

Fact Sheet for NPDES Permit WA0022900

BP Cherry Point Refinery

November 2, 2021

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for the BP Cherry Point Refinery.

This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for BP Cherry Point Refinery, NPDES permit WA0022900, are available for public review and comment from November 4, 2021 until December 17, 2021. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

BP Cherry Point Refinery reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as **Appendix M - Response to Comments**, and publish it when issuing the final NPDES permit. Ecology generally will not revise the rest of the fact sheet. The full document will become part of the legal history contained in the facility's permit file.

Summary

The BP Cherry Point Refinery operates a wastewater treatment plant that discharges to the Strait of Georgia. Ecology issued the previous permit for this facility on February 14, 2012 and a modification to this permit on December 2, 2013.

The proposed permit retains the effluent limits and monitoring frequencies for the conventional pollutants Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), Oil and Grease (O&G), and sulfide and reduces the monitoring frequencies for phenols, ammonia, and hexavalent chromium at Outfall 001. The proposed permit retains the stormwater benchmarks from the previous permit for stormwater Outfalls 002, 003, 004, 005, and 007 and revises dioxin monitoring.

The proposed permit adds the following requirements:

- Nutrient monitoring at Outfall 001
- Construction stormwater discharge authorization and monitoring
- Effluent mixing study
- Sediment monitoring study
- Wastewater treatment efficiency study and updated engineering report
- Fire system test water discharge at Outfalls 002 and 007
- Alternative stormwater discharge at Outfall 006
- Per- and Polyfluoroalkyl Substances (PFAS) study

The proposed permit also requires BP to conduct chronic Whole Effluent Toxicity (WET) testing in the first summer and first winter of the new permit cycle. A draft order accompanies the proposed permit requiring BP to conduct additional biomonitoring of the effluent at Outfall 001 for potential impacts to Pacific herring.

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I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to industrial NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (Chapter 173-220 WAC)
- Water quality criteria for surface waters (Chapter 173-201A WAC)
- Water quality criteria for ground waters (Chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (Chapter 173-205 WAC)
- Sediment management standards (Chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (Chapter 173-240 WAC)

These rules require any industrial facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for performance requirements imposed by the permit.

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See **Appendix A-Public Involvement Information** for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in **Appendix M**.

II. Background Information

Table 1 — General Facility Information

| | |
|--------------------------------------|---|
| Applicant | BP Cherry Point Refinery |
| Facility Name and Address | 4519 Grandview Road, Blaine, WA 98230 |
| Contact at Facility | Name: Lesli Higginson Telephone #: (360) 526-3766 |
| Responsible Official | Name: Eric Zimpfer Title: VP Refining, Cherry Point Address: 4519 Grandview Road Blaine, WA 98230 Telephone #: 360-371-1500 |
| Industry Type | Petroleum Refinery |
| Type of Treatment | Primary, biological, and tertiary treatment system |
| SIC Code | 2911 |
| NAIC Code | 324110 |
| Discharge Waterbody Name | Strait of Georgia |
| Strait of Georgia Outfall 001 | Latitude: 48.860833 Longitude: 122.757222 |
| Strait of Georgia Outfall 006 | Latitude: 48.866111 Longitude: 122.752222 |
| Discharge Waterbody Name | Terrell Creek |
| Terrell Creek Outfall 002 | Latitude: 48.859167 Longitude: 122.731944 |
| Terrell Creek Outfall 003 | Latitude: 48.8925 Longitude: 122.743056 |
| Terrell Creek Outfall 004 | Latitude: 48.8925 Longitude: 122.747778 |
| Terrell Creek Outfall 005 | Latitude: 48.8825 Longitude: 122.747778 |

| | |
|----------------------------------|--|
| Applicant | BP Cherry Point Refinery |
| Terrell Creek Outfall 007 | Latitude: 48.891944 Longitude: 122.726389 |

Table 2 — Permit Status

| | |
|---|---|
| Issuance Date of Previous Permit | February 14, 2012 |
| Application for Permit Renewal Submittal Date | September 2, 2016 (original) February 1, 2021 (update) |
| Date of Ecology Acceptance of Application | February 15, 2017 |

Table 3 — Inspection Status

| | |
|--------------------------------------|-------------------|
| Date of Last Non-sampling Inspection | March 5, 2020 |
| Date of Last Sampling Inspection | April 23-24, 2019 |

Figure 1. Facility Location Map



A. Facility Description

History

The BP Cherry Point Refinery is located in a rural area of Whatcom County, approximately six miles northwest of Ferndale, Washington. The refinery encompasses an area of about 740 acres, bordered by Grandview Road to the north, Point Whitehorn Road on the south, and Jackson Road to the west. BP's property extends eastward to the railroad spur west of the Chemco facility. Prior to construction of the refinery in 1971, the site was used as agricultural land. The refinery employs approximately 800 people.

Cooling Water Intakes

CWA § 316(b) requires the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. Since July 2013, Ecology has required a supplemental application for all applicants using EPA Form 2-C. BP Cherry Point Refinery selected "No" on this form when asked if a cooling water intake is associated with the facility. BP receives their raw water from Public Utility District #1 of Whatcom County and their potable water from Birch Bay Water and Sewer District.

Industrial Processes

In 1979, the refinery processed an average of 106,000 barrels (bbls) per day of crude oil. The refinery processed an average of 211,420 bbls per day of crude oil over a 24-month period from January 1, 2019 to December 31, 2020. The refinery receives their main source of crude oil from North Dakota and Alaska's North Slope delivered by railcars and ships, respectively.

The refinery separates crude oil into various components for further processing and blending into a variety of petroleum products. These products include gasoline, aviation fuel, diesel fuel, propane, sulfur, and petroleum coke. The refinery also has a coke calciner operation; coke is a product used in the aluminum smelting industry. The refinery processes use an average of 7.6 million gallons of water per day (MGD). Additionally, another 30,000 gallons per day are used for potable water purposes. Major process water uses include cooling tower water make-up (3.6 MGD), boiler feed water (1.7 MGD), and utility services (0.43 MGD).

Wastewater treatment processes

BP's wastewater treatment plant treats various wastewaters including process water, ballast water from tankers, tank water draws, and stormwater that falls in process areas of the site. The refinery treats its process water with primary and secondary treatment in a wastewater treatment system consisting of four parallel American Petroleum Institute (API) oil/water separators, two induced gas flotation units, an equalization tank, a complete mix activated sludge unit, a secondary clarifier, two clarification ponds, and a final holding pond. Oil recovered by the API separators is recycled back to refinery for processing. BP treats sludges generated in the activated sludge units by sludge thickening in aerated sludge holding tank, followed by dewatering with a belt filter press and disposal in the on-site non-hazardous waste landfarm located in the southwest corner of the refinery property.

The refinery's oily water sewer system collects stormwater that falls within the process unit boundaries and sends it for treatment, along with process wastewater, at the refinery's wastewater treatment plant.

The refinery's stormwater sewer system collects stormwater falling on other industrial areas of the refinery that are not within the process unit boundaries. This stormwater receives primary treatment before being discharged through Outfall 001. Any oil present on the water surface as it enters the stormwater observation channel is skimmed off by a rotating surface skimmer at the head of the channel. The oil is routed to the API separators. The stormwater from the observation channel overflows into the stormwater holding pond which allows for additional solids settling. From the holding pond, the stormwater flows into the final holding pond where it commingles with the treated process water before being discharged to the Strait of Georgia.

In the event that the final effluent does not meet specifications, the refinery can divert the effluent to the emergency wastewater impoundment until it can be returned to the wastewater treatment plant for additional treatment.

Sanitary wastewater from the refinery is discharged to the Birch Bay Water and Sewer District wastewater treatment plant for treatment.

The proposed permit authorizes BP to receive untreated wastewater from the Praxair, Inc. Ferndale facility. More details on these waste streams are provided below.

Linde Inc., formerly known as Praxair Inc., is a carbon dioxide (CO₂) manufacturing plant. The plant was built in 1978 and is located adjacent to the BP Cherry Point Refinery. Praxair's process water is treated in the refinery's wastewater treatment system and discharged through BP's Outfall 001 at an average flow rate of 50,000 gallons per day (gpd). The wastewater mainly consists of cooling tower blowdown, a small volume of cooling water sand filter back-wash, stormwater from the scale sump pit, process condensate, and wastewater from plant floor drains.

Ecology's Northwest Regional Office issued State Waste Discharge Permit No. ST0501315 to Praxair on October 8, 2018. Praxair's NPDES permit includes monitoring requirements and pretreatment limits for the wastestreams prior to their discharge to BP.

Solid wastes

The refinery manages various solid wastes onsite including: garbage, recyclables, (paper, plastic, glass, metal, and wood) biosolids, clay tower media, non-hazardous vessel sludge, off-spec coke, non-hazardous excavated soil, concrete, and refractory.

Discharge outfalls

The refinery has one process wastewater outfall (001) and six industrial stormwater outfalls (002, 003, 004, 005, 006, and 007).

Process Wastewater Outfall 001

The refinery treats process water, ballast water, and stormwater and discharges it via a 20-inch diameter multi-port submerged diffuser at Outfall 001. The diffuser is located under the south pier, 2200 feet offshore at a depth of 57 feet below mean lower low water.

The refinery pumps treated effluent into the Strait of Georgia on a continual basis. During the previous permit cycle, the monthly average effluent flow generally ranged between 4.3 to 5.9 MGD. During a heavy rainfall event, the flow can reach levels as high as 12.9 MGD, which occurred on January 4, 2019.

Stormwater Outfalls 002, 003, 004, 005, 006, and 007

The refinery has six industrial stormwater discharge points: Outfalls 002, 003, 004, 005, 006, and 007. These outfalls are described in more detail below:

Outfall 002 drains approximately 102 acres of refinery property including an administrative office and associated parking lot, construction laydown yards, contractor areas, a salvage yard, storage yards, and a warehouse. The drainage area for Outfall 002 contains the largest percentage of areas of industrial activity (as compared to the other stormwater outfalls). Discharge from Outfall 002 flows north under Grandview Road and through a series of ponds in the wetland mitigation site on the north side of Grandview Road before reaching Terrell Creek.

Structural and non-structural treatments and Best Management Practices (BMPs) include secondary containment, detention ponds, Vortech separators, oil stop valves, a bio-retention area, Excelsior wood fiber bale filters, and herbicide application.

Outfall 003 drains 36 acres of refinery property, primarily the area along the northern portion of the refinery. Approximately 25% of Outfall 003's drainage area is an area of industrial activity including a parking lot, construction laydown yards, and service roads. Discharge from the Outfall 003 flows west along Grandview Road towards Jackson Road before reaching Terrell Creek.

Outfall 003 could discharge wastewater in the unlikely event of an overflow of the Final Holding Pond or an alternative discharge of water held in the Storm Water Pond.

Structural and non-structural treatment and BMPs include containment, Excelsior wood fiber bale filters, and herbicide application.

Outfall 004 drains 64 acres of refinery property, primarily the northwest portion of the property. It includes the butane sphere impoundment area, employee parking lot, contractor equipment storage area, and roof runoff from the Green Coke Storage Building No. 2. Approximately 50% of Outfall 004's drainage area is an area of industrial activity. Discharge from the Outfall 004 flows north along Jackson Road before flowing west under Jackson Road at its intersection with Grandview Road before reaching Terrell Creek.

Structural and non-structural treatment and BMPs include containment, sweeping, Excelsior wood fiber bale filters, and herbicide application.

Outfall 005 drains 279 acres in the southwest corner of the refinery property, which includes an area below the pipelines running between the refinery and dock facilities along Jackson Road, as well as a tank dike area near the dock facilities. In addition, stormwater from east and west of the refinery's property drains to Outfall 005. Approximately 10% of Outfall 005's drainage area is an area of industrial activity. The discharge from Outfall 005 flows under Jackson Road to the northwest and eventually to Terrell Creek.

Outfall 006 drains 9 acres of refinery property near the dock facilities including roads, southern pipeway at the dock, a boom maintenance building, equipment and material laydown areas, and grassland areas. Stormwater discharging to Outfall 006 is normally captured in an on-shore sump. The purpose of the sump is to collect any occasional drips or leaks from the on-shore dock line valves. Water from the sump is normally pumped back to the refinery's wastewater treatment system.

During heavy rainfall events, the refinery may bypass the initial on-shore sump and direct the stormwater from the roadway and pipeline ditch to Outfall 006, rather than run the risk of overflowing the on-shore sump. Discharges associated with Outfall 006 discharge directly to the Strait of Georgia.

Outfall 007 drains 321 acres between Blaine Road and the BNSF Custer spur railroad tracks west of Kickerville Road. It includes the rail unloading facility (non-contact stormwater area), employee offices, contractor trailer areas, and laydown areas for construction material storage. Stormwater runoff from these areas is captured in the stormwater detention pond located in the northwest corner of the laydown area prior to discharge. Approximately 23% of Outfall 007's drainage area is an area of industrial activity. Discharge from Outfall 007 flows to the north under Grandview Road and eventually to Terrell Creek.

B. Description of the Receiving Water

BP discharges treated process wastewater and stormwater from Outfall 001 to the Strait of Georgia. Other nearby point source outfalls include Phillips 66 Refinery, Intalco Aluminum Smelter, and Birch Bay POTW. Significant nearby non-point sources of pollutants include stormwater runoff and groundwater seeps/discharges from contaminated sites, in particular the abandoned Treoil Industrial site.

The ambient background data used for this permit were obtained from Ecology's long-term monitoring station GRG002 in the Strait of Georgia from 2015 and 2016 and the *Background Metals Concentrations in Selected Puget Sound Marine Receiving Waters* prepared by Eric Crecelius, Battelle Marine Sciences Laboratory, February 1998. BP will conduct an updated receiving water metals study under Agreed Order No. 16819. The order requires BP to submit a Sampling and Analysis Plan to Ecology and conduct the study during the next critical period following Ecology's approval of the plan.

Table 4 — Ambient Background Data

| Parameter | Value Used |
|---|---------------------------------|
| Temperature (highest annual 1-DADMax) | 19.5 °C |
| Temperature (90 th percentile) | 11.8 °C |
| pH (Maximum / Minimum) | 8.7 standard units |
| Salinity | 30.27 mg/L as CaCO ₃ |
| Ammonia | 0.016 mg/L |
| Aluminum | 45.2 mg/L |
| Cadmium | 0.059 µg/L |

| Parameter | Value Used |
|-----------|------------|
| Mercury | 0.001 µg/L |
| Lead | 0.146 µg/L |
| Copper | 0.673 µg/L |
| Zinc | 3.9 µg/L |

C. Wastewater Characterization

BP reported the concentrations of pollutants detected in the discharge from Outfall 001 in their updated permit renewal application dated February 1, 2021 and in discharge monitoring reports (DMRs). The tabulated data represents the quality of the wastewater effluent discharged from 2017-2020. The wastewater effluent is characterized as follows:

Table 5 — Wastewater Characterization for Outfall 001

| Parameter | Units | # of Samples | Long Term Average Value | Maximum Daily Value |
|---|-------|--------------|-------------------------|---------------------|
| Biochemical Oxygen Demand (BOD ₅) | mg/L | 166 | 3.5 | 19 |
| Total Suspended Solids (TSS) | mg/L | 1094 | 14 | 30 |
| Chemical Oxygen Demand (COD) | mg/L | 1094 | 67 | 124 |
| Ammonia (as N) | mg/L | 1094 | 0.3 | 5.9 |
| Oil and Grease (O & G) | mg/L | 1094 | 1.6 | 5.8 |
| Phenols (Total) | mg/L | 156 | 0.03 | 0.08 |
| Sulfide | mg/L | 156 | 0.01 | 0.04 |
| Bromide | µg/L | 1 | -- | 479 |
| Chlorine, total residual | µg/L | 3 | 42 | 50 |
| Fluoride | µg/L | 3 | 283 | 360 |
| Nitrate-nitrite | µg/L | 3 | 3280 | 6800 |
| Nitrogen, total organic (as N) | mg/L | 3 | 1.63 | 1.83 |

| Parameter | Units | # of Samples | Long Term Average Value | Maximum Daily Value |
|-------------------|-------|--------------|-------------------------|---------------------|
| Phosphorus | mg/L | 3 | 0.46 | 0.68 |
| Sulfate | mg/L | 3 | 25 | 38 |
| Surfactants | mg/L | 1 | -- | 0.702 |
| Aluminum, total | µg/L | 3 | 47 | 60 |
| Barium, total | µg/L | 3 | 157 | 207 |
| Boron, total | µg/L | 3 | 690 | 880 |
| Cobalt, total | µg/L | 3 | 2.0 | 2.9 |
| Iron, total | µg/L | 3 | 228 | 320 |
| Magnesium, total | µg/L | 3 | 8137 | 8900 |
| Molybdenum, total | µg/L | 3 | 38 | 56 |
| Manganese, total | µg/L | 3 | 266 | 374 |
| Tin, total | µg/L | 3 | 0.6 | 0.8 |
| Titanium, total | µg/L | 1 | -- | 2.6 |

| Parameter | Units | # of Samples | Long Term Average Value | Maximum Value |
|-------------------|-------|--------------|-------------------------|---------------|
| Antimony (Total) | µg/L | 3 | 0.9 | 1.1 |
| Arsenic (Total) | µg/L | 3 | 54.8 | 57.2 |
| Beryllium (Total) | µg/L | 3 | 0.03 | 0.04 |
| Cadmium (Total) | µg/L | 3 | 0.095 | 0.125 |
| Copper (Total) | µg/L | 3 | 9.6 | 12.6 |
| Chromium (Total) | µg/L | 3 | 1.9 | 2 |
| Lead (Total) | µg/L | 3 | 0.7 | 1.2 |

| Parameter | Units | # of Samples | Long Term Average Value | Maximum Value |
|----------------------|-----------|--------------|-------------------------|---------------|
| Mercury (Total) | µg/L | 3 | 0.01 | 0.02 |
| Nickel (Total) | µg/L | 3 | 68.4 | 105 |
| Selenium (Total) | µg/L | 3 | 100.2 | 103 |
| Silver (Total) | µg/L | 3 | 0.32 | 0.8 |
| Thallium (Total) | µg/L | 3 | 0.7 | 1.1 |
| Zinc (Total) | µg/L | 3 | 47.8 | 80.9 |
| Cyanide (Total) | µg/L | 3 | 12.7 | 20 |
| Fecal Coliforms | cfu/100ml | 3 | 3 | 4 |
| Temperature (winter) | °C | Continuous | 18 | 22 |
| Temperature (summer) | °C | Continuous | 24 | 30 |

| Parameter | Units | # of Samples | Minimum Value | Maximum Value |
|-----------|----------------|--------------|---------------|---------------|
| pH | standard units | Continuous | 6.8 | 8.5 |

D. Summary of Compliance with Previous Permit Issued

The previous permit placed effluent limits on BOD₅, COD, TSS, O&G, Phenolic, Ammonia as N, Sulfide, Hexavalent Chromium, and pH at Outfall 001.

BP has consistently complied with the effluent limits and permit conditions throughout the duration of the permit issued on February 14, 2012.

Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs), and on inspections.

The previous permit required monitoring of the stormwater discharges at Outfalls 002, 003, 004, 005, 006, and 007. The results of this monitoring was compared to stormwater benchmarks. Stormwater benchmarks are not limits but rather action levels that when exceeded require BP to take actions defined in the permit. If BP does not take the defined action, then they are in violation of the permit.

BP had a number of exceedances of the stormwater benchmarks (primarily turbidity) in the previous permit. The heavy rain events mainly contributed to the exceedances. BP actions to resolve the exceedances included conducting inspections upstream to identify the sources, installing new BMPs for source controls, and taking additional samples.

Table 6 — Stormwater Benchmark Exceedances

| Date | Outfall | Parameter | Unit | Result | Benchmark |
|------------|---------|-----------|------|--------|-----------|
| 4/10/2013 | 002 | Turbidity | NTU | 164 | 25 |
| 4/10/2013 | 002 | Copper | µg/L | 15 | 14 |
| 4/10/2013 | 002 | Zinc | µg/L | 128 | 117 |
| 11/7/2013 | 002 | Turbidity | NTU | 81.3 | 25 |
| 10/7/2016 | 002 | Turbidity | NTU | 35.8 | 25 |
| 3/14/2017 | 002 | Turbidity | NTU | 30.9 | 25 |
| 10/11/2017 | 002 | Turbidity | NTU | 31.3 | 25 |
| 4/17/2018 | 002 | Turbidity | NTU | 38.3 | 25 |
| 10/1/2018 | 002 | Turbidity | NTU | 49.7 | 25 |
| 4/10/2013 | 003 | Turbidity | NTU | 28 | 25 |
| 4/10/2013 | 004 | Turbidity | NTU | 131 | 25 |
| 11/7/2013 | 004 | Turbidity | NTU | 54.3 | 25 |
| 3/1/2016 | 004 | Turbidity | NTU | 29.4 | 25 |
| 10/1/2019 | 004 | Turbidity | NTU | 43 | 25 |
| 7/1/2020 | 004 | Turbidity | NTU | 94.9 | 25 |
| 12/10/2014 | 006 | Turbidity | NTU | 39.9 | 25 |
| 1/5/2015 | 006 | Turbidity | NTU | 27.9 | 25 |
| 2/15/2016 | 006 | Turbidity | NTU | 91.3 | 25 |
| 4/10/2013 | 007 | Turbidity | NTU | 33.5 | 25 |
| 10/17/2013 | 007 | Turbidity | NTU | 26 | 25 |

The following table summarizes compliance with report submittal requirements over the last permit term.

Table 7 — Permit Submittals

| Submittal | Frequency | Received Date | Review |
|---|------------------|----------------------|---------------|
| Priority Pollutant Testing | Annually | Annually | Completed |
| Installation of Flow Meter at the secondary clarifier | 1/permit cycle | 9/17/2012 | Completed |
| Stormwater Outfall Inspections | Monthly | Monthly | Completed |
| Stormwater Monitoring Results | Quarterly | Quarterly | Completed |
| Discharge Monitoring Reports | Monthly | Monthly | Completed |
| Updated Treatment System Operating Plan | 1/permit cycle | 10/8/2013 | Completed |
| Acute Toxicity Tests | Quarterly | Quarterly | Completed |
| Chronic Toxicity Tests | 2/permit cycle | 10/18/2016 | Completed |
| Sediment Sampling and Analysis Plan | 1/permit cycle | 6/6/2016 | Completed |
| Sediment Data Report | 1/permit cycle | 2/13/2017 | Completed |
| Updated Pollution Prevention Plan | 1/permit cycle | 8/30/2013 | Completed |
| Dioxin Study Report | 1/permit cycle | 8/31/2016 | Completed |
| Groundwater Monitoring Reports | Annually | Annually | Completed |
| Outfall Evaluation Report | 1/permit cycle | 11/11/2016 | Completed |
| Application for Permit Renewal | 1/permit cycle | 8/31/2016 | Completed |

E. State Environmental Policy Act (SEPA) compliance

State law exempts the issuance, reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions that are no less stringent than federal and state rules and regulations (RCW 43.21C.0383). The exemption applies only to existing discharges, not to new discharges.

