create special hazards because of flow volumes and joint types. The minimum separation guidelines rely on the principles of protecting higher-quality water from contamination with lower-quality water and providing trench stability for the neighboring utility. In general, provide at least 10 feet of horizontal separation measured from the outer diameter of the pipes. Requirements that are more stringent may also be necessary in areas of high ground water, unstable soil conditions, or other geotechnical constraints. Any site conditions not conforming to conditions described in this section will require assessment and approval of the appropriate state and local agencies. When local conditions prevent 10 feet horizontal separation between the sewer and other utilities, exceptions must be approved by the County on a case-by-case basis. Reference to DOE "Criteria for Sewage Works Design" Section C1-9.1.2 for guidance.

2.2.4.4 **Vertical Separation**: Sewer lines crossing water lines at angles including perpendicular shall be laid below the water lines to provide a separation of at least 18 inches between the invert of the water line and the crown of the sewer. Vertical separation between sewer lines and all other utilities shall be at least 12 inches measured from the outer diameter of the pipes. Under extenuating circumstances, crossings with less than 12 inches may be permitted with approval from the County, but will require special provisions, such as requirement of a foam pad between the pipes, CDF backfill and/or other recommendations provided by the Engineer. If extenuating circumstances preclude installing the sewer beneath the water line, then the sewer main must be installed within a casing that extends a minimum of 8 feet beyond each side of the water line.

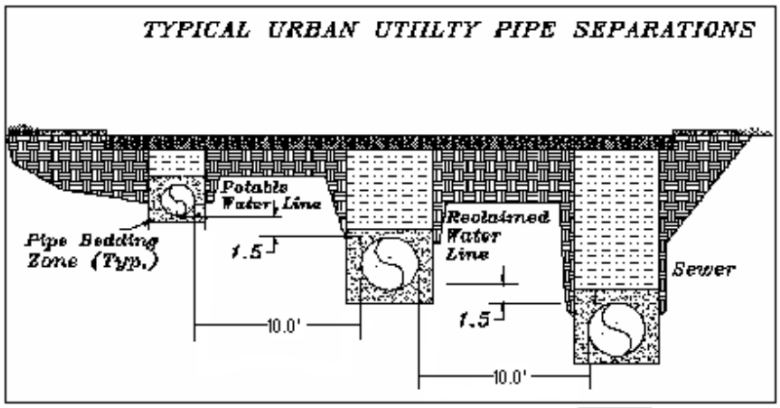

Figure from Department of Ecology's Criteria for Sewage Works Design

2.3 Materials

2.3.1 General

2.3.1.1 The Developer shall submit information from the material manufacturer or fabricator showing that the materials meet the requirements of the design and pertinent specifications. The Developer shall provide submittals to the County on all materials to be used.

2.3.2 Gravity Sewer Pipe

2.3.2.1 New gravity sewers shall be polyvinyl chloride (PVC), unless a different material is specifically required by the County due to certain circumstances. PVC gravity sanitary sewer pipes shall conform to the requirements of ASTM D 3034, SDR 35 for pipe up to 15 inches diameter and ASTM F 679, Type 1 only, for pipe sizes 18 inches to 27 inches. Joints for PVC gravity sewer pipe shall be push-on type with restrained elastomeric ring gaskets conforming to ASTM D 3212. Gaskets shall conform to ASTM F 477.

2.3.2.2 Side sewer and building sewer fittings for PVC pipes shall be PVC plastic having a cell classification of 12454-B, 12454-C, or 13343-C, as defined in ASTM D 1784. Fittings shall have sufficient strength to withstand handling and load stresses normally encountered.

2.3.2.3 Depths greater than 14 feet below ground surface require: PVC C-900 for pipe sizes from 4 – 12 inches, or PVC C-905 for pipe sizes from 14 – 48 inches, conforming to the requirements of ASTM D1784 and ANSI/AWWA C900 and C905 specifications, respectively.

2.3.2.4 Certain situations may require ductile iron pipe for gravity sewers as directed by the County. Ductile iron pipe for gravity sanitary sewer pipe and force main pipe shall conform to Class 52 (or greater) ANSI/AWWA C151/A21.51-17 and shall be cement mortar lined, push-on joint, or mechanical joint. Joints for ductile iron pipe shall be rubber gasketed conforming to the requirements of ANSI/AWWA C111/A21.11-12. WrapidSeal or other approved manhole encapsulation system must be applied to the exterior side of all manhole joints

2.3.2.5 Side sewer fittings for gravity pipes shall be rubber gasket push-on joint for PVC sewers or mechanical joint ductile iron fittings. Saddles fastened to pipe with external

bands shall not be acceptable on any new system. Fittings shall have sufficient strength to withstand handling and load stresses normally encountered.

2.3.2.6 Fittings for ductile iron gravity and force main pipe shall be ductile iron and shall meet the requirements of ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53-19. Fittings shall be cement mortar lined or epoxy lined, meeting the requirements of AWWA C104/A21.4-22.

2.3.3 Force Main Pipe

2.3.3.1 Force main pipe, fittings, transition couplings, reducing couplings, and flexible couplings shall be compression type, constructed with ductile iron or steel sleeves and ductile iron followers. Bolts and nuts shall be stainless steel 316. Factory finish shall be the standard of the manufacturer. Couplings shall be Romac, Smith-Blair, or equal.

2.3.3.2 PVC pressure sanitary sewer pipes shall meet the requirements of AWWA C900 or AWWA C905, Class 200, DR14. PVC pipe shall have the same inside dimensions as any other pipe materials on the same run of force main.

2.3.3.3 Joints for PVC force main pipe shall be push-on type meeting the requirements of ASTM D 3139 using a restrained rubber gasket conforming to ASTM F 477. Solvent welded pipe joints are not permitted except for pipe sizes below 3" diameter.

2.3.3.4 High Density Polyethylene (HDPE) force main pipes shall meet the requirements of AWWA C901 or C906, Class 200. HDPE pipe shall have the same inside dimensions as any other pipe materials on the same run of force main.

2.3.3.5 Joints for HDPE force main pipe shall be butt fusion weld type, meeting the requirements of ASTM F 2620 and ASTM D 3261. Solvent welded pipe joints are not permitted. Flanged ductile iron fittings conforming to Section 2.3.2 above may also be used with appropriate HDPE flange adaptors. All excess butt fusion weld material must be removed from the interior of the pipe prior to installation.

2.3.3.6 Sanitary sewer force mains for building sewers utilizing an IPS shall be a minimum of 1-1/4 inch diameter, HDPE in a continuous roll from the IPS control box to the connection at the main. Schedule 80 PVC may be utilized if the designer can demonstrate the HDPE is infeasible. The County has sole discretion to allow PVC. See Section 6.2 for additional requirements.

2.3.4 Pipe for Water Body and Critical Area Crossings

2.3.4.1 All pipe for water body or critical area crossings shall be High Density Polyethylene (HDPE) and shall meet the requirements of AWWA C901 or C906, Class 200, or as otherwise directed by the County. HDPE pipe shall have the same inside dimensions at the connections to existing pipe.

2.4 Joints and Fittings

2.4.1 Sewer Mains

2.4.1.1 Side sewer connections to new sewer mains shall be made using tees. "Wye" fittings will not be permitted unless specific authorization from the County is granted. Saddles fastened to pipe with external bands shall not be acceptable on any new system.

2.4.2 Side Sewers

2.4.2.1 A maximum of two residential units or, depending on design flow, one commercial or multi-family building shall be allowed to connect to each side sewer.

2.4.2.2 No domestic side sewer connections shall be made directly to any manhole.

2.4.2.3 Domestic side sewers extending from the sewer main to the edge of Right of Way or property line will be installed by the contractor and witnessed by County inspectors. Side sewers and cleanouts must be installed per County Standard Details PD-6, PD-7, PD-8, PD-14 and PD-15.

2.4.2.4 A building side sewer serving a commercial/industrial building or facility which has the potential of discharging grease, oil and/or chemicals to the sanitary sewer shall indicate so during the permit application process to the Department of Community Development, and the applicant shall submit plans indicating the type and location of the grease interceptor or pretreatment devices installed as part of the building plumbing and a scheduled maintenance plan. External grease traps plumbed to sewer will be required to be minimum size 1,500 gal, or as otherwise designed by a qualified professional.

2.4.3 Building Sewers

2.4.3.1 A maximum of one residential unit or one commercial/multi-family building shall be allowed for each building side sewer.

2.4.3.2 The building sewer shall be connected to the cleanout located at the end of the side sewer and extend to the building to be served.

2.4.3.3 No connections from downspouts, gutters, and basement sump pumps or outside drains or any other feature receiving or exposed to rain or groundwater shall be connected to the building sewers.

2.4.3.4 Any identified cross connections will be the responsibility of the property owner to rectify.

2.5 Miscellaneous

2.5.1 Air Release/ Vacuum Valve

2.5.1.1 Air and vacuum release valves shall be placed at all high points in the force main and shall conform to the County Standard Detail MD-5 for “air and vacuum release assembly.”

2.5.1.2 Air releases valves by A.R.I. or approved equal shall be used for sewage and designed to prevent clogging due to solids in the fluid. Valve bodies shall be reinforced nylon or stainless steel with a minimum 3 to 150 psi working pressure rating. Combination air valves shall be intended for wastewater application and have the following features:

1. Conical body shape
2. Funnel-shaped lower body
3. Spring-loaded joint between the stem and upper float
4. Rolling seal mechanism
5. All inner metal parts shall be 316 stainless steel (SS 316)
6. Floats to be made of composite materials.

7. Minimum 1 ½" threaded discharge outlet
8. Stainless steel ball valve to release trapped pressure and drain the body prior to maintenance.

2.5.2 Blow-Offs

2.5.2.1 Blow offs shall be constructed per Standard Detail MD-6.

2.5.3 Thrust Restraint

2.5.3.1 Thrust blocks, restrained joints, and/or tie rods and shackles shall be provided at all bends and at points where restraint is needed along the force main per Standard Detail PD-5.

2.5.3.2 Concrete thrust blocks for pressure force mains shall be commercial concrete (minimum 3,000 psi) per Section 6-02.3(2)B of the Standard Specifications for Road, Bridge, and Municipal Construction. Thrust blocks shall be poured in place with bond breaker at fittings and fasteners per County Standard Detail PD-5. Concrete thrust blocks shall bear against solid undisturbed earth at the sides and bottom of the trench.

2.5.3.3 Pipe anchors shall be constructed of commercial concrete (minimum 3,000 psi) per Section 6-02.3(2)B of the Standard Specifications for Road, Bridge, and Municipal Construction with 1-inch diameter galvanized steel rod tie downs. The anchors shall be constructed per County Standard Detail PD-2.

Section 3: Trenching and Pipe Installation

3.1 General

3.1.1 The Developer shall complete the proposed sanitary sewer construction in accordance with the approved construction drawings, details, specifications, state requirements, and local regulatory requirements.

3.1.2 Developer will be required to secure permitting from Roads Division for any work withing the Public Right of Way and adhere to all requirements and conditions of the permit related to roadway restoration.

3.1.3 All upstream lines must be completely cleaned and successfully tested, prior to connection to existing mainline systems. County Staff must be present to witness connection. Rechanneling of the existing manhole may be required.

3.1.4 Connection of a side sewer to an existing sewer main, where an existing stub meeting current standards is not available, will be made by the use of a saddle meeting County standards. Contractor is responsible for all equipment, shoring, and labor for safe working conditions. The Developer shall schedule the saddle with the County in advance for inspection. Developer shall obtain the necessary permits prior to exposing the existing sewer main.

3.2 Trenching

3.2.1 The maximum permissible trench widths in the pipe zone shall be according to County Standard Detail PD-1. Above the pipe zone, the trench width shall be at the Developer's discretion.

3.2.2 The Developer shall provide all materials, labor, and equipment necessary to shore trenches to protect the work, existing property, utilities, pavement, etc., and to provide safe work conditions in the trench. The Developer may elect to use any combination of shoring and overbreak, tunneling, boring, sliding trench shield, or other method of accomplishing the work consistent with applicable local, state and federal safety codes.

3.2.3 Upon completion of work, the Developer shall remove all shoring unless indicated otherwise on the approved plans or as directed by the County. Damages resulting from improper shoring or failure to shore shall be the sole responsibility of the Developer.

3.2.4 The Developer shall furnish, install, and operate all necessary equipment to keep excavations above the foundation level free from water during construction, and shall dispose of the water so as not to cause injury to public or private property or nuisance to the public. Sufficient pumping equipment in good working condition shall be available at all times for emergencies, including power outages, and competent workers for the operation of the pumping equipment shall be available at all times.

3.2.5 Excavations for manholes and other structures connected to the pipelines shall be sufficient to provide a minimum of 12 inches between their exterior surface and the sides of the excavation.

3.3 Materials

3.3.1 Pipe bedding and trench requirements shall be as indicated in County Standard Detail PD-1 Typical Trench Section. Backfill lifts shall be no greater than 12 inches and each lift shall be compacted to the required compaction. "Haunching" will be required around the pipe zone to ensure proper compaction.

3.3.2 Pipe foundation stabilization material for both flexible and rigid pipe shall be imported material conforming to WSDOT Standard Specifications Section 9-03.17, Class B.

3.3.3 Pipe zone bedding and pipe zone backfill for rigid pipe, flexible pipe, and HDPE pipe shall be imported material conforming to WSDOT Standard Specifications Section 9-03.12(3) Gravel Backfill for Pipe Zone Bedding. Use of native material may only be permitted if approved by stamped geotechnical report and continually monitored. The County has sole discretion to reject native material even with support of geotechnical report.

3.3.4 Pipe zone backfill in improved and paved areas for both flexible and rigid pipe shall consist of Gravel Backfill for Pipe Zone Bedding of crushed, processed, or naturally occurring granular material conforming to WSDOT Standard Specifications Section 9-03.12(3) for the 6 inches above and below the pipe for the full width of the trench. Trench zone backfill shall be native or special borrow material placed in no more than 12-inch lifts and compacted to 95% maximum density per WSDOT Standard Specifications Section 7-08.3(3) per Detail PD-1. For pavement section restoration, including aggregate base, follow the requirements of Kitsap County Roads Division.

3.3.5 In unimproved areas outside the jurisdiction of the County Roads Division, all trench zone backfill may be select native material obtained from the trench excavation that meets the requirements of Bank Run Gravel for Trench Backfill or imported Bank Run Gravel for Trench Backfill if supported by geotechnical analysis.

3.3.6 Controlled Density Fill (CDF) or Controlled Low-Strength Material (CLSM) shall be conforming to WSDOT Standard Specifications Section 2-09.3(1)E. No CDF shall be placed until the County has reviewed and approved the mix design. The County's approval of the mix design shall be understood to indicate conditional acceptance only. Final acceptance will be based on tests conducted on field installations for conformance with WSDOT Standard Specifications Section 2-09.3(1)E.

3.3.7 The use of pea gravel for pipe zone bedding and pipe zone backfill is not permitted.

3.3.8 Unauthorized use of pea gravel will result in re-excavation of the imported material. The County may consider the use of pea gravel for special cases on a case-by-case basis Should the use of pea gravel be allowed, approval may require the installation of trench check dams as indicated in the County Standard Detail PD-3 Check Dam.

3.4 Pipe Bedding

3.4.1 Pipe bedding shall be installed in accordance with the County Standard Detail PD-1. Bedding shall provide a uniform support along the entire pipe barrel, without load concentration at joint collars or bells. Bedding disturbed by pipe movement or by removal of shoring or movement of the trench shield or box shall be reconsolidated prior to backfill.

3.4.2 Bedding shall be placed in more than one lift. The first lift shall provide at least 6 inches of bedding under any portion of the pipe and must be placed before the pipe is installed and shall be spread smoothly so that the pipe is uniformly supported along the barrel. Subsequent lifts shall not exceed a thickness of 12 inches each and shall be installed to a depth of 6 inches over the crown of the pipe. Each lift shall be compacted to 95% of maximum density as determined by ASTM D 1557. Densities shall be determined by the sand-cone method, ASTM D 1556 or by nuclear methods, ASTM D 2922.

3.5 Pipe installation

3.5.1 The sewer pipe shall be laid up grade from the point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell end pointed upgrade. Pipe will be considered "sent home" when the pipe segment is fully seated within the bell section of the previously installed pipe segment. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with an approved temporary plug. A temporary plug shall be provided at the point of connection to the existing sewer and shall not be removed until the new lines have been flushed, cleaned, successfully tested and approved for use.

3.5.2 It is the contractor's responsibility to remove the temporary plug before the line is put into service.

3.5.3 After an accurate grade line has been established, the pipe shall be laid in conformity with the established line and grade in the properly dewatered trench. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces.

3.5.4 All pipe material between manholes shall be the same material, except for drop connections. All connections to manholes shall be made with manhole adapters. Manhole adapters shall be watertight with voids around manhole adapters, thoroughly wed and sealed inside and outside of the manhole walls and installed in accordance with manufacturer's recommendations. When a ductile iron pipe is cut, the cut end shall be coated with epoxy (or other approved coating) before connecting it to a new or existing pipeline.

3.5.5 When required, the design shall specify a check dam material of a mixture of pipe bedding material and imported bentonite clay material, or control density fill (CDF) material. The check dams shall be a minimum of one foot in length and keyed into the bottom and sides of the trench a minimum of one foot and extended a minimum of one foot over top of pipe, leaving a minimum of one foot between the top of the check dam and finished surface as per County Standard Detail PD-3.

3.6 Backfill

3.6.1 The location of the end of side sewers shall be marked by the Developer at the property line by a 2"x4" wood stake buried in the ground, located at the end of the side sewer stub, with tracer wire wrapped around the stub extending to the main. The exposed end shall be painted white and the depth to the side sewer or tee indicated in black paint. Minimum height above the surface shall be 3 feet.

3.6.2 Sewer trenches shall be backfilled as soon as possible after the pipe laying has passed the County's inspection. The Developer shall have no more than 200 feet of trench open in which the sewer has been completed, except by permission of the County.

