

CITY OF SCOTTSDALE
SEWER LIFT STATION DESIGN CRITERIA
Revised 10/15/15

The purpose of this Sewer Lift Station Design Criteria document is to provide direction for the design of sewer lift stations that will ultimately be owned and operated by the City of Scottsdale (City). It is also recommended that privately-owned lift stations follow this document in the event that the City is asked or required to assume responsibility. While this document provides additional guideline for the design of sewer lift stations, it is not comprehensive and additional criteria may be required by both the City and the client based on project specific needs. The reader is also referred to the City of Scottsdale Design Standards and Policies Manual (DS&PM) for additional wastewater system criteria, including lift stations. The criteria provided herein are organized into general categories as shown below.

1 GENERAL/DOCUMENTATION

- 1.1 Prior to final inspection and acceptance, three sets of the following documents shall be prepared and provided to the City Water Resources Department (WRD): (1) As-Built/Record Drawings, and (2) Operation and Maintenance manuals. Each set shall include 1 hard copy and 1 electronic copy of the provided materials. In addition, each control panel shall have a copy of the panel drawings located inside the panel itself.
- 1.2 The City shall be provided a copy of all Maricopa County Environmental Services Department (MCESD) Approval to Construct (ATC) and Approval of Construction (AOC) documentation. AOC shall be obtained after functional testing and prior to system start-up.
- 1.3 All equipment shall be provided with the manufacturer recommended spare parts.

2 PROCESS/MECHANICAL

- 2.1 Each sewer lift station shall include a minimum of 2 pumps sized in a 1 duty + 1 standby configuration (or n+1 for larger configurations). Design flows shall be calculated in accordance with the DS&PM and in consultation with City WRD. Each pump shall additionally include a 35 gpm flow allowance above the peak calculated flow to account for the draining of swimming pools in the service area.
- 2.2 The following list provides the submersible sewage pump requirements:
 - Pump shall be of submersible type and mounted on two (2) 304L stainless steel rails. Rail mounting hardware shall also be 304L stainless steel including the submersible cable for pump removal.
 - Motors shall be air cooled submersible type, totally enclosed, non-ventilated, constant speed, inverter duty (VFD rated), 480V/3PH/60Hz.
 - Pumps shall be capable of passing 2 1/2" solids.
 - Pump shall be equipped with stainless steel motor shafts.
 - Pump Manufacturer shall be Fairbanks Morris, Flygt ITT, or approved equal.
- 2.3 Provide ductile iron piping for the discharge forcemain to a point 10 feet outside of the lift station property boundary.
- 2.4 The wet well access hatch shall include a locking hasp and be construction of aluminum, stainless steel, or other non-corrosive material. Access hatch shall be H20 load rated if located within a vehicle pathway.
- 2.5 Check valves shall be the full-port solids handling ball-type and shall be located outside the wet well in a separate vault. Air release valves shall also be installed inside the vault upstream of the check valves and plug valves shall be installed downstream. All equipment shall be rated for sewer service.

- 2.6 A 1.5" metered water source shall be installed for wash-down and cleaning up. The meter and backflow prevention device will be located adjacent to but outside the walls of the facility (See City of Scottsdale Standard Detail 2354). At least one hose bib shall be provided and shall have an approved atmospheric vacuum breakers and installed in an above ground location. At no time shall there be a connection between domestic water and the wet well or waste water.
- 2.7 Wet well wall interior surface shall be coated with Raven 405, Neopoxy 5300 or approved Equal. The coating will be applied to a minimum thickness of 80 mils. A factory certified technician will install the coating. The coating will be guaranteed free of defects and workmanship for a five-year period. The warranty will cover material, coating replacement and or repair. After the protective coating has set hard to the touch it shall be inspected with high-voltage holiday detection equipment. An induced holiday shall be made on to the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of film thickness applied but may be adjusted as necessary to detect the induced holiday. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures shall follow the protective coating manufacturer's recommendations. The manhole that receives the sewer lift station fluids will also be coated per these details.

3 ODOR CONTROL

- 3.1 Odor generation at a lift station is a highly variable element of lift station design that is impacted by upstream dischargers, hydraulic turbulence, upstream odor control chemical use, etc. At a minimum, provisions for odor control chemical addition shall be provided, including a concrete pad for a future chemical storage tank. However, due to the variable nature of odor generation and odor mitigation alternatives, the City Water Resources shall be contacted for approval of the specific odor control concept.

