Chapter 8

SEWAGE LIFT STATIONS

8.1. OBJECTIVE

This chapter is intended to present information and provide an outline of the minimum general standards to be accomplished in planning a sewage lift station or grinder pump installation within the City of Ilwaco service area.

The Developer shall submit to the City for review and approval, complete sewage lift station or grinder pump plans and design which provide for the lift station, electrical service, SCADA controls, and auxiliary generator/transfer switch together with all accessories for a complete, automatically operating installation. The City, at its option, may direct the City's Engineer to prepare a feasibility study, at the Developer's expense and under a separate agreement with the Developer, prior to granting conceptual approval for the use of a lift station. This feasibility study will address specific design and planning issues identified by the City as necessary for evaluation of the proposal.

The grinder pump standards contained herein are intended to apply to a typical residential grinder pump station and to express the City's general policy with regard to standardization of grinder pump station design and operation. The grinder pump standards are supplemental to the general standards for sanitary sewer systems presented in Chapter 6 of these standards.

The lift station standards contained herein are intended to apply to a typical duplex sewage lift station within the typical size range for developer-constructed stations and to express the City's general policy with regard to standardization of lift station design and operation. At the City's discretion, stations with non-typical service requirements, such as high flows, high head pressures, flow monitoring, multiple pump operation, critical service or unusual site constraints, may be subject to additional or alternative design requirements.

The lift station standards are supplemental to the general standards for sanitary sewer systems presented in Chapter 6 of these standards.

Due to the inherent complexity of lift station design, and the associated health and safety risks, the lift station design shall be prepared by a professional engineer registered in the State of Washington and with demonstrable experience in lift station design. At the request of the City, the Developer shall provide a resume for the proposed lift station designer, listing similar projects designed by that individual, with references and phone numbers. After the lift station design is complete and has been approved by the City, the design engineer shall remain responsible for the preparation of all design documents, including the design report, plans, specifications and permit submittals. The design

engineer shall also be responsible for construction management-related engineering duties, including the coordination of submittals and shop drawings for City review, and the preparation of field change requests, record drawings, control description, and maintenance and operation materials. Engineering responsibilities shall not be reassigned by the Developer without the City's approval.

Design material and drawings shall provide all civil, mechanical and electrical details and align with all applicable codes and regulations, and good engineering practice.

8.2 GRINDER PUMP STATION

The minimum requirements for a residential sewage pumping system connecting a single residence to the City's system are specified as follows. The City accepts no responsibility for the design, operation and maintenance of such privately owned and operated systems.

A. All equipment and accessories shall be standard manufactured items and those coming in contact with sewage shall be specifically manufactured for sewage use.

B. Lift station must be located outside the building. If the station is completely buried, install 48" I.D. manhole with frame and cover over station for access.

C. The pump shall be a custom designed, integral, vertical rotor, submersible grinder progressing cavity type pump with a single mechanical seal, as manufactured by Environment One Corporation. The manufacturer supplied station shall be completely factory-built and tested wetwell grinder pump station consisting of a grinder pump suitably mounted in a basin constructed of high-density polyethylene (HDPE) with a minimum 70 gallon capacity, NEMA 6P electrical quick disconnect (EQD), pump removal system, stainless steel discharge assembly/shut-off valve, anti-siphon-valve/check valve, each assembled in the basin, electrical alarm panel and all necessary internal wiring and controls.

D. The grinder pump station shall be either a wired model (cable connects the motor controls to the level controls through a watertight penetration) or w wireless model (wireless technology – "radio frequency identification" – communicates between the level controls and the motor controls.

E. Wetwell shall be equipped with factory installed 4-inch diameter inlet grommet and 1.25-inch NPT female thread discharge connection.

F. A factory supplied stainless steel check valve must be installed between the grinder pump station and the street main to protect against backflow from the sanitary sewer.

G. A factory supplied NEMA 4X, corrosion-proof, thermoplastic enclosure shall include an audible alarm with manual silence, manual run feature and run

indicator, redundant start function with high-level alarm, a generator receptacle with auto transfer switch and GFCI receptacle.

8.3. LIFT STATION

8.3.1 DESIGN CALCULATIONS:

A. The Developer shall perform a study and make the determination to assure that the lift station installation is sized to serve the overall sewage flows generated within the potential service area. The flow study shall include the Developer's plat boundary area as well as adjacent and future service areas. The service areas shall be the areas within that which could be served by the installation of the lift station(s).

B. The station's design flow capacity shall be based on an average daily per capita flow with related peaking factors and inflow/infiltration allowances.

C. Documentation of present and future service area flow rates for lift station size and capacity determination shall be provided to the City.

