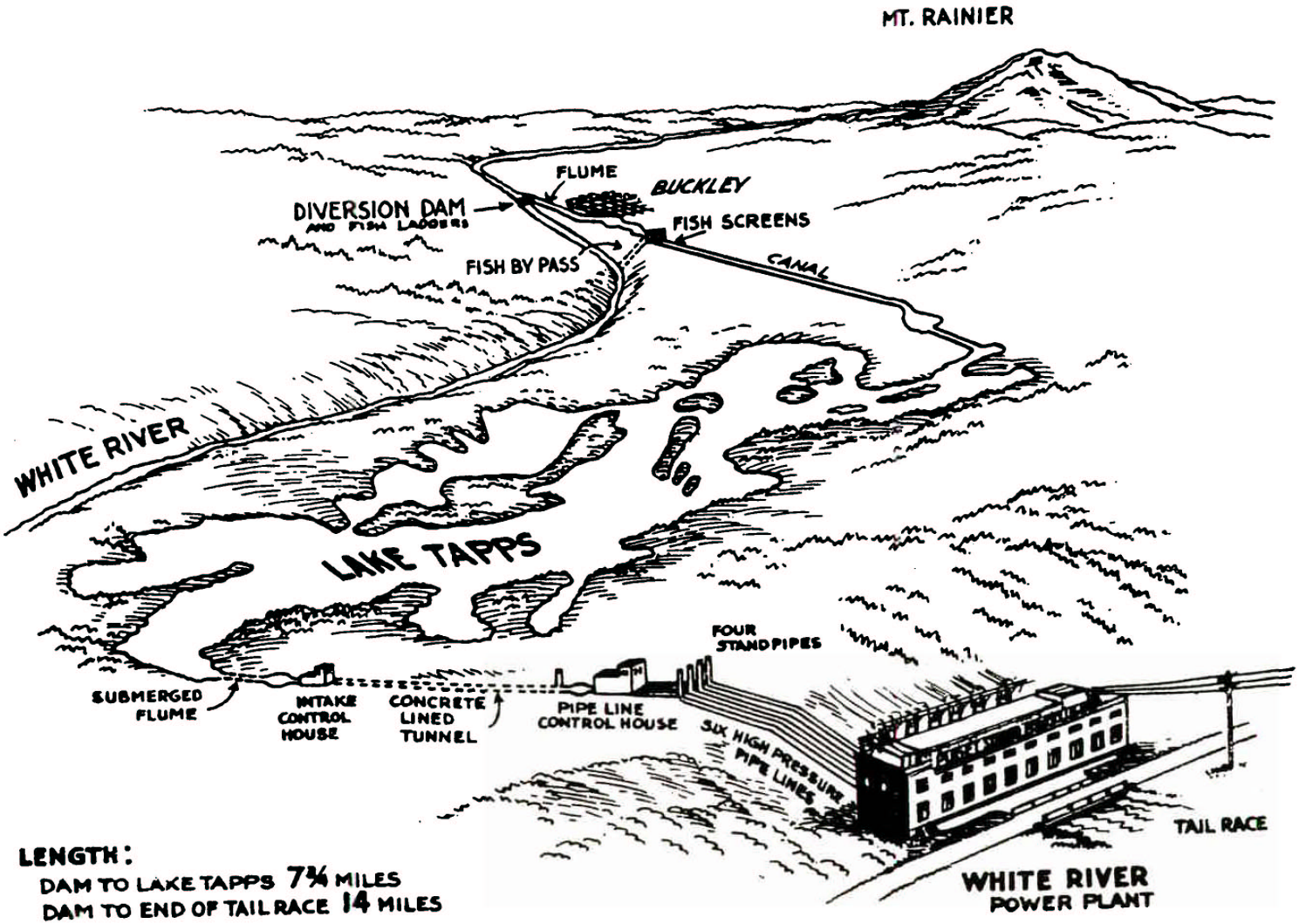
CASCADE WATER ALLIANCE

White River – Lake Tapps Reservoir
Asset Overview 1/21/22

Table of Contents


MT. RAINIER
FLUME
BUCKLEY
DIVERSION DAM
AND FISH LADDERS
FISH SCREENS
FISH BY PASS
CANAL
WHITE RIVER
LAKE TAPPS
FOUR STANDPIPES
SUBMERGED FLUME
INTAKE CONTROL HOUSE
CONCRETE LINED TUNNEL
PIPE LINE CONTROL HOUSE
SIX HIGH PRESSURE PIPE LINES
TAIL RACE
WHITE RIVER POWER PLANT
LENGTH:
DAM TO LAKE TAPPS 7¾ MILES
DAM TO END OF TAIL RACE 14 MILES

Lake Tapps Asset Overview

On Dec. 18, 2009, Cascade purchased Puget Sound Energy's former White River – Lake Tapps Reservoir Hydroelectric Project for use as future, municipal drinking water supply.

To date, Cascade's management of the Lake Tapps Reservoir Project (the Project) has focused on maintaining Recreational Lake Levels, managing aquatic vegetation, maintaining/improving water quality and maintaining/upgrading infrastructure to ensure reliable operations.

Lake Tapps Asset Overview

The Project can be divided into several segments:

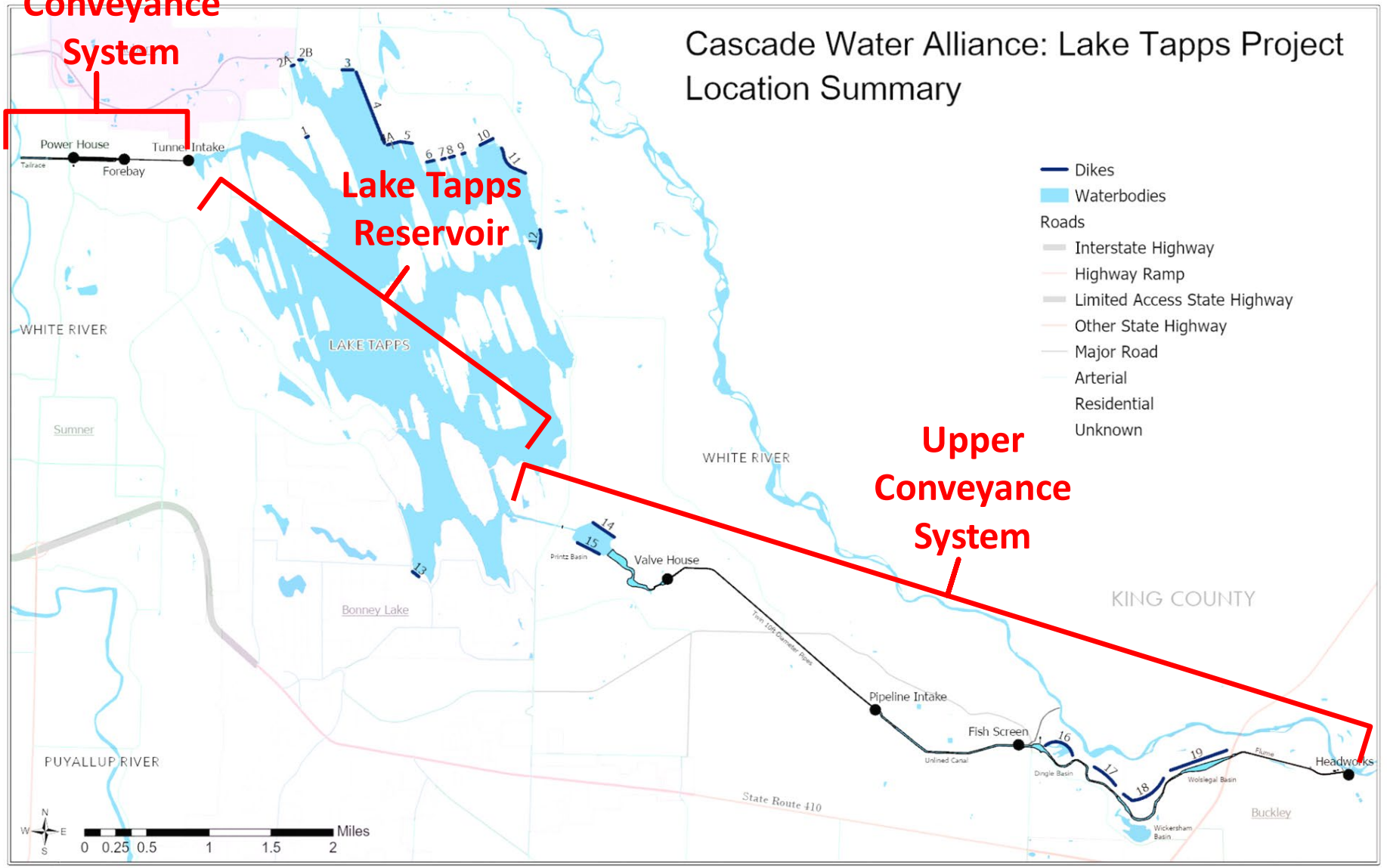
- **The Upper Conveyance System:** from the Barrier Structure in Buckley to the inlet to Lake Tapps in Bonney Lake; consisting of facilities to divert water from the White River and convey it to Lake Tapps, including Headgates, concrete and open flowline, settling basins, dikes and fish screens including a 30-inch fish return pipe, Valvehouse and pipeline intake.

- **Lake Tapps Reservoir:** including dikes

- **The Lower Conveyance System:** from the outlet of Lake Tapps to the White River in Sumner; consisting of tunnel intake, pipeline, forebay, penstocks, Powerhouse and Tailrace canal

Additionally, there is the **Stream Flow and Water Quality Gauging System,** where stream flow, Lake Levels and water quality data are collected (some required by Water Right conditions).

System Overview Map



Upper Conveyance System

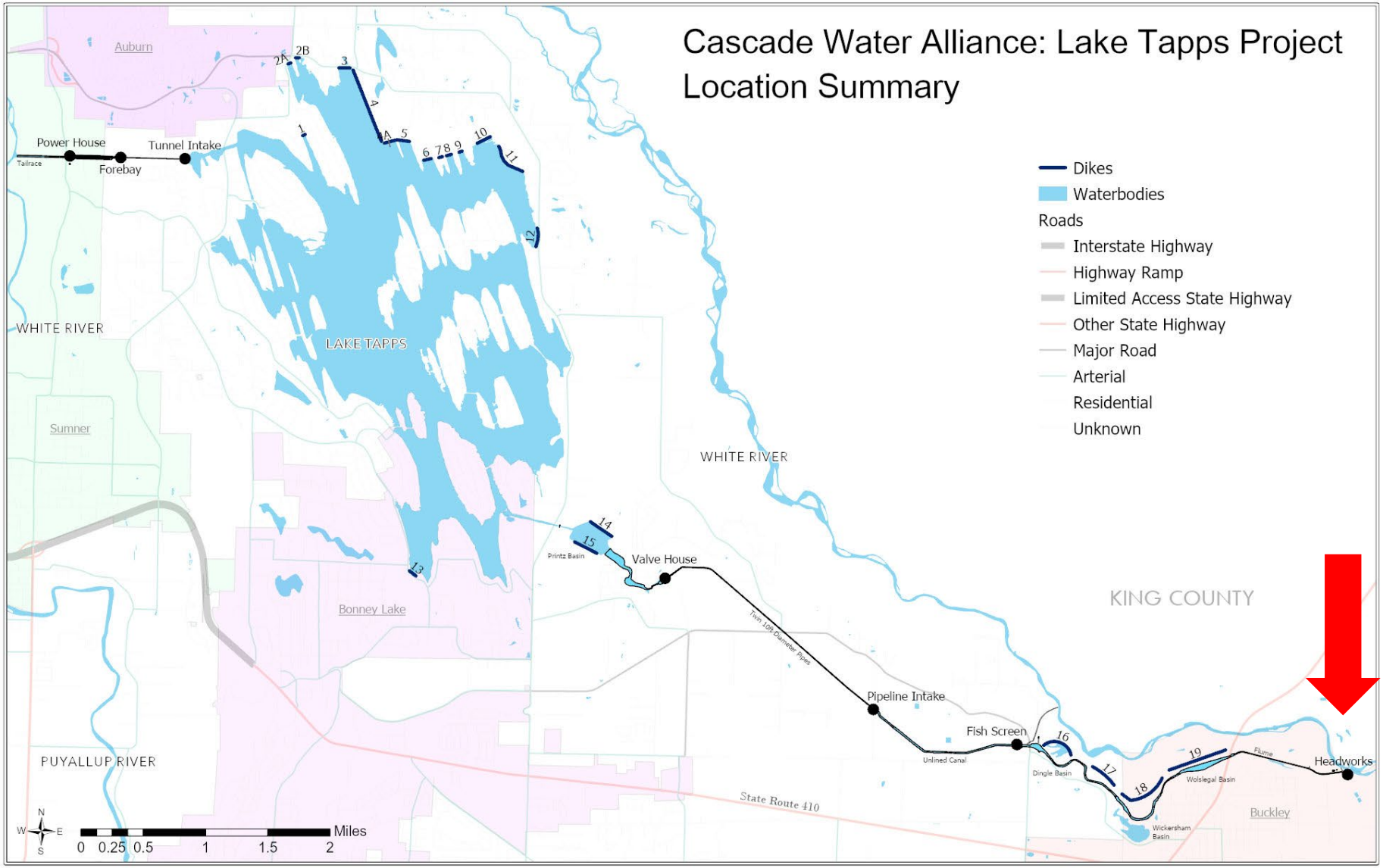
The Upper Conveyance System begins at the Headworks area in Buckley. The Headworks Area contains several facilities (described below) and auxiliary buildings (owned and leased) used for Project operations. From the Headworks area to the Powerhouse is approximately 14 miles by car but eight miles as the crow flies.

Upper Conveyance System - Barrier Structure

The original Barrier Structure in Buckley was built by PSE in 1911. The concrete and timber crib structure was operated and maintained by PSE (and Cascade) to create a pool enabling water to be diverted from the White River to fill Lake Tapps and also provided flow to a fish trap and haul facility owned and operated by the US Army Corps of Engineers (USACE) which was built in 1948 to transport fish around the USACE's Mud Mountain Dam (located approximately six miles upstream).

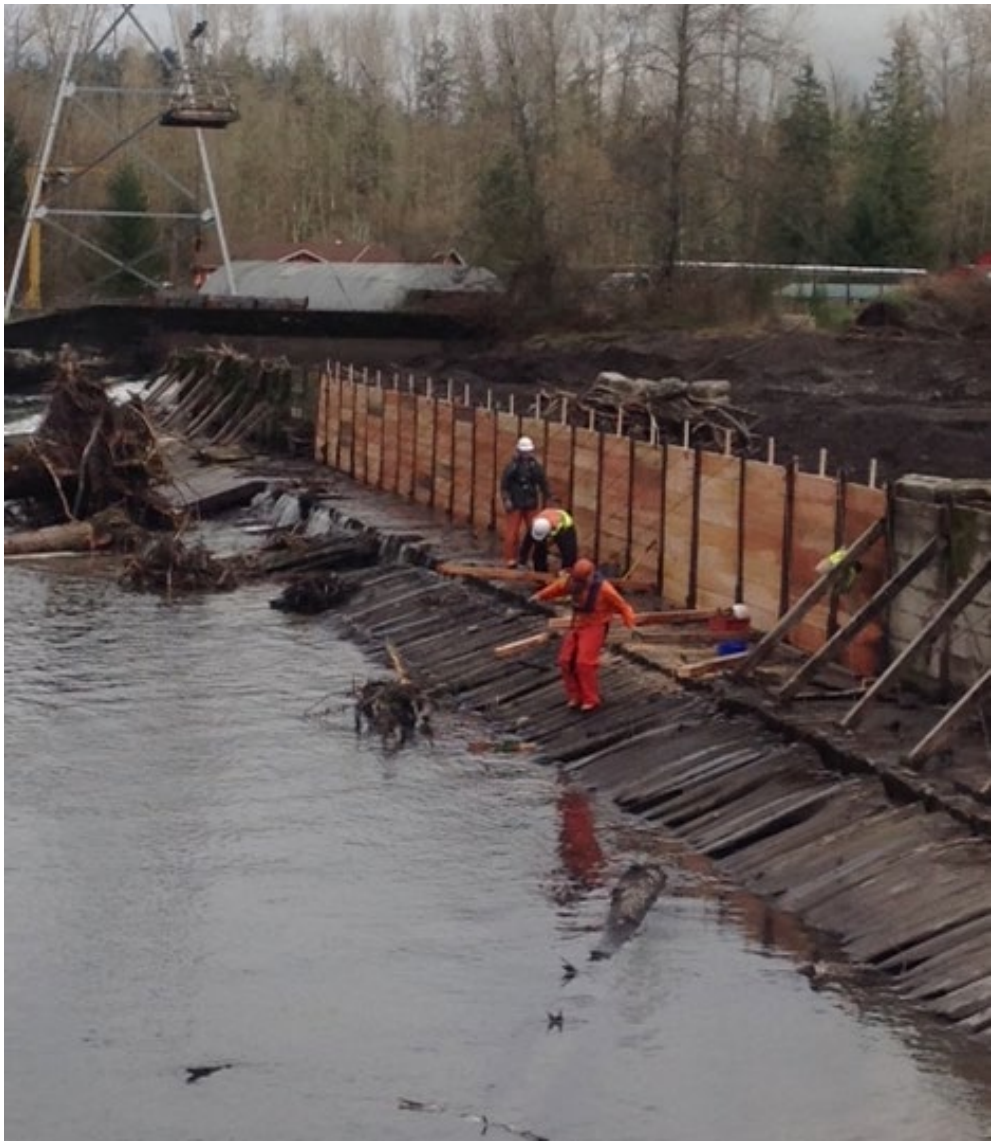
In 2018, Cascade conveyed the Barrier Structure and other property rights to the USACE to construct, own and operate a new barrier and trap and haul facility, as required by a Biological Opinion issued by the National Marine Fisheries Service (NMFS) in 2014.

Upper Conveyance System - Barrier Structure Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance System – OLD Barrier Structure



Upper Conveyance System – Barrier Structure Construction 2020

Upper Conveyance System - Headgates

Two, 13’ high by 15.5’ wide Headgates control diversion of water from the White River to Lake Tapps. These vertically operated riveted steel slide gates were originally constructed in 1911 and most recently refurbished and upgraded in 2015.