III. Proposed Permit Limits

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and Chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC), or the National Toxics Rule (40 CFR 131.36).

Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants.

Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent [40 CFR 122.42(a)].

Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

A. Design Criteria

Under WAC 173-220-150(1)(g), flows and waste loadings must not exceed approved design criteria. The proposed permit retains the design criteria from the previous permit in the table below:

Table 8 — Design Criteria for BP's Biological Wastewater Treatment System

| Parameter | Design Quantity |
|---|-----------------|
| Daily Maximum BOD ₅ Influent Loading to Aeration Basin | 25,160 lbs/day |
| Daily Maximum Flow from the Secondary Clarifier | 13 MGD |

BP reported the daily BOD₅ influent loading to the aeration basin ranged from 4,286 to 13,406 lbs/day and the daily flow from the secondary clarifier ranged from 2.99 to 8.86 MGD during the permit term.

B. Technology-Based Effluent Limits

Process Wastewater

In 1974, the Environmental Protection Agency (EPA) finalized the Petroleum Refining Effluent Guidelines and Standards (40 CFR Part 419) and amended the regulations in 1975, 1977, 1982, and 1985. EPA conducted studies of the petroleum refining industry from 1992-1996, in 2004, and from 2014-2019 to determine whether revisions to the petroleum refinery guidelines were warranted.

Ecology calculated effluent limits for the BP refinery based on Best Conventional Pollutant Control Technology (BCT), Best Available Technology Economically Achievable (BAT), Best Practicable Control Technology Currently Available (BPT), and New Source Performance Standards (NSPS) developed by EPA. These guidelines were published August 12, 1985 under 40 CFR Part 419 by EPA for the cracking subcategory of petroleum refining.

The refinery effluent limitations are based on terms of a settlement agreement dated April 17, 1984, between EPA and the Natural Resources Defense Council resolving litigation about the EPA guidelines. The August 12, 1985 guidelines establish Best Available Technology (BAT) and Best Conventional Technology (BCT) as equal to Best Practicable Technology (BPT) for all parameters except phenols and chromium. Phenols and chromium are regulated by whichever guideline is more stringent.

In 1996, EPA completed a study of the petroleum refining industry (EPA-821-R-96-015) including treatment technologies, pollutants discharged, pollutant loadings, and potential water quality impacts. Based upon this review, EPA decided not to revise the refinery effluent guidelines.

EPA determined that the best treatment technology currently available was essentially the same as that applied at the time the effluent guidelines were originally promulgated. EPA also determined that if the wastewater treatment systems at the refineries are properly operated and maintained, priority pollutants will be removed or treated to negligible or below detectable levels.

On December 31, 2003, EPA published its intent to review the petroleum refining industry again to decide the necessity for revising their effluent guidelines. EPA evaluated pollution prevention opportunities, emerging treatment technologies, revising the effluent guidelines, and expanding the list of regulated pollutants. EPA reviewed information and comments on several issues including: control technologies for polycyclic aromatic hydrocarbons (PAHs), dioxin sources and reduction/control technologies, sources of toxic metals, process modifications to reduce metals, and what toxics are being released and remain unreported.

On September 2, 2004 (Federal Register Volume 69 No. 170), EPA published its decision regarding revising the refinery effluent guidelines. EPA concluded that there was little evidence that PAHs were present in refinery wastewater discharges in concentrations above the detection limit. EPA also concluded that the concentration of metals being discharged by refineries is at or very near treatable levels, leaving little to no opportunity to reduce metals discharges through conventional end-of-pipe treatment.

EPA reviewed the available dioxin information collected by refineries nationwide, much of which was collected at the Washington state refineries. The overall data indicated that dioxins are only occasionally discharged in relatively low concentrations in treated refinery effluent.

In EPA's opinion, this data did not warrant the development of national categorical limitations on dioxin in refinery wastewater discharges. EPA did note that on a case-by-case, best professional judgment basis, permit writers may decide to include effluent limitations for dioxin.

EPA also encouraged permit writers and refineries to consider pollution prevention opportunities. As a result of their evaluation, EPA concluded that there was no need to revise the federal effluent guidelines at that time.

In 2014, EPA initiated a new study of the petroleum refining industry to investigate concerns about increased discharges of metals due to implementation of wet air pollution controls and changes in crude oil feedstock. As part of this study, EPA also investigated discharges of dioxin and dioxin-like compounds to discern whether these pollutants were being discharged at detectable concentrations. EPA conducted extensive data collection activities during the study, including visiting 10 refineries, sending out detailed questionnaires to 21 refineries, and reviewing 80 NPDES permits.

The data EPA gathered showed that there was no impact from implementation of wet air pollution controls or changes in crude oil feedstock on the characteristics of the wastewater generated by the industry. The information EPA gathered on discharges of dioxin and dioxin-like compounds indicated that the dioxin discharges found were primarily from a single refinery that was in upset at the time they reported their effluent data.

EPA completed their study in 2019 and determined that no further action regarding the petroleum refining category was necessary at this time. Additional details about the study are provided in the *Final 2019 Petroleum Refining Detailed Study Report*, (September) EPA-HQ-OW-2018-0618.

Ecology requires facilities to use all known, available, and reasonable methods to control toxicants (AKART) in its wastewater as required under Washington State regulations. Because Ecology applies New Source Performance Standards (NSPS) on the basis of the AKART requirements, the refinery's NPDES permit limits are more stringent than those in other states. Ecology has applied the more stringent NSPS limits to all crude throughput increases since 1984.

Ecology must decide whether the federal effluent guidelines constitute all known, available and reasonable methods of treatment (AKART). As a general rule, if the effluent guidelines for a particular category are 5 years old or less, they are considered to be AKART. This will be immediately apparent in reviewing the development document. The development document describes production processes, pollutants generated, treatment efficiencies, and unit process designs present nationwide in the specific industry at the time of effluent guideline development.

Generally, when effluent guidelines are over 10 years old, Ecology will analyze unit process designs and efficiencies to determine that the effluent guidelines constitute AKART and meet the intent of RCW 90.48.520. The 1999 NPDES permit required BP to prepare a treatment efficiency study and an engineering report describing the treatment capacity of the wastewater facility.

Ecology compared BP's production processes, pollutants generated, and treatment technology to EPA's original development document and the results of EPA's 1996, 2004, and 2019 evaluations of the petroleum refining industry. Ecology also examined the treatability data base and BP's wastewater treatment design and efficiencies. Ecology determined that BP is providing AKART for its wastewater.

The refinery's crude oil throughput rate has changed since Ecology issued the previous NPDES permit. During the permit term from the period of July 2015 through June 2016, the refinery's highest 12 consecutive month rolling average crude throughput on a per stream day basis was 235,000 bbls/day. BP anticipates being at or above this crude throughput rate during the proposed NPDES permit's term. The refinery process rate changes for the last several permits are shown in Table 9 below.

The size and process factor determinations are documented in **Appendix E**. Ecology multiplied the size and process factors by the actual feedstock rate, to obtain an adjusted feedstock rate for our use in determining effluent limits, except for determining BAT limits for phenols and chromium.

Table 9 — Refinery Process Throughputs

| Production Rates and Factors | 1979 Permit | 1990 Permit | 1999 Permit | 2012 Permit | Proposed Permit |
|--|-------------|-------------|-------------|-------------|-----------------|
| Actual Feed Stock, bbls/day | 106,000 | 172,200 | 205,000 | 209,000 | 235,000 |
| Desalting, bbls/day | 106,000 | 172,200 | 205,000 | 209,000 | 235,000 |
| Atmospheric Distillation, bbls/day | 106,000 | 172,200 | 205,000 | 209,000 | 235,000 |
| Vacuum Distillation, bbls/day | 55,000 | 89,400 | 115,100 | 139,000 | 122,000 |
| Hydrocracking, bbls/day | 35,000 | 47,600 | 53,510 | 55,000 | 62,500 |
| Coking, bbls/day | 29,000 | 51,300 | 55,710 | 59,600 | 55,400 |
| Process Factor | 1.09 | 1.09 | 1 | 1 | 1 |
| Size Factor | 1.23 | 1.41 | 1.41 | 1.41 | 1.41 |
| Adjusted Feed Stock, bbls/day | 142,114 | 265,000 | 289,050 | 294,690 | 331,350 |
| New Source Performance Standards Increment, bbls/day | -- | 122,990 | 146,940 | 152,576 | 189,236 |

Ecology applied New Sources Performance Standards to the increases in the feedstock rate above the 1984 baseline production levels on the basis of AKART. Ecology calculated these limits by multiplying the increase in adjusted feed stock, $(331,350 - 142,114 = 189,236$ barrels (bbls) per day) by the New Source Performance Standards (NSPS). The resulting NSPS limit increment (based upon the above calculated 163,615 bbls per day) was added to the BAT and BPT limitations (based upon the adjusted baseline feedstock rate of 142,114 bbls per day). Ecology did not include BCT limitations because they are equivalent to BPT limitations.

The EPA/NRDC settlement agreement provided separate factors for calculating phenols, total chromium, and hexavalent chromium for the BAT limitations. These calculations require feedstock rate data for additional processes including: hydrotreating, catalytic reforming, and alkylation. This information is included in the Table 9 above.

EPA determined federal effluent guidelines for total and hexavalent chromium when chromium was commonly used in cooling water systems and discharged at much higher levels in the effluent. Chromium was banned for use in cooling systems by EPA in the early 1990s and the only remaining source of chromium is in the crude oil.

Because federal effluent guidelines still include limits for chromium, Ecology must include an effluent limit for chromium in the proposed permit to ensure that refineries in Washington are subject to the same requirements as refineries located in other states.

Ecology believes the guideline-derived effluent limit is artificially high now that chromium in the effluent has decreased to levels bordering on non-detectable. All detectable samples of chromium in the BP effluent have been below 5 µg/l which is less than 1/10th of the marine chronic water quality standard of 50 µg/l for hexavalent chromium (acute standard = 1,100 µg/l).

Based on this information, Ecology's Best Professional Judgment is that a 50 µg/l hexavalent chromium concentration limit is technologically achievable, reasonable, and protective of the receiving water quality. The proposed permit condition includes the 50 µg/l as a technology-based limit and not as a water quality-based limit.

At a 3.53 MGD effluent flow (dry weather), the 50 µg/l limit converts to 1.5 lbs/day, which is more stringent than the federal effluent guideline BAT limit of 2.15 lbs/day. At lower effluent flows, this limit will continue to be more stringent than the federal effluent guideline BAT limit. However, at higher effluent flows, the federal effluent guideline limit will be more stringent. Therefore, the proposed permit includes both a concentration limit of 50 µg/l and a mass-based limit of 1.5 lbs/day to cover all flow situations that might occur.

If chromium levels change in the crude oil refined at BP and result in concentration increases, Ecology will modify the permit to increase the limit as needed to allow continued facility compliance. Ecology will evaluate any revised limit to ensure that the effluent continues to meet water quality standards within the authorized mixing zone, the anti-backsliding requirements are met, and to ensure that chromium concentrations do not exceed limits allowed under the federal effluent guidelines. In the event that the federal effluent guidelines are promulgated without chromium limits, Ecology will drop the chromium limits from the permit unless the situation changes and a water quality limit is necessary. BP will continue to perform semi-annual hexavalent chromium monitoring.

The effluent limit calculations are tabulated in **Appendix E**. The calculated limits are based on the NSPS increment and the more stringent of the BAT and BPT determinations. BPT limitations are more stringent for phenols.

The state's antidegradation program is discussed later in this document (see Section III.C, "Surface Water Quality-Based Effluent Limits"). The federally mandated program has three tiers of protection.

The Tier II antidegradation provisions limit the conditions under which waters of higher quality than standards can be degraded. A Tier II analysis is required for new or expanded sources of pollution from specific activities regulated by Ecology. A greater than 10% increase to an existing effluent concentration or mass limit in an NPDES permit is considered an expanded action. The effective date of new or expanded actions is defined in WAC 173-201A-020 as those actions that result in an increase in pollution after July 1, 2003.

For purposes of evaluating a greater than 10% increase, Ecology set the baseline as those effluent limits that applied in July 2003.

In this case, the baseline is the effluent limits in the NPDES permit issued to BP on October 1, 1999. The effluent limits in the 1999 permit were based on a crude throughput of 205,000 bbls/day.

Although the calculated limits for the previous permit issued on February 14, 2012 were higher, BP was willing to keep the permit limits from the 1999 permit.

Table 10 below compares the 2021 calculated effluent limits with the limits from the previous permit issued in 2012.

Table 10 — Comparison of 2012 and 2021 Calculated Technology-Based Effluent Limits

| Parameter | Units | 2012 Average Monthly | 2012 Maximum Daily | 2021 Average Monthly | 2021 Maximum Daily |
|-----------------------------------|---------|----------------------------|--------------------------|----------------------------|--------------------------|
| Biochemical Oxygen Demand (5-day) | lbs/day | 1240 | 2260 | 1370 | 2500 |
| Chemical Oxygen Demand | lbs/day | 8540 | 16610 | 9430 | 18370 |
| Total Suspended Solids | lbs/day | 990 | 1570 | 1100 | 1740 |
| Oil and Grease ^a | lbs/day | 360 | 680 | 400 | 750 |
| Phenolic Compounds | lbs/day | 7.6 | 16.7 | 8.3 | 18.5 |
| Ammonia as N | lbs/day | 870 | 1910 | 990 | 2190 |
| Sulfide | lbs/day | 6.7 | 14.7 | 7.3 | 16.2 |
| Hexavalent Chromium | lbs/day | -- | 2.0 | -- | 2.3 |

Footnote a: The concentration of oil and grease in the discharge must at no time exceed 15 mg/L, and must not exceed 10 mg/L more than three days per month.

pH technology-based effluent limits of 6.0 to 9.0 SU did not change.

The calculated mass loading effluent limits for all parameters are equal or greater than 10 percent of the limits in BP's 2012 permit. For Ecology to consider applying the higher limits to BP's discharge, BP must conduct a Tier II analysis. The Tier II analysis is used to ensure that waters of higher quality than standards are not degraded unless Ecology determines that lowering the water quality is necessary and in the overriding public interest. Based on the outcome of the Tier II analysis, Ecology may reopen the permit or revisit the effluent limit during the next permit renewal. Public involvement with the Tier II review will be conducted in accordance with the public involvement processes associated with the NPDES permit.

Ecology's review of BP's wastewater characterization and monthly discharge monitoring data shows that BP is meeting the effluent limits in the current permit. A Tier II analysis is not required unless BP requests that the 2021 calculated effluent limits from Table 10 be used. Ecology is proposing to retain the effluent limits for Outfall 001 from the previous permit issued in 2012.

The proposed limits for Outfall 001 are shown in the table below. pH technology-based effluent limits of 6.0 to 9.0 SU did not change.

Table 11 — Proposed Technology-Based Effluent Limits for Outfall 001

| Parameter | Units | Proposed Average Monthly | Proposed Maximum Daily |
|-----------------------------------|---------|--------------------------|------------------------------|
| Biochemical Oxygen Demand (5-day) | lbs/day | 1240 | 2260 |
| Chemical Oxygen Demand | lbs/day | 8540 | 16610 |
| Total Suspended Solids | lbs/day | 990 | 1570 |
| Oil and Grease ^a | lbs/day | 360 | 680 |
| Phenolic Compounds | lbs/day | 7.6 | 16.7 |
| Ammonia as N | lbs/day | 870 | 1910 |
| Sulfide | lbs/day | 6.7 | 14.7 |
| Hexavalent Chromium | -- | -- | 0.05 mg/L* or 1.5 lbs/day |

*Water quality-based effluent limit

Footnote a: The concentration of oil and grease in the discharge must at no time exceed 15 mg/L, and must not exceed 10 mg/L more than three days per month.

Ballast and Stormwater Allocations

Vessel personnel measure ballast water volumes off loaded from ships. The refinery pumps ballast water from the dock facilities to a tank in the wastewater treatment plant for treatment.

The volume of ballast water is very small compared to process water and stormwater. During the previous permit term, BP refinery did not receive any ballast water at the refinery.

Contaminated stormwater from process areas and the wastewater treatment plant area is collected in the oily water sewer system and conveyed to the wastewater treatment facility for treatment. Contaminated stormwater is stormwater that has come in contact with raw material, intermediate product, finished product, by-product, or waste product. Stormwater from the tank farms, roads, and other areas of the refinery is diverted into the stormwater system.

The stormwater from the stormwater system is discharged into the stormwater observation channel adjacent to the stormwater pond at the wastewater treatment plant. Any oil or grease on the surface is removed by a skimmer that discharges to the oily water sewer. The water then cascades into the stormwater pond, where settling occurs. The stormwater pond discharges from an outlet box located near the floor of the pond into the final holding pond and commingles with treated process wastewater.

The total stormwater volume discharged from the refinery cannot be measured directly. Direct measurement of total stormwater is not possible since the precipitation that falls within process areas is discharged to the oily water sewer and mixed with process wastewater at many collection points throughout the refinery. Precipitation that falls on roads and other areas outside of process areas is collected in the stormwater system. The refinery calculates stormwater flow during storm events by subtracting an estimated dry weather flow from the total flow discharged each day.

Ecology performed an average dry weather flow rate calculation using daily and monthly average flows from 2012 to 2020 for the months of June through September. The values used were from BP's DMRs for January 2012 through December 2020. Ecology calculated an average dry weather flow of 3.53 MGD to be used in the proposed permit (see **Appendix F**).

The ballast and stormwater allocations in the permit are based on guidelines in 40 CFR 419.12(c) and 419.22(e). The proposed permit does not include a stormwater allocation for chromium as provided for in the federal effluent guidelines because historic data shows that chromium is not present or present in very low concentrations in stormwater.

The allocations for stormwater were developed to apply to stormwater runoff from areas associated with industrial activity. During the months of June through October, BP may only claim the stormwater allocation when it can demonstrate that measurable rainfall has occurred at the refinery site during the previous **10** calendar days. Ecology chose ten days because when big storms hit it takes approximately that amount of time to discharge accumulated stormwater. BP retains stormwater within tank dikes during rain events to the maximum extent possible and then slowly discharges it into the stormwater system following a rain event to maximize the settling that occurs through the stormwater system.

Should the on-site means of measuring rainfall be unavailable due to equipment malfunction, BP may use rainfall data from other nearby industries or the National Weather Service station at Blaine.

Table 12 — Ballast Water and Stormwater Allocations

| Outfall 001 Ballast Water Allocation Parameter | Monthly Average (lbs/million gallons) | Daily Maximum (lbs/million gallons) |
|---|--|--|
| Biochemical Oxygen Demand (5-day) | 210 | 400 |
| Chemical Oxygen Demand | 2000 | 3900 |
| Total Suspended Solids | 170 | 260 |
| Oil and Grease | 67 | 126 |
| Phenolic Compounds | N/A | N/A |

| Outfall 001 Stormwater Allocation Parameter | Monthly Average (lbs/million gallons) | Daily Maximum (lbs/million gallons) |
|--|--|--|
| Biochemical Oxygen Demand (5-day) | 220 | 400 |
| Chemical Oxygen Demand | 1500 | 3000 |
| Total Suspended Solids | 180 | 280 |
| Oil and Grease | 67 | 130 |
| Phenolic Compounds | 1.4 | 2.9 |

BP claimed the stormwater allocations for TSS seventeen times during the previous permit cycle.

Stormwater Discharge Monitoring (Outfalls 002, 003, 004, 005, and 007)

Stormwater monitoring data for Outfalls 002, 003, 004, 005, and 007 collected during the previous permit term are located at <https://apps.ecology.wa.gov/paris/PermitLookup.aspx>. The facility exceeded the stormwater benchmarks 20 times from February 2012 through December 2020 (See Table 4). The parameter that most frequently exceeded the benchmarks was turbidity which usually occurred during the rainy season.

Alternative Stormwater Discharges

Outfall 003: The proposed permit authorizes the refinery to discharge water from the stormwater holding pond through Outfall 003 during heavy rainfall events. This allows the refinery to pump water from the stormwater holding pond to Outfall 003 to avoid overflowing the final holding pond, which contains treated process wastewater. In the event of a discharge at Outfall 003, the refinery must monitor the following parameters: turbidity, TSS, O&G, total copper, total zinc, pH, and estimated flow and report the monitoring results with the monthly discharge monitoring report. No discharge event from Outfall 003 occurred during the previous permit term.

Outfall 006: Under normal operating conditions, BP collects stormwater from the roadway along the vegetated hillside east of Jackson Road and the ditch under the pipelines to the dock, in an onshore sump.

The purpose of the sump is to collect any occasional drips or leaks from the on-shore dock line valves. Water from the sump is normally pumped back to the refinery's wastewater treatment system.

During heavy rainfall events, the refinery may bypass the initial on-shore sump and direct the stormwater from the roadway and pipeline ditch to Outfall 006, rather than run the risk of overflowing the on-shore sump. Discharges associated with Outfall 006 discharge directly to the Strait of Georgia. In the event of a stormwater discharge via Outfall 006, the refinery must monitor the following parameters: turbidity, TSS, O&G, total copper, total zinc, pH, and estimated flow and report the monitoring results with the monthly discharge monitoring report.

Fire Water Testing

The proposed permit authorizes BP to use treated final effluent for monthly firewater testing and during Emergency Response Team (ERT) training. It does not authorize the use of foam during the firewater testing or ERT training. The treated effluent is discharged through the dockside firewater system. The discharge must comply with all permit limits parameters at Outfall 001 and the events must be reported in the monthly discharge monitoring report.

The proposed permit also authorizes the discharge of Public Utility District (PUD) water taken from the Nooksack River and used in fire system testing, to Outfalls 002, 004, 005, and 007. BP must analyze the PUD water annually for priority pollutant metals and report the results to Ecology. BP must notify Ecology of any fire system test water discharges and report the discharge in the monthly DMR.

C. Surface Water Quality-Based Effluent Limits

The Washington State surface water quality standards (Chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

Numerical water quality criteria are listed in the water quality standards for surface waters (Chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical criteria for the protection of human health

In 1992, EPA published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State in its National Toxics Rule 40 CFR 131.36 (EPA, 1992). Ecology submitted a standards revision for 192 new human health criteria for 97 pollutants to EPA on August 1, 2015.

In accordance with requirements of CWA section 303(c) (2) (B), EPA finalized 144 new and revised Washington specific human health criteria for priority pollutants, to apply to waters under Washington's jurisdiction. EPA approved 45 human health criteria as submitted by Washington. The EPA took no action on Ecology submitted criteria for dioxin and thallium and disapproved the criteria for arsenic. For these pollutants, EPA applied the criteria in the National Toxics Rule specified in 40 CFR 131.36.