D. The effects of the minimum flow conditions shall be estimated to be sure that retention of the sewage in the wet well will not create a nuisance and that pumping equipment will not operate too infrequently. The wet well shall be sized to provide full submergence on the pumps as recommended by the pump manufacturer and a minimum of three (3) minutes between pump cycles at pump design capacity.

E. Lift station capacity shall meet the maximum rate of flow expected. The capacity of the receiving sewer shall also match the flow expected. At least two (2) pumping units shall be provided at each lift station installation. The pump shall have sufficient capacity and capability to efficiently handle the peak design flow with one (1) pump out of service and to ensure a minimum velocity of three (3) feet per second velocity in the force main.

F. The force main shall be sized for a minimum velocity of three (3) feet per second and a maximum of eight (8) feet per second. The minimum diameter of the force main shall be six (6) inches.

G. Three (3) copies of the Design Calculations shall be submitted to the City for review. As a minimum, the report shall include.

1. Project description
2. Projected flows
3. Connection point with downstream capacity
4. Wet well sizing

5. Run time calculations based on peak hourly and average annual flows for start-up and ultimate design conditions
6. Cycle time calculations to verify pump start frequency is within allowable limits, including operation on backup float control
7. Pump station head calculation to establish system curve
8. Pump selection
9. Force main size, length and material, local high and low points, and air/vacuum relief valve locations
10. Generator and fuel supply sizing
11. Odor potential calculations
12. Wet well buoyancy calculations

H. The above calculations and evaluation shall be provided for City review and approval in the form of a design report prior to, or together with, the plans for the developer extension, which shall be stamped by a professional engineer licensed in the State of Washington.

I. A geotechnical evaluation of the proposed site shall be provided by the Developer, and shall be stamped by a licensed geotechnical engineer. Site or project characteristics to be evaluated shall include, but are not necessarily limited to: steep slopes; groundwater; erosion hazards; unusual drainage conditions; unstable soils; proposed construction on fill; proposed retaining wall construction; wet weather construction; recommendation for backfill, subgrade and foundation materials; and a determination of seismic potential in accordance with local building code. The geotechnical evaluation may be submitted as a supplement to the geotechnical report for the underlying plat, and shall include a minimum of one boring at the proposed wet well/dry well site to a minimum depth of 15 feet below the deepest structure foundation.

8.3.2 LOCATION:

A. The Developer shall furnish a site layout for the lift station installation. The site plan shall clearly show the existing and proposed facilities as specified herein.

B. The lift station shall be located as far as practicable from present or proposed built-up residential areas, and an asphalt concrete access road shall be provided. Access to the lift station should be directly from a street or road. Sites for sewage lift stations shall be of sufficient size for future expansion or addition, if applicable.

C. The easement for the lift station site shall be submitted to the City for review prior to construction of the lift station. Lift station sites not located within the plat boundary shall be deeded to the City of Ilwaco.

D. As a minimum, the site shall provide for the following:

1. Lift station, including wet well, effluent valving and emergency bypass pump connection
2. Auxiliary power, including automatic transfer switch
3. Electrical service and distribution
4. Telemetry/SCADA
5. 3/4-inch water service with reduced pressure backflow preventor and hose bib installed in an above ground slab enclosure on concrete. Furnish 50 feet of 3/4-inch heavy-duty rubber hose.
6. Odor control, as applicable for location and capacity.
7. Cuts and fills to provide level site for maintenance.
8. Asphalt or cement concrete pavement for access and maintenance areas.
9. Six (6') foot high black powder coated chain link fence with vertical vinyl slats in-laid for screening, enclosing the site and a 12-foot wide access gate. Landscaping may be incorporated on site for screening to eliminate the vinyl slats.
10. Overhead weather protection for all electrical panels normally accessed by City personnel for system maintenance and operation; weather protection shall extend over the electrical equipment but without blocking vactor access to the wet well, and over the generator unit where feasible.
11. Area lighting as required by the City
12. Site drainage in accordance with City or County standards
13. Adequate clearances between equipment items and other facilities as required by all applicable codes, and as necessary for reasonable access for maintenance and repair, including access through all doors, hatches and lids
14. Separation from easements for stormwater detention facilities and other major utility structures

8.3.3. LIFT STATION REQUIREMENTS:

A. The sewage lift station shall be Flygt submersible, centrifugal, nono-clogging pumps and a Flygt Mix-Flush valve as approved by the City. Construction shall be in compliance with O.S.H.A., U.L., A.S.T.M., N.E.C. and other applicable codes and regulations. The station shall be constructed and anchored to comply with Seismic Zone 3 requirements.