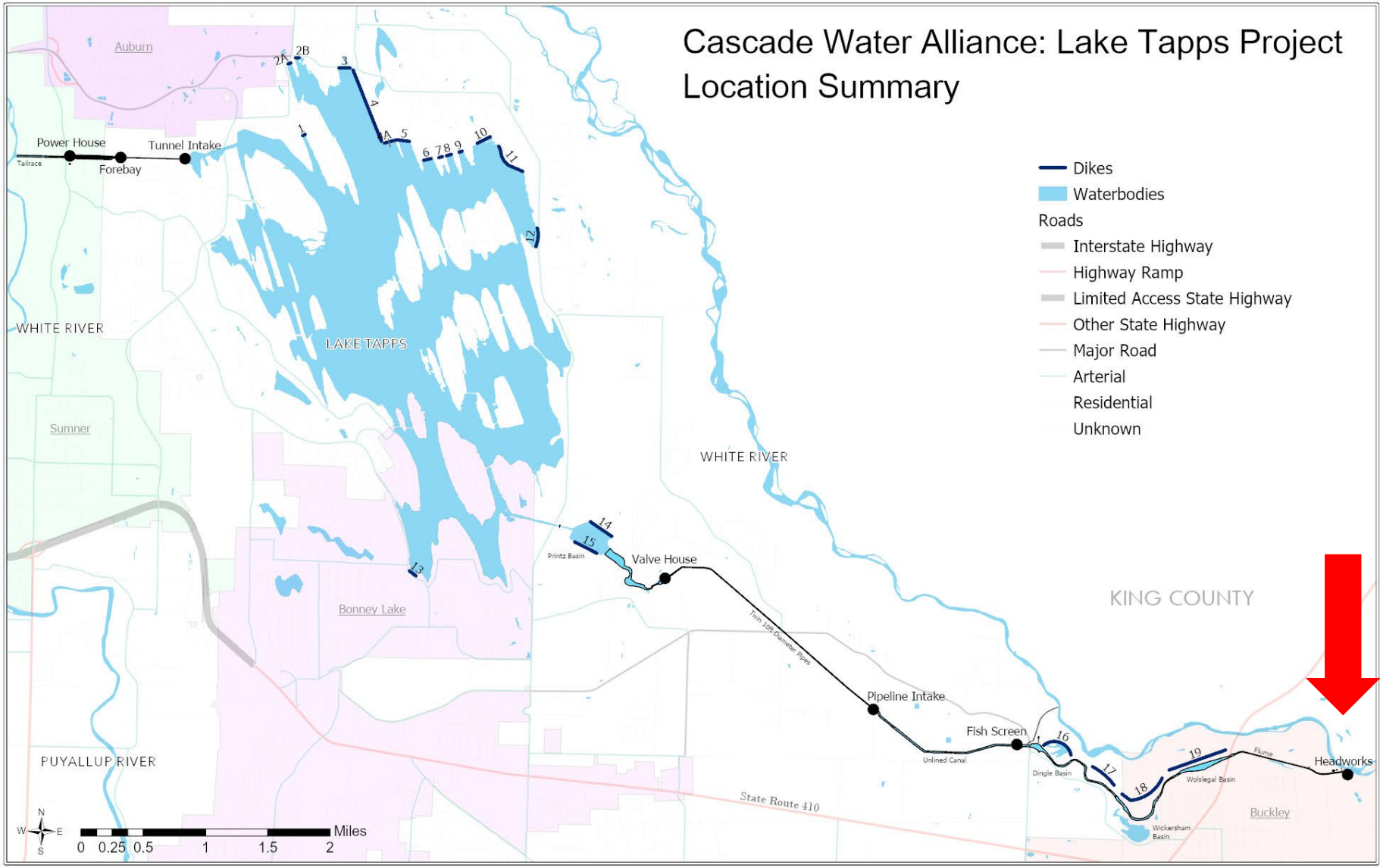
Gate No. 1 is the primary gate and is fitted with automated controls and can be operated remotely.

Gate No. 2 is an emergency gate that must be operated manually (requiring use of a crane to adjust gate height). It would be desirable to automate Gate No. 2, but it was determined not economically feasible.

The Headgate area includes the Tool House, Relief Cottage, Headgate Building, Dam Room, Pole Building and Comms Room.

Next Steps: Gate No. 1 is now automated, automating Gate No. 2 not economically feasible

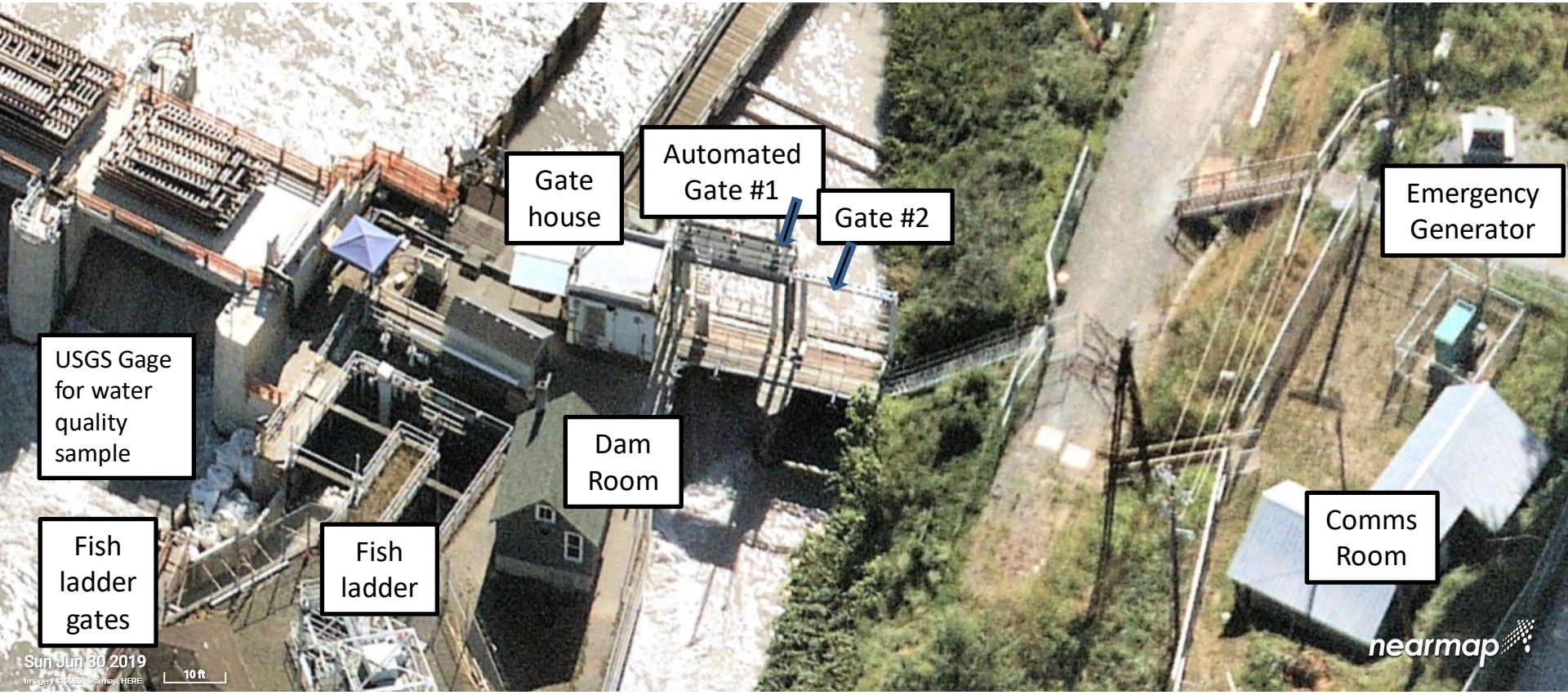
Upper Conveyance System – Headgates Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance System – Headgates (West)

Upper Conveyance System – Headgates (East)

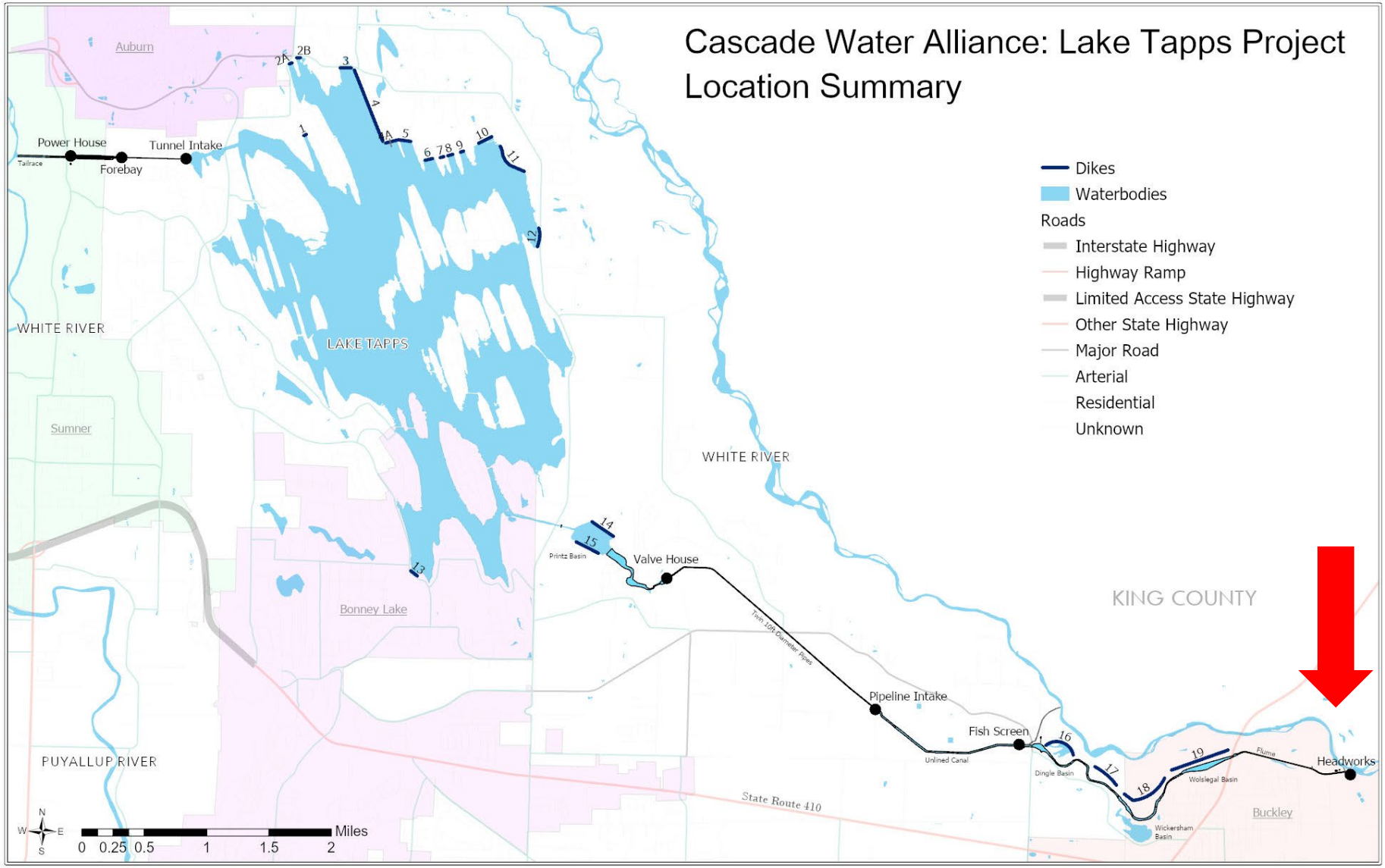


Upper Conveyance System – Cascade Intake Improvements

Cascade has designed new facilities to improve how water is diverted from the White River to Lake Tapps. These facilities will be constructed in conjunction with the USACE's Mud Mountain Dam Fish Passage Project beginning in 2021 (completion in 2022).

The primary advantage of the Intake improvements will be the new headwall along the River designed to reduce sediment and debris diversion (including a sediment sluiceway, automated sluice radial gate and bedload excluder wall). Automated flow control radial gates are located in the upper portion of the headwall to divert water from the higher level of the water column, thus reducing diversion of sediment and debris to the Flowline. Additional manually operated flow control slide gates are provided to allow maximum diversion. A flow divider wall splits flow between Headgate No. 1 and No. 2. A new access road and operating deck are included.

Upper Conveyance System – Cascade Intake Improvements Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance System – Artist Rendition of Intake Improvements

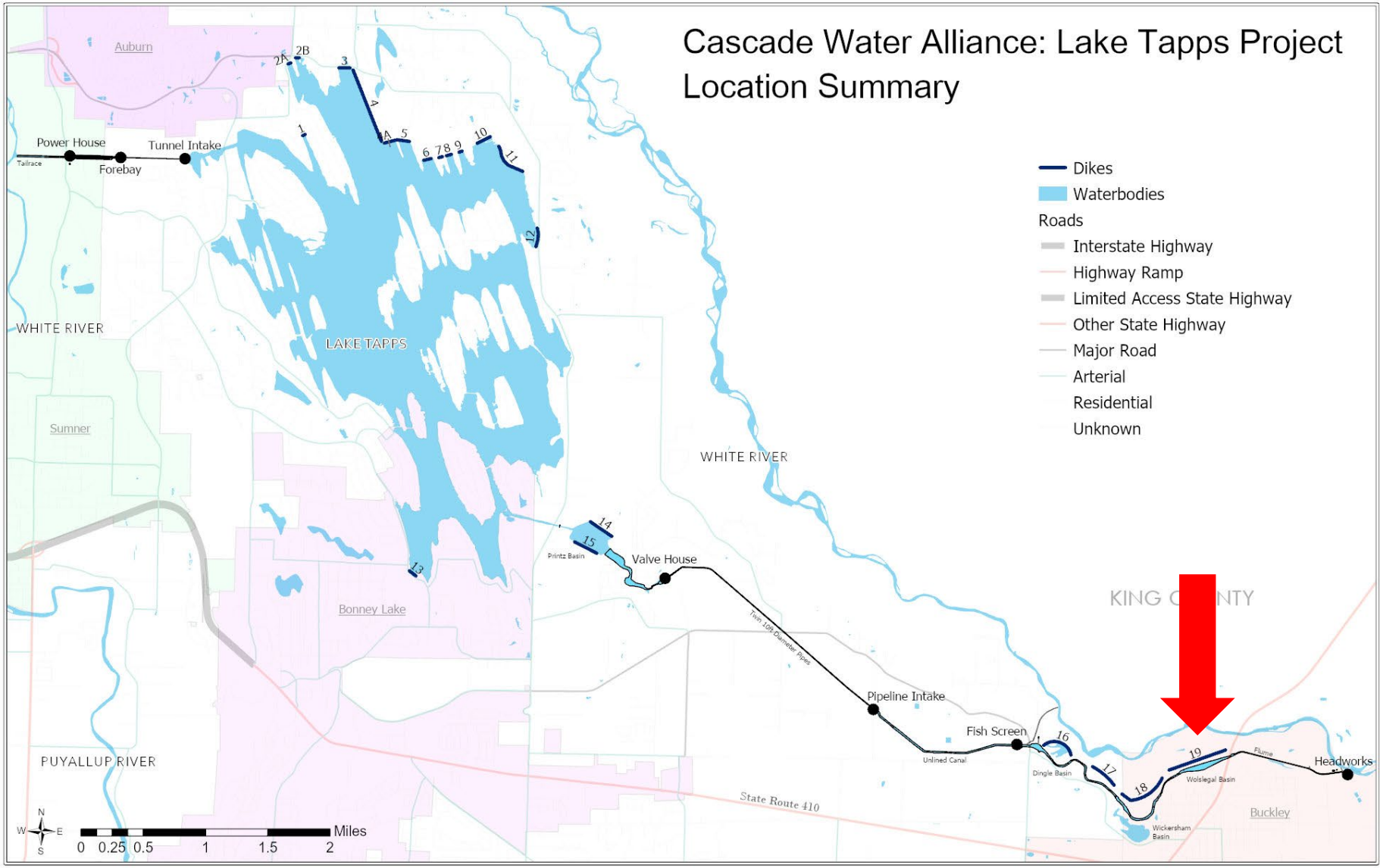
Project anticipated to begin 2021

Upper Conveyance System – Flume or Flowline

The Flume, or Flowline, conveys water approximately eight miles to Lake Tapps and consists of concrete lined canals, open canals, settling basins and a buried pipeline.

The last remaining section of timber flume was replaced in 2015. The original timber flume was 28’ wide and 9’ high, designed to handle 2,000 cfs. The total concrete canal is 18’ wide and approximately one mile long and is designed to handle the Water Right maximum diversion of 1,000 cfs. The current concrete canal is approximately 4,100 feet long.

Upper Conveyance System – Flume or Flowline Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance System – Flume or Flowline

Upper Conveyance System – Flume or Flowline – Old Wood Flume Tear Down

Upper Conveyance System – Flume or Flowline Construction

Upper Conveyance System – Flume or Flowline (new concrete flume that replace timber section)

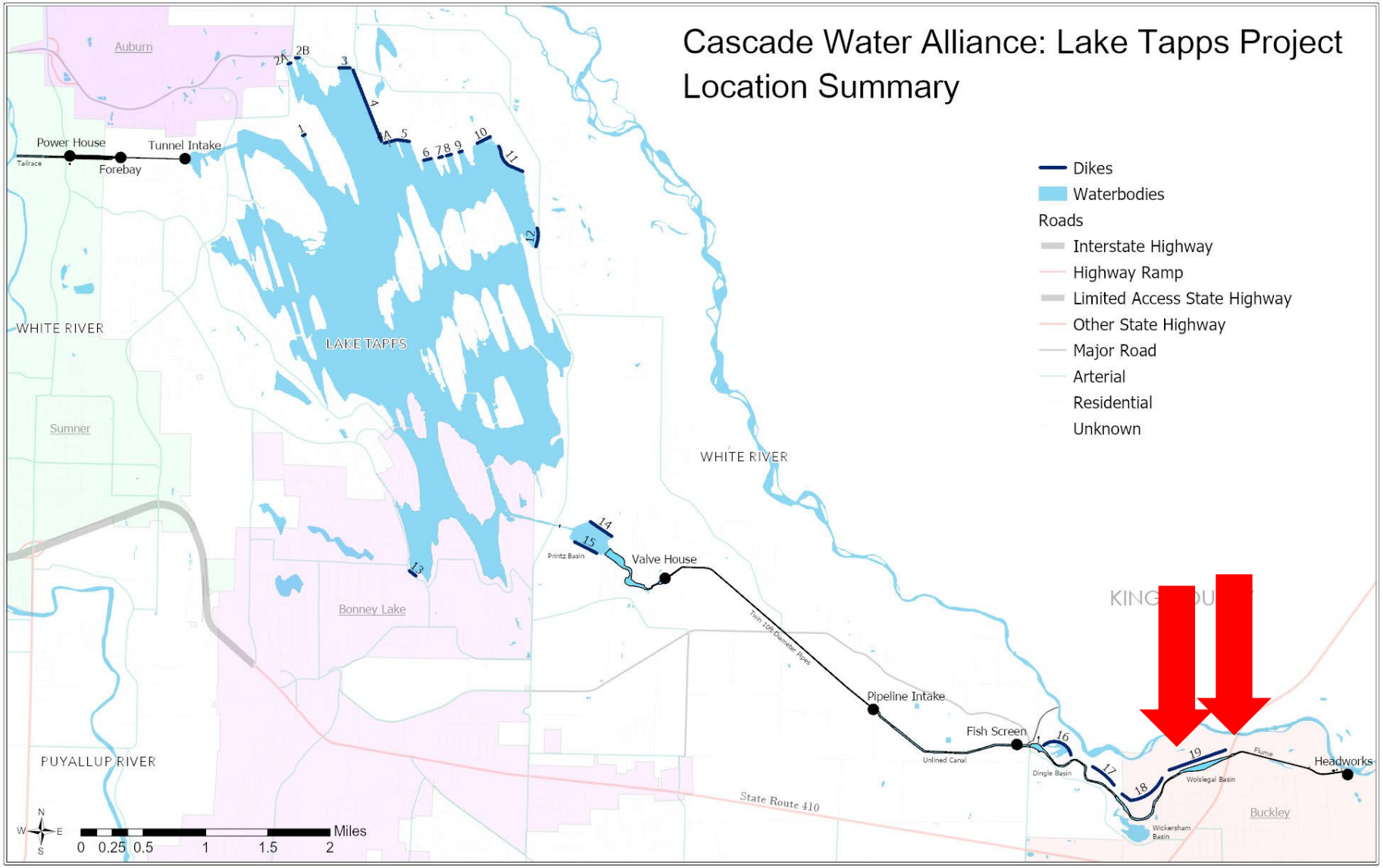
Upper Conveyance – Rock Chutes

Rock Chutes are pathways that remove small rocks and other debris from the Flowline with a crossbar that directs them back into the river.