On May 13, 2020, the EPA published a rule in the Federal Register (85 FR 28494) to withdraw the new and revised federal human health criteria previously finalized by EPA. This withdrawal effectively approved of all but two of the revised standards that were originally submitted by Ecology on August 1, 2016. The EPA also approved Ecology's revised standards for dioxin and thallium. These changes were effective on June 12, 2020. All of the new federal human health criteria promulgated in 2016 at 40 CFR 131.45 were withdrawn with the exception of the criteria for arsenic, methyl mercury, and bis(2-chloro-1-methylethyl) ether. Ecology is appealing this action.

The criteria that are currently legally enforceable are located in WAC 173-201A-240 and are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Note that at the time of the creation of this fact sheet, criteria for inorganic arsenic, methyl mercury, and bis(2-chloro-2-methylethyl) ether have not yet be incorporated into WAC 173-201A-240, and instead can be found at 40 CFR 131.45.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2006) and of all marine waters (WAC 173-201A-210, 2006) in the state of Washington.

Antidegradation

Description--The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).

- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

Facility Specific Requirements--This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in Chapter 173-201A WAC.

Ecology's analysis described in this section of the fact sheet demonstrates that the proposed permit conditions will protect existing and designated uses of the receiving water.

Ecology reviewed existing water quality data from Ecology's long-term monitoring station GRG002 and from Eric Crecelius (1998). The data show that the ambient water meets the temperature, dissolved oxygen, pH, turbidity, ammonia, cyanide and metals standards for marine waters extraordinary quality category given in Chapter 173-201A WAC. Therefore, Ecology uses the designated classification criteria for this water body in the proposed permit. The discharges authorized by this proposed permit should not cause a loss of beneficial uses.

Mixing zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones the pollutant concentrations may exceed water quality numeric standards, so long as the discharge doesn't interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART).

Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use more than 25% of the available width of the water body for dilution [WAC 173-201A-400 (7)(a)(ii-iii)].

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses.

Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Each aquatic life *acute* criterion is based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years.

Each aquatic life *chronic* criterion is based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two and four tenths (2.4) liters/day for drinking water (increased from two liters/day in the 2016 Water Quality Standards update).
- A one-in-one-million cancer risk for carcinogenic chemicals.

This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the point of discharge (WAC 173-201A-400). The water quality standards impose certain conditions before allowing the discharger a mixing zone:

1. Ecology must specify both the allowed size and location in a permit.

The proposed permit specifies the size and location of the allowed mixing zone (as specified below).

2. The facility must fully apply "all known, available, and reasonable methods of prevention, control and treatment" (AKART) to its discharge.

Ecology has determined that the treatment provided at BP meets the requirements of AKART (see Section III.B, "Technology-based Limits"). BP has implemented several upgrade projects to the refinery process over the last two permit cycles.

Each project on their own may not have had an impact on the wastewater treatment system but Ecology would like to examine any cumulative impacts. The proposed permit requires BP to conduct a wastewater treatment efficiency study and engineering analysis to confirm that the current wastewater treatment system meets the requirements of AKART.

3. Ecology must consider critical discharge conditions.

Surface water quality-based limits are derived for the water body's critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated waterbody uses). The critical discharge condition is often pollutant-specific or waterbody-specific.

Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising.

The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology uses the water depth at mean lower low water (MLLW) for marine waters. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: <https://apps.ecology.wa.gov/publications/SummaryPages/92109.html>.

Table 13 — Critical Conditions Used to Model the Discharge at Outfall 001

| Critical Condition | Value |
|---|-----------------------------------|
| Water depth at MLLW of 57 feet | 57 feet |
| Density profile with a difference of 9.29 sigma-t units between 57 feet and the surface | 9.29 sigma-t units |
| 10 th or 90 th percentile current speeds for acute mixing zone | 0.04 m/sec |
| 50 th percentile current speeds for chronic and human health mixing zones | 0.15 m/sec |
| Maximum average monthly effluent flow for chronic and human health non-carcinogen | 4.4 MGD |
| Annual average flow for human health carcinogen | 4.0 MGD |
| Maximum daily flow for acute mixing zone | 8.4 million gallons per day (MGD) |

| Critical Condition | Value |
|--------------------------------|----------------|
| 1 DAD MAX effluent temperature | 28.4 degrees C |

Ecology obtained ambient data at critical conditions in the vicinity of Outfall 001 from the *Mixing Zone Analysis of BP's Outfall* report submitted in May 2008. BP's consultant, ENSR Corporation, used a combination of the UM model supplied with the PLUMES interface (for initial dilution) and the Brooks far-field model (for final dilution) to determine the critical acute and chronic dilution factors. Ecology provided comments on the May 2008 report BP submitted an updated mixing zone evaluation to address Ecology's comments.

4. Supporting information must clearly indicate the mixing zone would not:

- Have a reasonable potential to cause the loss of sensitive or important habitat.
- Substantially interfere with the existing or characteristic uses.
- Result in damage to the ecosystem.
- Adversely affect public health.

Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms and set the criteria to generally protect the species tested and to fully protect all commercially and recreationally important species.

EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic standards assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of discharge.

The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers) because the buoyant plume rises in the water column. Ecology has additionally determined that the effluent will not exceed 33 degrees C for more than two seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics and the discharge location. Based on this review, Ecology concluded that the discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem, or adversely affect public health if the permit limits are met.

5. The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.

Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met.

6. The size of the mixing zone and the concentrations of the pollutants must be minimized.

At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. Because tidal currents change direction, the plume orientation within the mixing zone changes. The plume mixes as it rises through the water column therefore much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge.

Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving waterbody. When a diffuser is installed, the discharge is more completely mixed with the receiving water in a shorter time. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant concentration, the 90th percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

7. Maximum size of mixing zone.

The authorized mixing zone does not exceed the maximum size restriction.

8. Acute mixing zone.

- **The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.**

Ecology determined the acute criteria will be met at 10% of the distance (257 ft) of the chronic mixing zone.

- **The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.**

As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration.

The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organisms near the point of discharge (below the rising effluent).

- **Comply with size restrictions.**

The mixing zone authorized for the discharge at Outfall 001 complies with the size restrictions published in Chapter 173-201A WAC.

9. Overlap of mixing zones.

This mixing zone for the discharge at Outfall 001 does not overlap another mixing zone.

D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in Chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). The table included below summarizes the criteria applicable to this facility’s discharge.

- Aquatic life uses are designated using the following general categories. All indigenous fish and non-fish aquatic species must be protected in waters of the state.
 - Extraordinary quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
 - Excellent quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
 - Good quality salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
 - Fair quality salmonid and other fish migration.

The Aquatic Life Uses and the associated criteria for this receiving water are identified below for extraordinary quality.

Table 14 — Extraordinary Quality

| Criteria | Value |
|---|--|
| Temperature – Highest 1D MAX | 13°C (55.4°F) |
| Dissolved Oxygen – Lowest 1-Day Minimum | 7.0 mg/L |
| Turbidity | <ul style="list-style-type: none"> • 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU. |
| pH | pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.2 units. |

- To protect shellfish harvesting, fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.
- The recreational use is primary contact recreation. After December 31, 2020, all marine waters will be designated for primary contact recreation. This redesignation of the recreational use includes a change in the bacteria indicator from fecal coliform to enterococci and elimination of the secondary contact enterococci standard.

Table 15 — Recreational Use Criteria for the Strait of Georgia

| Recreational Use | Criteria |
|---|---|
| Primary Contact Recreation (effective 1/1/2021) | Enterococci organism levels within an averaging period must not exceed a geometric mean of 30 CFR or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample values exist) obtained within the averaging period exceeding 110 CFU or MPN per 100 mL. |

- The *miscellaneous marine water uses* are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

E. Water quality impairments

Ecology has not documented any water quality impairments in the receiving water in the vicinity of the Outfall 001.

For more information on how Ecology assesses water quality data and determines if water bodies are polluted, see Water Quality Policy 1-11 at <https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d/Assessment-policy-1-11>.

F. Evaluation of surface water quality-based effluent limits for narrative criteria

Ecology must consider the narrative criteria described in WAC 173-201A-160 when it determines permit limits and conditions. Narrative water quality criteria limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge which have the potential to adversely affect designated uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health.

Ecology considers narrative criteria when it evaluates the characteristics of the wastewater and when it implements all known, available, and reasonable methods of treatment and prevention (AKART) as described above in the technology-based limits section. When Ecology determines if a facility is meeting AKART it considers the pollutants in the wastewater and the adequacy of the treatment to prevent the violation of narrative criteria.

In addition, Ecology considers the toxicity of the wastewater discharge by requiring whole effluent toxicity (WET) testing when there is a reasonable potential for the discharge to contain toxics. Ecology's analysis of the need for WET testing for this discharge is described later in the fact sheet.

G. Evaluation of surface water quality-based effluent limits for numeric criteria

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biological oxygen demand (BOD) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

With technology-based controls (AKART), predicted pollutant concentrations in the discharge at Outfall 001 exceed water quality criteria. Ecology therefore authorizes a mixing zone at Outfall 001 in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by chapter 173-201A WAC.

Chronic Mixing Zone--WAC 173-201A-400(7)(c) specifies that mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 200 feet plus the depth of water over the discharge ports as measured during MLLW.

The horizontal distance of the chronic mixing zone is 257 feet from the centerline of the diffuser. The mixing zone extends from the bottom to the top of the water column.

Acute Mixing Zone--WAC 173-201A-400(8)(b) specifies that in oceanic waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the chronic zone. The horizontal distance of the acute mixing zone is 26 feet from the centerline of the diffuser. The mixing zone extends from the bottom to the top of the water column.

The diffuser at Outfall 001 is 52 feet long with a diameter of 20 inches. The diffuser has a total of 13 ports. Each port has a 3 inch diameter. The distance between ports is 4 feet. The mean lower low water (MLLW) depth is 57 feet. Ecology obtained this information from the dilution ratio study report submitted in May 2008.

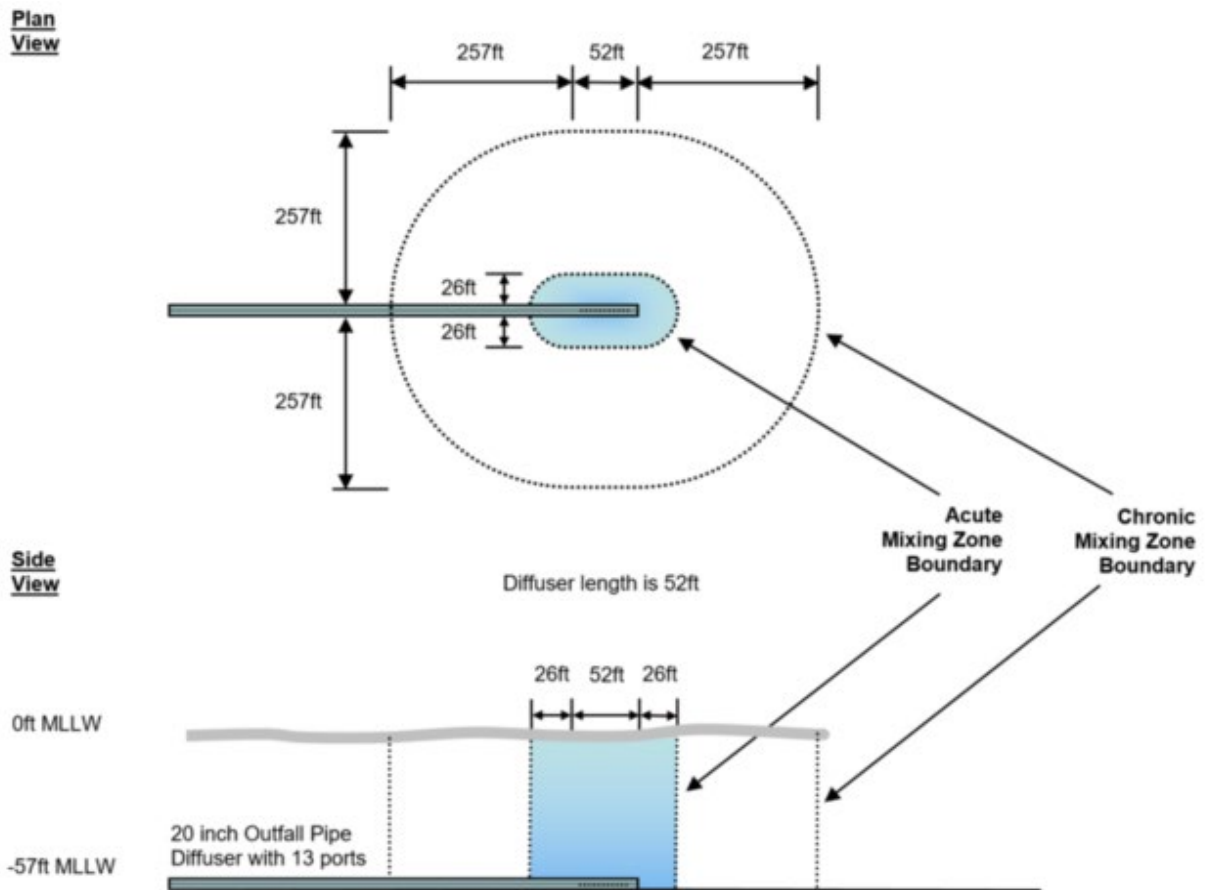


Figure 2. Mixing Zone Diagram

Ecology determined the dilution factors that occur within these zones at the critical condition using a dye study and modeling. The dilution factors for Outfall 001 are listed below in Table 16. Stormwater Outfalls 002, 003, 004, 005, 006, and 007 do not have mixing zones so the dilution factors are assumed to be 1.0 for these outfalls.

Table 16 — Dilution Factors for Outfall 001

| Criteria | Acute | Chronic |
|------------------------------|-------|---------|
| Aquatic Life | 28 | 110 |
| Human Health, Carcinogen | -- | 136 |
| Human Health, Non-carcinogen | -- | 136 |

Ecology determined the impacts of dissolved oxygen deficiency, pH, fecal coliform, chlorine, ammonia, metals, other toxics, and temperature for Outfall 001 as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

Dissolved Oxygen--BOD₅ and Ammonia Effects--Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD₅) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand in the receiving water.

With technology-based limits, this discharge results in a small amount of BOD₅ loading relative to the large amount of dilution in the receiving water at critical conditions. Technology-based limits will ensure that dissolved oxygen criteria are met in the receiving water.

pH--Compliance with the technology-based limits of 6.0 to 9.0 will assure compliance with the water quality standards of surface waters because of the high buffering capacity of marine water.

Fecal Coliform--The previous permit required BP to monitor fecal coliform weekly for 8 consecutive months. BP determined that the source was from wildlife activities. BP has implemented Best Management Practices to deter the wildlife activities around the tertiary treatment unit to control the fecal coliform source. Ecology evaluated the fecal coliform data with a chronic dilution factor of (110:1). The evaluation showed no reasonable potential for BP to exceed the Water Quality Standards for fecal coliform at the edge of the chronic dilution zone. No additional fecal coliform monitoring is required in the proposed permit.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

The following toxic pollutants were detected in the discharge at Outfall 001: ammonia, antimony, arsenic, cadmium, copper, cyanide, iron, lead, manganese, mercury, nickel, nitrate/nitrite, phenol, selenium, silver, sulfide, thallium, and zinc. Ecology conducted a reasonable potential analysis for these parameters to determine whether it would require water quality-based effluent limits in this permit. See **Appendix G**.

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature, pH, and salinity of the receiving marine water. To evaluate ammonia toxicity, Ecology used the available receiving water information for ambient station GRG002 and Ecology spreadsheet tools.

Valid ambient background data were available for copper, lead, mercury, nickel, selenium, and zinc. Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards.

Ecology determined that the toxic pollutants detected in the discharge pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991 and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

Temperature--The state temperature standards (WAC 173-201A-210 and 612) include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)
- Incremental warming restrictions
- Protections against acute effects

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.

- Annual summer maximum and supplementary spawning/rearing criteria

Each water body has an annual maximum temperature criterion [WAC 173-201A-210(1)(c), and Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

Some waters have an additional threshold criterion to protect the spawning and incubation of salmonids (9°C for char and 13°C for salmon and trout) [WAC 173-201A-602, Table 602]. These criteria apply during specific date-windows.

The threshold criteria apply at the edge of the chronic mixing zone. Criteria for most fresh waters are expressed as the highest 7-Day average of daily maximum temperature (7-DADMax). The 7-DADMax temperature is the arithmetic average of seven consecutive measures of daily maximum temperatures. Criteria for marine waters and some fresh waters are expressed as the highest 1-Day annual maximum temperature (1-DMax).

- Incremental warming criteria

The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii), 210(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

At locations and times when a threshold criterion is being exceeded due to natural conditions, all human sources, considered cumulatively, must not warm the water more than 0.3°C above the naturally warm condition.

When Ecology has not yet completed a TMDL, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3°C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

- Protections for temperature acute effects

Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C, unless a dilution analysis indicates ambient temperatures will not exceed 33°C two seconds after discharge.

General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.

Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

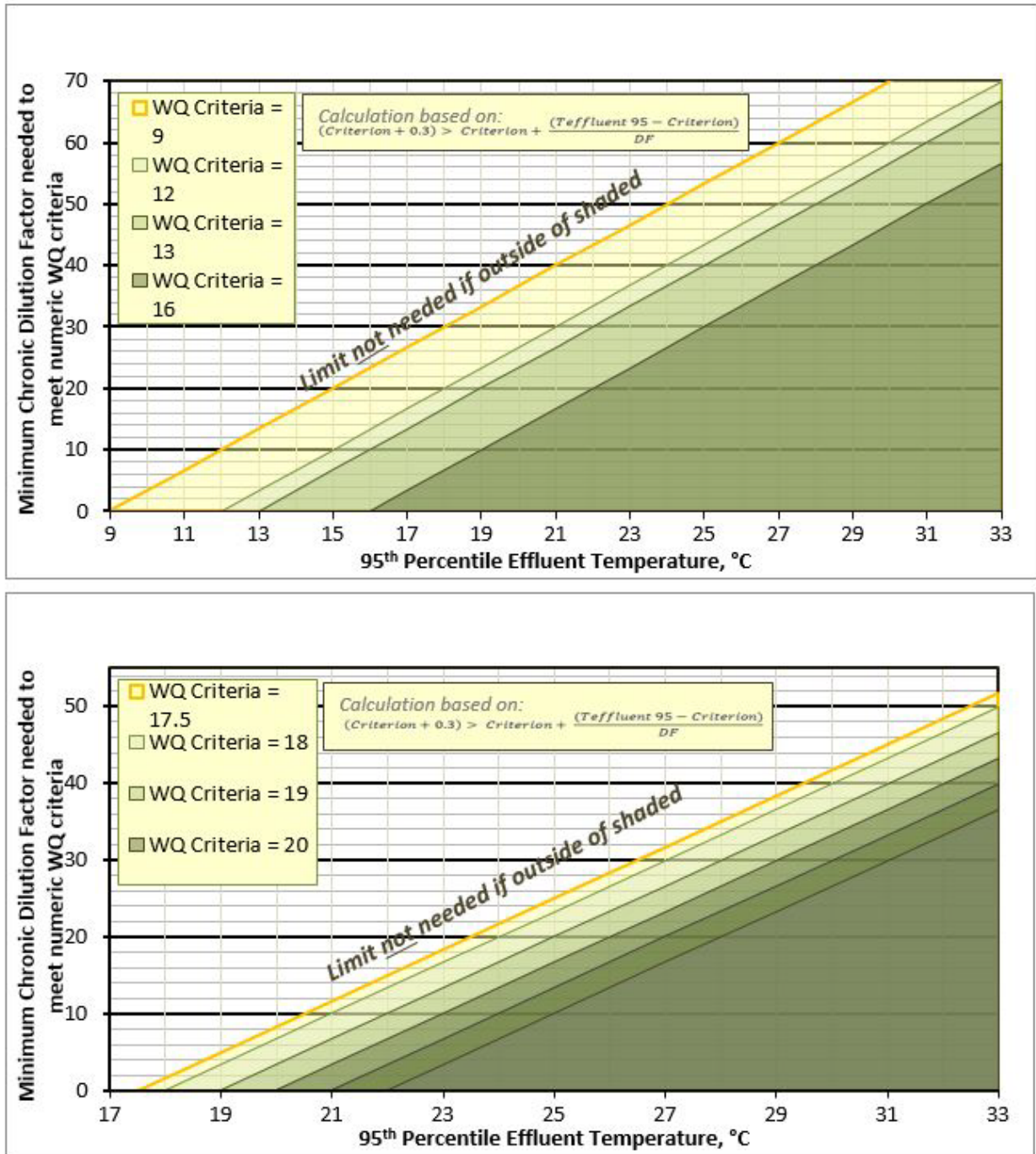
Reasonable Potential Analysis

Annual summer maximum, supplementary spawning criterion, and incremental warming criteria: Ecology calculated the reasonable potential for the discharge to exceed the annual summer maximum, the supplementary spawning criterion, and the incremental warming criteria at the edge of the chronic mixing zone during critical condition. No reasonable potential exists to exceed the temperature criterion where:

$(\text{Criterion} + 0.3) > [\text{Criterion} + (\text{Teffluent95} - \text{Criterion})/\text{DF}]$.

The figure below graphically portrays the above equation and shows the conditions when a permit limit will apply.

Figure 3. Dilution Necessary to Meet Temperature Criteria at Edge of Mixing Zone



The specific values in the equation above for Outfall 001 are $(13 + 0.3) > (13 + (30 - 13)/110) = 13.3 > 13.16$

Therefore, the proposed permit does not include a temperature limit. The permit requires continued temperature monitoring of the final effluent. Ecology will reevaluate the reasonable potential during the next permit renewal.

Stormwater Outfalls 002, 003, 004, 005, and 007

The toxic pollutants, copper and zinc, are present in the stormwater discharges at Outfalls 002, 003, 004, 005, and 007. Using the monitoring data from January 2018 through December 2019, Ecology conducted a reasonable potential analysis of these parameters for fresh water acute aquatic life water quality criteria.

Ecology determined that copper and zinc pose no reasonable potential to exceed the fresh water quality criteria, (see **Appendix H**). The proposed permit retains the stormwater benchmarks from the previous permit.

H. Human health

Washington's water quality standards include 97 numeric human health-based criteria that Ecology must consider when writing NPDES permits.

Ecology determined that the effluent at Outfall 001 may contain chemicals of concern for human health, based on data or information indicating the discharge contains regulated chemicals that Ecology knows or expects is present in the discharge.

Ecology evaluated the discharge's potential to violate the water quality standards as required by 40 CFR 122.44(d) by following the procedures published in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001) and Ecology's *Permit Writer's Manual* to make a reasonable potential determination. The evaluation showed that the discharge at Outfall 001 has no reasonable potential to cause a violation of human health-based water quality standards and effluent limits are not needed. See **Appendix G**.