B. The lift station shall have, as a minimum, two sewage pumps. The pumps shall have sufficient capacity and capability to efficiently handle the peak design flow with one pump and to ensure a minimum velocity of 3 feet per second in the force main. Design calculations and pump curves indicating the same shall be provided with the submittal information.

C. The sewage lift station supplier shall check the station during installation to determine if the installation is correct. Written confirmation of each visit and recommendations shall be provided to the City.

D. All pumps shall be tested to ensure that the vibration limits are within the standards of the current Hydraulic Institute Standards. Rotating assemblies shall be spin balanced by the pump station manufacturer prior to vibration testing. Factory test results shall be provided to the District prior to station delivery. Following installation of the pump station at the site and prior to startup, the pumps shall be retested for vibration by the pump station manufacturer. Copies of all test results shall be included in the maintenance and operation information.

E. The sewage lift station supplier shall provide a minimum of four (4) hours of training for City personnel at the station site during start-up.

F. The sewage lift station supplier shall provide four (4) complete copies of maintenance and operation material to the City. Maintenance and operation material shall include a complete discussion of pump control strategy in narrative form, including operational troubleshooting procedures, startup and reset procedures, and the calibration, set up and testing of level set points, gauges and alarms.

G. At a minimum, the station shall include the following:

1. 6-foot diameter wet well.
2. Aluminum double leaf locking wet well hatch positioned to allow removal of pumps and access to wet well.
3. Wet well access ladder with ladder up safety post.
4. Hoist socket installed adjacent to wet well.
5. Stainless steel guide rails and supports.
6. Discharge connection elbow and frame.
7. Grip eye system consisting of a sufficient length of nylon line for the application, short length of high tensile strength proof-tested 316 stainless steel chain and forged steel “grip eye” for use with mechanical lifting device. System shall be appropriately sized of for the weight of the pump to be lifted.
8. All wet well and valve vault hardware must be 316L stainless steel.
9. Valve vault including resilient seat gate valves and pressure gauge.
10. Aluminum double leaf locking valve vault hatch.
11. Valve vault access ladder with ladder up safety post.
12. Ductile iron piping between wet well and valve vault.
13. Intrinsically safe circuits for intrusion switches and level switches.
14. Intrusion alarm that will be triggered upon opening of the primary lid. Wire intrusion switches to be open-circuited in the hatch open position.
15. Explosion proof J-box mounted on a vertical wall of the valve vault.

16. The wet well, valve vault and seal off vault shall be considered classified environments.
17. NEMA 4X stainless steel central control panel with circuit breakers and intrinsically safe circuits.
18. Control panel, electric meter, transfer switch, and motor starters installed in a building or mounted on single aluminum plate. If equipment is located out-of-doors the equipment must be covered with a roof structure with minimum 3-foot overhang.
19. Yard lighting.
20. Extended warranty – 24 months from start-up or 30 months from time of shipment whichever is first.
21. Document certifying the lift station is in compliance with the NEC.

- Convenience receptacles, white, duplex, 20A, GFCI, in cast aluminum weatherproof boxes with full in-service covers. NEMA 3R GFI duplex receptacle.
- 3/4" conduit connection in electric panel for connection to the telemetry sub panel.

22. A permanent davit base shall be provided that is compatible with the City's portable jib crane.
23. Spare parts each pump:
    - Replacement pump shaft seal
    - Filter element for the seal filters
    - Volute gaskets
24. Touch up paint kit.

8.3.4. MOTORS

A. The pump and motor shafts shall be the maximum diameter available for these units.

B. Pump motors shall be 3-phase, 60-cycle, 480-voltage. Motors larger than 25 HP shall be furnished with soft start or variable frequency drives equipped with start rated bypass contactors. Where motors are used with VFDs, the motors shall be inverter duty rated and shall meet the applicable requirements of NEMA MG1.

C. The motors shall have 1.15 service factor and be non-overloading for the full range of the curve unless otherwise approved by the City.

8.3.5. WET WELL:

A. The wet well shall be precast concrete manhole sections and shall conform to manhole specification per Chapter 6 of these Standards, as modified herein. Joints between precast wall sections shall be confined O-ring or as otherwise approved.

B. The wet well shall be provided with polypropylene manhole steps as specified for manholes.

C. The wet well shall be checked to ensure all joints are watertight to prevent infiltration into and exfiltration from the wet well.

D. The wet well floor, walls and underside of the top shall be coated to comply with the following:

Surface Preparation: Allow 28 days cure time for concrete. Sweep blast to provide a surface profile. Surface shall be clean, dry and free of contaminants.