Rock Chute #1 is located just downstream from the Headgates and was replaced in 1988. It diverts water and material through a motorized 4-foot wide slide gate into a 4-foot wide by 5-foot high concrete box culvert, which runs beneath the access road, back to the White River.

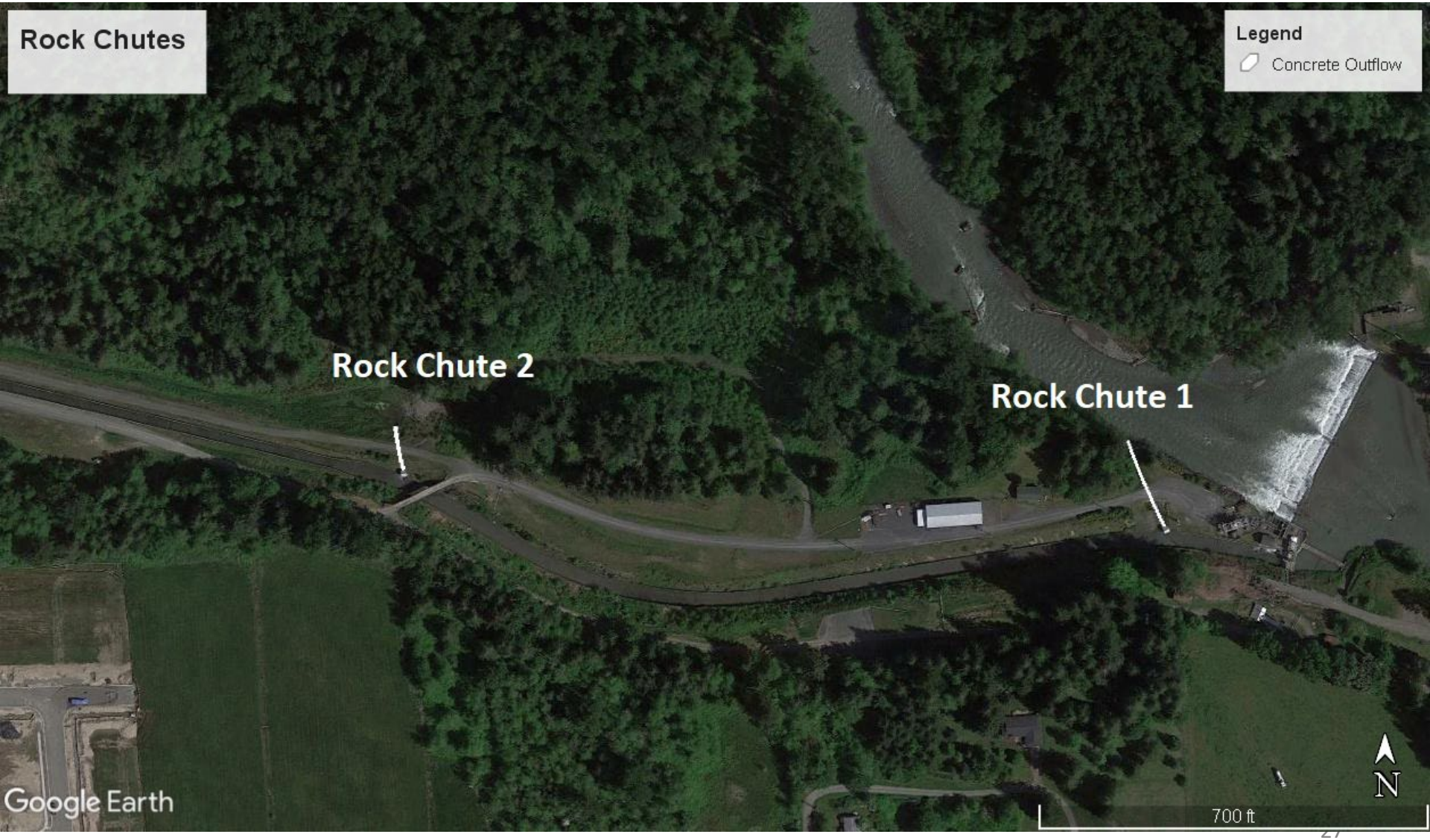
Rock Chute #2 is located just downstream of the Flowline bridge and was installed in 1988. Water and material flow through a box culvert under the access road to a low lying area paralleling the access road and eventually to the White River.

Upper Conveyance – Rock Chutes Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance – Rock Chutes

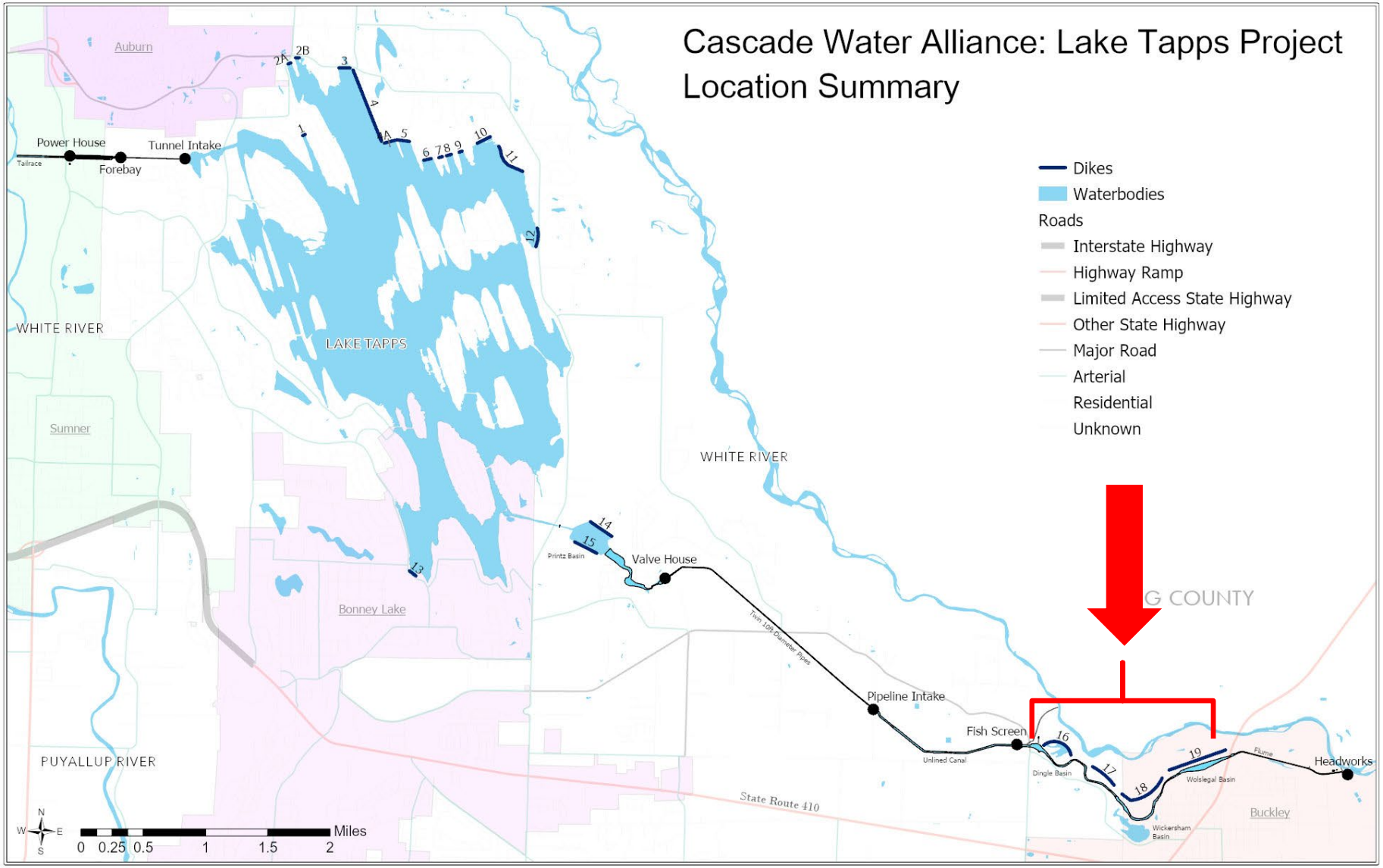


Upper Conveyance – Rock Chutes

Upper Conveyance – Dikes 16-19

Dikes 16 through 19 are dikes that were built to contain the unlined canal and formed the flowline and put water into, and out of, the basins.

Lake Tapps Reservoir and Dikes
Dikes 16-19 Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance – Settling Basins

After the concrete Flowline, water flows through four settling basins, (Wolslegal, Wickersham, McHugh and Dingle) connected by unlined canals, before reaching the fish screens and then Lake Tapps Reservoir. The settling basins were constructed with a clay hump at the end of each settling basin to catch the heavy sediment.

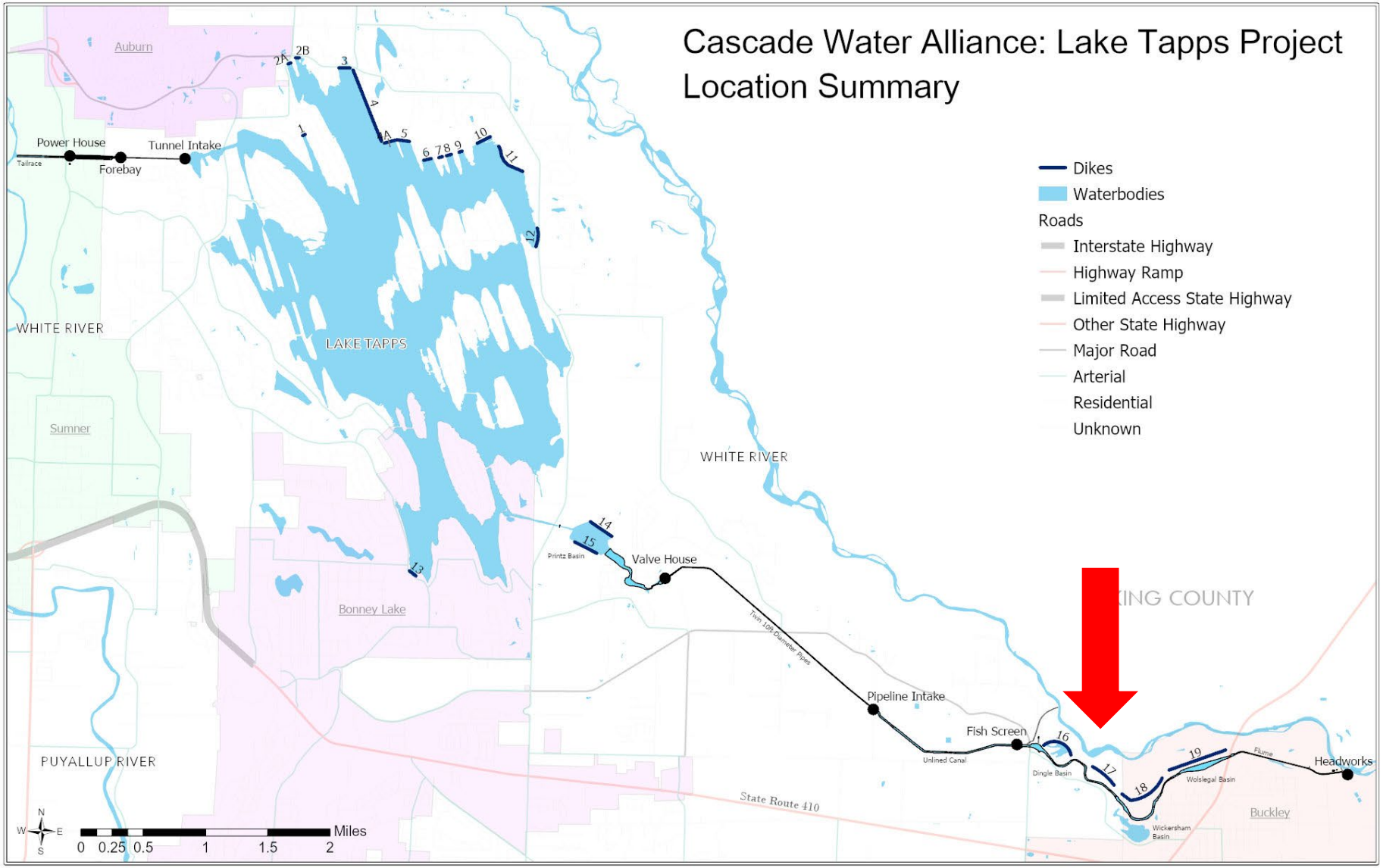
Wolslegal Basin/6-foot Valve

This is the first and largest settling basin. It is necessary to remove sediment from Wolslegal Basin every five to seven years. Cascade performed sediment removal activities in 2010 (approximately 150,000 cubic yards) and 2015 (approximately 75,000 cubic yards). To remove sediment, the basin must be drained using the 6' outlet valve, which was last upgraded in 1988 (with minor repairs done in 2015). The valve does not operate reliably and should be repaired/replaced. Next Steps: replace 6' valve during outage.

Dingle Basin/Outlet Valve/ Fish Recovery Structure

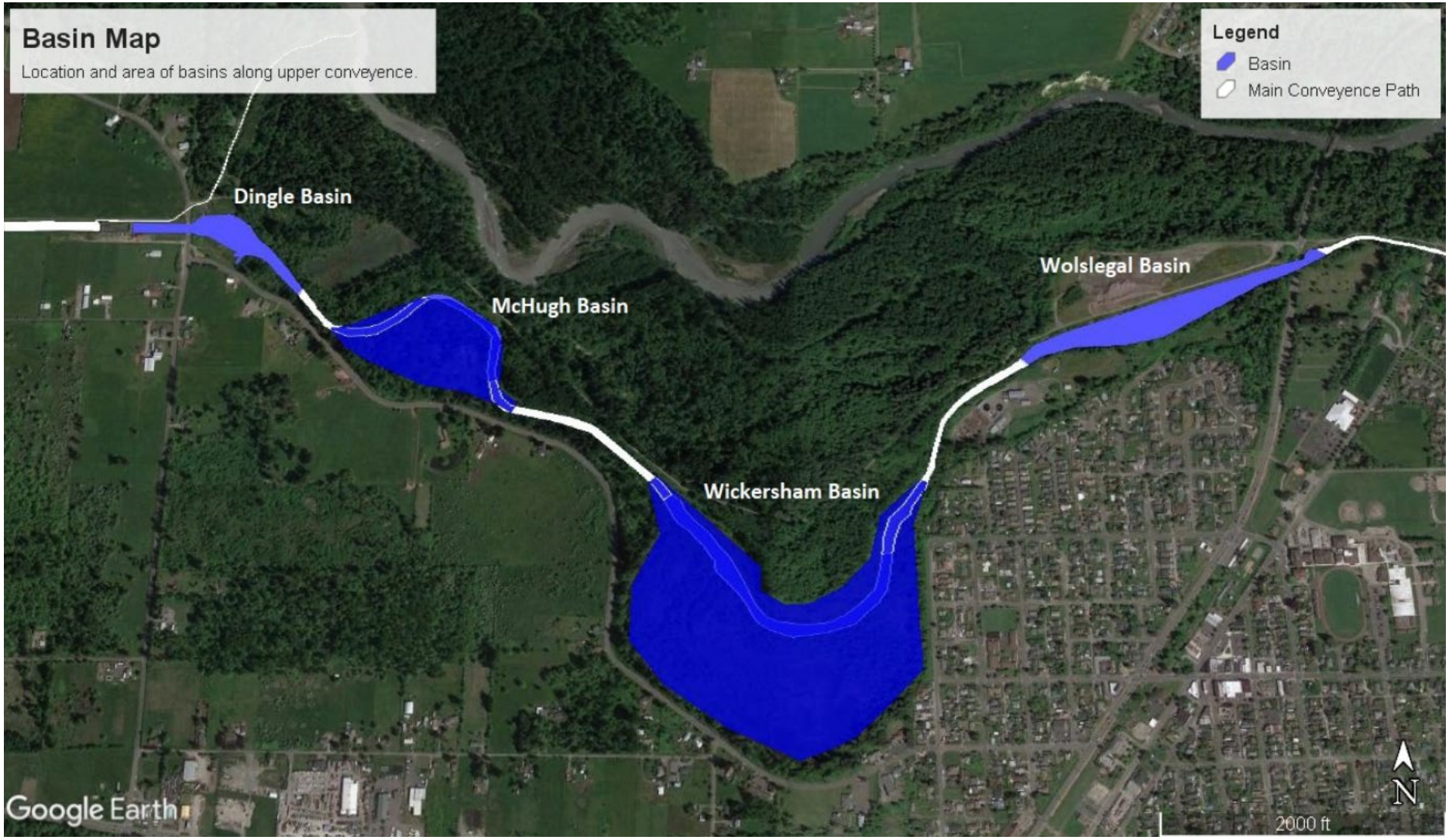
This is the last settling basin before the Fish Screens Facility and includes a fish recovery system installed in 1996, concurrently with construction of the Fish Screens Facility. The system includes: two slide gates within a concrete structure in the middle of the Basin; steel walkway bridge from the canal access road to the gatehouse; and a buried pipeline delivering fish to the capture pen. Fish can be recovered by crane and transported by fish trailer truck to the River.