3.6.3 Backfilling of trenches in the vicinity of manholes will not be permitted until the concrete or mortar has become thoroughly hardened.

3.6.4 Backfill above the pipe shall be accomplished in such a manner that the pipe will not be shifted out of position nor damaged by impact or overloading.

3.6.5 Trenches shall be backfilled in lifts no greater than 12 inches.

3.6.6 Backfill shall be compacted, as determined by ASTM D 1557, to at least 85 percent maximum density in unimproved areas, and to at least 95 percent maximum density in improved and paved areas. Densities shall be determined by the sand-cone method, ASTM D 1556 or by nuclear methods, ASTM D 2922.

3.6.7 Warning tape shall be placed approximately 2 feet below finished grade atop of all sanitary sewer pipes and shall extend the full length of the pipe. The warning tape shall be green in color and shall have the words "Caution Sewer Line Buried Below" printed continuously along the full length. Warning tape shall be Terra Tape or equal.

3.6.8 A (12 gauge) copper coated metal tracer wire shall be attached to all force main pipes and shall extend its full length. Tracer wire shall be continuous, with no underground splices. Tracer wire shall terminate at a test station in a valve can no more than 300 feet apart. The tracer wire shall be green in color and tested for continuity prior to acceptance. Tracer wire shall be installed above the pipe per Detail PD-1.

Section 4: Manholes and Cleanout Design and Construction

4.1 Locations of Cleanouts and Manholes

4.1.1 Cleanouts shall be installed on side sewers at the edge of the Right of Way. For areas with sidewalks present, cleanouts shall be installed as close to the back of the sidewalk as possible. Cleanouts shall also be installed when a side sewer branches to serve two residences, at the property/easement line for each building side sewer, at a 100-foot spacing of straight building sewer alignment, and at building connections, or as directed by the County.

4.1.2 Cleanouts shall be installed at all fitting combinations within an aggregate change in directions in excess of 45 degrees. Combinations of bends that have at least 4 feet of straight pipe between the bends shall not be considered an aggregate change of direction.

4.1.3 Cleanouts installed in roads, driveways or walkways, paved or unpaved, shall have a frame and cover per PD-12 and PD-13.

4.1.4 Cleanouts installed in non-paved surfaces shall be ductile iron and installed with a concrete collar on all sides per PD-13 and PD-14.

4.1.5 Manholes shall be installed at all changes in slope, alignment, or pipe size.

4.1.6 No horseshoe or saddle manholes shall be allowed without specific authorization by the County. Where a new manhole needs to be cut into the existing mainline, flow shall be temporarily rerouted and a new cut-in manhole must be installed.

4.1.7 Whenever possible, manholes located within the roadways shall be centered in a travelled lane or the crown of the roadway. Locations of lids should avoid the wheel alignments.

4.1.8 Maximum spacing of manholes shall be 400 feet. Manholes shall be installed at the end of all mainline sewer pipe runs. All manholes shall be accessible by maintenance vehicles. Sewer facilities shall be located within 5 feet of an existing accessible surface such as a road, parking lot, or driveway.

4.1.9 In cases with no existing access, an access road shall be constructed. The access road shall have a maximum slope of 12% and a minimum width of 12 feet. The access road shall be constructed by utilizing one of the following techniques to support the loads of a fully loaded vactor truck:

1. Construct an asphalt surface meeting Kitsap County Standards; or
2. Construct a gravel surface road by removing all unsuitable material, placing geotextile fabric over native soils, providing a minimum 12 inches of suitable subgrade material compacted to 95%, and providing a minimum of 2-inch thick crushed rock surface; or
3. Construct a landscape block surface by removing all unsuitable material, laying geotextile fabric over the native soil, placing landscape blocks, filling the honeycombs with soil particles, and planting grass to match the surrounding grassy areas.

4.1.10 Access roads must be constructed to meet Fire Code access requirements for fire apparatus vehicles, Widths of access areas may be required to accommodate multiple vehicles. Specific access needs will be evaluated on a project-by-project basis.

4.2 Manhole Connections

4.2.1 All connections to manholes shall be at the manhole base using approved connectors. Rechanneling or manhole replacement may be required.

4.2.2 The County will consider the use of manholes with an inside drop on a case-by-case basis. Should the use of inside drop manholes be allowed, the connections shall be made with PVC C900 materials including a minimum of one full length of pipe extending from the manhole to undisturbed soil. The inside drop piping shall be properly supported and attached to the manhole wall with at least two pipe supports. Minimum manhole diameter for an inside drop is 54 inches for a single drop and 60 inches for multiple drop connections. Larger manhole sizes may be required by the County to maintain structural integrity of the manhole. Inside drops shall conform to County Standard Detail MV-4.

4.2.3 Cleanouts shall be constructed of the same material as the sewer main and shall conform to and be installed per the County Standard Details PD-12, PD-13 and PD-14. Cleanouts installed in areas to be paved shall be brought to finish grade per County Standard Detail PD-12.

4.2.4 The side sewer cleanout shall be brought to within 6-inches of finished grade, plugged with a mechanical plug with a lip and butterfly nut on top, and enclosed in a cast iron valve box with cover and concrete collar. The method and installation of the plug must be approved and inspected by the County. See County Standard Details PD-7 and PD-14.

4.3 Manhole Design

4.3.1 General

4.3.1.1 Manholes shall be 48-inch minimum inside diameter precast concrete units with eccentric cones for pipe diameters up to 18-inches and depths up to 10 feet. For manholes greater than 10 feet deep, a manhole with 54-inch minimum inside diameter is required. Larger diameter manholes may be required depending on pipe size, number of penetrations, and pipe configuration. Manholes shall be sized to provide at least 8 inches of solid wall between pipe penetrations and at least 8 inches of bench width on both sides of channels in the bottom of the manhole.

4.3.1.2 Manhole sections shall be of the offset type and shall meet the requirement of AASHTO M 199. The diameter of the bottom precast unit may be in excess of 48 inches. However, a fixed opening of 24 inches shall be provided at the top. The joints shall be of tongue and groove type with rubber gaskets conforming to the applicable requirements of AASHTO M 198.

4.3.1.3 The mortar used between the joints in the precast sections and for laying manhole adjusting rings shall be composed of one part cement to two parts of plaster sand (5000 psi mortar mix).

4.3.1.4 Manholes manufactured with cast-in place rubber boots such as “A-lock’,” are acceptable.

4.3.1.5 Manhole frames shall be gray-iron conforming to the requirements of AASHTO M 105, Grade 30B. Covers shall be ductile iron conforming to ASTM A 536, Grade 80-55-06. Repair of defects shall not be permitted.

4.3.1.6 Manhole covers shall be interchangeable within the dimensions shown in the County Standard Plans (Detail MV-3). Manhole frames and covers shall meet the strength requirements of Federal Specification A-A-60005. All mating surfaces shall be machined finished to ensure a non-rocking fit. EON locking nuts are required on manhole rings.

4.3.1.7 Covers shall be locked to the frames by three 5/16-inch countersunk stainless steel bolts. In steep (in excess of 10% grade) or high traffic conditions (greater than 2,500 vehicles per day), recessed nut applications shall be used.

4.3.1.8 Drop manholes shall be constructed as a standard manhole, but as shown on the County Standard Detail MV-4.

4.3.1.9 Manhole steps shall be designed to withstand pullout forces of 1,500 pounds and meet the requirements of Detail MV-7. All steps shall be factory installed. In no case shall the steps be allowed to penetrate through the wall of the manhole section.

4.3.1.10 Manhole ladders shall meet the requirements of Detail MV-8.

4.3.2 Manhole Base Liners

4.3.2.1 When required by Kitsap County, new and existing manholes shall be provided with prefabricated fiberglass reinforced plastic (FRP) Manhole Base Liners. New Manhole Base Liners shall be integrally cast and adequately anchored inside new precast manhole base sections during the concrete casting process at the manhole suppliers manufacturing facility. Existing Manhole Base Liners shall be sized by the manufacturer to fit within the existing manhole and grouted in place in the field. The Contractor shall field verify invert elevations of existing sewer piping prior to the manufacturing of the base liner. The base liner shall be a one-piece construction of unlayered, homogenous composite with minimum thickness of 0.12 inches (3 mm) and shall be in lengths and nominal inside diameters corresponding to the new or existing concrete base section.

4.3.2.2 The Manhole Base Liner shall include full flow channels with sidewalls to the crown of the largest diameter pipe. Channels shall be constructed with orientation and inverts as required. The inner surface of the bench shall be provided with an anti-skid pattern. For new manholes, watertight gasketed pipe bell connections to suit specific pipe types, grade and alignment, shall be monolithically attached to the base liners and shall extend to the outside profile of the concrete structure. For existing manholes, Link Pipe Sewer Sealer or approved equivalent shall be used to repair the exterior piping once the Manhole Base Liner has been installed.

4.3.2.3 The outer surface of the liner shall be aggregate coated and have steel spirals/lattice bonded to the FRP in order to ensure adequate anchoring to concrete base sections to pass vacuum testing with 10 inches of negative pressure.

4.3.2.4 The inside liner surfaces shall be free of bulges, dents and other defects that result in a variation of inside diameter of more than ¼ inch (7 mm) for base liner flow channel and pipe connections. The precast concrete pipe penetration joint surfaces shall be free of excess concrete at external and internal surfaces to ensure a proper seal between the pipe connection and the liner.

4.3.2.5 The FRP liner shall be a non load-bearing component, which is resistant to the chemical environment normally found in wastewater collection systems. Base liner properties shall be in accordance with the following:

1. 0.12 inches (3mm) minimum thickness.
2. Fiberglass (Type E Glass).
3. Minimum length of fibers – 0.625 inches.
4. Content by weight 10% - 12%.
5. Inert Filler.
6. Content by weight 10% - 13%.
7. Bonding aggregate - prewashed, cleaned; dried, fractured 3/8-inch gravel.
8. Graded particle size minimum 0.08 inches and maximum 0.12 inches.
9. Rate of application – 3.5 lb/ sq ft.
10. Density of F.R.P. Polyurethane Hybrid Composite (ASTM D1622) – 1.17g/cm^3.
11. Shore "A" Hardness Durometer (ASTM D2240) – Exceeds 90 on scale.
12. Percolation Test - Water absorption of top surface – 0.032%.
13. Thermal shock (CSA-B45-M93) 100 thermal cycles – no sign of defects.
14. Chemical Resistance (Selected Reagents) (ASTM D1308):

Nitric Acid 69%	No surface Degradation - Surface Staining
Hydrochloric Acid 60%	No surface Degradation
Ammonia 28%	No surface Degradation
Sodium Hydroxide 5.25%	No surface Degradation
Sulfuric Acid 50%	No surface Degradation
Sulfuric Acid 70%	No surface Degradation
Sulfuric Acid 80%	No surface Degradation
Acetone	No surface Degradation
Unleaded Gasoline	No surface Degradation
Turpentine	No surface Degradation
Acetone Immersion (ASTM.	No attack

4.3.3 Miscellaneous

4.3.3.1 Allowances shall be made for a one-tenth foot minimum drop in elevation across the manhole in the direction of flow.

4.3.3.2 Infiltration through any part of the structure will be repaired as required, to the satisfaction of the County. New structures shall be grouted at all joints on the inside and outside of the structure during installation.

4.3.3.3 Manholes over 20 feet deep shall have intermediate safety platforms as per County Standard Detail MV-2.

4.4 Installation

4.4.1 Precast base sections shall be set on compacted foundation material (per 1-4.12.3). Before the precast base is set in place, the foundation material shall be carefully leveled to provide full bearing for the entire base section.

4.4.2 Manhole sections shall be placed and aligned so as to provide vertical sides and vertical alignment of the steps and ladders. The completed manhole shall be rigid, true to dimension, and be watertight. Rough, uneven surfaces shall not be permitted.

4.4.3 The outside and inside of the manhole adjusting rings, lift holes, and precast concrete section joints shall be mortared and troweled smooth with 1/2-inch (minimum) of mortar in order to attain a watertight surface.

4.4.4 All new manholes must be pre-channeled. The channels shall conform accurately to the sewer grade and shall be brought together smoothly with well-rounded junctions satisfactory to the County. Channel sides shall be carried up vertically from the invert to the crown elevation of the various pipes. The concrete shelf shall be warped evenly and sloped at 3/8-inch per foot to drain. Rough, uneven surfaces shall not be permitted. Channels shall be constructed to allow the installation and use of a mechanical plug of the appropriate size.

4.4.5 Manhole adapters shall be provided when connecting pipe to concrete manholes. Manhole adapters shall be rubber gasketed boot, Kor-n-seal or approved equal per Detail MV-5.

4.4.6 All stubbed out sewer pipes placed through manhole walls for future connections shall extend at a minimum 2% slope to the edge of the Right of Way or the edge of the utility easement, whichever is greater, but not less than 10 feet. Stubs shall be capped. If line is to be a future main extension, the County may require a lower slope be constructed.

4.4.7 All lift holes shall be completely filled from the outside with expanding mortar and smoothed both inside and out to ensure water tightness. All steel loops shall be removed flush with the manhole wall. The steel stubs shall be covered with mortar and smoothed. Rough, uneven surfaces shall not be permitted.

4.4.8 For grade adjustments of manhole frame and cones, a minimum of 4 inches and a maximum of 16 inches shall be provided between the top of the manhole cone or slab and the top of the manhole frame.

4.4.9 Manhole rims and cleanouts in undeveloped areas shall be constructed to an elevation from finish grade to no more than 6 inches above finish grade.

4.4.10 Existing manholes and cleanouts shall be adjusted to finish grade when the surface is altered by construction activity by the contractor responsible for altering final grade.

4.4.11 The cover assembly of a manhole shall not be grouted to final grade until the final elevation of the pavement, gutter, ditch, or sidewalk in which it is to be placed has been established, and until permission thereafter is given by the County to grout the assembly in place. Cover shall be seated properly to prevent rocking.

4.4.12 Structure Abandonment: The procedures to perform abandonment of a manhole and piping are outlined in WSDOT Standard Specifications Sections 7-05.3(2) and 7-08.3(4).

Section 5: Industrial and Commercial Pretreatment

5.1 Description/Design

5.1.1 Grease removal devices (interceptors) shall be sized based on the information in Section 5.2. The Developer shall submit supporting sizing calculations for review.

5.2 Grease Interceptor

5.2.1 Each facility is solely responsible for the cost of the grease interceptor installation, inspection, cleaning and maintenance. The minimum capacity of any exterior grease interceptor shall be 1,500 gallons unless otherwise designed and justified by a design professional with demonstrated competency. Sizing calculations may require a larger grease interceptor.

5.2.2 Grease interceptors must be vented.

5.2.3 Grease interceptors must be designed using standard engineering principles for sedimentation and flotation in gravity separators. The grease interceptor will have a minimum of two (2) compartments with fittings designed for grease retention.

5.2.4 Grease interceptors shall be equipped with a sampling port at the outlet of the interceptor. Inspection tees and manholes shall enable the County to monitor and test the discharge for compliance with County requirements or to allow monitoring and testing in accordance with the rules and regulations of other federal, state or local agency having governmental or contractual jurisdiction within the County service area.

5.2.5 Grease interceptor shall be installed at a location where it is easily accessible for sample collection, inspection, and cleaning and removal of retained grease, within 20-feet of drive for access by maintenance vehicle.

5.2.6 Grease interceptors shall be located in the food service establishment's lateral line between all fixtures which may introduce grease into the sanitary sewer and the connection to the sanitary sewer collection system. Such fixtures shall include but not be limited to sinks, dishwashers, floor drains for food preparation and storage areas, mop sinks, floor mat wash down areas, and any other fixture which is determined to be a potential source of grease.

5.2.7 Sanitary wastes (restroom wastes) cannot be introduced into the grease interceptor.

5.2.8 Access manholes, with a minimum diameter of 24 inches, shall be provided over each chamber and inlet/outlet tee. The access manholes shall extend at least to finished grade and be designed to prevent water inflow or infiltration. The manholes shall also have readily removable covers to facilitate inspection, cleaning and removal of retained grease and sample collection. Riser maximum will not exceed 24 inches.

5.2.9 Wastes removed from a grease interceptor or grease trap shall be properly disposed of at a facility permitted to receive such waste. Neither grease, solids, nor liquids removed from grease interceptors or traps shall be returned to any grease interceptor, private sanitary sewer line, any portion of the sanitary sewer collection system, or any portion of the storm water system.

5.2.10 A grease interceptor detail is required to be provided with project applications requiring grease removal exterior to the building.

5.3 Grease Trap

5.3.1 Grease traps internal to the building are permitted per the requirements of the Department of Community Development.

5.4 Operations and Maintenance

5.4.1 Flushing the grease interceptor with water that has a temperature in excess of 140 degrees Fahrenheit is prohibited.

5.4.2 Grease interceptors and grease traps shall be serviced and emptied of accumulated waste content as required for maintaining the minimum design capability or effective volume, but not less than once every ninety (90) calendar days or as otherwise designed by a design professional.

5.4.3 Sanitary wastes (restroom wastes) cannot be introduced into the grease interceptor.

5.4.4 A facility owner or designated occupant operator that has a grease interceptor or grease trap shall be responsible for all required maintenance.

5.4.5 An Operation and Maintenance manual for Grease Interceptors must be submitted for review and recorded against the property to include the following:

a) Manufacturer's specifications for maintenance including capacity.
b) Copy of cut sheets for installed infrastructure.
c) Copy of as-built site plan denoting cleanout locations and interceptor access points.

5.5 Plumbing for Dumpster Pads

5.5.1 Uncovered dumpster pads are not permitted to connect into the sewer system.

5.5.2 Dumpster Pads with covers may be permitted to the sewer system upon special approval by the Division Manager.

Section 6: Alternative Systems and Special Requirements

6.1 Special Requirements

6.1.1 The following items must comply with their corresponding portion of Section C1-9 of the Criteria for Sewage Works Design:

- Required Separation between Potable Water Lines, Reclaimed Water Lines, and /or Sanitary Sewers (Section C1-9.1)
- Pump out Facilities at Marinas (Section C1-9.2)
- Stream Crossing (Section C1-9.3)
- Inverted Siphons (Section C1-9.4)
- Required Separation from Water Supply Wells (Section C1-9.5)
- Odor Control (Section C1-9.6)
- Corrosion Control (Section C1-9.7)
- Trenchless Technologies (Section C1-9.8)
- Pipe Casing (Section C1-9.9)

6.1.1 Underground Utility Locations

6.1.1.1 The sewer contractor making the sanitary sewer extension shall be responsible for verifying the exact locations of all existing utilities prior to commencing any work. The Developer shall contact the Utility Underground Location Center, 1-800-424-5555, a minimum of two working days prior to commencing work.