4 ELECTRICAL

- 4.1 The electric utility service shall be 480V 3PH.
- 4.2 A main service entrance disconnect is required.
- 4.3 Electrical cabinets shall be NEMA 4.
- 4.4 Phase protection shall be provided for all three-phase motors and pumps.
- 4.5 An hour meter (i.e. run-time totalizer) with local display shall be provided for each pump.
- 4.6 A power monitor shall be provided for each pump and shall be a watt-hour transducer Sineax PQ502, or approved equal. Power monitoring shall detect electrical load balance with current transformers and shall produce a 4-20 mA signal to the RTU, proportional to power used at each pump.
- 4.7 Pumps shall be driven with a motor soft starter, Benshaw or approved equal. For "grandfathered" lift stations without 480V/3PH power, Toshiba Variable Frequency Drives shall be used to transform the site power to 3PH for the pumps.
- 4.8 Oversized conduits shall be provided for the pumps to facilitate future pump replacement. Additionally, a spare conduit shall be provided.

- 4.9 All conduits that penetrate the Class 1 Division 1 boundary shall include a conduit seal per NFPA 820.
- 4.10 A minimum of one (1) 20A, 120V, 1PH outdoor rated convenience receptacle shall be provided on a dedicated circuit.
- 4.11 A generator shall be provided for backup power. The generator shall be 4 cycle natural gas, or diesel if natural gas is not feasible. Generator shall be load tested at the site at full rated power for a minimum of 6 hours. Should the generator be diesel fueled the tank shall be topped off after the load test. (See Section 7.3 The wetwell shall be provided with the appropriate warning signage regarding confined space entry.
- 4.12 Sound Level Limits)
- 4.13 An Arc Flash and coordination study shall be completed on new or modified electrical equipment and the gear shall bear the appropriate Arc Flash labels.

5 INSTRUMENTATION/CONTROLS

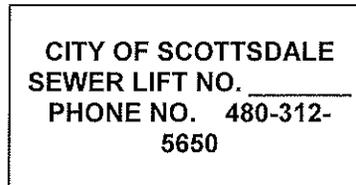
- 5.1 The control panel shall be powered through a dedicated circuit breaker and shall be separate from the pump starters.
- 5.2 Pump failure indicator lights shall be provided on the control panel. An internal lamp will latch upon failure. The alarm shall be capable of being reset either locally or remotely.
- 5.3 The lift station discharge flow meter shall be an ultrasonic type Endress+Hauser Prosonic Flow C, or approved equal, and shall comply with the following requirements.
 - 5.3.1 The ultrasonic flow meter must comply with the applicable provisions of AWWA C750-10.
 - 5.3.2 The totalizer will feature a digital indicator and solid state transmitter. The totalizer-transmitter will provide a 4-20 mA current signal proportional to the rate of flow.
 - 5.3.3 Meter shall be installed per manufacturer's specifications for upstream and downstream straight-run distances.
 - 5.3.4 Meter shall be sized to accurately measure both high and low flow and in accordance with the manufacturer's published data.
- 5.4 Level transducer shall be Endress+Hauser Waterpilot FMX21 and shall be used to measure wet well water level for pump operation and alarms. Level transducer shall be Waterpilot model number FMX21-FE211HGK25A (FE: Class 1 Division 1 Groups A-D; 2: 4-20m; 1: 316L 22mm Probe tube; 1H: 33 ft H2O Sensor range; G: Standard accuracy; K: 0-20FT/H2O custom factory calibration; 25: 60-ft shortable PE cable; A: FKM Viton seal).
- 5.5 Level switches, Roto-float or approved equal, shall be provided as a secondary means of control and shall be powered from the Uninterruptable Power Supply (UPS). Floats shall mounted using 316 stainless steel hanger(s), that provide a minimum separation distance of 8 inches.