Upper Conveyance – Settling Basins Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance – Settling Basins



Upper Conveyance – Settling Basins – Wolslegal Basin Outflow 6’ Valve

Upper Conveyance – Settling Basins – Wolslegal Basin Outflow Channel and 22’ Drop

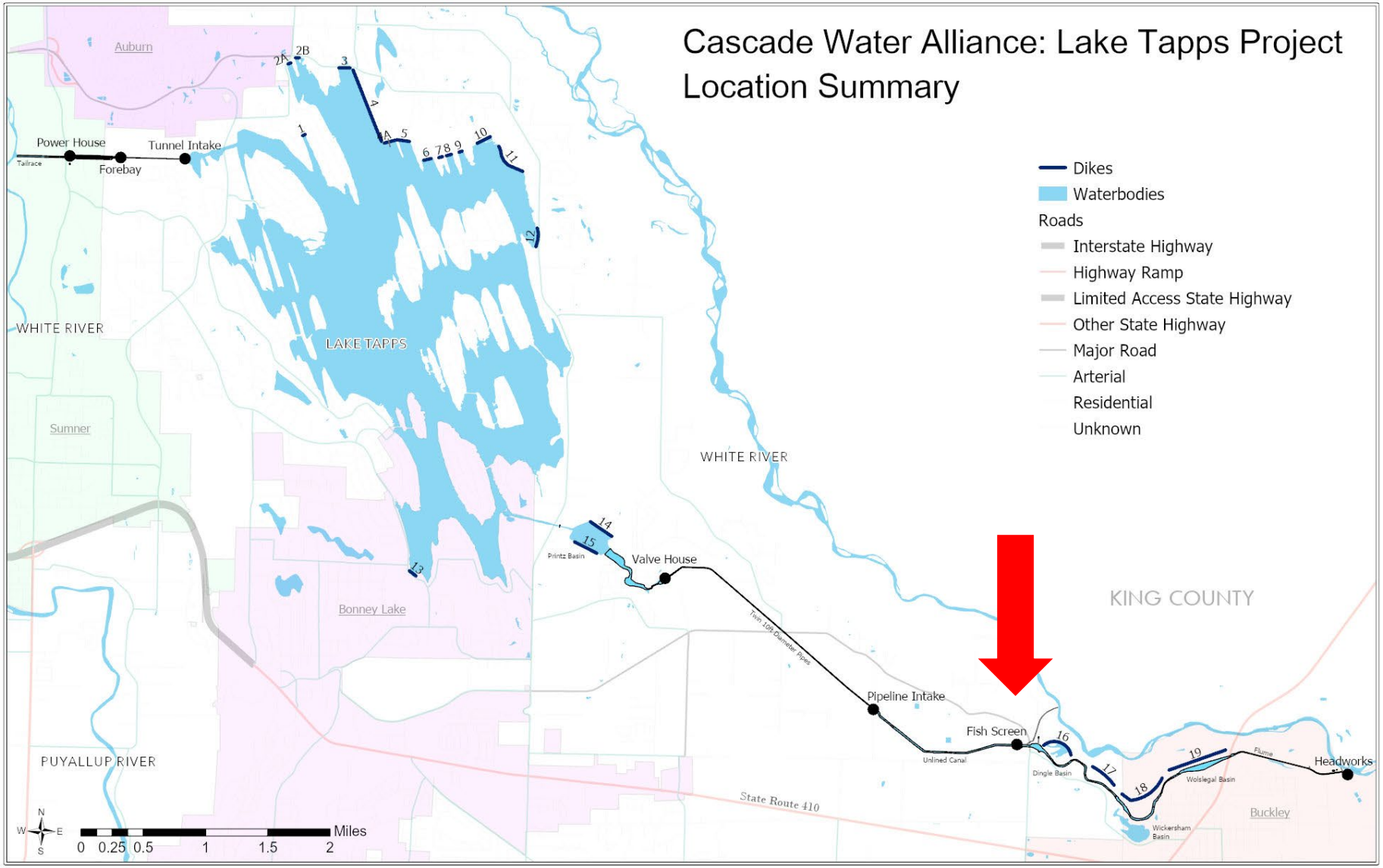
Upper Conveyance – Settling Basins –
Dingle Basin Mechanics (description on earlier slide)

Upper Conveyance – Fish Screens Facility

These screens were installed in 1996 (replacing the rotating drum screens installed in 1939) to ensure migrating fish do not enter Lake Tapps. The facility consists of large “V” shaped static screens with travelling cleaning brushes, preceded by a trash rack system to prevent large debris from damaging the screens. An approximately one mile long 30-inch fish bypass pipeline returns fish to the White River. The fish bypass pipeline typically operates at 20 – 30 cfs. The facility also includes a building for operations and equipment storage, hydraulic gear and back-up generator.

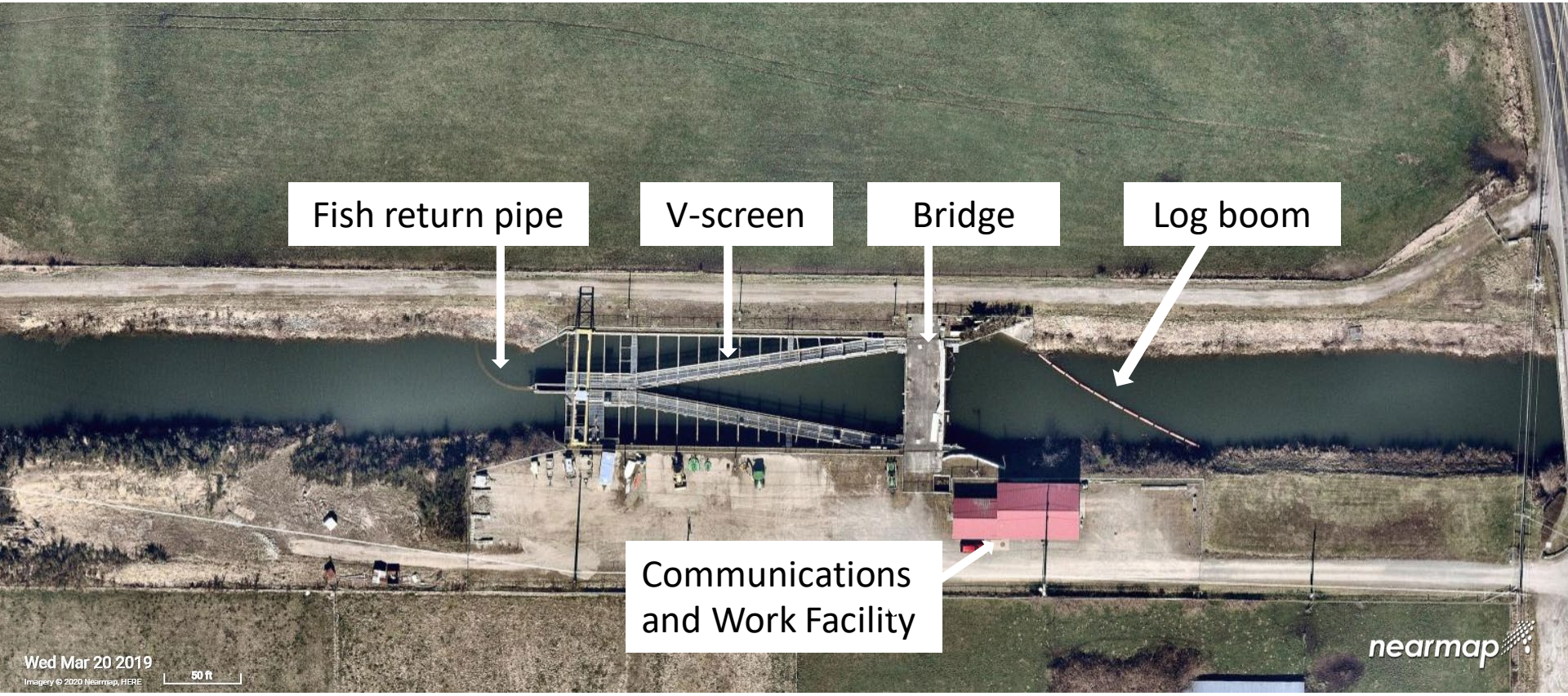
In 2010, a condition assessment was conducted on the Fish Screens facility, resulting in major repairs and adjustments to the system to accommodate the reduced flow allowed under Cascade’s Water Rights.

Upper Conveyance – Fish Screens Facility



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance – Fish Screens Facility



Upper Conveyance – Fish Screens Facility V-screens

Upper Conveyance – Fish Screens Facility / Fish Screen Intake Including Log Boom, Trash Rack and 20 Ton Gantry Crane

Upper Conveyance – Fish Screens Facility / Fish Return Pipeline

Upper Conveyance – Fish Return Pipeline Outfall

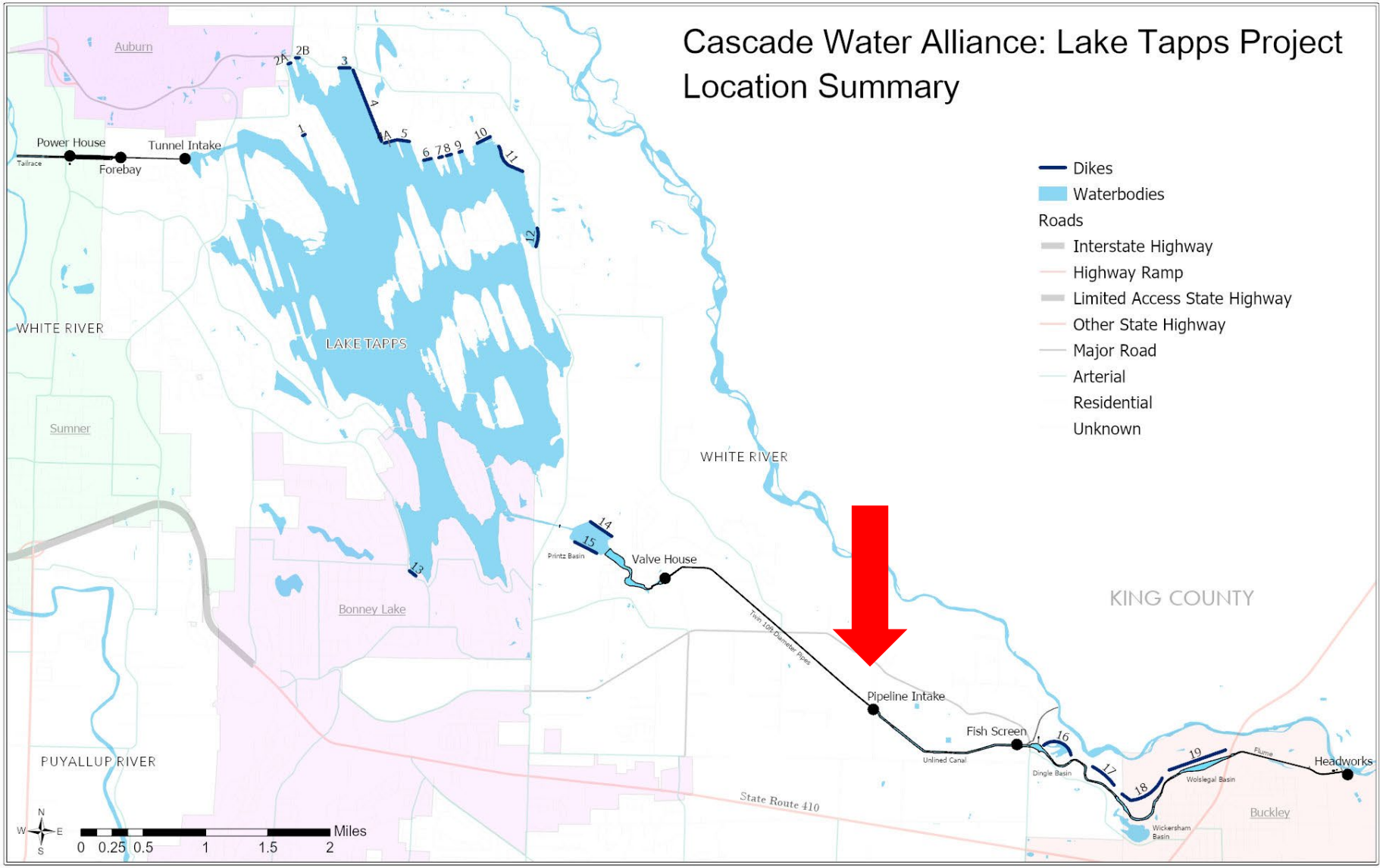
Upper Conveyance - Twin Pipeline System Overview

Following the Fish Screens facility, water flows through approximately 6,800 feet of open canal and concrete S-curved lined canal before entering the twin pipeline system, which was constructed in 1988 when the timber flume in the area failed.

Upper Conveyance - Twin Pipeline System – Intake/Trash Rack

The intake structure for twin pipelines is a 30x20 foot long reinforced concrete structure, containing a trash rack on the upstream side of the bulkhead, preceded by a 200-foot-long concrete lined canal. Each pipeline has a slide gate and a built-in 10-inch bypass sluice gate for balancing head across the slide gate to allow it to open. Debris from the log booms and trash rack is manually removed.

Upper Conveyance - Twin Pipeline System – Intake/Trash Rack Location

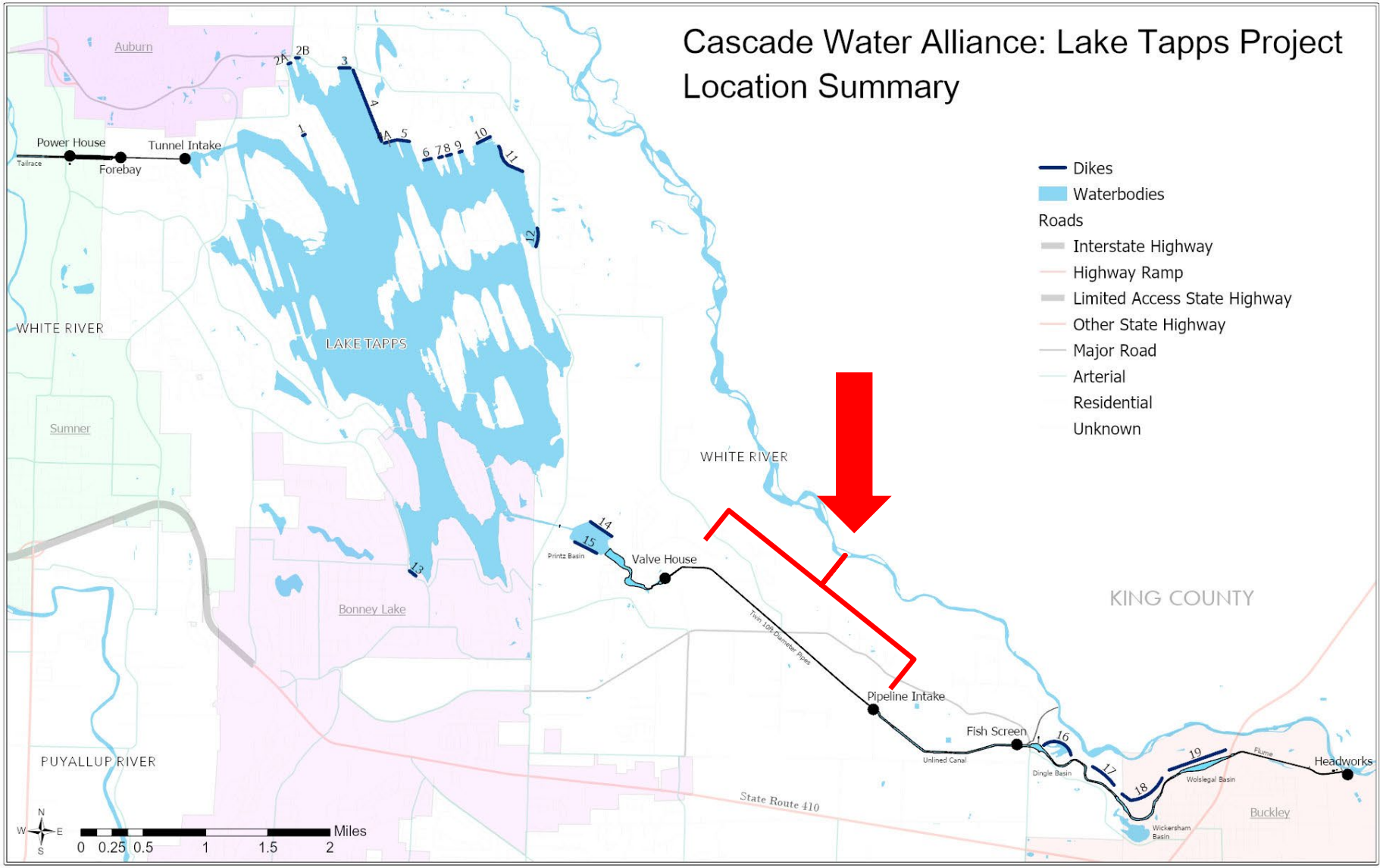


Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance - Twin Pipeline System – Intake/Trash Rack

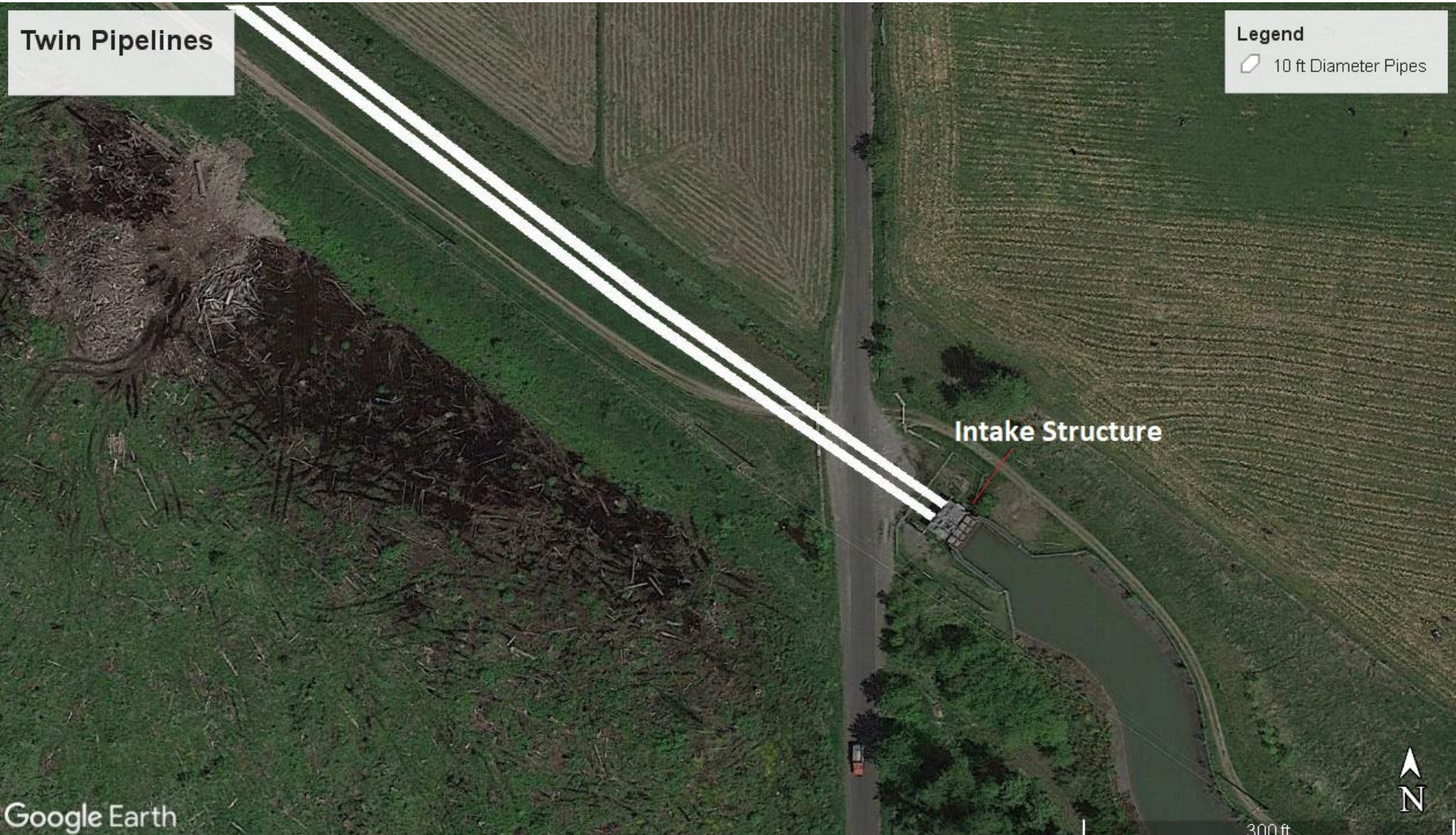
Upper Conveyance - Twin Pipeline System – Pipeline Intake/Trash Rack