6.1.1.2 The County is not required to provide locates on infrastructure which is not owned by the County.

6.1.2 County Inspections

6.1.2.1 All sewer installation inspections and test observations shall be made by the County. The County Inspector shall be notified a minimum of two working days in advance of commencing work on a sanitary sewer extension. Prior to final acceptance of all installations, the County shall conduct an inspection of all main lines by the use of television equipment. Final acceptance of sewer installations will not be made until tests and inspections are complete and prove satisfactory.

6.1.2.2 The County Inspector shall be notified a minimum of two working days in advance of commencing work on a sanitary sewer extension. Prior to final acceptance of all side sewer and building sewer installations in new sewer mains, the County shall conduct an inspection of the sewer mains by the use of television equipment. Final acceptance of side sewer and building sewer installations will not be made until tests and inspections are complete and prove satisfactory.

6.2 Individual Grinder Pump Stations

6.2.1 Application

6.2.1.1 Together with submittal of the individual sewage pump installation plans for approval, the property owner shall submit a signed copy of the “Sewage Pump Installation, Operation, and Maintenance Agreement” and the filing fee.

6.2.1.2 The property owner shall be responsible for obtaining preliminary approval of the concept for their particular situation. Upon preliminary approval, the property owner shall submit engineered plans of the proposed installation showing all pertinent information together with specifications of all materials to be used.

6.2.1.3 The County reviews plans and inspected systems including the proposed IPS system to the connection at the public force main. Department of Community Development is responsible for permitting and connection from the structure to the IPS system.

6.2.2 Design Considerations

6.2.2.1 The station’s operational components shall be located at an elevation that is not subjected to the 100-year frequency storm flood and associated wave action or shall be otherwise adequately protected as certified by a professional engineer registered in the State of Washington.

6.2.2.2 Only one grinder pump station is allowed per lot, and the property owner shall be responsible for maintaining the grinder pump station and the force main on their property by means of a recorded covenant on the title.

6.2.2.3 Developments proposed with private roadways may be served with a common force main serving no more than 15 Equivalent Residential Units (without possibility of future expansion). These developments will be required to construct the common force main to the public standard, however, will remain in private ownership and will not be maintained by the County. A redundant pig launch is required at the Right of Way Edge. These developments will be required to record a maintenance covenant against each parcel served by the common force main, designating perpetual O&M requirements for the system and showing evidence of a maintenance contract for the system to the County before final development permit closeout.

6.2.2.4 Developments proposed with public roadways may be served with a common force main serving no more than 15 Equivalent Residential Units (without possibility of future expansion) so long as all public standards are met.

6.2.2.5 Developments relying on pressurized sewer to serve between 16 and 20 Equivalent Residential Units must construct a lift station. No generator set is required, but a storage tank is required.

6.2.2.6 Developments relying on pressurized sewer to serve 21 or more Equivalent Residential Units must construct a lift station with a permanent generator set.

6.2.2.7 The Developer shall submit information from the material manufacturer or fabricator showing that the materials meet the requirements of the design and pertinent specifications. The Developer shall provide submittals to the County on all materials to be used.

6.2.2.8 Grinder pump structure and force main shall comply with the standards for manholes, trench excavation and backfill. Grinder pump station shall be installed as recommended and required by the Manufacturer, while following all County standards.

6.2.3 Grinder Pump (GP) Selection

6.2.3.1 General

6.2.3.1.1 The individual sewage pump installation shall consist of a single grinder pump, tank, and system controls, valves, piping, excavation, and backfill as outlined in these standards.

6.2.3.1.2 The pumps shall be capable of delivering between 10-20 gpm at the design TDH, with a rate of 12-15 gpm being preferred. The pumps shall be capable of operating at a negative TDH without overloading the motor. A pump curve indicating the pump capacity at design head and operating point shall be included with the submittal.

6.2.3.1.3 The grinder pump Manufacturer shall provide a part(s) and labor warranty on the complete station and accessories, including but not limited to, the panel, for a period of 24 months after notice of Owner's acceptance or receipt of equipment and materials.

6.2.3.1.4 The assembly shall be dynamically balanced and operate without unordinary noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or solids banks which could impair the operation of the pump.

6.2.3.1.5 The grinder shall be capable of reducing all components that can be typically found in domestic raw sewage, including but not limited to a reasonable amount of "foreign objects" such as paper, wood, plastic, glass, wipes, and rubber into finely divided particles which will pass freely through the passages of the pump and the discharge piping.

6.2.3.1.6 The grinder shall be positioned in such a way that solids are fed in an upward flow direction.

6.2.3.2 Control Panel/Level Control

6.2.3.2.1 System controls shall consist of a higher water alarm light, one circuit breaker per pump, 120V AC control voltage transformer, starters, NEMA 3R enclosure for electrical control circuits which shall be mounted on the building adjacent to the pump unit, three liquid level control floats (pump off, pump on, high water alarm) and necessary wiring and appurtenances for a complete installation.

6.2.3.2.2 The alarm panel shall include external audible and visual alarm, a push-to-run switch, a push-to-silence switch, redundant pump start, and high-level alarm capability.

6.2.3.3 Pump Selection

6.2.3.3.1 Pumps installed on a GP system shall meet the criteria for the maximum hydraulic grade line and be able to meet the pumping requirements of the structure where it is installed.

6.2.3.3.2 The designer shall review the system as a whole and select a type or characteristic of a pump for the entire system that has sufficient head to operate at the maximum hydraulic grade line. The designer may opt to include design zones within the system with different maximum hydraulic grade lines. Compute the hydraulic grade line using common engineering fluid mechanics calculations using the Hazen Williams or Manning equation with an appropriate roughness coefficient as listed in Section 2.2.2. The engineer shall select a pump capable of discharging the influent peak flow without exceeding the working volume within the pump holding vessel. The engineer shall determine the influent peak flow by reviewing the number of fixtures within a structure or by applying a peaking factor to average daily flows. The designer shall use a minimum of 400 percent of average daily flow for estimating peak influent flows.

6.2.3.3.3 Grinder Pumps shall be E-One or approved equal.

6.2.4 Tank/Vessel Type and Sizing

6.2.4.1 Tanks shall be constructed of fiberglass or HDPE and shall be watertight. Tanks shall be a minimum of 24 inches in diameter and have a minimum depth of 5 feet. For homes with basements, the minimum depth of tank shall be such that the tank can be

installed with adequate burial depth without the need for field fit risers. Tanks shall have a minimum of 24 hours of storage within the tank.

6.2.4.2 Corrugated sections shall be double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall shall have a minimum amplitude of 1-1/2 inches to provide necessary transverse stiffness. Any incidental sections of single wall construction shall be at least ¼-inch thick. All seams created during tank construction shall be thermally welded and factory tested for leak tightness.

6.2.4.3 The tank shall be furnished with one EPDM grommet fitting to accept a single 4.50-inch OD DWV or Schedule 40 pipe.

6.2.4.4 The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation, no field penetrations shall be acceptable.

6.2.4.5 All discharge piping shall be per Section 2.3. The discharge piping shall include a ball valve rated for 150 PSI. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

6.2.4.6 All electrical devices and connections shall be in accordance with NEC and approved by the authority having jurisdiction.

6.2.4.7 A concrete anti-flotation collar shall be provided if groundwater is present or if there is reasonable potential for groundwater. The anti-flotation collars shall be physically attached to the grinder pump tank.

6.2.4.8 No individual sewage pump shall be installed on the discharge side of an existing septic tank. Septic Tank Effluent Pumping (STEP) systems are not allowed. Pumping units shall be connected directly to the building sewer line. Kitsap County does not maintain septic systems.

6.2.5 System Components

6.2.5.1 Service Line/Check Valves

6.2.5.1.1 Each service line between the IPS and the collection line shall have a gate or ball valve installed at the main. In addition, install a minimum of two check valves on the GP service lines. The check valve attached to the IPS counts as one of the check valves. The check valve shall be installed at the property line.

6.2.5.2 Valves

6.2.5.2.1 Install sufficient mainline valves at locations to isolate portions of the system and to ensure continuous operation for maintenance and repair. On straight runs of pipeline, valves are required every one-quarter mile.

6.2.5.2.2 The pump discharge shall be equipped with a factory installed, gravity operated, flapper type integral check valve built into the discharge piping.

6.2.5.2.3 Holes or ports in the discharge piping are not acceptable anti-siphon devices.

6.2.5.3 Pipeline Material

6.2.5.3.1 The service piping from the pump unit to the side sewer or County force main shall be a minimum of 1-1/4 inch diameter HDPE SR11. A minimum burial depth of 24 inches shall be maintained on private property or 48 inches in the Right of Way.

6.2.5.4 IPS Testing

6.2.5.4.1 Each grinder pump shall be submerged and operated for 5 minutes (minimum). Included in this procedure will be testing of all ancillary components such as the check valve, the anti-siphon valve, discharge assembly, and dedicated level controls and motor controls for each unit. All completed stations shall be leak tested to assure the integrity of all joints, seams, and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets, etc.). Final inspections by Kitsap County will only be completed after the work is validated by Labor and Industries and a Labor and Industries sticker is visible.

6.2.5.4.2 The grinder pump station shall only be allowed to pump sanitary sewage into the County system after final testing and acceptance by the County.

6.2.5.5 Discharge to a Gravity Collection System

6.2.5.5.1 Where a gravity sewer main exists in the public Right of Way, building sewer pressure lines shall discharge into gravity side sewers at the property/easement line as per County Standard Detail PD-9.

6.2.5.6 Discharge to a Conventional Force Main

6.2.5.6.1 Where a gravity sewer main does not exist in the public Right of Way, building sewer pressure lines shall pass through a valve box containing an isolation valve and a check valve located at the property line prior to connecting to the force main as per County Standard Detail PD-10 and PD-11.

6.2.5.6.2 After the Developer has exposed the sewer main and provided any shoring necessary to provide for safe working conditions, a saddle with a 2-inch corporation stop valve shall be furnished and installed by the County where the service line connects to the County force main. Developer shall schedule the saddle installation with the County in advance. Developer shall obtain the necessary permits prior to exposing the existing sewer main. Developer shall provide and install the check valve and valve can over the corporation stop as shown on the County Standard Details.

6.2.6 Ownership, Operation, and Maintenance

6.2.6.1 Ownership, Operation, and Maintenance of the Individual Pump Stations shall be the responsibility of the property owner. Property owners shall complete an O&M Agreement form to be recorded against the property documenting their understanding of this requirement at the time of installation.

6.3 Other Alternative Systems

6.3.1 No other alternative systems are expressly permitted but will be considered by the County on a case-by-case basis and will be evaluated based on the merits of the project to the County.

Section 7: Pump Station Provisions and Records

7.1 Introduction

7.1.1 Except where otherwise indicated, the following sections are intended to be consistent with Ecology's "Criteria of Sewage Works Design." Except where provided otherwise, construction details, workmanship, and materials shall be in accordance with the latest edition of the WSDOT Standard Specifications.

7.1.2 The Developer shall submit information from the material manufacturer or fabricator showing that the materials meet the requirements of the design and pertinent specifications. The Developer shall provide submittals to the County on all materials to be used.

7.1.3 Equipment manufacturers or their authorized representatives shall submit a manufacturer's installation affidavit (certificate) with respect to their equipment certifying that:

1. the equipment has been properly installed and lubricated;
2. the equipment is in accurate alignment;
3. the manufacturer was present when the equipment was placed in operation;
4. the manufacturer has checked, inspected and adjusted the equipment as necessary;
5. the equipment is free from any undue stress imposed by connecting piping or anchor bolts;
6. the equipment is not imposing any undue stress on any connecting members;
7. vibration of the complete pump assemblies is within the limits recommended by the applicable standards of the Hydraulic Institute;
8. the equipment has been operated satisfactorily under full load conditions;
9. the manufacturer has inspected their equipment during the operational demonstrations and system validation tests to the extent specified; and
10. the equipment is fully covered under the terms of the guarantee.

7.1.4 Any extension of the Kitsap County sanitary sewer extension shall be completed in accordance with the applicable requirements of the Standards for Sanitary Sewer Extensions.

7.1.5 The County will perform a commissioning process before the lift station is permitted to be brought online. Flow will not be permitted to be sent to the lift station until the County is satisfied with the condition and operations of the lift station.

7.1.6 Developer is responsible for lift station operation, equipment warranty, and associated costs until developments are at 80% occupancy or 2 years, whichever is longer. A re-commissioning process will be required prior to the County assuming ownership of the facility. Any deficiencies identified will be required to be rectified prior to ownership change

and bond release. A bond will be required to be held with the County for 10% of the valuation of the Lift Station in addition to any other bonding requirements for sewer infrastructure.

7.1.7 Lift stations must be provided a street address by Kitsap County Department of Community Development prior to commissioning.

7.2 Operation and Maintenance Manuals

7.2.1 Provide complete O&M Manuals to the County for review and approval as follows:

1. Draft O&M Manual – One electronic copy in Adobe PDF DC, or Acrobat Pro 2020 version or greater format, bookmarked and searchable a minimum of 30-days prior to station start up.
2. Final O&M Manual – Two complete hardcopy sets of the approved Draft O&M Manual, along with one electronic copy on USB Flash Drive in Adobe PDF DC, or Acrobat Pro 2020 version or greater format, bookmarked and searchable for approval. Final manuals will be bound in identical hardcover three-ring binders with the pump station name, volume number, and set number clearly shown. Approved Final O&M Manuals shall be submitted to the County prior to final acceptance of the Sewer Pump Station.
3. Final Program Files – Two electronic copies of all final programming for all installed Program Logic Controllers (PLC), Human Machine Interfaces (HMI), Flow Meters, Variable Frequency Drives (VFD) or other programmed devices. Electronic copies shall be provided on two labeled USB flash drives.

7.2.2 The manuals shall be divided into sections and subsections as necessary to describe each component of the complete pump station and organized in a manner similar to this specification. An overall table of contents shall be provided.

7.2.3 All information shall be specifically for the installed components. Data sheets which cover multiple equipment or list options shall be marked to indicate the installed equipment, including provided options. All other equipment or options shall be crossed out. Each item in the submittal shall include, but not be limited to the following information:

1. Fly sheet indicating: Contracting Agency's name; description of equipment; manufacturer's name, address, and telephone number; and local supplier/ representative's name, address, and telephone number.
2. Detailed index indicating submittal contents, with major headings related to table dividers.
3. Disassembly and assembly drawings
4. Parts list and/or bill of materials
5. Wiring diagrams
6. Lubrication instructions, including type and frequency
7. Preventative and periodic maintenance summary
8. Operating instructions
9. Overhaul and parts replacement instructions
10. Source for parts

11. Testing and troubleshooting procedures
12. Performance curves
13. Factory test data
14. Manufacturer/Vendor Startup & Testing Reports
15. Manufacturer's Installation Affidavit (Certificate)
16. List of recommended spare parts
17. List of expendable parts (i.e., air or oil filters)
18. Warranty

7.3 Record Drawings

7.3.1 Provide pump station record drawings in accordance with Section 1.3 of these Standards. In addition to these requirements, provide as constructed panel and interconnection drawings for all control, telemetry, and electrical cabinets and panels.

Section 8: Site Requirements

8.1 Site Layout and Information

8.1.1 Site Requirements: The size of a proposed pump station site will vary depending on the facility configuration and access requirements. Design criteria include the following:

1. A minimum of 50 ft separation from the pump station structure (i.e., wet well/dry well) should be provided to the property line and/or adjacent facilities.
2. The maximum slope for access roads should be 12%.
3. Vaults should be designed to avoid designation as a confined space. Vaults that are six feet or deeper should have stairways or installed ladders with extensions per OSHA standards. A concrete pad that is suitable for confined space personnel retrieval equipment shall be placed around all vaults.
4. Facilities should be oriented according to prevailing wind direction and to minimize potential for hydrogen sulfide gases entering control building intake grills or electrical panels whenever possible.
5. Facilities should be oriented to provide satisfactory access to all components of the facility and avoid potential for vehicle conflict.
6. All site plans must include final details of Lift Station site layout before final approval.
7. Minimum tract/parcel area for a Lift Station shall be 75 ft x 75 ft unless a developed site plan is provided.
8. Site Plans must orient Lift Station wet well, valve vault, generator, communications panel and other equipment per detail PS-4.

8.2 Flood Protection

8.2.1 The station's operational components shall be located at an elevation that is not subjected to the 100-year frequency storm flood and associated wave action or shall be otherwise adequately protected as certified by a professional engineer registered in the State

of Washington. All electrical controls, connection boxes, disconnects, and motor drives shall be located above grade and not subject to flooding or sewage related malfunction.

8.3 Access for Maintenance

8.3.1 Access to pump stations is critical for County maintenance and operations (M&O) personnel. Pump station site design shall include space to facilitate service equipment. This is in addition to the permanent on-site equipment including an emergency generator.

1. Space for a standby generator shall be reserved whether the unit is fixed or portable.
2. Access shall be provided around the entire perimeter of the pump station for required maintenance equipment.
3. The driving area into the pump station shall be paved with asphalt and shall support vehicles with a gross vehicle weight of 50,000 pounds.
4. All maintenance vehicles anticipated to service the station shall be provided space to park on-site. No street parking (off-site) for maintenance vehicles shall be assumed.
5. Adequate clearance from overhead power lines to allow for the safe operation of a crane shall be provided.
6. Non-driving areas shall receive a 6-inch thickness of crushed surfacing top course material.
7. Above-grade equipment and piping shall be protected by bollards.
8. All hatches in areas subject to vehicular access shall have no less than an HS-30 rating.
9. Sufficient space for vehicles to turn around shall be provided at lift stations accessed directly from high traffic roadways.
10. A cast-in-place davit post shall be installed for each pump station wet well to provide access and to provide structural support for fall protection safety equipment. Exceptions may be provided by the County on a case-by-case basis.
11. A preliminary layout of the lift station must be included with each case-by-case application. The footprint of the lift station must be agreed upon by the County early in the design process. Minimum spacing for access requirements will be subject to review by the County.

