West Point Treatment Plant Facts Metrics (2013)

Treatment Process Technical Facts and Information

Design basis

- Average flow (Volume expected in Average Rainfall Year): 397.5 million liters per day
- Maximum flow design: 1666 million liters per day
- Biosolids Hauled: (2012) 45,000 wet tons, 12,500 dry tons @ 27.8%.
- Service Area: 295.54 square kilometers for population of 574,455

Preliminary Treatment:

Screening

- Screening Equipment: Six bar screens, 1.8m by 4.6m
- 15.87 mm screen spacing (2012)

Raw Sewage Pumping

- Pumping Equipment: Four variable speed methane/propane driven raw sewage engines that power non-clog centrifugal influent pumps downstream of the bar screens.

Grit Removal

- Pre-aeration Tanks: Four total, 9.1 m by 30.5 m, 4.6m deep

Primary Treatment:

- Design: 1666 million liters per day

Primary Sedimentation

- Sedimentation Tanks: Twelve total, 11.6m by 77.4m and 2.9m deep.
- Raw Sludge Pumps: Twelve total progressive-cavity type. Each rated 7.5 liters per second at a total head of 620kPA

Flow Diversion

- Flow diversion is performed via the CSO Gates. These gates are typically closed. Gates open to allow Primary Effluent flows in excess of 1136 million liters per day to bypass Secondary Treatment and flow directly to Disinfection.

Secondary Treatment:

- Design: 1136 million liters per day

Intermediate Pump Station (IPS)

- The IPS is located downstream of Primary Treatment and upstream of Secondary Treatment. Three motor-driven non-clog centrifugal pumps convey, up to 300 MGD, of Primary Effluent, to Secondary Treatment.

High Purity Oxygen (HPO) Aeration Trains:

- Six trains of four stages, each stage, 17.07m by 17.07m and 7.62m deep. Total volume of HPO system is 53,368 cubic meters
- Solids- Average retention time is 1.5 days

Oxygen Generation:

- Oxygen Generation: Two 70 tons per day VSA (Vacuum Swing Absorption)
- Liquid Oxygen – two 100 ton storage tanks.

Mixed Liquor Channel

- Mixed Liquor Channel Blowers: Four, centrifugal type, each rated at 133.06 liters per second with 149kW.

Secondary Clarification

- Clarifiers: Thirteen cement cast in-place type tanks each with a 43.43m diameter and side depth of 4.88m
- Return Activated Sludge: Twenty-six, non clog centrifugal variable speed drive, rated 80.1 to 233.4 liters per second.
- Is this where the solids average retention of 1.5 days should be? SRT is a Secondary process parameter but it's OK to leave under Aeration.

Final Effluent

- Effluent from Secondary Treatment flows toward Chlorine Contact Channels for Disinfection. If Plant flow is above 1136 million liters per day, Secondary Effluent is combined with excess Primary Effluent flows before Disinfection.

Disinfection

- Hypochlorite applied as disinfectant.
- Contact Channel: Four chambers 432.82m long, average width 2.13m and average depth 3.75m. Total volume of all four chambers is 13,895 cubic meters.
- Contact time: at 503,405 cubic meters per day is 0.66 hours, and at 1,650,400 cubic meters per day is 0.20 hours.

Dechlorination

- Sodium bisulfite applied for dechlorination.

Effluent Pump Station (EPS)

Pumping Equipment: Four motor driven non-clog centrifugal pumps to discharge up to 1666 million liters of plant effluent into Puget Sound.

Submarine Outfall

- Diameter: 2.44m
- Length: 1,113m
- Diffuser Length: 182.9m
- Depth of diffuser: 73.2m below mean sea level

Reclaimed Water – Tertiary Treatment Sand Filter

- 2.6 million liters capacity

Solids Handling

Sludge Thickening

- Gravity belt thickeners- 10 belt thickeners 3.3m long
- Thickens solids to approx. 6% solids content
- Polymer is added as a flocculating aid.

Sludge Digestion

- Anaerobic digesters: 6 total; typical operate as 5 Primary digesters and 1 Blend/Storage tank.
- Side water depth: 11.4m
- Depth at cone: 14.5m
- Diameter: 30.5m
- Volume: 8,455,115 liters each
- Approx. retention time 28 days
- The digestion process breaks down the solids content from 6% to approx. 3% (approx. 50% solids reduction)

Sludge Dewatering

- Centrifuges – 4 total
- Dewatered Biosolids –23 to 28% solid content
- Polymer is added as a flocculating aid.

Energy Systems- supply and recovery

Plant Power Supply

- Primary power supply: plant typically powered via a dedicated feeder from the Canal Substation, Seattle City Light.
- Back-up power: feeder from Broad Street Substation, Seattle City Light.
- Loss of Power Plant will automatically switch to back feeder when there is a power outage.
- Average energy demand typically ranges from 6 to 7 MW.
- Peak energy demand is above 10 MW.

Power Generation

- Engine generators: Two, 2.3 MW each, fueled by methane (digester?) gas. Correct. Digester gas is mostly methane.

Odor Control System

- Liquids Process Odor Control
  - ◊ Scrubber: Three one-stage (chemicals, sodium hydroxide and hypochlorite) packed tower, 3.6m diameter.
- Solids Process Odor Control
  - ◊ Scrubber: Three one-stage (chemicals, sodium hydroxide and hypochlorite) packed tower, 3.6m diameter.

Effluent quality

- National Pollution Discharge Elimination System permit. Reporting through the Washington State Department of Ecology
- Carbon Biological Oxygen Demand (CBOD) – monthly average permit limit of 25 mg/L:
- Total suspended solids (TSS) monthly average permit limit of 30 mg/L.:
- Fecal Coliform limits: monthly geomean permit limit of 200 counts per 100 mL
- Chlorine residual: monthly average permit limit of 139 µg/L