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MEMORANDUM

Date: April 15, 2025

To: City of Portland Water Bureau

From: Todd Alsbury and Ted Brown, Biohabitats, Inc.

RE: Potential for Aquatic Natural Resources Effects from the Bull Run Filtration Project

Subject: Biohabitats Expert Opinion

The City of Portland Water Bureau (PWB) requested the assistance of Biohabitats in reviewing the Bull Run Filtration Projects, including the Filtration Facility and associated pipelines and Intertie Site near Cottrell, OR (collectively, the "project"). We were asked to review the project with respect to potential adverse impacts that could occur to aquatic species or water quality in the area from operations of the project. The following expert opinions were provided by Biohabitats staff with direct knowledge of the status of fish and aquatic habitat in the area as well as staff with experience and expertise in stormwater design and performance of typical best management practices for stormwater systems. This memorandum integrates and supersedes in its entirety previous testimony provided by Todd Alsbury, Altap Restoration LLC, during initial review of the project, which is provided in the previous Multnomah County record as Exhibit I.95. Todd Alsbury is now part of Biohabitats.

Biohabitats assessed the pre-development and proposed post-development conditions of aquatic habitat and water quality in the area of potential effect of the project. These areas of aquatic habitat include watersheds containing sensitive aquatic species including several listed as endangered under the Endangered Species Act. Biohabitats considered potential impacts related to temperature increase, sediment introduction, toxic pollutants, and altered hydrology, and their potential impacts to aquatic species. We determined that necessary project design, operation, and maintenance plans are in place to prevent harm to water quality and aquatic habitat. PWB will also utilize an adaptive management approach to continuously assess and implement new opportunities for improving program effectiveness in preventing adverse impacts to aquatic resources in Johnson and Beaver Creeks. Therefore, it is our expert opinion that the project will not adversely affect aquatic habitat or water quality.

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I. Existing Habitat Conditions

The existing (pre-development) habitat conditions near the project areas were assessed by Todd Alsbury, who has over 25 years of experience conducting monitoring, restoration, and management of fish population and their habitats in the Johnson and Beaver Creek watersheds specifically. Mr. Alsbury has been involved in project planning since 2021, including field review of project proposals on subject properties and in rights of way, assisting with development of best management practices (BMPs), and in-field review in preparation of this memorandum and prior project-related assessments (*see* Exhibit I.95).

Stream and riparian habitat conditions that aquatic species rely on may be influenced by land use when considerations are not made for the potential impacts from development adjacent to a stream corridor. The loss of riparian habitat decreases shading and elevates water temperature, typically reduces the filtration of pollutants and sediments from runoff and can result in channel incision and streambank instability. Collectively, these development related impacts can reduce overall fish and wildlife habitat quality. Aquatic species that rely on streams and their associated riparian habitats can be influenced by these negative impacts associated with development actions.

Johnson Creek, located to the southwest of the main Filtration Facility site, and Beaver Creek, which passes near the Intertie Site near Lusted Road and the distribution main along Cottrell Road, are the main considerations for aquatic habitat that could be affected by the project. Habitat conditions in Johnson and Beaver Creeks are generally considered poor, particularly when considered in relation to streams in the region that have been less impacted by land use and development. Both are more urban stream systems with origins in the urban/rural interface of Multnomah and Clackamas Counties. The land uses in the watersheds varies from heavily developed urban areas in the lower and middle reaches of Johnson Creek (e.g., Cities of Portland, Milwaukie, and Gresham) and Beaver Creek (e.g., Cities of Gresham, Fairview, Troutdale) to rural and agricultural in the upper portions of both watersheds.

Channelization and development have greatly reduced riparian vegetation throughout most of the Johnson Creek and Beaver Creek watersheds. The riparian corridor is either narrow, minimal, or lacking. The riparian corridors of these creeks are also highly fragmented by frequent road crossings (BES, 2005). Road crossings often create barriers to the upstream passage of native migratory fish that historically occupied the upper reaches of Johnson Creek adjacent to the Filtration Facility and Beaver Creek near the Intertie and pipeline alignments prior to impacts from land use and rural development in the region.

II. Existing Water Quality

Oregon's Department of Environmental Quality (ODEQ) lists Johnson Creek as a water quality limited 303(d) stream. The listings are primarily due to high temperature (from lack of riparian canopy), bacteria (from wildlife, agriculture, and septic systems), and toxics (from remnant pesticides used in agricultural operations) among other factors contributing to degraded water quality. The North Fork of Beaver Creek is also listed as a water quality limited 303(d) stream for temperature and bacteria due to causes similar to Johnson Creek. See Table 2 of the Filtration Facility Site Stormwater Drainage Report (April 2025), submitted concurrently into the record with this memorandum, for a complete listing of Total Daily Maximum Loads (TMDLs) and 303(d) parameters for Johnson and Beaver Creeks.

A. Water Temperature

High water temperature has a significant impact on aquatic organisms found in streams like Johnson and Beaver Creeks. Cool water is a basic requirement for native salmon, trout, some amphibians, and other cold-water aquatic species. Growth, reproduction, and survival are impacted when the water temperature is too warm. Temperature also plays a role in dissolved oxygen (DO) concentration. The colder the water, the greater the amount of oxygen that can be dissolved in it. DO is important for fish survival. Numerous investigations of temperature in Johnson Creek and Beaver Creeks have consistently indicated that summer water temperatures do not meet state water quality standards throughout both watersheds. Elevated temperatures, together with potential nutrient contributions, result in DO concentrations that frequently drop below guidelines in the summer. These conditions limit salmon and trout productivity throughout both watersheds. Elevated water temperatures are caused by low summer base flows, lack of riparian shade, and impoundment of water in ponds (BES, 2005, City of Gresham, 2020).