8.4 Fire Protection

8.4.1 Number and location of fire extinguishers shall meet all appropriate fire and safety codes and the requirements of the Kitsap County Fire Marshal.

8.4.2 Fire extinguishers shall meet the following requirements:

1. Steel bodied, all metal top (head) and valves.
2. Multi-purpose dry chemical, UL Rated, 2A-10BC.
3. Provide hose and horn on each.
4. Red with epoxy finish coat.

8.4.3 Provide "FIRE EXTINGUISHER" sign for each extinguisher meeting requirements of NFPA 10.

8.4.4 Fire extinguishers and cabinets shall be obtained from a single manufacturer.

8.5 Fencing

8.5.1 A 6-foot chain link fence, with 24-foot wide double swing access gate, with pneumatic wheel assist shall be provided around the pump station site, two feet inside the property line. Gate shall be aligned with wet well unless otherwise approved in writing by Kitsap County.

8.6 Lighting

8.6.1 All pump station sites shall have a minimum of two LED equivalent 75-watt bulbs in adjustable floodlights for night visibility at outdoor control panels with one manual switch. No lighting shall be installed inside the pump station wet well.

8.6.2 All pump station buildings shall have a minimum of one manually controlled externally mounted floodlight for night visibility over each entrance door and interior lighting. All lighting shall be LED.

8.6.3 No automatic controlled lights shall be installed; only manual switch lights shall be installed.

8.7 Water Supply

8.7.1 All pump stations, unless otherwise directed by the County, shall be provided with a 3/4-inch non-freeze post hydrant on site. Non-freeze post hydrants shall be Zurn, Model Z-1385 (3/4-inch), or approved equal.

8.7.2 Water services shall meet all water purveyor requirements including backflow prevention.

8.7.3 Each proposal for a lift station must discuss water service requirements prior to station design.

8.8 Landscaping

8.8.1 Landscaping shall be provided on the outside of the fence to screen the site. All plantings shall be low maintenance.

Section 9: Building Requirements

9.1 General

9.1.1 Permanent pump station buildings shall be of concrete and masonry construction with metal roofing designed by an Engineer or Architect licensed in the State of Washington.

9.1.2 All buildings shall meet requirements of current Kitsap County Building Codes.

9.1.3 All pump station buildings shall be heated and ventilated.

9.2 Free-Standing Shelters

9.2.1 All exterior electrical control cabinets, transfer switches, RTU cabinets and other similar electrical equipment shall be provided a free-standing shelter to provide weather protection unless otherwise waived in writing by the County. Shelters shall be of a galvanized

structural steel construction with metal roof designed by an Engineer or Architect licensed in the State of Washington. Refer to Section 9.5 for roofing requirements. All shelters shall meet current Kitsap County Building Code requirements.

9.3 Masonry Walls

9.3.1 All masonry units shall be grouted solid and reinforced. Block shall be laid in a running bond, unless otherwise approved.

9.3.2 Masonry units shall be nominally 8 inches high by 16 inches long as manufactured by Mutual Materials Co. or approved equal.

9.3.3 Exterior masonry units shall be colored. Color shall be approved by Kitsap County.

9.3.4 Masonry units shall be manufactured with an integral water repellent additive during production such as “Dry-Block” by W.R. Grace & Co.

9.3.5 Exterior masonry unit faces and exposed unpainted faces shall receive a clear water repellent sealer installed over cleaned surfaces in accordance with manufacturer’s recommendations. Coating shall extend from masonry sill cap down to top of concrete footing.

9.3.6 Exterior masonry units shall be treated with PROSOCO Blok-Guard® & Graffiti Control II. Provide one gallon of PROSOCO Eraser® Graffiti Wipe to Kitsap County.

9.3.7 Mortar shall contain an integral water repellent admixture such as “Dry-Block” mortar admixture by W.R. Grace & Co. Follow manufacturer’s published recommendations for preparation and use.

9.4 Doors and Frames

9.4.1 Exterior doors and frames shall be FRP. Doors shall be 1-3/4-inch thick and of flush construction, having no seams or cracks. All doors up to 35-3/4 inches x 83-1/2 inches shall have equal diagonal measurements. For consistency in the resin chemistry tailored for this application and to maintain the same physical properties throughout the structure, all fiberglass components including face plates, stiles, rails and frames shall be fabricated by the same manufacturer. Components obtained through various outside sources for plant assembly will not be accepted.

9.4.2 Color shall be approved by Kitsap County.

9.4.3 Hardware shall be suitable and adapted for its required use and shall fit its designated location. Subject to requirements, provide products by one of the following manufacturers for each type of hardware:

1. Locks and Latches: Yale. No Substitutions.
2. Mechanical Pushbutton Lock: Dormakaba Simplex® L1000 Series. No Substitutions.
3. Cylinders and Keying: Same manufacturer for locksets.
4. Hinges: Bommer Industries, Hager.
5. Surface Mounted Closers: Von Duprin. No Substitutions.
6. Wall Stops: Trimco, Ives, Glynn Johnson.

7. Door Plates: Ives, Hager, Rockwood.
8. Security Bars: Pemko.
9. Door Gaskets: Pemko.
10. Exit Devices: Von Duprin. No Substitutions

9.4.4 External doors shall be provided with a Mechanical Pushbutton Lock assembly with cylindrical lock lever, combination entry, and key override. External double doors shall be security doors with guard strip in the middle or have removable mullion.

9.4.5 Hardware supplier shall meet with Kitsap County to determine the keying requirements for the project.

9.5 Metal Roofing

9.5.1 General

9.5.1.1 Metal roofing shall be a structural standing seam metal roof system by AEP Span, Design Span® hp or approved equal. The County will be the sole judge of what qualifies as an “equal” system.

9.5.1.2 Color shall be approved by Kitsap County.

9.5.2.3 Provide components approved by roof panel manufacturer and required for a complete weather tight panel system including trim, copings, fascia, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels.

9.5.2 Warranty

9.5.2.1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

9.5.2.2 Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 10 years from date of Substantial Completion.

9.5.2.3 Special Weather tightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weather tight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

9.6 Color

9.6.1 Typical exterior color scheme for pump stations is Tan colored masonry with Evergreen or Hunter Green metal roofing, flashing, gutters and downspouts.

9.6.2 Typical interior color is white.

Section 10: Pump Design and Hydraulics

10.1 General

10.1.1 The design of the submersible pump station shall provide for a “lead pump” cycle time of no more than six cycles per hour during peak wet weather flow design conditions, and no less than one cycle per hour during minimum dry weather flow design conditions.

10.2 System Hydraulics

10.2.1 The design capacity of a pump station shall be computed on the basis of the total tributary area and projected population that can be served by the pump station based on the most current zoning projections. Methods of calculation shall be consistent with DOE Criteria for Sewage Works Design Section C2-1.2.

10.2.2 Provide calculations for the operational parameters of the lift station pumps and force main system under low-flow conditions, accounting for phased occupancy of the development. Calculations must address varying levels of occupancy, including the minimum expected flow during initial phases and the maximum flow at full occupancy. Include flow rate, velocity, total dynamic head (TDH), and pump efficiency for each scenario. Calculations must also include flow rate within the discharge force main for different phases of development. Operating conditions must be clearly documented on the mechanical plans and included in the pump station configuration table or equivalent documentation.

10.3 Pump Selection and Requirements

10.3.1 General

10.3.1.1 At least two submersible pump units shall be provided. The pumps shall be designed to fit actual flow conditions and each shall be capable of handling the expected maximum peak sewage flow.

10.3.2 Submittals

10.3.2.1 Submit the following:

1. Technical literature, bulletins, and/or catalog cuts of the equipment.
2. Performance curves.
3. Quality control test results.
4. Materials of construction.
5. Complete installation instructions, including electrical and mechanical requirements.

6. Operations and Maintenance Manuals.
7. Warranties.

10.3.3 Warranty

10.3.3.1 The pump manufacturer shall warrant the pumps, including components and motor, against defects in workmanship and materials for a period of five (5) years under normal use and service.

10.3.3.2 The pump manufacturer shall warrant the guide system (including guide, cables or rails, and brackets) against defects in workmanship and materials for a period of ten (10) years under normal use and service.

10.3.3.3 The pump manufacturer shall fully warrant the impeller against clogging for a period of one year under normal use and service.

10.3.3.4 Pump manufacturer warranties shall be in published form and shall apply to all similar units.

10.3.4 Quality Control

10.3.4.1 Perform equipment tests in accordance with the Hydraulic Institute's - Submersible Pumps for Hydraulic Performance, Hydrostatic Pressure, Mechanical and Electrical Acceptance Tests.

10.3.4.2 Tests shall be performed on the actual assembled pumps to be supplied; prototype model tests are not acceptable. Tests shall cover a range from shut-off to a minimum 20 percent beyond specified design capacity. Conduct test per above on all supplied pumps, generating a curve showing actual flow, head, BHP, and hydraulic efficiency.

10.3.4.3 Obtain the submersible sewage pumps from one source and a single manufacturer.

10.3.5 Products

10.3.5.1 The pumps specified herein are the product of Xylem Flygt Corporation, NP-3000 series, and explosion proof. Other pumps may be considered as ‘approved equal’ in special circumstances and/or at the County’s discretion, subject to approval.

10.3.5.2 Local Supplier: Whitney Equipment Company, 16120 Woodinville-Redmond Rd NE, Suite #3, Woodinville, WA 98072, (425) 486-9499.

10.3.5.3 Performance and Conditions of Service: Pumps shall operate over the range of flows and heads specified and approved. Motor horsepower shall not exceed the values specified, and the hydraulic efficiency shall be equal to or higher than 50%.

10.3.5.4 Pumps shall operate without cavitation or vibration within the specified flow range, with a submergence of one (1) foot above the impeller centerline.

10.3.6 Pump Design

10.3.6.1 The pumps shall be submersible non-clog type that is suitable for the application, each connected to a discharge connection of a minimum diameter of 4 inches.

10.3.6.2 Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact.

10.3.7 Pump Construction

10.3.7.1 Provide pumps fabricated of the following materials:

Pump Components	Material
Pump Case	Cast Iron, ASTM A48, Class 35B
Motor Housing	Cast Iron, ASTM A48, Class 35B
Impeller	Hard Iron, ASTM A532 (Alloy III A, 25% chrome cast iron)
Intermediate Housing (Backplate)	Cast Iron, ASTM A48, Class 35B
Discharge Base Elbow	Cast Iron, ASTM A48, Class 35B
Pump/Motor Shaft	Stainless Steel, AISI 431
Shaft Sleeve	Stainless Steel, ASTM A276, Type 420
Wear Ring, Case	Cast Iron, ASTM A48, minimum 200 Brinell
Impeller	Hard Iron, ASTM A532 (Alloy III A, 25% chrome cast iron)
O-Rings/ Lock-in	Nitrile Rubber (NBR)
Fasteners	Stainless Steel, Type 316TI
Mechanical Seal – Lower	Tungsten Carbide
Mechanical Seal – Upper	Tungsten Carbide
Guide Rails	Stainless Steel, ASTM A276 Type 316L
Lifting Chains	Stainless Steel, ASTM A276 Type 316L
Oil – All Uses (Seal Lubrication, Motor Cooling, etc.)	FDA Approved, Ecologically Safe
Power/Control Cable Jacket	Chlorinated Polyethylene Rubber

10.3.7.2 Furnish pump case, impeller, intermediate housing, and motor housing with smooth surfaces devoid of blow holes and other irregularities.

10.3.7.3 All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory-applied polyamidoamine epoxy protective spray coating on the exterior of the pump.

10.3.7.4 Sealing design shall incorporate metal-to-metal contact between machine surfaces.

10.3.7.5 All major castings shall be produced in the manufacturer's own foundry, under the manufacturer's direct supervision.

10.3.8 Components

10.3.8.1 General:

10.3.8.2 Provide pumps capable of handling raw, unscreened sewage.

10.3.8.3 Where watertight sealing is required, machine and fit mating surfaces with O-rings.

10.3.8.4 Provide with heavy duty lift lugs or hoisting bail designed for lifting the entire pump and motor assembly.

1. Impeller and Wear Rings:
   a. Provide enclosed, non-clog type impeller of Hard Iron.
   b. Statically and dynamically balance impeller.
   c. For enclosed impeller pumps, provide wear rings on case and impeller of material and Brinell hardness specified to ensure maximum pump/impeller life and continuing high efficiencies. Soft metals (e.g., bronze) or elastomers as wear ring material are not acceptable.
2. Shaft
   a. Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings are not acceptable.
   b. Machine the shaft of Type 420 stainless steel; or, Gr 1045 carbon steel with a replaceable Type 420 stainless steel shaft sleeve under the lower mechanical seal to isolate the shaft from the pumped media.
   c. Carbon steel as shaft material without a stainless steel sleeve is not acceptable.
3. Mechanical Seal
   a. Provide two totally independent mechanical shaft seals, installed in tandem, each with its own independent spring system acting in a common direction.
   b. Install the upper seal in an oil-filled chamber with drain and inspection plug (with positive anti-leak seal) for easy access from external to the pump.
   c. Provide seals requiring neither routine maintenance nor adjustment, but capable of being easily inspected and replaced.
   d. Do not provide seals with the following characteristics:
      i. Conventional double mechanical seals with single or multiple springs acting in opposed direction.
      ii. Cartridge-type mechanical seals.
      iii. Seals with materials other than those specified.
      iv. Seals using the impeller hub as a mounting surface.
4. Bearings
   a. Furnish upper and lower bearings, single row (preferred) or double row as needed, to provide a B10 life of, at minimum, 50,000 hours at anticipated axial and radial loadings.
   b. Provide sealed, shielded (permanently lubricated) bearings.
5. Motor

a. Provide a motor that is squirrel cage, induction in design, housed in completely water-tight and air-filled chamber, with a minimum 1.15 service factor.
b. Insulate the motor stator and stator leads with, at minimum, Class H insulation rated for 180 degrees C total temperature.
c. Provide motor cooling by providing an adequately rated motor with sufficient surface area for ambient only cooling.
d. Provide motors that are capable of operating for at least 2 hours in a dry mode without damage to motor or seals.
e. Provide motors that are designed, rated, and warranted for continuous operation at 40 degrees C, temperature rise not to exceed 80 degrees C, capable of 30 evenly spaced starts per hour.
f. Do not provide motors that contain in excess of 2 gallons of oil (combined total for cooling and seals), or that contain other than an FDA approved, ecologically safe oil.
g. Pump and motor package to be FM approved, Class 1, Division 1, Group C & D service for hazardous locations as defined by the National Electric Code (NEC).
h. All motors shall be 3 phase, 480 volts and power supply to station shall be the same.

6. Thermal/Leakage Relay
   a. Provide an ITT Flygt MiniCAS thermal/leakage relay with mounting socket for each pump installed.

7. Protection
   a. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. Set temperature monitors at levels recommended by pump manufacturer. When activated, switches shall initiate an alarm and the pump shall shut down. The pump control panel shall send the activated alarm signal to the Radio Telemetry Unit (RTU) and the front panel. A power disconnect breaker shall be installed on the outside of the control panel.
   b. Leak detection sensors shall be provided to detect water in the stator chamber, cable entry chamber, and mechanical seal oil chamber. The leak sensors shall utilize a float switch to detect the presence of water. When activated, the sensors shall initiate an alarm illuminating an amber warning light on the pump control panel only. The pump shall not be shut down.

10.4 Appurtenances

10.4.1 Guide System

10.4.1.1 Provide a guide system that allows pumps to be removed and installed without the need to enter the wet well and without removal of bolts, nuts, or other fasteners.

10.4.1.2 Pumps shall connect to permanently mounted discharge connections by simple downward motion, without rotation; guided by at least two non load-bearing, Type 316L stainless steel, non-sparking, guide rails per pump permanently installed in the wet well extending from the top of the station to the discharge connection. Final connection shall ensure zero leakage between the pump and discharge connection flange.

10.4.1.3 Pumps shall automatically connect to the discharge elbow when lowered and sealed by a profile gasket or machined metal-to-metal watertight contact.

10.4.1.4 Discharge connection/guide system shall be such that no part of the pump bears directly on the floor of the wet well.

10.4.1.5 Each pump shall be fitted with a Flygt Pump Lift™ pump lifting system consisting of the following minimum components:

1. Minimum 3-foot length of Type 316L stainless steel chain of adequate strength for raising and lowering pumps.
2. Type 316 stainless steel shackles of adequate strength for raising and lowering pumps.
3. Spectra cord guide rope of adequate length to reach from top of pump to minimum 6-feet above wet well opening.
4. Flygt Grip-Eye pump lifting assembly.

10.4.1.6 Chain holder with safety hook for each pump to be Type 316L stainless steel.

10.4.1.7 Anchors, fasteners and other connecting hardware shall be Type 316 stainless steel.

10.4.2 Power and Control Cable

10.4.2.1 Provide combined power cable and control cable of adequate length to allow a unit to be wired without splicing. Cables shall be suitable for the application and sized in accordance with NEC requirements.

10.4.2.2 Cable entry sealing system:

1. Provide cable terminal box on side of motor housing, with cable entry sealed to ensure that no entry of moisture is possible into the motor terminal area even if the cable is damaged or severed below water level.
2. Control cable shall contain the required conductors for the temperature and seal leak detection systems.

10.4.3 Spare Parts

10.4.3.1 Supply the following spare parts:

1. Two Basic Pump Repair Kits (Seals, Bearings, and O-Rings) for each pump type and/or size.
2. One Critical Pump Kit (Impeller, Insert/ Wear Ring and Sleeve Assembly, which includes Sleeves, Washers, and Impeller Bolts) for each pump provided.