Arsenic

Ecology evaluated the discharge at Outfall 001 for the potential to exceed the inorganic arsenic human health criteria. This evaluation included a review of all total recoverable arsenic data and available dilution. Ecology determined that there is a potential to exceed the arsenic human health criteria at Outfall 001. This is a conservative determination while EPA reviews the inorganic arsenic human health criteria and until an approved analytical method for inorganic arsenic can be developed.

Ecology submitted newly adopted state Human Health Water Quality Criteria to the EPA for Clean Water Act (CWA) review and approval in August 2016. Parts of that submittal to EPA were new total arsenic criteria of 10 µg/L for both marine and freshwaters. Additional requirements in the new state rule included pollutant minimization requirements for anthropogenic inputs from both direct and indirect discharges. The state's new total arsenic criteria match the EPA's Safe Drinking Water Act maximum contaminant level (MCL) used in Washington State for drinking water protection. The state's new arsenic criteria took into account existing scientific data, high concentrations of naturally occurring arsenic in the State of Washington, the arsenic criteria proposal factored in existing scientific data, and EPA's CWA approval of 10 µg/L total arsenic criteria in almost all other western states.

Ecology intended the new total arsenic criteria to supersede the inorganic arsenic human health criteria adopted for the State of Washington by the EPA in the 1992 National Toxics Rule (NTR: 40 CFR 131.36). The EPA's 1992 risk based human health criterion for marine waters is 0.14 µg/L inorganic arsenic, and is based on exposure from fish and shellfish tissue ingestion.

The freshwater criterion is 0.018 µg/L, and is based on exposure from fish and shellfish tissue and surface water ingestion. The 2016 arsenic criteria adopted by Ecology eliminated uncertainties associated with the cancer potency factor used by the EPA in the 1992 NTR arsenic standards. However, the EPA disapproved Ecology's proposed total arsenic criteria in November 2016 and retained the inorganic arsenic human health criteria set in the 1992 NTR. The EPA's Technical Support Document for the approval/disapproval of Washington's Human Health Water Quality Criteria states that the federal agency intends to conduct a toxicological review of inorganic arsenic in 2017. The work has not yet been completed. This toxicological review could lead to an opportunity for Ecology to participate in a national dialogue associated with the update of the arsenic criteria in section 304(a) of the Clean Water Act. Until the EPA inorganic arsenic review is completed, scientific information is updated, and Washington State into rule EPA CWA-approvable new total arsenic criteria, the EPA's existing marine and freshwater inorganic arsenic criteria remain in effect at 0.14 and 0.018 µg/L.

The EPA's disapproval of Washington's new total arsenic criteria continues to create several difficulties in the wastewater discharge permitting process. One issue, as mentioned, involves natural background concentrations of both marine and freshwaters that exceed the criteria. This can be particularly problematic for groundwater-sourced drinking waters with arsenic concentrations above 0.018 µg/L, which then pass through wastewater treatment plants after initial use. In this situation, no implementation tool exists to account for the naturally occurring element in the drinking water source. Intake credits do not apply in this situation because the source water and the receiving water must be the same body of water or proven to be hydraulically connected. Another issue is the lack of a 40 CFR 136-approved analytical method for inorganic arsenic that can be used for compliance assessment. Evaluation of point source discharges for effluent limit compliance must use 40 CFR 136 methods. The current 40 CFR 136-approved method for arsenic measures the total recoverable portion of the metal, and does not differentiate the inorganic portion. The lack of federally approved translators for inorganic-to-total recoverable arsenic in discharges increases the difficulty in assigning an effluent limitation for discharges to surface waters.

Attainment of Washington's inorganic arsenic criteria remains challenging if not improbable. At best, current treatment technologies may be capable of arsenic removal to approximate concentrations ranging from 0.5 - 1 µg/L. The difference between the best available treatment technology and numeric effluent limits based on the criteria creates difficulty for both existing and proposed discharges. Ecology intends to continue to pursue a solution to the regulatory issue of groundwater sources with high arsenic concentrations that would cause treatment plant effluent to exceed effluent limits based on the numeric criteria.

Where numeric effluent limits are infeasible, 40 CFR 122.44(k) provides for the use of best management practices (BMPs) to control or abate the discharge of pollutants. This provision in the federal regulations provides the basis for Ecology's permitting strategy for inorganic arsenic until the EPA revisits their criteria development procedures and develops site specific total-to-inorganic arsenic translators for individual dischargers. Components of Ecology's permitting strategy include permit requirements to monitoring for total recoverable arsenic, source control BMPs, and an adaptive management process to refine BMP implementation for continuous pollutant minimization. While numeric effluent limits based on the human health inorganic arsenic criteria remain infeasible, Washington NPDES permits will continue to contain numeric effluent limits for arsenic based on best available treatment technology and aquatic life-based criteria as appropriate.

The proposed permit requires continued monitoring for total recoverable arsenic in annual priority pollutant scans and stormwater BMPs for source control and pollutant minimization.

Dioxin

EPA traced the dioxins found in some refinery effluents to an internal waste stream from the regeneration of catalytic reformer units. To ensure efficient operation of reformer units, catalyst regeneration is performed when necessary to remove coke deposits on the catalyst. Coke deposits can significantly reduce the performance of a catalyst. Catalyst regeneration is known to produce dioxins and furans in the regeneration wash water.

BP has two catalytic reformers, identified as No. 1 and No. 2. Each reformer regenerates once every 3 to 18 months, although not necessarily at the same time. The previous permit required BP to monitor the dioxin and furan (**twice** during the permit cycle) in the regeneration wastewater stream and in the final effluent captured at the time that is most likely to contain wastewater generated during the catalytic reformer regenerated events. The analysis included chlorinated dioxins and furans (2,3,7,8-Cl substituted tetra- through octa-congeners). The permit specified the test method and the required detection level.

BP performed dioxin studies as required by the NPDES permit for the past two permit cycles. The most recent study was completed and submitted to Ecology in 2016 under the current NPDES permit. Both the study from the current permit and the study from the previous permit (submitted in 2001) required sampling of the waste streams from the refinery's catalytic reformers during catalyst regeneration events as well as sampling of the final effluent when the dioxins and furans would most likely be present. The 2001 study also included sampling of the API separator solids.

Both studies showed measurable concentrations of dioxins in the reformer catalyst regeneration waste stream, but none present in the final effluent. The 2001 study found measurable concentrations of dioxins in API separator solids. Given the hydrophobic properties of all dioxin congeners, the data suggests that the majority of the dioxins generated during the regeneration of reformer catalysts attach to the solids in the wastewater and are removed from the wastewater in the API separators. See the dioxin results in **Appendix I**.

The proposed permit requires BP to sample the final effluent at Outfall 001 for chlorinated dioxins and furans (2,3,7,8-Cl substituted tetra- through octa-congeners) during each reformer catalyst regeneration event.

I. Sediment quality

The aquatic sediment standards (Chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website. <https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Sediment-cleanups>

BP conducted a sediment study at the south pier in the fall of 2016 in accordance with the *2016 Sediment Recharacterization Sampling and Analysis Plan* approved by Ecology on August 19, 2016.

The 2017 Sediment Recharacterization Sampling Data Report showed:

- The 2016 study had two (out of six) samples that failed one of the standard bioassay tests; one exceeding the Sediment Quality Standards (SQS) criterion and the other exceeding the Sediment Impact Zone Maximum (SIZmax) criterion. Both samples had high bulk sulfide concentrations and one of the samples also had exceedances of the SQS criteria for several PAH chemicals.
- There is a strong spatial gradient under the south pier (near Outfall 001) for sulfides that exists in both the 2006 and 2016 data. The 2006 chemistry data show the same spatial pattern and gradients with a number of other pollutants, mostly PAH compounds and dibenzofuran.
- The 2006 data showed elevated concentrations of sulfide and several PAHs near the north pier. The sediment concentrations were all below regulatory criteria. No samples were collected in this area in 2016.

Ecology determined that this discharge has potential to cause a violation of the sediment quality standards. The proposed permit, Special Condition S12, requires BP to conduct sediment monitoring during the next permit cycle. To better define spatial and temporal trends near the south and north piers, the sediment monitoring will include both chemistry and bioassay analyses at all stations.

J. Groundwater quality monitoring

The groundwater quality standards (Chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100).

All of the ponds in BP's wastewater treatment system have native clay bottoms and could potentially discharge to groundwater. Based on an analysis of the water in these ponds, it has been determined that there is a potential for an impact to ground water beneath the ponds. The previous permit required BP to monitor groundwater from four monitoring wells (MW-109 upgradient, MW-110 crossgradient, MW-111 downgradient, and MW-117 downgradient). The parameters monitored include iron, arsenic, manganese, sulfate, chloride, total dissolved solids (TDS), and total petroleum hydrocarbons (TPH-Dx). The monitoring data (see **Appendix J**) for the permit cycle show that iron, manganese, sulfate, and TDS concentrations were detected in downgradient well MW-111 above the state Ground Water Quality Standards.

The impacts observed in MW-111 appear to be localized, the system is at steady state, and there are no clear trends in the data. Ecology is requiring that BP continue groundwater monitoring during the next permit term. The proposed permit requires BP to monitor the groundwater in the existing wells (MW-109 upgradient, MW-110 crossgradient, MW-111 downgradient, and MW-117 downgradient) **once** per year during the permit term.

K. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

- *Acute toxicity tests measure mortality as the significant response* to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.
- *Chronic toxicity tests measure various sublethal toxic responses*, such as reduced growth or reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know about WET testing and how to calculate an NOEC, LC50, EC50, IC25, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (<https://apps.ecology.wa.gov/publications/SummaryPages/9580.html>), which is referenced in the permit. Ecology recommends that BP send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

Acute toxicity testing conducted during the previous permit term showed the facility's effluent has a reasonable potential to cause acute toxicity in the receiving water. The acute toxicity test was performed using 100% effluent, the acute critical effluent concentration (ACEC) **3.6%**, and a control. The proposed permit will continue to include an acute toxicity limit. **The effluent limit for acute toxicity is: No acute toxicity detected in a test sample representing the acute critical effluent concentration (ACEC) of 3.6%.** The acute critical effluent concentration (ACEC) is the concentration of effluent at the boundary of the acute mixing zone during critical conditions.

Compliance with an acute toxicity limit is measured by an acute toxicity test comparing test organism survival in the ACEC (using a sample of effluent diluted to equal the ACEC) to survival in nontoxic control water. BP is in compliance with the acute toxicity limit if there is no statistically significant difference in test organism survival between the ACEC sample and the control sample.

Chronic toxicity testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water chronic toxicity. BP also retested the final effluent prior to submitting the permit renewal application in 2016. This testing showed no reasonable potential for chronic toxicity. The proposed permit does not include a chronic WET limit.

Since the last chronic WET testing was performed in 2016, BP must retest the effluent at Outfall 001 in the first year of the permit to provide updated data. BP must also retest the effluent before submitting an application for permit renewal in order to demonstrate that chronic toxicity has not increased in the effluent.

If WET testing conducted in the first year of the permit or for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased.

If WET testing in the first year of the permit shows chronic toxicity levels that have a reasonable potential to cause receiving water toxicity, then the proposed permit will:

- Set a limit on chronic toxicity.
- Require BP to conduct WET testing to monitor compliance with the chronic toxicity limit.

- Specify the procedures BP must use to come back into compliance if toxicity exceeds the limit.

If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization. BP may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing and/or chemical analyses after the process or material changes have been made. BP should check to make sure that Ecology will consider the demonstration adequate to support a decision to not require an additional effluent characterization.

See **Appendix K** for a summary of the WET tests conducted during the last permit cycle.

Cherry Point Herring

The Pacific herring, *Clupea pallasii*, stock which spawns near Cherry Point was once the largest in Washington. The stock has dramatically declined in abundance in the last 45 years and remains at critically low levels. Cherry Point herring once had a spawning biomass equal to that of all other herring stocks in the state combined. The Cherry Point stock size has declined from 13,606 tons in 1973 to only 468 tons in 2016.

Although much of the decline and lack of recovery may be due to natural factors (e.g., temperature increases, predation, disease, and a lack of food source), point and non-point sources of pollution may also be potential stressors. There was concern that pollutants in the discharges from the refineries and other industry in the Cherry Point area were contributing to the decline. Pacific herring are an important forage fish species in Puget Sound that spawn along shorelines potentially impacted by human activities. Petroleum hydrocarbons have been shown to be toxic to herring. However, there was not a definitive method to evaluate the impact of industry effluent on herring.

In response to these concerns, Ecology, academic and private entities worked together to develop and validate a suite of herring toxicity tests to evaluate the possible effects of industry effluent on herring. This effort produced methods for a 96-hour herring acute survival test, a herring embryo survival and development test, and a herring larval 7-day survival and growth test. Ecology declared the three herring tests ready for regulatory use in November 2005. However, the new tests were not approved for compliance monitoring or effluent characterization.

Once the herring protocols were developed, Ecology's goal was to compare them to EPA standard test methods to find surrogate species for each of the tests. Then the EPA tests could be included in future permits in lieu of the herring tests. Ecology wants to get away from testing with herring because the test organisms are not commercially available, they are only available seasonally, and they are difficult to obtain. This limited availability is not reliable enough for routine effluent monitoring. In addition, the herring protocols have not been approved for use in compliance testing. Ecology's hope was that in comparing the responses of herring toxicity tests to standard EPA toxicity tests might find an EPA test that was as sensitive as a herring test.

Acute Testing

In April 2006, Ecology issued a joint agreed order (Agreed Order No. 3192) to the BP Cherry Point Refinery, ConocoPhillips (Phillips 66) Ferndale Refinery, Shell Puget Sound Refinery, Tesoro Anacortes Refinery, and the Intalco Ferndale aluminum smelter requiring them to conduct herring larval acute toxicity testing.

Under the agreed order, the industries tested split samples for acute toxicity (96-hour survival) to herring, topsmelt, and fathead minnow.

Ecology concluded that the EPA standard acute survival tests for topsmelt and fathead minnow are adequately protective of Pacific herring. In the majority of the tests conducted under Agreed Order No. 3192, refinery effluent showed no toxicity to any fish, resulting in equal sensitivity between herring and the other fish species. When there was toxicity, topsmelt were more sensitive twice as often as herring and fathead minnow were always more sensitive than herring.

Chronic Testing

In October 2013, Ecology signed individual agreed orders with BP, ConocoPhillips (Phillips 66), Shell, Tesoro, and Intalco (Agreed Order Nos. 10296-10300, respectively) to conduct studies comparing the relative sensitivity of Pacific herring and standard EPA toxicity test species to the industries' effluents. The goal of the side-by-side testing was to determine if an EPA-approved WET test method would be a suitable surrogate for predicting herring toxicity. The herring tests were compared to a panel of EPA established toxicity tests (herring embryo survival and development to echinoderm (sea urchin) embryo; herring larval survival and growth to topsmelt, silverside minnow, and mysid shrimp larval).

In the situation where a herring test was shown to be more sensitive than comparable EPA tests, Ecology's intent was to define a correlation between the EPA standard tests and herring tests. The ratio of sensitivity could be used to adjust the ACEC and CCEC. Then this translator could be used in conjunction with an EPA test in future monitoring to assess the potential toxicity of an industry's effluent to herring.

Ecology concluded that the EPA echinoderm (sea urchin) embryo survival and development test is adequately protective of the Pacific herring embryo. The herring larval survival and growth test was shown to be more sensitive than the EPA tests to effluent from BP, Shell, and Tesoro. Ecology concluded that the EPA survival and growth test for mysid shrimp is adequately sensitive for protecting herring from effluent from Phillips 66 and Intalco.

Future WET Testing

The EPA topsmelt acute survival test and EPA echinoderm (sea urchin) chronic embryo test were shown to be more sensitive than the comparable herring tests. These tests are included in BP's draft NPDES permit renewal.

The EPA mysid shrimp chronic larval test was shown to be the most sensitive of the EPA-approved chronic toxicity tests in the BP chronic biomonitoring but it was not as sensitive as the herring chronic larval survival and growth test. Ecology used the results of BP's chronic side-by-side tests to calculate a modifying factor or herring translator. Ecology has determined that routine effluent monitoring can be performed by BP using the mysid chronic survival and growth test if the ACEC and CCEC are adjusted by the herring translator.

Ecology has drafted an agreed order to accompany the proposed permit that requires BP to conduct additional chronic toxicity testing using the EPA mysid survival and growth test with adjusted ACEC and CCEC comparison values. BP's NPDES permit is a compliance document. The adjusted ACEC and CCEC were calculated from test results using herring protocols that have not been approved for compliance testing. Therefore, Ecology is proposing to enter into an agreement with BP to gather additional data regarding the potential toxicity of their wastewater discharge on herring in the receiving water. Further evaluation will be needed if toxicity is shown at the adjusted critical values.

L. Comparison of proposed effluent limits with the previous permit limits

Ecology evaluated BP's monitoring results from the last permit term and determined that BP can achieve the effluent limits at Outfall 001 from the previous permit (2012). The proposed permit retains the limits for all parameter from the previous permit, except for Hexavalent Chromium. The proposed Hexavalent Chromium maximum daily limit changed from 0.05 mg/l and 2.0 lbs/day to 0.05 mg/l and 1.5 lbs/day.

Table 17 — Comparison of Previous and Proposed Effluent Limits for Outfall 001

| Parameter | Units | Previous Average Monthly Limit | Previous Maximum Daily Limit | Proposed Average Monthly Limit | Proposed Maximum Daily Limit |
|-----------------------------------|---------|--------------------------------|------------------------------|--------------------------------|------------------------------|
| Biochemical Oxygen Demand (5-day) | lbs/day | 1240 | 2260 | 1240 | 2260 |
| Chemical Oxygen Demand | lbs/day | 8540 | 16610 | 8540 | 16610 |
| Total Suspended Solids | lbs/day | 990 | 1570 | 990 | 1570 |
| Oil and Grease | lbs/day | 360 | 680 | 360 | 680 |
| Phenolic Compounds | lbs/day | 7.6 | 16.7 | 7.6 | 16.7 |
| Ammonia as N | lbs/day | 870 | 1910 | 870 | 1910 |
| Sulfide | lbs/day | 6.7 | 14.7 | 6.7 | 14.7 |

pH effluent limits of 6.0 to 9.0 SU did not change.

I. Monitoring Requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, detection level (DL), and quantitation level (QL) on the discharge monitoring report or in the required report.

A. Wastewater and stormwater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

In addition to the parameters with limits, the proposed permit requires BP to monitor the final effluent at Outfall 001 for priority pollutants to further characterize the effluent.

Ecology will use this data to determine reasonable potential for exceeding water quality standards at the next permit renewal.

The proposed permit requires BP to collect and report information in the monthly DMR about parameters that do not have limits established in the permit. BP provides data on crude feedstock rates so that Ecology can determine technical discharge limits in the next permit. BP reports ballast water flow rate and the total final effluent flow rate to calculate ballast and stormwater allocations for several parameters. BP also reports precipitation and temperature data. Ecology uses rainfall data to determine if the refinery can use the stormwater allocation. Ecology will use the temperature data to evaluate compliance with water quality standards in the receiving water.

The proposed permit also includes new monitoring for nutrients (particulate organic carbon, total organic carbon, dissolved organic carbon, ammonia as N, nitrate as N, nitrite as N, Total Kjeldahl Nitrogen filtered and unfiltered, total phosphorus filtered and unfiltered, soluble reactive phosphorus, carbonaceous biochemical oxygen demand five-day, and alkalinity) to accurately quantify the nutrients in the discharge at Outfall 001. This data will support the work of the Puget Sound Nutrient Reduction Project to evaluate dissolved oxygen impacts in the receiving water. Excess nutrients in the form of nitrogen and carbon can lead to low dissolved oxygen in Puget Sound which negatively affect aquatic life. Monitoring data is necessary to evaluate individual sources of anthropogenic nutrients for both near field and far field effects. Ecology intends to use this discharge data in both the Salish Sea Model and in future reasonable potential evaluations.

The proposed permit requires BP to monitor the stormwater discharges at Outfalls 002, 003, 004, 005, and 007 to compare to stormwater benchmarks. The monitoring includes sampling for hardness in the receiving water to help Ecology calculate the applicable water quality standards for these parameters.

Stormwater benchmarks are not water quality standards or permit limits. They are indicator values. Values at or below the benchmark are considered unlikely to cause a water quality violation.

The proposed permit also includes standard language regarding general prohibitions for stormwater associated with industrial activity and requires corrective actions in response to monitoring results above benchmark values.

Puget Sound Water Quality Management Plan

The Puget Sound Water Quality Management Plan (PSWQA Plan) of 2000 presents goals, strategies, and work elements to improve and protect the quality of Puget Sound (Puget Sound Water Quality Authority 2000).

The PSWQA Plan requires that Ecology consider the need for the following five types of monitoring when reissuing NPDES permits and include this monitoring as appropriate:

- Sediments in the vicinity of every significant outfall.
- Particulate fraction of the effluent from each significant outfall.
- Acute and chronic toxicity bioassays on the effluent and sediments near the outfall.
- Biota surveys in the vicinity of each significant outfall.
- Water quality at the boundary of the mixing zone.

Sediments in the vicinity of every significant outfall: In this case, Ecology considered Outfall 001 as the only significant outfall to Puget Sound.

See Section III.I, "Sediment Quality," for more information describing BP's most recent receiving water sediment sampling in 2016 and the proposed permit requirements.

Particulate fraction of the effluent: BP and Ecology have conducted TSS sampling of the effluent at Outfall 001. See Table 5 for TSS sample results in the effluent.

Acute and chronic toxicity of the effluent and sediments near the Outfall 001: BP performs WET testing on the effluent at Outfall 001. See Section III.K, "Whole Effluent Toxicity" for more information on BP's WET testing.

Biota surveys in the vicinity of each significant outfall: See Section III.I, "Sediment Quality," for more information describing BP's most recent receiving water sediment sampling in 2016 and the proposed permit requirements.

Water quality at the boundary of the mixing zone: BP routinely monitors the effluent at Outfall 001 for toxics pollutants. BP has conducted mixing zone modeling which was used in evaluating water quality at the boundaries of the acute and chronic mixing zones. As shown in **Appendix G**, no reasonable potential exists at the boundaries of the mixing zones for Outfall 001 for parameters monitored in BP's effluent.

Ecology believes that the effluent limits and monitoring requirements in the proposed permit are protective of the receiving water. Ecology will continue to evaluate BP's discharges as additional monitoring and information is available.

B. Monitoring reduction for exemplary performance

EPA distributed guidance in April 1996 titled "Interim Guidance For Performance-Based Reduction of NPDES Permit Monitoring Frequencies." EPA's goal was to reduce the regulatory burden associated with reporting and monitoring on the basis of excellent performance. The guidance provides a tool to evaluate a facility's performance.

Ecology may reduce monitoring frequency by examining the performance of the discharge. The amount of reduction is dependent upon the ratio of the long term effluent average to the monthly average effluent limit.

Appendix L summarizes the performance of the parameters monitored at Outfall 001 during the last permit term. The table in Appendix L compares the long term averages with the month average effluent limits from March 2012 through December 2020.