Warm water temperature is a widespread existing problem within the watersheds and may be the most significant limitation on aquatic communities. Even the upper reaches of many tributaries are in "poor" or "fair" condition for water temperature, primarily due to low summer stream flows, loss of riparian shading, and presence of ponds that lead to dramatic increases in temperature in Johnson Creek and Beaver Creeks. During the summertime, both streams are often hotter than state water quality standards for rearing and migratory salmon and trout, which is 64.4° Fahrenheit (F) (Table 1).

Table 1. Biologically Based Numeric Temperature Criteria Applicable to Salmonid Uses

Biologically Based Numeric Temperature Criteria Applicable to Salmonid Uses	
Use	**Numeric Criteria (7-day statistic)**
Salmon and Steelhead Spawning	13.0°C / 55.4°F
Core Cold Water Habitat	16.0°C / 60.8°F
Salmon and Trout Rearing and Migration	18.0°C / 64.4°F
Salmon and Steelhead Migration Corridors	20.0°C / 68.0°F

Table 2. Modes of Thermally Induced Cold Water Fish Mortality

Modes of Thermally Induced Cold Water Fish Mortality (Brett, 1952; Bell, 1986, Hokanson et al., 1977)		
Modes of Thermally Induced Fish Mortality	**Range**	**Time to Death**
Instantaneous Lethal Limit – Denaturing of bodily enzyme systems	> 90° F (> 32° C)	Instantaneous
Incipient Lethal Limit – Breakdown of physiological regulation of vital bodily processes, namely: respiration and circulation	70 - 77° F (21 - 25° C)	Hours to Days
Sub-Lethal Limit – Conditions that cause decreased or lack of metabolic energy for feeding, growth or reproductive behavior, encourage increased exposure to pathogens, decreased food supply and increased competition from warm water tolerant species	64 - 74° F (18 - 23° C)	Weeks to Months

Johnson Creek temperature monitoring from 2009 to 2014 indicates violations of the temperature standard in most of the tributary streams in the watershed, even high up in the "headwaters" reaches near Boring, and in Damascus, Gresham, and Happy Valley. The lower mainstem of Johnson Creek, in Portland and Milwaukie, is consistently above average and outside of acceptable levels for aquatic wildlife. Historically, streams were kept cool by forests that shaded the stream channels. But in 2002, the average effective shade over mainstem Johnson Creek was just under 40% (ODEQ, 2004). Monitoring conducted by the City of Gresham in Beaver Creek shows a similar concern with respect

to stream temperatures that exceed standards established by DEQ (City of Gresham, 2020).

Reduction of stream temperatures requires a system-wide riparian landscape perspective. Restoring vegetation along stream banks to provide shade is one of the most effective means of reducing stream temperatures. Eliminating or bypassing in-line ponds is an additional restoration strategy identified by the Johnson Creek Watershed Council (JCWC)[1] for reducing high water temperatures in the watershed (JCWC, 2015). The Portland Bureau of Environmental Services (BES), JCWC, and their partners implement riparian restoration projects throughout the watershed that are targeted at reducing stream temperature in area streams. Multnomah County protects riparian areas on private land through land use codes and ordinances. The County also partners with local jurisdictions, such as through the Beaver Creek Conservation Partnership and the Interjurisdictional Committee of Johnson Creek, to identify restoration opportunities. Outreach work to inform landowners of the benefits of riparian vegetation and on-the-ground restoration work is conducted by partner agencies and non-profits (Multnomah County TMDL, 2022).

B. Turbidity/Sedimentation

Sediment laden runoff from agricultural operations in the upper reaches of Johnson and Beaver Creeks makes its way into the watersheds where it contributes to degradation of instream and riparian habitats that aquatic species rely on to survive. Removal of riparian and upland vegetation to convert forested areas to agricultural operations has led to increases in fine sediment that can impact stream substrate used by aquatic insects and spawning fish. Fine sediment covers and compacts gravel, reducing the ability of aquatic insects to respire and limiting survival of eggs deposited by fish through reduction in oxygen available to developing embryos.

Riparian and upland revegetation actions along with implementation of stormwater BMPs in and around the Filtration Facility, Pipeline alignments, and Intertie will significantly reduce the amount of fine sediment contributed to Johnson and Beaver Creeks compared to the previous agricultural land uses. PWB has made key design choices to avoid waterways throughout the project area, including boring beneath Beaver Creek at Cottrell Road, staying within the existing public right of way for pipeline alignments to the maximum extent possible, and, where not possible, placing pipeline alignments outside of riparian areas and instead using previously developed farm roads and farm areas.

[1] Johnson Creek Watershed Council is the local nonprofit organization organized in 1995 to protect, restore, and enhance the creek. The organization has been highly successful in advancing that mission through decades of projects, including controlling invasive species, planting native riparian vegetation, improving fish passage, and creating off-channel flood storage.

These design choices will reduce the potential for sediment being introduced to area streams that would lead to adverse impacts to aquatic resources.