Upper Conveyance - Twin Pipeline System – Twin 10’ Buried Pipelines Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance - Twin Pipeline System – Twin 10’ Buried Pipelines



Upper Conveyance - Twin Pipeline System – Twin 10’ Buried Pipelines

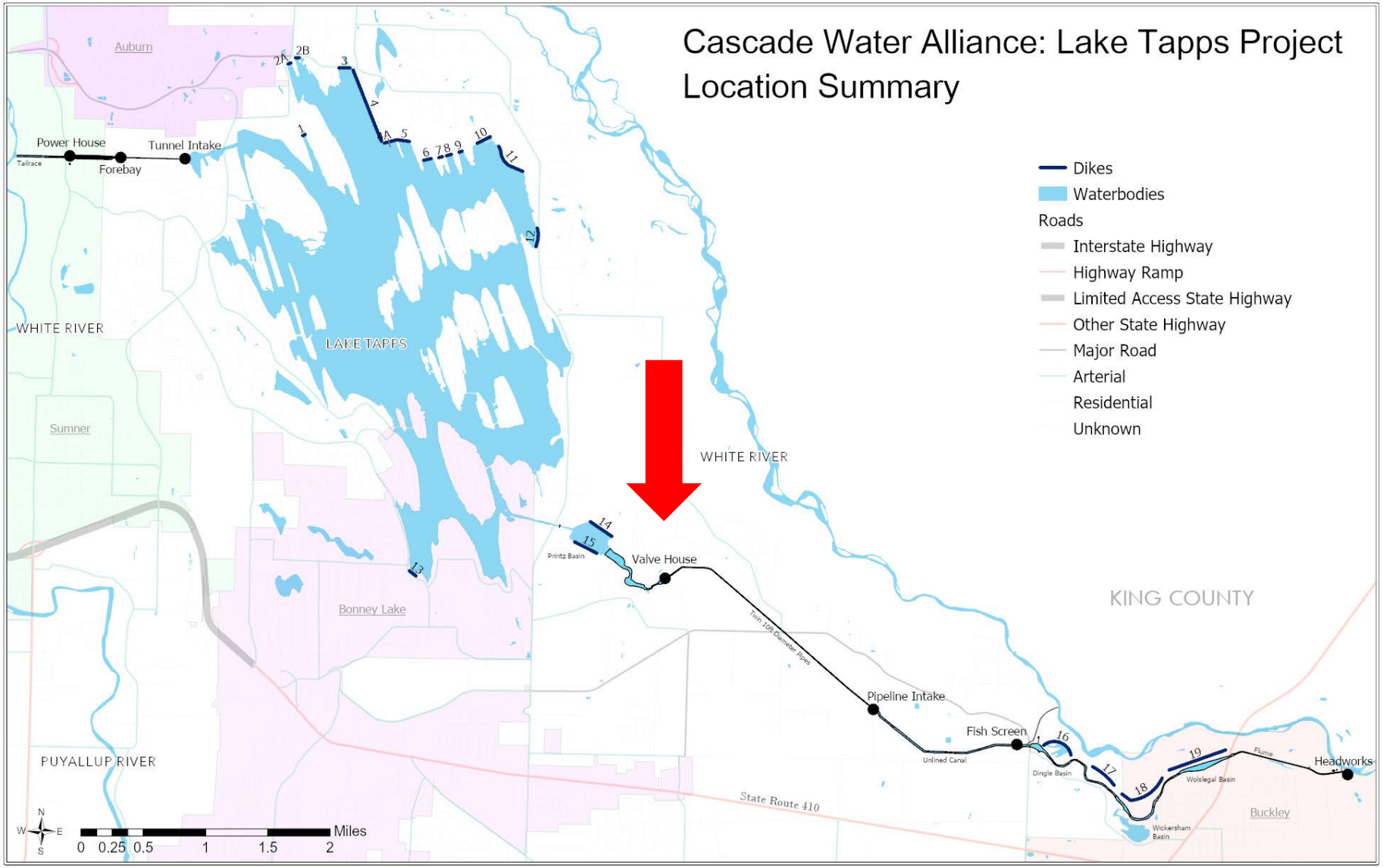
Upper Conveyance - Twin Pipeline System – Twin 10’ Buried Pipelines Construction

Upper Conveyance - Twin Pipeline System – Valve House / Outlet Structure

The outlet structure transitions flow from the pressurized Twin 10-foot Tunnels to the open canal leading to Printz Basin. The buried portion of the structure contains two 60” energy dissipating cone valves. The above ground portion contains hydraulic and electrical controls. A back-up generator is located on site.

Next step: Inside repair and replace one of 60” energy dissipating cone valve

Upper Conveyance - Twin Pipeline System – Valve House / Outlet Structure Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance - Twin Pipeline System – Valve House / Outlet Structure

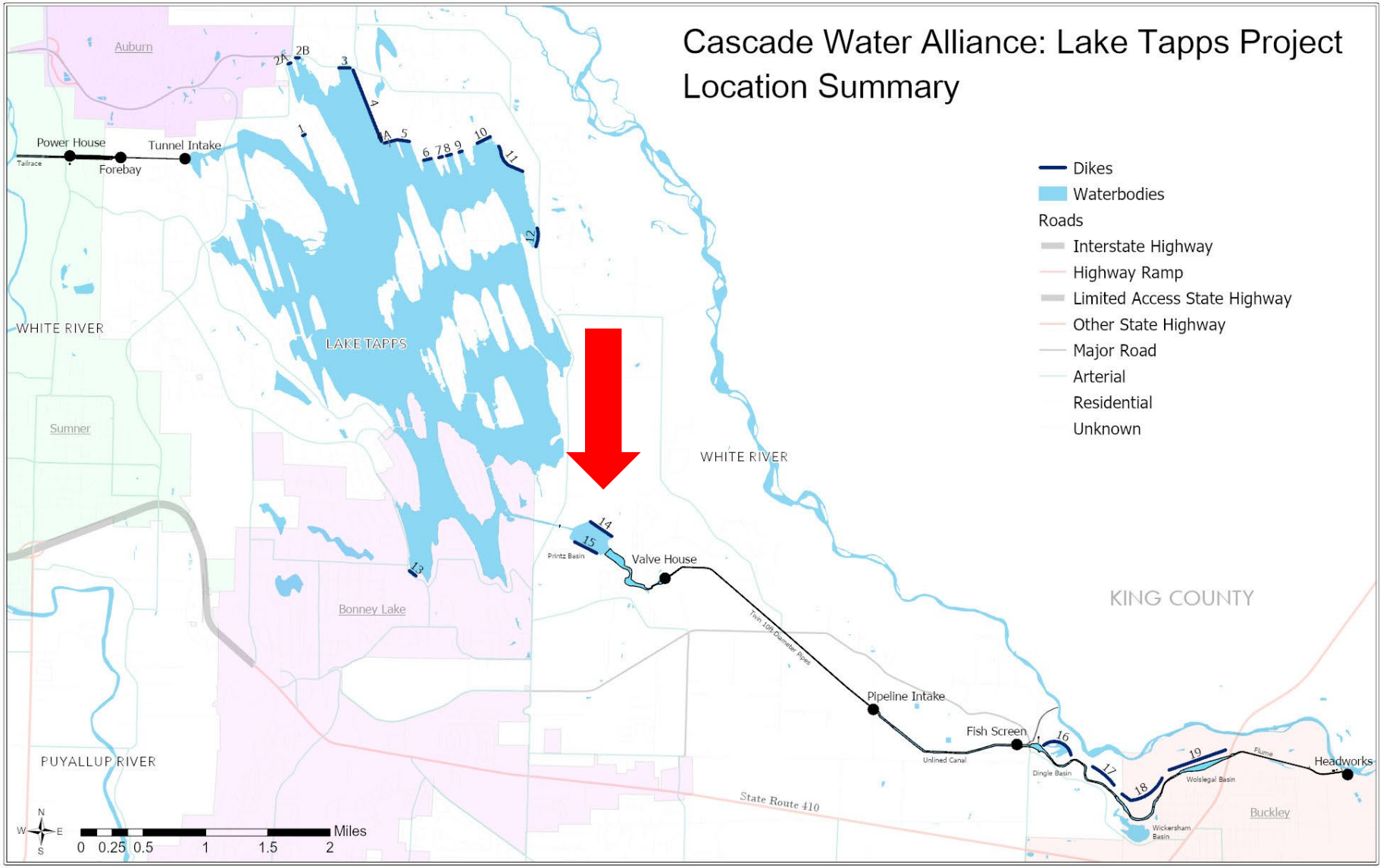
Upper Conveyance - Twin Pipeline System – Valve House / Outlet Structure

Upper Conveyance – Printz Basin / Dikes 14 and 15

Printz Basin is the last settling basin before the water enters the Reservoir.

Dikes 14 and 15 border Printz Basin.

Upper Conveyance – Printz Basin / Dikes 14 and 15 Location



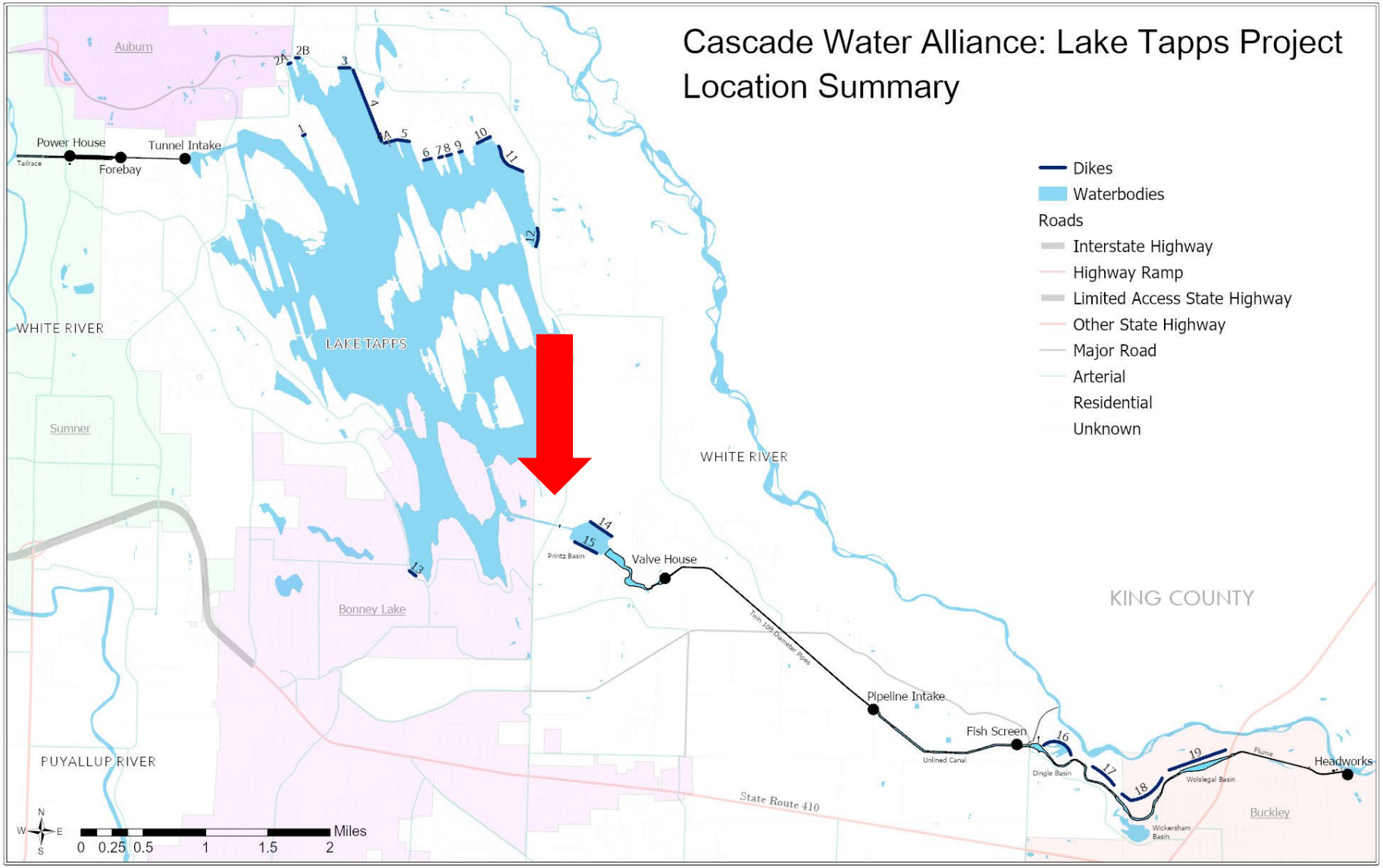
Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance – Printz Basin / Dikes 14 and 15

Upper Conveyance – Backflow Preventer

Constructed by PSE in 2007, this facility consists of a concrete dam with two tide gates designed to prevent water from the Reservoir from draining into Printz Basin in the event of the failure of Dike 14 and/or 15. PSE, Cascade and the Washington Department of Ecology Dam Safety Office (DSO) determined that this approach was more cost effective than upgrading Dikes 14 and 15 to meet seismic standards.

Upper Conveyance – Backflow Preventer Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Upper Conveyance – Backflow Preventer

Upper Conveyance – Backflow Preventer

Lake Tapps Reservoir

Lake Tapps Reservoir

Lake Tapps Reservoir and Dikes 1-13

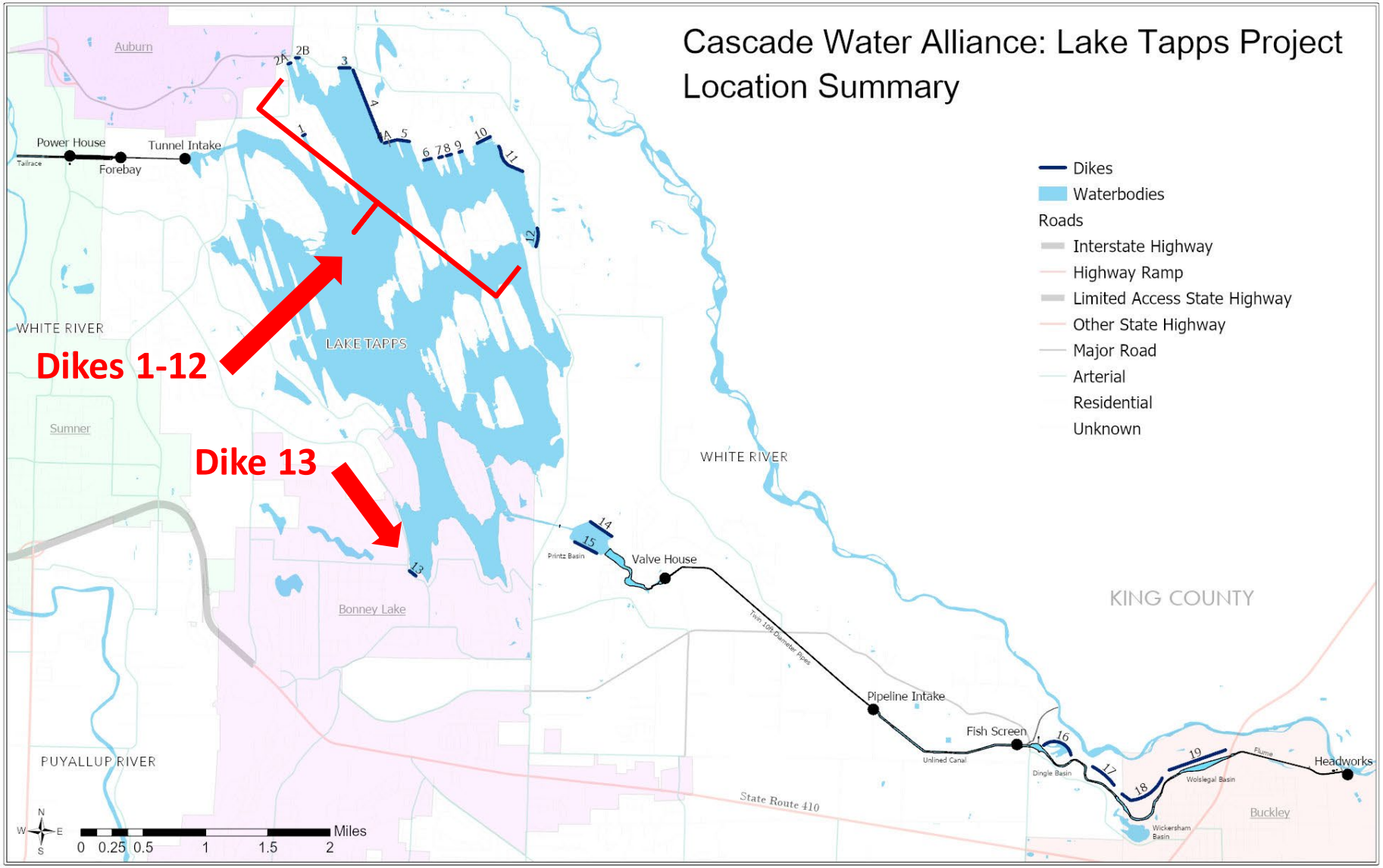
In 1911, PSE completed building a series of earthen dikes that, when water was diverted from the White River, flooded the area between four small lakes (Church, Kirtley, Lake Tapps and Crawford lakes) to create the Lake Tapps Reservoir.

Cascade owns the Lake Tapps Reservoir (including the lakebed), all land below the elevation 545-foot line (gage height), and the dikes.

Lake Tapps Reservoir - Dikes 1-13

- These earthen dikes were built to create Lake Tapps Reservoir and are maintained to ensure the safety of development surrounding the Reservoir. Emergency plans are in place should a dike be breached due to damage caused by an earthquake, etc. DSO performs inspections of the Lake Tapps Dikes every five years. Crest elevations of the Lake Tapps dikes range from approximately elevation 548 feet to elevation 551 feet.
- PSE upgraded Dikes 4A, 5 ,6 ,8 and 11 in 2004. Cascade upgraded Dike 13 in 2012 and Dike 3 in 2014. The crest elevation of Dike 12 was raised in 2020.
- Flow of approximately one cfs is routed through Dike 4 to maintain flow in Bowman Creek. Drainage from Dikes 10 and 11 flows through Thompson's Ditch.
- Weirs and piezometers (monitored per DSO requirements) measure leakage through each Dike. Cascade performs routine maintenance (annual inspections, drainage ditch maintenance, vegetation control, etc.) to ensure the integrity of the Dikes.