The guidance in Ecology's Permit Writer's Manual to evaluate the performance to determine if a parameter was eligible for reduced monitoring. For the parameters evaluated, BP's monitoring history has demonstrated the ability to consistently comply with regulatory limits. Ecology based the proposed monitoring frequencies on the guidance recommendations and best professional judgment.

Ecology elected to maintain the current monitoring frequencies for BOD, COD, TSS, oil and grease, and sulfide even though EPA's guidance would have allowed less frequent monitoring for these parameters. BOD, TSS, and oil and grease are good indicators of when there is an upset condition at the wastewater treatment facility. Ecology reduced the frequency of monitoring for phenolic compounds, ammonia, and hexavalent chromium.

Ecology used best professional judgment to determine a reduced monitoring frequency to reward BP's good performance but also provide enough data to monitor the health of the wastewater treatment process. BP must maintain good performance levels to continue to receive the reduced monitoring frequencies. If the facility's performance levels deteriorate, Ecology can revert the monitoring requirements to the previous levels.

C. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters). Accreditation is required to be updated every year. Ecology has accredited the laboratory at this facility for: BOD₅, COD, TSS, O&G, sulfide, phenols, ammonia, pH, and the hexane extractable method. BP uses off-site accredited laboratories to analyze samples for priority pollutants and bioassay samples.

To find an accredited laboratory, visit <https://apps.ecology.wa.gov/laboratorysearch/>.

D. Effluent limits which are near detection or quantitation levels

The water quality-based effluent concentration limits are near the limits of current analytical methods to detect or accurately quantify. The method detection level (MDL) also known as detection level (DL) is the minimum concentration of a pollutant that a laboratory can measure and report with a 99 percent confidence that its concentration is greater than zero (as determined by a specific laboratory method). The quantitation level (QL) is the level at which a laboratory can reliably report concentrations with a specified level of error. Estimated concentrations are the values between the DL and the QL. Ecology requires permitted facilities to report estimated concentrations. When reporting maximum daily effluent concentrations, Ecology requires the facility to report "less than X" where X is the required detection level if the measured effluent concentration falls below the detection level.

II. Other Permit Conditions

A. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

B. Non routine and unanticipated wastewater

Occasionally, BP may generate wastewater which was not characterized in the permit application because it is not a routine discharge and was not anticipated at the time of application. These wastes typically consist of waters used to pressure-test petroleum storage tanks or fire water systems and leaks from drinking water systems.

When BP reconditions petroleum storage tanks, it thoroughly cleans and inspects them. The final step in the inspection is the hydrotest, which consists of filling the tank with clean water and monitoring the water level in the tank over time to see if any leakage has occurred.

Discharging the hydrotest water to the wastewater treatment system can reduce the efficiency of the treatment since the clean water dilutes the process water. BP sends hydrotest water to the Stormwater Pond via the Clean Water Sewer. The transfer rate to the WWTP is managed by controlled release to the API separators.

BP also regularly tests its fire water system.

BP may request to discharge this wastewater through stormwater outfalls, such as when its wastewater system is experiencing heavy hydraulic loadings or when local wildlife managers request water to keep local streams or ponds viable for habitat during very dry summer conditions.

The permit authorizes the discharge of non-routine and unanticipated wastewater under certain conditions. BP must characterize these wastewaters for pollutants and examine the opportunities for reuse. Depending on the nature and extent of pollutants in this wastewater and on any opportunities for reuse, Ecology may:

- Authorize the facility to discharge the wastewater.
- Require the facility to treat the wastewater.
- Require the facility to reuse the wastewater.

C. Wastewater treatment efficiency study and updated engineering plan

The proposed permit requires BP to repeat the wastewater treatment efficiency study completed in 2001. The study requires BP to collect influent and effluent samples from several points within the wastewater treatment system to determine treatment and removal efficiencies. BP must use the data from the new study to update the predicted design capacities and effluent characteristics at design flows in the engineering plan D.

D. Mixing zone study

Ecology estimated the amount of mixing of the discharge with receiving water and the potential for the mixture to violate the water quality standards for surface waters at the edge of the mixing zone (chapter 173-201A WAC). BP conducted the last mixing zone study in 2008. The proposed permit requires BP to more accurately determine the mixing characteristics of the discharge. The effluent mixing study must measure or model the characteristics of the discharge under conditions specified in the permit to assess whether the receiving water quality is protected outside the mixing zone boundary.

E. Operation and maintenance manual

Ecology requires industries to take all reasonable steps to properly operate and maintain their wastewater treatment system in accordance with state and federal regulations [40 CFR 122.41(e) and WAC 173-220-150 (1)(g)]. BP has prepared and submitted an operation and maintenance manual as required by state regulation for the construction of wastewater treatment facilities (WAC 173-240-150). Implementation of the procedures in the operation and maintenance manual ensures the facility's compliance with the limits and conditions in the permit.

F. Outfall evaluation

BP conducted the final effluent Outfall 001 evaluation on August 25, 2016. The purpose of the evaluation was to determine the condition of the discharge pipe and diffusers and to document its integrity and continued function. BP reported that the outfall structure is performing as designed.

The proposed permit requires BP to conduct an outfall inspection and submit a report detailing the findings of that inspection (Special Condition S13). The inspection must evaluate the physical condition of the discharge pipe and diffusers and evaluate the extent of sediment accumulation in the vicinity of the outfall.

G. Pollution Prevention Plan

The previous permit required BP to submit and follow a NPDES Pollution Prevention Plan (PPP) to identify opportunities to prevent, reduce, eliminate, or control releases of pollutants to influent wastewater streams, stormwater, and other waters of the state. The previous permit required BP to implement pollution prevention opportunities that were technically and economically feasible. The PPP incorporates previous NPDES permit requirements for a spill plan, solid waste handling and disposal plan, and a stormwater pollution prevention plan.

The refinery stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. Ecology can require a facility to develop and follow best management practices to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080]. BP's PPP includes BMPs for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs.

BP could cause pollution of the waters of the state through inappropriate disposal of solid waste or through the release of leachate from solid waste. The proposed permit requires the refinery to update the BMPs in the PPP to prevent solid waste from causing pollution of waters of the state.

The following are projects completed by BP during the last permit cycle that had a positive impact on wastewater treatment plant operations and provide protection to the receiving waters:

- Isomerization unit
- Ultra low sulfur diesel unit
- Railcar unloading station
- Coker heater upgrade
- Tallow fat/used cooking oil

The proposed permit includes a pollution prevention requirement to follow-up on the work done by the refinery in the previous permit cycle. It includes a requirement to:

- Continue to follow and update BMPs, SOPs, and other work practices to prevent or minimize the release of pollutants to the wastewater treatment system, stormwater, and waters of the state.
- Submit an update to the current PPP.
- Submit a biennial evaluation of the PPP.
- Conduct stormwater inspections to ensure the adequacy of BMPs and to identify any unknown improper discharges to stormwater.

- Continue to identify and evaluate pollution prevention opportunities in all decisions having environmental consequences.

Stormwater Pollution Prevention

Ecology has determined that BP must update their PPP and implement adequate BMPs in order to meet the requirements of AKART for stormwater discharges. BP must identify potential sources of stormwater contamination from industrial activities in the PPP and identify how it plans to manage those sources of contamination to prevent or minimize contamination of stormwater. BP must continuously review and revise the PPP as necessary to assure that stormwater discharges do not degrade water quality.

Best Management Practices (BMPs)

BMPs are the actions identified in BP's PPP to manage, prevent contamination of, and treat stormwater. BMPs include schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs also include treatment systems, operating procedures, and practices used to control plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage. BP must ensure that its PPP includes the operational and structural source control BMPs listed as "applicable" in Ecology's stormwater management manuals. Many of these "applicable" BMPs are sector-specific or activity-specific, and are not required at facilities engaged in other industrial sectors or activities.

Ecology-Approved Stormwater Management Manuals

Consistent with RCW 90.48.555 (5) and (6), the proposed permit requires the facility to implement BMPs contained in the *Stormwater Management Manual for Western Washington (SWMMWW, 2012 edition as amended in July 2019)*, or any revisions thereof, or practices that are demonstrably equivalent to practices contained in stormwater technical manuals approved by Ecology. The manual can be found at <https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Stormwater-manuals>.

This should ensure that BMPs will prevent violations of state water quality standards, and satisfy the state AKART requirements and the federal technology-based treatment requirements under 40 CFR part 125.3. BP's PPP must document that the BMPs selected provide an equivalent level of pollution prevention, compared to the applicable stormwater management manual, including the technical basis for the selection for all stormwater BMPs (scientific, technical studies, and/or modeling) which support the performance claims for the BMPs selected and an assessment of how the BMPs will satisfy AKART requirements and the applicable technology-based treatment requirements under 40 CFR part 125.3.

Operational Source Control BMPs

Operational source control BMPs include a schedule of activities, prohibition of practices, maintenance procedures, employee training, good housekeeping, and other managerial practices to prevent or reduce the pollution of waters of the state. These activities do not require construction of pollution control devices but are very important components of successful stormwater pollution prevention. Employee training, for instance, is critical to achieving timely and consistent spill response.

Pollution prevention is likely to fail if the employees do not understand the importance and objectives of BMPs. Prohibitions might include eliminating outdoor repair work on equipment and certainly would include the elimination of intentional draining of crankcase oil on the ground. Good housekeeping and maintenance schedules help prevent incidents that could result in the release of pollutants. Operational BMPs represent a cost-effective way to control pollutants and protect the environment. The BP's PPP must identify all the operational BMPs and how and where they are implemented. For example, the PPP must identify what training will consist of, when training will take place, and who is responsible to assure that employee training happens.

Structural Source Control BMPs

Structural source control BMPs include physical, structural, or mechanical devices or facilities intended to prevent pollutants from entering stormwater. Examples of source control BMPs include erosion control practices, maintenance of stormwater facilities (e.g., cleaning out sediment traps), construction of roofs over storage and working areas, and direction of equipment wash water and similar discharges to the sanitary sewer or a dead end sump. Structural source control BMPs likely include a capital investment but are cost effective compared to cleaning up pollutants after they have entered stormwater.

Treatment BMPs

Operational and structural source control BMPs are designed to prevent pollutants from entering stormwater. However, even with an aggressive and successful program, stormwater may still require treatment to achieve compliance with water quality standards. Treatment BMPs remove pollutants from stormwater. Examples of treatment BMPs are detention ponds, oil/water separators, biofiltration, and constructed wetlands.

Volume/Flow Control BMPs

Ecology recognizes the need to include specific BMP requirements for stormwater runoff quantity control to protect beneficial water uses, including fish habitat.

New facilities and existing facilities undergoing redevelopment must implement the requirements for peak runoff rate and volume control identified by Volume 1 of the *SWMMWW* as applicable to their development. Chapter 3 of Volume 3 of the *SWMMWW* lists BMPs to accomplish rate and volume control. Existing facilities in western Washington should also review the requirements of Volume 1 (Minimum Technical Requirements) and Chapter 3 of Volume 3 in the *SWMMWW*. Although not required to implement these BMPs, controlling rate and volume of stormwater discharge maintains the health of the watershed. Existing facilities should identify control measures that they can implement over time to reduce the impact of uncontrolled release of stormwater.

H. Construction Stormwater

The proposed permit authorizes the discharge of stormwater associated with construction activity and construction support activity from Outfalls 002, 003, 004, 005, and 007 subject to a number of requirements and limitations. Construction activity refers to the clearing, grading, excavation, and other land disturbing activities which result in the disturbance of one or more acres. Construction support activity includes equipment staging yards, material storage areas, borrow areas, etc.

The permit states that stormwater discharges must comply with water quality standards. Ecology presumes that discharges are in compliance with water quality standards if the Permittee is in compliance with permit conditions, unless site-specific information shows otherwise.

The proposed permit establishes a narrative technology-based effluent limitation of AKART for construction stormwater. AKART specifically includes the preparation and implementation of an adequate Construction Stormwater Pollution Prevention Plan (CSWPPP) with all appropriate BMPs installed and maintained in accordance with the CSWPPP and the terms and conditions of the permit.

The permit includes an enforceable adaptive management approach for construction stormwater that includes benchmarks. A turbidity benchmark is included in the permit because it is an effective management tool for highly variable stormwater discharges. A benchmark is not a water quality standard or a numeric effluent limit. It is an indicator value used to determine the effectiveness of BMPs onsite. Meeting the benchmark established in the proposed permit in no way precludes the requirement for discharges to be in compliance with applicable permit conditions and water quality standards. If the benchmark is exceeded, the Permittee is required to take appropriate actions to identify and correct the problems causing the exceedance.

The proposed permit also includes monitoring and reporting requirements.

I. Dangerous Wastes – Permit by Rule Requirements

The proposed permit authorizes BP to treat dangerous wastes, generated on or off-site, at the wastewater treatment facility under the permit by rule provisions of Chapter WAC 173-303-802(5). This authorization is limited to the onsite and off-site waste streams identified on the permit application and application amendments as approved by Ecology.

Wastes received from off-site include ballast water and retail distribution water. Ecology determined that the waste streams from off-site are similar in nature to those generated on-site and concluded that BP's wastewater treatment facility should effectively treat them.

Effluent sampling and monitoring requirements established in the permit should adequately address the pollutants in the waste stream. Permit-by-rule provisions cover the identified waste streams as long as BP complies with the conditions of the NPDES permit and with the following dangerous waste requirements in WAC 173-303, as required by WAC 173-303-802(5)(a), pertaining to:

- Notification and identification numbers
- Designation of dangerous wastes
- Performance standards
- General waste analysis
- Security
- Contingency plans and emergency procedures
- Emergencies
- Manifest system
- Operating record
- Facility reporting

J. Per- and Polyfluoroalkyl Substances (PFAS) Study

PFAS are a large group of perfluoroalkyl and polyfluoroalkyl substances. They are manufactured chemicals that are persistent in the environment and some PFAS are bioaccumulative. In the past, BP never used a type of firefighting foam (aqueous film-forming foam or AFFF) that contained PFAS in their fire training area but only used it for real responses. The foam would have drained to the refinery's oily water sewer and potentially been discharged in the final effluent.

EPA recently developed SW-846 Method 8327 for measuring 24 PFAS substances in groundwater, surface water, and wastewater samples. While this method is not included under 40 CFR Part 136, EPA has stated that Method 8327 can be used in NPDES permits for monitoring when quality control operations and associated acceptance criteria are used (EPA FAQ about PFAS Methods for NPDES Permits). Work is still being done to develop additional methods for wastewater as well as for measuring PFAS in soils and sediment. Laboratories will need to be accredited to run these new tests. In addition, while Washington's Department of Health has proposed rules for some PFAS in drinking water, there are currently no state or federal regulatory standards to determine whether detected PFAS concentrations pose a health risk. There are also no state or federal standards for PFAS in surface or fresh water at this time. Ecology expects that additional clarity regarding analytical methods, applicable standards, and cleanup guidance will be available in the future.

The proposed permit requires BP to submit a PFAS Sampling and Analysis Plan to Ecology for review and approval within one year of the permit effective date and to begin monitoring a year later. As stated in the permit, this requirement is being included in this permit to begin characterizing the wastewater for the potential presence of PFAS. This information will be used to inform monitoring or other requirements in future permit renewals.

K. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual industrial NPDES permits issued by Ecology.

III. Permit Issuance Procedures

A. Permit modifications

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for groundwaters, after obtaining new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

B. Proposed permit issuance

This proposed permit includes all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of 5 years.

IV. References For Text And Appendices

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.
1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.
1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.
1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.
1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C.

Tsivoglou, E.C., and J.R. Wallace.

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

- January 2015. *Permit Writer's Manual*. Publication Number 92-109
(<https://apps.ecology.wa.gov/publications/SummaryPages/92109.html>)
- September 2011. *Water Quality Program Guidance Manual – Supplemental Guidance on Implementing Tier II Antidegradation*. Publication Number 11-10-073
(<https://apps.ecology.wa.gov/publications/summarypages/1110073.html>)
- October 2010 (revised). *Water Quality Program Guidance Manual – Procedures to Implement the State's Temperature Standards through NPDES Permits*. Publication Number 06-10-100
(<https://apps.ecology.wa.gov/publications/summarypages/0610100.html>)
- Laws and Regulations(<https://ecology.wa.gov/Footer/rulemaking>)
- Permit and Wastewater Related Information (<https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-quality-permits>)
- February 2007. *Focus Sheet on Solid Waste Control Plan, Developing a Solid Waste Control Plan for Industrial Wastewater Discharge Permittees*, Publication Number 07-10-024
(<https://apps.ecology.wa.gov/publications/summarypages/0710024.html>)
- Wright, R.M., and A.J. McDonnell. 1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

Appendix A--Public Involvement Information

Ecology proposes to reissue a permit to BP Cherry Point Refinery. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology will place a Public Notice of Draft on November 4, 2021 in the Blaine Northern Light to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft Permit and Fact Sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Urges people to submit their comments, in writing, before the end of the Comment Period
- Tells how to request a public hearing of comments about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document titled *Frequently Asked Questions about Effective Public Commenting* which is available on our website at <https://apps.ecology.wa.gov/publications/SummaryPages/0307023.html>.

You may obtain further information from Ecology by telephone, Liem Nguyen at 360-790-4730, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Industrial Section
P.O. Box 47600
Olympia, WA 98504-7600

The primary author of this permit and fact sheet is Liem Nguyen.

Appendix B--Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt. The appeal process is governed by RCW 43.21B and WAC 371-08. "Date of receipt" is defined in RCW 43.21B.001(2). More information is available at www.eluho.wa.gov.

To appeal you must do all of the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see filing options below). "Filing" means actual receipt by the PCHB during regular business hours as defined in WAC 371-08-305 and -335. "Notice of appeal" is defined in WAC 371-08-340.
- Serve a copy of your notice of appeal and this permit on the Department of Ecology, in paper form, by mail or in person (see addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in RCW 43.21B and WAC 371-08.

Filing an appeal with the PCHB

For the most current information regarding filing with the PCHB, visit: eluho.wa.gov/content/11

Filing by mail

Mailing Address:

Pollution Control Hearings Board
PO Box 40903
Olympia, WA 98504-0903

Filing electronically

Email address:

Filing in person (or by certified mail/courier)

Street Address:

Pollution Control Hearings Board
1111 Israel RD SW
STE 301
Tumwater, WA 98501

pchb-shbappeals@eluho.wa.gov

Serving a copy of the appeal on Ecology

Electronic copies of appeals are not accepted at the Department of Ecology per WAC 371-08-305(10).

Filing by mail

Mailing Address:

Department of Ecology
Attn: Appeals Processing Desk
PO Box 47608
Olympia, WA 98504-7608

Filing in person (or by certified mail/courier)

Street Address:

Department of Ecology
Attn: Appeals Processing Desk
300 Desmond Drive SE
Lacey, WA 98503

Appendix C--Glossary

1-DMax or 1-day maximum temperature -- The highest water temperature reached on any given day.

This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or 7-day average of the daily maximum temperatures -- The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute toxicity -- The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance -- An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

Ambient water quality -- The existing environmental condition of the water in a receiving water body.

Ammonia -- Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual average design flow (AADF) -- average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly (intermittent) discharge limit -- The average of the measured values obtained over a calendar month's time taking into account zero discharge days.

Average monthly discharge limit -- The average of the measured values obtained over a calendar month's time.

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state.

BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD₅ is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass -- The intentional diversion of waste streams from any portion of a treatment facility.

Categorical pretreatment standards -- National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Chlorine -- A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic toxicity -- The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean water act (CWA) -- The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance inspection-without sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance inspection-with sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite sample -- A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction activity -- Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous monitoring -- Uninterrupted, unless otherwise noted in the permit.

Critical condition -- The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment.

This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Date of receipt – This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Detection limit -- The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Dilution factor (DF) -- A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Distribution uniformity -- The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit -- The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

Engineering report -- A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal coliform bacteria -- Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab sample -- A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Groundwater -- Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Industrial user -- A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater.

These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated stormwater and, also, leachate from solid waste facilities.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local limits -- Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Major facility -- A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum daily discharge limit -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum day design flow (MDDF) -- The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) -- The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) -- The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection level (MDL) -- See Detection Limit.

Minor facility -- A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing zone -- An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations (Chapter 173-201A WAC).

National pollutant discharge elimination system (NPDES) -- The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States.

Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH-- The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Pass-through-- A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

Peak hour design flow (PHDF) -- The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

Point of compliance -- The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Potential significant industrial user (PSIU) -- A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

- a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;
- b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) -- The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to $(1, 2, \text{ or } 5) \times 10^n$, where n is an integer. (64 FR 30417).

ALSO GIVEN AS:

The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

Reasonable potential -- A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding \$25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Sample Maximum -- No sample may exceed this value.

Significant industrial user (SIU) --

- 1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;
- 2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug discharge -- Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3, or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD₅ -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD₅ test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD₅ test is sufficient to remove the particulate organic fraction.

State waters -- Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based effluent limit -- A permit limit based on the ability of a treatment method to reduce the pollutant.

Total coliform bacteria--A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

Total dissolved solids--That portion of total solids in water or wastewater that passes through a specific filter.

Total maximum daily load (TMDL) --A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

Total suspended solids (TSS) -- Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset -- An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water quality-based effluent limit -- A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

Appendix D--Technical Calculations

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the PermitCalc workbook on Ecology's webpage at: <https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance>.

Simple Mixing:

Ecology uses simple mixing calculations to assess the impacts of certain conservative pollutants, such as the expected increase in fecal coliform bacteria at the edge of the chronic mixing zone boundary. Simple mixing uses a mass balance approach to proportionally distribute a pollutant load from a discharge into the authorized mixing zone. The approach assumes no decay or generation of the pollutant of concern within the mixing zone. The predicted concentration at the edge of a mixing zone (C_{mz}) is based on the following calculation:

$$C_{mz} = Ca + \frac{(Ce - Ca)}{DF}$$

where: Ce = Effluent Concentration
Ca = Ambient Concentration
DF = Dilution Factor

Reasonable Potential Analysis:

The spreadsheets Input 2 – Reasonable Potential, and LimitCalc in Ecology's PermitCalc Workbook determine reasonable potential (to violate the aquatic life and human health water quality standards) and calculate effluent limits. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets are taken directly from the *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).

Calculation of Water Quality-Based Effluent Limits:

Water quality-based effluent limits are calculated by the two-value wasteload allocation process as described on page 100 of the TSD (EPA, 1991) and shown below.

