



June 15, 2022

Ellen Hilbig, Utilities Director
Town of Johnstown
450 S Parish Ave.
PO Box 609
Johnstown, CO 80534

Subject: Process Design Report Approval
Regulation 22 Site Location Approval No. ES.20.SA.05539 (No. 4689)
Town of Johnstown, Low Point WWTF Expansion
Colorado Discharge Permit System (CDPS) No. CO0047058
Larimer County
Enforcement Order No. DO-200123-2, ES Project No. ES.20.CWPDR.05540

Dear Ellen Hilbig:

The Water Quality Control Division (Division), Engineering Section has received and reviewed the Process Design Report (PDR) including preliminary plans, and PDR Checklist for the Town of Johnstown's Low Point WWTF Expansion.

This PDR approval does not constitute approval for construction. The Town of Johnstown must submit a self-certification form when the final design documents are complete. Please refer to items 1 and 2 of the *Conditions of Approval* section of this letter for specific requirements associated with the acceptance of the self-certification form.

The PDR submittal, as reviewed, meets the requirements of the *State of Colorado Design Criteria for Domestic Wastewater Treatment Works, WPC-DR-1* (Design Criteria) and is hereby approved as listed below. **The approved maximum month hydraulic and organic design capacities are 1.5 MGD (peak hourly flow 4.69 MGD) and 4,880 lbs of BOD per day, respectively.**

This PDR approval addresses the following:

- Calculations and associated information included in the PDR.
- Influent Criteria:
 1. Wastewater minimum temperature: 10.0°C.
 2. BOD: 390 mg/l.
 3. TSS: 400 mg/l.
 4. TKN: 77 mg/l.
 5. Alkalinity: 207 mg/l.
 6. Ammonia: 58 mg/l.
 7. Total phosphorus: 8 mg/l.
- Design Effluent Targets:
 1. Ammonia-nitrogen: <1.0 mg/l.
 2. Total inorganic nitrogen: 6.99 mg/l.
- Influent Compliance Point:
 1. New influent flow measuring and sampling for compliance.
 2. Influent flow measured at lift station discharge (design basis: 12" magnetic flowmeter).
 3. Influent refrigerated composite sampler on lift station discharge header. Sampler is located downstream of screening, and upstream of any recycle streams returning to treatment.



- New Headworks Building.
- Primary Treatment:
 1. Influent pumping:
 - a. All influent flows into the lift station through a single 24 inch sewer and is pumped through screening and grit separation to equalization.
 - b. 6 feet x 25.5 feet x 28 feet deep self-cleaning lift station, operating volume 2,300 gallons (operating depth 2 feet).
 - c. Level transducer with backup floats.
 - d. Three influent pumps, screw-centrifugal submersible pumps (design basis: Wemco SFE8-T), open slot for fourth pump (not installed). Lead lag configuration, pass 3-inch sphere, each pump rated for 1,650 gpm (2.38 MGD) at 39 feet TDH, 20 hp, VFD driven. Combination air release valve on discharge header. Pumps on guide rail and fast-out elbow.
 - e. Influent lift station overflows to equalization basin.
 2. Screening:
 - a. Two 35 degree inclined, 63 inch diameter mechanical basket screen with internal screw (design basis: Huber ROTAMAT RPPS), 2 mm perforated openings.
 - b. Design capacity each screen 4.69 MGD, 18 inches freeboard at PHF. Channel mount design, installed indoors. Wash spray bar and stainless steel wiper brush, ultrasonic level transducer upstream and downstream. Screened solids discharge to a roller dumpster.
 - c. Emergency overflow bypass pipe to grit removal.
 3. Grit removal / washer:
 - a. One 10 foot diameter gravity vortex separator (design basis: Hydro International Grit King) within a concrete basin. Design capacity 4.69 MGD. 95% removal efficiency of all grit less than 106 microns at peak flow.
 - b. One self-priming grit removal pump design capacity 150 gpm at 17 feet TDH. 5 hp. Shelf spare.
 - c. One grit washing and dewatering system, 150 cubic yards / hour capacity.
 - d. Overflow diversion box - bypass pipe to equalization basin.
 4. Equalization basin:
 - a. Design equalized flow 1.5 MGD, peak pumped flow 2.1 MGD.
 - b. Interior dimensions 76 feet x 33 feet, operating level 18 feet deep, operating volume 330,000 gallons.
 - c. Four submersible non-clog centrifugal pumps (design basis: Sulzer XFP100E), design capacity 500 gpm at 45 feet TDH, 10 hp, VFD driven. Combination air release valve on discharge header. Pumps on guide rail and fast-out elbow.
 - d. Level transmitter with back-up float level switches.
 - e. Pumps are installed in two separate sumps separated by walls and sluice gates.
 - f. Mixing: one submersible propeller mixer (design basis: Flyght 4230) VFD driven, 10 hp.
 - g. Overflow: None.
- Secondary Treatment:
 1. Replace/modify existing two train Sequential Batch Reactor process with Membrane Bio-Reactor (MBR) in an Anaerobic, Anoxic, Aerobic (A2O) configuration. Add a third train.
 2. Flow splitter box with isolation gates to distribute flow evenly across all operating basins.
 3. Acceptance of biological design calculations for reduction of BOD and Ammonia with an A2O process followed by MBR. The A2O process design capacity each train 0.5 MGD, MLSS is 8,000 mg/L.
 4. Three equal trains with three basins. Minimum 18 inches freeboard.
 - a. Anaerobic basin is 11 feet long x 26 feet wide x 18 feet side water depth, 38,500 gallons.
 - b. Anoxic basin is 40 feet long x 26 feet wide x 18 feet side water depth, 140,000 gallons.
 - c. Aeration basin is 62.75 feet long x 26 feet wide x 17.5 feet side water depth, 213,500 gallons.
 - i. Flux rate at equalized flow (one offline) 9.91 gal/ft²/day.
 - ii. F:M ratio 0.157.
 - iii. 0.54 lbs O₂/lbs BOD.
 - iv. SOTE - 25% overall (1.5% per foot), AOTE 12.4%.
 - v. Alpha factor 0.6, beta factor 0.95.
 - vi. AOR 9,017 lbs O₂/day (no denitrification credit).
 - vii. SOR 17,953 lbs O₂/day (no denitrification credit).