Primer: Tnemec Series 201 Epoxoprime Applied at 6.0 to 8.0 mils dry film thickness.

Intermediate Filler and Surfacer: Tnemec Series 201 Filler and Surfacer. Applied as needed. After the application of the prime coat, the bugholes and surface voids shall be filled to ensure that the finish coat is monolithic and pinhole free.

Finish: Tnemec Series 280 Tneme-Glaze Applied at 8.0 to 10.0 mils dry film thickness.

Total System: 14.0 to 18.0 mils dry film thickness.

E. The wet well shall provide for the volute of the pumps to be fully submerged and a minimum of three (3) minutes between pump cycles at pump capacity. The high water alarm shall be set a minimum of seven (7) inches below the invert of the lowest gravity sewer inlet pipe, or at an elevation as may be set by the City.

F. The wet well shall be of pre-cast concrete construction with aluminum hatch covers for access. The flat slab concrete cover shall be provided with a 4-inch vent which is "hooked and screened".

8.3.6. CONTROLS:

A. The control panel shall include:

- Main disconnect
- Panel mounted running light for each pump
- Panel mounted overtemp light for each pump
- Panel mounted prime fail light for each pump
- Panel mounted ammeter for each pump to read percentage of load
- Panel mounted running time meter for each pump

- Panel mounted HOA switches for each pump
- Spare contact on HOA switches to remotely indicate when the switch is in Auto position.
- Operator- in-Trouble push button, located on the panel outer door within 3 feet of the ground .
- Contact to allow remote start (same as hand operation – not auto off).
- HOA switches to be Cuttler Hammer and in hand mode not to be spring return.
- Mounting bracket for telemetry sub panel in station (size: 13 ½" L x 10" W x 6 ½" Deep).
- Local/Remote contact for the following alarms:
  a) Low Alarm
  b) High
  c) Power/Phase Failure (single & 3-phase)
  d) Pump Failure
- Panel mounted wet well gauge. Minimum 3" dial and read for depth of wet well
- Voltage monitor relays to protect the pump motors from single-phase reversal and low voltage
- Discharge check valve limit switches on each pump discharge
- Pump alternator, each cycle
- Panel mounted digital level displays connected in the loop outputs for each of the two pressure transmitters
- Panel mounted pressure transmitter "active" (green) and "available" (yellow) lights, one set for each pressure transmitter (energized by remote contacts).
- Uninterruptible power supply (UPS) of adequate capacity to maintain the connected alarm load in the control panel for a period of at least 10 minutes
- Control relays as required for pump starting, pump protection, and alarming functions; plus space for mounting 20% additional relays
- Twenty percent spare terminals for future use.

B. A terminal cabinet shall be provided within the pump station enclosure for the wet well mounted pump station for connection of all 120V/240V single phase circuits between the control panel and the pump station, to include:

- Sufficient terminals for connection of all 120V/240V circuits to the pump station, with 20% additional spare terminals, minimum
- Key activation/deactivation switch for the intrusion alarm, located on the outer door of the enclosure

8.3.7. ELECTRICAL SERVICE/CONTROLS & TELEMETRY SYSTEM:

A. Codes and regulations exist at the federal, state, and local level dictating minimum acceptable requirements for electrical systems. The following standards shall be used as a basis for design and review.

- National Electric Code (NEC)
- Occupational Safety & Health Act (OSHA)
- State & Local Building Codes
- National Electrical Code (NESC)
- National Electrical Manufacturers Association (NEMA)
- Underwriters' Laboratory (UL)
- Insulated Power Conductor Engineering Association (IPCEA)
- American National Standards Institute (ANSI)
- Institute of Electrical & Electronic Engineers (IEEE)

8.3.8. ELECTRICAL SERVICE

A. The local electric utility will be the primary source of electrical power. The Developer shall ascertain proper coordination between the nominal secondary delivery voltage supplied by Pacific County P.U.D. No. 2 and the connection to the lift station equipment. The electrical service shall be 4-wire, 3-phase, 60 hertz, with a solid neutral terminal at the disconnect or as may otherwise be required by Pacific County P.U.D. No. 2. This shall be confirmed with the Pacific County P.U.D. No. 2 and confirmed by the suppliers.

B. All installation shall be approved by Pacific County P.U.D. No. 2 and shall be in conformance with the N.E.C. (current issue) U.L., O.S.H.A. and County and State electrical codes. Particular attention is directed to the fact that the State of Washington requires that electrical equipment and electrically powered equipment be listed or labeled by a testing laboratory (U/L or other Nationally Recognized Testing Laboratory) acceptable to the Washington State Department of Labor and Industries.