1. Calculate the acute wasteload allocation WLA_a by multiplying the acute criteria by the acute dilution factor and subtracting the background factor. Calculate the chronic wasteload allocation (WLA_c) by multiplying the chronic criteria by the chronic dilution factor and subtracting the background factor.

$$WLA_a = (\text{acute criteria} \times DF_a) - [(\text{background conc.} \times (DF_a - 1))]$$

$$WLA_c = (\text{chronic criteria} \times DF_c) - [(\text{background conc.} \times (DF_c - 1))]$$

where: DF_a = Acute Dilution Factor

DF_c = Chronic Dilution Factor

2. Calculate the long term averages (LTA_a and LTA_c) which will comply with the wasteload allocations WLA_a and WLA_c .

$$LTA_a = WLA_a \times e^{[0.5\sigma^2 - z\sigma]}$$

where: $\sigma^2 = \ln[CV^2 + 1]$

$$z = 2.326$$

CV = coefficient of variation = std.
dev/mean

$$LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$$

where: $\sigma^2 = \ln[(CV^2 \div 4) + 1]$

$$z = 2.326$$

3. Use the smallest LTA of the LTA_a or LTA_c to calculate the maximum daily effluent limit and the monthly average effluent limit.

MDL = Maximum Daily Limit

$$MDL = LTA \times e^{(z\sigma - 0.5\sigma^2)}$$

where: $\sigma^2 = \ln[CV^2 + 1]$

$$z = 2.326 \text{ (99th percentile occurrence)}$$

LTA = Limiting long term average

AML = Average Monthly Limit

$$AML = LTA \times e^{(z\sigma_n - 0.5\sigma_n^2)}$$

where $\sigma^2 = \ln[(CV^2 \div n) + 1]$

e: n = number of samples/month

$$z = 1.645 \text{ (95th \% occurrence probability)}$$

LTA = Limiting long term average

Appendix E--Technology-Based Effluent Limit Calculations

| Process | Process Rate (1000 bbls/day) | Capacity Relative to Throughput | Weighting Factor | Process Configuration | | | | |
|--|----------------------------------|---------------------------------|------------------|-----------------------|------------------------|----------|--|--|
| BASELINE: | | | | | | | | |
| Crude: | | | | | | | | |
| Desalting | 106 | 1.00 | | | | | | |
| Atmospheric Distillation | 106 | 1.00 | | | | | | |
| Vacuum Distillation | 55 | 0.52 | | | | | | |
| Total Crude: | 267 | 2.52 | 1 | 2.52 | | | | |
| Total Cracking: | 35 | 0.33 | 6 | 1.98 | | | | |
| Total Coking: | 29 | 0.27 | 6 | 1.64 | | | | |
| Total Process Configuration: | | | | 6.14 | | | | |
| NEW SOURCE PERFORMANCE STANDARDS: | | | | | | | | |
| CURRENT PRODUCTION | | | | | | | | |
| Crude: | | | | | | | | |
| Desalting | 235 | 1.00 | | | | | | |
| Atmospheric Distillation | 235 | 1.00 | | | | | | |
| Vacuum Distillation | 122 | 0.52 | | | | | | |
| Total Crude: | 592 | 2.52 | 1 | 2.52 | | | | |
| Total Cracking: | 62.5 | 0.27 | 6 | 1.60 | | | | |
| Total Coking: | 55.4 | 0.24 | 6 | 1.41 | | | | |
| Total Process Configuration: | | | | 5.53 | | | | |
| The process rate information can be found tabulated in the fact sheet in the technology based limits section. | | | | | | | | |
| A comprehensive example of the above calculation can be found in 40 CFR Chapter 419.42(b)(3). | | | | | | | | |
| A process configuration of 5.5 - 5.99 results in a process factor of 1.00 in 40 CFR 419.22(B)(2) | | | | | | | | |
| Size factor is determined from the amount of feedstock per day. 150,000 bbls/day or greater results in a size factor of 1.41 in 40 CFR 419.22(b)(1) . | | | | | | | | |
| Baseline Process Factor = 1.09 (baseline production = 106,000 bbls/day) | | | | | (as per 419.22 (b)(2)) | | | |
| Current Process Factor = 1.00 (current production 235,000 bbls/day) | | | | | (as per 419.22 (b)(2)) | | | |
| Baseline Size Factor = | 1.23 | Baseline Condition = | 106,000 | bbls/day | [as per 419.22(b)(1)] | | | |
| Current Size Factor = | 1.41 | Current Condition = | 235,000 | bbls/day | [as per 419.22(b)(1)] | | | |
| Adjusted Production = Production *(Process factor)*(Size factor) | | | | | | | | |
| Adjusted Baseline Production = | 106,000 bbls/day * 1.09 * 1.23 = | | 142,114 | bbls/day | | | | |
| Adjusted Current Production = | 235,000 bbls/day * 1.00 * 1.41 = | | 331,350 | bbls/day | | | | |
| New Source Performance Standard Increment = Adjusted Current Production - Adjusted Baseline Production = | | | | | 189,236 | bbls/day | | |
| Technology based limits are based on the adjusted production levels, with the exception of BAT limits for phenols and chromium. | | | | | | | | |

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| | BAT LIMITS | | BASELINE PERMIT | | BPT LIMITS | | BASELINE PERMIT | | NSPS LIMITS | | NSPS INCREMENT | | TOTAL LIMIT | | TOTAL LIMIT | |
|---|-------------|------------|-----------------|------------|--|------------|--|--|-------------|------------|----------------|------------|-------------|------------|-------------|------------|
| | LBS/1000BBS | | LBS/DAY | | LBS/1000BBS | | LBS/DAY | | LBS/1000BBS | | LBS/DAY | | BPT BASIS | | BAT BASIS | |
| | MAX DAY | 30 DAY AVE | MAX DAY | 30 DAY AVE | MAX DAY | 30 DAY AVE | MAX DAY | 30 DAY AVE | MAX DAY | 30 DAY AVE | MAX DAY | 30 DAY AVE | MAX DAY | 30 DAY AVE | MAX DAY | 30 DAY AVE |
| BOD | | | | | 9.9 | 5.5 | 1407 | 782 | 5.8 | 3.1 | 1097 | 587 | 2504 | 1368 | | |
| TSS | | | | | 6.9 | 4.4 | 981 | 625 | 4 | 2.5 | 757 | 473 | 1737 | 1098 | | |
| COD | 74 | 38.4 | 10516 | 5457 | 74 | 38.4 | 10516 | 5457 | 41.5 | 21 | 7852 | 3973 | 18368 | 9430 | 18368 | 9430 |
| OIL & GREASE | | | 0 | | 3 | 1.6 | 426 | 227 | 1.7 | 0.93 | 322 | 176 | 748 | 403 | | |
| AMMONIA AS N | 6.6 | 3 | 938 | 426 | 6.6 | 3 | 938 | 426 | 6.6 | 3 | 1249 | 568 | 2187 | 994 | 2187 | 994 |
| SULFIDE | 0.065 | 0.029 | 9 | 4 | 0.065 | 0.029 | 9.24 | 4.12 | 0.037 | 0.017 | 7.00 | 3.22 | 16.2 | 7.3 | 16.24 | 7.34 |
| PHENOLIC CMPDS | | | | | 0.074 | 0.036 | 10.52 | 5.12 | 0.042 | 0.02 | 7.95 | 3.78 | 18.5 | 8.9 | 26.56 | 8.29 |
| CRUDE | 0.013 | 0.003 | 3.47 | 0.80 | | | | | | | | | | | | |
| CRACKING | 0.147 | 0.036 | 11.32 | 2.77 | | | | | | | | | | | | |
| REFORMING | 0.132 | 0.032 | 3.83 | 0.93 | | | | | | | | | | | | |
| TOTAL CHROMIUM | | | | | 0.15 | 0.088 | 21.32 | 12.51 | 0.084 | 0.049 | 15.89 | 9.27 | 37.21 | 21.78 | 31.10 | 14.57 |
| CRUDE | 0.011 | 0.004 | 2.94 | 1.07 | | | | | | | | | | | | |
| CRACKING | 0.119 | 0.041 | 9.16 | 3.16 | | | | | | | | | | | | |
| REFORMING | 0.107 | 0.037 | 3.10 | 1.07 | | | | | | | | | | | | |
| HEX CHROMIUM | | | | | 0.012 | 0.0056 | 1.71 | 0.80 | 0.0072 | 0.0032 | 1.36 | 0.61 | 3.07 | 1.40 | 2.33 | 1.04 |
| CRUDE | 0.0007 | 0.0003 | 0.19 | 0.08 | | | | | | | | | | | | |
| CRACKING | 0.0076 | 0.0034 | 0.59 | 0.26 | | | | | | | | | | | | |
| REFORMING | 0.0069 | 0.0031 | 0.20 | 0.09 | | | | | | | | | | | | |
| NOTES: | | | | | | | | | | | | | | | | |
| ADJUSTED BASELINE PRODUCTION IN 1000 BBSL/DAY | | | | | 142.1 (See Process Factor Determination) | | | | | | | | | | | |
| NSPS INCREMENT IN 1000 BBSL/DAY | | | | | 189.2 (See Process Factor Determination) | | | | | | | | | | | |
| For BAT Limitations: | | | | | | | | For BAT limitations Calculations: | | | | | | | | |
| BASELINE (1984) CRUDE IN 1000 BBSL/DAY | | | | | 267 | | Crude processes include desalting, atmospheric distillation, and vacuum distillation. (106 + 106 + 55 = 267) | | | | | | | | | |
| BASELINE (1984) CRACKING IN 1000 BBSL/DAY | | | | | 77 | | Cracking processes include hydrocracking, delayed coking and hydrotreating (35 + 29 + 13 = 77). | | | | | | | | | |
| BASELINE (1984) REFORMING IN 1000 BBSL/DAY | | | | | 29 | | Reforming processes include catalytic reforming. | | | | | | | | | |

Appendix F--Dry Weather Flow Rate Calculation

(Data from January 2012 – December 2020)

| Monthly Correlation Check (expecting high to low) | | |
|---|---------------------------------------|---|
| Correlation (R2) | Basis | |
| 0.696 | Monthly Precipitation vs Average Flow | |
| 0.000 | Monthly Production vs Average Flow | |
| 0.006 | Monthly Precipitation vs Production | |
| | | |
| | | |
| Correlation (R2) | Dry Weather Flow (MGD) | Basis |
| 0.264 | 3.40 | Daily average flow and 10-day daily precip total, linear regression, flow at zero precip |
| 0.599 | 3.48 | 10-day daily average flow and 10-day daily precip total, linear regression, flow at zero precip |
| 0.696 | 3.46 | Monthly average flow and monthly precip total, linear regression, flow at zero precip |
| - | 3.55 | Average flow (not using 10-day daily average) of days with no precip for 10 days on 10-day daily precip total |
| - | 3.63 | Average of June - September daily average flows |
| - | 3.66 | Average of June - September monthly average flows |
| - | 3.45 | Average of linear regression method |
| - | 3.61 | Average of average flow method |
| - | 3.53 | Average of both methods |

Appendix G--Reasonable Potential Analysis for Outfall 001

| Reasonable Potential Calculation | | | | | | | | | | | | | | | |
|---|--|--|---------------------------------|--------------------------------|---|---------------------------------------|-------------------|--------------|---|-------------------|--------------------|---|-------|------|-----|
| Facility | | BP Cherry Point Refinery | | | | | | | | | | | | | |
| Water Body Type | | Marine | | | | | | | | | | | | | |
| | | | | | | | | | | | Dilution Factors: | | | | |
| | | | | | | | | | | | Acute | Chronic | | | |
| | | | | | | | | | | | 28.0 | 110.0 | | | |
| | | | | | | | | | | | 136.0 | 136.0 | | | |
| | | | | | | | | | | | 136.0 | 136.0 | | | |
| Pollutant, CAS No. & NPDES Application Ref. No. | | AMMONIA, Criteria as Total NH3 | ANTIMONY (INORGANIC) 7440360 1M | ARSENIC (dissolved) 7440382 2M | CADMIUM - 7440439 4M Hardness dependent | COPPER - 744058 6M Hardness dependent | CYANIDE 57125 14M | IRON 7439896 | LEAD - 7439921 7M Dependent on hardness | MANGANESE 7439965 | MERCURY 7439976 8M | NICKEL - 7440020 9M - Dependent on hardness | | | |
| Effluent Data | | # of Samples (n) | 1094 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | |
| | | Coeff of Variation (Cv) | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | | | |
| | | Effluent Concentration, ug/L (Max. or 95th Percentile) | 5,900 | 1.1 | 57.2 | 0.125 | 12.6 | 20 | 320 | 1.2 | 374 | 0.02 | | | |
| | | Calculated 50th percentile Effluent Conc. (when n>10) | | | | | | | | | | | | | |
| Receiving Water Data | | 90th Percentile Conc., ug/L | | | | | | | | | | | | | |
| | | Geo Mean, ug/L | | | | | | | | | | | | | |
| Water Quality Criteria | | Aquatic Life Criteria, ug/L | Acute | 5,207 | - | 69 | 42 | 4.8 | 9.1 | - | 210 | - | 1.8 | 74 | |
| | | | Chronic | 782 | - | 36 | 9.3 | 3.1 | 2.8 | - | 8.1 | - | 0.025 | 8.2 | |
| | | WQ Criteria for Protection of Human Health, ug/L | | - | 180 | - | - | - | - | 270 | - | - | 100 | 0.15 | 190 |
| | | Metal Criteria | Acute | - | - | 1 | 0.994 | 0.83 | - | - | 0.951 | - | 0.85 | 0.99 | |
| | | Translator, decimal | Chronic | - | - | - | 0.994 | 0.83 | - | - | 0.951 | - | - | 0.99 | |
| | | Carcinogen? | N | N | Y | N | N | N | N | N | N | N | | | |
| Aquatic Life Reasonable Potential | | | | | | | | | | | | | | | |
| Effluent percentile value | | 0.950 | 0.950 | 0.950 | 0.950 | 0.950 | 0.950 | 0.950 | 0.950 | 0.950 | 0.950 | 0.950 | | | |
| s | | $s^2 = \ln(CV^2 + 1)$ | 0.555 | 0.555 | 0.555 | 0.555 | 0.555 | 0.555 | 0.555 | 0.555 | 0.555 | 0.555 | | | |
| Pn | | $Pn = (1 - \text{confidence level})^{1/n}$ | 0.997 | 0.368 | 0.368 | 0.368 | 0.368 | 0.368 | 0.368 | 0.368 | 0.368 | 0.368 | | | |
| Multiplier | | 1.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | | | |
| Max concentration (ug/L) at edge of... | | Acute | 211 | 6.128 | 0.013 | 1.120 | 2.143 | 0.122 | 0.031 | 0.002 | 11.136 | | | | |
| | | Chronic | 54 | 1.560 | 0.003 | 0.285 | 0.545 | 0.031 | 0.001 | 2.835 | | | | | |
| Reasonable Potential? Limit Required? | | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | | | |
| Human Health Reasonable Potential | | | | | | | | | | | | | | | |
| s | | $s^2 = \ln(CV^2 + 1)$ | 0.55451 | | | | 0.554513 | | 0.55451 | 0.55451 | 0.55451 | | | | |
| Pn | | $Pn = (1 - \text{confidence level})^{1/n}$ | 0.368 | | | | 0.368 | | 0.368 | 0.368 | 0.368 | | | | |
| Multiplier | | 1.20486 | | | | | 1.2048606 | | 1.20486 | 1.20486 | 1.20486 | | | | |
| Dilution Factor | | 136 | | | | | 136 | | 136 | 136 | 136 | | | | |
| Max Conc. at edge of Chronic Zone, ug/L | | 0.00975 | | | | | 1.8E-01 | | 3.31337 | 0.00018 | 0.93022 | | | | |
| Reasonable Potential? Limit Required? | | NO | | | | | NO | | NO | NO | NO | | | | |

Reasonable Potential Calculation - Page 2

| Facility | | BP Cherry Point Refinery | | Dilution Factors: | | Acute | Chronic | | | | | |
|---|--|--------------------------|-------------------|-------------------------------|---|-----------------------------------|----------------------|---------------------------------------|-------|-----|-----|-----|
| Water Body Type | | Marine | | Aquatic Life | | 28.0 | 110.0 | | | | | |
| | | | | Human Health Carcinogenic | | | 136.0 | | | | | |
| | | | | Human Health Non-Carcinogenic | | | 136.0 | | | | | |
| Pollutant, CAS No. & NPDES Application Ref. No. | | NITRATE/NITRITE (N) | PHENOL 108952 10A | SELENIUM 7782492 10M | SILVER - 7740224 11M dependent on hardness. | SULFIDE, HYDROGEN SULFIDE 7783064 | THALLIUM 7440280 12M | ZINC - 7440666 13M hardness dependent | | | | |
| Effluent Data | # of Samples (n) | 3 | 156 | 3 | 3 | 156 | 3 | 3 | | | | |
| | Coeff of Variation (Cv) | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| | Effluent Concentration, ug/L (Max. or 95th Percentile) | 6800 | | 103 | 0.8 | 0.04 | 1.1 | 80.9 | | | | |
| | Calculated 50th percentile Effluent Conc. (when n>10) | | 0.08 | | | | | | | | | |
| Receiving Water Data | 90th Percentile Conc., ug/L | | | | | | | | | | | |
| | Geo Mean, ug/L | | | | | | | | | | | |
| Water Quality Criteria | Aquatic Life Criteria, ug/L | Acute | - | - | 290 | 1.9 | - | 90 | | | | |
| | | Chronic | - | - | 71 | - | 2 | 81 | | | | |
| | WQ Criteria for Protection of Human Health, ug/L | | - | 200000 | 480 | - | - | 0.27 | 2900 | | | |
| | Metal Criteria Translator, decimal | Acute | - | - | - | 0.85 | - | - | 0.946 | | | |
| | | Chronic | - | - | - | - | - | - | 0.946 | | | |
| | Carcinogen? | | N | N | N | N | N | N | N | | | |
| Aquatic Life Reasonable Potential | | | | | | | | | | | | |
| Effluent percentile value | | | | 0.950 | 0.950 | 0.950 | | 0.950 | | | | |
| s $s^2=\ln(CV^2+1)$ | | | | 0.555 | 0.555 | 0.555 | | 0.555 | | | | |
| Pn $Pn=(1-\text{confidence level})^{1/n}$ | | | | 0.368 | 0.368 | 0.981 | | 0.368 | | | | |
| Multiplier | | | | 3.00 | 3.00 | 1.00 | | 3.00 | | | | |
| Max concentration (ug/L) at edge of... | | Acute | | 11.034 | 0.073 | 0.001 | | 8.199 | | | | |
| | | Chronic | | 2.809 | 0.022 | 0.000 | | 2.087 | | | | |
| Reasonable Potential? Limit Required? | | | | NO | NO | NO | | NO | | | | |
| Human Health Reasonable Potential | | | | | | | | | | | | |
| s $s^2=\ln(CV^2+1)$ | | | 0.55451 | 0.554513 | | 0.554513 | 0.554513 | | | | | |
| Pn $Pn=(1-\text{confidence level})^{1/n}$ | | | 0.981 | 0.368 | | 0.368 | 0.368 | | | | | |
| Multiplier | | | 0.31654 | 1.204861 | | 1.204861 | 1.204861 | | | | | |
| Dilution Factor | | | 136 | 136 | | 136 | 136 | | | | | |
| Max Conc. at edge of Chronic Zone, ug/L | | | 0.00059 | 0.912505 | | 9.7E-03 | 7.2E-01 | | | | | |
| Reasonable Potential? Limit Required? | | | NO | NO | | NO | NO | | | | | |

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Outfall 003

| Facility | | BP Cherry Point Refinery | | | | | | | | | |
|---------------------|--|---------------------------|--|--|--|--|--|--|--|--|--|
| Water Body Type | | Freshwater | | | | | | | | | |
| Rec. Water Hardness | | Acute=59, Chronic=59 mg/L | | | | | | | | | |

| Dilution Factors: | | Acute | Chronic |
|-------------------------------|--|-------|---------|
| Aquatic Life | | 1.0 | 1.0 |
| Human Health Carcinogenic | | | 1.0 |
| Human Health Non-Carcinogenic | | | 1.0 |

| Pollutant, CAS No. & NPDES Application Ref. No. | | COPPER - 744068 6M Hardness dependent | | ZINC - 744066 13M hardness dependent | | | | | | | |
|---|--|---------------------------------------|-----------|--------------------------------------|------|-----|-----|-----|-----|-----|-----|
| | | | | | | | | | | | |
| Effluent Data | # of Samples (n) | | 10 | | 16 | | | | | | |
| | Coeff of Variation (Cv) | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| | Effluent Concentration, ug/L (Max. or 95th Percentile) | | 4.1 | | 37.5 | | | | | | |
| | Calculated 50th percentile Effluent Conc. (when n>10) | | | | 21.8 | | | | | | |
| Receiving Water Data | 90th Percentile Conc., ug/L | | | | | | | | | | |
| | Geo Mean, ug/L | | | | | | | | | | |
| Water Quality Criteria | Aquatic Life Criteria, ug/L | Acute | 10.35049 | 73.189493 | | | | | | | |
| | | Chronic | 7.231408 | 66.833106 | | | | | | | |
| | WQ Criteria for Protection of Human Health, ug/L | | 1300 | 1000 | | | | | | | |
| | Metal Criteria Translator, decimal | Acute | 0.996 | 0.996 | | | | | | | |
| | | Chronic | 0.996 | 0.996 | | | | | | | |
| | Carcinogen? | | N | N | | | | | | | |
| Aquatic Life Reasonable Potential | | | | | | | | | | | |
| Effluent percentile value | | | 0.950 | 0.950 | | | | | | | |
| s $s^2 = \ln(CV^2 + 1)$ | | | 0.555 | 0.555 | | | | | | | |
| Pn $Pn = (1 - \text{confidence level})^{1/n}$ | | | 0.741 | 0.829 | | | | | | | |
| Multiplier | | | 1.74 | 1.47 | | | | | | | |
| Max concentration (ug/L) at edge of... | | Acute | 7.102 | 54.870 | | | | | | | |
| | | Chronic | 7.102 | 54.870 | | | | | | | |
| Reasonable Potential? Limit Required? | | | NO | NO | | | | | | | |