2/18/2020 – Pre-development SW corner of the site looking west with SEC-wr overlay zone in the foreground. Johnson Creek is to the left in the photo. Photo shows bare soil agricultural area in SEC-wr overlay zone designed to protect Johnson Creek. (Approximately Located at 45.461602773819, -122.29999966927318)

8/31/23 – Pre-development photo from Johnson Creek near the SW corner of the filtration plant during a summer storm showing high levels of sediment in the water

III. Existing Aquatic Species Distribution

Native migratory fish species are well studied in this area, due to their at-risk status (most populations in the region are listed under the Endangered Species Act) and regional importance. The distribution of native migratory fish is often used as a surrogate for the presence and distribution of other species with less research available to determine the extent of distribution. Native fish species are typically distributed as far up in a watershed as instream habitat conditions will allow for successful spawning, rearing, and migration. These conditions include the availability and quality of water (cool

temperature, low toxicant concentrations), suitability of instream habitat (pool depth, substrate composition, large woody debris), and the presence/absence of barriers to migration.

In February 2001, as part of the Oregon Plan for Salmon and Watersheds (Oregon Plan), the Oregon Department of Fish and Wildlife (ODFW) began an effort to develop consistent and comprehensive fish habitat distribution data at a scale of 1:24,000 (24K). The primary goal of the 24K Project was to develop consistent baseline datasets at the 24K scale by obtaining universal input and agreement from other Oregon Plan participating projects. While fish habitat distribution data was the primary target, other important information or attributes were also studied during the 24K Project, including:

- barriers to adult migration,
- documentation of direct observations,
- species origin and present production information, and
- timing of different life-stages (i.e., holding, spawning, rearing, adult and juvenile migration, and incubation/gravel emergence, etc.).

This 24K Project dataset provides a picture of the fish habitat that is or was historically available and utilized by fish species in Oregon. For the purposes of the 24K Project, "habitat distribution" is defined as suitable areas believed to be currently or historically used by wild, natural, and/or hatchery fish populations. The term "currently" is defined as within the past five reproductive cycles for a given species. "Historically," is defined as prior to the past five reproductive cycles for a given species (Cooney, 2003). The 24K Project provides extensive and authoritative information about the fish habitat distribution in the area where the project is proposed.

As documented in the 24k Project, Johnson Creek and Beaver Creek support several species of native migratory and resident fish that are common to Oregon rivers and streams including: coho salmon (ESA listed – threatened), fall Chinook salmon (ESA listed – threatened), winter steelhead (ESA listed – threatened), cutthroat trout (Oregon – sensitive species), rainbow trout, lampreys, minnows (e.g., dace, shiners), and sculpins. Non-native fish species are present in the lower reaches of both watersheds where warmer water and habitat conditions are suited for their persistence through harsher winter stream conditions.

The upper reaches of both streams are impacted by development including agriculture, roads, and expansion of the urban/rural interface. Despite ongoing development in the area, cutthroat trout are known to be present as far upstream as Cottrell Road (Wild Fish

Conservancy, 2012) in Johnson Creek[2]. Cutthroat trout are the native fish species that typically occupies the uppermost reaches of regional streams. ESA listed fish species (coho and winter steelhead) are considered present in Johnson Creek up to a point that is 2.26 miles downstream of the southwest corner of the Filtration Facility site (ODFW, 2023). The distribution of ESA listed fish likely ends at that location due to the presence of 14 barriers to migration (dams, fords, road culverts) that are documented between 307th Ave. and Cottrell Road. All except one of the barriers are deemed to be partial barriers to upstream migration, so there may be occasions when they are passable to ESA listed fish. A large pond creates a complete barrier immediately upstream of Cottrell Road (between Cottrell Road and the Filtration Facility site). If these barriers did not exist, migratory fish could access the reach of Johnson Creek adjacent to the Filtration Facility and benefit from the additional habitat provided.

Cutthroat trout are distributed upstream to Lusted Road in all the upper tributaries of Beaver Creek[3]. The Intertie Site is further upstream, across Lusted Road. ESA listed fish species are considered present 1.42 miles downstream of Lusted Road on the South Fork Beaver Creek and 1.92 miles downstream of Lusted Road on the North Fork Beaver Creek. ODFW's determination of the historical upper extent of ESA listed fish presence is based on "Concurrence of Professional Opinion" based on habitat conditions required by fish to survive and reproduce. Additionally, observations of fish have been conducted for the North Fork Beaver Creek, where ESA listed winter steelhead were documented during juvenile fish surveys (Wild Fish Conservancy, 2012), and for the South Fork of Beaver Creek, where cutthroat were documented during bioassessment surveys conducted in area streams.

In addition to fish species known to be present in the Johnson and Beaver Creek watersheds, several amphibian species are present in wetland and riparian habitats near the Filtration Facility, Intertie Site, and along the Pipeline alignments. There are 63 observations of amphibians (including northern red-legged frog, Pacific chorus frog, Oregon slender salamander, Dunn's salamander, northwestern salamander, rough-skinned newt, Pacific giant salamander, and western painted turtle) reported within the upper Johnson Creek and Beaver Creek watersheds based on data collected from iNaturalist (iNaturalist, 2025) and surveys conducted for BES in reaches of Johnson Creek downstream of the Filtration Plant (Adolfson, 2000). The iNaturalist observations do not

[2] Upstream distribution of cutthroat trout in Johnson Creek is historical distribution based on concurrence of professional opinion. See Attachments 1 and 2 for maps of current/historical fish presence.
[3] Upstream distribution of cutthroat trout in Beaver Creek is historical distribution based on concurrence of professional opinion. See Attachments 1 and 2 for maps of current/historical fish presence.

provide exact location information due to the sensitivity of most amphibian species but it provides a clear indication that amphibians are present in the area.