C. The City shall be furnished with a certificate of final inspection by the inspecting agency.

D. All wire shall be copper.

E. All exposed conduit shall be rigid galvanized. All underground conduits shall be PVC with rigid galvanized PVC-coated elbows and rigid galvanized PVC coated transitions to exposed conduit.

F. All underground conduits shall be marked with polyethylene tape placed 6-inches below finished grade and directly above the conduit.

G. All conduit shall have a minimum of 24 inches of cover.

H. Heating strips shall be provided for outside electrical enclosures.

I. A service entrance shall be provided with a pedestal on which shall be mounted, as a minimum, the following equipment:

1. Meter and meter can (as required by the P.U.D.)
2. Meter C.T.S. (as required by the P.U.D.)
3. Main disconnect circuit breaker in a NEMA, 3R, enclosure, with padlock to City standards.
4. Service voltage shall be 277/480 volts, 3 phase, 4-wire, except as required by Pacific County P.U.D. NO. 2.
5. Single phase services shall be 240/120 volt, 3 wire. Panels shall conform with NEMA 3R.
6. A 120-volt duplex in NEMA 3R enclosure with padlock to City standards.
7. Ground rod and connector wire in conduit to N.E.C. standards.
8. Telemetry panel in a NEMA 3R enclosure with locking 3-point latch with PLC and radio, operator interface, annunciator, and auto dialer installed.
9. Spread spectrum radio (Cellnet Series 4) and antenna, 902-928 MHz frequency range, tuned to 915 MHz of the type and length required to provide a signal compliant with the City's present radio system.
10. Provide electrical single-line diagram showing all components and control between pedestal, lift station and generator with wire and conduit sizes.
11. The City shall be provided with a complete reproducible set of as-constructed plans and details showing final location of all equipment, conduit and wire.

8.3.9. CONTROLS

A. Control and instrument system plans shall thoroughly and completely depict system design. The plans, in conjunction with the specifications, shall define the type of control system, the type of components in the system, set points and the interface between the instrumentation and control system and the lift station system. To accomplish this, the control and instrument plan(s) shall include, as a minimum, the following:

1. Control and instrumentation system legend and general notes
2. Control, instrumentation and distribution diagram
3. Plans showing location of all control, instrument, and distribution system equipment and components, both electrical and pneumatic
4. All equipment and installation details

B. The power, control and instrumentation systems shall be designed with both operational reliability and maintainability. Use standard products wherever possible.

C. All components within the lift station system, including both internally and face-mounted instruments and devices, shall be clearly identified with phenolic nameplates of black background with white letters.

D. All wiring between cabinet, equipment and components shall be marked and multiple color coded where applicable.

E. All pump motors shall have an independent circuit breaker located within the lift station and the lift station shall have a main circuit breaker located outside the lift station.

F. The pump controls shall be ultrasonic level controller type or pressure transducer type with float level sensor back-up, and shall provide for both pumps to operate at high water conditions. The control elevations shall be indicated on the plans, i.e., on-off, first pump on, second pump on, and high water alarm.

G. The single-phase transformer for the lift station shall be as required for proper operation of the single phase side system.

H. The lift station electrical circuit shall include generator starting and telemetry.

I. A complete set of spare fuses shall be provided for all fused equipment.

8.3.10. TELEMETRY

A. The City's telemetry system utilizes RUG9 RTUs for SCADA functions related to the wastewater collection systems. The RTUs report to a master unit at the City Wastewater Treatment Plant (WWTP). The master unit communicates with a personal computer running Wonderware *Intouch* software to allow Supervisory Control and Data Acquisition functions to take place.

B. The RTUs shall be provided in enclosures with auxiliary equipment to facilitate connection of external signals to the RTU, and to monitor voltage and similar status signals. Communication with the RUG9 PLC at the WWTPmust be via leased telephone lines to the City's WWTP office. Provide an OID complementary to the RUG9 PLC that matches existing Rugid pump station hardware used through the City of Ilwaco water/wastewater system. OID shall allow local display and change of all set points. It shall display all alarms and allow for Reset/Acknowledge functions. The OID shall be mounted in the face of the control panel and be rated such that the panel's UL rating shall be maintained.