Outfall 007

| Facility | | BP Cherry Point Refinery | | | | | | | | | |
|---------------------|--|---------------------------|--|--|--|--|--|--|--|--|--|
| Water Body Type | | Freshwater | | | | | | | | | |
| Rec. Water Hardness | | Acute=76, Chronic=76 mg/L | | | | | | | | | |

| Dilution Factors: | | Acute | Chronic |
|-------------------------------|--|-------|---------|
| Aquatic Life | | 1.0 | 1.0 |
| Human Health Carcinogenic | | | 1.0 |
| Human Health Non-Carcinogenic | | | 1.0 |

| Pollutant, CAS No. & NPDES Application Ref. No. | | COPPER - 744068 6M Hardness dependent | | ZINC - 744066 13M hardness dependent | | | | | | | |
|---|--|---------------------------------------|-----------|--------------------------------------|-----|-----|-----|-----|-----|-----|-----|
| | | | | | | | | | | | |
| Effluent Data | # of Samples (n) | | 10 | | 10 | | | | | | |
| | Coeff of Variation (Cv) | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| | Effluent Concentration, ug/L (Max. or 95th Percentile) | | 3.4 | 10.6 | | | | | | | |
| | Calculated 50th percentile Effluent Conc. (when n>10) | | | | | | | | | | |
| Receiving Water Data | 90th Percentile Conc., ug/L | | | | | | | | | | |
| | Geo Mean, ug/L | | | | | | | | | | |
| Water Quality Criteria | Aquatic Life Criteria, ug/L | Acute | 13.13913 | 90.702485 | | | | | | | |
| | | Chronic | 8.978112 | 82.825123 | | | | | | | |
| | WQ Criteria for Protection of Human Health, ug/L | | 1300 | 1000 | | | | | | | |
| | Metal Criteria Translator, decimal | Acute | 0.996 | 0.996 | | | | | | | |
| | | Chronic | 0.996 | 0.996 | | | | | | | |
| | Carcinogen? | | N | N | | | | | | | |
| Aquatic Life Reasonable Potential | | | | | | | | | | | |
| Effluent percentile value | | | 0.950 | 0.950 | | | | | | | |
| s $s^2 = \ln(CV^2 + 1)$ | | | 0.555 | 0.555 | | | | | | | |
| Pn $Pn = (1 - \text{confidence level})^{1/n}$ | | | 0.741 | 0.741 | | | | | | | |
| Multiplier | | | 1.74 | 1.74 | | | | | | | |
| Max concentration (ug/L) at edge of... | | Acute | 5.890 | 18.361 | | | | | | | |
| | | Chronic | 5.890 | 18.361 | | | | | | | |
| Reasonable Potential? Limit Required? | | | NO | NO | | | | | | | |

Appendix I—Summary of Dioxin Data

| Date | Source | 2,3,7,8-TCDF | 2,3,7,8-TCDD | 1,2,3,7,8-PeCDF | 2,3,4,7,8-PeCDF | 1,2,3,7,8-PeCDD | 1,2,3,4,7,8-HxCDF | 1,2,3,6,7,8-HxCDF | 2,3,4,6,7,8-HxCDF | 1,2,3,7,8,9-HxCDF | 1,2,3,4,7,8-HxCDD | 1,2,3,6,7,8-HxCDD | 1,2,3,7,8,9-HxCDD | 1,2,3,4,6,7,8-HpCDF | 1,2,3,4,7,8,9-HpCDF | 1,2,3,4,6,7,8-HpCDD | OCDF | OCDD |
|-------------|----------------|--------------|--------------|-----------------|-----------------|-----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------|---------------------|---------------------|-------|-------|
| Spring 2000 | Reformer #1 | <10 | <10 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <100 | <100 |
| Spring 2000 | Final Effluent | <10 | <10 | <51 | <51 | <51 | <51 | <51 | <51 | <51 | <51 | <51 | <51 | <51 | <51 | <51 | <100 | <100 |
| Fall 2000 | Reformer #2 | <9.5 | <9.5 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <95 | <95 |
| Fall 2000 | Final Effluent | <9.5 | <9.6 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <48 | <96 | <96 |
| Spring 2001 | Reformer #2 | 210 | 28 | 310 | 670 | 79 | 380 | 450 | 640 | 270 | <50 | 91 | 63 | 700 | 220 | 220 | 350 | 190 |
| Spring 2001 | Final Effluent | <10 | <10 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <100 | <100 |
| Fall 2001 | Reformer #1 | 90 | <10 | 170 | 150 | <50 | 460 | 320 | 150 | 85 | <50 | <50 | <50 | 970 | 180 | 100 | 1300 | 170 |
| Fall 2001 | Final Effluent | <10 | <10 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <100 | <100 |
| Summer 2014 | Reformer #2 | <5 | <50 | 240 | 340 | 200 | 2,200 | 1,600 | 130 | 450 | 840 | 4600 E,P | 2,500 | 520 | 720 | 7,500 | 2,600 | 8,100 |
| Summer 2014 | Final Effluent | <5 | <50 | <50 | <50 | <50 | <50 | <100 | <10 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <100 |
| Winter 2014 | Reformer #1 | <5 | <50 | <50 | <50 | <50 | 190 | 330 | 78 | 220 E,P | 230 | 1,500 | 490 | 98 | 170 | 2,400 | 690 | 4,300 |
| Winter 2014 | Final Effluent | <5 | <50 | <50 | <50 | <50 | <50 | <100 | <10 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <100 |
| Spring 2015 | Reformer #1 | 14 | 210 | 190 | 440 | 230 | 1900 | 2700 | 550 | 1300 | 1900 | 4600 E | 2300 | 1100 | 1100 | 7500 | 2600 | 18000 |
| Spring 2015 | Final Effluent | <5 | <50 | <50 | <50 | <50 | <50 | <100 | <10 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <100 |
| Winter 2015 | Reformer #2 | <5 | <50 | 62 | 93 | 53 | 500 | 430 | 83 | 330 | 300 | 1,100 | 760 | 160 | 250 | 2,500 | 810 | 3,000 |
| Winter 2015 | Final Effluent | <5 | <50 | <50 | <50 | <50 | <50 | <100 | <10 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <100 |

All values reported in picograms per liter (pg/L).

< = Not detected above the method reporting limit.

E = Estimated Maximum Possible Concentration.

P = PCDE Interference.

| | | | | | | | | | | | | | | | | | | |
|-------------|------------|--------|--------|-----------|---------|--------|---------|-----------|---------|----------|----------|-----------|---------|--------|---------|--------|--------|--------|
| Spring 2000 | API Sludge | <920 | <820 | 4600 J | 5000 J | <1200 | 24000 J | 17000 E,I | 7500 J | 8000 E,I | 3200 J | 5600 E,I | 3500 J | 87000 | 26000 J | 58000 | 140000 | 370000 |
| Fall 2000 | API Sludge | 6000 | <3400 | 14000 E,I | 22000 J | 5300 J | 51000 | 32000 | 13000 J | 17000 J | 5700 E,I | 11000 J | 4700E,I | 130000 | 45000 | 61000 | 190000 | 170000 |
| Spring 2001 | API Sludge | <9300 | <13000 | <21000 | <21000 | <21000 | 47000 J | 27000 J | <21000 | <21000 | <21000 | 29000 E,I | 21000 J | 190000 | 83000 J | 130000 | 440000 | 390000 |
| Fall 2001 | API Sludge | <15000 | <26000 | <18000 | <15000 | <15000 | 69000 J | 38000 J | 39000 J | 33000 J | <26000 | <27000 | <19000 | 230000 | 96000 | 130000 | 410000 | 550000 |

Appendix J--Groundwater Monitoring Data

| | Unit | MW-109 (up gradient) | MW-110 (cross gradient) | MW-111 (down gradient) | MW-117 (down gradient) | GWQS | MTCA GW Criteria |
|------------------------|------|-------------------------|----------------------------|---------------------------|---------------------------|---------|---------------------|
| Year 2012 | | | | | | | |
| Iron | mg/l | 0.24 | 0.25 | 5.1 | 0.18 J | 0.3 | NV |
| Arsenic | mg/l | 0.001 | 0.004 | 0.003 | 0.002 | 0.00005 | 0.005 |
| Manganese | mg/l | 0.28 | 0.12 | 0.82 | 0.04 | 0.05 | 2.24 |
| Chloride | mg/l | 23 | 15 | 482 | 18 | 250 | NV |
| Sulfate | mg/l | 27 | 16 | 1277 | 24 | 250 | NV |
| Total Dissolved Solids | mg/l | 301 | 279 | 40 | 378 | 500 | NV |
| TPH-Dx | | <0.2 | <0.2 | <0.2 | <0.2 | NA | |
| Year 2013 | | | | | | | |
| Iron | mg/l | 0.13 | 0.13 | 0.35 | <0.050 | 0.3 | NV |
| Arsenic | mg/l | 0.001 | 0.003 | 0.28 | 0.002 | 0.00005 | 0.005 |
| Manganese | mg/l | 0.14 | 0.08 | 0.003 | 0.19 | 0.05 | 2.24 |
| Chloride | mg/l | 20 | 15 | 240 | 12 | 250 | NV |
| Sulfate | mg/l | 14 | 14 | 988 | 23 | 250 | NV |
| Total Dissolved Solids | mg/l | 276 | 279 | 2224 | 338 | 500 | NV |
| TPH-Dx | mg/l | <0.2 | <0.2 | <0.2 | <0.2 | NA | |
| Year 2014 | | | | | | | |
| Iron | mg/l | 0.33 | 0.43 | 1.3 | 0.02 J | 0.3 | NV |
| Arsenic | mg/l | 0.0007 | 0.004 | 0.001 | 0.002 | 0.00005 | 0.005 |
| Manganese | mg/l | 0.14 | 0.26 | 0.35 | 0.13 | 0.05 | 2.24 |
| Chloride | mg/l | 18 | 15 | 158 | 12 | 250 | NV |
| Sulfate | mg/l | 30 | 13 | 702 | 22 | 250 | NV |
| Total Dissolved Solids | mg/l | 273 | 280 | 1593 | 358 | 500 | NV |
| TPH-Dx | mg/l | <0.2 | <0.2 | <0.2 | <0.2 | NA | |
| Year 2015 | | | | | | | |
| Iron | mg/l | 0.2 | 0.15 | 1.64 | 0.007 J | 0.3 | NV |
| Arsenic | mg/l | 0.0007 | 0.0036 | 0.002 | 0.0013 | 0.00005 | 0.005 |
| Manganese | mg/l | 0.073 | 0.249 | 0.241 | 0.086 | 0.05 | 2.24 |
| Chloride | mg/l | 23.3 | 15.3 | 47 | 11.7 | 250 | NV |
| Sulfate | mg/l | 27.7 | 13.2 | 248 | 23.8 | 250 | NV |
| Total Dissolved Solids | mg/l | 276 | 278 | 608 | 300 | 500 | NV |
| TPH-Dx | mg/l | <0.2 | <0.2 | <0.2 | <0.2 | NA | |
| Year 2016 | | | | | | | |
| Iron | mg/l | 0.06 | 0.23 | 2.4 | <0.05 | 0.3 | NV |
| Arsenic | mg/l | 0.0005 | 0.004 | 0.002 | 0.001 | 0.00005 | 0.005 |
| Manganese | mg/l | 0.124 | 0.284 | 0.226 | 0.064 | 0.05 | 2.24 |
| Chloride | mg/l | 25 | 15 | 36 | 12 | 250 | NV |
| Sulfate | mg/l | 30 | 13 | 136 | 26 | 250 | NV |
| Total Dissolved Solids | mg/l | 282 | 278 | 508 | 313 | 500 | NV |
| TPH-Dx | mg/l | <0.2 | <0.2 | <0.2 | <0.2 | NA | |
| Year 2017 | | | | | | | |
| Iron | mg/l | 0.11 | 0.15 | 1.49 | 0.3 | 0.3 | NV |
| Arsenic | mg/l | 0.0002 J | 0.003 | 0.002 | 0.0004 | 0.00005 | 0.005 |
| Manganese | mg/l | 0.03 | 0.081 | 0.21 | 0.044 | 0.05 | 2.24 |
| Chloride | mg/l | 26.3 | 14.8 | 21.7 | 11.7 | 250 | NV |
| Sulfate | mg/l | 28 | 12.4 | 113 | 25.8 | 250 | NV |
| Total Dissolved Solids | mg/l | 296 | 283 | 429 | 305 | 500 | NV |
| TPH-Dx | mg/l | <0.2 | <0.2 | <0.2 | <0.2 | NA | |

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| Year 2018 | | | | | | | |
|---|------|-----------|----------|---------|--------|---------|-------|
| Iron | mg/l | 0.056 | 0.1 | 2.7 | 0.05 U | 0.3 | NV |
| Arsenic | mg/l | 0.001 U | 0.0035 | 0.0039 | 0.0011 | 0.00005 | 0.005 |
| Manganese | mg/l | 0.036 | 0.068 | 0.47 | 0.045 | 0.05 | 2.24 |
| Chloride | mg/l | 26 | 16 | 38 | 13 | 250 | NV |
| Sulfate | mg/l | 27 | 12 | 240 | 27 | 250 | NV |
| Total Dissolved Solids | mg/l | 250 | 250 | 540 | 240 | 500 | NV |
| TPH-Dx | mg/l | 0.13 U | 0.13 U | 0.23 U | 0.13 U | NA | |
| Year 2019 | | | | | | | |
| Iron | mg/l | 0.0058 U | 0.0058 U | 1.6 | 0.05 U | 0.3 | NV |
| Arsenic | mg/l | 0.00015 U | 0.0035 | 0.0033 | 0.0013 | 0.00005 | 0.005 |
| Manganese | mg/l | 0.021 | 0.041 | 0.54 | 0.0033 | 0.05 | 2.24 |
| Chloride | mg/l | 28 | 15 | 54 | 6.9 | 250 | NV |
| Sulfate | mg/l | 28 | 12 | 360 | 26 | 250 | NV |
| Total Dissolved Solids | mg/l | 300 | 280 | 800 | 280 | 500 | NV |
| TPH-Dx | mg/l | 0.39 U | 0.03 U | 0.27 NJ | 0.36 U | NA | |
| Year 2020 | | | | | | | |
| Iron | mg/l | 0.24 | 0.059 U | 0.93 | 0.05 U | 0.3 | NV |
| Arsenic | mg/l | 0.0011 | 0.0036 | 0.0025 | 0.0016 | 0.00005 | 0.005 |
| Manganese | mg/l | 0.045 | 0.038 | 0.54 | 0.062 | 0.05 | 2.24 |
| Chloride | mg/l | 31 | 17 | 50 | 16 | 250 | NV |
| Sulfate | mg/l | 31 | 13 | 260 | 35 | 250 | NV |
| Total Dissolved Solids | mg/l | 320 | 270 | 600 | 270 | 500 | NV |
| TPH-Dx | mg/l | 0.13 U | 0.13 U | 0.13 U | 0.13 U | NA | |
| Notes: | | | | | | | |
| NV: no value | | | | | | | |
| NJ - Tentatively identify and estimated | | | | | | | |
| J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample | | | | | | | |
| U = Analyte was not detected above the method detection limit | | | | | | | |
| GWQ Criteria Table 1 WAC 173-200-040 | | | | | | | |

Appendix K--WET Test Summary

| Scheduled | Duration | Organism | Endpoint | NOEC | LOEC | PMSD | Effluent Survival (100%) | Met Performance Standard? |
|----------------|----------|---|------------------|------|-------|-------|--------------------------|---------------------------|
| 2012 March | Acute | <i>Daphnia magna</i> Water Flea | 48-Hour Survival | 100% | >100% | 5.0% | 100.0% | Yes |
| 2012 October | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 11.3% | 95.0% | Yes |
| 2012 October | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | 9.3% | 95.0% | Yes |
| 2012 December | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 5.0% | 100.0% | Yes |
| 2013 February | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | 10.1% | 90.0% | Yes |
| 2013 June | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 14.4% | 100.0% | Yes |
| 2013 August | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | 5.9% | 95.0% | Yes |
| 2013 November | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 15.5% | 100.0% | Yes |
| 2014 March | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | 9.8% | 95.0% | Yes |
| 2014 May | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 11.8% | 100.0% | Yes |
| 2014 August | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | 9.9% | 87.5% | Yes |
| 2014 October | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 13.5% | 90.0% | Yes |
| 2015 March | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | 53.5% | 57.5% | Yes |
| 2015 June | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 9.2% | 100.0% | Yes |
| 2015 September | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 50% | 100% | 10.1% | 55.0% | No* |
| 2015 December | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 9.2% | 95.0% | Yes |
| 2016 March | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 50% | 100% | 15.5% | 40.0% | No* |
| 2017 March | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 98% | >100% | 7.2% | 97.5% | Yes |
| 2017 June | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 50% | 100% | 18.7% | 75.0% | Yes |
| 2017 October | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 9.2% | 100.0% | Yes |
| 2018 January | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | 4.6% | 100.0% | Yes |
| 2018 April | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | n/a | 100.0% | Yes |

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| | | | | | | | | |
|----------------|-------|---|------------------|------|-------|-------|--------|-----|
| 2019 February | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 50% | 100% | 13.3% | 60.0% | No* |
| 2019 June | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 100% | >100% | 15.9% | 90.0% | Yes |
| 2019 September | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 50% | 100% | 12.1% | 50.0% | No* |
| 2019 December | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 50% | 100% | 17.9% | 55.0% | No* |
| 2020 August | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | n/a | 100.0% | Yes |
| 2020 December | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 50% | 100% | 23.1% | 35.0% | No* |
| 2020 June | Acute | <i>Atherinops Affinis</i> Topsmelt | 96-Hour Survival | 50% | 100% | 23.4% | 35.0% | No* |
| 2020 August | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | n/a | 100.0% | Yes |
| 2020 January | Acute | <i>Americamysis bahia</i> Mysid Shrimp | 48-Hour Survival | 100% | >100% | 4.9% | 95.0% | Yes |

*The acute test result showed less than 65% survival in 100% effluent. An acute WET limit is needed if the testing was for effluent characterization (WAC 173-205-050(2)(a)(ii)) or compliance monitoring (WAC 173-205-120(1)(a)). Another effluent characterization for acute WET (WAC 173-205-060(3)(a)) is needed if the testing was an end of permit term check (WAC 173-205-030(8)). Note: This does not necessarily mean that the asterisked test was out of compliance with the effluent limits set forth in the permit.

| Sample Date | Duration | Organism | Endpoint | NOEC | LOEC | PMSD | Effluent Survival (100%) | Met Performance Standard? |
|-------------|----------|--------------------------------------|----------------|------|------|--------|--------------------------|---------------------------|
| 3/8/2016 | Chronic | <i>Strongylocentrotus purpuratus</i> | Survival | 70% | >70% | 25.2% | N/A | Yes |
| | | Urchin | Development | 35% | 70% | 4.2% | | |
| 2/10/2016 | Chronic | <i>Atherinops Affinis</i> | 7 Day Survival | 70% | >70% | 8.2% | N/A | Yes |
| | | Topsmelt | 7 Day Biomass | 3.6% | 35% | 15.5% | | |
| 9/13/2016 | Chronic | <i>Strongylocentrotus purpuratus</i> | Survival | 70% | >70% | 11.1% | N/A | Yes |
| | | Urchin | Development | 3.6% | 35% | 3.16% | | |
| 9/7/2016 | Chronic | <i>Atherinops Affinis</i> | 7 Day Survival | 70% | >70% | 12.7% | N/A | Yes |
| | | Topsmelt | 7 Day Biomass | 35% | 70% | 25.20% | | |

Appendix L--Monitoring Reductions for Exemplary Performance

| Parameter | Baseline Monitoring Frequency | Previous Permit Monitoring Frequency | Long Term Average (lbs/day) | Previous Average Monthly Limit (lbs/day) | Ratio of Long Term Average to the Average Monthly Limit | Guidance Monitoring Frequency Recommendations | Proposed Monitoring Frequencies |
|---------------------|-------------------------------|--------------------------------------|-----------------------------|--|---|---|---------------------------------|
| BOD ₅ | 1/Week | 1/Week | 108 | 1240 | 9% | 1/2 months | 1/Week |
| COD | 7/Week | 3/Week | 2135 | 8540 | 25% | 3/Week | 3/Week |
| TSS | 7/Week | 7/Week | 485 | 990 | 49% | 3/Week | 7/Week |
| O&G | 7/Week | 7/Week | 37 | 360 | 10% | 3/Week | 7/Week |
| Phenolic Compounds | 1/Week | 1/Week | 1.1 | 7.6 | 14% | 1/2 months | 1/Month |
| Ammonia as N | 5/Week | 3/Week | 20 | 870 | 2% | 1/Week | 1/Week |
| Sulfide | 1/month | 1/month | 0.6 | 6.7 | 9% | 1/6 months | 1/Month |
| Hexavalent Chromium | 2/year | 2/year | 0.021 | 2 | 1% | No guidance | Annually |

Appendix M--Response to Comments

Comments collectively from environmental groups: Puget Soundkeeper, Friends of the Earth, Friends of the San Juans, North Sound BayKeeper / RE Sources, and Washington Environmental Council

Comment 1: Hexavalent Chromium Numeric Effluent Limitation

The draft Fact Sheet at p. 25 discusses Best Professional Judgment in the establishment of the hexavalent chromium numeric effluent limitation and includes this statement: "... Ecology's Best Professional Judgment is that a 50 ug/L hexavalent chromium concentration limit is technologically achievable, reasonable, and protective of the receiving water quality." Does Ecology consider "technologically achievable, reasonable, and protective of receiving water quality" to be the equivalent of "all known, available and reasonable methods of treatment and control", which is the state standard that must be applied?

It appears that Ecology is imposing this effluent limitation not to satisfy AKART, which demands the implementation of "all" known, available and reasonable pollution controls, but with something less. Environmental Groups object to the citation of this standard as inconsistent with the AKART standard, which requires the implementation of all known, available and reasonable methods of pollution control without regard to the separate mandate to protect water quality. Under Washington law, the requirement to implement AKART is not contingent on any water quality protection need. What is the source of the standard set forth on Fact Sheet p. 25?

Given that the proposed numeric effluent limitations for hexavalent chromium (50 ug/L and 1.5 lbs/day) do not ensure that discharges are maintained at the low levels regularly attained by the facility's treatment system, deemed AKART by Ecology, which are below 5 ug/L, what conditions of the permit ensure that BP will continue to operate treatment to maintain discharges at this low level? What conditions of the permit would be violated if BP's hexavalent chromium discharge concentrations started averaging around 40 ug/L instead of less than 5 ug/L (absent a change in feed stock)? Environmental Groups urge Ecology to calculate and use numeric effluent limitations for hexavalent chromium based on the facility's discharge performance as discussed in section 1.8 of the Ecology Water Quality Program Permit Writer's Manual.

Ecology's response: Much of the hexavalent chromium data is non-detect and it is therefore difficult to use statistical approaches to derive a numerical limit based upon performance. The observed effluent concentrations of chromium are not reflective of a specific wastewater treatment technology employed by BP Cherry Point; Ecology does not believe it would be reasonable to implement a numeric "performance based" technology standard for the treatment of chromium.

Chromium is a contaminant in crude and depending on the source of the crude, the concentrations in the final effluent can vary. Ecology used Best Professional Judgment to impose a water quality-based effluent limit that applies the marine acute water quality standard for hexavalent chromium as a concentration limit at the end of pipe. The mass-based effluent limitation was reduced to 1.5 lbs/day from the previous permit. Ecology believes a water-quality based effluent limit is more protective than technology-based limits and has used that as the basis for the final effluent limit in the permit for chromium.