Amphibians rely on healthy, intact riparian areas where they can forage and seek refuge from predators, with many species being dependent on waterbodies to breed. Red-legged frogs are a state sensitive / strategy species in Oregon that use riparian vegetation, moist forests, and woodlands, as well as dense brush and logs during summer months. The project will enhance the existing riparian and upland areas compared to the previous agricultural land use, which directly negatively impacted habitats required by amphibians to survive.

IV. Review of Stormwater Design and System Operation and Maintenance

The potential adverse impacts to water quality, aquatic species, and the habitats they rely on were targeted considerations during development of the design and specifications for the project, and in particular the project stormwater systems which are the only project aspect which has the potential to have an adverse effect on water quality or aquatic species. Those stormwater designs and specifications are outlined in three reports that have been provided into the Multnomah County land use record for this proceeding: (1) the Filtration Facility Site Stormwater Drainage Report (April 2025), submitted concurrently into the record with this memorandum; (2) the Finished Water Intertie Site Stormwater Drainage Report, Exhibit A.75; and (3) the Pipelines Project Stormwater Report, Exhibit A.77. Collectively, these reports provide information about the stormwater management for the entire project and are referred to in this memorandum as the "Project Stormwater Reports."

As explained further below, it is our expert opinion that the proposed project will not adversely affect water quality or aquatic habitat in the area (including in Johnson or Beaver Creek). This includes the main Filtration Facility site, the Intertie site, and the pipeline alignments. We reach this conclusion after reviewing the Project Stormwater Reports and after receiving extensive responses to our questions posed to stormwater and project designers.

C. Sedimentation

At the Filtration Facility site, post-construction site conditions will convert approximately 14 acres of the total 95-acre site to impervious surface. In addition, approximately 33 acres of cropland will be restored to native meadow, grassland, or Oak woodland.

Compared to the prior agricultural conditions of the site, this will decrease sediment loading from the site (CBP, 2018; Stuntebeck et al., 2011). Furthermore, stormwater best management practices (BMPs) are being implemented across the site to treat runoff for the water quality design storm (1.61 inches). The proposed BMPs include ecoroofs, vegetated swales, filter strips, bioretention and stormwater planters. The specified BMPs are referenced in the Portland SWMM as approved facilities to meet water quality performance standards. Table 3 of the Filtration Facility Stormwater Drainage Report shows collective reduction in sediment loading by upwards of 70%. Additionally, for storm events greater than the water quality design storm, the proposed detention ponds will provide further treatment by allowing sediment to settle out during the time water is detained in these facilities.

At the Intertie site, the stormwater system, which includes grassy swales and bioretention, will reflect a treatment train approach to provide both water quality and water quantity treatment for the same suite of stormwater design events as the Filtration Facility site. Sediment loads from the 0.57-acre site will be reduced compared to the pre-development (agricultural land) condition loads because of the proposed post-development stormwater treatment system. The proposed pipelines will create temporary disturbances during construction but will have no post-development changes compared to pre-development conditions with respect to water quality and water quantity.

Both the Filtration Facility site and Intertie site stormwater management designs provide a treatment train approach for most of the flow paths, such that runoff is treated and managed through multiple BMPs. The result is stormwater traveling to Johnson Creek and Beaver Creek in a manner that contributes significantly less sediment loading to the receiving waters compared to the pre-development agricultural land use. Therefore, the project will not adversely affect, and will instead positively affect, sediment loading of aquatic habitats in the area.

The Lusted Road Distribution Main (LRDM) will be within the developed area of the right-of-way of SE Cottrell Road and cross under Beaver Creek below the culvert that conveys the creek, just downstream of Cottrell near the intersection of Dodge Park and Cottrell Road. Although the selected low impact design alignment passes through the SEC-WR zone where the zone encompasses the Cottrell Road right-of-way, neither the creek itself nor any of the vegetated corridor will be disturbed. Accordingly, there is no risk associated with the LRDM of introducing sediment laden water into Beaver Creek that would lead to adverse impacts to aquatic species in the creek and associated riparian area.

D. Other Pollutants

Similar to sedimentation, the project stormwater treatment practices will result in lower pollutant loading rates in area aquatic habitats compared to the pre-development agricultural land use.

Excess nutrients (e.g., total phosphorus and total nitrogen) in receiving waters can contribute to impaired water quality. Like sediment, compared to the prior agricultural conditions of the site, nutrient loading from developed land is anticipated to be less (CBP, 2018; Stuntebeck et al., 2011). Additionally, the stormwater systems for the Filtration Facility and Intertie will significantly reduce pollutants, including nutrients and other pollutants of concern,[4] in Johnson Creek and Beaver Creek. The treatment capability of the BMPs of the project stormwater systems are estimated to result in a pollutant load reduction of at least 40% more from the site area being treated by the BMPs (see Table 3 from the 2025 Filtration Facility Site Stormwater Report). As noted above, on the eastern portion of the Filtration Facility site, about 29 acres of cropland will be restored to a native meadow and oak woodland, which will produce significantly lower nutrient loading compared to the prior cropland use (CBP, 2018; Stuntebeck et al., 2011). At the Intertie site, the conversion of 0.31 acres of cropland to impervious surface will result in a net reduction in nutrient and other pollutant loading based on land cover change. Additionally, the stormwater BMPs on site (swales and bioretention) will provide additional load reductions of at least 40%. The proposed pipelines will create temporary disturbances during construction but will have no post-construction changes compared to existing conditions with respect to water quality.