6 TELEMETRY

- 6.1 The Remote Terminal Unit (RTU) shall be Bristol Babcock Control Wave and compatible with the City's existing telemetry system. The preferred DO card is CWM-SEG 60-Sel 11. The City shall be contacted to obtain the specific RTU requirements that apply to the project. The engineer shall provide the system design elements, including number of pumps, sequence of operation, etc. so that the number of digital inputs and outputs can be verified and included in the RTU specification. The RTU shall include a keypad.
- 6.2 As soon as the location for the lift station is identified, Water Resources will conduct a survey to check communication with a City repeater. The outcome of this survey will be to provide an antennae height requirement that shall be implemented in the project.
- 6.3 Microwave Data Systems 9710A "smart" data remote transceiver, TX ON: 928.18125 MHz, 12V, DC input power, 4800 and 9600 baud rate Asynch digital interface modem, RS 232 interface-direct, type "N" female antenna connector with loopback option.
 - 6.3.1 Scala TY-900 Yagi antenna, "N" female connector
 - 6.3.2 Polyphaser IS-50NX-C2 lightning arrester
- 6.4 Helix coaxial cable 1/2" foam dielectric 50 OHM LDF 4-50A; number of feet to be determined by the design engineer.
 - 6.4.1 Two Andrew type L44PLU "N" male connectors
- 6.5 Hoffman enclosure - NEMA 4, 30" x 24" x 8", including panel, painted white, or approved equal.
 - 6.5.1 Hoffman Catalog #A30H24BLP
 - 6.5.2 Hoffman Catalog #A30P24, including lock kit.
- 6.6 Single output series power supply 12V, DC output, 3.4 Amp, 115VAC input. Newark Catalog #89F1271
 - 6.6.1 Single output series power supply 24V, DC output, 3.6 AMP, 115VAC input. Newark Catalog #89F1264
 - 6.6.2 Two gel-cell batteries, 12VDC, 6 AMP/hr operable to 140° F. Newark Stock #99F1805
- 6.7 RTU will be programmed by the City of Scottsdale personnel.
- 6.8 RTU will include keypad option.
- 6.9 RTU shall include an uninterruptable power supply, Liebert GXT3 with Micropod. Liebert model number shall be GXT3-1000RT120, 1000 VA / 900 Watt UPS System, configured with 120VAC input and output power and furnished complete.
- 6.10 A 120V, 15A service receptacle shall be installed in the RTU cabinet.
- 6.11 Add 2 DO's – 1 for P1 fault reset and 1 for P2 fault reset. Need the high level and tempo for each pump separated.

7 SAFETY, SECURITY, AND SIGNAGE

- 7.1 All lift station sites shall be secured by an eight-foot high block wall, with a minimum of two access points. Access shall be provided by a 36" wide passage door and a sliding gate, minimum of twelve feet wide for vehicular access (See City of Scottsdale Standard Detail 2165-1 and 2165-2). Each access will be electronically keyed to City specification. No equipment inside the site shall protrude above the fence line, except the emergency beacon and the RTU antenna.
- 7.2 A site sign mounted on the exterior wall will have a green background with 2" white reflective lettering. The sign will be made of aluminum. The sign will read:



- 7.3 The wetwell shall be provided with the appropriate warning signage regarding confined space entry.

8 SOUND LEVEL LIMITS

- 8.1 It shall be unacceptable for any pump station to cause noise by any means to the extent that any fifteen minute period average sound level exceed the applicable limit given in the following table, at any location in the City of Scottsdale on or beyond the boundaries of the property line of the pump station facility. The noise subject to these limits is that part of the total noise at the specified location that is due solely to the action of said pump station.

TABLE OF APPLICABLE LIMITS	
Land Use Zone	Fifteen-Minute Average Sound Level (decibels)
Residential	45
Commercial	60

GENERATOR MAXIMUM NOISE LEVEL WILL BE 85 DECIBELS

- 8.2 Average sound level measurements will consist of Leq (15) measurements performed with an ANSI-S1.4-1971 Type 1 or Type 2 Sound Level Meter using the A-weighting network. Instrument response shall be "slow". Leq means the constant sound level that, in a given situation and time period, conveys the same sound energy as the actual time-varying A-weighted sound. Measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.
- 8.3 The location for measuring exterior sound levels shall be at the property line of the pump station facility and four to five feet above ground level and at least four feet from walls and other reflective surfaces. If a wall is closer than the required four feet to the property line, move the required distance outside the property line. An exception occurs when the pump station shares a boundary with an affected property. In this case the location for measuring exterior sound levels shall be at least one foot inside the property line of the affected property and four to five feet above ground level and at least four feet from walls and other reflective surfaces.

8.4 Alternative sound level measurements. Compliance with these guidelines can be demonstrated if the maximum sound level caused by the operation of the pump station does not exceed the average sound level limits set forth in paragraph 1 when tested at the locations described in paragraph 3.

9 MISCELLANEOUS

9.1 Install reset button for each pump on control panel.

9.2 Install high level reset to control panel

9.3 Lead float turns on P1 and lag float turns on P2

9.4 City of Scottsdale requires a cover over the instrumentation reads – hard cover on the NEMA box and a canopy over the instrument cluster.