C. For each new lift station the Developer shall provide a RUG9 RTU that matches existing Rugid pump station hardware used throughout the City of Ilwaco water/wastewater system along with an enclosure, power supply, relays, surge protection devices for power and telephone lines, and other auxiliary devices as required for proper operation of the system. Typical discrete inputs for a station include:

- Commercial Power Fail
- Three Phase Power Fail
- Generator Run
- Generator Fail
- Wet Well High Level
- Wet Well Low Level
- Pump No. 1 Run
- Pump No. 2 Run
- Pump No. 1 Fail
- Pump No. 2 Fail
- Station High Temperature
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D. Typical discrete outputs include:

- Start Generator (with an interposing relay driven by the RTU)

E. Typical analog inputs include:

- Pump No. 1 Amperes
- Pump No. 2 Amperes
- Wet Well Level
- Flow

F. Provisions shall also be made for additional I/O signals by providing 20% spare terminals within the telemetry panel.

G. The telemetry panel and all items contained therein shall be provided by Calvert Technologies, (509) 244-1839.

H. The Developer shall also be responsible for correct set-up of the RTU with respect to the existing system configuration. This includes coordinating configuration parameters such as:

- RTU addressing
- Master unit configuration
- RTU configuration,
- I/O point configuration (enable/disable format)
- Debounce time
- NO/NC inputs
- Percent change reporting
- High/low alarm limits
- Accumulator sampling rates
- Momentary/latched outputs
- Signal adjustments (receive gain, transmit gain).
- Incorporate pump station into the Wonderware computer screens at the WWTP.

I. The Developer shall coordinate with the telephone utility and the City for obtaining proper telephone service to the site. The developer shall be responsible for obtaining, installing, and starting up the RTU for the new lift station. The Developer shall coordinate obtaining, installing and starting up the RTU with the City to ensure that the station is properly configured and functions correctly in conjunction with the existing system.

J. All major components, including relays, timers, and power supplies shall be identified using phenolic or vilam engraved labels.

K. Provide a 600 ohm impedance matching transformer for the telephone line.

L. A line (surge) protector unit shall be provided for the telemetry equipment. The unit shall protect the equipment from transient and electrical surges on the telephone line. Protection shall include line fuses and clamps for voltages over 25 volts, gas tubes shall be provided as an integral part of the lighting protection unit.

8.3.11. .AUXILIARY POWER SYSTEM:

A. Emergency power generation equipment shall be provided at the lift station site which will operate the lift station in the event of a commercial power outage.

B. It is essential that the emergency system be designed with capacity and rating to carry safely the entire connected lift station load, including all pumps and ancillary loads unless otherwise approved by the City.

C. The auxiliary power unit shall be complete in every respect and shall include, but not be limited to, the following:

1. Generator, control panel & circuit breaker.

2. Engine, radiator & exhaust system.
3. Fuel tank. (Capacity for 24 hours full load plus 25%.)
4. Generator set enclosure, lockable to City Standards.
5. Automatic transfer switch.
6. Block Heater
7. Battery & rack.
8. Battery charger.
9. Conduit, wire and piping.

D. The generator set and transfer switch shall be Cunnins/Onan complying with the latest edition of Onan Corporation standard specifications and with the City Standards.

E. The generator set shall be spark-ignited, liquid propane, or diesel if approved by the City, 60 Hertz, 1800 RPM, 3-phase, 277/480 volt standby power.

F. The generator set shall include the following:

1. Engine

a. Single phase, 1500 watt coolant heater (115 VAC)

2. Generator Set

a. Mainline circuit breaker
b. Weather-protective enclosure with mounted silencer (maximum noise level of 68 dBA at 23 feet)
c. 5-year basic power warranty

3. Accessories

a. Batteries
b. Battery Charger, 2 AMP, 12 VDC, 120 VAC Input
c. Vibration Isolators, Pad Type

4. Control Panel

a. Annunciator relays (12)
b. Run relay package (3)
c. Low coolant level shutdown
d. Anti-condensation space heater, 120 VAC
e. Oil temperature gauge
f. Wattmeter
g. Emergency stop switch

5. Fuel Systems

a. Liquid LPG or diesel if approved by the City

6. Alternator

a. Anti-condensation heater, 120 VAC

7. Exhaust System

a. Exhaust silencer (68 dBA at 23 feet)

8. Control Features

a. Run-stop-remote switch
b. Remote starting, 12-volt, 2 wire
c. Coolant temperature gauge
d. Field circuit breaker
e. DC voltmeter
f. Running time meter
g. Lamp test switch
h. Oil pressure gauge
i. Fault reset switch
j. Cycle cranking
k. 12-light engine monitor with individual 1/2 amp relay signals and a common alarm contact for each of the following conditions:
    i. Run (Green Light)
    ii. Pre-Warning For Low Oil Pressure (Yellow Light)
    iii. Pre-Warning For High Coolant Temp (Yellow Light)
    iv. Low Oil Pressure Shutdown (Red Light)
    v. High Coolant Temperature Shutdown (Red Light)
    vi. Overcrank Shutdown (Red Light)
    vii. Overspeed Shutdown (Red Light)
    viii. Switch Off (Flashing Red Light- Indicates Generator Set Not In Automatic Start Mode)
    ix. Low Coolant Temperature (Yellow Light)
    x. Low Fuel (Yellow Light)
    xi. Two Customer Selected Faults (Red Light)