For pesticides, the prior nursery crop production at the Filtration Facility and Intertie sites required the application of pesticides, resulting in runoff with pesticide loading into area aquatic habitats. In contrast, PWB has committed[5] to not applying pesticides or herbicides to any vegetation of the project. Additionally, the project includes removal and beneficial reuse of soils that were contaminated by agricultural use of pesticides, under guidance and permitting from ODEQ. The removal of contaminated soils, in combination with the commitment to not applying any new pesticides or herbicides to project areas, will result in a dramatic reduction in pesticide loading rates traveling from project areas into area aquatic habitats.

Similarly, for bacteria, the project will result in reduced bacteria loading compared to the pre-development agricultural condition. The Johnson and Beaver Creek impairments for

[4] Defined in the 2025 Filtration Facility Stormwater Report, Section 1.6.2.
[5] PWB also proposed this commitment as a condition of approval, which was incorporated by the former Hearings Officer into the prior Final Order as a condition of approval on page 84.

bacteria are primarily attributed to livestock, wildlife, and/or failing septic systems in the watershed. The proposed site conditions at the Filtration Facility, Intertie, and pipeline alignments do not create any added sources of bacteria loading compared to existing conditions. Additionally, the stormwater BMPs on site will treat bacteria loads. A new state of the practice septic system will be installed within Basin A of the Filtration Facility site, and the Intertie site and pipeline alignments do not have any restrooms or other sources of septic effluent.

Overall, the project will not adversely affect, and will instead positively affect, pollutant loading to aquatic habitat in the area.

E. Temperature

PWB has included extensive BMPs in the Project Stormwater Reports to ensure that stormwater does not have an adverse temperature effect on area aquatic habitats.

For the Filtration Facility, those BMPs include enhanced planting approaches to promote shading of detention basins, use of an ecoroof on 93,700 square feet of roof, filtration practices like planters and grassy swales for conveyance and treatment (these flows will discharge through discharge point #1). In addition, the revegetation of 29 acres on the eastern side of the Filtration Facility site will promote shallow groundwater recharge that will help regulate water temperature, flow rates, volumes, and velocities.

Revegetation of 2 acres in the southwest corner of the Filtration Facility site has already begun and will increase the riparian buffer width and provide additional protection from potential thermal inputs to Johnson Creek related to development of the Filtration Facility site.

Stormwater leaving the Filtration Facility at Discharge Point #2 (the discharge closest to Johnson Creek) will be evenly dispersed using the flow spreader. The area immediately below the flow spreader will have approximately one foot of drain rock to accept water dropping off the flow spreader weir and then approximately twenty feet of native shrubs and grasses (the "Grass/Brush Area"). The planting plan for the Grass/Brush Area is provided in Table 3 below. This Grass/Brush Area below the flow spreader will allow for maintenance of the flow spreader and provides a buffer between the concrete flow spreader and tree roots lower on the slope.

Table 3. Grass/Brush Area Planting

Grass/Brush Area - Containerized Planting		
Botanical Name	**Common Name**	**Lbs/Acre**
Cornus sericea	Red-Osier Dogwood	1 Gallon - 1 Row @ 6' O.C.
Spiraea douglasii	Douglas Spirea	1 Gallon - 2 Rows @ 6' O.C.
Carex obnupta	Slough Sedge	1 Gallon @ 36" O.C.
Deschampsia cespitosa	Tufted Hairgrass	1 Gallon @ 18" O.C.
Cornus and Spiraea are to be arranged in rows directly below the flow spreader drain rock on 6' centers. Carex is to be interplanted throughout the 20' zone on 3' centers around the Cornus and Spiraea. Deschampsia is to be planted below the rows of Cornus and Spiraea. It is to be interplanted between the Carex on 18" centers.		

Grass/Brush Area - Stormwater Seed Mix		
Botanical Name	**Common Name**	**Lbs/Acre**
Grasses		
Danthornia californica	California Oatgrass	5
Deschampsia cespitosa	Tufted Hairgrass	3
Deschampsia elongata	Slender Hairgrass	3
Hordeum brachyantherum	Meadow Barley	1
Flowering Plants		
Achillea millefolium	Yarrow	0.5
Aesclepias speciosa	Milkweed	0.5
Carex densa	Dense Sedge	1
Carex unilateralis	Lateral Sedge	1
Juncus patens	Slender Rush	1
Juncus tenuis	Spreading Rush	1
Lupinus latifolius	Broadleaf Lupine	0.1
Potentilla gracilis	Slender Cinquefoil	0.5

Restoration of the area between the Grass/Brush Area and Johnson Creek (the "Riparian Buffer Area") has been underway since 2023 with the goal of establishing a functioning riparian forest. A functioning riparian area will provide a resilient plant cover, be resistant to surface erosion, shade runoff, and protect aquatic resources in the creek. The planting plan for the Riparian Buffer Area is summarized in Table 4 and includes native shrubs and trees well suited to post-development conditions in this area and designed to augment existing woody native cover along Johnson Creek. Willow bundles will be incorporated in the plan for the purpose of quickly creating a means to slow and redisperse surface flow and stabilize soil in the Riparian Buffer Area.

Table 4. Riparian Buffer Area Planting

Botanical Name	**Common Name**	**Composition**
Trees		
Malus fusca	Western Crabapple	6/10,000 s.f.
Pseudotsuga menziesii	Douglas Fir	3/10,000 s.f.
Rhamnus purshiana	Cascara	20/10,000 s.f.
Salix scouleriana	Scouler's Willow	7/10,000 s.f.
Thuja plicata	Western Red Cedar	3/10,000 s.f.
Shrubs		
Cornus sericea	Redosier Dogwood	80/10,000 s.f.
Lonicera involucrata	Twinberry	80/10,000 s.f.
Physocarpus capitatus	Ninebark	80/10,000 s.f.
Rosa pisocarpa	Swamp Rose	80/10,000 s.f.
Spiraea douglasii	Douglas Spirea	80/10,000 s.f.