Lake Tapps Reservoir - Dikes 1-13 Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Lake Tapps Reservoir - Bowman Creek Outflow

There is a pipe in the Reservoir that takes water in front of Dike 4 to provide minimum outflow to Bowman Creek. This is the only outflow from the Reservoir.

Bowman Creek is not owned by Cascade, but PSE entered into two agreements (in 1935 and 1936), which were transferred to Cascade, providing for a flow of 30,000 gallons per hour (+/- 10,000 gph) from Lake Tapps to maintain Bowman Creek throughout the year.

Lake Tapps Reservoir - Bowman Creek Intake

Lake Tapps Reservoir - Bowman Creek Outflow (Dike 4 Weir)

Lower Conveyance System Overview

The only significant outlet for Lake Tapps is the Lower Conveyance System. No other overflow or reservoir release systems have been constructed, making these facilities essential to the safe operation of the Reservoir.

Lower Conveyance System – Tunnel Intake/Gate House/Trash Rack

The Gate House at the Tunnel Intake is an 18-foot square concrete building (surrounded by a deck) which houses electrical equipment. The Tunnel Intake structure is a 54-foot tall by 55-feet wide curved reinforced concrete structure carved into a bench of a steep embankment. It includes a Trash Rack and 12-foot-wide by 12 foot six-inch-high steel vertical slide gate (Stoney Gate) with a motor operated dual rising screw stem. A two-foot square bypass slide gate in the Stoney Gate provides a means for filling the tunnel and equalizing pressure on the gate before opening. Stop Log slots are located Lake-ward of the Stoney Gate.

These facilities were originally constructed in 1911. The lake level must be lowered to approximately elevation 502 feet in order to perform inspection/maintenance/repair on these facilities.

Lower Conveyance System – Tunnel Intake/Gate House/Trash Rack Cont.

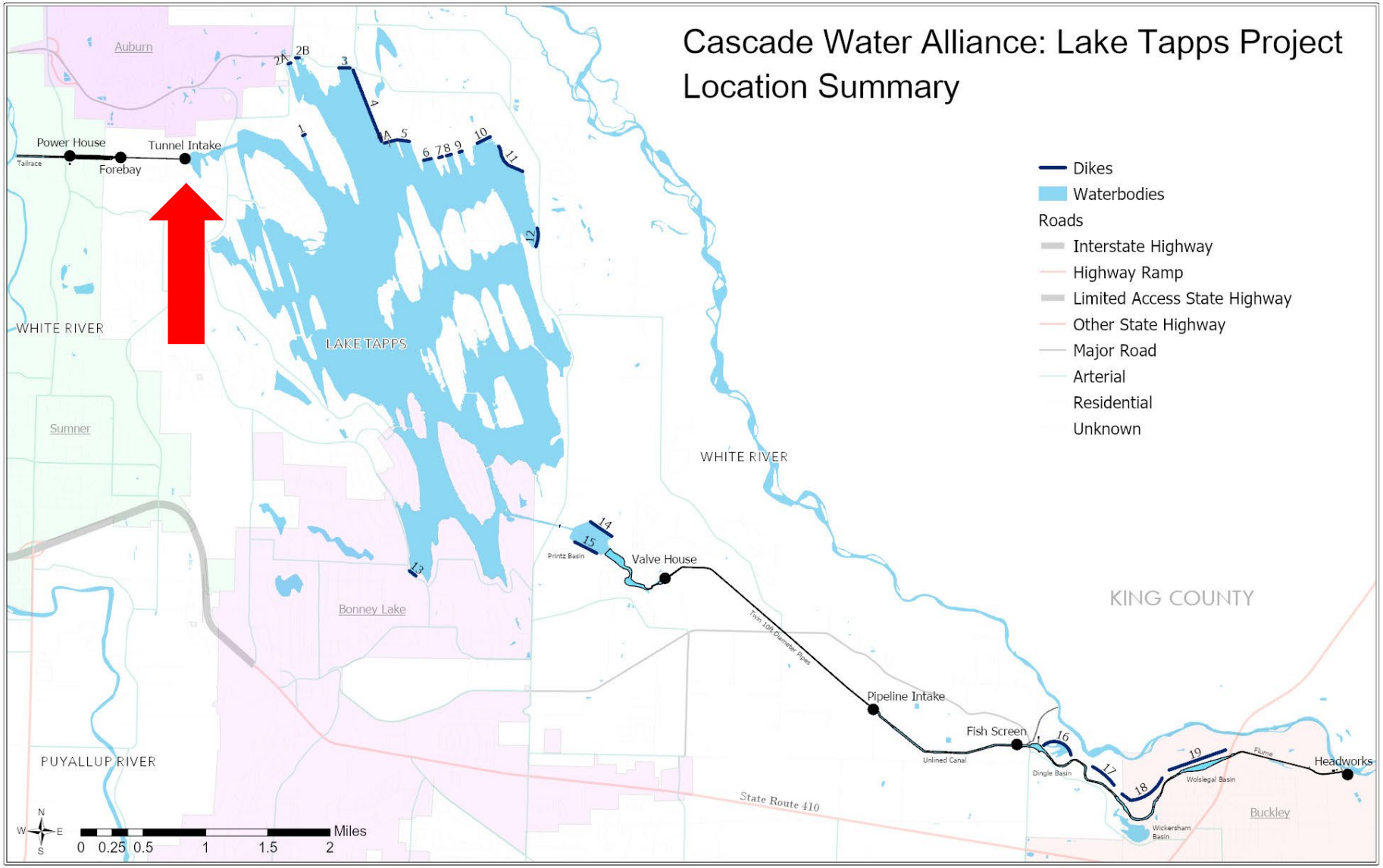
PSE conducted a condition assessment of the Tunnel Intake facilities in 2003 and rehabilitated the trash rack and trash rack cleaning system.

As a result of the condition assessment conducted by Cascade in 2014:

- The Gate House decking was replaced
- Repairs were made to deteriorating concrete
- The bypass gate (and operating system) were replaced
- Replaced stop log guides and fabricated new stop logs

Next Step: Replace Trash Rack Rake

Lower Conveyance System – Tunnel Intake/Gate House/Trash Rack Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Lower Conveyance System – Tunnel Intake/Gate House/Trash Rack and Rake

Lower Conveyance System – Tunnel Intake/Gate House/ OLD Trash Rack and Rake

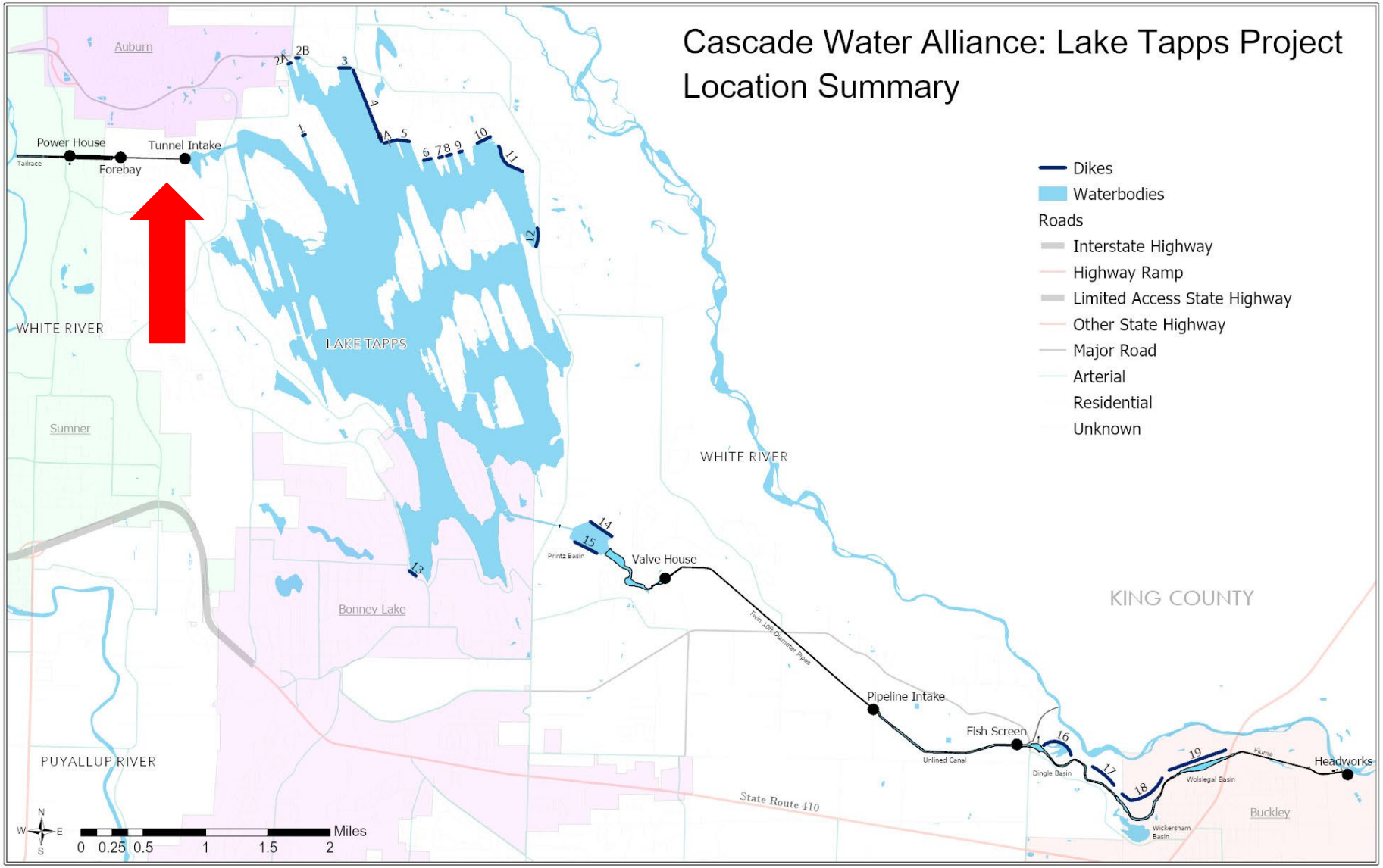
Lower Conveyance System – Tunnel Intake/Gate House/Trash Rack and Rake Construction

Lower Conveyance System – 12’ Tunnel

This 12-foot (interior) diameter steel reinforced concrete tunnel connects to the Tunnel Intake and extends approximately 3,000 feet long to the Forebay.

The tunnel has more than 40 feet of cover.

Lower Conveyance System – 12’ Tunnel Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Lower Conveyance System – 12’ Tunnel Aerial Imagery

Lower Conveyance System – 12’ Tunnel

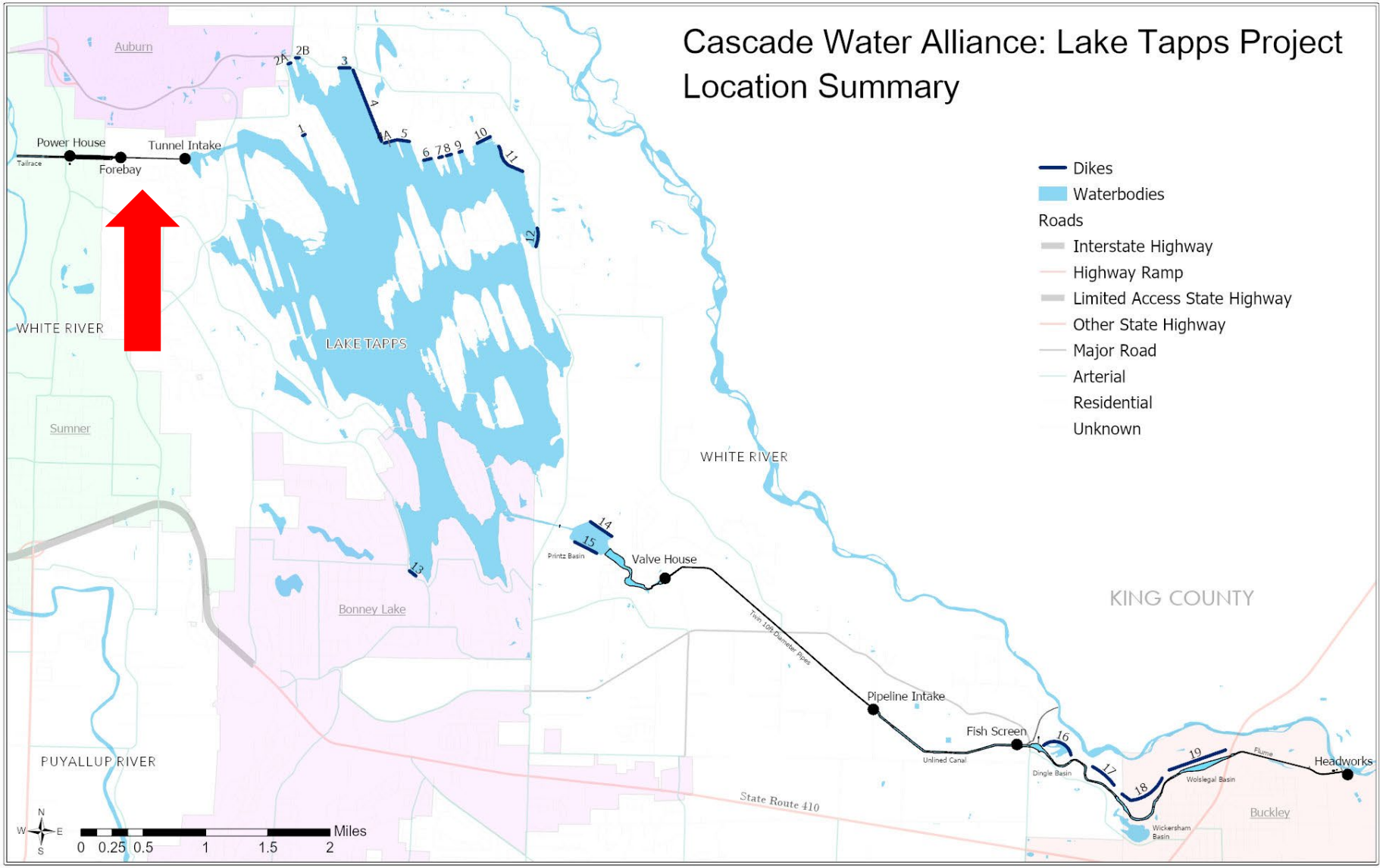
Lower Conveyance System – Bear Trap

Constructed between 1911 and 1924, this 12-foot diameter, 55-foot tall concrete shaft is located approximately halfway between the Tunnel Intake and the Forebay. It provides an overflow spillway in the event of a surge in the tunnel because of rapid stoppage of water flow.

The Bear Trap was inspected and cleaned in 2014 and used as an access point for inspections of other facilities. The top of the shaft is temporary (two, steel sheets welded together) and temporary chain link fencing was purchased, and this requires a permanent replacement.

Next Steps: Install new cover for Bear Trap

Lower Conveyance System – Bear Trap Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Lower Conveyance System – Bear Trap

Lower Conveyance System – Temporary Bear Trap Cover (structure was removed)

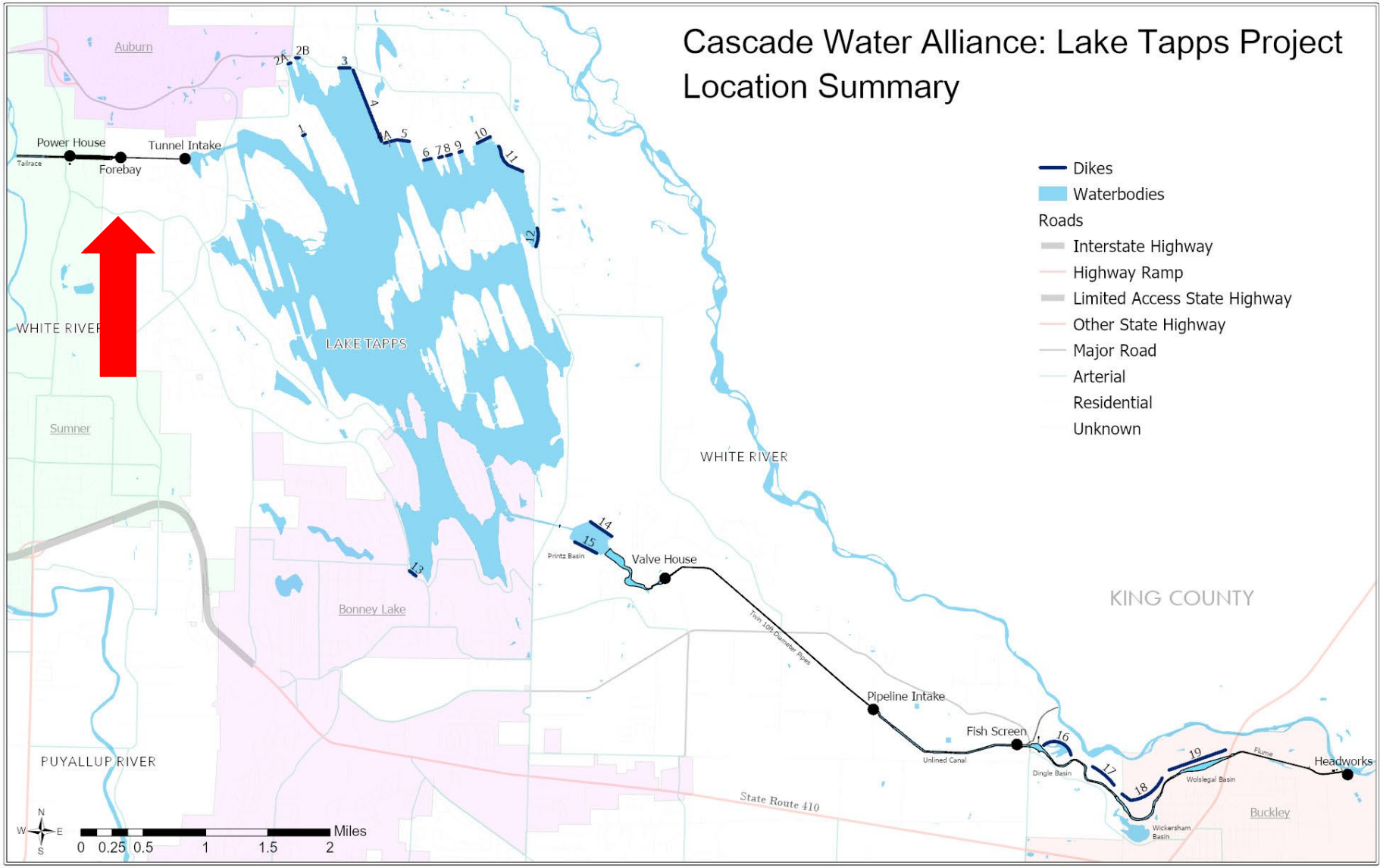
Lower Conveyance System – Forebay

The Forebay consists of the caisson, surge chamber and building, all originally constructed in 1911, with some modifications in 1924. The Forebay connects the 12’ Diameter Tunnel to the Penstocks.