- d. Hydraulic retention time: anaerobic - 1.9 days, anoxic - 6.5 days, aerobic - 10 days.
 - e. Solids retention time: anaerobic - 2.1 days, anoxic - 7.1 days, aerobic - 10.8 days.
 - f. Fine bubble tubular diffuser with flexible membrane (design basis: forty six FlexAir MiniPanel MP5 per aeration basin).
 - g. MBR:
 - i. Secondary treated effluent collected in a single channel with isolation gates into each MBR basin.
 - ii. Three individual MBR basins 28.3 feet long x 8 feet wide x 12 feet deep.
 - iii. Membrane reinforced hollow fiber (design basis: Suez ZeeWeed 500D Series). Each basin contains 176 membrane modules. Each membrane module has a filtration surface area of 430 sqft or a total surface area of 75,680 sqft/tank.
 - iv. Bridge crane for moving MBR modules.
 - v. One rotary lobe permeate pump per basin, design capacity 572 gpm at 105 feet TDH, 20 hp VFD driven (design basis: Borger CL 520).
 - h. Mixing:
 - i. Mixing: pneumatic mixers (design basis: 18 inch diameter JDV Turbomixer) large bubble educting type mixer.
 - ii. Anaerobic basin: One large bubble eductor mixer per basin.
 - 1. Estimated 0.25 kW delivered/10³ m³ per bubble.
 - iii. Anoxic basin: Two large bubble eductor mixers per basin.
 - 1. Estimated 0.1 kW delivered/10³ m³ per bubble.
 - i. Recycling:
 - i. Internal recycle up to 4Q from aerobic basin to anoxic zone. One pump per basin, submersible axial flow, design capacity 2,080 gpm at 2 feet TDH, VFD driven, 5 hp.
 - ii. RAS recycle up to 4Q from MBR basin to splitter box. Three pumps (2 duty / 1 stand-by), submersible, design capacity 2,100 gpm at 22 feet TDH, VFD driven, 15 hp.
 - j. Solids Wasting: Manual / automatic valve and flowmeter from RAS line to discharge solids to aerated solids retention tank.
 - k. Process instrumentation:
 - i. Anaerobic basin one ORP meter.
 - ii. Anoxic basin one ORP meter.
 - iii. Aerobic basin two DO meters.
 - 1. Mass flow meters coupled with modulating valves and DO meters for controlling flow to each aeration basin.
 - l. Scum control: Spray bars provided in the MBR effluent/RAS collection channel. Spray bars keep scum, oil, and grease incorporated into the mixed liquor and then wasted through the waste activated sludge and solids dewatering system. Scum captured in MBR effluent channel removed by operators when necessary.
 - m. Membrane cleaning - air scour, backpulse and chemical clean-in-place.
 - i. Floor space for manual washing.
5. Blowers:
- a. Process air: three (2 duty / 1 standby) hybrid rotary lobe compressor (design basis: Aerzen Model D 76S), design capacity 2,017 scfm each blower, VFD driven, 125 hp.
 - b. Total process air demand:
 - i. Secondary treatment aeration - 2,887 scfm (without denitrification credit).
 - ii. Anoxic / anaerobic zone mixing - 90 scfm.
 - iii. SHT mixing air and other miscellaneous - 699 scfm.
 - c. Air scour: two (2 duty / 1 stand-by) positive displacement rotary lobe compressor (design basis: Arzen GM35S), design capacity 950 scfm each blower, VFD driven, 50 hp.
 - d. Design effluent DO - 2 mg/l.
6. Permeate tank: permeate tank head maintains hydraulic head against UV reactors / flow meter.
- Disinfection Process:
 - 1. Replace existing chlorination system with UV reactors.
 - 2. Two Trojan closed vessels Model 32AL50, each average design flow 1.5, 32 lamps per reactor. UV reactors installed in parallel. Minimum design dosage 30 mJ/cm².
 - 3. UV system spares - manufacturer recommended:

- a. UV lamps - six.
 - b. Lamp sleeves - six.
 - c. Lamp driver, electronic - two.
 - d. Wiper seals - twelve.
 4. Trojan control and monitoring panel.
 5. Alarm conditions: UV system control panel minimum alarming conditions:
 - a. Lamp fault.
 - b. UV intensity low.
 - c. System UV transmittance low.
 - d. Inlet flow low and high.
 - e. Major multiple lamp failure.
 - f. System I/O and SCADA communications fault.
- Chemical Feed Systems:
 1. Safety Considerations: Existing emergency showers remain, one additional at cleaning chemical storage area.
 2. Sodium hypochlorite:
 - a. Indoor storage with secondary containment.
 - b. One hypochlorite system added to filter backwash pump header.
 - c. 270 gallon chemical tote.
 - d. Two air operated diaphragm pumps (one operating / one spare).
 - e. Calibration column.
 3. Magnesium hydroxide:
 - a. Alkalinity required: design dosage 107 gpd 62% magnesium hydroxide at 1.5 MGD.
 - b. Dual peristaltic pumps.
 - c. 2,000 gallon, open top carbon steel storage tank.
 - d. Tank levels managed by ultrasonic (level) transmitters.
 - e. Outside fill connection within containment, containment drains to headworks.
 - f. Design effluent alkalinity: 75 mg/l.
 4. Citric acid:
 - a. Indoor storage with secondary containment.
 - b. 270 gallon chemical tote.
 - c. One citric acid system added to filter backwash pump header.
 - d. One air operated diaphragm pump.
 - e. Calibration column.
 - Flowmeters located:
 1. One on influent pump discharge.
 2. One on EQ basin discharge header to secondary treatment.
 3. One on WAS line.
 4. One on RAS line to splitter structure.
 5. One on permeate discharge.
 6. One on each screw press sludge feed (design basis: Endress Hauser W400).
 7. One on each UV discharge.
 - Odor Control:
 1. Screening channels and grit chamber are covered.
 2. Negative pressure air system with carbon adsorber (design basis: EcoVerde).
 - Back-up Power:
 1. Inclusion of a new 850 KW generator for emergency operations of critical system component including the primary treatment and disinfection systems.
 - a. Influent pumping.
 - b. Mechanical screens.
 - c. Grit washer.
 - d. Equalization pumps.
 - e. MBR permeate pumps.

- f. RAS pumps.
 - g. Internal mix liquor pumps.
 - h. UV disinfection.
 - i. Measurement and control instrumentation.
 - j. Process controller and autodialer.
 - k. Lighting / heat.
2. Existing generator to remain and be connected to:
 - a. Blower building equipment.
 - b. Dewatering equipment.
- Effluent Compliance Point:
 1. New effluent flow measuring and sampling for compliance.
 2. Effluent flow is measured at MBR permeate pumped through flow meter (design basis: 12" closed magnetic flow meter) and UV disinfection.
 3. Effluent flow sampling:
 - a. Refrigerated composite sampler on UV discharge pipe, downstream of all treatment.
 4. Outfall remains unchanged with design review.
 - Solids handling:
 1. Improvements to existing solids handling system.
 2. Repurpose existing headworks building for solids handling.
 3. One new aerated solids handling tank.
 - a. 40 foot diameter x 20 foot tall concrete tank, 2 foot operating freeboard.
 - b. Mass flow meters coupled with modulating valve for controlling flow to aerated solids holding tank.
 - c. Fortyeight MaxAir coarse bubble diffusers.
 4. Dewatering feed pumps:
 - a. Rotary lobe type.
 - b. Design capacity 187 gpm at 41 psi TDH, variable speed, 7.5 hp.
 5. Two rotary presses (design basis: Fournier model 5-900/6000CV):
 - a. Solids capacity per unit - 700 lbs/hr.
 - b. Hydraulic capacity per unit - 187 gpm @ 0.75% solids.
 - c. System operating without the addition of polymer - maintain use of existing dewatering system or haul sludge as necessary.
 - d. Pressate return to secondary treatment splitter box.
 - Abandon in place / remove:
 1. Chlorine contact basin and effluent flume.
 2. Existing process blowers.