10.5 Installation and Training

10.5.1 Installation

10.5.1.1 Equipment shall be installed in accordance with the equipment manufacturer's written installation instructions and the requirements of the design. The Contractor/Developer shall provide and pay for the services of a manufacturer's service engineer to review the installation and make final adjustments to the equipment.

10.5.1.2 Manufacturer installation affidavits (certificates) shall be provided in accordance with Section 7.1.

10.5.1.3 Pumps shall be set plumb with no stresses on the pump discharge.

10.5.1.4 Equipment shall not be subject to electrical or mechanical shock. Damaged, dented or marred equipment shall be replaced or repaired in a manner satisfactory to Kitsap County, at the option of Kitsap County, at no cost to Kitsap County.

10.5.2 Start-up/Commissioning and Training Service

10.5.2.1 Start up and Commissioning will not occur by County Staff until all systems are fully functional and pre-inspected.

1. Gen-Set.
2. Permanent Power, system will not be tested on temp power or without commissioned generator.
3. Telemetry.
4. Station Operation.

10.5.2.2 The Developer shall provide the equipment manufacturer's qualified factory-trained field service engineer to conduct a site visit to inspect, check, service, adjust and make corrections to the installation. Additionally, after the pumps have been completely installed and wired, the equipment manufacturer's qualified factory-trained field service engineer shall do the following:

1. Megger test stator and power cables.
2. Check seal lubrication.
3. Check for proper rotation.
4. Check power supply voltage.
5. Measure motor operating load and no-load current.
6. Check level control operation and sequence.

10.5.2.3 A written report by the manufacturer's service engineer shall be submitted to Kitsap County certifying that the equipment has been properly installed and checked.

10.5.2.4 Field test all pumps, generators, and supporting equipment after installation to demonstrate satisfactory operation. See Section 13.

1. Furnish all labor, materials, tools, equipment, incidentals and services for developing a sufficient supply of potable water for functional testing. Sufficient quantities of water shall be available to test the full range of the equipment.
2. Testing shall be done in the presence of Kitsap County personnel.
3. Any equipment that fails to meet the requirements shall be modified, repaired, or replaced.
4. Instruct Kitsap County's personnel on the operation and maintenance of the equipment.

10.5.3 Cleaning

10.5.3.1 All materials and equipment shall be new and shall require only a minimum amount of routine cleaning during or after installation.

10.5.3.2 All debris, grit, petroleum products, rust scale, construction by-products, and foreign matter shall be removed, and damaged coatings shall be repaired prior to final acceptance. All cleaning regimen suggested by the manufacturer shall be done.

Section 11: Wet Well and Vault Design and Construction

11.1 System Fabrication

11.1.1 Wet wells and vaults shall be precast reinforced concrete, cast-in-place reinforced concrete, or stainless steel construction. Wet well floors shall be sloped to the pump suction to minimize grit accumulation, per the DOE “Criteria for Sewage Works Design”. Vault floors shall be sloped to integral floor drain. Wet wells and vaults shall be watertight.

11.1.2 Precast assemblies shall be manufactured to meet the requirements of ASTM C-478, and the following minimum design requirements:

1. Normal weight concrete.
2. Minimum concrete cover over reinforcement shall not be less than that required by ACI 318, if greater than ASTM C858.

11.2 Loading Requirements

11.2.1 Loading assumptions shall conform to ASTM C857 except as follows:

1. Top slabs shall be designed for HS30 Loading OR 250 PSF Live Loading, whichever is greater.
2. Wall and bottom slab design and uplift calculations shall include hydrostatic pressure from groundwater. Groundwater level shall be assumed to be at the ground surface.
3. For structures designed using groundwater pressures, buoyancy calculations shall have a minimum factor of safety equal to 1.5.
4. Live loads and weights for post-installed items such as internal piping, pumps, valves, sewage, concrete grout fill, etc. shall not be included in the buoyancy calculations.

11.2.2 All precast assembly sections shall utilize a round rubber gasket meeting ASTM C-443 specifications. All joints shall be watertight and will be mudded with non-shrink grout. All wet well and vault components, including, but not limited to, access hatches, pump bases, ladders, and supports will be securely fastened to the precast sections in a watertight manner.

11.2.3 Cast-in-place wet well and vaults designs shall be stamped by a registered engineer, licensed in State of Washington.

11.2.4 All penetrations in wet wells and vaults shall be sealed utilizing one or both of the following methods:

1. Modular Mechanical Seal - Expanding rubber seal with 316 stainless steel hardware installed in accordance with the manufacturer’s recommendations to provide a

watertight seal. Modular seals shall be PSI/Thunderline Link-Seal® or approved equal.

2. Rubber Flexible Connector – Kor-N-Seal Boot with 316 stainless steel pipe clamp assembly, 316 stainless steel Korband assembly, cavity O-Ring, and non-shrink grout, or approved equal.

11.2.5 All miscellaneous metal parts in wet well shall be 316L stainless steel. Metal outside the wet well shall be aluminum, stainless steel or hot dipped galvanized following fabrication.

11.2.6 No lights or intrusion alarms shall be installed in the wet well.

11.3 Coating Systems

11.3.1 Surface coatings shall be semi-gloss, except that ceilings shall be coated with flat coatings to match wall areas.

11.3.2 Surfaces to be coated and coating systems to be used are described below. The final coat shall be applied only after all other work, including punch list items, has been completed.

Surface	**Coating System**
1. Metal Work: Equipment, including metal base and guards; conduits, piping; appurtenances, including grilles and louvers; doors; electrical, pneumatic, and instrumentation control panels and stations, including supports. Refer to equipment specifications for exceptions.	
a. Iron and steel (includes galvanized) (except non-ferrous and stainless), exposed above ground or in vault structures (not buried)	B (except as indicated under b. & c.)
b. Iron and steel piping and appurtenances located in the wet well	D (except as indicated under c.)
c. Submersible pumps	E
2. Concrete, Grout, and Masonry:	
a. Exterior concrete exposed slabs and surfaces	Unpainted
b. Exterior concrete buried surfaces of wet wells, manholes, valve vaults	A
c. Interior concrete/grouted surfaces of wet well	C
d. Interior concrete/grouted surfaces of manholes	C
e. Interior concrete surfaces of valve vault	A or C
3. Materials Not Requiring Paint	
a. Rubber, stainless steel, copper pipe, PVC pipe, and fiberglass fabrications.	—
b. Labels and Nameplates: Do not paint over Underwriters Laboratories Factory Mutual, or other code-required labels or equipment name, identification, performance rating, nomen-clature plates.	—

Surface	Coating System
c. Pre-Finished Items, except as damaged, including: (1) acoustic materials (2) finished mechanical and electrical equipment (3) light fixtures (4) switchgear (5) distribution cabinets (6) operating louvers	—
d. Metal Surfaces, including: (1) aluminum railing, ladders, hatlines, light poles (2) stainless steel (3) chromium plate (4) copper (5) bronze (6) brass (7) aluminized and galvanized (and vinylized) chainlink fabric fences, gates, and closures (8) Duct silencers and motor-operated dampers	—
e. Moving Parts of Operating Equipment such as the following: (1) valve and damper operators (2) linkages (3) sensing devices (4) motor and fan shafts (5) gears	—

Coating System A	
Coating Material:	Modified Polyamine Epoxy
Surfaces:	Concrete
Surface Preparation:	1. Allow new cast-in-place concrete to cure a minimum of 28 days at 75°F (24°C). 2. Verify concrete dryness and prepare concrete surfaces in accordance with NACE 6/SSPC-SP13 Joint Surface Preparation Standards and ICRI Technical Guidelines. 3. Moisture vapor transmission shall not exceed three lbs per 1,000 sq ft in a 24-hour period (Reference ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride"). 4. Relative humidity shall not exceed 80% (Reference ASTM F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes"). 5. Abrasive blast, shot-blast, water jet or mechanically abrade concrete surfaces to remove laitance, curing compounds, hardeners, sealers and other contaminants and to provide a minimum ICRI-CSP 3 surface profile. 6. Large cracks, voids and other surface imperfections shall be filled with a recommended filler or surfacer.
Application:	Factory: Exterior Surfaces Field: Interior Surfaces
Coating System:	Primer: Tnemec Series 141 Epoxoline, one coat, 16 mils DFT Finish: Tnemec Series 141 Epoxoline, one coat, 16 mils DFT
Coating System B	
Coating Material:	Modified Polyamidoamine Epoxy or Aliphatic Acrylic Polyurethane
Surfaces:	Metal
Surface Preparation:	1. Bare ferrous metal surfaces shall be prepared in accordance with SSPC SP-6 (Commercial Blast Cleaning). 2. Shop primed surfaces which are to be incorporated in the work shall be prepared in the field by cleaning all surfaces in accordance with SSPC SP-2 (Hand Tool Cleaning). 3. Galvanized or nonferrous surfaces shall be treated with a passivator and vinyl wash primer as recommended by the coating system manufacturer. 4. If smoothing of rough metalwork is necessary, a smoothing cement acceptable to the paint system material manufacturer shall be used.
Application:	Field
Coating System:	Primer: Tnemec Series 135 Chembuild, one coat, 4.0 to 6.0 mils DTF, Color: Off-White Finish: Tnemec Series 73 Endura-Shield, two coats, 2.0 to 3.0 mils DFT per coat, color to be determined by Kitsap County (submit color chart)

Coating System C	
Coating Material:	100% Solids High Build Epoxy
Surfaces:	Concrete
Surface Preparation:	1. Surfaces must be sound and contaminant-free with a surface profile equivalent to a minimum CSP3 to CSP5 in accordance with ICRI Technical Guideline No. 310.2R-2013. 2. Dry abrasive sand with water blast to surface profile as recommended by the manufacturer.
Application:	Field
Coating System:	Primer: Raven 155 WB Epoxy Primer, spread at 200 sq. ft. per gallon or as recommended by coating system manufacturer Finish: Raven 405, spray apply two coats, 125 mils DFT total, allowed tolerances of plus 40 miles DFT to minus 0 mils DFT, color to be Light Blue
Coating System D	
Coating Material:	100% Solids Modified Polyamine Epoxy
Surfaces:	Metal
Surface Preparation:	As recommended by coating system manufacturer.
Application:	Field
Coating System:	Primer: As recommended by coating system manufacturer. Finish: Tnemec Series 435 Perma-Glaze, two coats, 12 to 15 mils DFT per coat, color to be determined by Kitsap County (submit color chart)
Coating System E	
Coating Material:	Epoxy (per Flygt/Xylem)
Surfaces:	Metal
Surface Preparation:	In accordance with SSPC SP-10 (Near white metal blast)
Application:	Factory (curing as required by coating manufacturer)
Coating System:	Xylem Standard Code 08 Coating System Primer: Temanyl PVB, one coat 1.6 Mil DFT Finish: Duasolid 50, 3 coats, 4-5 Mil DFT per coat

11.3.1 Preparation

11.3.1.1 Surfaces to be coated shall be clean. Before applying coating or surface treatments, oil, grease, dirt, rust, loose mill scale, weathered coatings, and other foreign substances shall be removed except as specified. Oil and grease shall be removed before mechanical cleaning is started. Where mechanical cleaning is accomplished by blast cleaning, the abrasive used shall be washed, graded, and free of contaminants that might interfere with the adhesion of the coatings.

11.3.1.2 Clean cloths and clean fluids shall be used in solvent cleaning. Cleaning and painting shall be scheduled so that dust and spray from the cleaning process will not ahdere on wet, newly painted surfaces.

11.3.1.3 The Developer/Contractor shall demonstrate that field coating is compatible with factory coating by applying small test patches of specified coating over shop coating.

11.3.1.4 The Developer/Contractor shall pay special attention to painting of existing surfaces adjacent to the new piping and structures. Care shall be taken in surface preparation and finish work to provide a smooth transition from one surface to the other. If necessary, compatible primer shall be used when painting over existing surface.

11.3.1.5 Metallic surfaces shall be prepared in accordance with applicable portions of surface preparation specifications of the SSPC. Specific applicable standards are specified in each coating system. The solvent in solvent cleaning operations shall be as recommended by the manufacturer.

11.3.1.6 Preparation of metallic surfaces shall be based upon comparison with SSPCVis167T (ASTM D220), and as described herein. To facilitate inspection, the Developer/Contractor shall, on the first day of sandblasting operations, sandblast metal panels to the standards specified. Plates shall measure a minimum of 82 inches by 11 inches. Panels meeting the requirements of the specifications shall be initialed by the Developer/Contractor and the County Inspector and coated with a clear non-yellowing finish. One of these panels shall be prepared for each type of sandblasting and shall be used as the comparison standard throughout the project.

11.3.1.7 Ductile iron pipe and fittings to be painted shall be purchased from the manufacturer without the petroleum asphalt coating normally furnished pursuant to AWWA Standards C110, C115, C151 or C153. Prepare ductile iron pipe in accordance with pipe manufacturer's recommendations and NAPF 500-03.

11.3.1.8 Surface preparation for galvanized metal, aluminum, copper, and brass shall be in accordance with SSPC SP1 (solvent cleaning) and passivated in accordance with the coating manufacturer’s written instructions. Non-ferrous surfaces shall be prepared per SSPC SP-16.

11.3.1.9 Unless otherwise specified, concrete, masonry, and plaster surfaces which are to be coated shall be allowed to age for at least 28 days and allowed to dry to the moisture content recommended by the coating manufacturer. Moisture content may be tested by the County Inspector with a Delmhorst Instrument Company moisture detector or accepted equal. In addition, the surfaces shall be mechanically abraded per SSPC SP-13/NACE 6. Loose concrete and laitance shall be removed by sandblasting and chipping, and voids and cracks shall be repaired as approved by the coating manufacturer. Concrete masonry units shall incorporate CMU filler as recommended by the paint manufacturer.

11.3.1.10 Plaster surfaces shall be dry and clean and free from grit, loose plaster, and surface irregularities. Cracks and holes shall be repaired with acceptable patching materials, keyed to existing surfaces, and sandpapered smooth. Surfaces to be coated with oil or varnish base paints shall be tested for the presence of alkali. If present, the alkali shall be neutralized with acid solution as above.

11.3.1.11 Surfaces shall be cleaned with clear water by washing and scrubbing to remove foreign and deleterious substances.

11.3.1.12 Plastic surface shall be roughened with sandpaper or steel wool and shall be cleaned with solvent compatible with specified primer.

11.3.2 Application

11.3.2.1 All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice, and in accordance with the coating manufacturer's instructions. Coated surfaces shall be free from runs, drops, ridges, waves, laps, and brush marks. Coats shall be applied so as to produce an even film of uniform thickness completely coating corners and crevices. Painting shall be performed in accordance with the requirements of SSPC PA-1.

11.3.2.2 Each coat of paint shall be applied evenly and sharply cut to line. Care shall be exercised to avoid over-spraying or spattering paint on surfaces not to be coated. Glass, hardware, floors, roofs, and other adjacent areas and installations shall be protected by taping, drop cloths, or other suitable measures.

11.3.2.3 Paint, when applied, shall provide a satisfactory film and smooth even surface, and glossy undercoats shall be lightly sanded to provide a surface suitable for the proper application and adhesion of subsequent coats. Paints shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings consisting of two or more components shall be mixed in accordance with the manufacturer's instructions. Where necessary to suit the conditions of the surface, temperature, weather and method of application, the paint may be thinned immediately prior to use by the addition of not more than one pint of the proper thinner per gallon. Unless otherwise specified, paint shall not be reduced more than necessary to obtain the proper application characteristics. Thinner shall be as recommended by the coating manufacturer.

11.3.2.4 Unless otherwise specified or required for certain water-thinned paints, paints shall be applied only to surfaces that are dry, and only under such combination of humidity and temperatures of the atmosphere and surfaces to be painted as will cause evaporation rather than condensation. Paint shall not be applied during rainy, misty weather, or to surfaces upon which there is frost or moisture condensation. During damp weather, when the temperature of the surface to be coated is within 10°F of the dew point, the surfaces shall be heated to prevent moisture condensation thereon. Bare metal surfaces, except those which may be warped by heat, may be dehydrated by flame-heating devices immediately prior to paint application. During painting, and for a period of at least 8 hours after the paint has been applied, the temperature of the surfaces to be painted, the painted surfaces, and the atmosphere in contact shall be maintained at or above 40°F and 10°F above the dew point. Paint, when applied, shall be approximately the same temperature as that of the surface on which it is applied. Fans or heaters shall be used inside enclosed areas where conditions causing condensation are severe.

11.3.2.5 Where two or more coats are required, alternate coats shall contain sufficient compatible color additive to act as indicator of coverage, or the alternate coats shall be of contrasting colors. Color additives shall not contain lead or any lead compound which may be destroyed or affected by hydrogen sulfide or any gas likely to be found in wastewater facilities.

11.3.2.6 Electrical and mechanical equipment, on which the manufacturer's coating is acceptable, shall be touchup primed and painted with two coats of the specified coating system to match the color schedule.

11.3.2.7 Paint shall not be applied to the surface until it has been prepared as specified. Unless otherwise specified, the primer or first coat shall be applied by brush to ferrous surfaces, except subsequent coats for blast-cleaned ferrous surfaces, that may be either brush- or spray-applied. Unless otherwise specified, prime and finish coats shall be applied at the rate recommended by the manufacturer for the service involved. After the prime coat is dry, suction spots shall be touched up before succeeding coats are applied. Unless otherwise specified, coats for concrete and masonry shall be brushed or rolled.

11.3.2.8 Unless otherwise specified, finish coats shall not be applied until other work in the area is complete, and until the prime and intermediate coats have been inspected.

11.3.2.9 Coating system thickness is the total thickness of primer and finish coats and does not include passivators or sealers.

11.3.2.10 The surface area covered per gallon of paint for various types of surfaces shall not exceed those recommended by the manufacturer. The first coat on metal surfaces refers to the first full paint coat and not to conditioning or other pretreatment applications. Film thickness shall be inspected per SSPC PA-2.