The Caisson is a circular concrete and steel structure measuring 30’ in diameter and extending 73’ below grade. Initially, three Penstock inlets were located on the west side, with independent motor operators for each 8’ slide gate. The top was originally open, providing and overflow chamber. This was enclosed in 1924, replaced by two 7’ diameter side outlets (the surge chamber). The concrete Forebay building measures 18.5’ by 39’ and houses control equipment for the Forebay gates. Gate operators two and three are cracked in the floor and have been temporarily fixed. New BFDs and electronics were installed in 2014 to control the rising stem valves.

Next Steps: Repair guides for 8’ slide gates inside Forebay, replace roof on east side, replace gate operators for Nos. 2 and 3

Lower Conveyance System – Forebay Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Lower Conveyance System – Forebay

Lower Conveyance System – Forebay

Lower Conveyance System – Penstocks/Standpipes

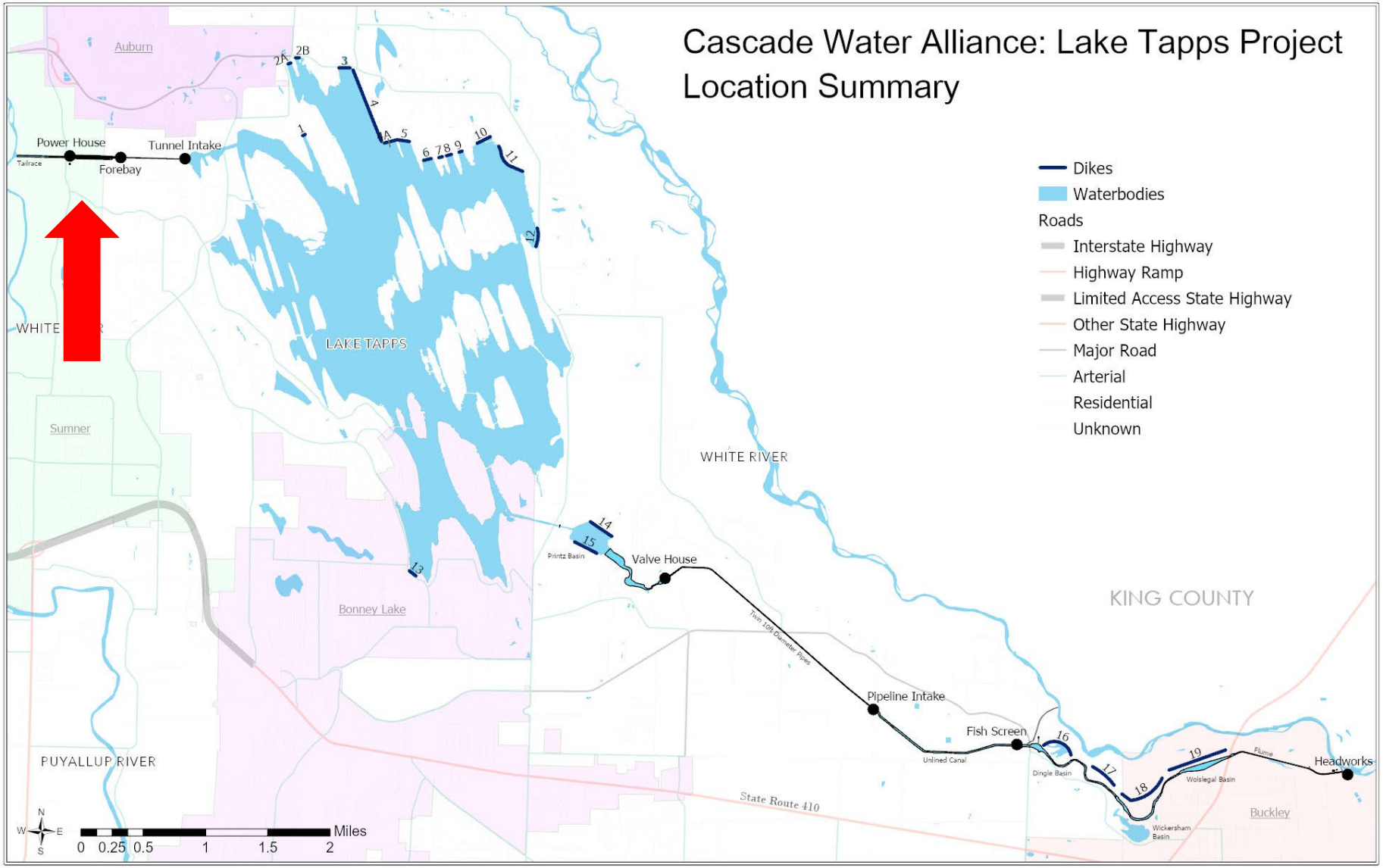
The Penstocks lead from the Forebay to the Powerhouse. Penstocks 1 and 2 were constructed in 1911. Penstock 3 was added in 1918. These Penstocks are eight-foot diameter riveted steel pipelines hosed inside independent approximately 300-foot-long elliptical nine-foot diameter concrete tunnels. From this intermediate point they are direct buried to the Powerhouse (approximately 2,200 feet). The diameter of the Penstocks reduces to six feet at the Powerhouse. A 24-inch pipeline is installed with Penstock 1 and 2 to provide a source for the exciter. Penstock 4 and an additional 24-inch exciter line were added in 1924. Penstock 1 and 2 were bifurcated at the intermediate point to create Penstock 4. Two butterfly valves and gatehouses were also installed to control flow. Four 6-foot diameter riveted steel standpipes (one for each Penstock) rise approximately 75 feet above grade at the intermediate point. Penstock 4 has been decommissioned due to the butterfly valves being inoperable. The Standpipes require further evaluation for seismic risk.

Lower Conveyance System – Penstocks/Standpipes

Next Steps:

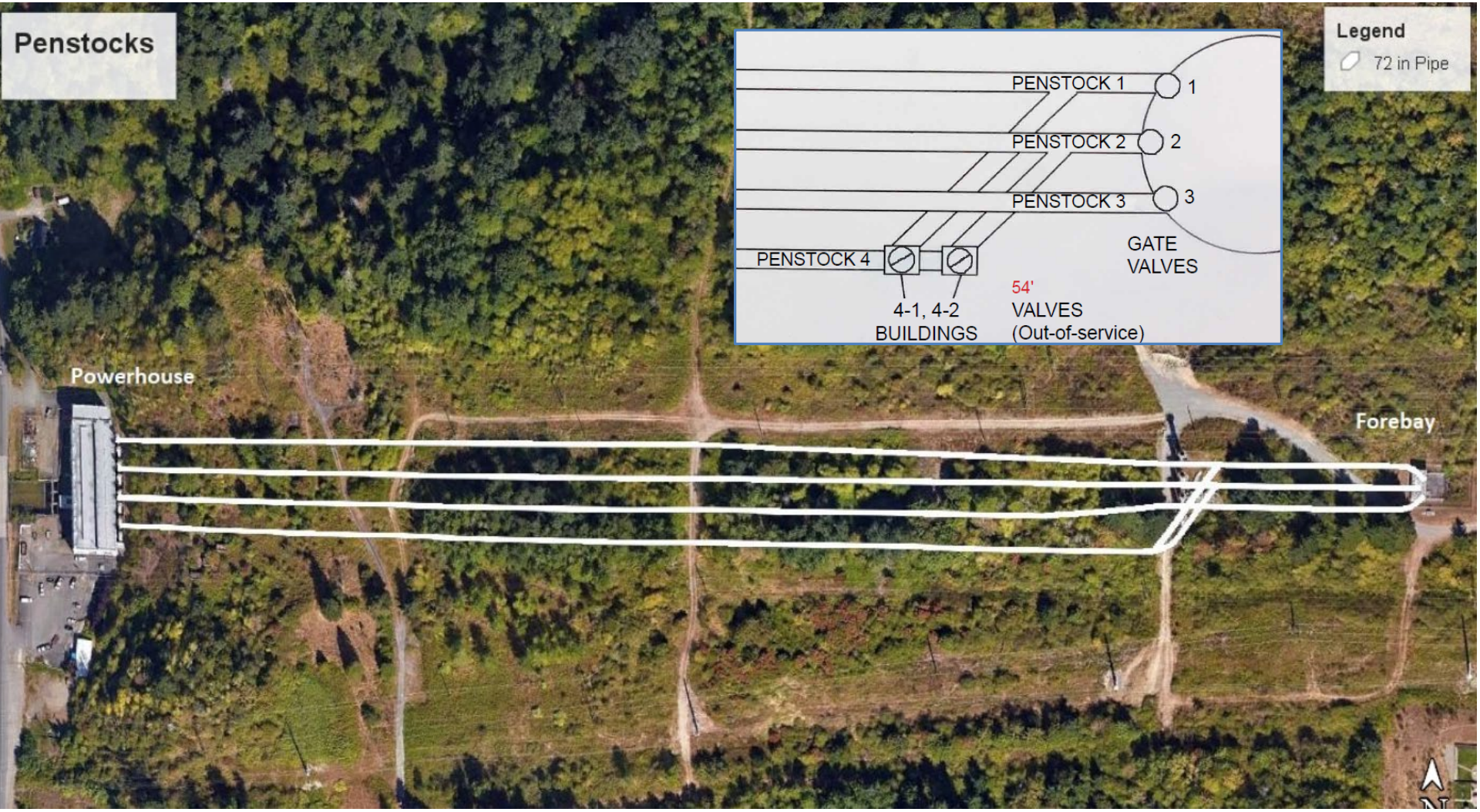
- Enclose pipeline No. 1 and 2 in concrete (275')
- 4.1 and 4.2 Butterfly valves frozen; buildings still there but power retired - buildings need to be retired
- Cut and cap Penstock 1 for 4.1
- Cap Penstock 2 for 4.2
- Upgrade and replace Standpipe on No. 3
- Replace and paint guidewires on standpipes (all three and No. 4 should be decommissioned
- Cap and fill two, 24 inch exciter pipes
- Penstock No. 4 needs to be cut, capped and filled
- Remove trees over penstocks

Lower Conveyance System – Penstocks/Standpipes Location

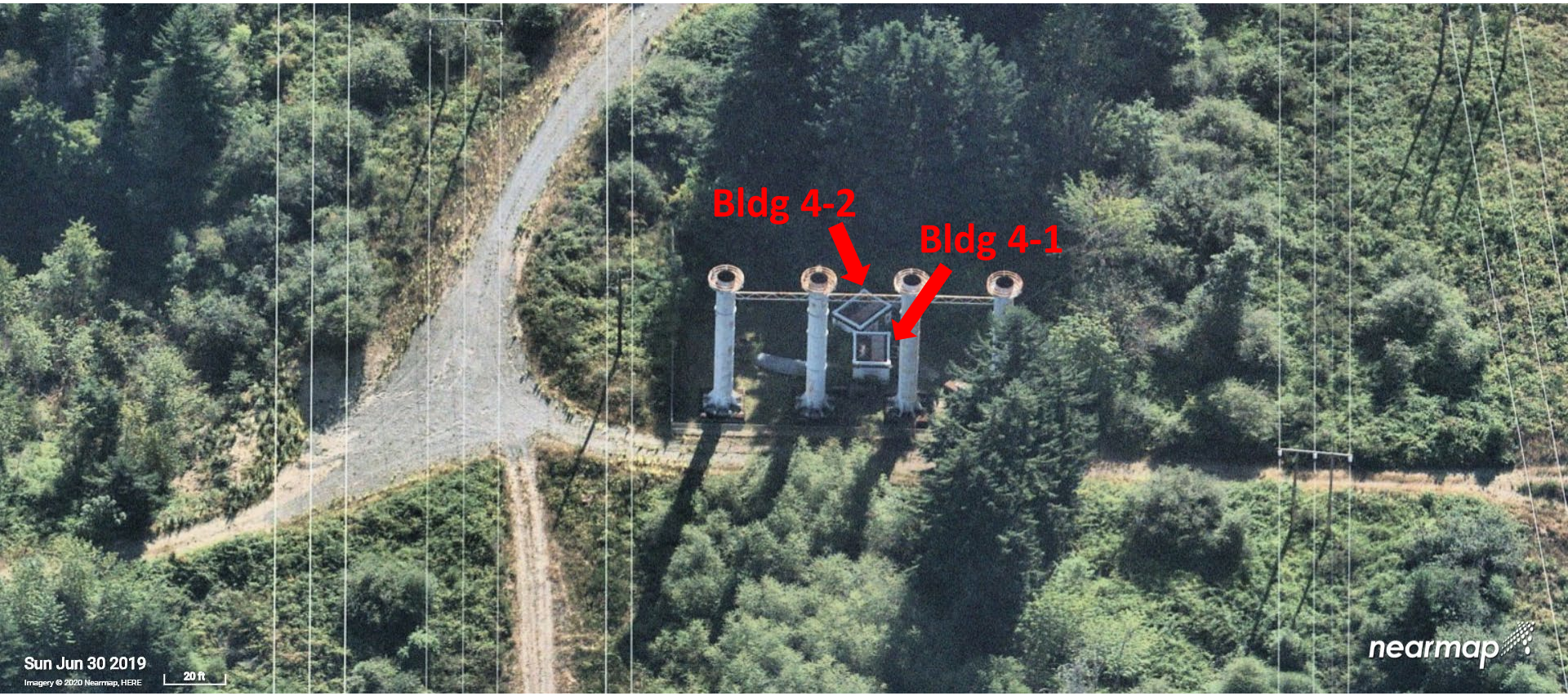


Ethan Duvall, Cascade Water Alliance, November 4 2019

Lower Conveyance System – Penstocks/Standpipes



Lower Conveyance System – Penstocks/Standpipes

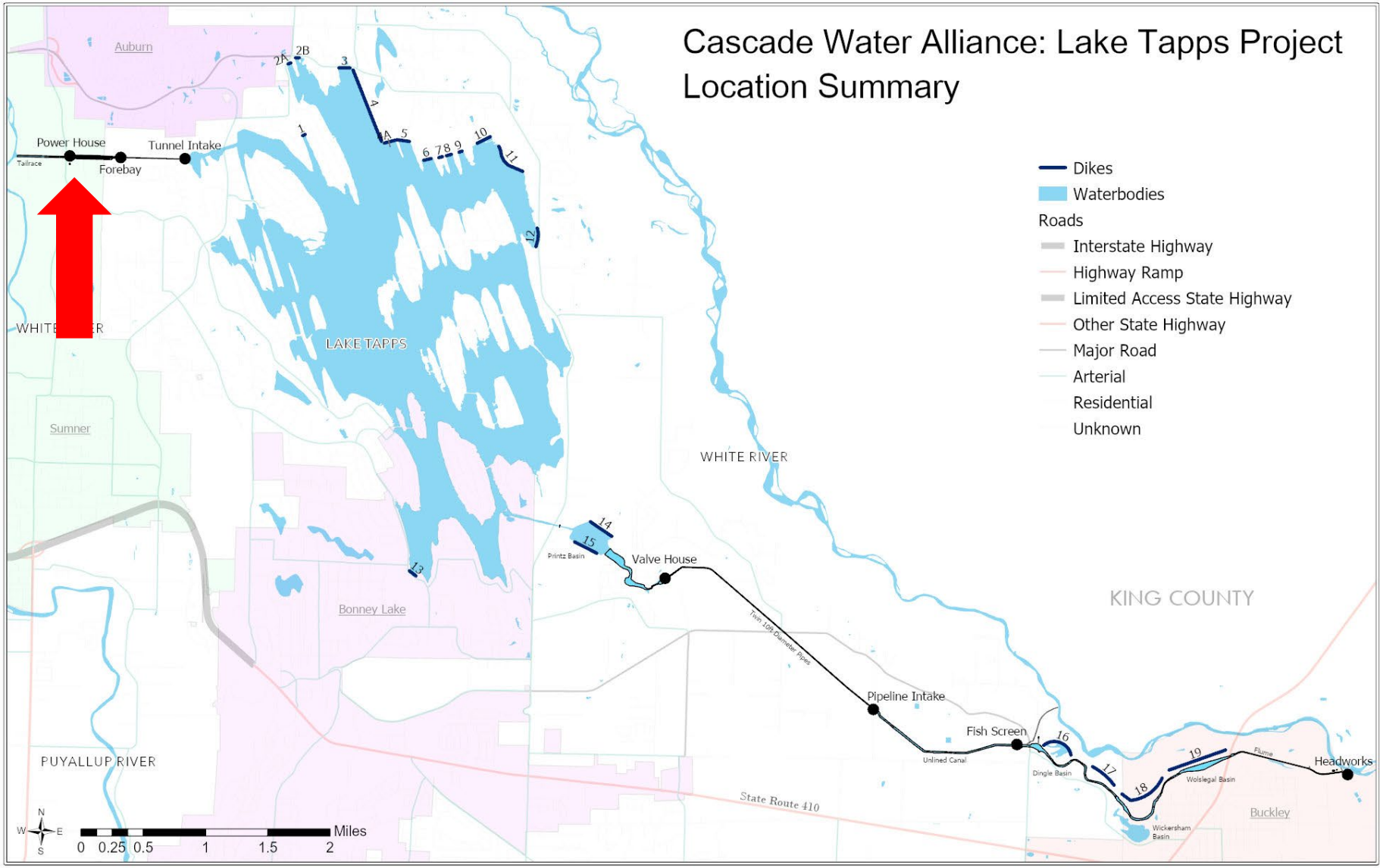


Lower Conveyance System – Surge Chambers (out of service)

Twin air chambers for surge control exist on each of the four penstocks (for a total of eight chambers) behind the Powerhouse.

Each chamber is seven feet in diameter, and over 80 feet tall. They are disconnected and have been retired.