PWB will take an adaptive management approach in response to challenges with establishing planned vegetation in both the Grass/Brush Area and the Riparian Buffer Area by adjusting the plant palette to those that are appropriate for post-development conditions. Plans are in place to irrigate plants as needed during drier months to ensure effective establishment and survival of the proposed vegetation. Appropriate measures to address challenges related to planting will be taken to ensure successful establishment and survival of vegetation between the flow spreader and Johnson Creek.

The BMPs and extensive revegetation described above, once established, will minimize the risk of thermal loading in stormwater that reaches Johnson Creek. Together, these measures are anticipated to fully prevent adverse thermal effects on area aquatic habitat from the Filtration Facility.

The most significant risk of thermal loading in stormwater leaving Discharge Point #2 would come from a large storm (e.g., 2-yr storm event), during a time of excessive heating in the region, that occurs prior to the full establishment of the planned vegetation in the Riparian Buffer Area. As detailed in the Filtration Facility Site Stormwater Drainage Report (April 2025), in this area specifically, that kind of large storm during the dry season (when excessive heating is possible) has only occurred a few times in 38 years of data reviewed by the stormwater designers (see Tables 6 and 7 in the Filtration Facility Site Stormwater Drainage Report). However, even those few times in the 38 years of data were not accompanied by times of excessive heating – with the highest temperature day during those events being only 68 degrees.

However, given that it is unknown how the potential impacts from climate change will alter the frequency or intensity of rainfall events in the future, PWB will take additional steps to ensure that the project will not adversely affect thermal loading in Johnson Creek. First, PWB will monitor stream temperatures in Johnson Creek above and below the point of entry of project stormwater from Point of Discharge #2 to confirm that stormwater released from the site is not increasing temperature in a manner that could potentially cause adverse impacts to aquatic resources. Monitoring would include placement of digital data loggers in the creek upstream of the influence of stormwater being released from Point of Discharge #2 and downstream an adequate distance to ensure mixing of the stream and contributing stormwater flow from the Filtration Facility. Monitoring would follow industry protocols to ensure accuracy and precision of temperature measurements including proper calibration of data loggers, determination of measurement intervals, and screening for errors in data collection (Dunham, et. al. 2005).

Second, to additionally ensure that the project will not adversely affect thermal loading in Johnson Creek, the project will facilitate the reduction of water temperatures in Johnson Creek through partnership with the Johnson Creek Watershed Council. In meetings with PWB about reducing temperatures in Johnson Creek, the Council has identified several opportunities for restoration of private land within the upper watershed near the project site, each of which would increase riparian vegetation and reduce thermal loading in the Creek.

As stated before, in 2002 the average effective shade over mainstem Johnson Creek was just under 40% (ODEQ, 2004). Facilitating the restoration of riparian habitats throughout Johnson Creek would reduce thermal loading and provide a myriad of other benefits to fish, amphibians, and other wildlife currently present in other parts of the basin that are dependent on healthy riparian areas to fulfill specific life history needs. Once established, the Riparian Buffer Area between the Filtration Facility and Johnson Creek will provide substantial benefit to aquatic species by reducing temperatures of stormwater from the site below a level that leads to adverse impacts from the project.

The Intertie site represents less than 2% of the overall drainage area to the culvert under Lusted Road. The conversion of 0.31 acres of cropland to impervious surface will not influence temperatures in Beaver Creek compared to pre-development conditions. The site uses grassy swales and bioretention to manage the stormwater runoff which both have cooling benefits via filtration and infiltration. For the pipeline alignments, post-development conditions will be the same as pre-development conditions.

F. Hydrology (Stormwater Quantity)

With increased impervious surface, stormwater runoff volumes and rates will increase. For the project, applicable stormwater management standards and controls are applied to address the potential for change in hydrologic condition (also known as hydromodification) by requiring post-development peak discharges to match or be less than pre-development peak discharges for a range of design storms (i.e., water quantity flow control). In addition, for smaller, more frequent storm events (i.e., the 2-year return frequency and less) post-development design criteria require over-control, which is intended to maintain discharge velocities to non-erosive levels. These levels of control are achieved by implementing a range of BMPs to slow, filter, infiltrate, and detain the runoff volumes. For larger storms, the detention ponds provide the most significant levels of water quantity flow control.

As documented in the Filtration Facility Stormwater Report, the proposed stormwater management system will employ a treatment train approach, where flows are directed and conveyed to both water quality and water quantity control BMPs. In addition to treating the runoff from the Portland water quality storm (1.61 inch/24 hours) storm, there are flow control (quantity) requirements that range from over-control of the 2-year return frequency storm (limit the 2-year post-development peak flow to ½ the 2-year pre-development peak flow) to peak control of the 5-, 10-, and 25-year design storms (ensuring post-development discharge does not exceed pre-development discharge).

The over-control of the smaller, more frequent storms is a presumptive design approach that will control peak flow rates and prevent the channel-forming flows associated with hydromodification. In addition, at Point of Discharge #2, the flow spreader will spread flows out, reduce velocities even further, and promote the shallow infiltration and filtering of flows. The extensive plantings in the Grass/Brush Area and the Riparian Buffer Area described above will additionally slow velocities, re-spread flows, and promote shallow infiltration. Overall, the Filtration Facility stormwater will not adversely affect Johnson Creek through hydromodification or any other adverse impacts to area aquatic habitat related to post-development stormwater discharge and velocity.