11.3.2.11 Hangers and supports shall be coated, except for the final coat, prior to installation. Except for those to be filled with grout, the underside of ungalvanized equipment bases and supports shall be coated with at least two coats of rust inhibiting primer prior to setting the equipment in place. Bolt and bolt holes in flanges (such as those used with couplings or wafer-type valves where holes and bolts as finally installed will be exposed to weather or moisture) shall be painted prior to assembly to prevent rusting of the unprotected metal.

11.3.3 Quality Assurance

11.3.3.1 Developer/Contractor shall comply with the requirements of the Washington Department of Occupational Safety and Health (DOSH) for this work. All surface preparation, coating and painting shall conform to the applicable requirements of the NACE and SSPM as published by SSPC.

11.3.3.2 The products in Section 11.3 are listed as the standard of quality, in terms of performance and characteristics. Other manufacturer's products will be considered subject to those products meeting the listed quality, performance, and characteristics of the standard/product(s) for the particular application and compliance with the specifications. Substantiating technical data is required. Submit request for substitution to the County. Substitutions which decrease the film thickness, solids by volume, or the number of coats will not be considered. All requests for substitutions shall include test reports that demonstrate the product(s) meet or exceed the performance and characteristics of the listed standard/product(s). Testing shall demonstrate that the product(s) also meet or exceed the performance and characteristics for liquid/submerged environment (wastewater immersion) as well as the gas or vapor/unsubmerged environment (hydrogen sulfide gas and sulfuric acid).

11.3.3.3 Developer/Contractor shall comply with the manufacturer's specifications, directions, and recommendations for best results in the use of each of their products for

each condition. If results are at a variance with these specifications, report the discrepancy to Kitsap County for a decision.

11.3.3.4 The coating system manufacturer shall provide a qualified representative to visit the site from time to time during the coating operations if requested by Kitsap County at intervals agreed upon by all parties. The manufacturer's representative shall provide a written report of the observations, findings and any clarifications or directions provided to the Developer/Contractor, who shall be responsible for providing a copy of said documents to the County.

11.3.4 Testing

11.3.4.1 Upon full cure, the installed coating system shall be checked by high voltage spark detection in accordance with NACE RP0188-90 to verify a pinhole-free surface. This testing shall be performed by an independent contractor retained by the Developer/Contractor and be witnessed by the County. Areas which do not pass the spark detection test shall be corrected at no cost to the County and rechecked. High voltage spark detection shall be conducted on the chemical resistant mortar before the installation of the gel coat.

11.3.4.2 Upon completion of the Coatings, the lined area shall be cleaned and prepared to permit close visual inspection by the County. Any and all deficiencies or defective work (not in compliance with this section or related sections) will be marked for repair or removal/replacement by the Developer/Contractor at no additional cost to the County.

11.3.5 Cleanup

11.3.5.1 Upon completion of painting, the Developer/Contractor shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces and repair any overspray or other paint related damage.

11.4 Hatches

11.4.1 The hatch opening shall be sized and located to allow unobstructed removal of the pumps.

11.4.2 Hatches shall be rectangular aluminum, Bilco style or equal. Hatches shall work with the pump rails in the wet well to provide unobstructed removal of pumps.

11.4.3 Hatches shall be a dual leaf type with a hold open arm that automatically locks the cover in the open position and have hasp type mechanism for a Kitsap County provided padlock.

11.4.4 All hatches shall contain a safety cage for secondary fall prevention system that is powder coated safety orange or safety yellow with an automatic lock to keep gratings in the open position unless otherwise directed by the County.

11.4.5 Hatches for vaults shall contain a ladder with safety extension posts with spring balanced mechanisms to provide smooth, easy, controlled operation when raising and lowering the post. Vault 6-foot deep or greater shall be equipped County approved davit receiver.

11.4.6 Hatches shall be H-30 rated with 316 stainless steel compression spring tubes that are constructed of anti-corrosive material. All hatch and safety grate hardware and fasteners shall be 316 stainless steel.

11.5 Station Valve Vault

11.5.1 The valve vault will be placed adjacent to the wet well.

11.5.2 All pipes, valves and check valves shall be connected via bolted FL x FL except between the wet well and valve vault.

11.6 Wet Well Flushing Line and Valve

11.6.1 Provide 4-inch wet well back flushing line and gate valve between valve vault and wet well. Back flushing line and associated gate valve shall be configured to allow the redirection of one pump's discharge back into the wet well while a second pump discharges into the force main. Back flushing line shall be routed into the wet well to an elevation equal to 1-foot above the lead pump on setpoint. Provide a Groove End (GE) x Plain End (PE) 45-degree bend connected to end of back flushing line with a grooved coupling inside wet well.

11.7 Valves

11.7.1 Pump Station Isolation Gate Valves

11.7.1.1 Provide a pump station isolation gate valve outside the wet well on all influent lines into wet well.

11.7.1.2 Provide a pump station isolation gate valve on the force main side of the valve vault outside of the valve vault and downstream of the flow meter.

11.7.1.3 Isolation valves will be provided with an operating wrench of sufficient length to extend from the surface to the operator nut. A cast iron valve box with cover marked "sewer" is required.

11.7.1.4 Valves unable to be oriented for optimal access may require plug valve installation, at the direction of the County.

11.7.2 Gate Valves

11.7.2.1 Resilient Wedge Gate Valves, 2 to 18 IN (Water, Wastewater Application):

1. Comply with AWWA C509 or AWWA C515.
2. Materials:
   a. Stem and stem nut:
      i. Bronze:
      ii. Wetted bronze parts in low zinc bronze.
      iii. Aluminum bronze components: Heat treated.
   b. Body, gate: Ductile iron.
   c. Resilient wedge: Fully encapsulated rubber wedge per ASTM D429.
   d. Seating rubber: EPDM elastomer.
   e. Nuts and bolts for connecting bonnet and body shall Type 304 stainless steel. Bolts may be regular square or hexagonal heads confirming to ANSI B18.2.1. Metric size socket head cap screws are not allowed.

f. Interior lining and exterior coating shall be fusion bonded epoxy meeting the requirements of AWWA C550.

3. Design requirements:
   a. Minimum 150 psig cold water working pressure.
   b. Buried: NRS, O-ring stem seal, 2 IN square operating nut.
   c. Exposed: NRS, O-ring, stem seal, handwheel.
   d. Counter-clockwise open rotation.
   e. Fusion bonded epoxy coating interior and exterior except stainless steel and bearing surfaces:
      i. Comply with AWWA C550.
      ii. Wetted bronze parts in low zinc bronze.
      iii. Aluminum bronze components: Heat treated.
   f. Ends to match connecting piping.

4. Acceptable manufacturers:
   a. Kennedy.
   b. M&H.

11.7.3 Check Valves

11.7.3.1 Swing Check Valves (Wastewater):

1. Comply with AWWA C508.

2. Acceptable manufacturers:
   a. M&H.
   b. Kennedy.
   c. Clow.

3. Materials:
   a. Body and cover: Cast iron, ASTM A126, Class B.
   b. Seat ring, hinge: Bronze, AWWA C508.
   c. Disc: Cast iron, ASTM A126, Class B with rubber face.
   d. Hinge shaft: Stainless Steel, ASTM 276, type 304.
   e. Stuffing box, follower and gland: Bronze, AWWA C508.
   f. Interior lining and exterior coating shall be fusion bonded epoxy meeting the requirements of AWWA C550.

4. Design requirements:
   a. Integral flanged ends, flat faced and drilled per ANSI B16.1 Class 125.
   b. 175 psig working pressure and 350 psig hydrostatic pressure.
   c. Valves shall be provided with one outside lever and spring. Spring tension shall be adjustable. The valve design shall permit mounting levers and springs on either side of the valve body.
   d. Valve shall be provided with a clear opening equal to or greater than the connection piping, with no raised seating surface. Seats shall be threaded onto the body and shall be replaceable.
   e. Constructed to permit top entry for complete removal of internal components without removing the valve from the line.
   f. Inspection lid shall have minimum 1/4-inch NPT tap for pressure gauge.

11.8 Pipe, Fittings, and Gaskets

11.8.1 All pipes passing through concrete basin walls shall be proved with Link Seal™ Modular Seals, installed in accordance with the manufacturer's recommendations, to provide a watertight, non-shrinkable seal.

11.8.2 Ductile Iron Pipe:

1. AWWA/ANSI C111.
2. AWWA/ANSI C115.
3. AWWA/ANSI C150.
4. AWWA/ANSI C151.
5. Line pipe with 40 mils nominal dry film thickness: Protecto 401 Ceramic Epoxy or accepted equal.

11.8.3 Fittings and Flanges:

1. AWWA/ANSI C110.
2. AWWA/ANSI C115.
3. Flanges drilled and faced per ASME B16.1 for both 125 and 250 psi applications.
4. Line fittings with 40 mils nominal dry film thickness: Protecto 401 ceramic epoxy or accepted equal.

11.8.4 Flanges: Unless otherwise specified, comply with AWWA C115 with the following restrictions:

1. Flange material: Meeting the requirements of AWWA 207 with the following restrictions:
   a. Ductile iron or gray iron for Pipe Size up to 12 IN.
   b. Ductile iron for Pipe Size greater than 12 IN.
2. Flange finish: Flat faced.
3. Flange Type: Solid.

11.8.5 Gaskets:

1. Gasket Materials: Gasket Materials shall meet the requirements AWWA C115 and the following:
   a. Rubber: Red Rubber (SBR) per ASTM D1330, Grade I & II:
      i. Hardness (Shore A Value) per ASTM D2240: 80±5.
      ii. Minimum Gasket Yield Pressure: 200 psi.
      iii. Suitable for Maximum Seating Pressure: 1,200 psi.
   b. Non-asbestos Synthetic: Shall be a blend of synthetic fibers, fillers, and elastomeric binders {suitable for potable water service}:
      i. Minimum Gasket Yield Pressure (1/16 IN thick Gasket) 3000 psi.
      ii. Minimum Gasket Yield Pressure (1/8 IN thick Gasket) 4000 psi.
      iii. Suitable for Maximum Seating Pressure: 15,000 psi.
   c. Neoprene:
      i. Hardness (Shore A Value) per ASTM D2240: 80±5.

d. EPDM:
    i. Hardness (Shore A Value) per ASTM D2240: 60±5.

2. Gaskets for Flanged Joints:
    a. Gasket materials shall meet the requirements of AWWA C115 with the following restrictions:
        i. Design Internal Pressure ≤ 150 psi:
            1. Pipe Size 3 IN through 12 IN: Rubber, Full faced, 1/8 IN thick.
            2. Pipe Size 14 IN through 64 IN: Rubber, Ring, 1/8 IN thick.
        ii. Design Internal Pressure > 150 psi and ≤250 psi:
            1. Pipe Size 3 IN through 64 IN: Rubber, Ring, 1/8 IN thick.
3. Gaskets for Mechanical Joints: Comply with AWWA/ANSI C111/A21.11:
    a. Gasket material: Vulcanized Styrene Butadiene Rubber (SBR) meeting the physical property requirements per Table 4, AWWA/ANSI C111/A21.11 and the following:
        i. Hardness (Shore A Value) per ASTM D2240: 75±5.
        ii. Min Ultimate Tensile Strength per ASTM D412: 1,500 psi.
        iii. Min Ultimate Elongation (based on original length) per ASTM D412: 150%.
        iv. Minimum Aging per ASTM D572: 60%.
        v. Maximum Compression Set per ASTM D395, Method B: 20%.
        vi. Resistance to Surface Ozone per ASTM D1149: No Cracking.
4. Gaskets for Push-on Joints: Comply with AWWA/ANSI C111/A21.11:
    a. Gasket material: Vulcanized Styrene Butadiene Rubber (SBR) meeting the physical property requirements per Table 8, AWWA/ANSI C111/A21.11.
5. Gaskets for Grooved Type Mechanical Coupling (AWWA C606) Joints: Rubber meeting ASTM D2000 meeting the physical property requirements per Table 1, AWWA C606.

11.9 Wet Well Drop Bowl Assembly

11.9.1 Wet Well Drop Bowl Assemblies are not permitted. Exceptions would need to be approved by the County on a case-by-case basis.

11.10 Pump Station Standards and Requirements

11.10.1 Noise Control

11.10.1.1 All constructed facilities and equipment shall meet the requirements of Kitsap County Code Title 10 Peace, Safety and Morals Chapter 10.28 Noise. Maximum permissible noise levels shall not exceed those defined by the Kitsap County Code.

11.10.2 Odor Control

11.10.2.1 All pump stations shall be provided with an odor control system. The use of sodium hypochlorite will not be permitted.

11.10.2.2 Odor control requirements shall be evaluated by the design engineer and approved by the County. A minimum of an un-obstructed 12’ by 12’ area will set aside for future odor control equipment.

11.10.2.3 Odor control equipment shall be enclosed in an above grade structure within the pump station site.

11.10.3 Equipment Redundancy

11.10.3.1 The station shall be designed to handle the maximum peak sewage flows with one pump out of service. For duplex stations (2 pumps), this means each pump shall have the capacity to handle the maximum peak inflows. For a triplex station (3 pumps), the peak inflows may be handled with two pumps operating in parallel with the third pump out of service.

11.10.4 Bypass Capability

11.10.4.1 All pump stations shall be provided with provisions to bypass pump directly from the wet well using County provided portable pumps directly into the force main. The connection point on the force main for bypass pumping shall be an aluminum male camlock fitting with cap and shall be configured with valving to allow the connection to be made without draining the force main.

11.10.5 Overflow Storage Capability

11.10.5.1 When overflow storage is required, the lift station shall be provided with an overflow tank of sufficient volume to hold an 8-hour peak flow. Facility type will be determined on a case-by-case basis.

11.10.6 Site Piping Layout

11.10.6.1 The pump station force main must discharge to a manhole.

Section 12: Electrical and Controls

12.1 General

12.1.1 Pump motors and any electrical equipment installed within the wet well area shall be designed and listed for use therein.

12.1.2 All electrical and controls shall be furnished and installed in accordance with the applicable Federal, State, and local codes and standards including:

1. National Electrical Code (NEC)
2. Occupational Safety & Health Act (OSHA)
3. National Electrical Safety Code (NESC)
4. National Electrical Manufactures Association (NEMA)
5. Underwriters Laboratory (UL)
6. Insulated Power Conductor Engineering Association (IPCEA)
7. American National Standards Institute (ANSI)
8. Institute of Electrical & Electronic Engineers (IEEE)

12.1.3 The Developer shall prepare shop drawings and product data for all electrical and control cabinets and devices for approval by the Developer's Project Engineer and the

County prior to fabrication. No fabrication shall commence until written approval is received by the Developer's Project Engineer and the County.

12.2 Standards and Codes

12.2.1 Permits, licenses, approvals and other arrangements for work shall be obtained by the Developer.

12.2.2 Electrical work shall be executed in strict accordance with the latest edition of the National Electrical Code and local ordinances and regulations. All electrical equipment, materials, construction methods, tests and definitions shall be in strict conformity with the established standards of the following in their latest adopted revision:

1. Underwriters' Laboratories, Inc. (UL)
2. National Electrical Manufacturers Association (NEMA)
3. Canadian Standards Association (CSA)
4. Electrical Testing Laboratories (ETL)
5. Factory Mutual (FM)
6. All applicable Washington State Codes and local County Codes.

12.2.3 All materials and equipment permanently incorporated into the work shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

12.2.4 All materials shall be new, free from defects, of current manufacture, and of good quality. Each type of material shall be of the same manufacturer throughout the work.

12.3 Emergency Power

12.3.1 Portable Engine Generators

12.3.1.1 A power transfer switch (double throw disconnect) and receptacle compatible with the County's portable generators shall be provided.

12.3.1.2 Power receptacle compatible with the County's portable generator shall be receptacle number AREA10415S22 for 1½-inch hub or AREA10416S22 for 2-inch hub Crouse-Hinds Receptacles. 100 amp, 4 wire and 4 pole.

12.3.2 Permanent Engine Generators

12.3.2.1 When an emergency power source or auxiliary-pumping equipment is required by the County, permanent engine generators shall be provided to ensure continuous operability. Generators shall be equipped with an automatic load transfer switch. See Section 12.7 for generator and transfer switch requirements.

12.3.2.2 Generator fuel shall be diesel, unless otherwise directed by the County.

12.3.3 Stand-By Pump

12.3.3.1 For systems requiring permanent engine generators, a standby pump may be discussed as an alternative. Discussion with County is required, and requirements will be provided as applicable.

12.3.4 Fuel Storage

12.3.4.1 The Developer shall coordinate the fuel system requirements with the local building and fire codes for installation and shall verify all necessary space, containment, alarming and monitoring requirements are met. The Developer shall provide all necessary equipment, raceway, wiring etc. to meet the requirements of the local codes, Fire Marshall, NEC, and as recommended by the generator manufacturer. A sufficient amount of fuel shall be stored to allow the station to continuously operate for a minimum of 48 hours without disruption.

12.4 Alarms

12.4.1 An alarm system shall be provided for all pumping stations. Alarm system activation shall be required for the conditions:

1. Power Fail.
2. Dry Well Flood (if equipped).
3. High Wet Well.
4. Low Wet Well.
5. Pump Fail.
6. Generator Fail (if equipped).
7. Intruder.
8. VFD Fail.
9. Odor control system failure.
10. Pump 1 Run.
11. Pump 2 Run.
12. Pump 3 Run (if equipped).
13. Analog Real Time Effluent Flow.

12.4.2 All alarms shall be transmitted from the control panel to the Telemetry System.

12.4.3 The control panel shall be equipped with an exterior alarm light. The audible alarm shall have an "Alarm Silence" switch inside the control panel door.

12.4.4 The High Wet Well alarm shall activate an externally mounted rotating or flashing red light with a placard instructing to call 911.

12.5 Telemetry Equipment

12.5.1 The RTU shall monitor, log, and control the following I/O Terminations from the control panel:

1. Power Fail.
2. Dry Well Flood (if equipped).
3. High Wet Well.
4. Low Wet Well.

5. Pump Fail.
6. Generator Fail (if equipped).
7. Intruder.
8. VFD Fail.
9. CL2 Leak (if equipped).
10. Pump 1 Run.
11. Pump 2 Run.
12. Pump 3 Run (if equipped).
13. Analog Real Time Effluent Flow.
14. Spare.