9. AC Meter Package

a. Order with NFPA 110 monitor to meet code requirements.
b. AC voltmeter (dual range)
c. AC ammeter (dual range)
d. Voltmeter/ammeter phase selector switch with an off position
e. Dual scale frequency meter/tachometer
f. AC Rheostat (panel mounted) for + 5% voltage adjust

10. Transfer Switch

a. The transfer switch shall include the following:
    i. Sized for full station and auxiliary equipment load plus 25%.
    ii. Delayed transition, including dry contacts for signaling the generator to start on commercial power failure.

iii. Contacts for signaling commercial power fail, generator power fail, connected to utility power, and connected to generator power.

11. Pole Configuration

a. Poles - 3 (Solid Neutral)

12. Frequency

a. 60 Hertz

13. Application

a. Appl - Utility to Genset

14. System Options

a. Three phase, 3-wire or 4-wire

15. Enclosure

a. B002 Type 3R; Intended for outdoor use (dustproof and rainproof)

16. Listing

a. Listing - UL 1008

17. Programmed Transition

a. Programmed Transition, 1-60 sec.

18. Exerciser Clock

a. 7-day solid-state exerciser clock, programmable as to day and time of day for generator exercising.

19. Applications Modules

a. Monitor - Phase Sequence/Balance

G. Suitable guards shall be provided on all electrical parts to minimize the personal shock hazard.

H. Generator shall be broken-in sufficiently to permit application of full load immediately upon installation.

I. Generator supplier shall provide all tools for the generator set as recommended and required by the manufacturer.

J. Generator installation shall be checked by the supplier after installation to determine that the installation is correct. Written confirmation shall be provided to the City. Generator supplier shall perform a full load test for two (2) hours after installation is complete. Provide resistive load bank for this test.

K. Generator supplier shall provide a minimum of four (4) hours of training for City personnel at the station site during start-up.

L. Generator manufacturer shall provide four (4) copies of the maintenance and operation manual. These manuals shall be complete and shall include all information necessary to allow City personnel to maintain the generator.

M. Generator mounting pad shall be reinforced concrete to carry the weight of the unit and shall extend a minimum of 3 inches beyond generator housing. Chamfer all edges 3/4-inch.

N. Propane tank support pad shall be as above.

O. Diesel tanks (if diesel generator is approved by the City) shall be a subbase tank.

P. The generator shall be provided with a 2 year service agreement and set of manufacturer's recommended spare parts, including filters, belts, hoses, and similar items.

8.3.12. FORCE MAIN

A. The force main shall be a minimum 6-inch diameter ductile iron Class 52 polyethylene or epoxy lined or high0density polyethylene (HDPE) and provided with a continual positive slope. There shall be no intermediate high point between the pump station and the force main discharge point (depth shall be a minimum of 4'-0"). All pipes (gravity and pressure) entering and leaving the wet pit or dry pit shall have flexible couplings within 18-inches of the structure.

B. Discharge of the force main to the gravity sewer shall be made at a manhole with the force main penetration core drilled and the force main aligned to discharge towards the downstream pipe. The invert of the force main shall be 0.1 – foot above the invert of the downstream pipe. Channel the manhole as required.

C. An emergency pump connection equipped with a Cam Lock fitting and cap shall be located near the wet well.

8.3.13. LIFT STATION TEST PROGRAM

A. The Developer shall perform, as a minimum, the following tests and provide the City written documentation of the date performed and results obtained. Pump tests shall meet or exceed specified capacity. The City shall be informed of the testing schedule 48 hours prior to the test.

1. Demonstrate proper station operation under normal operating and individual alarm conditions
2. Pump capacity by drawdown test, for each pump operating alone and each combination of multiple pump operation. Record amperes and furnish pressure gauge to record static head and total dynamic head for each condition, across a representative wet well range as specified by the City's Engineer
3. Ultrasonic level sensor or pressure transducer operation, float switch operation
4. Generator load test
5. Automatic transfer to and from auxiliary power; generator load test; generator operation under pump load
6. Telemetry control to terminal strip
7. Sewage pump vibration test

B. Fill water for testing shall be obtained in accordance with the cross-connection policies of the local water purveyor.