Comment 2: Arsenic

The draft Fact Sheet at p. 46 concludes that BP's discharges of arsenic as reported levels present the reasonable potential to cause or contribute to the applicable 1992 National Toxics Rule arsenic human health criteria. WAC 173-201A-240(1) appears to prohibit discharges with BP's arsenic concentrations because of this reasonable potential. How does the permit meet the -240(1) prohibition with regard to arsenic? What conditions of the permit satisfy the requirement of WAC 173-220-130(1)(b)(i) to include effluent limitations stringent enough to meet water quality standards? The Fact Sheet fails to explain how the conditions of the permit ensure compliance with the arsenic standard. See *Washington State Dairy Federation v. Ecology*, 18 Wash.App.2d 259, 288 – 297 (2021) (NPDES permit must include effluent limitations to ensure compliance with water quality standards). The draft Fact Sheet at pp. 47 – 48 asserts that inclusion of a numeric effluent limitation based on the human health criteria for arsenic is "infeasible," thus allowing the substitution of narrative limitations purporting to ensure compliance with this water quality standard. The reasons asserted for "infeasibility" are 1) that there is no federally approved translator for inorganic-to-total arsenic in discharges, and 2) the improbability that arsenic discharges could attain compliance with appropriately derived numeric effluent limitations for arsenic. Neither of these reasons makes the establishment of an arsenic numeric effluent limitation "infeasible" under 40 CFR 122.44(d)(1) and 122.44(k)(3). The term "infeasible" as used in EPA regulations means only "not capable of being calculated," and does not allow omission of numeric effluent limitations needed to protect water quality if their calculation is merely difficult or if their attainment by the discharger would be difficult. *NRDC v. EPA*, 808 F.3d 556, 577 – 580 (2nd Cir. 2015).

Thus, questions of attainability are not relevant to "infeasibility." Ecology's Permit Writer's Manual at Ch. 6, Sec. 1.2 discusses conversion factors and translators for metal criteria and presents options for translator selection. Why are none of these methods "feasible" for the derivation of a numeric WQBEL for arsenic? Environmental Groups suggest that regulations require the inclusion of a numeric effluent limitation for arsenic.

Ecology's response: Ecology made a conservative determination that there is a potential to exceed the human health inorganic arsenic criteria at Outfall 001. This determination was based on an evaluation using total recoverable arsenic data and available dilution.

As discussed in Section III.H. of the fact sheet, there are several difficulties in applying EPA's criteria for inorganic arsenic in NPDES permits. There are natural background sources of marine and freshwater arsenic that exceed the criteria; there are no approved analytical methods for inorganic arsenic that can be used for compliance assessment; and there are no federally approved translators for inorganic-to-total recoverable arsenic for discharges. These factors make it infeasible to establish or evaluate compliance with a numerical limit for inorganic arsenic. Ecology will re-evaluate its decision if there is a change in the criteria or approval test methods.

The requirement for annual monitoring for total recoverable arsenic, source control BMPs now specified in Appendix C, and pollution prevention planning in the permit constitutes an effluent limit when numeric limits are infeasible (40 CFR 122.44(k)).

Comment 3: Sediment Standards

The draft Fact Sheet at p. 49 states that BP's discharge has the reasonable potential to cause a violation of the sediment quality standards, citing a failure of bioassay test, and samples exceeding Sediment Quality Standards and Sediment Impact Zone Maximum criteria.

The conditions of the draft permit are inadequate to protect against violation of WAC 173-204 sediment standards and do not meet regulatory mandates.

First, the sediment quality standards are part of the water quality standards per WAC 173-201A-010(4) and the permit omits any effluent limitation that satisfies the WAC 173-220-130(1)(b)(i) requirement to ensure compliance.

Second, the draft permit totally ignores the requirements of WAC 173-204 Part IV. See, e.g., WAC 173-204-410(6)(a). Under these regulations, when a discharge is found to potentially violate sediment quality standards, the establishment of a sediment impact zone or numeric effluent limitations adequate to prevent sediment impacts are required. WAC 173-204-400(7). A water quality mixing zone is not equivalent to a sediment impact zone. WAC 173-204-400(11).

Why has BP not been required to apply for a sediment impact zone under WAC 173-204-415(2)(a) or sediment quality-protective numeric effluent limits been included in the permit?

Ecology's response: The permit specifies sediment monitoring shall be performed based on aquatic sediment standards (Chapter 173-204 WAC). The sampling will include both chemical and bioassay analyses in the vicinity of the North and South Piers including Outfall 001.

Ecology's request for comprehensive sediment sampling is based on the decision that prior sediment studies did not provide enough spatial information to determine the source of contamination. The upcoming permit-required sediment sampling will allow Ecology to determine if additional actions should be implemented, such as a sediment impact zone (SIZ) or an investigation via the Model Toxics Control Act. Ecology may require the facility to apply for a sediment impact zone if results fall between the Sediment Quality Standards and the SIZmax criteria per WAC 173-204. A sediment impact zone can only be designated in the vicinity of a permitted discharge area. If the sediment results show contaminant sources are not in the vicinity of the outfall, then Ecology may require alternative actions other than issuing a sediment impact zone.

Comment 4: Mixing Zone

Environmental Groups do not understand how the establishment of mixing zones for BP's discharge is consistent with WAC 173-201A-400(4), which prohibits the establishment of a mixing zone "unless the supporting information clearly indicates the mixing zone would not have a reasonable potential to cause a loss of sensitive or important habitat, substantially interfere with the existing or characteristic uses of the water body, result in damage to the ecosystem, or adversely affect public health ..."

The establishment of mixing zones allows the use of dilution factors in the calculation of numeric effluent limitations and results in substantially higher pollution discharge allowances. Ecology has found that the BP discharge currently causes violation of sediment quality standards as well as human health criteria for arsenic. There is no information "clearly indicating" that the relaxed effluent limitations allowed by the establishment of a mixing zone, i.e., the discharge of greater concentrations and masses of pollutants, is unlikely to cause a loss of sensitive sediment habitat, substantially interfere with wildlife impacted by sediment quality or the safety of harvest of fish or shellfish from the area, damage to the ecosystem, or adversely affect human health.

Without this clear indication from supporting information, the mixing zones are contrary to the mixing zone regulation.

WAC 173-201A-400(1) requires that the "size and location" of a mixing zone be established in the permit.

The permit fails to comply with this requirement because its descriptions of the “maximum boundaries” of the mixing zones, draft permit p. 10, are unintelligible. The crucial parts of the descriptions at Condition S1.B. for the chronic and acute mixing zones are: “The mixing zone is a circle with a radius of [257 feet or 26 feet, respectively] measured from the center of each discharge port.” No single circle can have a radius measured from more than one location. Instead of a single circle, the mixing zones appear to be intended as a series of overlapping or adjacent circles centered on each of the discharge ports.

The regulation requires an accurate and identifiable description of the mixing zones’ locations, which the draft permit does not provide. At a minimum, the descriptions should be revised for accuracy and intelligibility, and drawings depicting the size and area (perhaps by overlay on a map or aerial photograph) should be included in the Fact Sheet.

Ecology’s response: Ecology is requiring additional sediment characterization in BP’s permit renewal to confirm the sediment contamination in the vicinity of the North and South Piers and to determine the source of the contamination found in prior sediment studies. If the source of sediment contamination is determined to be one or more constituents in the wastewater discharge at Outfall 001, Ecology may reevaluate compliance with water quality standards for those constituents without the use of a dilution factor.

The description of the chronic and acute mixing zone in the permit and the fact sheet have been revised to state that the maximum chronic mixing zone extends 257 feet in any horizontal direction from the centerline of the diffuser and the maximum acute mixing zone extends 26 feet in any horizontal direction from the centerline of the diffuser. A diagram has also been added to the fact sheet to visually depict the acute and chronic mixing zones.

Comment 5: WET Monitoring Requirements

Environmental Groups do not understand why the herring whole effluent toxicity (“WET”) monitoring requirements are not to be included in the permit but in a separate order. These are potentially important monitoring requirements that are directly related to the future regulation of BP’s discharges. It is appropriate that they be included in the NPDES permit, and thus subject to regulatory procedural safeguards for NPDES permit conditions, rather than in an administrative order that can be discontinued or modified without the same level of procedural protection.

Ecology’s response: The herring protocols were not approved for use in compliance monitoring. They were approved for regulatory use to screen for toxicity and conduct comparison studies with standard EPA whole effluent toxicity (WET) tests. Acute and chronic herring study requirements were included in previous BP and other refinery NPDES permits. These permits were appealed on the grounds that the permit is a compliance document and the herring protocols could not be used for compliance purposes. Ecology, industry, and several environmental groups negotiated a settlement of the permit appeals that removed the herring studies from the permit and included them in agreed orders.

The comparison studies have been successful in identifying EPA toxicity tests that are equally or more sensitive than herring tests to BP’s effluent. The EPA tests are approved for compliance monitoring and are included in BP’s permit. The EPA tests are actually better for monitoring effluents. The species used in the EPA tests are available year round, the tests can be performed more easily, and there are more accredited labs to run the tests.

Comment 6: Monitoring Frequency

At page 57, the Fact Sheet explains that monitoring frequencies for phenolic compounds, ammonia, and hexavalent chromium are reduced in the draft permit due to BP’s record of consistent compliance.

It is asserted that “[i]f the facility’s performance levels deteriorate, Ecology can revert the monitoring requirements to the previous levels.”

Environmental Groups ask that Ecology include provisions in the permit to require reversion to previous levels of monitoring frequency if performance levels deteriorate, rather than leaving this reversion to be possibly ordered by Ecology in unspecified circumstances.

Ecology’s response: There are several criteria that Ecology will review to determine if the monitoring frequency for a parameter should be increased, including changes in performance and non-compliance with permit limits. For facilities that do not maintain good performance, Ecology may require increased permit monitoring by a minor permit modification or an administrative order.

Comment 7: 6PPD-Quinone

WA Department of Ecology is well aware that researchers recently demonstrated that 6PPD-quinone – an oxidation product of a chemical additive in tires that is intended to prevent damage to tire rubber from ozone - causes Urban Runoff Mortality Syndrome (URMS) in coho salmon.

Ecology should incorporate monitoring and evaluation of concentrations of this harmful chemical in BP’s discharges. Please require BP to monitor effluent for presence and concentration of 6PPD-Q and report those results.

Ecology’s response: Currently, there are no EPA-approved methods for analyzing 6PPD-quinone in wastewater. Once a method is approved, laboratories will need to be accredited to run the new test. The water quality standards do not include criteria for 6PPD-Quinone. Therefore, no monitoring for 6PPD-Quinone is proposed for this permit renewal. A lot of work is being done in this area. We expect that additional information regarding analytical methods, applicable standards, and monitoring guidance will be available in the coming months.

Comment 8: PFAS Requirements

Environmental Groups support inclusion of new requirements for PFAS (Per- and Polyfluoroalkyl Substances) sampling and analysis. Permit S20.

Ecology’s response: Comment noted.

Comment 9: Piecemeal Project Permitting

Environmental Groups are concerned that there may be inappropriate piecemeal development happening at the BP Cherry Point Refinery. BP has submitted other permit applications that indicate plans for future projects that are not addressed in this NPDES permit renewal or in the other permit applications.

These applications include:

- SEPA Determination of Nonsignificance (DNS), file SEP2021-00086, that Whatcom County issued to BP Products North America, Inc. (BP Cherry Point Refinery) for site preparation and eventual construction of a new electrical substation--the new MS-4 Main Substation.
- BP’s request for a Clean Water Act Section 401 Water Quality Certification and a Joint Aquatic Resources Permit Application (JARPA) to conduct advance mitigation on a 92.07-acre site north of the BP Cherry Point Refinery that will generate advance mitigation credits through wetland creation and wetland rehabilitation that may be used to compensate for future, proposed, unavoidable wetland and/or upland impact projects.

see Public Notices for Section 401 Water Quality Certifications & CZM Federal Consistency, BP Cherry Point Refinery Advance Mitigation Project 4: <https://apps.ecology.wa.gov/aquatics/notices/>).

Environmental Groups believe Ecology should address these permits either in this NPDES renewal or in the processes for the other permit applications BP has submitted to Ecology or Whatcom County.

Ecology's response: BP's permit requires them to notify Ecology of any planned changes, such as physical alterations or additions to the facility, production increases, or process modifications which will result in a significant change in the nature or increase in the quantity of pollutants discharged (Permit Condition G4.). Ecology is also notified by Whatcom County of any SEPA permit applications made by BP. Ecology reviews all notifications or applications to determine if the planned changes or projects will impact BP's wastewater treatment system or discharge. Depending upon the circumstances of the change, the permit may be modified. The two projects mentioned by the commenter will likely require review under Ecology's construction stormwater and wetland authorities.

Each project on their own may not have an impact on BP's wastewater treatment system or discharge but Ecology would like to examine any cumulative impacts of these projects. The proposed permit requires BP to conduct a wastewater treatment efficiency study and engineering analysis to confirm that the current wastewater treatment system meets the requirements of AKART.

Comment 10: Herring

Herring spawning occurs along the shorelines at Cherry Point during the winter and spring and is ecologically, culturally, and environmentally important. Cherry Point is also usual and accustomed fishing grounds for several Tribes. Egg incubation occurs February through June and is a time when refinery operators and Ecology regulators need to be more attentive and careful so as to avoid harmful discharges that will occur during process startups and during maintenance. Plant turnaround and start up should be scheduled at other times to reduce risk to the herring population during this vulnerable stage in their life cycle when possible.

Increased monitoring during herring egg incubation could better protect this important species, particularly with the historical decline of the Cherry Point herring population as Cherry Point once served as the "core" region of spawn deposition for the largest single herring spawning stock in Washington State waters, declining by 97% from 1973 to 2018 (Cherry Point Management Plan, DNR, p. 27:

https://www.dnr.wa.gov/publications/aqr_ar_cp_managementplan_20211013.pdf). Environmental Groups would like to see the prevention of undetected harmful releases of water soluble fractions (WSF) of hydrocarbons, such as acetone and benzene, which are extremely toxic to developing herring embryos. Even trace levels of crude oil to herring embryos have shown issues with fish development such as abnormal hearts and reduced cardiorespiratory function, possibly leading to delayed population declines (Incardona et al. 2015: <https://www.nature.com/articles/srep13499>).

Monitoring of the receiving water during the incubation period of herring eggs with a herring bioassay as well as water quality sampling for WSF hydrocarbons and other potential toxic substances at several sites along the Cherry Point shoreline should be required under this permit. Herring populations from Alaska to California could provide herring to fertilize live herring embryos in the late winter/early spring for the bioassays.

Ecology's response: Early life stages of herring are sensitive to PAHs. Previous comparison studies between herring tests and standard EPA WET tests determined that the sea urchin embryo-larval development test was more sensitive to BP's effluent than the herring embryo test.

Permit Condition S17.A. requires BP to conduct chronic toxicity testing of the final effluent using several EPA toxicity tests including the sea urchin embryo-larval test. This permit condition was changed to require BP to conduct the winter chronic testing during February-March of 2023.

BP routinely monitors for a suite of indicator parameters at their process and stormwater outfalls and is required to perform annual priority pollutant testing, including PAHs, in the proposed permit. BP is also required to conduct quarterly WET testing at Outfall 001 for acute and chronic toxicity.

Any data collected from receiving water monitoring would be very difficult to interpret. There is a large variability in natural systems that would have to account for influences not related to BP's discharge, such as non-point source discharges, groundwater seeps from a nearby cleanup site, and temperature changes. Instead, Ecology relies on monitoring for specific chemicals and whole effluent toxicity testing of individual discharges to detect potential impacts to aquatic species.

Comments from Western State Petroleum Association (WSPA)

Comment 1: Special Condition S20 Monitoring Requirement is Premature. WSPA accepts that both the U.S. Environmental Protection Agency (USEPA) and Ecology have growing interest in understanding the presence and effect of PFAS compounds in the environment. The footnoted documents describe (almost without exception) multi-year activities to develop basic information in support of future regulation development. For example, in the 2022-2024 period USEPA will announce a national testing strategy, finalize toxicity assessments for a limited number of PFAS compounds, publish multi-laboratory validated analytical methods, and then start regulation development for selected PFAS compounds in drinking water, water quality standards, effluent limits, soil cleanup, and much more.

Ecology will surely follow USEPA's lead in deciding on state actions. WSPA believes that It would be prudent for Ecology's Industrial Section to delay the requirement for effluent monitoring until the nationwide PFAS requirements come into better focus.

Ecology's response: USEPA memo, Interim Strategy for Per- and Polyfluoroalkyl Substances in Federally Issued National Pollutant Discharge Elimination System Permits, recommends that permit writers include PFAS monitoring requirements.

Comment 2: Special Condition S20 instructions are vague. WSPA is concerned that the vagueness in the instructions will lead to an inefficient "review and approval" process.

The permittee has an obligation to submit a plan to Ecology for "review and approval" before the one-year mark. However, given the instructions, it is not clear as to what Ecology is expecting and/or what will be approved in the plan. thus, it becomes a "guessing game" Assuming that each of the petroleum refineries will face a common requirement to complete this monitoring program, it would be in the best interest of the NPDES program for Ecology to simply identify the scope and details of the desired industry monitoring program and provide an opportunity for company comment.

Ecology's reliance on the refinery NPDES permit to impose this poorly defined monitoring program is unfair. An NPDES permit is to impose unambiguous requirements which if not met could subject the permittee to Clean Water Act civil and criminal liability. At this point, BP or any other applicant cannot fully understand Ecology's intentions on the ultimate scope and cost of the monitoring program. Ecology has the obligation to fully define permit requirements and to allow for permittee/public engagement through public comment to seek clarification or adjustment of those proposed terms and conditions.

Ecology's response: Ecology revised Special Permit Condition S20 to clarify the requirement of submitting the PFAS Sampling and Analysis Plan. This requirement is being included in this permit to begin characterizing the wastewater for the potential presence of PFAS.

Comment 3: Special Condition S20 Monitoring Requirement is inequitable. Imposing this PFAS monitoring requirement on BP Cherry Point Refinery constitutes an inequitable demand. The USEPA and Ecology clearly appear to have intentions to develop multi-media regulatory requirements targeting at least some PFAS compounds. Yet, a cursory review of recent NPDES permitting actions suggests the BP PFAS NPDES monitoring requirement is unique. It is noteworthy that a draft Industrial Section permit for a pulp and paper facility does not include PFAS monitoring. Further, Ecology recently issued a general NPDES permit to Puget Sound POTWs addressing nutrient discharges and PFAS monitoring was not addressed.

Ecology's response: Ecology will be requiring PFAS study requirements in all of the refinery permit renewals. Ecology is planning to include a PFAS study in industry permits where we have knowledge of a source of PFAS, like the refineries use of firefighting foam containing PFAS at the fire training areas or storing raw materials onsite.

Comment 4: Special Condition S20 Monitoring Requirement may conflict with other programs. WSPA believes that the monitoring requirement on BP Cherry Point Refinery likely fails to address Ecology's broader regulatory program interests. Ecology's decision to impose the PFAS special study requirement in refinery NPDES permit renewals implies it will be sometime after 2029 before full industry data is received to the agency. It seems unlikely this disjointed approach will fulfil the agency's apparent objective of petroleum refinery PFAS characterization on a timeline to support program development.

Ecology's response: This requirement is being included in this permit to begin characterizing the wastewater for the potential presence of PFAS. This information will be used to inform monitoring or other requirements in future permit renewals. Ecology believes that including the PFAS study in requirement in the permit is an appropriate process meeting EPA workgroup's recommendations.

Comment 5: Using Inferior Test Method 8327 for Wastewater Sampling. USEPA Test Method 8327 is an approved method for surface water, groundwater, and wastewater matrices. However, this method appears to be inferior in accuracy and robustness when compared to other USEPA test methods for drinking water. The method does not use isotope dilution and therefore inferior and more susceptible to interferences than other methods that are not approved for wastewater streams such as USEPA method 537.1. Note that neither of these analytical methods is listed in 40 CFR 136 as an NPDES reference method or alternate method.

Ecology's response: EPA has stated that Method 8327 can be used in NPDES permits for monitoring when quality control operations and associated acceptance criteria are used (EPA FAQ about PFAS Methods for NPDES Permits). Ecology has also revised the language in the permit to more clearly allow for alternative analytical methods (such as draft Method 1633) upon approval by Ecology. Ecology expects that additional clarity regarding analytical methods, applicable standards, and cleanup guidance will be available in the future and has included flexibility within the permit to account for future regulatory clarifications.

Comments from BP Cherry Point Refinery

Comment 1: Permit Condition S1.E. Cherry Point requests the flexibility to discharge fire system test water into the watersheds that drain to Outfalls 004 and 005. The attached map shows the location of fire system features within or immediately adjacent to these watersheds.

Testing these elements of the fire system can reasonably be expected to result in test water being deposited into the watersheds that discharge to Outfalls 004 and 005.

Ecology's response: Ecology added Outfalls 004 and 005 to Permit Condition S1.E.

Comment 2: Permit Condition S11. The proposed permit requires collecting final effluent samples from each reformer catalyst regeneration event at Cherry Point for the permit's duration. Cherry Point historically averages two catalyst regeneration cycles per year. Therefore, approximately 10 samples will be collected during a hypothetical five-year permit period. The previous permits limited collection of final effluent samples to two catalyst regeneration events at each reformer (four samples total). Dioxins have not been detected in any final effluent samples collected and tested during previous permit cycles. Based on the foregoing, Cherry Point requests the same number of samples as requested in previous permits (i.e., four total samples: two from catalyst regeneration events at each of the two reformers).

Ecology's response: Ecology revised Permit Condition S11.A.1 to clarify 4 samples required during the permit term.

Comment 3: Permit Condition S20 and Fact Sheet Item II.J. This permit condition proposes new sampling and analysis requirements for Per- and Polyfluoroalkyl Substances (PFAS). While Cherry Point understands that Ecology (and the United States Environmental Protection Agency, "USEPA") are seeking to increase the understanding of PFAS compounds present in the environment, placement of this requirement in Cherry Point's NPDES permit creates a singular and undue burden on Cherry Point, the only industrial facility in Washington with this requirement as of permit issuance. Cherry Point presumes that the intent of this permit condition is to gather information from refinery facilities (if not other industries). Cherry Point believes this goal would be better achieved in a cohesive manner (and contemporary timeframe) through the use of a regulatory order process between Ecology and all of the refinery facilities in Washington, with input from USEPA as appropriate.

Additionally, paragraph two of the referenced section of the Fact Sheet states that the USEPA's recent method for PFAS cannot be used for compliance with an NPDES permit. As outlined in USEPA's FAQ: Frequent Questions about PFAS Methods for NPDES Permits | US EPA, Cherry Point assumes that Ecology would also approve "any suitable methods," for use in this sampling and analysis program. However, this further points out the need for collaboration between Ecology and the Washington refinery facilities in a regulatory order process to ensure use of consistent methods to produce a cohesive data set.

Ecology's response: Ecology will be requiring PFAS study requirements in all of the refinery permit renewals. Ecology is planning to include a PFAS study in industry permits where we have knowledge of a source of PFAS, like the refineries use of firefighting foam containing PFAS at the fire training areas or storing products onsite. Ecology believes that including the PFAS study in requirement in the permit is an appropriate process meeting EPA workgroup's recommendations.