12.5.2 Radio Antenna and Cable: Antenna shall be Kathrien YA7-166 series VHF Yagi antenna with pigtail 18'' RG 400 TNC Male-n- Male Adaptor, and Lightning Arrestor- Polyphaser DT-NFF. Cable shall be Times Microwave Systems–LMR–400DB or accepted equal cable. The total installed antennation must be less than 2.7dB loss per 100 ft at 450 MHz.

12.5.3 Radio Antenna Tower: Provide minimum 4-inch diameter by 20-foot tall antenna tower.

12.5.4 The RTU provider shall be:
Quality Controls Corporation
5015 208th St. SW, Unit 1-B
Lynnwood, WA 98036

12.5.5 The standard RTU enclosure shall be:
Stahlin Enclosures
Model #J3024HPL (or larger)
Type NEMA 4X

12.5.6 The RTU PLC shall be:
Alan Bradley
MicroLogix 1400

12.5.7 The Radio shall be:
CALAMP VIPER SC-100
Frequency 173.3125 MHZ
Part No. 140-5018-502
Accu-Comm, Inc.
1-800-404-9334

12.5.8 The Cellular Ethernet Radio Modem System shall consist of:
Cradlepoint, Part Number IBR900-600M-NA
Cellular Antenna

12.5.9 The Telemetry provider shall coordinate with the County, Electrical Foreman at (360) 536-2022 to obtain necessary Radio and PLC programming and ensure compatibility with County's existing system.

12.6 Electrical Design

12.6.1 Provide service entrance equipment with a separate compartment for installation and wiring of the underground service entrance loop and metering equipment for the panel. The meter base and related accessories will be in strict accordance with Puget Sound Energy Company requirements for the site location.

12.6.2 Power supply voltage shall be 460 volt, 3-phase, 60 cycle, four wire. This is an operating voltage, not a static or net source.

12.6.3 A step down transformer, with a 460 VAC primary, and 120 VAC secondary winding is required. The transformer will be appropriately sized for the anticipated site conditions.

12.6.4 Circuit breakers will be appropriately sized for the transfer and protection of the power and control circuits, per NEC.

12.6.5 All electrical conductors shall be stranded copper.

12.6.6 All exposed conduits and air gaps shall be rigid aluminum and all buried conduit shall be Schedule 40 PVC.

12.6.7 A minimum of one 120V 20-amp GFI service receptacle is to be provided at the pump station.

12.6.8 For each pump there shall be:

1. Motor Starter (across the line magnetic contactor and overload unit) and combination circuit breaker/overload unit providing overload protection and short circuit protection.
2. Reset and disconnect for all phases.
3. 120V AC control power transformer (as needed).
4. Overload relay to be pre-calibrated to match motor characteristics.
5. Thermal overtemp relay and thermal overtemp reset push-button, each factory sealed to ensure trip setting is tamperproof.
6. Elapse time meter that will count the time pump magnetic starter is engaged. The timer shall count in hours and tenth of an hour.
7. Two 120 volt receptacles (15 amp) for each pump station – one at the pump station and one in the control panel.
8. Analog AC Amp Meter to monitor each pump's health. Non-analog (digital/ electronic) amp meters are subject to approval by the County.

12.6.9 No electrical devices, controls, or connection boxes are permitted in a wet well.

12.6.10 All components within the pump station system, including both internally and face-mounted instrumentation and devices, shall be clearly identified with phenolic nameplates of black background with white letters. Controls, resets, and displays shall be readily accessible without exposing personnel to electrical hazards.

12.7 Control Panel

12.7.1 General

12.7.1.1 The control panel cabinet breaker should have remote operators with lockout devices.

12.7.2 Control Panel Lighting

12.7.2.1 Function lights mounted on the inner door and appropriately labeled will light and show the following functions:

1. Pump run light, green lens, one per pump.
2. Power on light, amber or white lens, one required.
3. Seal failure lights, red lens, one per pump.
4. Motor temperature trip, red lens, two required, one per pump.
5. High wet well level, steady red lens, one required.
6. Low wet well level, steady red lens, one required.
7. Amperage gauges, one per pump, and external circuit breakers.

12.7.2.2 Panel function lights will be the low voltage LED type and supplied with "push-to-test" function. Also, include manual reset button for latched lights.

12.7.3 Panel Heaters

12.7.3.1 Each panel compartment will be supplied with a 115 VAC area strip heater with thermostat control for moisture and freeze control. Each heater will be sized appropriately for its compartment.

12.7.4 Elapsed Time Meters

12.7.4.1 Elapsed time meters are required and will be mounted on the front of the panel marked with phenolic labels showing equipment name and number. All meters will be the non-resettable seven-digit type. One meter is required for each pump, to totalize individual pump run time.

12.7.5 Enclosures

12.7.5.1 Enclosures shall be free standing of NEMA 4X construction (weather tight) for installation outdoors and made of 316L stainless steel. The enclosures shall be of sufficient size to meet all design and space needs as determined in the most recent editions of the NEC and OSHA handbooks. Enclosures shall be of door behind door construction, with dead front covers, and of ample size to accept the power distribution circuits, control and instrumentation circuits, service entrance equipment and all specified accessories. Enclosure shall also be supplied with a drip shield above the outer doors and hinge pins shall be 316L stainless steel. The RTU shall either be contained in a separate, weather tight, enclosure by itself or with a window in the door to view the display shall it be enclosed with other instrumentation. A window shall be provided in the door to view the RTU display.

12.7.5.2 Special attention shall be given to the additional space needed for the RTU. The supplier shall coordinate with the County for RTU specifications and provide shop drawing for approval prior to fabrication.

12.7.6 Hand-Off-Automatic (HOA) Switches

12.7.6.1 Hand-Off-Automatic (HOA) switches shall be provided, one for each pumping unit. These switches shall provide continuous run in the HAND position and a controlled or logic function in the AUTOMATIC position. OFF Position: When the HOA switch is placed in the OFF position, neither the primary controller nor the backup controller shall be able to operate the pump(s) – the pumps shall immediately stop.

12.7.7 Motor Starter Units/Contactors

12.7.7.1 Motor starter units shall be of the combination type with components as required to provide a fully functioning system. Magnetic contactors shall be heavy duty NEMA rated, Square-D Type S, Allen Bradley Bulletin 509, Furnas Innova, Cutler Hammer Freedom, or approved equal. All contactors shall be provided with two field convertible auxiliary contacts. An auxiliary switch shall be provided to indicate the circuit breaker is in the "ON" position. Switch shall be open when the CB is open. Motor starters and associated equipment shall be provided to match the load being served. The use of soft starters shall not be acceptable.

12.7.8 Variable Frequency Drives (VFD)

12.7.8.1 Pump stations designed for a capacity of 100 or greater equivalent residential units shall be provided variable frequency drive (VFD) units for each pump. VFDs shall be Allen-Bradley PowerFlex 755 with full function HIM module, or approved equal. VFDs and associated equipment shall be provided to match the load being served. VFDs shall be arranged to control the pumps such that the pumping rate will match the in-flow rate.

12.7.9 Automatic Transfer Switch

12.7.9.1 Acceptable Automatic Transfer Switch Manufacturers are Cummins, Onan, Cutler Hammer/Westinghouse, and Asco Power.

12.7.9.2 An Automatic Transfer Switch (ATS) shall transfer from normal service to a standby generator in the event of power failure. The switch shall transfer the system back to normal power after power has been restored. The switch shall include all controls and accessories. The switch shall be UL labeled, shall meet the requirements of UL standard 1008 and shall be suitable for total system transfer including motor and lighting loads. ATS shall have a separate mechanism with regular throw transfer switch. The commercial power disconnect shall be located between the meter and the transfer switch.

12.7.9.3 The automatic transfer switch shall include the following controls and accessories:

1. Three-Phase Relay Protection
2. Test Switch: Start, Transfer, Re-Transfer, etc., for simulating power outage.
3. Override Switch
4. Indicating Lights: Normal and Standby

5. Engine Starting Delay: Adjustable up to 2 minutes (set at 5 seconds)
6. Transfer Relay: Set to prevent transfer to standby until the standby power voltage and frequency are 90% of rated values.
7. Retransfer Delay: Adjustable from 1 up to 25 minutes (minimum range)

12.8 Wet Well Junction Boxes

12.8.1 A minimum of two wet well junction boxes shall be provided and shall be located at least 36 inches horizontal and 18 inches vertical from the wet well, in accordance with current Washington State L&I standards.

12.8.2 Junction boxes shall be provided with an air gap between the junction box and wet well. Air gaps shall be on the bottom of the junction box and cords shall be held in place by a stainless steel or PVC cord grip. Seal-offs shall be located between the wet well junction box and the system control panel if required. Provide protective cage with hinged door for all exposed cords.

12.8.3 The junction boxes shall be of NEMA 4X construction, 316L stainless steel, and mounted on stainless steel supports.

12.8.4 One junction box shall receive the float wires from the wet well and shall be supplied and installed with a "Y" type gas seal off, above grade, between the junction box and the system control panel in this conduit run, allowing float change without "chico" removal. A second junction box shall receive the power and sensor cords from both pump motors, with "seal offs" between the junction box and the control panel. Prior to final acceptance by the County, the "Y" type gas seal off fittings shall be filled with a sealing compound approved by the State of Washington's Electrical Inspection Division. Seal-offs shall be removable – no cured or hard resin seal-offs shall be permitted.

12.8.5 All power and control wiring splices shall be made utilizing an insulated tap or terminal strip.

12.8.6 The Developer/Contractor shall be responsible for obtaining any and all electrical permits from Labor & Industries, along with an approved installation.

12.9 Generator

12.9.1 Engine-Generator Set

12.9.1.1 Acceptable engine-generator manufacturers are Cummins, no exceptions.

12.9.1.2 The engine fuel system shall be as directed by the County.

12.9.2 General

12.9.2.1 The engine-generator shall be a factory fabricated and assembled package of new and current equipment, and shall consist of an engine, generator, automatic transfer switch, controls, engine block heater, fuel tank and engine mounted fuel pump if applicable, and other accessories as required for a complete and operable assembly, capable of automatic startup and shutdown. The engine-generator shall be permanently installed on a welded steel base for anchoring to a concrete base with vibration isolators provided between the engine-generator and welded base.

12.9.2.2 The engine-generator shall have only one source of supply and responsibility. The assembly and complete installation shall comply with the current NFPA 70 National Electrical Code (NEC) and the State of Washington Electrical Laws (RCW) and Rules (WAC).

12.9.2.3 Manufacturer installation affidavits (certificates) shall be provided in accordance with Section 7.1.

12.9.3 Engine

12.9.3.1 The engine shall be a water-cooled, in-line or V-type, four-stroke cycle, have a maximum of six cylinders, and include a mounted radiator with duct flange and pusher-type fan. The engine shall be fully and completely capable of and equipped for driving electrical generators at a governed speed of 1800 rpm to operate all the features of the pump station.

12.9.3.2 Engine Controls – All engine controls, signal lights, gauges, and generator instruments shall be housed in one control panel for simplicity and convenience of operation. All meters will be panel mounted with sweep needle indicators. The following items shall be provided:

1. Oil Pressure Gauge
2. Water Temperature Gauge
3. Transfer Sensor Circuits
4. Three Position Selector Switch (Hand-off-Automatic)
5. High Water Temperature Cutoff and Alarm Light
6. Low Engine Temperature Alarm Light
7. Low Oil Pressure Cutoff and Alarm Light
8. Engine Overspeed Stop and Alarm Light
9. Individual Dry Contacts, Normally Open, and Fault Lights to operate in the Event of Shutdown of any Alarm above
10. Interior Panel Light
11. Volt Meter, internally connected, dual range
12. Frequency meter, internally connected
13. Engine Elapsed Time Meter

12.9.3.3 Engine Fuel System – Shall be as directed by the County. The Contractor/Developer shall be responsible for coordinating the fuel system requirements with the local building and fire codes for installation. The Contractor/Developer shall verify all necessary space, containment, alarming and monitoring requirements are met. The Contractor/Developer shall provide all necessary equipment, raceway, wiring etc. to meet the requirements of the local codes, Fire Marshall, NEC, and as recommended by the generator manufacture. Specific requirements are as follows:

1. Diesel Fuel System: Provide the following:

a. Fuel tank system shall be double walled, have 48-hour gallon capacity at 75% load and shall be mounted integral to the enclosure base. The fuel tank system shall include:
    i. Dry contacts wired to terminals in the control panel for a low-level fuel alarm.
    ii. Critical low fuel alarm which shall also cause the generator engine to shut down.
    iii. Manual fuel fill cap.
    iv. Level gage.
    v. Fuel strainer.
    vi. Plastic sight glass.
    vii. Interstitial monitoring, leak detection, and alarming per local requirements.
b. Provide a fuel tank monitoring, indicating, and alarming system for tank gauging and non-discriminating leak detection. The monitor shall operate on a 120v power and shall be microprocessor based, and have 4 programmable relay outputs, selectable level indication in inches or gallons, programmable overfill and low-level alarms. The console display shall display level and have status indicators for alarms and leak detection.
c. The low-level fuel alarm shall be set to trip when the fuel tank quantity reaches 33% of capacity.
d. Fuel tank venting per local codes – Discharge point shall be at least 12 feet above grade.
e. Overfill protection – Device shall meet local code requirements and IFC 340.2.9.6. Fill port spill container shall be a minimum of 5-gallon capacity and made of non-combustible materials.
f. Signs for filling procedures, NO SMOKING or OPEN FLAMES WITHIN 25 FT, and contents and as required by the local authority.
g. Emergency Vents shall terminate outside of weather housing.

2. Engine Cooling System – The engine cooling shall be accomplished with a skid mounted radiator. Provide sheet metal cowling between the generator and exhaust louver. Provide all equipment associated with the radiator for a complete operating system. Provide level switch in radiator for low coolant level alarm. Radiator shall be sized per manufacturer recommendations.
3. Engine Exhaust System – The exhaust system shall include a flexible stainless-steel bellows exhaust pipe connection to the engine exhaust manifold, exhaust piping, silencer, exhaust pipe flashing, collar and rain cap, and support system. Silencer shall be a critical rated unit, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
4. Air-Intake Filtration System – The air-intake filtration system shall consist of a heavy-duty, engine-mounted air cleaner with replaceable dry-filter(s) element and "blocked filter" indicator.
5. Lubrication System – The engine shall be equipped with a pressurized oil lubricating system which shall include threaded, spin-on type, full flow lubricating oil filters which are located for easy removal. The lubricating system shall be equipped with spring-loaded bypass valves which will allow oil circulation if the filters are plugged. The crankcase drain shall be arranged for complete gravity

drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

6. Jacket Water Heater – The engine shall be equipped with single-phase water jacket heater(s) with one thermostat. Heaters shall be sized to maintain the coolant temperature in either the 80 to 100 degrees F zone or the 100 to 120 degrees F zone depending on the size of the engine. The heater shall operate at an ambient temperature of 20 degrees F . Heaters having a total wattage of 1,200 or less shall be 120-volts; larger shall be 208-volt or 240-volt. Operation of the heater(s) shall be stopped while the engine is turning.
7. Batteries – Starting batteries shall be provided and mounted in attached battery racks with non-conducting floor. Batteries shall be guaranteed for two years or more. Batteries shall be the AGM type, selected to provide engine break-away current for one second at a battery temperature of 20 degrees F and to 1-1/2 minutes total cranking without recharging.
8. Battery Charger – Provide fully automatic constant voltage, current limiting battery charger sized for the generator starting batteries. Charger shall have the following features: Protection fuses, DC ammeter, temperature compensating voltage regulator, and LED alarm lamps indicating AC power fail, low battery voltage, and high battery voltage. Form C contacts for alarm indication, high and low battery alarm adjust pots, float voltage adjustment pot. Charger shall monitor battery voltage and control the SCR to deliver the optimum current level to the battery. The battery shall be permanently connected and when the battery approaches full charge preset voltage, the charging current shall automatically taper to zero amperes or to the steady state load on the battery.

12.9.4 Generator

12.9.4.1 General Design

12.9.4.1.1 The generator shall be four-pole and of revolving field design with temperature compensated solid state voltage regulator and high speed brushless rotating rectifier exciter system. The stator shall be directly connected to the engine flywheel housing and the rotor shall be driven through semi-flexible driving flanges to ensure permanent alignments. The insulation system shall be Class F with Class B temperature rise. The three-phase, broad range generator shall be 12-lead, reconnectable, and shall meet the requirements of NEMA Standard MG-1.

12.9.4.2 General Performance

1. Frequency regulation shall be mechanical or isochronous ±3% nominal, ±5% maximum from no-load to rated load.
2. Steady - state voltage regulation shall be within ±2% of rated voltage, from no load to full rated load. Rheostats shall provide a minimum ±5% voltage adjustment from rated value. Voltage regulator shall be of the silicon-controlled rectifier type. Stable voltage shall be reestablished within 2 seconds following sudden application or removal of 25% increments of rated load.
3. The maximum allowable short-term voltage dip shall not exceed 18% of rated voltage (for a total of 20% voltage dip including the steady state allowance).

12.9.4.3 Control Panel

12.9.4.3.1 The alternator control panel shall be wired, tested, and shock mounted on the generating set by the manufacturer. It shall contain panel lighting with ON/OFF switch, manual reset circuit breaker, frequency meter, running time meter, voltage adjusting rheostat, wattmeter, AC voltmeter, AC ammeter (which includes current each phase), and voltmeter-ammeter phase selector switch with OFF position. Frequency meter, wattmeter, ammeter and voltmeter shall be 250-degree circular switchboard type, 2% accuracy class. The control panel shall include engine controls.