Lower Conveyance System – Surge Chambers Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Lower Conveyance System – Surge Chambers (out of service)

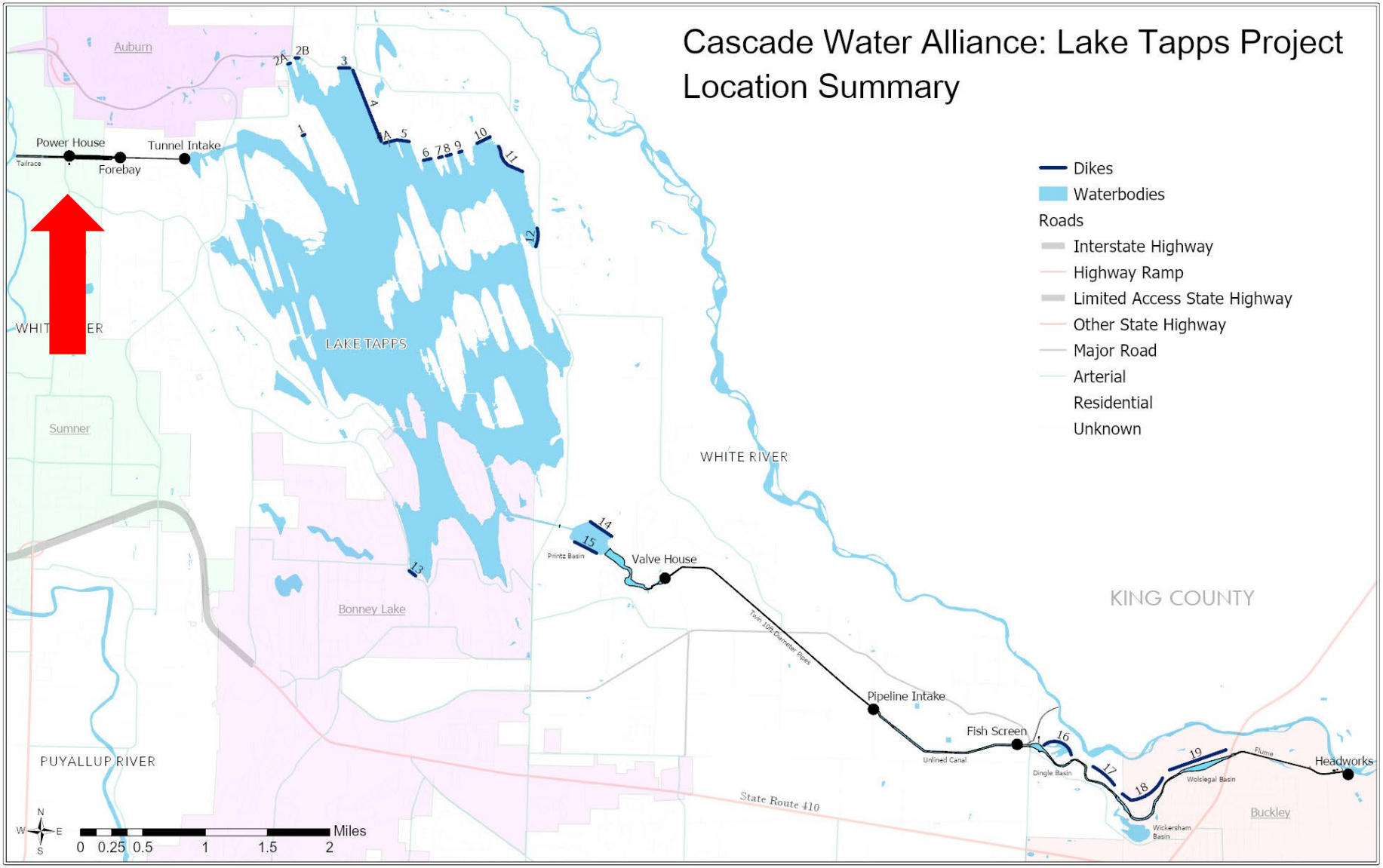
Lower Conveyance System – Powerhouse & Admin Buildings

The Powerhouse is a rectangular concrete –framed building two and a half stories tall, 85 feet wide by 225-foot-long constructed in 1911.

The building contains an operating area, shop, offices and the main turbine/generator area. The four turbine/ generator units are no longer functional.

The Admin building houses the Cascade offices.

Lower Conveyance System – Powerhouse and Admin Buildings Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Lower Conveyance System – Powerhouse

Lower Conveyance System – Powerhouse Projects

Other projects at the Powerhouse include removal of decking over the Plunge Pool; installation of new windows on the south and east sides; interior asbestos and lead paint abatement and repainting; and replacement of the 20,000 square foot roof.

Lower Conveyance System – Powerhouse Valves

Most critical to Cascade's operation are the valves that enable water to be released to the Tailrace. Without operational turbines, water can be released through 8-inch butterfly bypass valves, 16-inch Penstock drain valves and Relief valves associated with each turbine unit.

The DSO requires Cascade to be able to release 450 cfs from the Reservoir (through the Powerhouse) under emergency conditions (i.e., dike failure caused by an earthquake). Without turbines to dissipate energy in the water flowing through the Penstocks, the available valves, intended for short term emergency situations, were being made to operate in a manner that could lead to catastrophic failure.

Lower Conveyance System – Powerhouse Valves Cont.

Following the 2014 condition assessment, Valve 4 was decommissioned, Valve 1 and 2 were rebuilt/refurbished. Valve 3 was replaced and is now the main operating valve, with an operating range from 5 cfs to 450 cfs. Additional work was completed to repair flow tubes.

Next Steps: Replace Valve No. 2 with new plunger valve.

Lower Conveyance System – Powerhouse Plunge Pool

Releases from the Powerhouse initially flow into the 200 foot-long by 22-foot-wide by 23-foot-tall reinforced concrete Plunge Pool, originally constructed in 1911. Flow exits the Plunge Pool through a 58-foot-wide weir wall into the Tailrace. The concrete needs repair; steel sheets have been installed on the wall directly across from Valve 1 to prevent further damage.

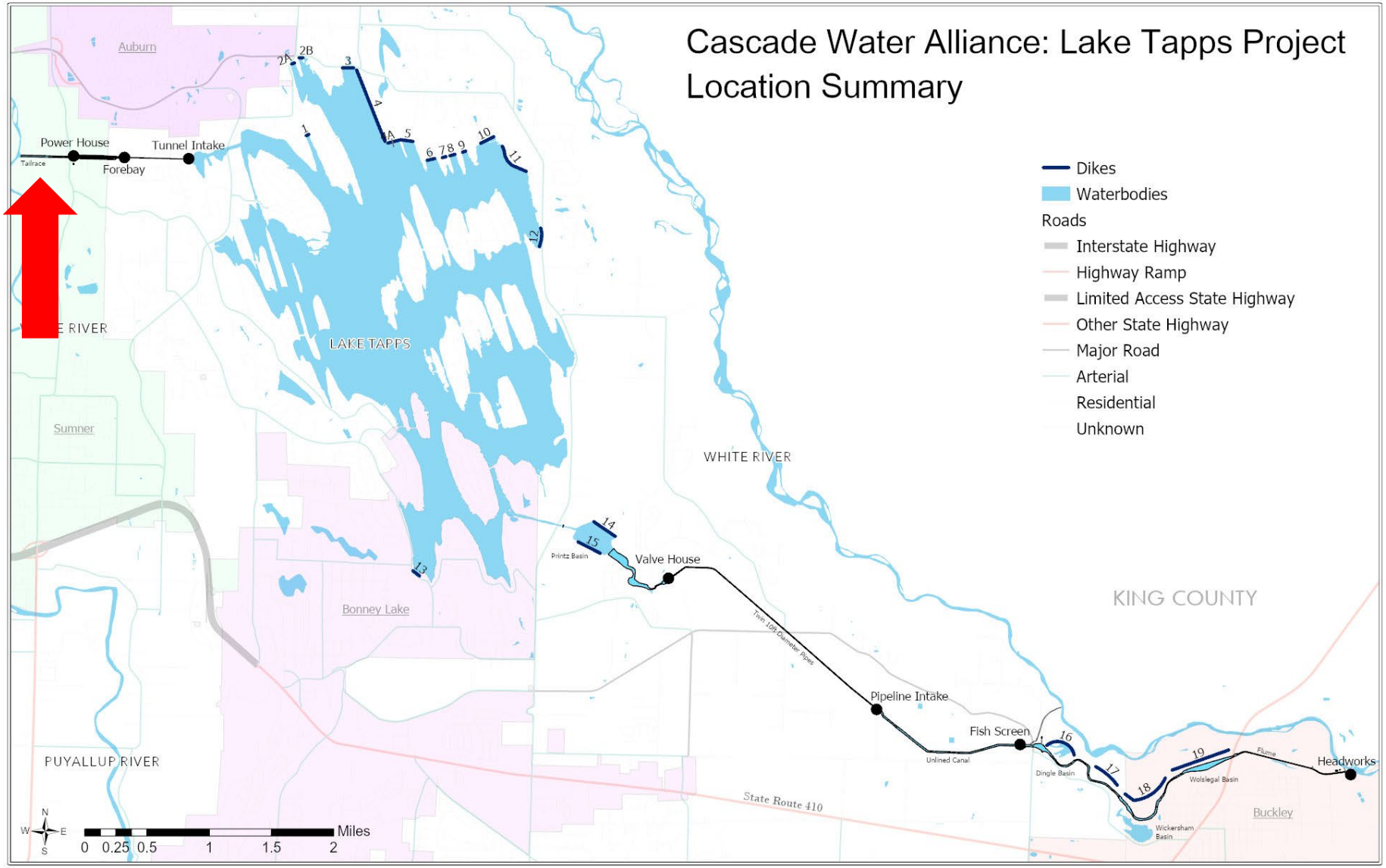
Lower Conveyance System – Powerhouse Plunge Pool

Lower Conveyance System – Tailrace

The Tailrace is an open channel that conveys water released from the Powerhouse back to the White River. Repairs have been made to the wooden retaining walls on both sides of the Tailrace near the Plunge pool.

Next Steps: North and South retaining walls must be replaced. South wood wall in plunge pool needs to be replaced. Wood decking at plunge pool needs to be replaced.

Lower Conveyance System – Tailrace Location



Ethan Duvall, Cascade Water Alliance, November 4 2019

Lower Conveyance System – Tailrace

Site of Future Water Treatment Plant

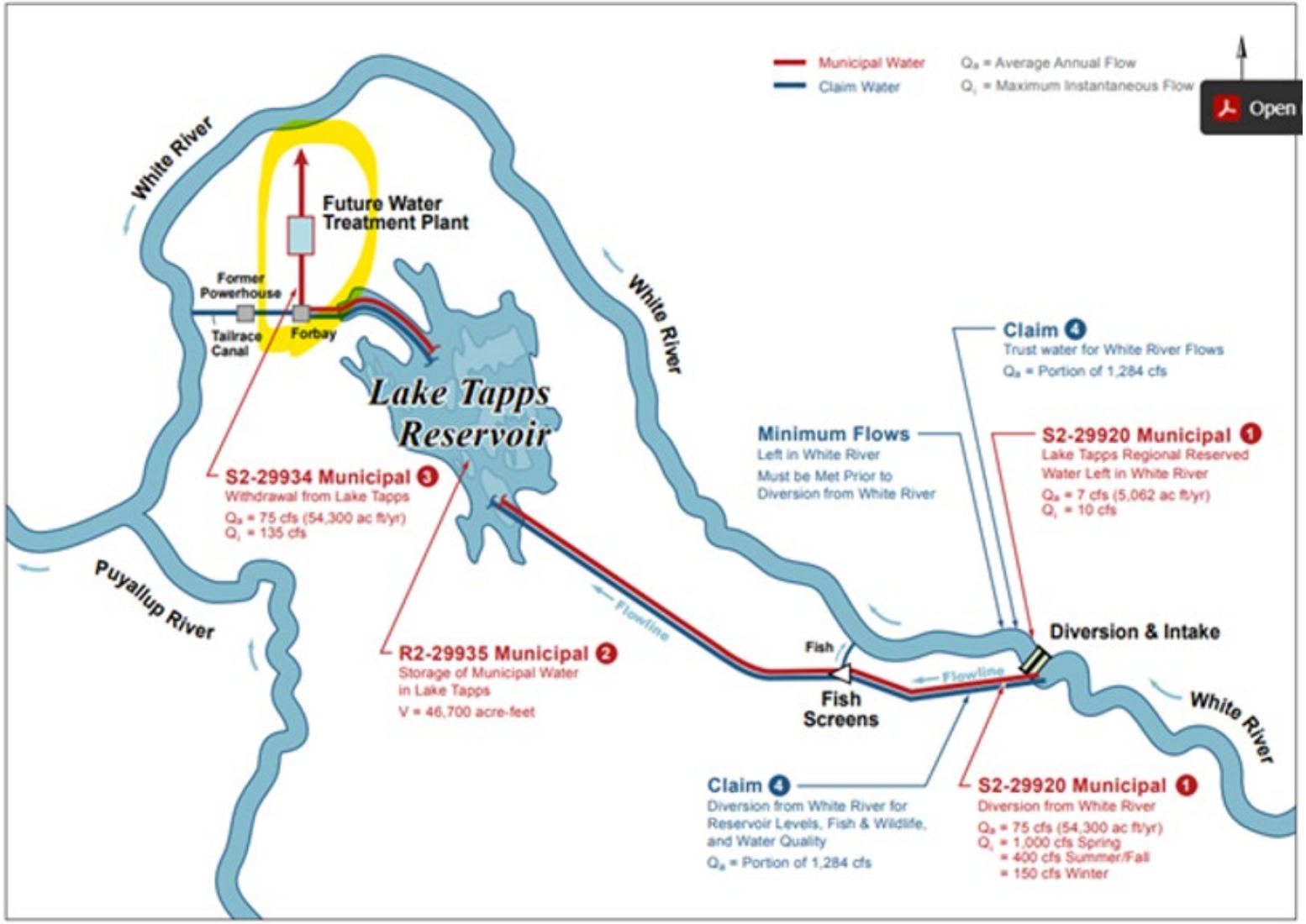


Figure S-1. Schematic of the Water Right Applications and Change of Use Application
Lake Tapps Water Rights and Supply Project

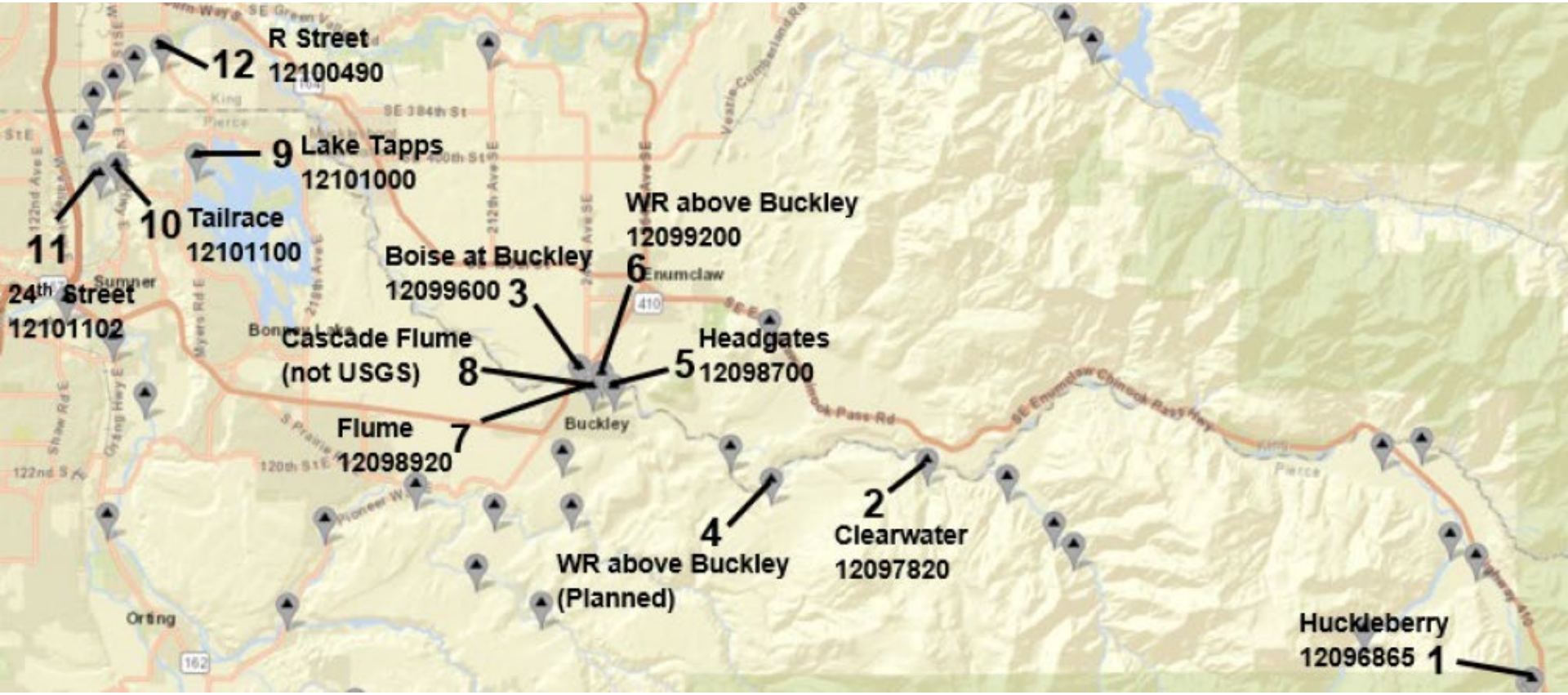
Site of Future Water Treatment Plant

Stream Flow and Water Quality Gaging System - Stream Gage System

Cascade's Lake Tapps Water Rights and the White River Management Agreement (with the Muckleshoot and Puyallup Tribes) require operation and maintenance of a series of streamflow gauges to measure compliance with Minimum Flows, Ramping Rates, Lake Levels and Maximum Diversion Rates. Currently a series of 11 gages are operated by the USGS on behalf of cascade (4 required by the Water Rights and WRMA). In addition to stream flow, water quality parameters are measured at 4 gages.

Stream Flow and Water Quality Gaging System - Stream Gage System Aerial View

Stream Flow and Water Quality Gaging System - Stream Gage System – Gage Locations



Stream Flow and Water Quality Gaging System - Reservoir Water Quality Monitoring System

In 2010, Cascade completed the first water quality monitoring system and installed USGS water Buckley and R-Street, tailrace. In 2015 added another.

2019, Cascade initiated a 2-year water quality monitoring program. Samples will be collected from 4 locations for monthly analysis October through March and twice monthly April through September. Samples will be analyzed for drinking water parameters twice during the first year of the program.

Pre-Purchase Condition Assessment

Prior to completing the purchase of the White River-Lake Tapps Project from PSE, the Board received the *Engineering Report – White River Diversion, Conveyance and Storage Facilities*, prepared by CH2MHill for Buck and Gordon, LLP in September 2006 (Cascades "due diligence" condition assessment analysis).

This report concluded that significant investment would be necessary in Project features (not including the specific municipal water specific facilities i.e. treatment plant and transmission lines), in both the short and long-term.

Pre-Purchase Condition Assessment – Key Findings

Annual O/M cost

$1.3 million in 2006 or $1.96 million in 2020 (escalated at 3% annually)

Capital Upgrades, Long and Short-Term Improvements

2006 – 2010 -- $13 million in 2006 or $19.6 million in 2020 (escalated at 3% annually)

2011 – 2018 -- $6 million in 2006 or $9.3 million in 2020 (escalated at 3% annually)

2019 – 2050 -- $37 million in 2006 or $55.6 million in 2020 (escalated at 3% annually)

Total -- $56 million in 2006 or $84.5 million in 2020 (escalated at 3% annually)

Dike Repair/Replacement (see attached)

$47 – 58 million in 2006 or $71 – 87.5 million in 2020 (escalated at 3% annually)

Total Capital/Improvements/Repair/Replacement

$103 - 114 million in 2006 or $155.5 - 172 million in 2020 (escalated at 3% annually)

Pre-Purchase Condition Assessment – Key Findings

The report indicated that the following Project features would likely require improvements, repair or replacement:

- Tunnel Intake/Gatehouse
- Penstocks/Standpipes
- Surge Chambers
- Powerhouse Valves
- Headworks Buildings
- Fish Screens
- Twin Pipeline System
- Headgates
- Timber Flume
- Bear Trap
- Forebay
- Dikes 2A, 2B, 3, 4, 4A, 5, 6, 8, 9, 10, 11, 12 and 13

Improvements, repair or replacement for many of these Project features has been completed or is in the planning phase. Cascade has also identified other Project features requiring improvements, repair or replacement.