The Intertie site similarly provides hydrologic control based on the same design criteria. As documented in the Intertie Stormwater Report (Exhibit A.75), the proposed stormwater management system will employ a treatment train approach, where flows are directed and conveyed to both water quality and water quantity control BMPs to meet the range of design storm water quality and flow control requirements, including over-control of smaller, more frequent storms to address hydromodification risk. As a result, Intertie stormwater will not adversely affect Beaver Creek through hydromodification or any

other adverse impacts to area aquatic habitat related to post-development stormwater discharge and velocity.

For the pipeline alignments, post-development conditions will be the same as pre-development conditions.

G. Adaptive Management

While measures described above are more than adequate to result in the project having no adverse impact to area aquatic habitat or water quality, contingency measures to mitigate unforeseen conditions are nonetheless prudent. PWB will establish an adaptive management approach that is based on stormwater inspections, water quality monitoring data, and operations and maintenance feedback loops. Adaptive management will allow PWB to implement a plan and continually revise it as they evaluate its effectiveness in achieving short- and long-term goals of protecting area aquatic resources.

V. Conclusion

Overall, the project will not adversely affect water quality or aquatic habitat in the area because necessary stormwater management design, operation, and maintenance plans are in place, and because PWB will facilitate the improvement of water quality and aquatic habitat in the area by JCWC. PWB will utilize adaptive management strategies as necessary to improve program effectiveness in preventing adverse impacts to aquatic resources in Johnson and Beaver Creeks.

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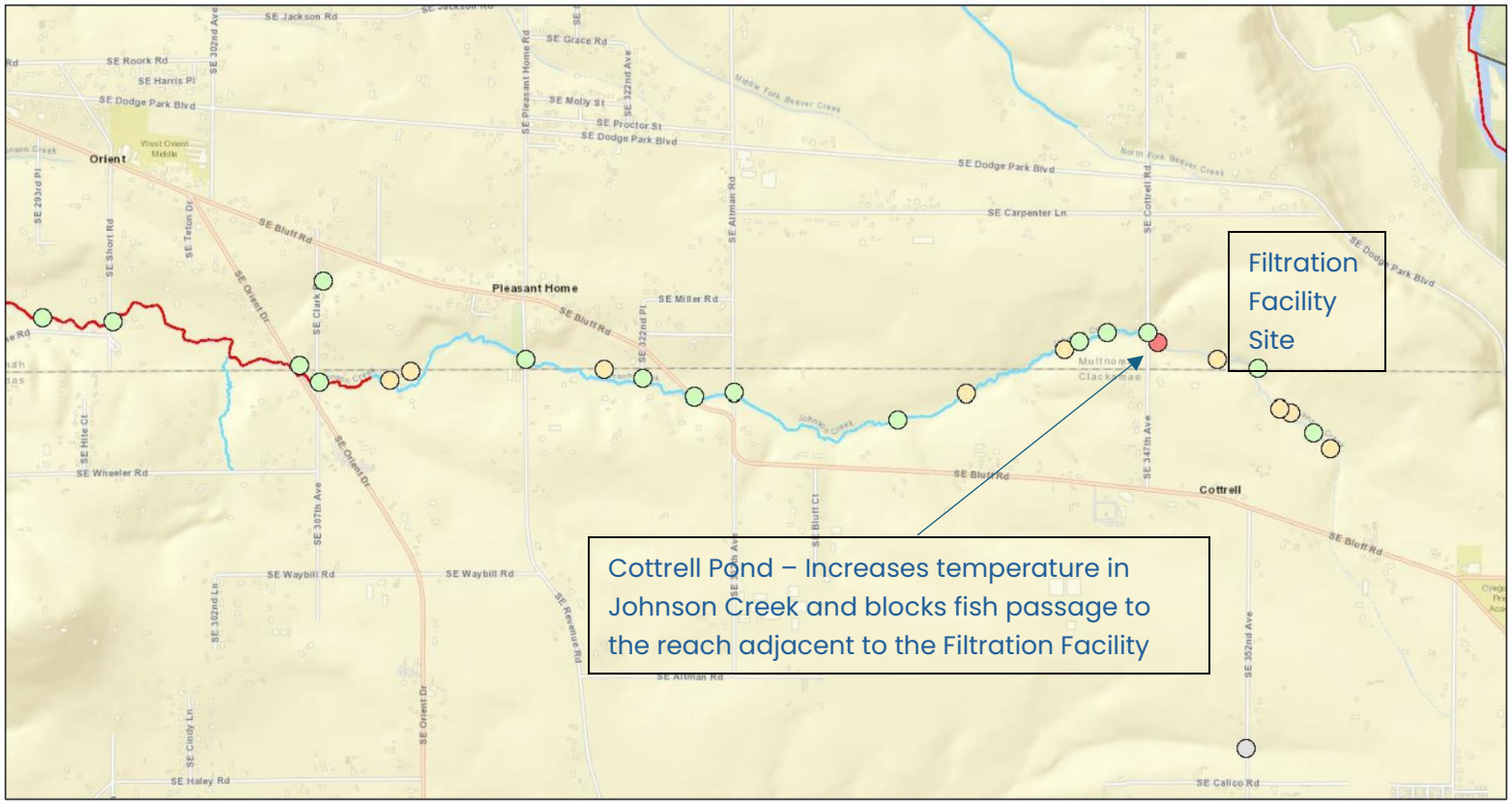
Attachment 1. Johnson Creek Fish Habitat Distribution & Barriers