This Approval includes the following site specific deviations from the Design Criteria:

- None requested.

Conditions of Approval:

1. In accordance with Regulation 22, Section 22.13 (1, par. 3), upon completion of final design (plans and specifications) documents, including all addenda, and prior to commencement of construction, each Colorado registered professional engineer(s) in responsible charge of the final design documents (plans & specifications) shall complete and submit a Self-Certification Form to the Division.
2. In accordance with Regulation 22, Section 22.13 (1, par. 4), if the Division discovers discrepancies between the facilities as described in the PDR and those finally constructed, the applicant will either agree to make modifications to resolve the inconsistency to the Division's satisfaction or the approval of the design will be null and void.
3. Upon completion of construction and prior to commencement of operation, a written certification must be submitted to the Division stating that the project facilities were built in accordance with the approved plans, specifications, and change orders. The certification must be signed by the applicant's

registered engineer. This form is available at <https://www.colorado.gov/cdphe/wq-facility-design-and-approval-forms> under the “Domestic wastewater construction complete form” heading.

4. Any change orders or addenda that change the treatment plant’s capacity, water quality, or processes, must be submitted to this office for review and approval.
5. When construction is estimated to be within 14 days of completion, please notify the Division. A representative of the Division may schedule a site visit to conduct a final construction inspection before the facility commences operations.
6. Please note that during construction and operation activities, the provisions specified in the Design Criteria, Sections 2.2.0, 2.3.17 and 2.3.18, must be implemented and followed. This review does not relieve the applicant/owner from compliance with all Federal, State, and local regulations and requirements prior to construction nor from responsibility for proper engineering, construction, and operation of the treatment plant.
7. No point source discharges of water and/or contaminants from this treatment plant to the waters of the state are authorized during construction unless a permit for such discharges has been issued by the Division. If you have any questions regarding permit issues or requirements, please contact the Permits Section at 303-692-3510.
8. In accordance with the Design Criteria, Section 2.4.0, all treatment plants shall develop suitable operations and maintenance manuals.
9. In accordance with Chapter 11 of the Design Criteria, all treatment plants shall develop management and operating plans for ultimate use or disposal of biosolids. Biosolids management plans shall conform to Federal Requirements in 40 CFR 503. All disposal options shall also conform with Federal Requirements 40 CFR 257 and 40 CFR 503, Colorado Biosolids Regulation 64, and the requirements of the Colorado Regulations Pertaining to Solid Waste Disposal Sites and Facilities, as applicable.
10. All biosolids and/or similar waste material removed from the project site during the abandonment, demolition, replacement, and/or expansion of any treatment process must be properly disposed at an approved site.

Facility Classification under Regulation 100:

In accordance with the current Operators Certification Board Regulations, following construction this wastewater treatment plant will be a Class A Domestic Wastewater Treatment Facility, and the collection system remains as a Class 2 collection system.

Documents reviewed:

- Site Application for the Town of Johnstown by Aqua Engineering dated February 2020.
- Process Design Report for Town of Johnstown by Aqua Engineering dated June 2021.
- Process Design Report supplemental drawings and specifications for Town of Johnstown by Aqua Engineering dated June 2021.
- PDR checklist for Town of Johnstown by Aqua Engineering dated June 2021.
- Miscellaneous correspondences.

The Engineering Section is interested in gaining feedback about your experience during the engineering review process. We would appreciate your time to complete a Quality-of-Service Survey regarding your experience during the engineering review process leading up to issuance of this decision letter. The Engineering Section will use your responses and comments to identify strengths, target areas for improvement, and evaluate process improvements to better serve your needs. Please take a moment to fill out our survey [here](#).

If you should have any questions, please contact Anthony Kerr by phone at 720-383-7291 or by email at anthony.kerr@state.co.us.

Sincerely,

Anthony Kerr Digitally signed by Anthony Kerr
Date: 2022.06.15 18:11:29 -06'00'

Anthony Kerr, P.E.
Senior Review Engineer
Engineering Section
Water Quality Control Division
Colorado Department of Public Health and Environment

cc: Matt LeCerf, Town of Johnstown Manager
Craig Matsuda, Aqua Engineering
Chris Manley, Larimer County Public Health Department
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