12.9.4.4 Generator Main Power Circuit Breaker

12.9.4.4.1 The circuit breaker shall be sized to match the generator in accordance with all applicable codes. The breaker shall be housed in a NEMA 1 gasketed enclosure mounted on the generator set. The breaker shall be quick make, quick-break type with wiping contacts and arc chutes for each pole. Breaker shall be trip free and have trip indication independent of on-off positions. Breaker lugs shall be front accessible and shall be UL listed for either copper or aluminum cables. A battery and charger shall be provided for shunt trip circuit.

12.9.5 Generator Enclosure

12.9.5.1 Generators that are installed outdoors shall be enclosed in a standard sound attenuating housing that is totally weatherproof as manufactured by the generator manufacturer. The unit shall be skid mounted and the walls and roof shall be adequately reinforced to carry all anticipated dead and live loads. The enclosure shall be sized to contain the generator set, fuel tank, and batteries with adequate room to service the entire unit.

12.9.5.2 Doors shall be provided on each side of the enclosure and a control panel access door shall be provided on the end. All doors shall be equipped with handles and latches that are keyed. Each door or opening shall have prewired magnetic type intrusion switch for alarming unauthorized entry. All magnetic switches shall be wired to a common terminal at the main control panel.

12.9.5.3 The unit shall be primed and finished in accordance with the manufacturer's standards. Color shall be approved by Kitsap County.

12.9.5.4 The sound attenuating unit shall meet the noise level requirements of Section 11.10.1. Noise Control with generator unit under full load running conditions.

12.9.5.5 The operating louver assembly, including the louver, motor and guard, shall be completely factory assembled. Sizing per generator manufacturer's recommendations required. The louver shall be equipped with a motor which shall be spring loaded to open the louver when the generator is called to start, and electrically operated to close the louver when the generator is called to stop.

12.9.5.6 The generator set shall be mounted in the enclosure using spring type vibration isolators between the generator set mounting skids and the enclosure.

12.9.5 Spare Parts

12.9.5.1 Supply the following spare parts for the generator set:

1. Two air filters
2. Two oil filters
3. Two fuel filters
4. Coolant
5. Any other spare parts recommended by the manufacturer

12.9.5.2 The developer is responsible for the cost of any spare parts, consumables and maintenance of the generator set until the end of the warranty period.

12.10 Instrumentation

12.10.1 Pressure Sensors and Gauges

12.10.1.1 Provide annular pressure sensor with gauge on the pump side of the check valve for each pump.

12.10.1.2 Provide annular pressure sensor with gauge and transmitter on the discharge side of the pump isolation valves. Only one sensor assembly is required in this location for remote monitoring of force main pressure.

12.10.2 Flow Measurement

12.10.2.1 Provide pump stations with a magnetic flow meter. Acceptable devices for measuring sewage flow are Krohne Enviromag 2000 or Siemens SITRANS F M MAG 5000 with remote wall or panel mounted transmitter. Flow meters must be installed in a location that is accessible for maintenance and removal. Provide a matching pipe segment that can be installed if the flow meter were to be removed.

12.10.3 Liquid Level Sensors

12.10.3.1 Pump stations serving 50 or less equivalent residential units shall have constant speed pumps controlled by a Multitrode™ Controller, Barrier Module, Conductivity Sensor with ten level points on the probe and relay logic, no equal.

12.10.3.2 Pump stations serving 51 or greater equivalent residential units shall have constant speed or variable frequency drive (VFD) driven. Pumps shall be provided a Siemens A1000i Submersible Level Transducer/Transmitter, no equal.

12.10.3.3 All pump stations shall be provided with a high-high, high, and low-level backup float system meeting the following requirements:

1. Float-type level switches used for wastewater applications shall be non-mercury tilt switch type with a minimum 1.22 pounds zinc plated cast iron external weight. Floats shall be of a polypropylene construction with a solid polyurethane foam interior, hermetically sealed. Switches shall be Normally Open (N.O.) or Normally Closed (N.C.) rated at 10A at 120V. Cable shall be #18 AWG 2, Type SJOOW - 300, stranded, with chlorinated polyethylene jacket, integral to float with a minimum 30-feet length or longer as required to meet requirements of the design.
2. Floats shall be mounted on a stainless steel mounting bracket with individual hooks and a float cord wedge clamp for easy level adjustment for each float. Wire grip type supports/cord grips are not allowed. Floats shall be easily accessible

from outside the wet well for maintenance and replacement. All mounting hardware shall be type 316 stainless steel or cast aluminum.

3. Float switches shall be Conery NTG Inc. 2900-B8SIC1 (N.O.) or 2901-B8SIC1 (N.C.).

12.11 Controls

12.11.1 General

12.11.1.1 All pump stations shall be provided with programmable control equipment.

12.11.1.2 All pump stations with VFD driven pumps, PLC, and an analog level controller shall have a selector switch to bypass automatic electronic control and go straight to floats and starters for control in case of failure. This shall be both automatic and selectable.

12.11.2 Control Cabinets

12.11.2.1 Pump control panels for pump stations with control room enclosures shall be NEMA 12 powder coated steel construction.

12.11.2.2 Pump control panels for pump stations with no control room enclosure shall be a 316L stainless steel NEMA 4X enclosure mounted on a 316L stainless steel pedestal above ground inside a secondary 316L stainless steel vented cabinet. Panel door shall face away from prevailing winds to minimize water entering the enclosure and shall be a minimum of 10 feet from the fence to minimize vandalism. Provide a heater strip to prevent condensation accumulation in the enclosure. A 120 volt (15 amp) outlet shall be provided in the control panel.

12.11.2.3 Door latches on all enclosures shall be stainless steel fast operating type 3-point latch door handle. Where a 3-point latch will not meet enclosure rating requirements and for enclosures that are too small for a 3-point latch, use fast operating stainless steel clamp assembles, Hoffman Bulletin A-80 or approved equal. The latch handle shall operate toward the center of the panel to open the door and be pointing down when closed.

12.11.2.4 Cabinets shall be hinged with stainless steel pins. Provide outdoor enclosure with two post shelter.

12.11.2.5 Provide all control cabinets with a data pocket and insert the cabinet drawings in the pocket when shipped to the site.

12.11.2.6 Provide all control cabinets that house PLC equipment with a 12”x12” folding shelf, HOFFMAN A-CSHELF12 or approved equal.

12.11.2.7 Provide corrosion inhibitors in all control cabinets prior to shipping. Amount of inhibitor shall be provided for the volume of the enclosure for one year.

12.11.3 Pump Station Controller

12.11.3.1 Pump stations with 50 or less equivalent residential units shall be provided with a MTIC 10 Probe Input, no equal.

12.11.3.2 Pump stations with 51 or greater equivalent residential units shall be provided with an Allen-Bradley CompactLogix Programmable Logic Controller (PLC), no equal.

Section 13: Testing and Acceptance

13.1 General Sewer Testing

13.1.1 The required test methods are derived from Section 7-17.3(2) of the WSDOT Standard Specifications. As the Standard Specifications are updated, there may be discrepancies between the County test methods and the most current Standard Specifications. If such cases arise, the most stringent test methods shall be adhered to.

13.1.2 For gravity sewer systems, the Developer may use the low pressure air method for gravity sewer systems. T.V. inspection is required for gravity sewer systems.

13.1.3 The Hydrostatic Pressure Test method is required for force mains. T.V. inspection of force mains will not be required.

13.1.4 All constructed sanitary sewer installations shall be cleaned and backfilled prior to tests. Developer shall conduct preliminary tests and be assured that the section to be tested is in an acceptable condition before requesting the County to witness the test. Persons authorized to complete the work shall be present during all inspection and testing.

13.1.5 For gravity sanitary sewer systems, the system may be pretested any time during the construction process after at least two feet of backfill has been placed over the pipe. The County shall require final testing for County acceptance after backfilling has been completed and all other utilities (gas, telecommunication lines, electric, water, storm, etc.) have been installed.

13.1.6 Visual inspections shall be conducted on all alignment, grade, backfill, etc., and other items the County deems relevant. When an inspection is required on a weekend, holidays, or after normal business hours, the Developer will be charged for the inspector's overtime.

13.1.7 If any sanitary sewer installation fails to meet the requirements of the test method used, the Developer shall repair or replace all defective materials or workmanship at no expense to the County.

13.1.8 Notices of corrections or deficiencies shall be given at the time of inspection or written and delivered to the Developer. All corrections and/or deficiencies noted by the County shall be corrected prior to scheduling a re-inspection. Fees for re-inspection may be applied at the discretion of the County.

13.1.9 Upon the satisfactory testing and upon satisfactory evidence that all interior plumbing has been approved, the side sewer shall be approved for use and operation by the County and allowed to discharge into the County sanitary sewer system.

13.2 Television Inspection

13.2.1 All gravity sanitary sewer lines shall be inspected by the use of a television camera before final acceptance. The costs incurred in making the initial inspection shall be included in the initial inspection fee charged by the County for the project.

13.2.2 The Developer shall bear all costs incurred in correcting any deficiencies found during television inspection including the cost of any additional television inspection that may be required by the County to verify the correction of said deficiency.

13.2.3 The Developer shall be responsible for all costs incurred in any television inspection performed solely for the benefit of the Developer.

13.2.4 The Developer shall make every effort to avoid bellies in the sewer pipe. Any inadvertent belly shall not exceed 1/8 inch. Bellies that exceed 1/8-inch shall be repaired by the Developer at the Developer's expense prior to project completion.

13.3 Pressure Testing

13.3.1 Low Pressure Air Test for Sanitary Sewers constructed of Air Permeable Materials

13.3.1.1 This test will be performed according to the procedures outlines in Section 7-17.3(2)E of the WSDOT Standard Specifications.

13.3.2 Low Pressure Air Test for Sanitary Sewers constructed of Non-Air Permeable Materials

13.3.2.1 This test will be performed according to the procedures outlines in Section 7-17.3(2)F of the WSDOT Standard Specifications.

13.3.3 Hydrostatic Pressure Test

13.3.3.1 All sewer force main pipe shall be hydrostatically tested. Prior to the hydrostatic test, the Developer shall flush all mains. Flushing shall entail launching and flushing polyurethane pigs through the mains, or an equivalent method, until the line is deemed clean by the County inspector. An inspector shall witness all flushing prior to the installation of air release valves, pressure sustaining valves, and other appurtenances.

13.3.3.2 This test shall be performed after all appurtenances have been installed according to the procedures outlines in Section 7-09.3(23) of the WSDOT Standard Specifications. Test pressure shall be 150 psi or 1.5x the operating pressure, whichever is greater.

13.4 Side Sewer Testing

13.4.1 The County shall inspect all side sewers prior to backfilling. Any work that has been covered and which the County did not inspect shall be uncovered at the Developer's expense to allow inspections and testing.

13.4.2 All side sewers shall be pressure tested to 4 psi of pressure and held for a 5-minute period.

13.5 Pump Station Testing

The following describes the responsibilities of the Developer and/or Contractor to perform testing and startup of the pump station.

13.5.1 General

13.5.1.1 A Kitsap County Sewer Utility Startup and Testing checklist that indicates the items that will be verified by County personnel will be provided to the Developer/Contractor.

13.5.1.2 Based on the section requirements, the Contractor shall submit a Master Test Plan for approval by the County at least 30-days prior to expected field testing. This plan shall include a step-by-step compilation of the specific tests to be performed in the facility test sequence, and the sample forms to be submitted to document the results of the tests and test information. During the step-by-step testing, these forms will require signing off by specified County representative(s) and the contractor's test representative(s) prior to continuation of the test sequence. All tests shall be successfully completed and signed-off by the County.

13.5.1.3 Factory representatives shall:

1. Inspect and certify in writing the proper installation of their equipment a minimum of 5 working days prior to startup.
2. Witness the startup and make any necessary adjustments to the equipment for satisfactory operation.
3. Be responsible for instructing the County's personnel as to the proper operation and maintenance of the pump station.

13.5.1.4 The completed pump station shall be given an operational field test of all equipment to check for leaks in all piping and seals, and to ensure the correct operation of the automatic control system and all auxiliary equipment. The Developer shall conduct preliminary tests and be assured that the section to be tested is in an acceptable condition before requesting the County to witness the test.

13.5.1.5 The Contractor is responsible for all utility costs including power, fuel, potable water, testing/training specialists, and other testing costs, such as generator fuel, communication costs, etc., associated with the facility test sequence until such time that the station is accepted by the County

13.5.1.6 Operational field tests shall be conducted under both normal and emergency power.

13.6 Field Testing

13.6.1 The Contractor/Developer shall notify the County 10 days prior to scheduled beginning of field testing. The County shall witness all field-testing activities as agreed to in the approved Master Test Plan.

1. All equipment shall be tested and demonstrated to the County's representative that proper operation and capacity have been fully complied with. For pumps, this shall include measurement of discharge pressure at the valve box and measurement of pumping rate by volumetric means, or through a suitably calibrated meter for two points on the performance curve. Any test equipment or measuring devices required which are not part of the permanent installation shall be furnished by the Contractor.
2. The Contractor will demonstrate a continuous 8-hour operation of each pump system installed. The contractor will provide the means to recirculate testing water back to the wet well that is isolated from the force main during this test.
3. The facility/equipment/system shall be demonstrated to be in full operating order prior to acceptance. Should any equipment or part thereof fail to operate as intended, the developer shall immediately remove and replace the equipment or part at no expense to the County.

13.7 Generator Testing

13.7.1 General

13.7.1.1 Tests shall be performed to determine proper operation and capacity of the equipment and to demonstrate compliance with these Standards and the engineered design. All field testing shall be performed by an authorized manufacturer's field representative. All equipment that fails any test will be rejected, and complete re-testing will be required after the Contractor/Developer makes corrections or modifications to equipment which has previously failed any test. All tests shall be witnessed by the County.

13.7.2 Factory Tests

13.7.2.1 Test the engine-generator in the factory to assure compliance with these Standards, the engineered design, NEMA MG-1, and the manufacturer's quality control provisions. Copies of all factory tests shall be submitted to Kitsap County for review.

13.7.3 Field Tests

1. Fully field test the engine-generator to demonstrate that all components are in compliance with these Standards, the engineered design and are ready for service. Refer to Section 13.9.3.
2. The installation of the engine-generator shall be complete, and the unit shall be serviced, tested, adjusted, and ready for use before the field tests are scheduled.
3. Provide written notice to the County of the scheduled dates for field test at least ten (10) working days prior to the field test date. The notice shall include a written test schedule listing the tests, the test procedure, the criteria for a satisfactory test, and ratings of the load bank to be used, and description of special measurement equipment to be employed.
4. Provide load banks, fuel, test equipment, labor, materials, and all other equipment and services required for all tests.
5. Make repairs and adjustments as required to achieve satisfactory performance of the engine-generator unit. If repairs or adjustments are made during the tests, additional testing shall be performed as required by the County.
6. Make written records of the tests and, within ten (10) days after completion of the field test, submit three (3) copies of the test record to the County. The test record shall indicate the test criteria and arrangement, the time of the test, the results, and pertinent data such as voltage, frequency, kilowatts, power factor, load current, oil pressure, water temperature, and ambient temperature. Pertinent data shall be recorded for each test, and at least every thirty minutes when the test requires more than thirty minutes.

13.7.4 Operational Tests

1. Simulate power failure to demonstrate the proper operation of the automatic transfer switch and engine generator.
2. Demonstrate motor starting capability by starting and running at the specified motor loads. Measure and record voltage dip to demonstrate conformity to these Standards and the engineered design.

3. Show that phase rotation of the engine-generator and the existing power are compatible at the site.

13.7.5 Endurance (Load Bank) Tests

1. Operate the engine-generator for 1/2 hour (30 minutes) at one-half its kW rating.
2. Operate the engine-generator for four (4) hours continuously at 100% of its kW or kVA ratings.
3. Measure the temperature rise of the windings of the generator using the resistance method.

13.8 Alarm, Control, and Equipment Tests

13.8.1 Demonstrate each alarm and safety shutdown provision by the abnormal condition, unless an alternative test condition has been approved by the County prior to scheduling of the tests. Operate each control circuit and device to demonstrate its proper operation. Demonstrate the battery charger and jacket water heater operation.

13.9 Acceptance and Closeout

13.9.1 Acceptance

13.9.1.1 The Contractor/Developer shall obtain Final Inspection for all required building, fire, electrical, stormwater, and other permits issued for construction of the pump station from the Authority Having Jurisdiction prior to acceptance by the County.

13.9.1.2 Final testing for County acceptance is required after backfill has been completed and all other utilities have been installed.

13.9.1.3 Prior to acceptance by the County, the Developer shall correct all irregularities.

13.9.1.4 Prior to final acceptance, the Developer shall provide to the County all required facility operation and maintenance manuals, and spare parts.

13.9.1.5 Provide one set of spare parts for each set of two or less pumps of the same model and other mechanical and electrical equipment. Except as specified herein, spare parts shall be as recommended by the manufacturer. The spare parts shall be packed in a hinged wooden box with hasp and clearly labeled for contents.

13.9.1.6 Final acceptance of the completed pump station including testing and startup shall include approval by the Kitsap County Sewer Utility Inspector, and Sewer Utility Operations Manager.

13.9.1.7 Only after final testing and acceptance by the County shall the pump station be allowed to pump sanitary sewage into the County system.

13.9.2 Training

13.9.2.1 The manufacturer's field representative shall be available to provide at least 4 hours of on-site training for the maintenance and operation of the generator and associated equipment during commissioning of the facility.

13.9.2.2 The Contractor/Developer shall provide written notice to the County of the scheduled date(s) for training at least ten (10) working days prior to the scheduled training date.

13.9.3 Guarantee/Warranty

13.9.3.1 The Developer shall guarantee for the duration of the bonding period, from the final acceptance date that the entire station and all equipment is free from defects in design, material, and workmanship.

13.9.3.2 In addition, a printed guarantee will be supplied by the pump manufacturer concerning the pumps and motors only. This guarantee will provide an additional 4 years, or 48 months, with a prorated sliding scale rate, covering the mechanical shaft seals, bearings, rotors, stators, volutes and impellers within the pump and motor.

13.9.3.3 A printed copy of this guarantee, showing at minimum a 60-month total, will be provided as a part of the submittal data.

13.9.3.4 Any defect in the constructed infrastructure must be resolved prior to final bonding release.