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Fish Passage Barriers by Passage Status
- Blocked
- Partial Passage
- Passable
- Unknown Passage

Coastal Cutthroat Trout
- Resident, multiple uses
- Unknown

Winter Steelhead
- Spawning

Coho
- Spawning

ODFW Fish Biologist Districts

1:20,807

0 0.17 0.35 0.7 mi
0 0.28 0.55 1.1 km

Oregon Metro, Bureau of Land Management, State of Oregon GEO, State of Oregon, Esri, HERE, Garmin, INCREMENT P, NGA, USGS, U.S. Forest Service, ODFW, ODFW and multiple contributing state and federal agencies, ODFW, numerous state and federal

ODFW Web Map
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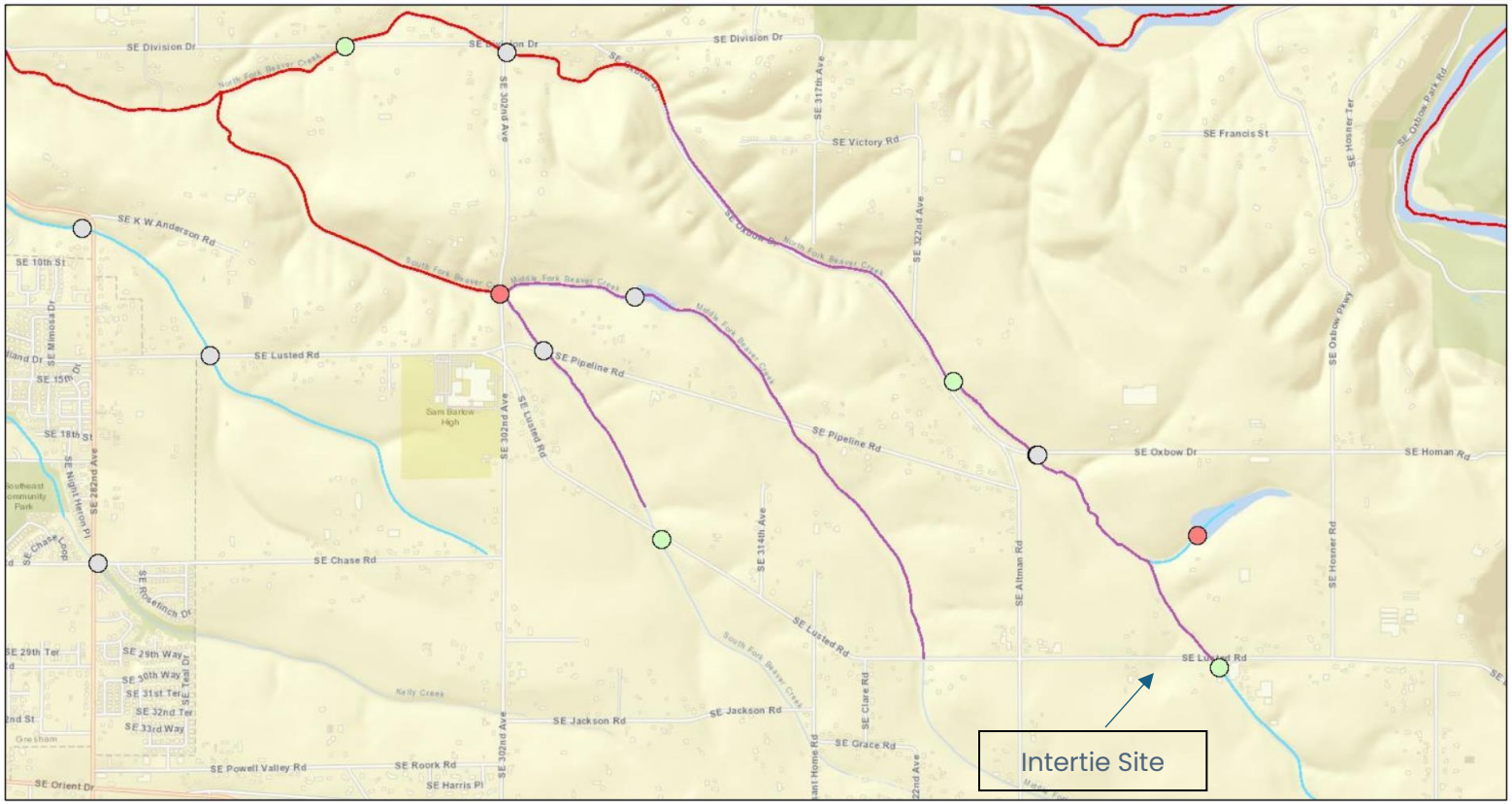
Attachment 2. Beaver Creek Fish Habitat Distribution & Barriers



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0 0.28 0.55 1.1 km

Fish Passage Barriers by Passage Status
- Blocked
- Passable
- Unknown Passage

Coastal Cutthroat Trout
- Resident, multiple uses
- Unknown

Winter Steelhead
- Historical
- Spawning

Coho
- Spawning

ODFW Fish Biologist Districts

Oregon Metro, Bureau of Land Management, State of Oregon GEO, State of Oregon, Esri, HERE, Garmin, INCREMENT P, NGA, USGS, U.S. Forest Service, ODFW, ODFW and multiple contributing state and federal agencies, ODFW, numerous state and federal

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