C. Documentation of satisfactory installation shall be provided for the pump station and the auxiliary generator. Documentation of satisfactory installation shall be in the form of a notarized manufacturer's affidavit submitted by the manufacturer or an authorized representative, 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 into 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. the equipment has been operated satisfactorily under full load conditions,
8. the manufacturer has inspected his equipment during the operational demonstrations and system validation tests to the extent specified, and the equipment is fully covered under the terms of the guarantee.

8.3.14. OPERATIONS AND MAINTENANCE INFORMATION:

A. Record (as-constructed) information for the lift station shall recorded by the Contractor on site during construction, and shall be incorporated into the record drawings for the developer extension. In addition, the Developer shall submit operations and maintenance information for the lift station equipment.

B. The following information shall be furnished for all items of equipment installed on the project requiring operational and/or maintenance procedures, and for any additional items indicated by the Engineer. Level of detail and format shall conform to current City specifications.

1. Lubrication Information: This shall consist of the manufacturer's recommendations regarding the lubricants to be used and the lubrication schedule to be followed.

2. Drawings and Diagrams: Drawings shall include record (as-constructed) version of dimensional outline drawings in either full-size (22"x34") or half-size (11"x17") format. Diagrams shall include record (as-constructed) versions of schematic electrical and connection diagrams, showing points of connection, numbers of circuits, size and number of conduits and conductors.

3. Start-Up Procedures: These instructions shall consist of equipment manufacturer's recommendations for installation, adjustment, calibration, and troubleshooting.

4. Operating Procedures: These instructions shall consist of the equipment manufacturer's recommended step-by-step procedures for starting, operating, and stopping the equipment under specified modes of operation.

5. Preventive Maintenance Procedures: These instructions shall consist of the equipment manufacturer's recommended steps and schedules for maintaining the equipment.

6. Overhaul Instructions: These instructions shall consist of the manufacturer's directions for the disassembly, repair and reassembly of the equipment and any safety precautions that must be observed while performing the work.

7. Parts List: This list shall consist of the generic title and identification number of each component part of the equipment. Component equipment items provided by other manufacturers shall be identified with the manufacturer's name, part description, and part number.

8. Spare Parts List: This list shall consist of the manufacturer's recommendations of number of parts and quantities that should be stored by the Owner and any special storage precautions that may be required. Note spares provided.

9. Exploded View: Exploded or cut views of equipment shall be provided if available as a standard item of the manufacturer's information. When

exploded or cut views are not available, plan and section views shall be provided with detailed callouts.

10. Copies of factory test results, startup check lists, manufacturer's affidavits of proper installation, initial equipment set points and related documentation

11. Maintenance Information Summaries as specified herein.

C. A minimum of two preliminary review copies of the manufacturer's equipment O&M manuals shall be submitted to the City for review at the time of equipment delivery and not later than 7 days prior to product training. Additional copies may be submitted to expedite review or if return of markups is desired. A minimum of two preliminary copies of the manuals will be retained (one by the City and one by the Engineer) until the final versions of the manual are approved. Allow 14 days for Engineer's review.

D. Four (4) copies of the final acceptable operational and maintenance materials shall be submitted to the Engineer prior to project acceptance.

E. Maintenance Information Summaries (MIS) shall be provided for the following component equipment items, within the appropriate section of the equipment manuals, prepared according to the format specified herein:

1. non-clog pumps
2. sump pumps
3. heating and ventilation equipment
4. standby generator
5. valves (larger than 1" in size)

F. Maintenance information summaries shall contain the following information compiled from manufacturer's recommendations in the order shown.

1. Description or name of item of equipment.
2. Manufacturer.
3. Name, address, and telephone number of local manufacturer's representative.
4. Serial number (where applicable).
5. Equipment nameplate data including model number.
6. Recommended maintenance procedures:
    i. Description of procedures.
    ii. Maintenance frequency required.
    iii. Lubricant(s) or other materials required (where applicable), including type of lubricant, lubricant manufacturer, and specific compound.

iv. Additional information as required for proper maintenance.

7. Spare parts provided (where applicable).

G. All operation and maintenance information shall be comprehensive and detailed, and shall contain information adequately covering all normal operation and maintenance procedures. The information shall be organized in high quality D-style 3-ring binders. The binders shall be provided with spine labels, cover inserts, a table of contents and tab sheets to permit easy location of desired information. Each volume shall contain an index for the entire set. Sheets shall be 3-hole punched, and not otherwise punched for comb binding or spiral binding.

H. All information shall be specifically for items of equipment installed in the Project. Material not directly applicable shall be removed, neatly lined out, or omitted from catalogs or other printed information.

I. Lubricants shall be described in detail, including type, recommended manufacturer, and manufacturer's specific compound to be used.

J. If manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated.