Metro
600 NE Grand Ave.
Portland, OR 97232-2736

Council work session agenda

Tuesday, November 21, 2017 **2:00 PM** **Metro Regional Center, Council Chamber**

2:00 Call to Order and Roll Call

2:05 Chief Operating Officer Communication

Work Session Topics:

2:10 Draft Willamette Falls Legacy Project Master Plan 17-4923

Presenter(s):	Lisa Goorjian, Metro Alex Gilbertson, Metro Brian Moore, Metro
Attachments:	Work Session Worksheet Draft Resolution No. 17-4824 Draft Staff Report Draft Willamette Falls Riverwalk Master Plan Appendix A to Master Plan Appendix B to Master Plan Appendix C to Master Plan Appendix D to Master Plan Appendix F to Master Plan Draft Appendix G to Master Plan Appendix H to Master Plan

2:40 Councilor Communication

2:50 Adjourn

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ការគោរពសិទ្ធិពលរដ្ឋរបស់ ។ សំរាប់ព័ត៌មានអំពីកម្មវិធីសិទ្ធិពលរដ្ឋរបស់ Metro ឬដើម្បីទទួលពាក្យបណ្តឹងរើសអើងសូមចូលទស្សនាគេហទំព័រ www.oregonmetro.gov/civilrights។ បើលោកអ្នកត្រូវការអ្នកបកប្រែភាសានៅពេលអង្គប្រជុំសាធារណៈ សូមទូរស័ព្ទមកលេខ 503-797-1700 (ម៉ោង 8 ព្រឹកដល់ម៉ោង 5 ល្ងាច ថ្ងៃធ្វើការ) ប្រាំពីរថ្ងៃ ថ្ងៃធ្វើការ មុនថ្ងៃប្រជុំដើម្បីអាចឲ្យគេសម្រួលតាមសំណើរបស់លោកអ្នក ។

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February 2017

DRAFT WILLAMETTE FALLS LEGACY PROJECT MASTER PLAN

Metro Council Work Session
Tuesday, November 21, 2017
Metro Regional Center, Council Chamber

METRO COUNCIL

Work Session Worksheet

PRESENTATION DATE: November 21, 2017 **LENGTH:** 30 minutes

PRESENTATION TITLE: Draft Willamette Falls Riverwalk Master Plan

DEPARTMENT: Parks and Nature

PRESENTER(S): Alex Gilbertson, x1583 alex.gilbertson@oregonmetro.gov
Lisa Goorjian, x1854 lisa.goorjian@oregonmetro.gov

WORK SESSION PURPOSE & DESIRED OUTCOMES

- Purpose: To provide members of Council with an overview of the planning process for the Willamette Falls Riverwalk project.
- Purpose: To identify and respond to Council questions, comments or concerns related to the Draft Willamette Falls Riverwalk Master Plan.
- Outcome: To have an adopted plan that will receive the City of Oregon City land use and subsequent development approval.

TOPIC BACKGROUND & FRAMING THE WORK SESSION DISCUSSION

Willamette Falls is one of the nation's most beautiful and historic natural wonders and is the second largest waterfall by volume in North America. It has long been an important cultural and gathering place for Native American Tribes. Industrial development, beginning in the 1830s, blocked the falls from access and greatly modified the riverbank with manmade industrial structures. With the closure of the Blue Heron Paper Company in February of 2011, the opportunity arose to bring public access to the east bank of Willamette Falls for the first time in over 150 years.

The Willamette Falls riverwalk site is located on the 22-acre former Blue Heron Mill property in downtown Oregon City via an easement that was donated to Metro by the private property owner, Falls Legacy LLC. The main portion of the site is largely defined by heavy industrial use and is currently occupied by old paper mill structures and remnants of buildings from earlier industrial eras of wool and flour processing layered upon each other and interwoven into a highly complex assembly.

After the Blue Heron mill closed in 2011 the four partner agencies - Oregon City, Clackamas County, Metro and the State of Oregon, came together as the Willamette Falls Legacy Project, to secure public access to the falls. In 2012, The Partners identified four core values in order to bring the Willamette Falls Legacy Project to life. The four values are Historic and Cultural Interpretation, Public Access, Healthy Habitat and Economic Redevelopment. The values have been used as a framework for all project decisions and will continue to guide future decisions as the project is implemented. In 2014, the Framework Master Plan was created to guide future development of the site.

From the winter of 2015 to present, project staff have been involved with the riverwalk planning, design and community engagement for the riverwalk. The master plan is a result of a two-year design process developed in collaboration with the City of Oregon City, Metro, Clackamas County, the State of Oregon, PGE, Falls Legacy LLC, the five confederated tribes and thousands of community members. Other stakeholders included conversations with agencies to understand the complexities and science of the site, meetings with focus groups and state partners.

Five community events and online surveys, an online Community Check-In, numerous presentations, facilitated conversations to local groups or organizations and weekday tours of the site helped shape the master plan. Stakeholders and community members weighed in with their vision for the site. Eight key uses drive the design of the public space and include PGE dam operations, falls viewing and tribal access and use.

The master plan provides a long-term vision and implementation strategy to guide future public use and development of the riverwalk. This master plan document establishes project goals and objectives, key public uses, outlines site resources and conditions and summarizes the planning process. It also lays out a framework for implementation, including phasing, future maintenance and operational needs and funding.

The overall riverwalk is an aspirational plan that anticipates future funding commitments, grants and fundraising efforts. It is anticipated that the design of the riverwalk will be built in phases as funding becomes available. Goals for Phase 1 include providing a prominent view of the falls, safe and secure interim access and building demolition that will prepare the site for future phases of the riverwalk and reduce barriers for redevelopment. Phase 1 will include habitat restoration work, historic and cultural interpretive elements and provide a viewing area in the Mill H building and Boiler Plant complex.

The Partners intend to develop public access to the site in a sensitive and balanced way that ensures all four core values are considered now and into the future.

Staff recommends adoption of Resolution No. 17-4824, for the purpose of approving the Willamette Falls Riverwalk Master Plan on January 4, 2018.`

QUESTIONS FOR COUNCIL CONSIDERATION

- Does Council have any questions, comments or concerns related to the draft Willamette Falls Riverwalk Master Plan?

PACKET MATERIALS

- Would legislation be required for Council action ☑ Yes ☐ No
- If yes, is draft legislation attached? ☑ Yes ☐ No
- What other materials are you presenting today?
    - Draft Willamette Falls Riverwalk Master Plan
    - Draft staff report
    - Draft resolution 17-4824

BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF APPROVING THE)
WILLAMETTE FALLS RIVERWALK MASTER)
PLAN)

RESOLUTION NO. 17-4824

Introduced by Chief Operating Officer Martha
Bennett in concurrence with Council
President Tom Hughes

WHEREAS, in May 1995, area voters approved ballot Measure 26-26, authorizing Metro to issue $135.6 million for bonds for Open Spaces, Parks, and Streams to purchase land in regional target areas; and

WHEREAS, in November 2006, area voters approved Metro's Natural Areas Bond Measure, authorizing Metro to issue $227.4 million for bonds to purchase land in regional target areas; and

WHEREAS, after the Blue Heron Paper mill closed, Metro and its public partners – the City of Oregon City, Clackamas County and the State of Oregon (the “Partners”), came together as the Willamette Falls Legacy Project to secure public access to the falls; and

WHEREAS, in 2012, the Partners identified four core values in order to bring the Willamette Falls Legacy Project to life: economic redevelopment, healthy habitat, historic and cultural interpretation and public access to Willamette Falls, a natural wonder in our region; and

WHEREAS, in 2014, Falls Legacy LLC purchased the 22-acre former Blue Heron Paper mill property in downtown Oregon City and Portland General Electric (PGE) owns the dam on the site. Falls Legacy LLC granted Metro an easement to construct a riverwalk on its property, and PGE granted Metro an easement option; and

WHEREAS, given the site’s significant historic associations and strong connection to the Willamette River and Willamette Falls, the site has been identified as a “legacy opportunity,” and utilizing bond funds, Metro is playing a lead role in the development of the riverwalk and long term stewardship of natural areas; and

WHEREAS, a technical advisory committee was created and included staff from Metro, Oregon City, Clackamas County and the State of Oregon and reviews contracts, budgets and project milestones; and

WHEREAS, extensive stakeholder meetings and focus groups included, but are not limited to neighbors of the site including residents and business owners in downtown Oregon City, the McLoughlin and Canemah neighborhoods and West Linn; Native American Tribes with ties to the site and to the falls; Falls Legacy LLC; PGE, the Locks and West Linn Paper Company; User groups advocating for river dependent activities such as fishing, kayaking and pleasure boating; Boating companies such as Willamette Jetboat and the Portland Spirit; Cultural and heritage organizations and advocates; Environmental organizations, federal, state and local agencies and advocacy groups interested in establishing healthy habitats and protecting water quality and river health; Business and tourism organizations providing economic development input; and the non-profit friends group, Rediscover the Falls; and

WHEREAS, in order to identify desired and appropriate visitor improvements, Metro and its partners met extensively with the property owner and PGE, conducted widespread public outreach, including open houses, online surveys, an online community check-in, weekly site tours, presentations and facilitated conversations to local groups and organizations; and

WHEREAS, in 2017, the Willamette Falls Riverwalk Master Plan was developed by and with the oversight, input and review of the Partners, Technical Advisory Committee, project stakeholders, members of the community and Metro Council; and

WHEREAS, the Willamette Falls Riverwalk Master Plan identifies improvements for Metro's easement on the site and future easement on the PGE property, which improvements focus on the Partners' goals and the four core values to protect and enhance the natural, scenic and cultural resources while providing access for visitors to positively experience the natural area; and

WHEREAS, the Metro Council's approval of the Willamette Falls Riverwalk Master Plan does not establish final design improvements, is not a final land use decision, and is not binding on local governments, but rather provides recommendations to guide Metro staff and partner jurisdictions as they continue design work; NOW THEREFORE,

BE IT RESOLVED that the Metro Council hereby approves the Willamette Falls Riverwalk Master Plan, attached hereto as Exhibit A.

ADOPTED by the Metro Council this 4th day of January 2018.

____
Tom Hughes, Council President

Approved as to Form:

____
Alison R. Kean, Metro Attorney

STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 17-4824, FOR THE PURPOSE OF ADOPTING THE WILLAMETTE FALLS RIVERWALK MASTER PLAN

Date: November 21, 2017 Prepared by: Alexandra Gilbertson, Parks & Natural Areas, Ext.1583

BACKGROUND

Willamette Falls is one of the nation's most beautiful and historic natural wonders and is the second largest waterfall by volume in North America. It has long been an important cultural and gathering place for Native American Tribes. Industrial development, beginning in the 1830s, blocked the falls from access and greatly modified the riverbank with manmade industrial structures. With the closure of the Blue Heron Paper Company in February of 2011, the opportunity arose to bring public access to the east bank of Willamette Falls for the first time in over 150 years.

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After the Blue Heron mill closed in 2011 the four partner agencies - Oregon City, Clackamas County, Metro and the State of Oregon, came together as the Willamette Falls Legacy Project, to secure public access to the falls. In 2012, The Partners identified four core values in order to bring the Willamette Falls Legacy Project to life. The values have been used as a framework for all project decisions and will continue to guide future decisions as the project is implemented. In 2014, the Framework Master Plan was created to guide future development of the site.

From the winter of 2015 to present, project staff have been involved with the riverwalk planning, design and community engagement for the riverwalk. The master plan is a result of a two-year design process developed in collaboration with the City of Oregon City, Metro, Clackamas County, the State of Oregon, PGE, Falls Legacy LLC, the five confederated tribes and thousands of community members. Other stakeholders included conversations with agencies to understand the complexities and science of the site, meetings with focus groups and state partners.

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The overall riverwalk is an aspirational plan that anticipates future funding commitments, grants and fundraising efforts. It is anticipated that the design of the riverwalk will be built in phases as funding becomes available. Goals for Phase 1 include providing a prominent view of the falls, safe and secure interim access and building demolition that will prepare the site for future phases of the riverwalk and reduce barriers for redevelopment. Phase 1 will include habitat restoration work, historic and cultural interpretive elements and provide a viewing area in the Mill H building and Boiler Plant complex.

The Partners intend to develop public access to the site in a sensitive and balanced way that ensures all four core values are considered now and into the future.

ANALYSIS/INFORMATION

1. **Known Opposition**
   The public engagement planning and communication practices were successful in piquing interest, inspiring involvement and providing feedback loops for stakeholders. The innovative, large-scale scope of the public involvement program, as well as the success of the process, as shown by the large participation numbers, positive stakeholder feedback and broad public support of the final design prove there is positive support from the community.

   However, this project has many layers and there are two topics that we have known opposition. The first being a passionate wildlife advocate concerned about the release of information via the Oregon Department of Fish and Wildlife regarding trapping, hazing and culling Steller sea lions to protect threatened salmon and steelhead fish at Willamette Falls. National Marine Fisheries Service and Oregon Department of Fish and Wildlife are the regulatory authority over marine mammals. Any comments about trapping, hazing, etc. should be directed to them.

   The second known opposition is from a group of community members within the City of Oregon City who believe funding $50,000 to help form Rediscover the Falls, the non-profit friends group, is a disguise for funneling public money to improve private property and private companies. There is also a lack of trust amongst members in the community that the property owner intends to actively develop the site.

2. **Legal Antecedents**
   Metro Council Res. 14-4556, “For the Purpose of Approving the Willamette Falls Riverwalk Memorandum of Understanding with City of Oregon City, Clackamas County and State of Oregon;” Metro Council Res. 16-4676, “For the Purpose of Approving the Willamette Falls Legacy Project Governance Intergovernmental Agreement Among the State of Oregon, Clackamas County, Metro and Oregon City;” Metro Council Res. 17-4815, “For the Purpose of Approving the Amended and Restated Intergovernmental Agreement Among the State of Oregon, Metro, Clackamas County, and Oregon City for the Willamette Falls Legacy Project.”

3. **Anticipated Effects**
   The riverwalk conceptual design was finalized in June 2017. At the same time, the project team identified a “Phase 1” for the project that involves the demolition and construction of access and a falls viewing location. On August 17, 2017, the Metro Council, acting as the Contract Review Board, approved a resolution to pursue a request for proposal to procure a Design-Build team. Once project staff reach an agreement with the property owner, next steps will involve design engineering, land use approval and permitting. The Design-Build team will prepare construction drawings and construction, including demolition and site preparation, is expected to begin following permitting approvals.

4. **Budget Impacts**

This effort represents the responsible expenditure of funds contemplated in the IGA, including $5M provided by the Metro Natural Areas Bond funding, $5M provided by SB 5506, $1.2M from Oregon City, roughly $10M from private fundraising, $400,000 from the property owner and $7.5M provided by HB5030 and SB 5507. Alternative funding sources, such as grants, may also be pursued to help provide additional funding for design and construction for the riverwalk.

The project also spurred the creation of a nonprofit friends group, Rediscover the Falls that is dedicated to advancing the Willamette Falls Legacy Project through building friendships and fundraising. Additional funding secured by fundraising or grants could potentially extend the project completion date.

RECOMMENDED ACTION

Staff recommends adoption of Resolution No. 17-4824, for the purpose of approving the Willamette Falls Riverwalk Master Plan as presented.

MASTER PLAN

Willamette Falls Riverwalk

NOVEMBER 2017 DRAFT

Willamette Falls
LEGACY PROJECT

ACKNOWLEDGEMENTS

Project Partners

City of Oregon City

Clackamas County

Metro

State of Oregon

Technical Advisory Committee and Project Staff

City of Oregon City

Clackamas County

Metro

State of Oregon

Property Owners

Falls Legacy LLC

Portland General Electric

Native American Tribes

Confederated Tribes of the Umatilla Indian Reservation

Confederated Tribes of the Grand Ronde

Confederated Tribes of Siletz Indians

Confederated Tribes of Warm Springs

Confederated Tribes and Bands of Yakama Nation

Design Team

Snøhetta

Mayer/Reed, Inc.

DIALOG

JLA Public Involvement

KPFF Consulting Engineers

Flowing Solutions LLC

DKS Associates

NW Geotech, Inc.

DCW Cost Management

Technical Consultants

CH2M

Stillwater Sciences

MIG, Inc.

ECONorthwest

Maul Foster Alongi, Inc.

Rick Williams Consulting

Heritage Resource Associates, Inc.

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OREGON CITY

CLACKAMAS COUNTY

Metro

1859

Willamette Falls

LEGACY PROJECT

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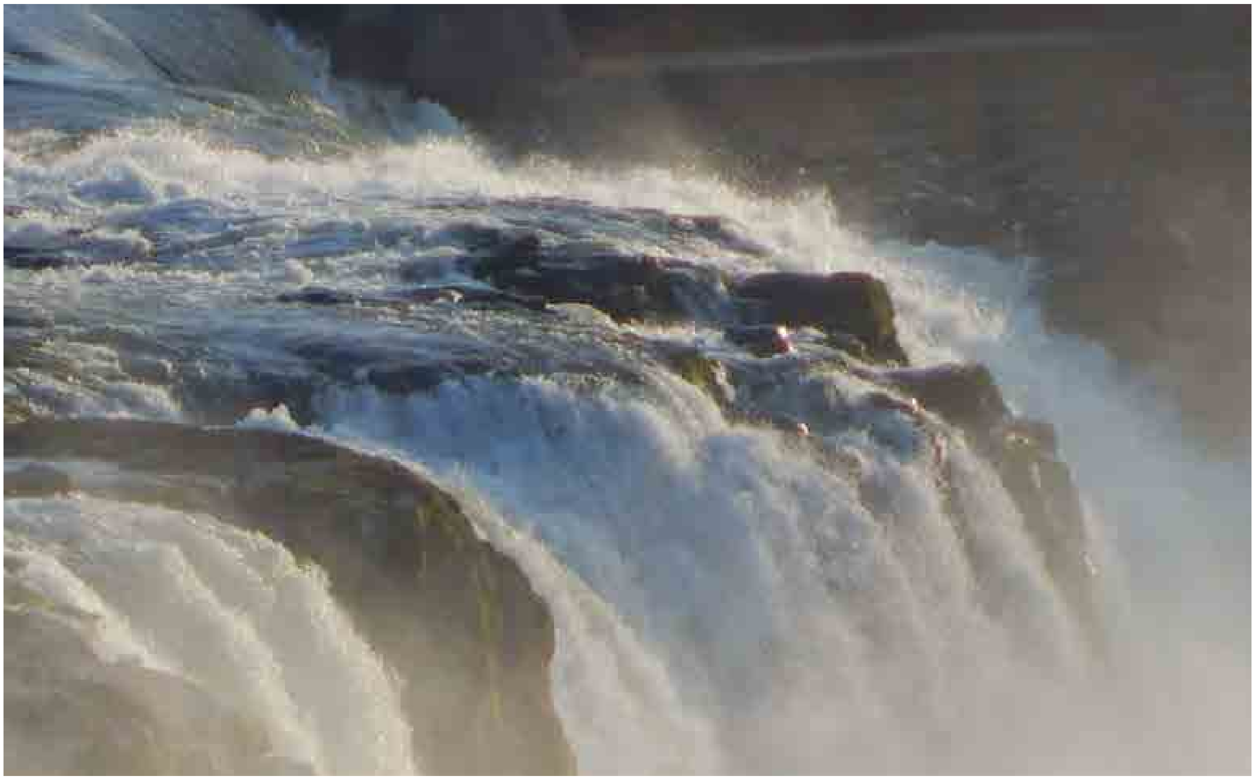
EXECUTIVE SUMMARY

Willamette Falls is one of the nation's most beautiful and historic natural wonders. The second largest waterfall by volume in North America, it has long been an important cultural and gathering place for Native American tribes. Industrial development, beginning in the 1830s, blocked the Falls from public access and greatly modified the riverbank with man-made industrial structures. The Blue Heron Paper Company was the most recent in a succession of various industries that nested itself on the east bank of the Willamette River at Willamette Falls. The closure of the paper mill in February of 2011, due to bankruptcy, allowed the opportunity to bring public access to the Falls for the first time in more than 150 years.

Following the paper mill's closure, the City of Oregon City, Clackamas County, Metro and the State of Oregon joined together as Project Partners to form the Willamette Falls Legacy Project. These four government agencies have partnered since 2012 to establish and carry out a vision for the 22-acre site and reduce and remove barriers to redevelopment. A key feature of the vision for the project site is the creation of a world-class riverwalk to allow for public access and viewing of Willamette Falls.

The Willamette Falls Legacy Project site in Oregon City contains more than 50 industrial buildings, various degraded natural habitat areas, and is partially within the Willamette River floodplain. At the southern end of the project site, and on Willamette Falls itself, is a dam owned and operated by Portland General Electric (PGE). The site presents many opportunities and challenges. Opportunities for the riverwalk include strong ties to Native American tribes and culture, a site rich with the history of the Oregon Territory, the industrial west and power generation, and a fully operational dam walkway that can draw visitors close to the Falls to feel the mist and hear the roar of the water. Challenges for site development include hazardous building materials, flooding risks, state and federal protection of fish and wildlife species and dam operations.

In 2014, Falls Legacy LLC purchased the mill site and donated an easement along the shoreline to Metro for the purposes of building a public riverwalk. Metro has taken the lead in riverwalk design using funding from its 2006 Natural Areas Bond, along with contributions from the other three agency Partners and the private property owner.



Guided by the project's four core values of economic redevelopment, public access, historical and cultural interpretation and healthy habitat, the riverwalk design began in 2015. Robust community engagement has shaped the riverwalk conceptual design; thousands of people have participated in events, surveys, tours and meetings related to the Willamette Falls riverwalk.

Based on community and site owner input as well as technical studies and conservation science, the recommended riverwalk plan takes inspiration from the power of the Falls, selectively carving away concrete, steel, wood and stone from the project site to reveal the rich cultural, ecological and geological layers of history aggregated on the site.

The Willamette Falls Legacy Project site lies within an area of the Willamette River watershed that Metro and other conservation groups have identified for important habitat restoration and boasts several rare native plant species that thrive in the mist of the Falls. Improvements made to create healthy habitats and enhance natural environments can make a big difference for salmon, steelhead and Pacific lamprey migrating past the site.

The riverwalk is expected to be a catalyst for the redevelopment of the remainder of the site and for economic improvement in adjacent downtown Oregon City and neighboring West Linn. Throughout the riverwalk design, public spaces intertwine with redevelopment parcels and buildings in order to increase to economic viability. Pathways and promenades connect islands of re-used industrial structure and large areas of restored habitat. Exploring the site, visitors will travel through a rich sequence that celebrates Willamette Falls in its fullest depth of nature, culture, industry and time. The design includes the following elements:

- A wide promenade for visitors to walk along the river
- Explorer Trails that provide additional pathways to bring visitors closer to the river and navigate through and over wildlife habitat areas and historic structures
- Removal of several industrial buildings and structures along the river with low redevelopment and historic value

- A new boat dock for light watercraft, both motorized and non-motorized
- Exposure of industrial water channels, also known as tailraces, to promote healthy floodplain function
- A flexible public plaza for events and gatherings
- Removal of a large amount of structural fill to restore historic shoreline conditions near the Woolen Mill
- Reuse of a historic mill building for covered gathering space, interpretive elements and a visitor center
- Multiple viewpoints of the falls, both up close and from building rooftops
- Removal of invasive plants and industrial debris from the river's edge and planting of native tree and shrub species
- Addition of large woody debris in shoreline areas to create natural habitats for river species
- A walkway on the PGE dam and a destination falls overlook from an old powerhouse foundation
- Reuse of the large clarifier tank for landscape of oak savanna habitat and connection to pedestrian bridges
- A vertical play structure that utilizes the steel structure of a mill building
- A pedestrian bridge to the McLoughlin Promenade, rising 100 feet above the site
- Immersive experiences and historic and cultural interpretation throughout the public space
- Opportunities for integration with future private development
- Visitor parking areas and access improvements for all transportation modes


The Woolen Mill Alcove and Public Yard


The Woolen Mill Overlook


The Clarifier Landscape and PGE Dam Promenade

The overall concept will be constructed in phases, with Phase 1 beginning once the Partners reach an agreement with the private property owner. Phase 1 will include habitat restoration, historic and cultural interpretative elements and open public access closer to the falls. Phase 1 will focus demolition and site preparation in the Yard and Mill Reserve areas and provide a viewing area in the Mill H building and Boiler Plant complex.

The project has also spurred the creation of a 501(c)3 nonprofit friends group, Rediscover the Falls, that is dedicated to advancing the Willamette Falls Legacy Project through building friendships and fundraising.

Keeping the four core values of economic redevelopment, public access, historical and cultural interpretation and healthy habitat as a guide, the riverwalk will be one of the many transformations of this site over time. Metro and the Project Partners are writing a new chapter--one that honors history, provides healthy habitat, fosters the economic development opportunities and connects people with downtown Oregon City and Willamette Falls.

PART I: INTRODUCTION

Willamette Falls: A Natural Treasure

Willamette Falls is one of the nation's most beautiful and historic natural wonders, but also one that is largely hidden from the public. It is the second largest waterfall by volume in North America and has long been an important cultural and gathering place for Native American Tribes.

The Falls, on the Willamette River, sits at the end of the Oregon Trail and is flanked by the cities of Oregon City and West Linn. In the late 1800's, on the eastern side of the Falls, you would have found a thriving frontier city—it became the site of energy generation for Oregon's early industries, including the state's first paper mill and the world's first long-distance electrical power transmission line from Oregon City to downtown Portland.

The former Blue Heron Paper Company spanned the eastern side of the Falls and was the last in a succession of businesses that contributed to a strong working waterfront in Oregon City. They closed their doors in 2011, leaving a gap to be filled in the city's historic downtown and local economy, but also an opportunity to bring people to Willamette Falls.

Nowhere else will you find quite the same juxtaposition of history, culture, industry and nature. The riverwalk was conceived during a visioning process in 2013 and 2014 that resulted in an undertaking to give the public an up-close view of Willamette Falls and a unique and breathtaking waterfront experience.

> Willamette Falls is one of the nation's most beautiful and historic natural wonders. The second largest waterfall by volume in North America, this has long been an important cultural and gathering place for Native American Tribes.

Metro Parks and Nature

Within Metro's 2016 Parks and Nature System Plan, the Willamette Falls riverwalk is classified as a Regional Recreation Area. Regional Recreation Areas offer access to some of the region's most distinctive natural features for boating, swimming, picnicking and other activities. While some include sensitive lands and areas managed and treasured for their cultural habitat and ecosystem values, Regional Recreation Areas generally support high levels of activity and use.

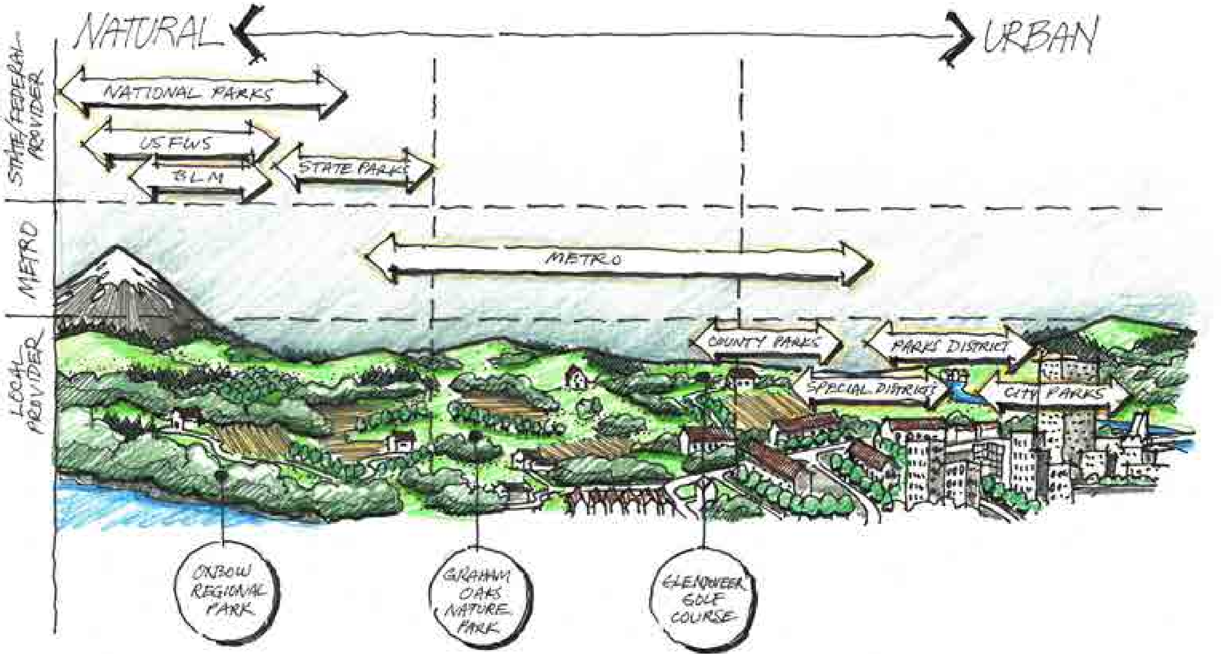
The riverwalk is envisioned as a catalyst for a much larger transformation of the site: a thriving, connected downtown anchor, with room for housing, public spaces, habitat restoration, education and employment.

The riverwalk is just one site that sits within the greater regional context of properties and natural areas owned and managed by Metro in and around Oregon City. Some other notable sites include: Newell Creek Canyon Natural Area, Canemah Bluff Nature Park and the Willamette Narrows Natural Area.

Natural Areas Bond Measures

In 1995 and 2006, voters approved general obligation bond measures to protect water quality, restore fish and wildlife habitat and provide opportunities for nature-based recreation across the region. This public investment is responsible for the growth of Metro's portfolio of parks and natural areas, which today totals roughly 19,000 acres.

Given the site's significant historic associations and strong connection to the Willamette River and Willamette Falls, the site has been identified as a "legacy opportunity." The Willamette Falls riverwalk design was funded from multiple sources, including contributions from Metro, the City of Oregon City, Clackamas County, and Falls Legacy LLC. Utilizing $5 million in Natural Areas Bond funding, Metro is playing a lead role in the development of the riverwalk and long term stewardship of natural areas. The construction funding for the riverwalk Phase 1 will also come from multiple sources. More information on project funding is found on page 110.



As a park provider, Metro focuses on large-scale natural area conservation close to home in an urban setting. Metro acquires, restores and provides access to large sites that typically are beyond the reach of local jurisdictions, but closer to population centers than those managed by state and federal providers.

Oregon City Parks and Recreation

The addition of the Willamette Falls riverwalk will create a regional park in historic downtown Oregon City and expand recreational opportunities in the greater metropolitan region. The Oregon City Parks and Recreation 1999 Master Plan and the 2008 Master Plan Update identify goals which are met through the realization of the riverwalk. These goals include acquiring park land for a growing community, improving efficiencies and level of service through strategic partnerships, improving connectivity through trail development, as well as prioritizing sustainability.

Sustainability is recognized by the Oregon City Parks Department as a top priority. This is achieved through protecting natural resources, public resource stewardship, cultural resources, fostering economic development and utilizing other sustainability practices.

The Willamette Falls riverwalk, as envisioned, will connect the people of Oregon City to Willamette Falls and will reconnect residents, businesses and visitors alike with the rich history of the area.

Clackamette Park

Rivercrest Spraypark

The McLoughlin House

The Oregon City Public Library and Carnegie Library Park

Partners Group Members, 2017

Metro

Council President Tom Hughes

Councilor Carlotta Collette

Chief Operating Officer Martha Bennett

Clackamas County

Commissioner Paul Savas

Commissioner Martha Schrader

Administrator Don Krupp

City of Oregon City

Mayor Dan Holladay

Commissioner Renate Mengleberg

City Manager Tony Konkol

State of Oregon

Senator Alan Olsen

Representative Mark Meek

Deputy Director of State Parks MG Devereux

Metro Regional Solutions Coordinator Raihana Ansary

Project Background

After the Blue Heron Paper mill closed in 2011, four government partners – Oregon City, Clackamas County, Metro and the State of Oregon ("the Partners") – came together as the Willamette Falls Legacy Project to secure public access to Willamette Falls, which has been hidden behind the growth of industry in Oregon City for more than 150 years.

The Partners have been working together since 2011 to establish a vision for the former mill site, craft a site-wide master plan, and build a world-class riverwalk. Each agency brings a unique perspective and set of goals.

Partners Group members with project staff, members of Rediscover the Falls and riverwalk design team members

When the Blue Heron Paper Company closed, Oregon City was faced with 22-acres of vacant industrial waterfront property next to its downtown and wanted to reduce barriers for acquisition to make redevelopment a reality. Clackamas County joined the partnership to assist with redevelopment and job creation. Metro entered the partnership recognizing the once-in-a-lifetime opportunity for public access to Willamette Falls and the need for restoration of habitat in this unique section of the Willamette River. Similarly the State of Oregon saw the opportunity to create public access and also to honor the history and culture of the site's Native American and industrial history.

Aerial drone footage of the former Blue Heron Paper mill

Previous Work: Laying the Foundation

Together in 2012, the Partners identified four core values in order to bring the Willamette Falls Legacy Project to life. The values have been used as a framework for all project decisions and will continue to guide future decisions as the project moves forward.

Four shared values will shape the riverwalk:

Public Access

Historic and Cultural Interpretation

Economic Redevelopment

Healthy Habitat

Four Core Values

Public Access: Visitors will get a front-row seat to experience the majestic and truly extraordinary Willamette Falls. Inaccessible for public enjoyment and effectively removed from the public consciousness for more than 150 years, the Falls are one of the most scenic places along the Willamette River. They also provide an important opportunity for Oregonians to connect with the river, which is isolated from many of the communities along its route.

Historic and Cultural Interpretation: This section of the Oregon City riverfront is rich with history. Willamette Falls served as an important cultural site for Native American tribes. The Falls also tell the story of the area's industrial development – John McLoughlin built the Pacific Northwest's first lumber mill here, and in 1844 Oregon City became the first incorporated city west of the Rocky Mountains. As the end of the Oregon Trail and the birthplace of Oregon, the region served as a transition point for thousands of new Oregonians.

Economic Redevelopment: With the closure of the Blue Heron Paper Company, Oregon City lost 175 jobs – a blow that can be redressed through redevelopment. The Partners' actions to date have been aimed at returning part of the site to private development, reinvigorating the downtown as a hub of employment, shopping, businesses and tourism. The riverwalk is seen as a catalyst that will attract private development and investment to the site and to surrounding areas in Oregon City and neighboring West Linn.

Healthy Habitat: Protecting and restoring natural habitats at Willamette Falls is important for water quality, fish and wildlife habitat in this reach of the lower Willamette River.

Historically, the Falls were surrounded by unique plants that thrived in microclimates created by the mist. Protecting the site provides an opportunity to re-establish native plant communities and improve fish habitat, enhancing this ecologically diverse stretch of the Willamette River.

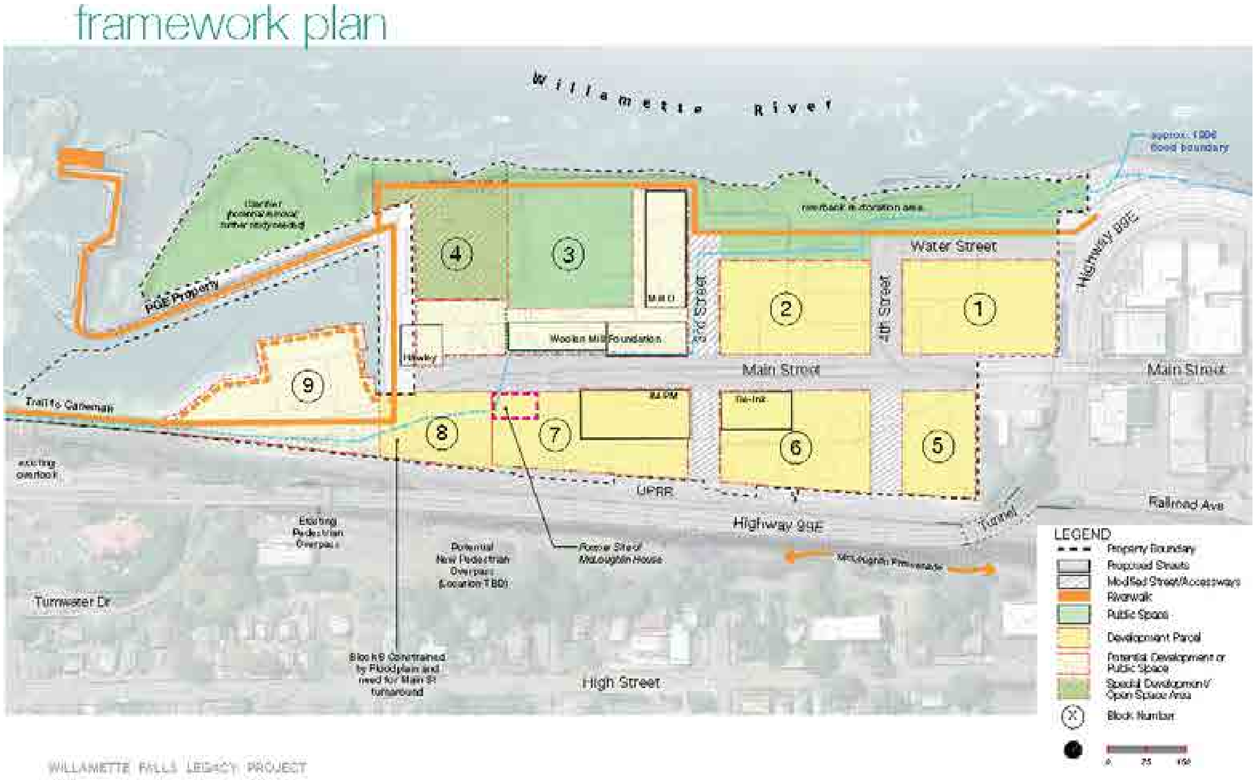
Governor Kate Brown with Metro Councilor Carlotta Collette and former Governor Barbara Roberts on a site tour

Community members celebrate the end of the visioning process in 2014

2013 to 2014: Visioning and Master Planning

In 2014, the Partners created the Framework Master Plan to guide future development of the site. It creates a new, mixed-use Willamette Falls Downtown zone to replace industrial zoning and provided a plan for anticipated patterns of development. The master plan identifies general areas for redevelopment, open space, streets, habitat restoration and shows the riverwalk connecting the existing sidewalk on Hwy 99E to an overlook at the edge of the Falls. Development standards for the area and design guidelines for future buildings are part of the plan, as well as a clear process for future builders to follow when they propose specific projects. Existing protections for flood zones, natural resources, geologic stability and the Willamette River Greenway remain in place.

The "Vision for the Willamette Falls Legacy Project" was also adopted in 2014. This document summarizes the public's input around the core values, their desire to reconnect with the river and Willamette Falls and the need to redevelop the site. It described the riverwalk as including a series of overlooks, platforms and docks along the river's edge to the Falls, and connecting to the proposed street grid and future open spaces.



Site Ownership

The site is privately owned. Falls Legacy LLC purchased the former mill property in 2014 and Portland General Electric (PGE) owns the dam on the site. The Partners were granted an easement from Falls Legacy LLC to construct the riverwalk on its property and PGE granted the Partners an easement option that would allow the public to walk on the dam as part of the planned riverwalk. The Partners adopted an Intergovernmental Agreement that placed Metro in charge of holding the easement and designing the riverwalk, with support and close coordination from all the Partners. The Intergovernmental Agreement established a decision-making process that relied on consensus of all four agencies, at the staff level and by elected officials.

Purpose of this Document

In early 2015, the Partners initiated a public master planning process for the riverwalk. The master plan provides a long-term vision and implementation strategy to guide future public use and development of the riverwalk. This document establishes project goals and objectives, key public uses, outlines site resources and conditions and summarizes the planning process. It also lays out a framework for implementation, including phasing, future maintenance and operational needs and funding.

The Partners intend to develop public access to the site in a sensitive and balanced way that ensures all four core values are considered now and into the future.

A Vision for the Willamette Falls Legacy Project

The riverwalk is a critical first step in providing public access to the Falls and in demonstrating public commitment to creating an amenity that will spur the future redevelopment of the site.

Willamette Falls at sunset

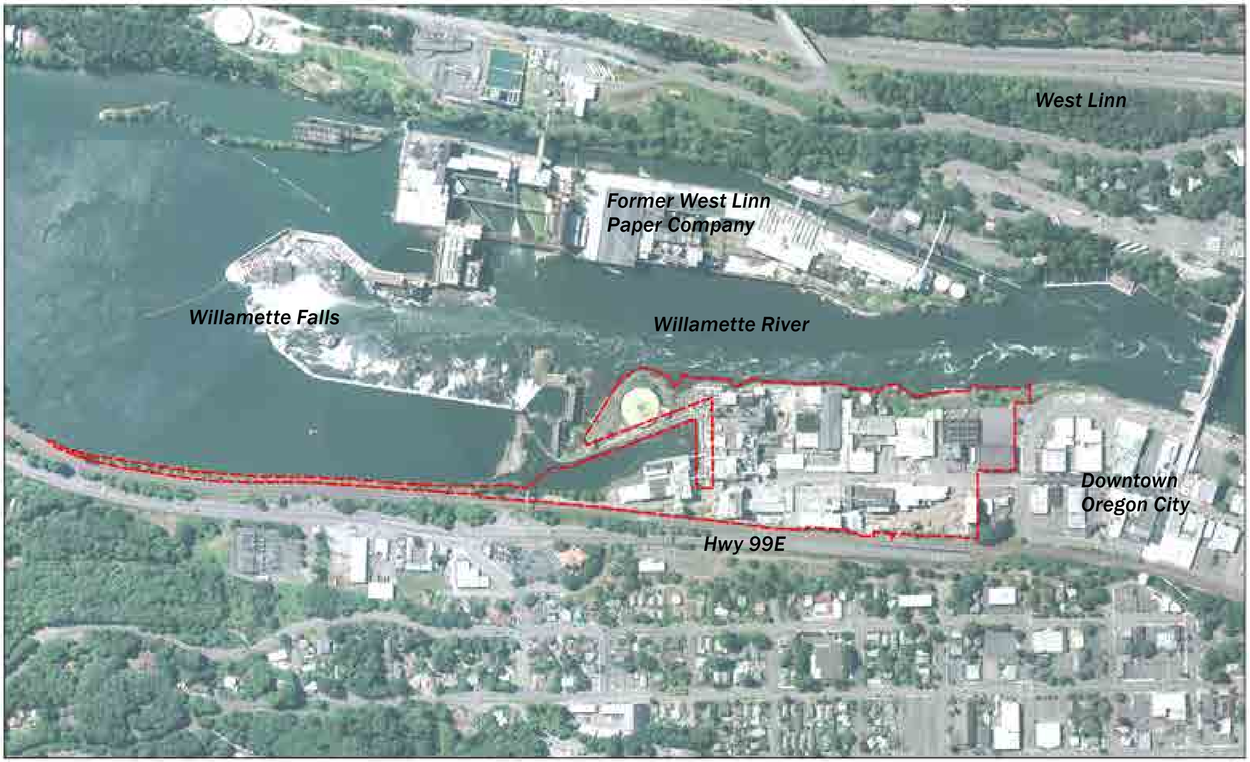
PART II: ABOUT THE SITE

Site Location

The Willamette Falls riverwalk is located in the heart of the Pacific Northwest, on the Willamette River in Oregon City, Clackamas County, Oregon. The 22-acre riverfront site is an accessible destination within a 30-minute driving distance of several Northwest cities, including Portland, West Linn, Lake Oswego, Vancouver, Gresham and Wilsonville.

Its placement along the Willamette River makes this site highly visible to anyone visiting or driving past downtown Oregon City. It is less than a mile from Interstate 205 and 13 miles from downtown Portland. The Portland International Airport is less than 20 miles from the site.

Oregon City itself, with a growing population of 34,000 is classified as a Regional Center under the Portland metro region's long range plan.

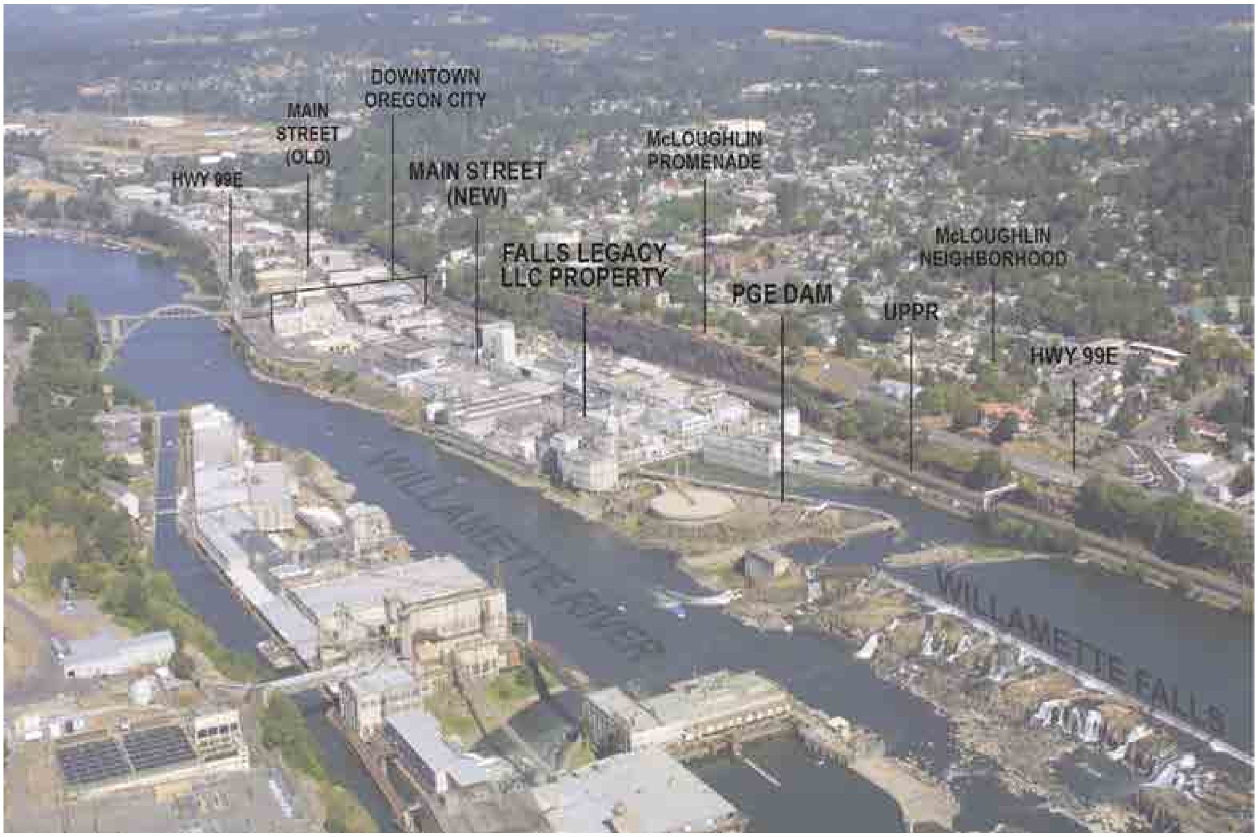


Red outline indicates the former Blue Heron Mill site boundary

Site Description

The project site sits along almost a mile of Willamette River frontage. The southern portion of the site borders the calm, upper portion of the falls. The main portion of the site is largely defined by heavy industrial use and is currently occupied by old paper mill structures and remnants of buildings from earlier industrial eras of wool and flour processing layered upon each other and interwoven into a highly complex assembly. There are dozens of buildings on the site of various ages and conditions. The buildings sit empty; all equipment and infrastructure that had any value was removed during bankruptcy by a salvage contractor. There are also dozens of tanks, cylinders and other industrial structures scattered throughout the site. For ease of understanding and purposes of design, the site was divided into four distinct areas:

- **Area 1: North Riverfront:** from Highway 99E to 3rd Street
- **Area 2: South Riverfront:** from 3rd Street, including the Public Yard, Pipe Chase and Mill Reserve areas
- **Area 3: PGE dam and Mill E:** Clarifier, PGE dam, intake basin and Mill E
- **Area 4: Canemah Connection:** narrow strip of land along railroad tracks, which ends at the northern edge of the Canemah neighborhood

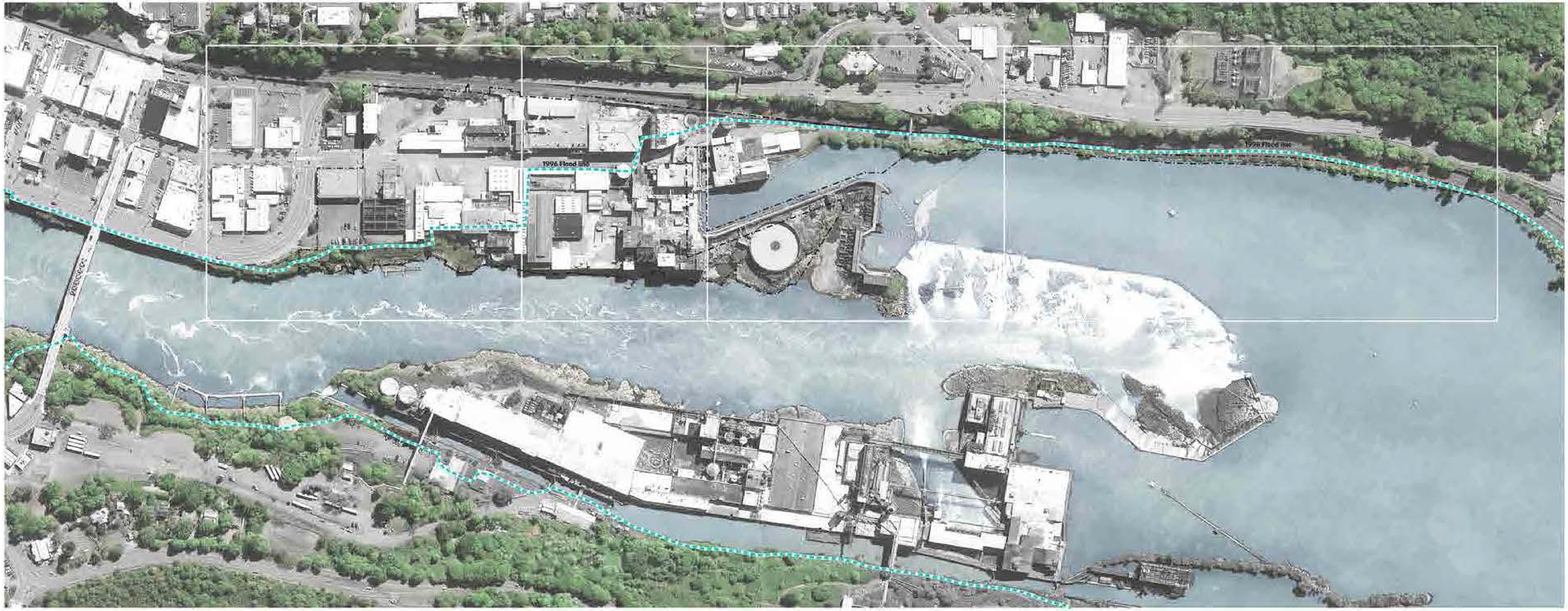


Area 1
North Riverfront

Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah



Site History

From time immemorial people have been drawn to Willamette Falls. The area around Willamette Falls was home to a large population of native peoples spanning multiple tribes. Villages around the falls are described by many of the early explorers. In addition to those who resided nearby, Willamette Falls was a major center of regional intertribal contact and commerce.

Anadromous fish congregating below the falls and awaiting favorable river conditions for moving upstream could easily be taken by Native fishermen. Some of the earliest evidence of prehistoric peoples in the Pacific Northwest has been found at archaeological sites on the Columbia River, most notably at Celilo Falls near The Dalles, where the record of occupation extends back 10,000 years. A similar, very long record of Native American occupation may be in evidence at Willamette Falls.

After The Dalles, Willamette Falls is often cited as the second most important trading center in the Pacific Northwest. Willamette Falls is mentioned prominently in the oral literature and stories of Native Americans, including the Chinookan and Kalapuyan peoples.

The importance of this place as a transition point along the main transportation artery meant that it also became a destination for settlers. Long before streets were platted in Seattle, Portland or San Francisco, Oregon City's Main Street extended from the falls, through this site and north through the basalt bench, becoming the spine of a thriving pioneer community and the end of the legendary Oregon Trail.

New settlers built industries and businesses centered on the transport of goods around the Falls and on the use of the roaring volume of water to produce power. As the U.S. entered the electric age, the 30 to 40 feet of water height, or "head," at the Falls was a natural source for power generation, and the location was promoted as the "Niagara Falls of the West." During this time white settlers worked and lived amongst Native American people, who later were removed to reservation lands through treaties with the United States Federal government. After reservations were formed, tribal members continued to fish at the Falls in accordance with their treaty rights.

Using generators originally employed in a Portland sawmill, the Willamette Falls Electric Company, a precursor of Portland General Electric, produced the nation's first long-distance transmission of electricity on June 3, 1889. Power traveled from Station A in Oregon City to the streetlights in Portland 14 miles away. Power generation later moved to the West Linn side of the river, with remnants of the old turbines and equipment remaining on the Oregon City side.

American Indians at the Falls fished using platforms that allowed them to balance over the water, scooping the salmon as they tried to pass, c. 1842

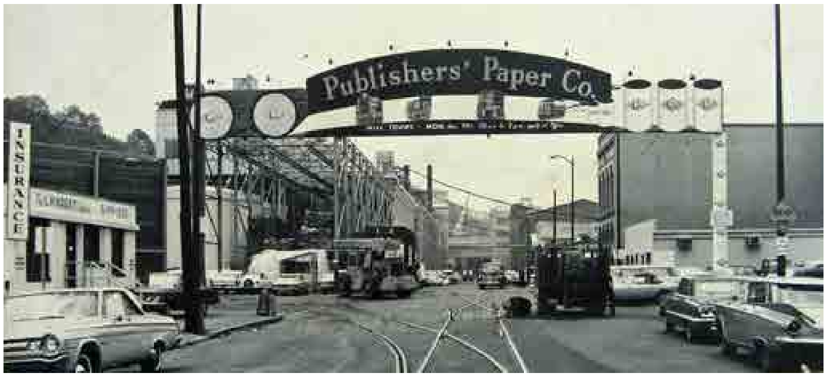
This drawing shows what would have been one of the last American Indian settlements near the Falls, at Abernathy Creek. Disease and conflict destroyed what had once been a vibrant community of tribes, 1857

> If Oregon has a spirit of place, it would be embodied at Willamette Falls. This landscape's spirit is impossible to ignore since it emanates an almost palpable energy attracting people generation after generation. Recognizing, understanding and respecting a place's spirit is critical for future planning so that it can re-emerge if it's been obscured or can come through in new ways with respect to the past.

Over time the site transformed into part of a burgeoning town, with industries clustered around the falls and various residences, business, churches and hotels built along Main Street. As industry grew, and papermaking replaced wool and flour mills, the homes and businesses were replaced with large industrial buildings. In 1948-1950 Hawley Pulp & Paper sold and Publisher's Paper was established. By the 1970s, the southern end of Main Street, along with 3rd, 4th, and Water Streets, were vacated by the city and turned over to the mill to create one 22-acre site. In 1986 Jefferson Smurfit Co. purchased the mill and in 2000 the employees established the Blue Heron Paper Company, the last industrial operation to occupy the site. Thousands of people were employed by the mill over the years, and despite a variety of mergers and name changes, it was the economic engine of Oregon City. At the time of its bankruptcy in 2011, 175 people worked at the Blue Heron Paper Company.

Habitat Conditions

The site is located within the Willamette Greenway and serves as a linkage to other natural areas in the lower Willamette River such as the Canemah Bluff Natural Area, Camassia Nature Preserve, Coalca Landing, West Linn White Oak Savanna, Willamette Islands and the Willamette Narrows. These natural areas, including the project site, provide linkages from central and south Willamette valley north to the Portland metropolitan area and are essential to regional biodiversity conservation in an area of urbanization.



Left, above: 1892 image of early industry on the river

Left, below: Main Street entrance to Publisher's Paper in the 1960s

Below: Mill workers at a log lift in 1951

Currently, habitats on the site are relatively small and highly fragmented due to the historic site development, highways (I-205 and 99E) and the adjacent railroad. Historic fill and grading of the site have further decreased the amount of natural habitat available. Remaining habitat in natural or semi-natural condition includes areas wetted by high waters of the Willamette River, areas of seasonal or perennial spring seepage and basalt outcrops with varying exposures.

Due to these processes and existing site conditions, six major habitat types are present or potentially present at the site and are described below.


Juvenile spring chinook

In-channel river

In-channel river habitat areas on the Willamette are important to a wide range of native fish and wildlife species. Integrating tributary headwaters down to the valley floor, this habitat type serves as an iconic feature of the Northwest landscape. It includes open water riverine areas with no vegetation and islands of basalt rock formed in-channel at low water. In general, rivers, streams and open waters provide multiple ecological services, including: attenuating flood flows, recharging ground water, sediment storage and transport, diluting and converting harmful nutrients, water delivery and atmospheric heat moderation. Mainstem rivers such as the Willamette also support high levels of biodiversity and provide critical migration and movement corridors for fish and wildlife.


Pacific lamprey
(Entosphenus tridentatus)

Off-channel alcove

Highly diverse and dynamic in nature, off-channel alcove habitat on the Willamette River serves as an uncommon and important resource for native fish, wildlife and plant species. Alcove habitat historically existed in greater abundance along the site shoreline. Much of the former off-channel habitat has been filled in and covered by infrastructure. Emergent native wetlands, as well as floating aquatic plant communities are associated with off-channel alcove areas.


Riparian Basalt habitat

Riparian basalt

The basalt outcrops and rocky substrate along the shoreline contributes to the mosaic of rocky habitats located to the north and south of the project site in and along the Willamette River. The outcrops are a relic of the Bretz or Missoula Floods, and exposures along this part of the Willamette River provide important habitat for both dry and wet plant species more common in the Columbia River Gorge. Shallow depressions that hold water on the basalt also provide unique wetland habitat. The vegetation assemblages found on the basalt outcroppings of the site are similar to those found in neighboring oak habitat and key habitat for pollinators and birds.


Basalt surrounding the Clarifier on site

Riparian forest

Riparian forests are associated with alluvial soil and springs and seeps emerging from the site. Large areas of the site may have been historically dominated by this habitat, but due to significant alterations and industrial development, this habitat has been reduced to small areas.

Example Riparian Basalt plant community from nearby Willamette Narrows

Upland forest

Upland forests with large conifer and deciduous trees are found on mid to toe of slopes on valley floors as exemplified at the Canemah Bluff and Willamette Narrows natural areas. The interior portions of the project site may have been historically dominated by this habitat but due to significant alterations and industrial development, this habitat is now limited to a narrow corridor alongside the railroad spur.

Oak woodland savanna

Oak woodland and savannas are dry to wet grasslands occurring on hilltops and slopes with patches of shrubs and Oregon white oak trees. This habitat type surrounds the Willamette Falls site and can be found along the McLoughlin Promenade. Oak savanna is an Oregon Department of Fish and Wildlife conservation strategy habitat for the Willamette Valley.

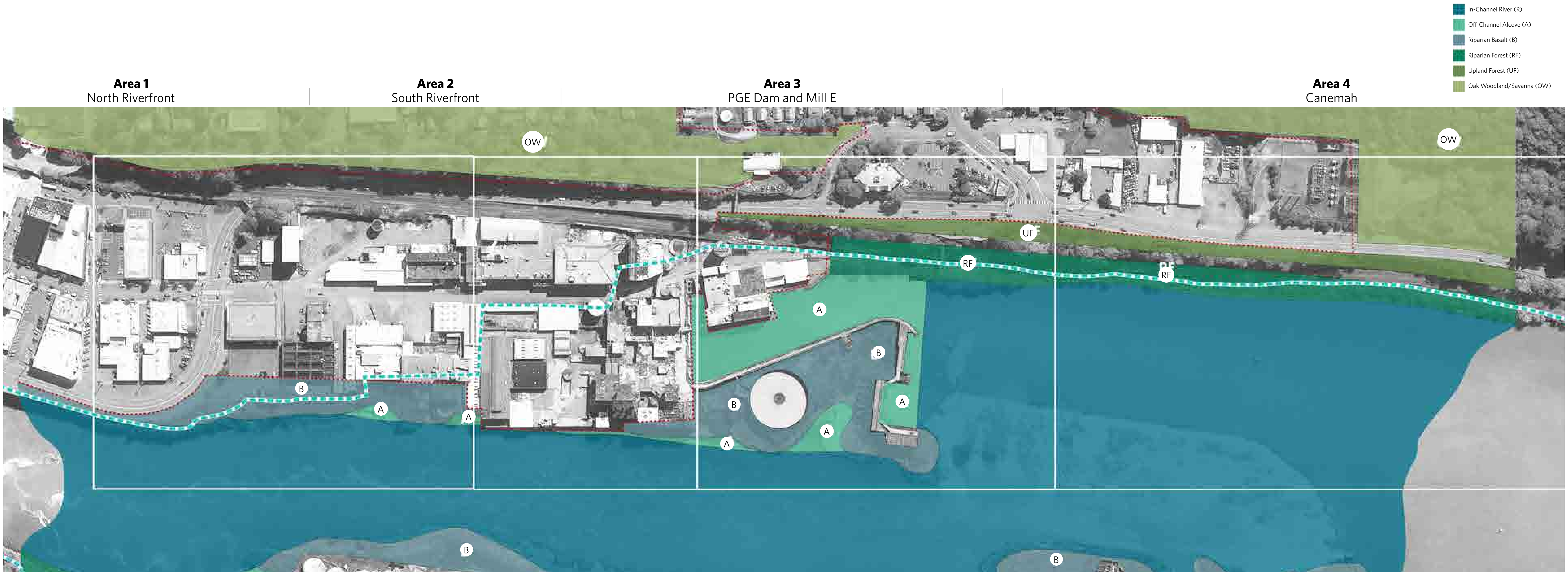
Example upland forest habitat

Existing Habitat Types

A more in-depth description of these habitat types, their condition and examples of plants and animals that are native to each habitat type are found in the Baseline Habitat Conditions Report in Appendix A. The habitat areas referenced on the Existing Habitat Types plan are not necessarily demonstrative of high-quality habitat. Many of the existing habitat areas are in various states of degradation through human use, industrial development and invasive species. That said, the site's existing conditions are unique and well-positioned for ecological restoration.

Willamette Falls and riparian forest habitat from the McLoughlin Promenade

Existing Habitat Types

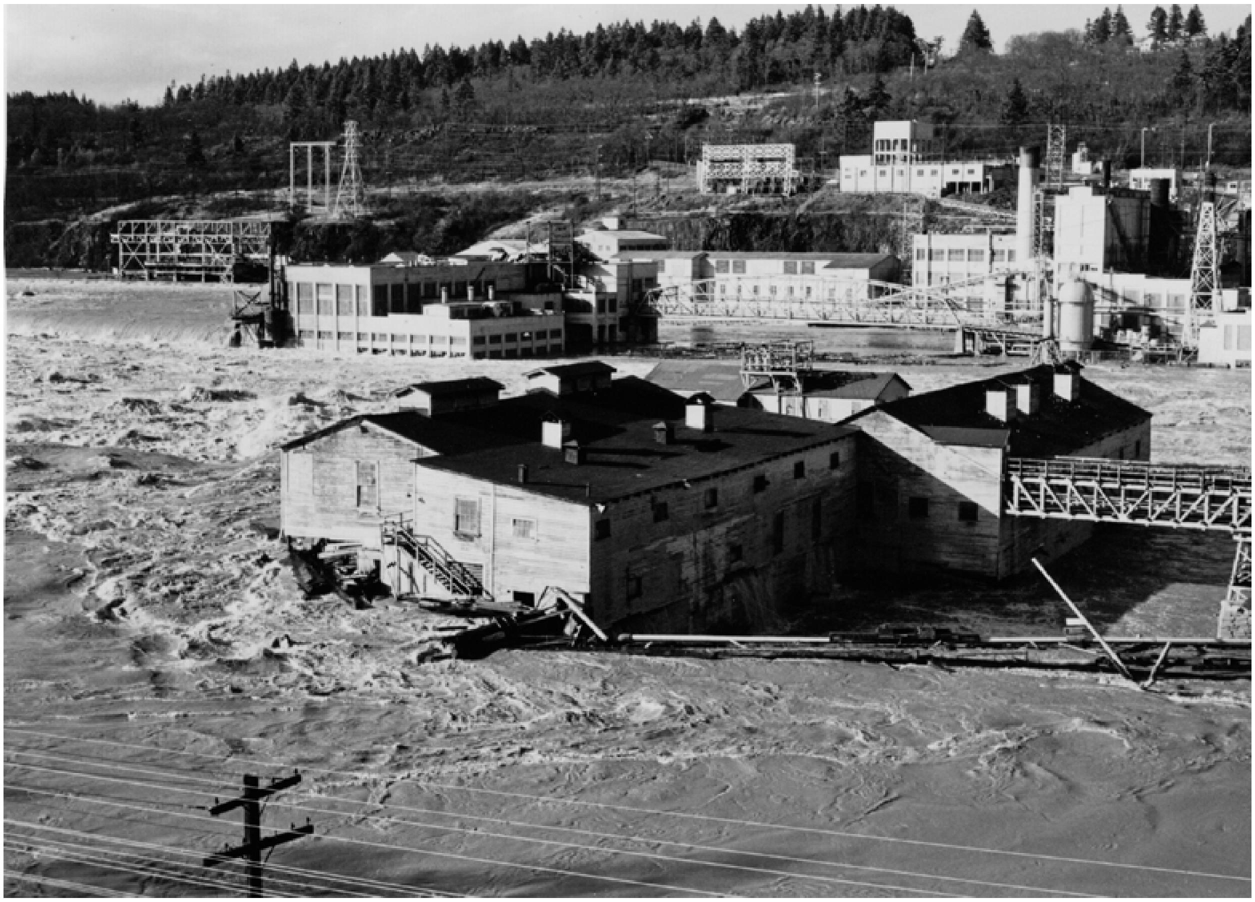


Flooding and Hydrologic Conditions

Willamette Falls is the second largest waterfall by volume in North America, second only to Niagara Falls. Flow rates downstream of the project site range from an average of 8,390 cubic feet per second (cfs) in August to 76,100 cfs in December, which roughly equates to more than a half million gallons per second. The Willamette River is also tidally influenced up to Willamette Falls.

Located on the right bank of the Willamette River, a significant portion of the riverwalk site, 12.5 acres, is within a city-designated flood overlay. The southern portion is subject to flooding and last experienced major flood events in 1996 and 1964. Floods on the site result from the river level below the falls rising and from water above the falls overtopping the PGE dam and flowing into the site from the south. The unique hydraulics at the site make flood modeling challenging.

Surface water is generally the result of treated stormwater that flows through historic channels, small waterfalls, and alcoves. Seepage below outcrops and spillways is an additional hydrologic characteristic of the site, and these springs and seeps could provide cold water input to the Willamette River, benefiting native fish and other aquatic species.



The flood in 1964 impacted almost the entire west coast and brought significant changes to the mills, including the inevitable razing of Mill A. Water rushed over the basin and across the Mill Reserve area, but the dam seems to have withstood the torrent. The flood is considered by some as the worst in Oregon history

Onlookers watch the 1996 flood from McLoughlin Blvd/Hwy 99E.

Geology and Topography

The Willamette Falls area expresses the sequential effects of two catastrophic geologic events— the eruption of many hundreds of cubic miles of flood basalts that blanketed much of what is now the states of Washington and Oregon about 15 million years ago; and the voluminous release of floodwaters across much of the same region, previously impounded by the melting North American ice sheet between about 18,000 and 13,000 years ago.

The Columbia River Basalts are a sequence of lava flows that erupted from vents in eastern Washington and Oregon, mainly between about 17 and 14 million years ago.

At the close of the last global glacial era, the ice sheet that covered much of northwestern North America began retreating from its terminal position in northeastern Washington State. The Columbia River and its tributaries, long-dammed by the ice to form a voluminous lake in eastern Washington and Idaho, discharged catastrophically beneath the thinning ice margin to create the Missoula Floods. Although the primary flood continued down the Columbia River to the Pacific Ocean, discharges were so great that water backed up the Willamette River up to and well south of the project site, depositing extensive terraces of silt, sand and gravel. This glacial era flooding occurred many dozens of times over a period of at least several thousand years, with multiple iterations of scour and deposition resulting from them.

The site now sits at 60 feet above sea level, with the basalt cliff east of the site towering an additional 100 feet. The grade on site falls from 60 feet toward the river and Willamette Falls. Much of the natural grade is hidden by built up structures and buildings with multiple basement levels.

Neighboring Uses, Site Access and Connections

Downtown Oregon City

Downtown Oregon City is directly adjacent to the proposed riverwalk. Main Street is the vehicular entrance to the site and also provides transit connections, with the closest bus stop (Line 33) at 8th and Main Street.

Historic Oregon City

Downtown is a small but thriving district of offices, shops and restaurants along Main Street. The historic core stretches from 5th to 10th Street, and the north end - from 10th to 15th Street - has significant development opportunities. The celebrated municipal elevator connects downtown to the bluff at 7th Street, and the transit center is located on Main and 11th. The riverwalk is envisioned to be the connector to seamlessly integrate downtown into the new Willamette Falls District.

Potential boat access to the downtown core exists via an old dock site located at McLoughlin and 8th Street. Residents have expressed interest in a water taxi service between Oregon City and Portland, and the 8th Street dock site has the potential to become an iconic water gateway to downtown.

West Linn Paper Company

West Linn Paper Company (WLPCo), formerly Crown Zellerbach, was West Linn's largest employer and sits directly across the river from the former Blue Heron mill. Using a long term lease from PGE, WLPCo operated on an island between the river and the Willamette Falls Locks; however, the company announced its closure in October 2017. The West Linn Paper Company made different paper products from what was manufactured at Blue Heron.

Upper Right: Oregon City Municipal elevator

Middle: Local businesses on Main Street in downtown Oregon City

Lower: Looking toward the former West Linn Paper Company

Aerial view of the dam, looking toward the Sullivan Plant and the former West Linn Paper Co across the river

PGE Sullivan Plant

PGE operates the T. W. Sullivan Hydropower Electric Project just across the river from the Blue Heron mill site and next to the former West Linn Paper Company. The dam is PGE's oldest and has a capacity of 18 megawatts, enough to power about 11,000 homes.

Station B opened on the West Linn side of Willamette Falls in 1895. PGE closed Station A in 1897, but B continued operating, taking the name in 1953 of the PGE hydraulic engineer who designed the station, Thomas W. Sullivan. The entire development was called the Willamette Falls Hydroelectric Project.

PGE's dam wraps all the way around the horeshoe of the falls and hits the edge of the river on the Oregon City side. The walkway that runs along the top of the spillway and some portions of the dam on the Oregon City side of the river will be part of the riverwalk project. PGE has given Metro an option for an easement on this portion of the dam.

> "Out of this State Heritage Area designation, we intend to foster 'heritage tourism,' drive key economic development and enhance cultural offerings in and around Oregon City, West Linn, Lake Oswego and beyond. But this is an equally important milestone as we move toward designation at the national level."
>
> -Alice Norris, president of the Willamette Falls Heritage Coalition

Willamette Falls Locks

The Willamette Falls Locks, built in 1873, are not currently operating, but a separate effort that is outside of the Willamette Falls Legacy Project is underway to reopen them for commerce and tourism. The 40-foot wide lock chambers previously enabled barges, commercial boats, fishing boats, kayakers and canoers to bypass the Falls.

Middle: PGE Sullivan Plant in West Linn from Oregon City

Lower Right: North entrance to the Willamette Falls Locks

Willamette Falls Heritage Area

The Willamette Falls Heritage Area, which encompasses 26 square miles of natural and historic areas of Oregon City, West Linn and Lake Oswego, earned a State Heritage Area designation from the Oregon Heritage Commission in 2015. The Coalition's mission is to advocate for and strengthen the identity and economy of the communities around Willamette Falls by preserving, enhancing and promoting the nationally significant and distinctive stories of the area, while cultivating public-private partnerships to develop its natural, cultural, industrial, scenic, recreational and historic resources.

John McLoughlin statue in Oregon City

McLoughlin Conservation District

The McLoughlin Conservation District, overlooking the site from the bluff, is referred to as the "second level" in Oregon City, reflecting its topography and relationship to the original town of Oregon City. In the 1850s few people built homes on the second level, but as the downtown area became more crowded, and after completion of the Oregon and California Railroad in late 1869, more residents moved up the hill. In 1986, the city designated the area as a historic district. The municipal elevator offers a convenient pedestrian link between downtown and the McLoughlin Conservation District.

Canemah National Register District

The Canemah National Register District is located south of the riverwalk site, just above the falls. The community lies within a crescent-shaped hollow in the basalt cliffs that rise above the river to the south. Its name is said to derive from a Native American word "kanim" for "canoe place," and it was the existence of a graveled beach there that gave rise to the town's establishment in 1845. Because of the falls, cargo and passengers had to be portaged at this point.

Passengers unboarding form the streetcar in Canemah

Upper: McLoughlin Promenade

Middle: Existing sidewalk along McLoughlin Boulevard between 10th Street and the project site

Lower: Willamette Terrace, an esplanade along McLoughlin Boulevard from 10th Street to Clackamette Park

This location allowed the founding of the town for the purpose of river boat building and as a trade destination during the 1850s through 1870s. Canemah is significant to the state as one of only a few remaining intact former riverboat towns. Canemah was annexed to Oregon City in 1928 and boasts dozens of historic homes in a unique and heavily wooded neighborhood. Canemah also includes a commercial business area along McLoughlin Blvd (Hwy 99E).

Museum, McLoughlin House and McLoughlin Promenade

Just above the riverwalk site, on the bluff, lie a handful of significant historic destinations, including the Museum of the Oregon Territory, the McLoughlin Promenade and the McLoughlin House. There is an opportunity to create connections or partnerships that link the riverwalk to these surrounding historic destinations.

Trail Connections

Trail connections to the site include the Willamette Terrace, which begins in Clackamette Park on the north end of Oregon City, runs along the river, and ends at 10th Street. Between 10th Street and the riverwalk, a wide shared-use path is planned, but currently this route consists of a 5-foot wide sidewalk.

The Trolley Trail is a shared-use path that connects the Springwater Corridor to Oregon City. The Springwater Corridor Trail is the major southeast segment of the 40-Mile Loop, the greater Portland region's most iconic trail system. The Trolley Trail runs through Milwaukie, Oak Grove, Jennings Lodge, and Gladstone, before crossing the Clackamas River and connecting to Oregon City's Clackamas River Trail and eventually the Willamette Terrace. Connecting these routes provides a pleasant and safe bike connection all the way to the heart of Portland and to other areas of the region.

The Oregon City Loop Trail is a proposed trail that will run along the edge of Oregon City, and the section that hugs the river would include the riverwalk. The riverwalk will then connect to the future McLoughlin-Canemah Trail segment of the Loop Trail.

Passenger trolleys once passed through the site on their way to a public park at Canemah, bringing weekenders from Portland to enjoy the falls vicinity. A rail spur remained through the site as an important freight route in and out of the mill. This spur, which is part of the 22-acre site, has incredible recreational potential as a connection to the Canemah Bluff Natural Area and Willamette Narrows beyond.

Upper Right: The McLoughlin-Canemah Trail Plan project aims to connect the riverwalk and McLoughlin Promenade to Old Canemah Park and Canemah Children's Park with a shared use trail

Middle: Overgrown railroad spur line to Canemah, with Union Pacific railroad tracks, Hwy 99E and the McLoughlin Promenade above. The spur line is part of the 22 acre former mill site

Lower Left: Clackamas River Trail in Oregon City, which connects to Gladstone and eventually the Trolley Trail

Buildings, Structures and Special Features

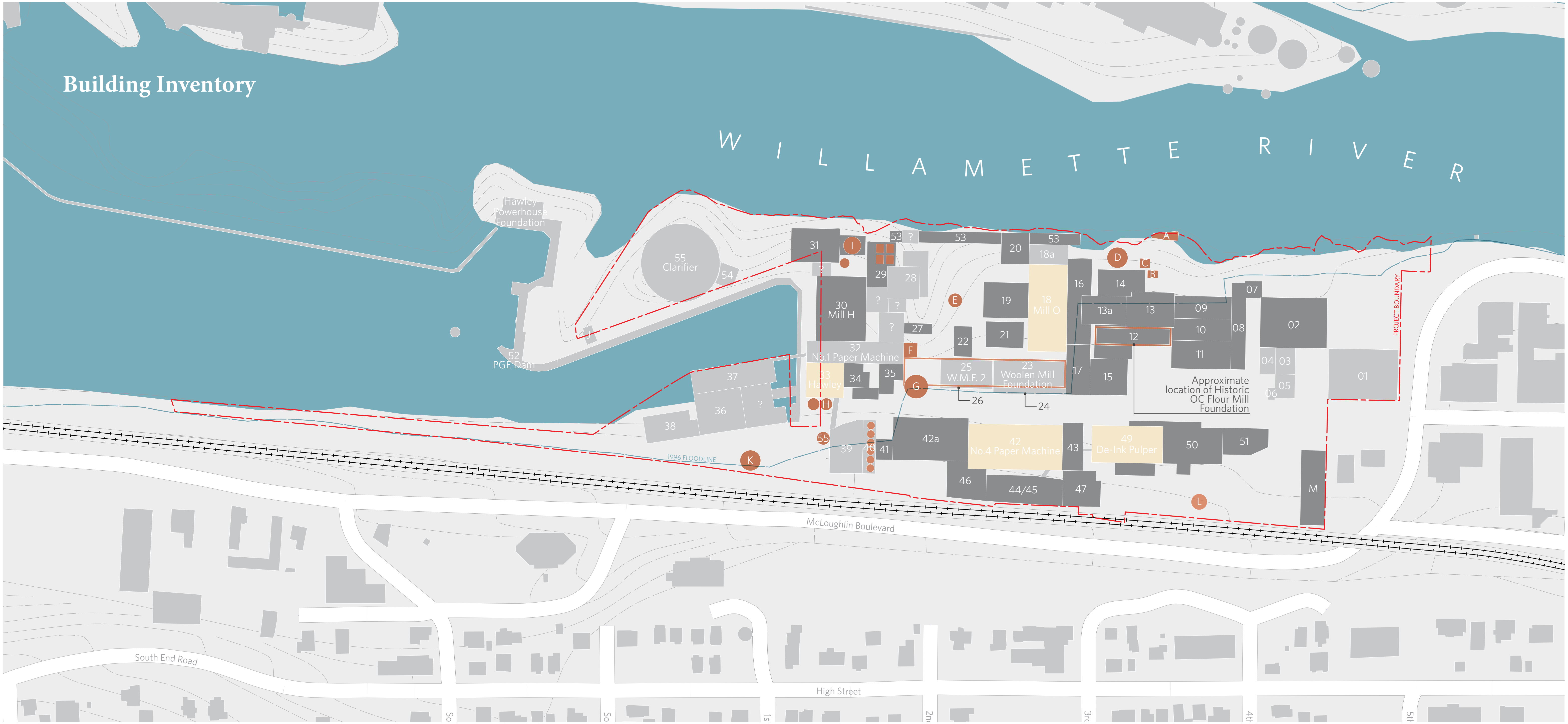
The existing mill site contains over fifty buildings and multiple tanks and industrial structures. Many of these elements have a unique character and, if retained, can help tell the industrial history of the site. Buildings have been highly modified over the years as the mill expanded and as equipment sizes changed, and many of the buildings had multiple uses, owners and functions. Major materials on site include basalt, wood, steel and concrete.

Building Inventory

During the visioning and master planning process in 2013 and 2014, the Partners inventoried all the existing buildings on the mill site. Fifteen of the approximately fifty total structures were determined to be potentially eligible for the National Register of Historic Places. Of those fifteen, five were identified to be intact based on architectural integrity, reuse potential, or were otherwise thought to be more historically significant due to their age or use. Two of these buildings, Mill O and the Woolen Mill foundation, are part of the riverwalk plan, and the other three are part of future private development areas on site. The adopted Framework Master Plan placed protections on these five buildings, requiring that they be integrated in some way in the redevelopment plans for the site. Other non-building elements such as the digesters, boilers and other tanks throughout the site were also identified and protected through the Framework Master Plan. All remaining structures are not required to be reused, but may offer opportunities for reuse.

Chimneys at Mill C.

Building Inventory



- ■ Inventory Building / Structure
- ■ Site Artifact
- ■ Building / Structure yet to Inventory
- ■ Historic Building to Remain

01 Blue Heron Paper Office Area
02 Water Filtration Plant
03 Water Filtration Plant
04 Fire Station
05 Office
06 Guard Shack
07 Mill D North Train Siding
08 Mill D Metel Roof
09 Mill D
10 Mill D Warehouse No.3 Finishing
11 Mill D Warehouse No.2 Finishing
12 No.2 Paper Machine
13 No.3 Paper Machine
13a No.3 Paper Machine Demo
14 No.3 Paper Machine 2
15 Butler Building
16 Roof Structure Over 3rd St. Access
17 Roof Structure Over 3rd St. Access
18 Mill O
18a Mill O Lab
19 Carpentry Shop
20 Pipe Shop
21 Millwright Shop
22 Auto Shop
23 Woolen Mill Foundation
24 North Woolen Mill Roof Structure
25 Woolen Mill Foundation 2
26 South Woolen Mill Roof Structure
27 South Substation
28 Recovery Boiler
29 Boiler Plant
30 Mill H De-Ink/THP Area
31 THP Reject Refining
32 No.1 Paper Machine
33 Hawley Building
34 No.1 Paper Mill Bleach Plant
35 No.1 Paper Mill Rewind
36 Receiving and Store Room
37 Mill E Offices
38 Weld Shop
39 Sulphite Plant
40 Digester
41 Save All
42 No.4 Paper Machine
42a No.4 Paper Machine South Addition
43 No.4 Paper Mill North Addition
44 No.4 Finishing Room and Warehouse
45 No.4 Finishing Room and Warehouse 2
46 No.4 F.R. and W.H. South Addition
47 Shipping Shed
48 North Substation
49 De-Ink OMG Pulper
50 De-Ink ONP Repulper
51 De-Ink ONP Repulper
52 PGE Dam
53 Pipe Chase
54 Clarifier Control
55 Sulphite Sphere
A Platform
B No.3 Paper Machine Machinery 1
C No.3 Paper Machine Machinery 1
D Circular Foundation 1
E Tank 1
F Grotto
G Tank 2
H Hawley Tanks
I Tank 3
J Dam Building 1
K Tank 4
L Tank 5
M Truck Dump

N

0' 100' 200' 400'

Mill O

Mill O was built in 1917 as an annex to the Woolen Mill. It sits along 3rd Street and is partially within the city-designated floodplain. Mill O has a footprint of approximately 18,000 square feet and has two main stories plus a partial third level that housed a variety of functions related to paper manufacturing operations.

Mill O, second story

Oregon City Flour Mill Foundation

The structure was completed in the fall of 1866 and converted into a flour mill in 1868. The business was called the Oregon City Flouring Mills, but was known locally as the "Brick Mill" because of the red brick exterior. The foundation that remains is buried under the No. 2 Paper Machine.

The Brick Mill had different owners and different functions over time, but was part of Oregon City's visual landscape and anchored Third Street for many years, 1890s

Woolen Mill

The Woolen Mill was built in 1865 with a foundation of basalt stone from a quarry near Carver, Oregon and was a major fixture of Original Main Street. The mill was initially powered by water and still boasts an archway in the basalt foundation where the spent water poured back into the river. For many years, the three-story brick building was covered in ivy vines and in 1980, the building was mostly demolished except for the stone foundation. The remaining foundation is approximately 10 feet tall, and the old windows have been filled in with concrete, but their forms are still visible.

Woolen Mill basalt stone foundation walls

The Service Yard

The Service Yard, standing on the Pipe Chase looking at the Boiler Plant complex

Service Yard

The service yard is a fairly flat, paved surface that is approximately an acre in size and includes the Carpentry Shop and other small structures. It is bounded by the Woolen Mill foundation, Mill O, the Pipe Chase and the Boiler Plant. The service yard was partially flooded in 1996, the year of the last major flood.

Pipe Chase (Pipe Tunnel)

The Pipe Chase is a hollow, concrete tunnel structure on the edge of the site, right along the banks of the Willamette. The 390-foot long tunnel held pipes that carried effluent from the paper-making process to the clarifier for treatment. The pipes were removed after the mill shut down in 2011.

Inside the Pipe Chase

Carpentry Shop

The building first shows up on a 1911 Sanborn map, prior to construction of Mill O. It appears to have been built for the Oregon City Woolen Mill as a pullery building on or around 1902. At some point the use of the building was changed by Publishers Paper, which renamed it the Carpentry Shop. The building's previous siding was removed and today it is completely covered in corrugated metal. However, the interior of the building is constructed of exposed timber framing. This structure, which sits next to Mill O, is the oldest building on site that is still mostly intact. Water damage has compromised the upper floor, but much of the old growth wood within is in good condition.

Boiler Plant

The Boiler Plant was constructed after World War II, when naval warship boilers were installed in the mill. In 1955, the original Mill H was reconfigured as the primary boiler location for the entire Publishers Paper mill and its corporate successor operations. The hulking metal structures are grouped together in one building, where they convey an impressive and daunting industrial era.

Clarifier

The Clarifier tank was built in 1968 to treat effluent from the papermaking process. This large concrete cylinder once held two million gallons of effluent at a time. The structure was built just below the dam on a basalt outcropping overhanging the river – a feat that would not be permitted today due to environmental rules that better protect river habitats. The footprint of the Clarifier is approximately 19,000 square feet.

Upper: Interior of the Carpentry Shop

Middle: Mill H and the boiler stacks

Lower: View of the Clarifier from the river

Hawley Powerhouse Foundation

Built in 1916, the Hawley Powerhouse is connected to the PGE dam and once held large turbines that generated power for the early paper mills. A small building was removed from the foundation in 2009. The structure offers the best and closest views of Willamette Falls on the Oregon City side of the river. From here, one can feel the mist of the Falls, see the wildlife in the river and experience the immense power of the water rushing over the Falls.

Industrial remnants

The numerous tanks and cylinders add to the site's industrial intrigue – one in particular is the Horton Sphere. It housed sulfuric acid used to break down pulp for paper production. It was left on site by the decommission company because it was too difficult to remove – the exterior is steel and the interior is lined with concrete. The abandonment of industrial remnants is an opportunity to maintain and preserve intriguing relics of the property's industrial past.

Upper: Hawley Powerhouse Foundation

Lower: Horton Sphere

PART III: PROCESS AND COMMUNITY ENGAGEMENT

The Design Team

Metro, on behalf of the four agency partners, contracted with a collaborative design team that included lead design firm Snøhetta, local design firm Mayer/Reed and development specialist DIALOG. These designers brought unique international perspectives to the project. JLA Public Involvement led the project's community engagement effort.

Design Principles

After gaining a detailed understanding of the site, and considering the four core values and the community's vision, the design team developed five design principles to guide their future design work.

> "The first time I visited the Blue Heron site I was immediately inspired and connected to this landscape as though it were a long lost friend. I'm intrigued not only by what is visible here, but by so much that is invisible. It's an incredible three-dimensional place that's absolutely inspiring and powerful."
>
> -Michelle Delk, Snøhetta

Ground

This site's rugged ground has always played a role in shaping use and access. From the layers of basalt, structural platforms, existing buildings and new construction, the design will mindfully distinguish where and what is ground.

Time

The site, like all landscapes, has always been and always will be in a state of becoming. The design will work in a way that uses time as a driver for designing riverwalk elements with day and night, the full year and long future in mind.

Water

The site's powerful hydrology dictates not only what goes where on the site, but also what can safely occur and when. The design will respect the capricious nature of the river, recognizing it is the ultimate determinant of success and resiliency.

Context

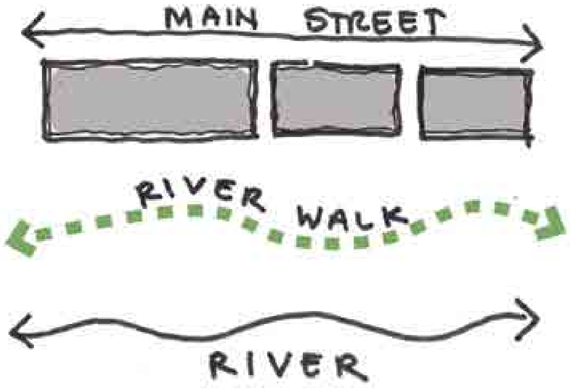
The site's profound importance and potential impact demands that an understanding of its place in the region and in history is imbued in the design; which thinks bigger than the site's boundaries.

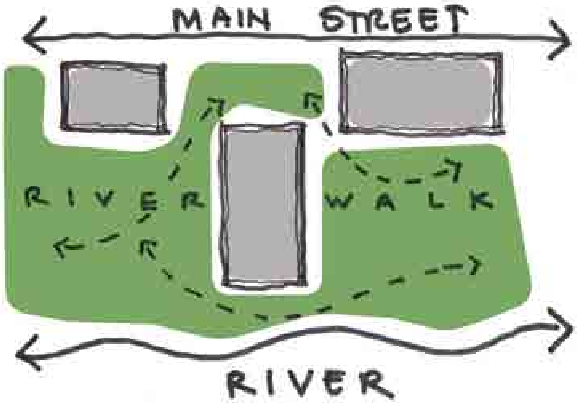
Spirit

The design will aim at editing and adjusting the site, not recreating it, so that the spirit remains palpable.

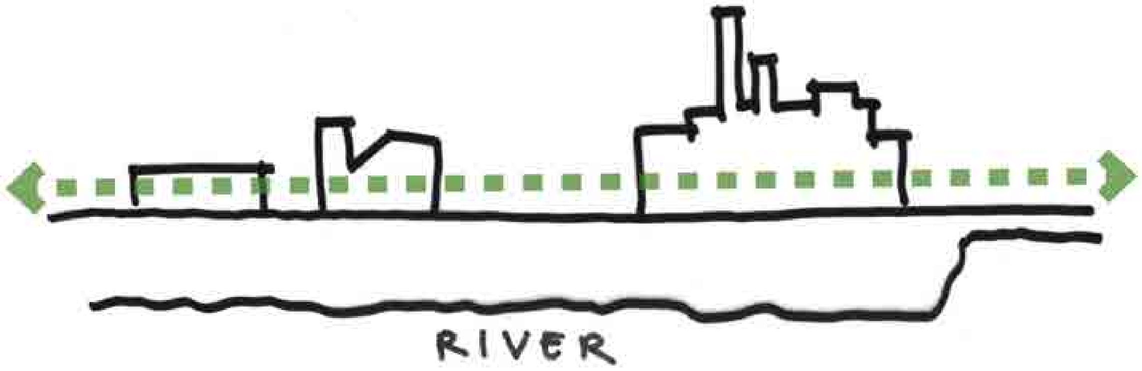
The riverwalk is more than a walk!

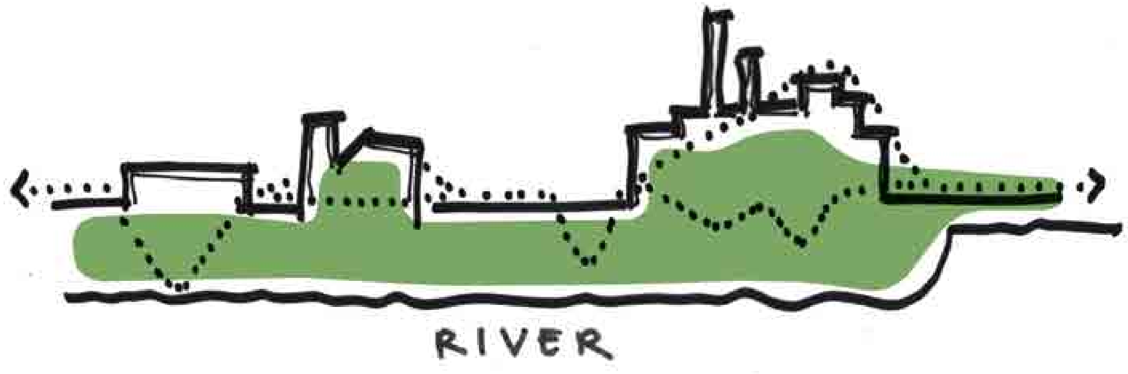
In addition to the design principles, it was important to communicate to the public and partners that the riverwalk is more than just a sidewalk. The plan image on the left shows a typical configuration of a linear riverwalk walkway occuring between the river and the private development. However, the plan image on the right illustrates that it can be more. The riverwalk could weave in and out of buildings to create a more dynamic experience that integrates with the whole site and river.





And, instead of building a riverwalk that connects from point A to point B, as shown in the elevation graphic below, the riverwalk could embrace the three-dimensionality of the site and take into consideration the multiple layers and levels that make it so unique; further adding to the dynamic experiences. Exploration of these basic concepts, coupled with the design principles created an important base to begin design.





Stakeholder Input

Who are the stakeholders?

Intricate planning and coordination between Metro, partner agencies and the large consultant team shaped a public process to meet the needs of the project's many stakeholders. Receiving, considering and incorporating public input is essential to a successful outcome. During the planning process, this project generated an incredible amount of public interest. The project's stakeholders are numerous and diverse, and they include but are not limited to:

- Neighbors of the site, including residents and business owners in downtown Oregon City, the McLoughlin and Canemah neighborhoods, and West Linn
- Native American Tribes with ties to the site and to the falls
- PGE, the Locks and West Linn Paper Company
- User groups advocating for river dependent activities such as fishing, kayaking and pleasure boating
- Boating companies such as Willamette Jetboat and the Portland Spirit
- Cultural and heritage organizations and advocates
- Federal, state and local agencies, environmental organizations and advocacy groups interested in establishing healthy habitats and protecting water quality and river health
- Business and tourism organizations providing economic development input
- The non-profit friends group, Rediscover the Falls

> "This site can become a world-class bicycle and pedestrian destination, if bicycles and pedestrians are prioritized over cars within the site. Connecting the site to surrounding areas with safe bicycle and pedestrian facilities is crucial, so that it is a clear benefit to neighbors."
>
> -Public Comment

Fishing boats on the Willamette River

Stakeholder Meetings and Focus Groups

The project team organized focus groups and met with other stakeholder groups to discuss specific riverwalk elements. These included:

- Programming and Operations Focus Group
- River Activities Focus Group
- Habitat Focus Group
- Downtown Oregon City Association meetings
- Interpretive Plan Focus Group
- Public Yard Focus Group
- Rediscover the Falls Friends Group
- Multiple Oregon City Boards and Committees

Rediscover the Falls, the project's non-profit friends group, board retreat

Programming and Operations Focus Group Participants

- City of Oregon City
- City of Portland
- Clackamas County Tourism
- The Oregon Zoo
- Oregon City Farmer's Market

Interpretation Focus Group Participants

- City of Oregon City
- Clackamas County Tourism
- Lower Columbia Archaeology
- City of West Linn
- Portland State University
- Ice Age Floods Institute
- Willamette Falls Heritage Area Coalition
- Clackamas County Historical Society
- McLoughlin Neighborhood Association
- Local residents and historians

Public Yard Focus Group Participants

- Downtown Oregon City Association
- City of Oregon City
- Clackamas County Tourism
- Clackamas County Arts Alliance
- Rediscover the Falls
- Local residents
- Clackamas Repertory Theater

River Activities Focus Group Participants

- Willamette Falls Locks
- Willamette Jetboat
- Willamette River fishermen
- West Linn Paper Company
- Oregon City Boat Club
- Portland Spirit
- City of Oregon City
- Oregon State Marine Board
- Oregon Department of Fish and Wildlife
- U.S. Army Corps of Engineers
- We Love Clean Rivers
- Willamette Riverkeepers

Habitat Focus Group Participants

- Oregon Department of Fish and Wildlife
- NOAA Fisheries
- Portland General Electric
- U.S. Army Corps of Engineers
- Oregon Department of Fish and Wildlife Service
- City of Oregon City's Natural Resource Committee
- Greater Oregon City Watershed Council
- Clackamas River Basin Watershed Council
- Portland Audubon
- Urban Greenspaces Institute

Tribal Advisory Board

Since 2013, the project has made great effort to reach out to the five tribes with historic and current ties to Willamette Falls, including the Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Grand Ronde, Confederated Tribes of Siletz Indians, Confederated Tribes of Warm Springs and the Confederated Tribes and Bands of Yakama Nation.

Engagement with Native American tribes is different from the engagement that public agencies conduct with local communities and neighborhoods. Tribal governments are independent sovereign entities that have treaties with the federal government. Many of these treaties, like the 1855 Walla Walla Treaty, required Native Americans to surrender much of their land, while retaining the legal rights of tribal members to hunt and fish in their usual areas, both inside and outside of reservation land. These treaties are relevant to this project because Willamette Falls is a place where Native Americans historically fished and gathered and still do today.

It is important to understand the painful history of Native American tribes in the Pacific Northwest and throughout the country. This history has lasting legacies and continues to shape the way we interact today. Past government actions have greatly harmed tribal communities, and that history is not easily forgotten or forgiven.

Building trust between tribes and government agencies, such as the Willamette Falls Legacy Project Partners, takes time. As Armand Minthorn, Member of the Board of Trustees for Umatilla said at the riverwalk event on June 3, 2017, "We need to truly listen, and we must be open to change." The Partners could not agree more.

To engage the tribes early and often and provide opportunities for meaningful feedback during the design process, a Tribal Advisory Board was established between the local tribes and state and local governments, with the intention of establishing a model for successful tribal engagement in future public projects. The board meetings are in addition to the required formal consultation with the federal government. A key element to the project's core value of Historic and Cultural Interpretation is to recognize and honor Native Americans' enduring presence at Willamette Falls in the past, present and future. The project is working to build relationships with local tribes to ensure tribal involvement and guidance as the project progresses.

Drummers from the Confederated Tribes of Grand Ronde Community of Oregon singing *Stankiya*, an old word for Coyote. Pictured from left to right Grand Ronde tribal members: David Harrelson, Travis Stewart and Sophia Stewart

The Partners have held numerous meetings and visits about the project with the tribes over the past four years:

2013

- Grand Ronde Tribal Council visit and site tour (September 2013)
- Umatilla site tour with Chair Minthorn (November 2013)

2015

- Warm Springs site tour and visit (May and October 2015)
- Cultural Landscape Report meeting with Grand Ronde (May 2015)
- Cultural Landscape Report meeting and site tour with Siletz (October 2015)
- Cultural Landscape Report meeting with Umatilla (July 2015)
- Cultural Landscape Report meeting with Warm Springs (October 2015)

2016

- Columbia River Intertribal Fish Commission meeting and site tour (May 2016)
- Tribal Advisory Board (July 2016)
- Tribal Advisory Board (November 2016)
- Grand Ronde visit (November 2016)
- Umatilla visit – Board of Trustees (November 2016)

2017

- Tribal Advisory Board (January 2017)
- Cultural Landscape Report meeting with Umatilla (January 2017)
- Cultural Landscape Report meeting with Grand Ronde (January 2017)
- Umatilla visit – Cultural Resources Commission (March 2017)
- Umatilla visit – Fish Commission (May 2017)
- Grand Ronde visit (May 2017)
- Umatilla site tour and cultural investigations in Oregon City (May 2017)

The input the Partners heard from the tribes is reflected in the design and in other project work. The Willamette Falls Legacy Project is committed to continuing to work with tribal leaders and communities, and while the Partners are listening and learning from the Native American community, it is not appropriate to repeat or share their input with the public.

> "After nearly two centuries of broken treaties, fractured relationships and superficial inclusion on projects that were far too far along in the process for tribal communities to have any meaningful input, tribes have been understandably wary of collaborating with government agencies. Often, tribes are asked for project input once plans have already been all but finalized – with news arriving in the mail with a rapidly approaching deadline for input on a project they've never heard of before. The Willamette Falls Legacy Project Partners are seeking to create a model for successful engagement with Native American tribes. I'm hopeful this can be used as a standard in future public projects that seek tribal input and collaboration."
>
> – Judy BlueHorse-Skelton, Tribal Advisory Board facilitator

Property Owners: Working with PGE and Falls Legacy LLC

The property owners were closely involved in the design process through design submittals, one-on-one meetings and group meetings. Both Falls Legacy LLC and PGE received submittals at each concept design checkpoint. Project staff held individual meetings with Falls Legacy LLC to review and discuss design progress and direction, focusing on integration with private development. Project staff also held individual meetings with PGE to address interfacing the design with the dam and analyzing vehicular access to the dam. In addition, project staff held meetings with both Falls Legacy LLC and PGE to help facilitate communication between all three parties because of the close interface between the riverwalk, the PGE dam and possible private redevelopment.

At each milestone, meetings were held to discuss the designs and hear comments first hand. Subsequent iterations of the design incorporated comments from both property owners. Comments received closer to the release of the final design required significant modifications that were incorporated by providing generalized alternatives due to the limited opportunity to fully implement the recommended changes. It is anticipated that critical modifications to the design will be implemented during the next phases of design. Because of the iterative design approach, feedback from the property owners was instrumental in validating the design. This was particularly true regarding vehicular access to the site in regard to maintaining PGE's access to the dam and possible areas of future private development.

View of Mill E, the intake basin and the PGE dam

Community Engagement Opportunities

In addition to stakeholder meetings and focus groups, there were multiple opportunities for the public to participate in the design. This project set a high bar for large-scale public engagement events, meticulously designed to be fun, yet informational and to actively solicit targeted feedback. Instead of traditional open houses, the Willamette Falls Legacy Project Partners created true community affairs.

At each event, exit surveys allowed stakeholders to provide input on the event and help shape the future engagement activities to better meet community needs.

Throughout the design process, the project team provided consistent communications to the public and stakeholders across the Portland metro area. Regular project updates and check-ins were implemented to make sure the community was informed about the project's progress and how they could participate. The Partners will continue conversations with the community beyond the completion of the riverwalk design. Some notable communications during the project include:

- A 60-second video screened at movie theaters in the Portland metro area and bolstered online communication
- A Community Check-In provided a project update for stakeholders and a short survey to capture more thoughts from the community
- Numerous presentations and facilitated conversations were held for local groups or organizations. Staff met with over 50 groups during the design process
- Weekday tours of the site were offered to community organizations and general public tours were held a few times throughout the planning process

Community members at the November 2016 community event

> "Getting close to the falls is the thing I most long for - to experience up-close the beauty and power of the falls and feel the spray on my face!"
>
> -Public Comment

Coloring lamprey at the kid's activity table

Programming Input

In March 2016, the project held a large community event to begin talking with the community about riverwalk programming and experiences. There was great community enthusiasm for this event held in downtown Oregon City, with an estimated attendance of 800 people at the in-person event and almost 1,200 visitors for the online event. A series of activities were available at the event for people to give input in creative ways.

For one of the event activities, the most common type of experience people wanted to have on the riverwalk were described as: Adventurous, Breathtaking, Fascinating, Humbling, Celebratory, Calming, and Reflective.

The most common riverwalk activities desired were: whitewater kayaking, learning about tribal history, nighttime viewing, habitat restoration, discovering the site via natural trails, exploring and outside dining. The design team used the results to inform the types of activities and experiences to include in the riverwalk design.

Left: The girls in the photo above want to have some type of play experience in the riverwalk design

Right: Community input on riverwalk experiential opportunities

Riverwalk activities and programming element ideas project staff heard included the following:

Recreational Activities

- Experiencing the Falls
- Fishing
- Exploring
- Urban spelunking
- Birdwatching
- Athletic sports
- Nature play
- Playground
- Fitness
- Photography
- Geo-caching
- Climbing
- Water trail portage
- Art-making
- Meditation
- Access to nature
- Sitting
- People watching
- Picnicking
- Kayaking/Canoeing

Habitat Elements

- Habitat restoration
- Salmon
- Lamprey
- Sturgeon
- Bird species
- Water quality
- Geological interpretation
- Flooding and hydrology Interpretation

Cultural Activities and Elements

- Civic Gathering Space
- Public Institution
- Ceremonial Space
- Public 'Living Room'
- Tribal access and heritage
- Pioneers
- Explorers
- European expansion
- Other cultures
- Industrial heritage

In another event station, the design team asked participants to choose images that they reacted to positively and negatively. Each particpant was given three post-its for images they liked and three for images they didn't like and could write comments on the post-its to explain their thinking.

These three images received the most positive reactions. The design team used the results to inform their design of the look and feel of the riverwalk.

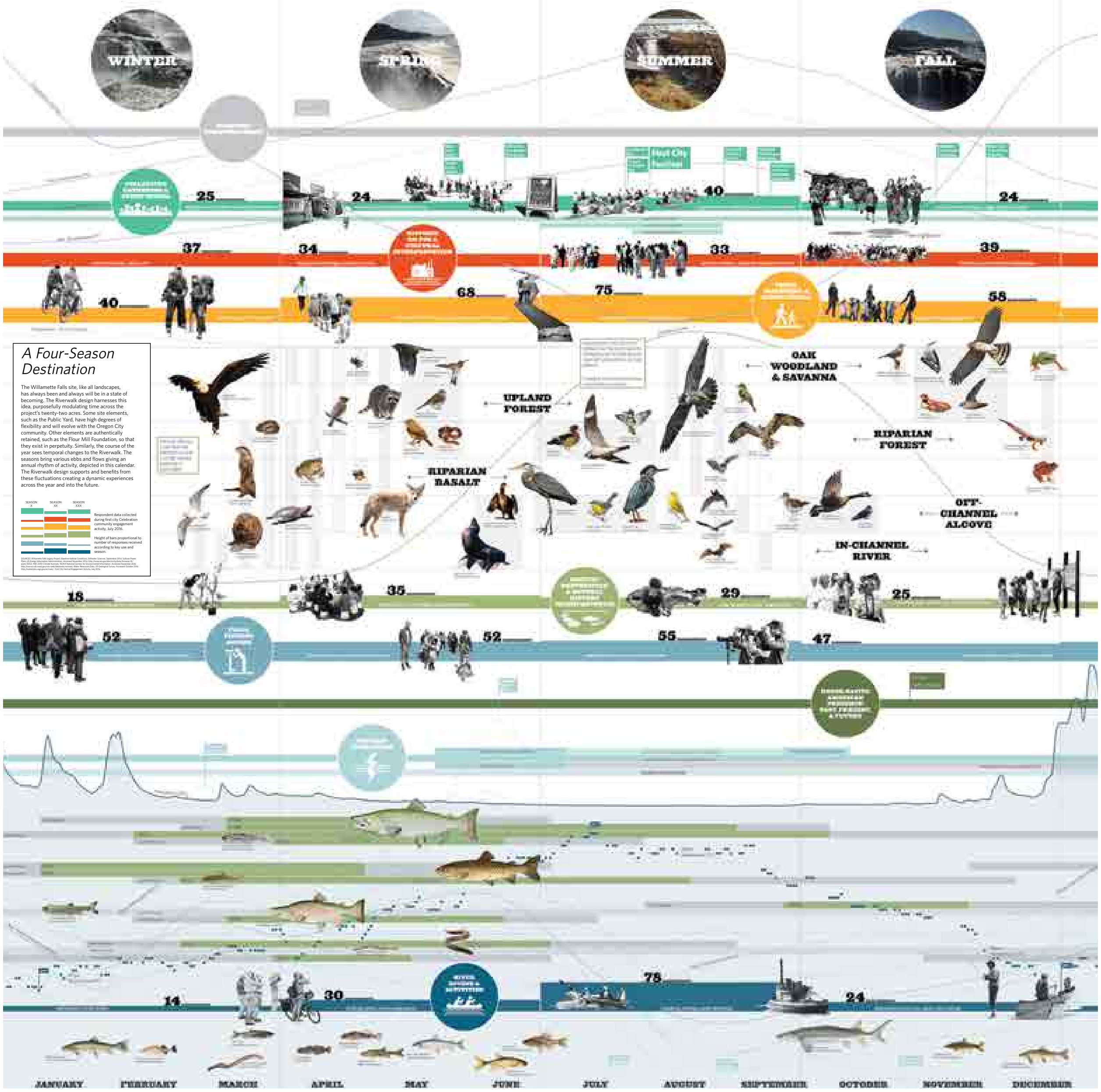
These three images receieved the most negative reactions.

Programming and Seasonality Input

The input from the March community event was taken to Oregon City's "First City Celebration" in July 2016 so that participants could continue to provide feedback. The project team asked more in depth questions, specifically, looking to understand when people want to be on site for any given activity.

Willamette Falls flow levels change drastically throughout the year. When the Falls are at their most powerful, the weather can be unpleasant. When the weather is pleasant, the Falls can be almost dry. The seasonality for programming and other uses on the riverwalk will balance activity on the site and create a place that is dynamic year round.

The community participation results were graphically represented in a riverwalk four-season calendar which demonstrated the anticipated activity across the year.



A Four-Season Destination

The Willamette Falls site, like all landscapes, has always been and always will be in a state of becoming. The Riverwalk design harnesses this idea, purposefully modulating time across the project's twenty-two acres. Some site elements, such as the Public Yard, have high degrees of flexibility and will evolve with the Oregon City community. Other elements are authentically retained, such as the Flour Mill Foundation, so that they exist in perpetuity. Similarly, the course of the year sees temporal changes to the Riverwalk. The seasons bring various ebbs and flows giving an annual rhythm of activity, depicted in this calendar. The Riverwalk design supports and benefits from these fluctuations creating a dynamic experiences across the year and into the future.

Respondent data collected during first city Celebration community engagement activity, July 2016.

Height of bars proportional to number of responses received according to key use and season.

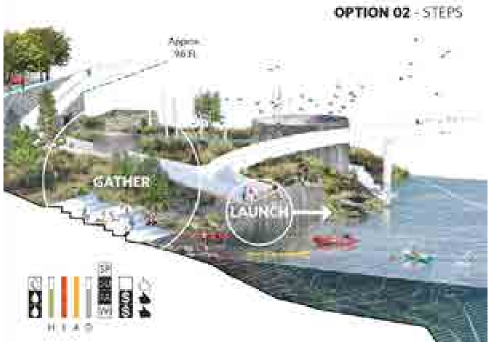
SOURCES: Willamette Falls Legacy Project: Baseline Habitat Conditions, Stillwater Sciences. September 2016. Sullivan Power Plant, US Energy Information Administration. Accessed November 2016. http://www.eia.gov/electricity/data/browser/#/plant/3053. 1981-2010 Climate Normals. NOAA National Centers for Environmental Information. Accessed November 2016 http://www.ncdc.noaa.gov/cdo-web/datatools/normals. Water Resources Data, US Geological Survey. Accessed October 2016. http://waterdata.usgs.gov/or/nwis/. First City Festival Engagement Activity, July 2016.

Design Options Input

In November 2016, the project held another event for the public to weigh in on ideas for six key areas of the site. Well over 500 people attended the event at Clackamas Community College in Oregon City. The event included an open house staffed by project staff and site experts and offered a facilitated workshop activity. An online survey version of the event was also made available and received 1,200 entries.

One activity in the workshop allowed participants to review design ideas for water access along the riverwalk. Below are some feedback themes related to water access:

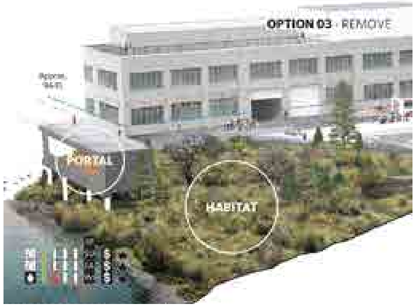
- The design should accommodate a variety of uses, such as watercraft, fishing, swimming and enjoying nature.
- There is broad support for water access, including the ability to launch non-motorized craft.
- There is some support for motorized craft, but also a concern about safety, noise, pollution and conflicts with other uses.
- There should be consideration of accessibility for different users (widths of trails, materials, etc.).



> "I am most interested in a pathway that would allow for canoes and kayaks to bypass the falls. Either a short portage route, a small lock system, or a manufactured rapids would meet my needs. Completion of the Willamette River Water Trail is very important to me."
>
> -Public Comment

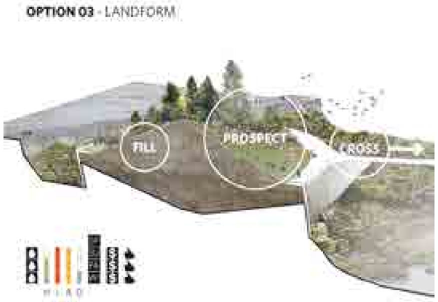
In another activity, participants from the workshop and survey were asked to provide feedback on materials and design ideas for the Pipe Chase and Yard elements of the riverwalk. Some feedback themes related to these design options showed that:

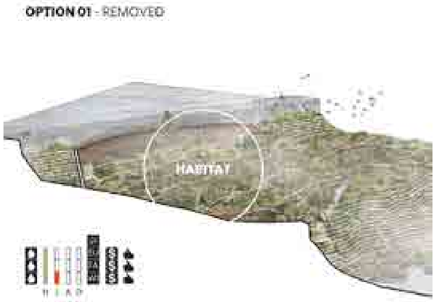
- Views are important. A Pipe Chase element should include broad views, perhaps to both sides of the river. There was also a concern that the Pipe Chase would block views from the Yard.
- There were many suggestions for design tweaks to the Pipe Chase, such as opening up views to the river, opening some portions to the sky, keeping some portions completely closed in, planting vegetation on top, etc. Many liked having at least some protection from sun and rain to increase seasonality.
- Suggestions for interpretive information and/or an area for cultural presentations were supported.
- There was support for habitat restoration and also trails through habitat to access the Pipe Chase.



Another question for participants focused on design ideas for the Clarifier. Below are some general feedback themes related to the Clarifier:

- There were mixed opinions on keeping versus removing the Clarifier. Some consider it an iconic element of the site. Most consider it part of the site's history and support keeping at least portions of the structure.
- As with other areas within the riverwalk project, there was a high level of support for using natural materials (stone, greenery) mixed with industrial materials (salvaged materials, Clarifier relics).
- There was support for habitat restoration and supporting native ecosystems. Some liked the landform concept for this reason, whereas others wondered whether the landform was natural.
- Many indicated a desire for views from the Clarifier.



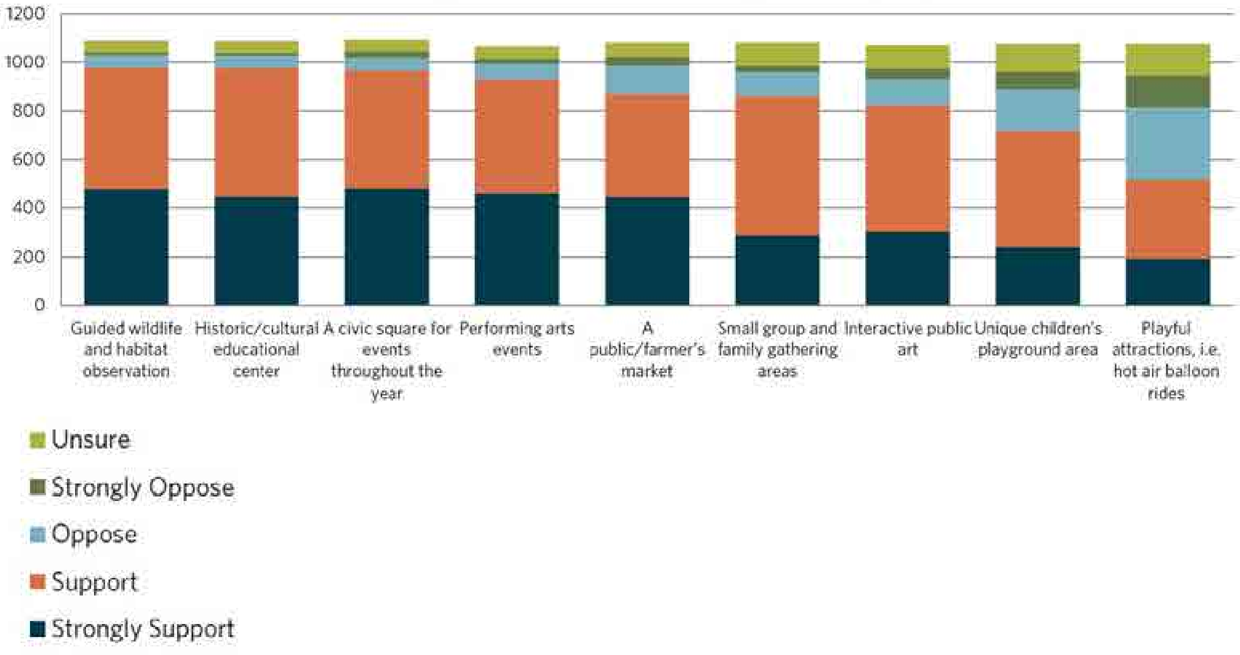


At this event and in the online survey, participants were asked about materiality through a series of precedent images. Some of the most popular selections are outlined in red below:

> "Oregon City has a history of being family oriented and supportive of family and small group gatherings. Having gimmicky events such as hot air balloon rides, while fun, will not be supported long term. Also, don't build something that would be significantly destroyed should the waters flood the area."
>
> -Public Comment

The online survey gave participants a chance to weigh in on the design options without actually being part of the workshop. One question in particular dealt with the seasonality of the falls; acknowledging that during the summer, the water flowing over the falls is low and the riverwalk may want to provide other items of interest. See results in the "Support for Summer Programming" graph below:

Support of Summer Programming



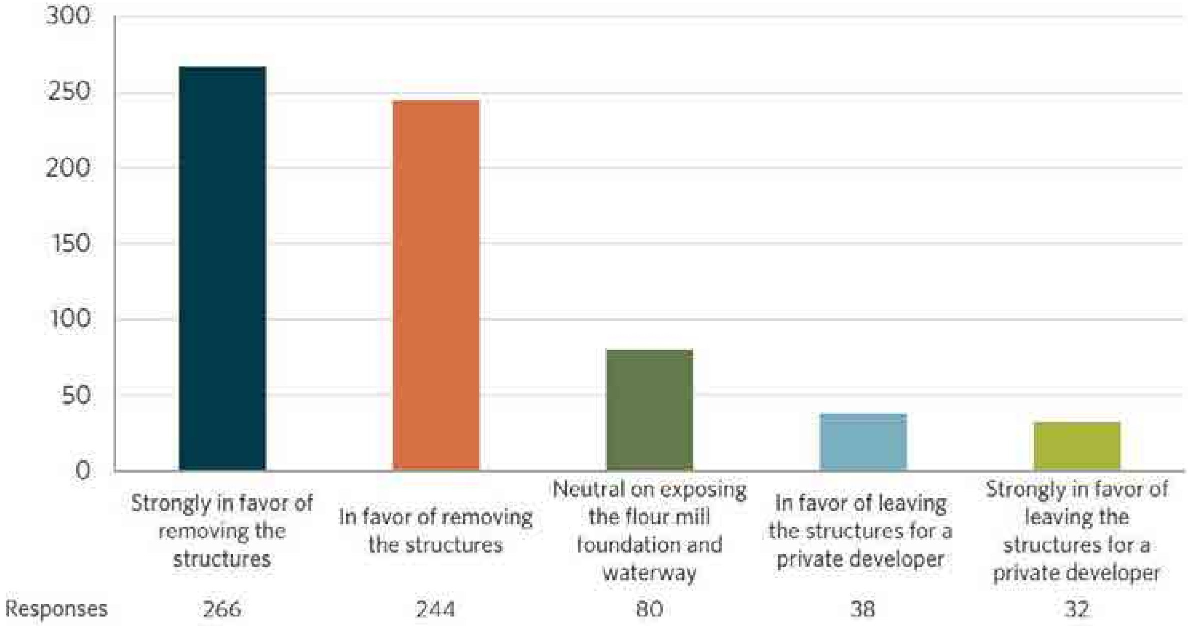
Community Check-In

A Community Check-In was conducted from March 6 through 20, 2017 to provide an update on the project progress, reflect on feedback from the community events, describe next steps and collect feedback on site-specific questions. The Community Check-In was hosted on the project website and included short topical videos and a brief survey. Almost 700 people responded to the survey.

The survey questions encompassed several categories of community interest, including the Flour Mill structures, access to nature and bank fising.

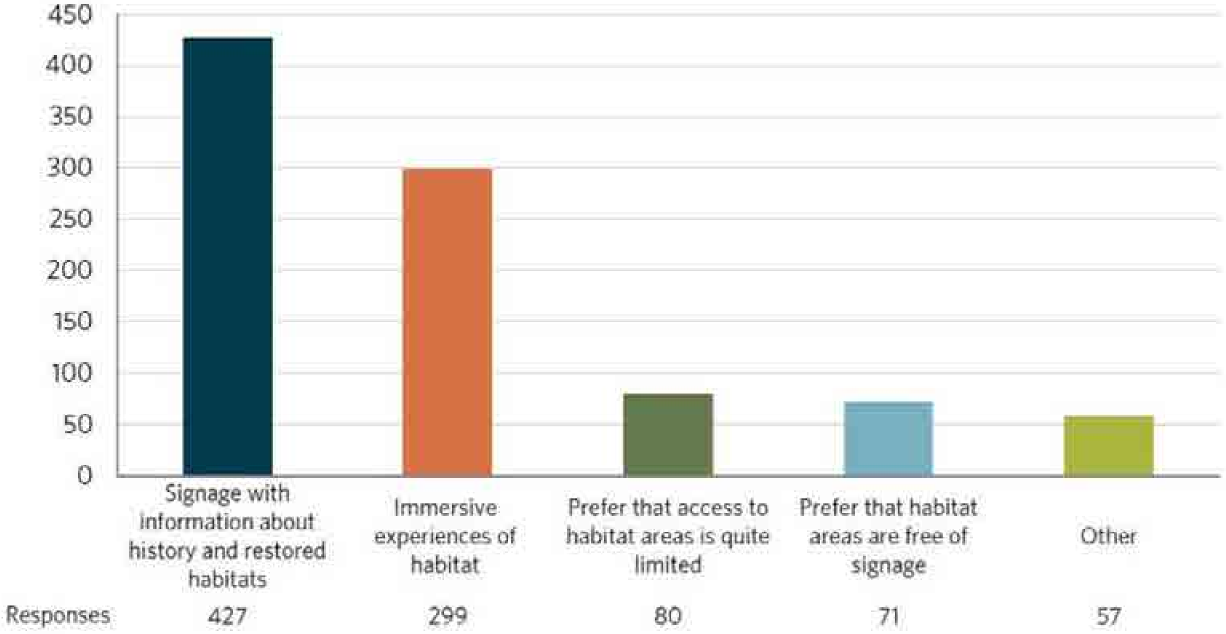
The Flour Mill: The riverwalk design process included decisions about which structures and stories should be highlighted. Survey participants were asked whether they preferred that the Flour Mill structures be removed to expose the building foundation and waterway to create open space, or if the structures should be left in place for the site's private developer to redevelop.

of the 660 responses, 77% were either strongly in favor or in favor of removing the structures. In the write-in comments section, a small but passionate group of people advocated for the preservation of the structures.



Access to Nature: Access to natural areas along the riverwalk is an important priority in the riverwalk design, which will include pathways providing access through (but not upon) sensitive habitat areas. Survey participants were asked what type of experience they would like to have while on these pathways.

Of the 934 responses from 661 people (who had the opportunity to provide up to two preferences), the top choices were: signage with information about history and restored habitats (46%) and immersive experiences of habitat (32%). In the write-in comments section, they key theme that emerged was a desire for less activity and fewer structures withn the natural areas, allowing the focus to be on the habitat itself.

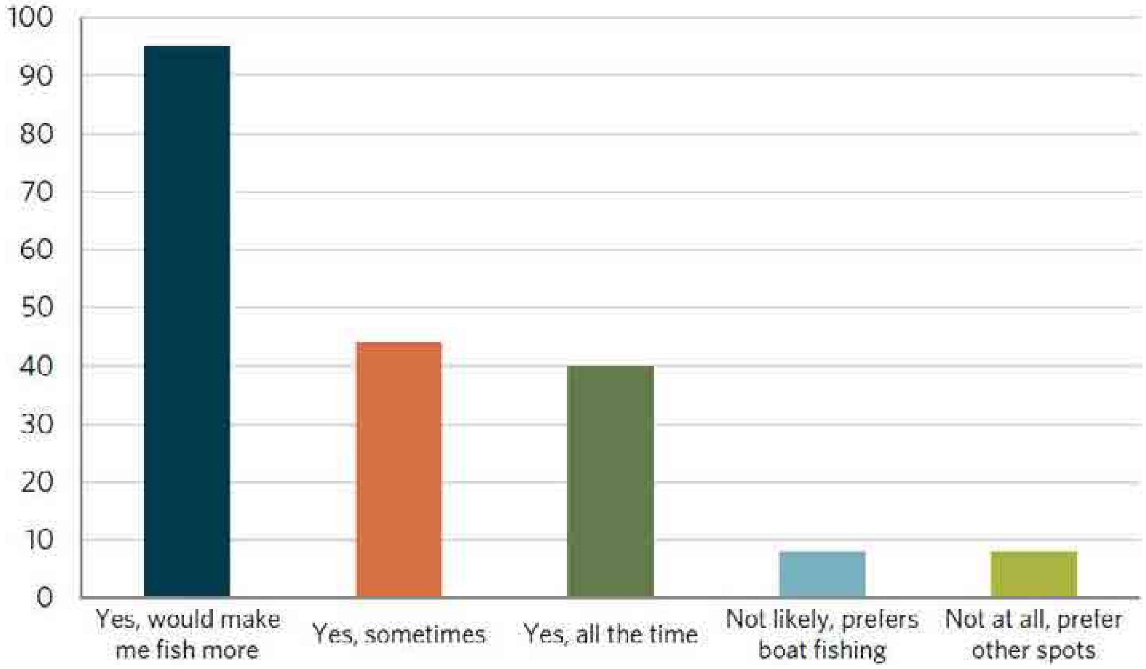


Fishing Near Willamette Falls: Survey participants were asked if they were interested in fishing near the falls. Of the 672 people who responded, the majority (68%) said no.

Bank Fishing: of the 207 survey respondents who said they were interested in fishing, the majority said they would utilize access to the shoreline along the riverwalk for bank fishing if it were available.

Dozens of people provided comments on what makes for an ideal fishing spot. Key themes that emerged include: secluded areas away from human activity, seasonal restrictions and various ways to provide for access and safety.

The community participation and feedback has contributed greatly to the recommended design.



1953 - Flood

High water flows below the Boiler Plant complex in February 2017

Technical Studies

As design of the riverwalk began, the Partners identified technical studies that could provide critical information to the design team and help inform decision-making.

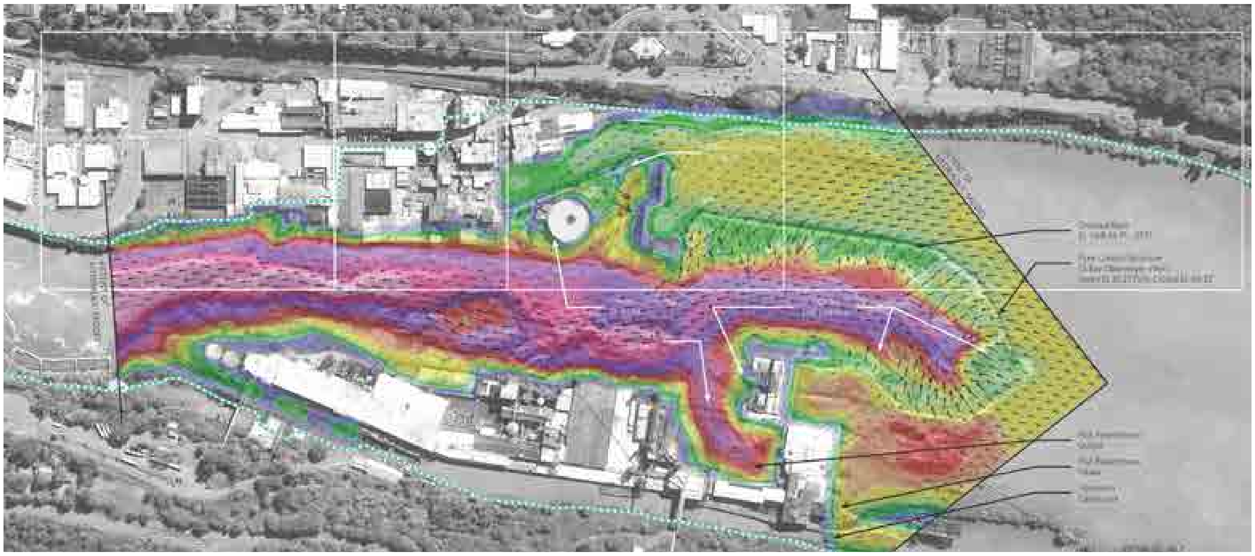
Habitats

Restoring natural conditions on the site conserves sensitive habitats and addresses regional and local conservation priorities. Conservation science provides context to help make decisions about restoration priorities and investments. This focus on science also helps create a unique destination where visitors can experience and appreciate Oregon's natural treasures in the context of a special historic setting at Willamette Falls.

As part of the design process, Metro hired CH2M and Stillwater Sciences to understand existing conditions related to the river and habitat and to apply information learned to inform the riverwalk design. Technical studies included: understanding habitat baseline conditions, developing habitat restoration designs, mapping extents of Columbia River basalt formations, developing and running a hydraulic model and jurisdictional determination of ordinary high water for the site. Information learned can be found in the Baseline Habitat Conditions Report in Appendix A and the Habitat Restoration Concept Design Report in Appendix B.

Hydraulic Modeling and Ordinary High Water Determination

A team of hydrologists and geomorphologists from CH2M were hired to understand river conditons, develop and run a hydraulic model to test designs and propose jurisdictional water elevations for the conceptual design for the riverwalk. Information learned can be found in the Hydraulic Model Development and Characterization of Existing Conditions Report found in Appendix C.



Existing hydrology: Total water depth in a 2-year flood. The dark purple/red color represents deeper water and the yellow/green color represents shallower depths

Rare Plant Survey

Historic and current site vegetation was documented in a 2015 site survey by the Oregon Biodiversity Information Center at Portland State University. Although the site is highly altered, the survey reported native vegetation as being in good conditions relative to elsewhere in the Portland metropolitian area. At least 16 plant species rare to the area were observed including *penstemon richardsonii* which had not been seen at the site since 1976.

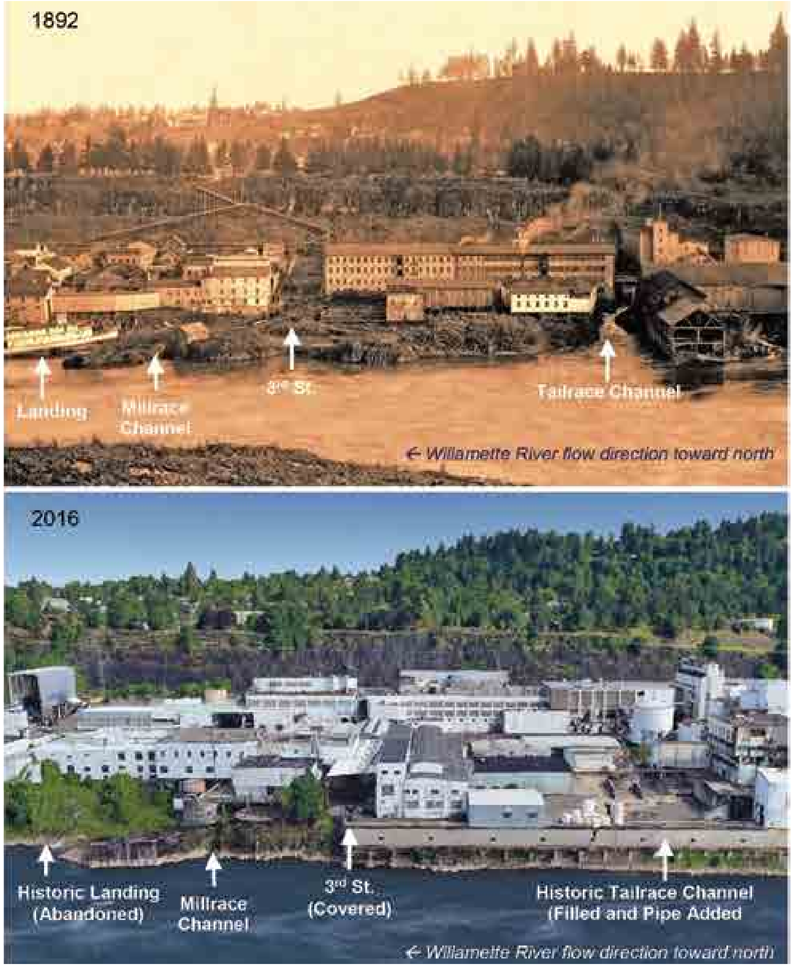
Geotechnical Drilling

Tailraces, water channels that run below the site have been filled in or channelized as industrial development progressed at the site. Geotechnical explorations, testing and reporting were required to better understand existing fill conditions and establish bedrock elevations in the Yard area with a focus on the historic tailrace location.

To determine the depth to bedrock and provide background for characterizing the existing fill, two types of subsurface drilling explorations were performed. The results of this technical investigation informed the design team's technical understanding of the site. The design plan calls for the removal of a significant portion of the historic fill to re-expose the bedrock surface and potentially create a restored habitat and expanded shoreline area. For more in-depth information, see the report by Northwest Geotech, Inc. in Appendix D.

A view of the falls from the McLoughlin Promenade

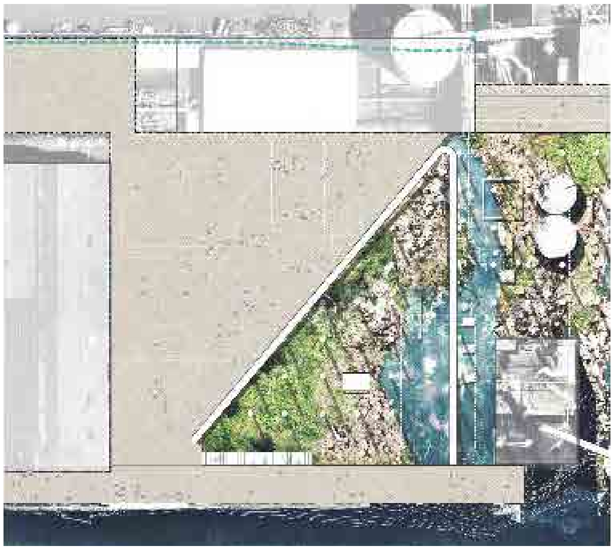
A sample from one of the geotechnical borings



Upper: Basalt bedrock exposures along the river margins based on a historical ground-based photograph taken in 1892 looking toward the unpaved 3rd Street (source: Metro archives)

Lower: Contemporary imagery from 2016 with 3-dimensional topography and buildings rendered in Google Earth

Area 2 - Alternative A



Area 2 - Alternative B

Area 2 - Alternative C

Alternatives Evaluation

The design is a culmination of a complex two-year planning process, underpinned by a robust community engagement effort, technical investigations and consideration of a variety of concept alternatives for each of the four areas of the site.

The project team evaluated each alternative based on the following criteria:

- Public access to Willamette Falls and the river
- Public gathering and event space
- Historic and cultural interpretation
- Engagement of the river experience
- Accommodation of upland mixed-use development
- Minimization of cost for structure removals
- Floodplain protection and natural river conditions
- Removal-fill below ordinary high water elevation (OHWE)
- Protection and enhancement of fish and wildlife habitat
- Relation to developable areas

The riverwalk project team selected alternative designs, by riverwalk project area, that best met the criteria while minimizing environmental impacts. Public input received at the community event in November 2016 also played a large part in the evaluation of the alternative design concepts. The design alternatives were then further refined after hearing stakeholder feedback from the Community Check-In and from project partners such as PGE and Falls Legacy LLC. The graphics shown on this page illustrate an example of the alternatives developed for Area 2: South Waterfront. The team identified a list of opportunities and constraints for each alternative which helped to provide direction in the evaluation process. Multiple alternatives were developed for each of the four project areas. The alternatives with the most consensus were cobbled together to create a base plan, which was refined into the final riverwalk design.

Celebrating the Riverwalk Design

After years of planning and countless rounds of community input, a final community event was held on June 3, 2017 at the Oregon Museum of Science and Industry (OMSI). More than 600 people attended to celebrate the unveiling of the riverwalk design.

Attendees thoroughly examined information boards. In addition to design, the project shared information about habitat restoration, interpretive plans, parking and transportation plans and flood modeling

Attendees gathered to learn about the non-profit group Rediscover the Falls, the friends group working to raise awareness and funding for the riverwalk

A live lamprey, on loan from the Confederated Tribes of the Umatilla Indian Reservation and part of a traveling US Fish and Wildlife/OSU Extension/4-H Club exhibit, made an appearance at the event

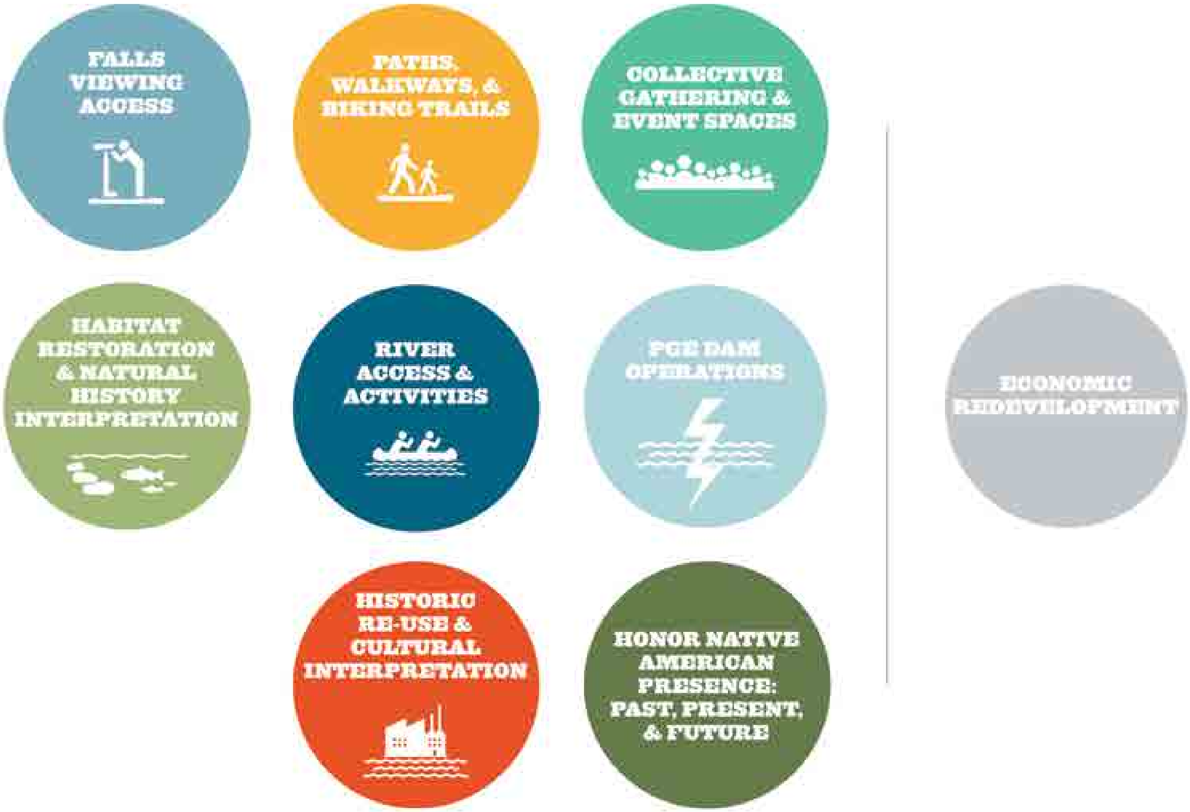
A full house listened in the OMSI auditorium as the project team describes the riverwalk design

PART IV: RECOMMENDED RIVERWALK CONCEPT DESIGN

Key Uses

Key uses for the riverwalk were derived from the riverwalk-specific community engagement events in the spring and summer of 2016.

Project staff heard many ideas from the public, which informed and guided the design of the riverwalk. Redevelopment uses will be inspired and invigorated by these key uses. Each key use is described in further detail below.



FALLS VIEWING ACCESS

Falls Viewing Access

The riverwalk experience will include multiple views of the Falls and also views of the river, the Arch Bridge and the newly formed habitat areas. Figure 1 shows multiple great viewpoints that will be provided. See the Figures section at the end of this report.

PATHS, WALKWAYS, & BIKING TRAILS

Paths, Walkways and Biking Trails

Paths, walkways and trails are a core component of the riverwalk. All paths are designed to be accessible for people of all ages and abilities. The riverwalk design includes a "Primary Path" along with secondary "Explorer Trails" and the cycling route is planned to utilize Main Street and connect to the Canemah Neighborhood via the rail spur. These connections could fill a missing segment in the regional trail system. See Figure 2.

COLLECTIVE GATHERING & EVENT SPACES

Collective Gathering and Event Spaces

In today's downtown Oregon City, outdoor gathering space is extremely limited. Designing for public gathering spaces will allow for public and private events, festivals, performances and markets. The riverwalk will open up possibilities for events and programming, with multiple flexible spaces, both covered and uncovered. There are a variety of flexible use and event spaces programmed into the design of the riverwalk. See Figure 3.

HABITAT RESTORATION & NATURAL HISTORY INTERPRETATION

Habitat Restoration and Natural History Interpretation

Using onsite natural habitat types and regional conservation planning efforts as guides, conservation targets and restoration designs were developed to encompass the site's biodiversity values and regional conservation priorities. Restoration of riparian forests, basalt outcroppings, off-channel habitat, Oak woodland and savanna habitat areas are included in the design to restore healthy habitat and provide a natural experience for visitors. See Figure 4. More information about habitat restoration can be found in the Habitat Restoration Conceptual Design Report included in Appendix B.

RIVER ACCESS & ACTIVITIES

River Access and Activities

Connecting with nature means connecting with the river, not just through views but also through direct access to the water. The Falls create a spectacular, but turbulent river. Slightly north of the Falls, the water begins to calm, but is still fast-moving. This creates challenges for some types of river access. Swimming in this portion of the river is not advised due to the fast current, but motorized and non-motorized boating is safely practiced by many river users today. The riverwalk will provide access for boats, as well as a place for visitors to touch the water in the alcove. Depending on the future of the Locks, the site could also provide a portage route for kayakers and canoers. See Figure 5.

While the riverwalk does not include any provision for commercial boat access, the shoreline area along the intake basin could be considered for potential commercial boat access as part of the private redevelopment of Mill E structure. PGE safety and operational requirements would need to be taken into consideration.

PGE Dam Operations

As mentioned earlier in this report, PGE has granted the project an option for an easement to route the riverwalk onto the existing dam walkway. As a working dam, it will need to be closed periodically for PGE maintenance and operations and the riverwalk design must obey safety and operational requirements. This design work is ongoing and will be closely coordinated with PGE.

Historic Re-Use and Cultural Interpretation

The Willamette Falls Legacy Project site is among the most historic places in Oregon. The layers of history represented on the site can provide a much deeper understanding of the power of this place.

Cultural Landscape Report

In 2014 MIG, Inc. was hired by Oregon City to prepare a Cultural Landscape Report (CLR), which is a place-based research and planning document that ties information from the public record— documents, photographs, illustrations, and oral histories—to a place, focusing on how it has developed and changed over time. Developing a CLR respects and supports the task of revealing and honoring a complex history and its relationship to the landscape.

The Willamette Falls CLR was developed based on guidelines established by the National Park Service, the leading agency for cultural resource planning and management. Following those guidelines, a mixture of primary and secondary research materials was gathered, and key stakeholders were engaged as part of the research phase. The CLR serves as a primary source of information for those interested in telling the site's story, specifically through means addressed in an Interpretive Framework Plan.

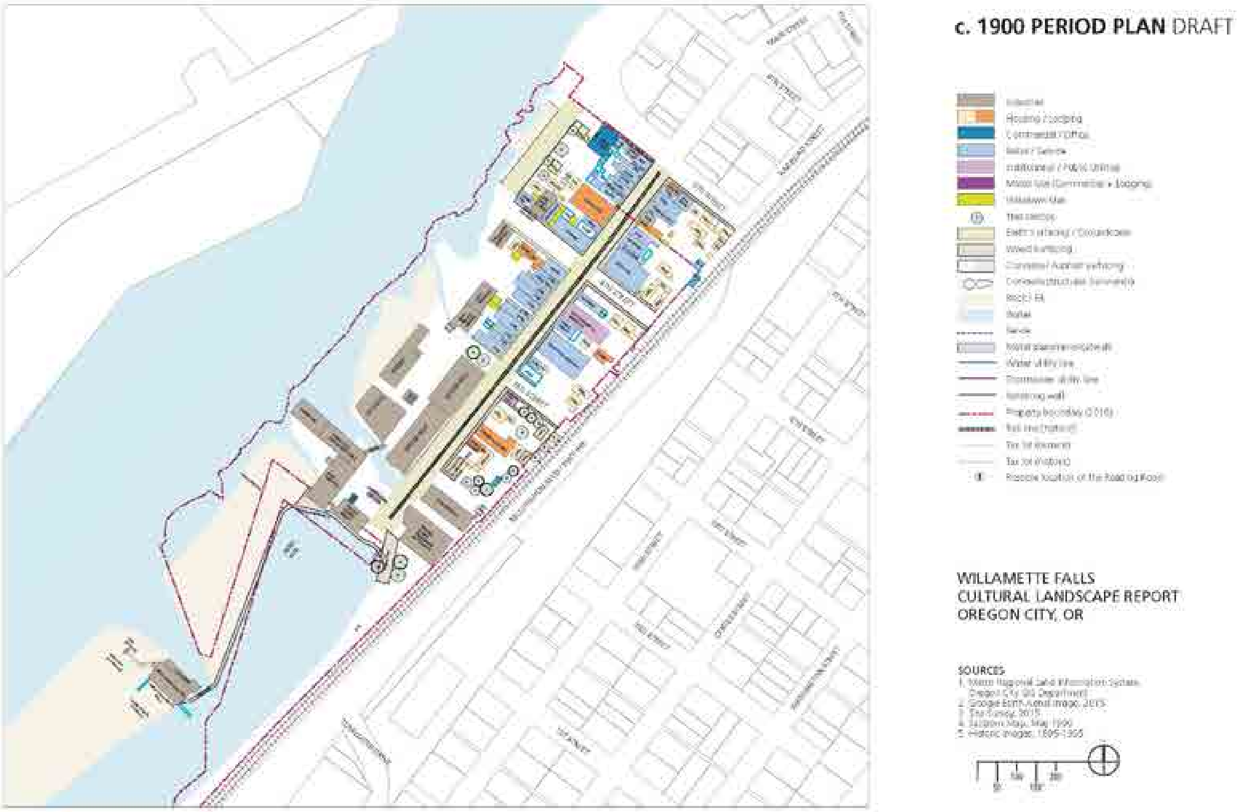
While the Interpretive Framework Plan focuses on implementation of interpretive elements along the riverwalk, the CLR focuses on the entire Willamette Falls redevelopment site and can be used by other public and private developments.

The CLR includes a narrative summary of the site's history that is


Onsite Archaeology explorations


The water level relative to Station A was one indication of the severity of the flooding in the late nineteenth century, 1890


The Brick Mill, a flour mill in the converted paper mill was constructed on stilts, likely to mitigate the impacts of flooding, 1870



supported by thousands of primary and secondary resources and hundreds of historic illustrations and photographs, a set of historic era plans that provide a snapshot of the site at different moments in time depicting its transformation and an annotated chronology that provides additional details about the site's metamorphosis. It also includes period plans from 1851, 1884, 1900, 1925, 1950, and 1970, which are maps showing what was present on the site at each point in time. See Appendix E for a draft of the Cultural Landscape Report, which will be further refined during the federal Section 106 permitting process.

Interpretive Framework Plan

Using the CLR as a resource, the Interpretive Framework Plan for the riverwalk was created. The Interpretive Framework Plan is a guide for creating an interpretive experience at the riverwalk that affects people on a visceral level and compels them to return, season after season. The Interpretive Framework Plan, along with the CLR, provides critical context to guide the riverwalk design approach and provide a lens for interpretation.

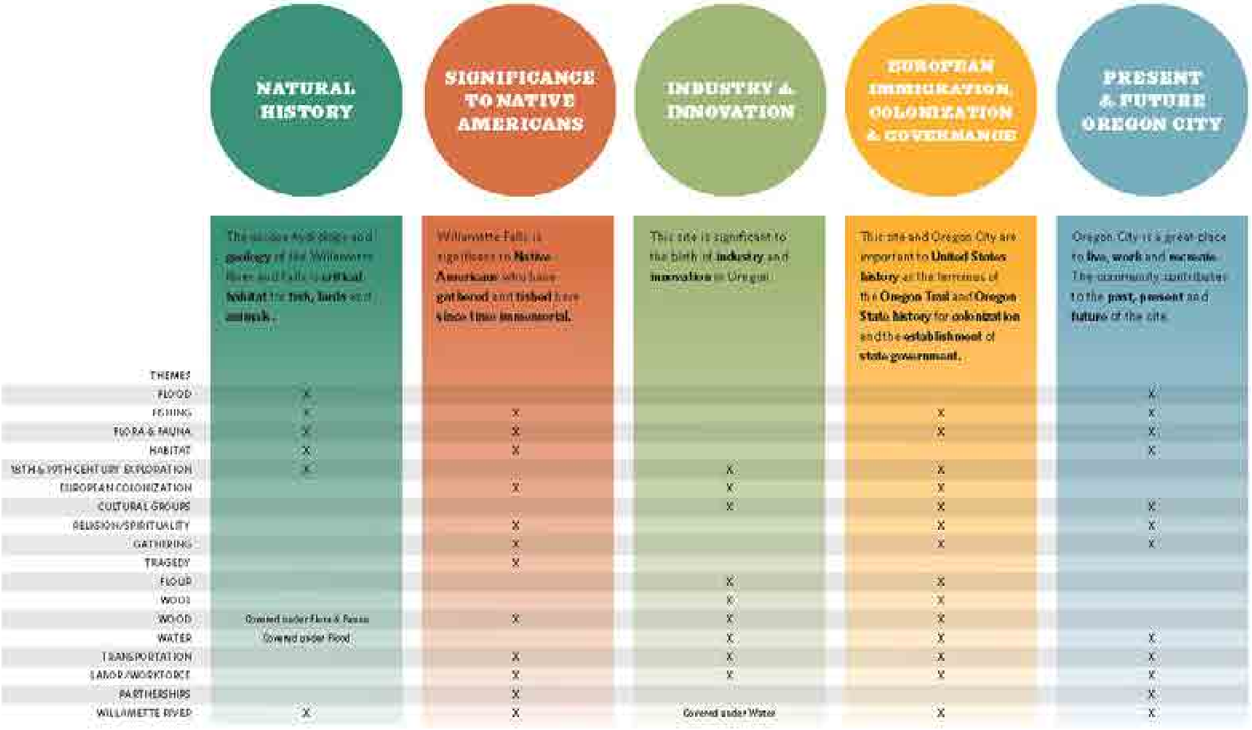
The framework is not a completed catalog of people and stories; it constitutes an approach and is a living document that will change as the phases of the riverwalk are realized. Ongoing efforts are being made to find opportunities to share stories of the site's past, present and future—highlighting its historical, cultural, ecological and economic significance.

The goals of the Interpretive Framework Plan include:

- Creating high expectations and encouraging an innovative approach to interpretation
- Identifying criteria for future projects to be funded or supported
- Establishing a partnership approach that supports the work of interpretation in phases
- Honoring native peoples' stories and relationship to Willamette Falls and planning for a long-term approach to tribal engagement and interpretation
- Developing a framework that will celebrate, challenge and grow our understanding of the site and connection to it

When these goals are met, people who visit the riverwalk will be able to learn, experience and imagine and visitors from the local community, across the nation and around the world will have different but equally powerful experiences.

As with many historic sites, the interpretive opportunities on the former Blue Heron mill site are plentiful. It is important to remember that not all stories can be told on site. By defining interpretive take-home messages, thoughtful prioritization of elements which support these messages is possible.



THEMES	NATURAL HISTORY	SIGNIFICANCE TO NATIVE AMERICANS	INDUSTRY & INNOVATION	EUROPEAN IMMIGRATION, COLONIZATION & GOVERNANCE	PRESENT & FUTURE OREGON CITY
	The unique hydrology and **geology** of the Willamette River and Falls is **critical habitat** for **fish, birds** and **animals**.	Willamette Falls is significant to **Native Americans** who have **gathered** and **fished** here **since time immemorial.**	This site is significant to the birth of **industry** and **innovation** in Oregon.	This site and Oregon City are important to **United States history** as the terminus of the **Oregon Trail** and **Oregon State history** for **colonization** and the **establishment** of **state government.**	Oregon City is a great place to **live, work** and **recreate**. The community contributes to the **past, present** and **future** of the site.
FLOOD	X				X
FISHING	X	X		X	X
FLORA & FAUNA	X	X		X	X
HABITAT	X	X			X
18TH & 19TH CENTURY EXPLORATION	X		X	X	
EUROPEAN COLONIZATION		X	X	X	
CULTURAL GROUPS			X	X	X
RELIGION/SPIRITUALITY		X		X	X
GATHERING		X		X	X
TRAGEDY		X			
FLOUR			X	X	
WOOL			X	X	
WOOD	Covered under Flora & Fauna	X	X	X	
WATER	Covered under Flood		X	X	X
TRANSPORTATION		X	X	X	X
LABOR/WORKFORCE		X	X	X	X
PARTNERSHIPS		X			X
WILLAMETTE RIVER	X	X	Covered under Water	X	X

Interpretive Take-Home Messages

Good interpretive design provokes attention and curiosity, relates concepts and facts to visitors' own lives and reveals key messages in unforgettable ways. The Interpretive Framework Plan defines three main approaches: immersion, narration and reintroduction. Together they aim to engage future visitors with the site intellectually, physically and emotionally. See Appendix F to reference the full Interpretive Framework Plan.

Immersion

Can we engage the past without saying a word?

Narration

How can we explain rich and varied histories, without encumbering the site?

Reintroduction

What lost histories might we introduce to the site?

HONOR NATIVE AMERICAN PRESENCE: PAST, PRESENT, & FUTURE

Honor Native American Presence: Past, Present and Future

Defining tribal-related key uses is an ongoing process and will need to be coordinated with the Tribal Advisory Board. In addition to meeting legal obligations through the federal permitting Section 106 consultation process, the Partners fully intend to continue to work with the Tribal Advisory Board, form agreements with the tribal governments regarding management and operations of the riverwalk, and work together to develop interpretive elements for the riverwalk that respectfully convey the tribal connections to the site.

ECONOMIC REDEVELOPMENT

Economic Redevelopment

With a world-class riverwalk to attract visitors and locals alike, the site will become an attractive redevelopment opportunity. The ultimate redevelopment of this site will take time, money and well-coordinated public and private support. The riverwalk is a key strategic investment for attracting private interest in the mill property, creating an opportunity to leverage public investment for economic development returns and a future increase in tax revenues.

Building upon the previous Framework Master Plan, the planning process determined what parts of the site will become the riverwalk and public open space versus private development. See Figure 6. Much of the area shown in green is subject to periodic inundation.

A vision for the re-connection of Main Street through the mill site, with mixed-use development and revitalized historic structures facing a walkable, multi-modal streetscape, image extracted from the 2014 Vision Plan

On-Site Development Opportunities

The 2014 Vision Master Plan estimated the amount of private development that could occur on site, considering the zoning, building height regulations, open space and right-of-way needs, reuse of some buildings, and market factors. While this is an estimate, it reflects a reasonable expectation and range of various development types on site.

We can expect that development at the site will fall within the following ranges:

- 290 – 700 new residential units (apartments, condominiums, senior living)
- 100,000 – 240,000 square feet of new office, flex office, craft industrial space
- 50,000 – 70,000 square feet of new neighborhood-serving and destination retail
- 18,000 – 35,000 square feet grocery store
- 120 – 200 room limited service hotel
- 640,000 – 835,000 gross square feet new development (not including structured parking)
- $115M – $220 million estimated ending market value
- 600 – 1,270 permanent jobs (full-time equivalent)
- 920 – 1,140 construction jobs (full-time equivalent)

> “This site can become a world-class bicycle and pedestrian destination, if bicycles and pedestrians are prioritized over cars within the site. Connecting the site to surrounding areas with safe bicycle and pedestrian facilities is crucial, so that it is a clear benefit to neighbors.”
>
> -Public Comment

While the estimate considered the entire 22 acres, there are a few specific redevelopment opportunities within the riverwalk area:

Woolen Mill Foundation

The Woolen Mill foundation could be privately redeveloped, except for the southern end that will be a public viewpoint. With ample frontage on Main Street and proximity to the Public Yard, ground-level active uses such as retail and restaurants could be an ideal complement to the public space. Upper floors could include office, hotel or residential uses.


The Woolen Mill in 1904

Flour Mill

The Flour Mill foundation could be built upon and private development could take advantage of the wide riverwalk promenade with space for café seating, and be complementary to the future nearby boat dock.

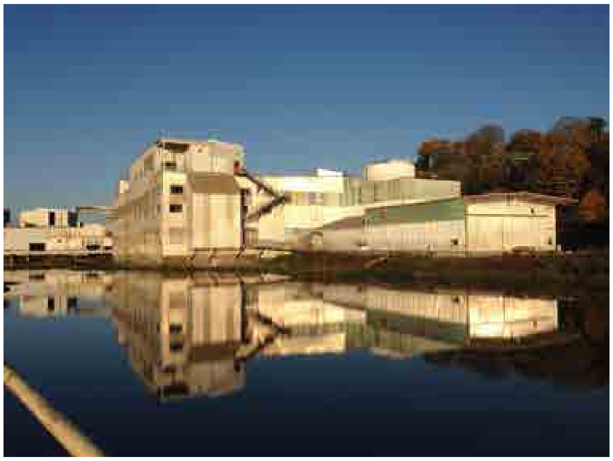

The Chicago Riverwalk, design precedent

Mill O second story

While the ground floor of Mill O is planned as public space, the upper floor could be a unique opportunity for private offices or other private uses.

Mill E

Private redevelopment opportunities would capitalize on views of the falls and would be integrated with the riverwalk to offer additional activity, commerce and activation of the intake basin edge. One possible location of the pedestrian bridge to the McLoughlin Promenade is within a renovated and reused Mill E.


Looking across the intake basin to Mill E

Remainder of site

The riverwalk was designed to anticipate and accommodate private uses adjacent to it. By providing ample spaces for overflow café seating, large public gathering spaces like the Yard, and multiple connections to the street grid, the riverwalk will complement and catalyze vibrant economic development.


The former mill is flanked by the river on the west and the bluff along the eastern edge of the site

Development Strategy

In a separate effort, but integral to the success of the riverwalk, the Partners are working together to reduce and remove barriers to redevelopment of the site. As the project lead, Oregon City was awarded funds from the Community Planning and Development Grants Program administered by Metro (now called the 2040 Planning and Development Grants) to further understand and reduce development barriers onsite. This includes evaluating finance and funding options, understanding the current and future market conditions and site strengths and conducting infrastructure planning and phasing strategies. However, Falls Legacy LLC walked back from the core value of economic redevelopment when they stopped this grant-funded work to plan private development in November 2016.

A view of the Arch Bridge, with Willamette Falls in the distance

Main Street Terminus

This area of the site affects a number of stakeholders, histories and pragmatic needs; thus requires additional technical consideration to arrive at a preferred approach. Factors at play relate to PGE dam access, potential for redevelopment, reconstruction of Main Street, Union Pacific Railroad requirements, potential for flood mitigation, tribal considerations, interpretation of mill structures and connection to the bluff.

Two options offered as part of the concept design, as seen on the next page, will serve as the basis for continued design conversations moving forward. Both options maintain riverwalk access throughout the site and fulfill the goals of the four core values.

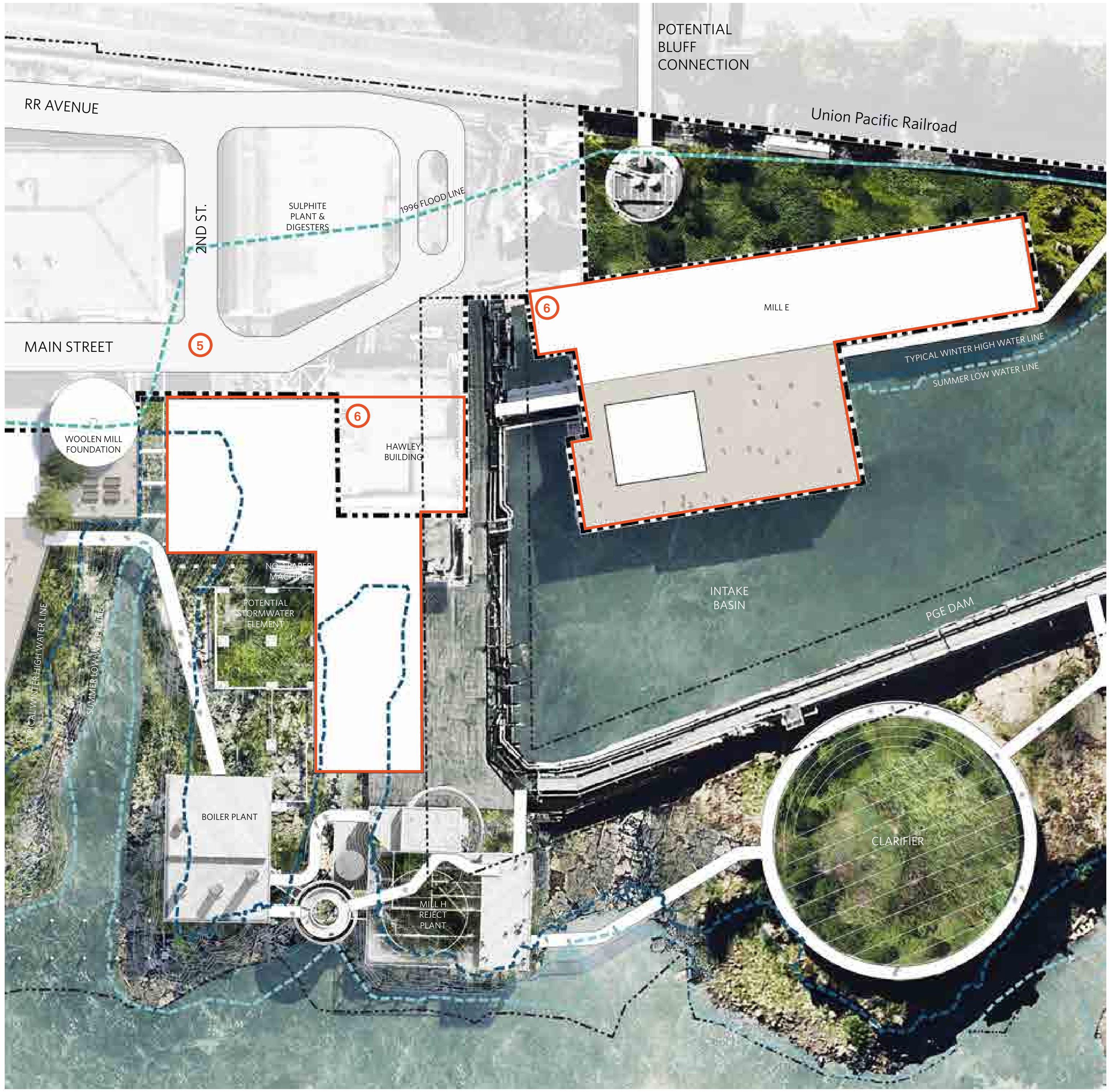
Option 1: Main Street extends to the northern leg of PGE dam allowing public vehicular access to the southernmost portion of the site. Potential private redevelopment (6) includes a hotel proposal for the Mill E site as well as the Mill H area on the north edge of PGE dam in the mill reserve. This option presumes the reconstruction of Main Street and the railroad trestle area south of the Woolen Mill (5). Public circulation routes are shared with PGE access and service areas for redevelopment.

Option 2: Main Street extends to the southern end of the Woolen Mill with a turnaround located between No. 4 Paper Machine and the Digesters. Public connection to the bluff occurs through an elevator and stair within the Digesters structure. Potential private redevelopment (6) includes a hotel proposal for the Mill E site as well as the Mill H area on the north edge of the PGE dam in the mill reserve. This option presumes that Main Street south of the Woolen Mill is not reconstructed for potential flood control (5). PGE and redevelopment service access occurs east of the Digesters and Sulphite Plant.

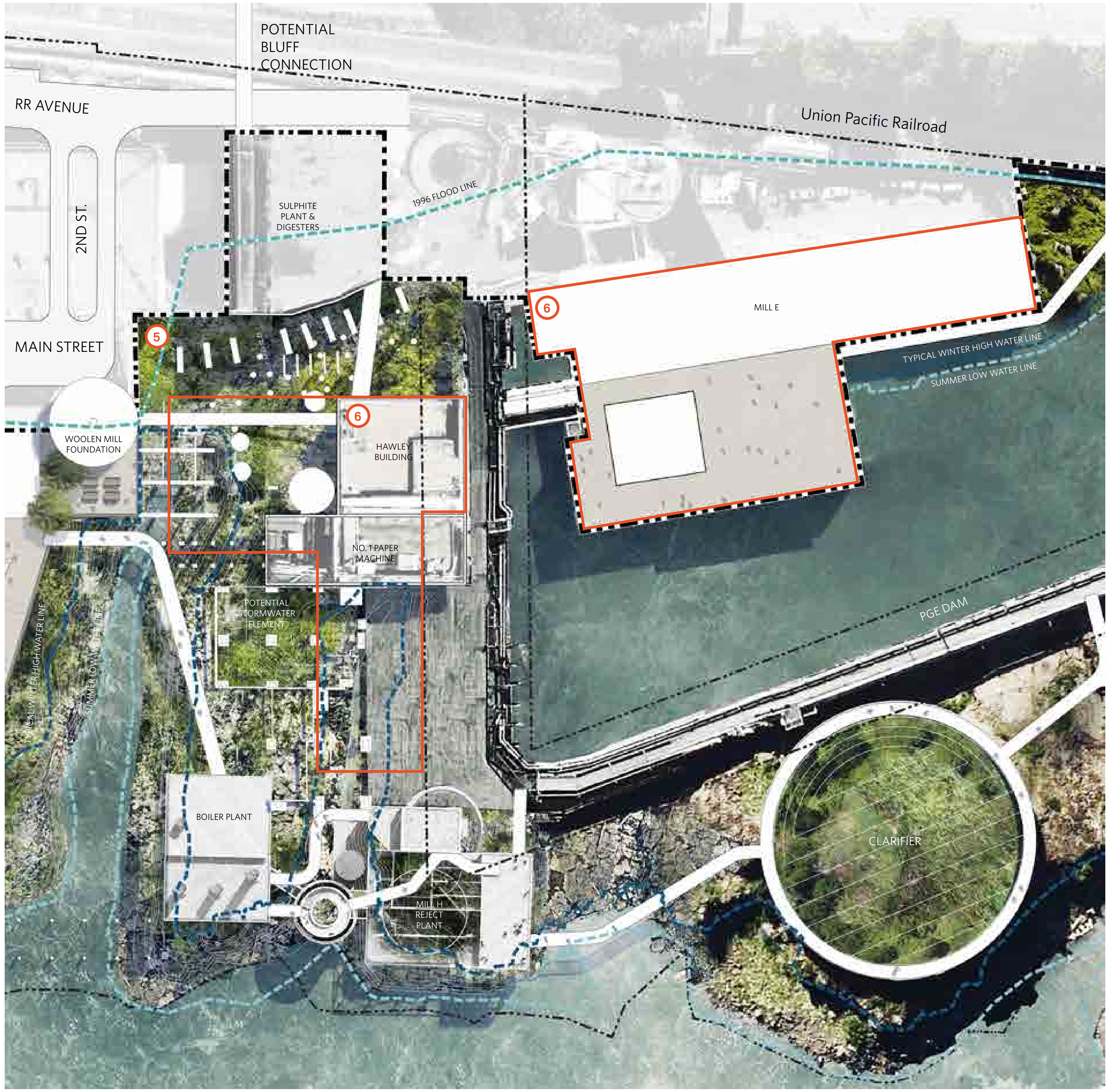
Both options require further discussions and coordination with PGE and Falls Legacy LLC for selection and refinement.

Standing on Mainstreet, looking at the terminus

Option 1: Main Street Terminus



Option 2: Main Street Terminus



Riverwalk Access and Connections

Main Street: Main Street will be the primary motor vehicle access to the site, while also accommodating bicycles and pedestrians. This Main Street connection will reconnect the site to downtown Oregon City.

Water Street: Water Street, parallel to Main Street, is a secondary vehicular access from Hwy 99E. It will allow for right turns in and out only and will be connected to Main by 4th Street. The riverwalk promenade in the north riverfront portion of the site will be built alongside Water Street.

McLoughlin Boulevard Viaduct Replacement: Also known as McLoughlin Blvd. Plan Phase 3, this project, which is adjacent to the riverwalk, will replace the viaduct with a new roadway and ample pedestrian and shared use space along the waterfront, filling the gap between 10th Street and the riverwalk. Timing of the project is uncertain, but it is critical to full connection of the pedestrian and bicycle network.

Bridge to McLoughlin Promenade: A pedestrian bridge proposed in the riverwalk plan will link the riverwalk to the McLoughlin Promenade, approximately 100 feet above the site. An elevator will likely provide the connection, but a ramp is also a possibility. There are a few potential locations for the bridge, and a final location will be more apparent when future private redevelopment in the area of the site near Mill E and the digesters occurs. The benefits of the pedestrian bridge could provide:

- A direct connection to Oregon City community and institutions atop the bluff
- Unique falls views from the bluff
- Re-use of historic structures for bluff connection
- Links to McLoughlin Promenade and Canemah Bluff Natural Area

Multiple options allow for review and feedback from stakeholders, such as ODOT, Union Pacific and adjacent property owners on the bluff.

A festival on Main Street in historic Downtown Oregon City

Water Street, looking north toward the Arch Bridge

Public connection to the bluff could occur through an elevator and stair connection within the chip cylinder east of Mill E

Parking, Access and Transportation Strategy

An important piece of the riverwalk plan is how visitors will access the new public space. A Parking, Access and Transportation Plan has identified solutions for transportation and parking for the riverwalk. This plan optimizes the riverwalk experience, reduces its impact on neighbors and can be phased in as development occurs over time.

Goals for the plan include:

- Reach a shared understanding among stakeholders, including transportation and parking issues, tools and goals for this project
- Create a long term metric-based strategy that can guide the community through the many phases of private and public development onsite
- Achieve Oregon City Planning Commission approval of the strategy and plan as part of the upcoming riverwalk land use approval, including identification of proportional requirements for Phase 1 of the riverwalk
- Identify actionable next steps that the community and the city can implement

Early riverwalk phases will include interim on-site parking, utilizing open paved areas on the property. In addition to this new parking, which will be market-priced in coordination with existing downtown public parking, the Parking, Access and Transportation Plan includes a variety of actions to increase the "universe of trips" by cultivating and improving the connections for all modes of transportation. These improvements will be implemented with a near, mid and long term lens though the use of a cross-stakeholder implementation committee. Not just specific to the riverwalk project, the plan includes strategies such as pedestrian and bicycle improvements, the potential addition of a new transit stop and development of a wayfinding system for the entire downtown area. Several more strategies are identified in the Transportation Demand Management Plan, which is included in Appendix G.

Oregon City Transit Center on 10th and Main Street

> "Light-rail should be extended from Clackamas Town Center or Oak Grove (or both) to downtown Oregon City and up to CCC. The I-205 bike path should be extended to the falls site. A safe connection to the Trolley Trail should be constructed. Sidewalks and crosswalks in Downtown Oregon City should be improved upon."
>
> -Public Comment

> "Parking is the biggest challenge for those arriving in cars. Encouragement to use public transit seems the best option if nearby convenient stops are available, or if large scale parking is at a distance, coordinated with shuttles can be made a reality. What I do not want to see is McLoughlin neighborhood becoming the parking lot for this attraction."
>
> -Public Comment

Riverwalk Concept Design

Off-Site
Downtown Oregon City

Area 1
North Riverfront

Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah

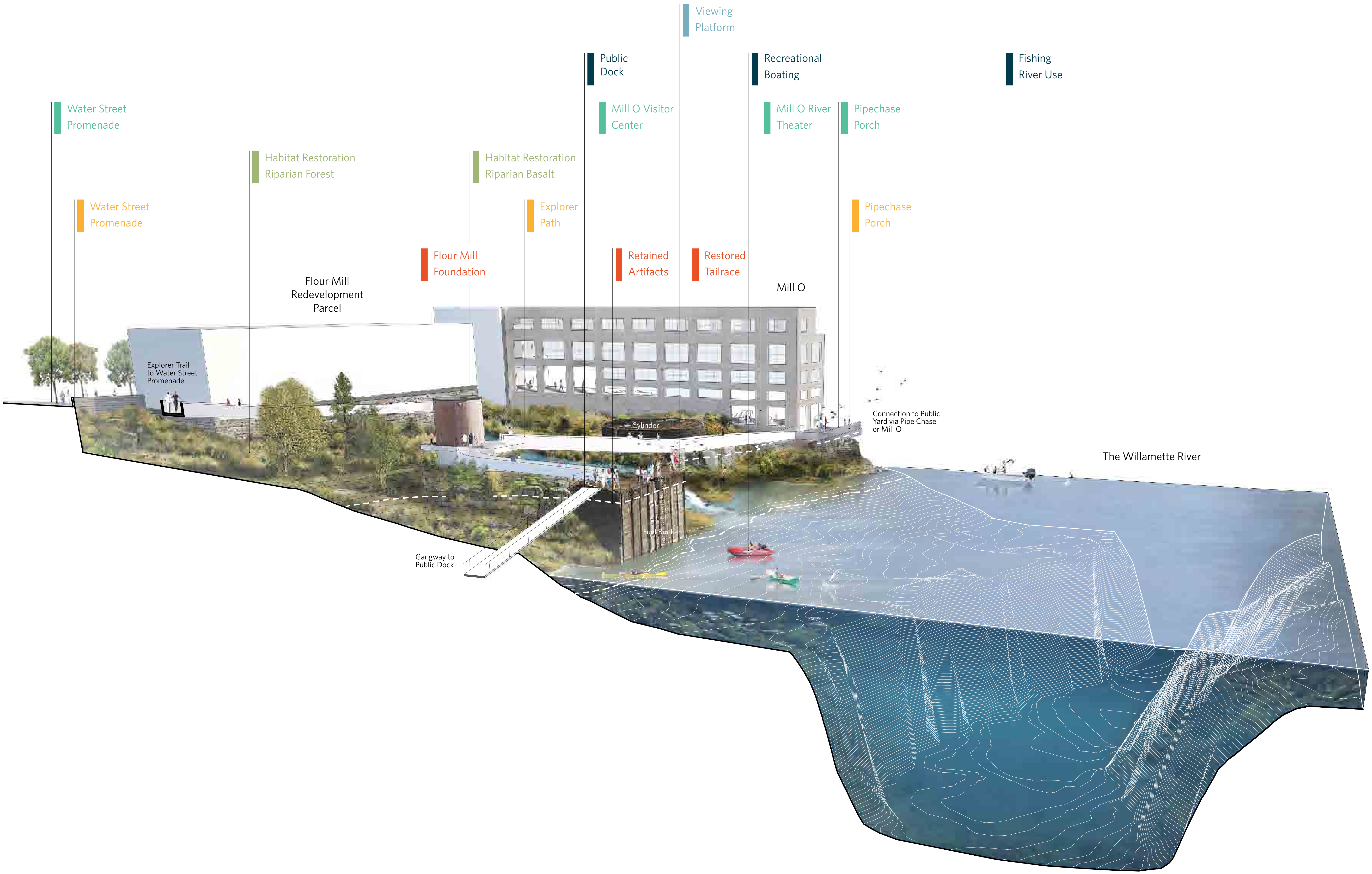
Riverwalk Design

Area 1: The North Riverfront

In the North Riverfront area, existing structures and platforms are peeled away to expose the outcrop of ancient basalt on which the historic 1860s Four Mill was constructed. An elevated Explorer Trail draws visitors through the area, providing interpretive access to the restored riparian basalt habitat, basalt masonry foundations, tailrace and machinery of the Flour Mill. The path also provides access to a historic fuel bulkhead on the water that is re-used as both a viewpoint as well as an access point to a proposed dock to the north.

The North Riverfront, existing condition

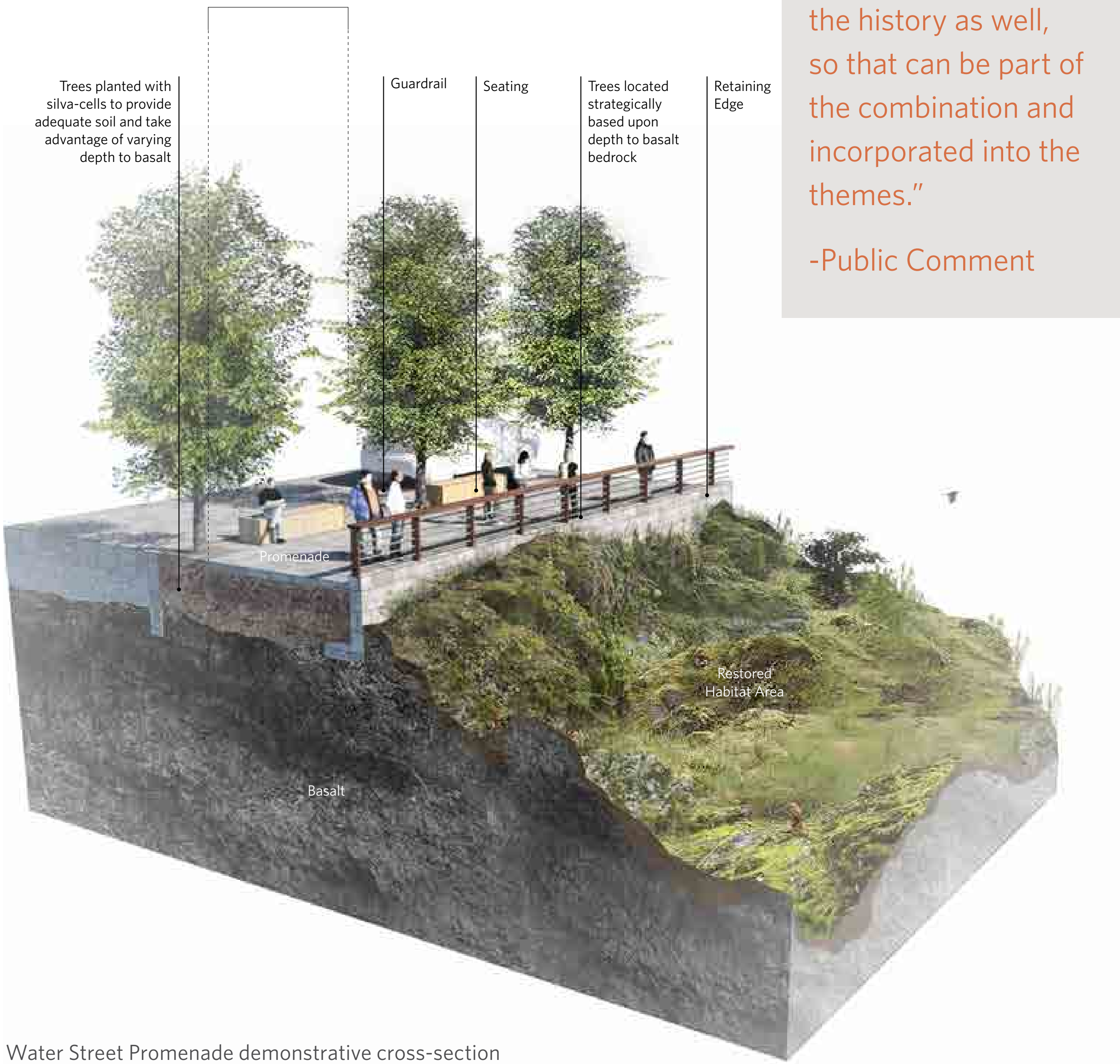
The North Riverfront and Flour Mill Foundation



Stairs or ramps to the river's edge are not included in the North Riverfront area due to safety concerns. The riverbed quickly drops off, and currents are strong. The location south of the existing Oregon City Boat Club dock has potential for a moored, floating dock devoted to small, private motorized and non-motorized craft. This location provides the potential depth for boat access, as well as an existing structure to establish mooring.

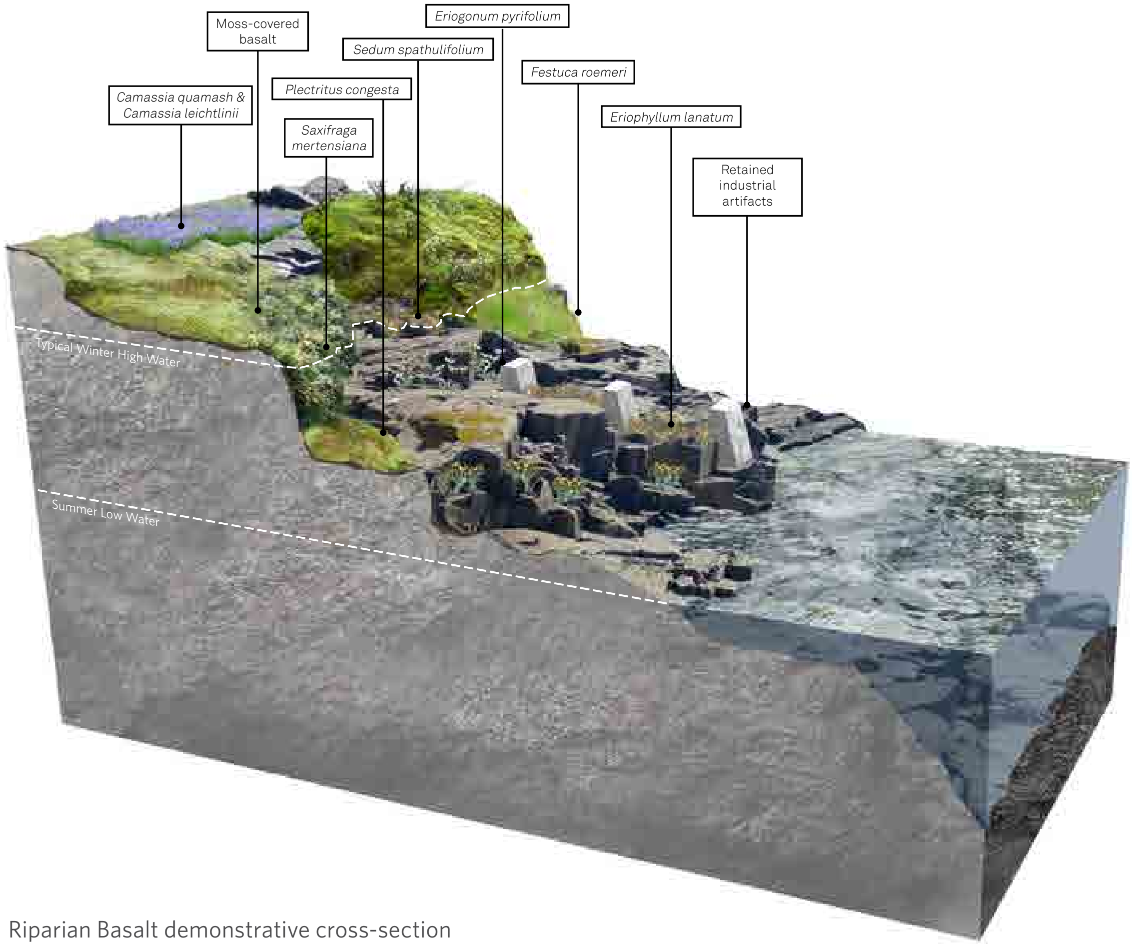
Water Street Promenade: The Water Street Promenade extends from the northernmost portion of the site at McLoughlin Boulevard. It parallels the proposed extension of Water Street and weaves its way to the east of the exposed Flour Mill before tying into 3rd Street. This orientation establishes a strong connection to the energy and activity of Main Street, and funnels activity to the Public Yard. Along its length, canopy trees, furnishings and a guardrail establish a complimentary character to the adjacent redevelopment parcels and restored habitat areas.

> "We would like to see it be an area like the San Antonio Riverwalk only with a natural habitat feel. Little shops or eating cafes, or a farmers market can be there and an area to hold events like concerts and movies, with a kid/adult play area. We appreciate the history as well, so that can be part of the combination and incorporated into the themes."
>
> -Public Comment



Water Street Promenade demonstrative cross-section

Riparian Basalt: In this stretch of the river and adjacent to the Water Street Promenade, basalt outcrops and rocky substrate along the shoreline provide habitat for unique plant species and is important habitat for pollinators and birds. The riverwalk plans include removal of invasive species, removal of structures and industrial debris not necessary for re-use or historic preservation, repair of damaged basalt with concrete patches and planting native grasses and wildflowers in these areas. Public access in riparian basalt habitat should be restricted to protect the sensitive plants and wildlife that live here.



Riparian Basalt demonstrative cross-section

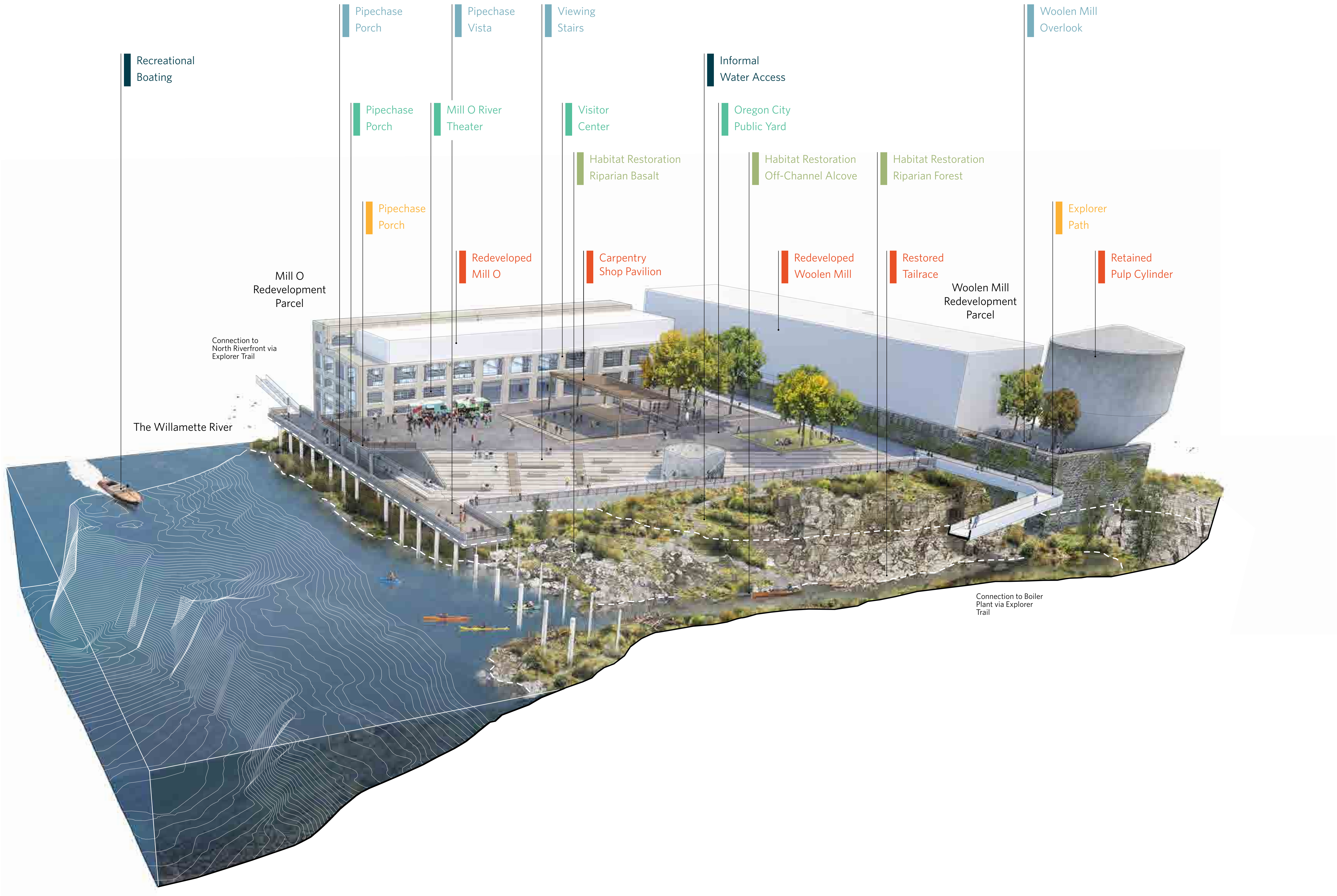
Riverwalk Design

Area 2: The South Riverfront

Visitors following the main promenade pass between Mill O and the Woolen Mill foundation arriving at the Public Yard, a broad plaza with expansive views toward the falls and PGE dam to the south. The Yard and adjacent structures provide a highly flexible public space where people can mingle and congregate in a new civic heart for Oregon City. The Yard is able to host a variety of events: beer festivals, food carts, concerts, movie screenings, or even a summertime regatta when the river's flows are low. The Carpentry Shop (Woolen Mill Pullery) is featured as a central focal point of the Yard. It is retained and the restored historic wood structure serves as an informal pavilion or outdoor stage for performances or other events. At the southern edge of the Yard, the concrete structures and urban fill area are removed to expose the historic shoreline and basalt bedrock, with unique riparian basalt plant communities and off-channel alcove habitat.

The South Riverfront, existing condition

The Public Yard and Woolen Mill Alcove



The Woolen Mill Alcove and Public Yard: More passive public river access uses are designed within the Yard area alcove, where currents and depths are expected to be more gradual. This is where future riverwalk users will be able to dip their toes in the water, and potentially launch a kayak from an informal gravel path. Due to the existing basalt bedrock, this informal access path would not likely meet ADA accessibility guidelines (the accessible water access point would be located in the North Riverfront area via the dock). The alcove could also serve as a lower portage connection and water access point, with the upriver connection located along the Canemah extension.

To support public access, the walls of the Pipe Chase are selectively removed, leaving behind lower portions of the structure re-used as a porch-like promenade at the water's edge. Removing structure lessens shadowing impacts on river ecosystems, while retained remnants of the structure enrich historical interpretation of the water's edge, allowing people to mentally reconstruct what once occurred on the site.

The Woolen Mill Alcove and Public Yard

Mill O Visitor Center and Pipe Chase Porch: Visible from Main Street and commanding a presence from the water, Mill O, the historic extension to the Oregon City Woolen Mill is well-positioned to serve as the riverwalk's visitors' center. The exterior shell of the building is reinforced and retained, while the interior is opened up to make a large public hall, and offers opportunities to re-use the interior wood structure. Large portions of the ground floor spill out to the adjacent Public Yard, creating flexibility and all-weather use. The eastern end of the structure is conditioned and provides restrooms, a kitchen, storage and flexible use spaces. It also supports upper stories of the building being devoted to redevelopment.

A generous stair and ramp at the western end of the structure spills down to the lower level of the Pipe Chase creating a river theater: a flexible location for events, such as concerts and classes, but also a sheltered place to watch the river go by. The existing Pipe Chase structure is selectively removed, producing a porch-like promenade parallel to the river. Connected to Mill O, Explorer Trails to the north and the Public Yard to the south, it serves as a key accessible location for visitors to get close

> "Make this a place for the community that is respectful of the nature, wildlife and history of the falls area. Keep commercialization to a minimum using attractions that emphasize history, the arts, nature, and healthy activities."
>
> -Public Comment

to the water and have views of the falls. Certain portions of the upper level of the structure are maintained at the yard level, providing additional vantage points above, and sheltered areas below.

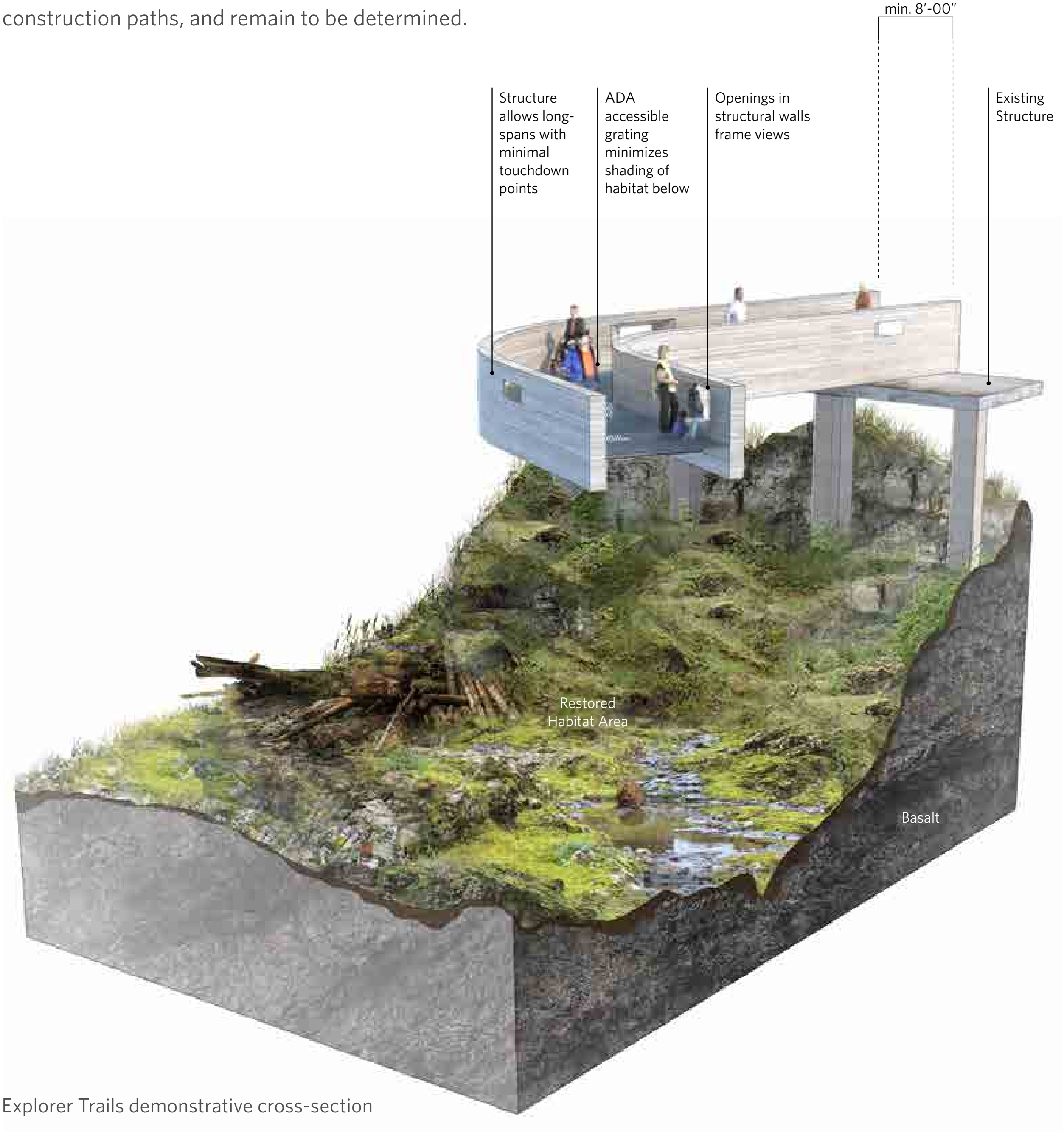
The Mill O Visitor Center and Pipe Chase Porch

The Woolen Mill Overlook: The Woolen Mill Overlook serves as the public terminus of Main Street, offering 360 degree views of the PGE dam, the historic boiler complex, the restored river alcove and the Public Yard.

Woolen Mill Overlook

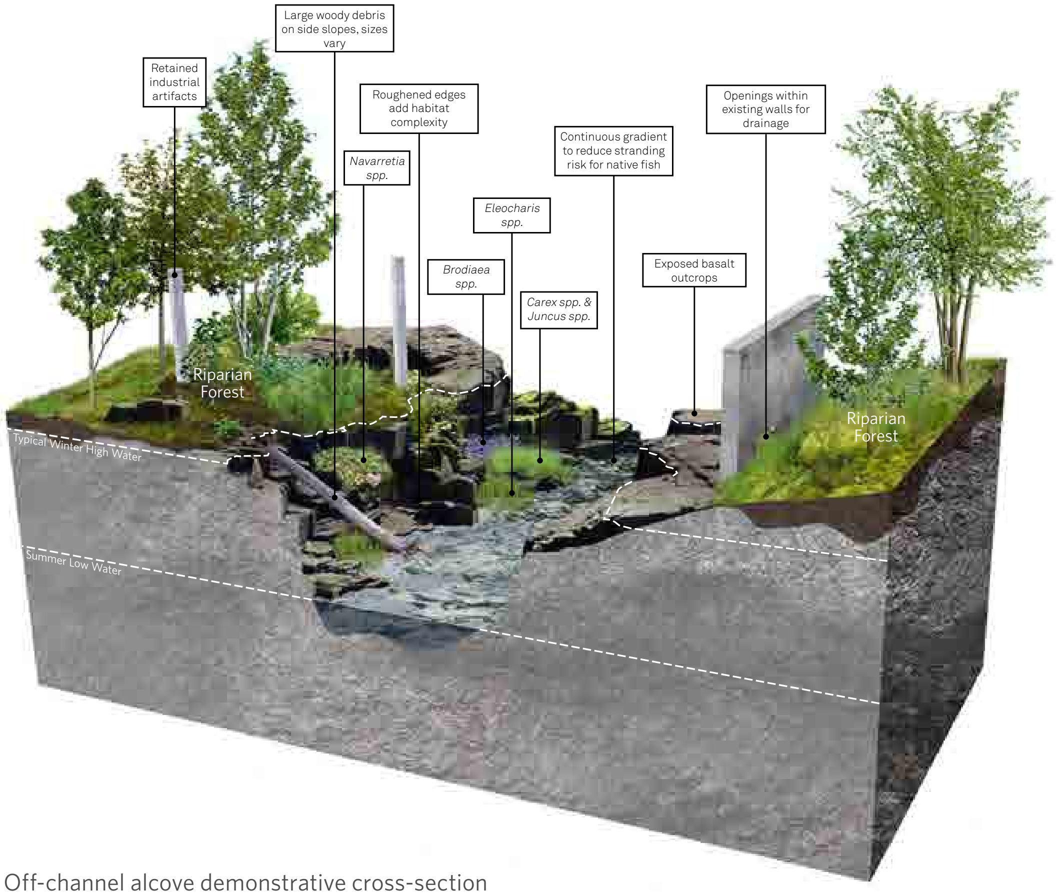
Through selective removal of existing structures and platforms, the full height of the PGE dam is revealed and the historic boiler plant complex becomes a defining focal point of the riverwalk. An elevated Explorer Trail connects the yard area to the boiler plant complex, providing interpretive opportunities focused on the restored alcove habitat and the historic Woolen Mill foundation. Explorer Trails provide intimate access to habitat and historic interpretation opportunities throughout the site.

Explorer Trails: The custom paths are designed to take advantage of existing walls and columns for structural support, and offer universally accessible routes to the far reaches of the site. Openings in the structural walls of the paths focus attention on interpretive moments, while the grating below, minimizes environmental impact on the restored habitat below. Several material choices are being considered for the design and construction paths, and remain to be determined.



Explorer Trails demonstrative cross-section

Off-Channel Alcove: In the South Riverfront Area, restoration of off-channel alcove habitat serves as a key opportunity for enhancing areas for native fish, including federally listed Spring chinnook, steelhead and Pacific lamprey. Fish require habitat complexity along the Willamette River and alcove areas provide opportunities for them to rest during high flow conditions. The riverwalk design includes actions to increase shoreline complexity by removing areas filled in or covered by structures, establishment of wetland plants and placement of large woody debris. These restored off-channel alcoves also provide important habitat for great blue herons, beavers, river otters and other aquatic species that depend on the river.

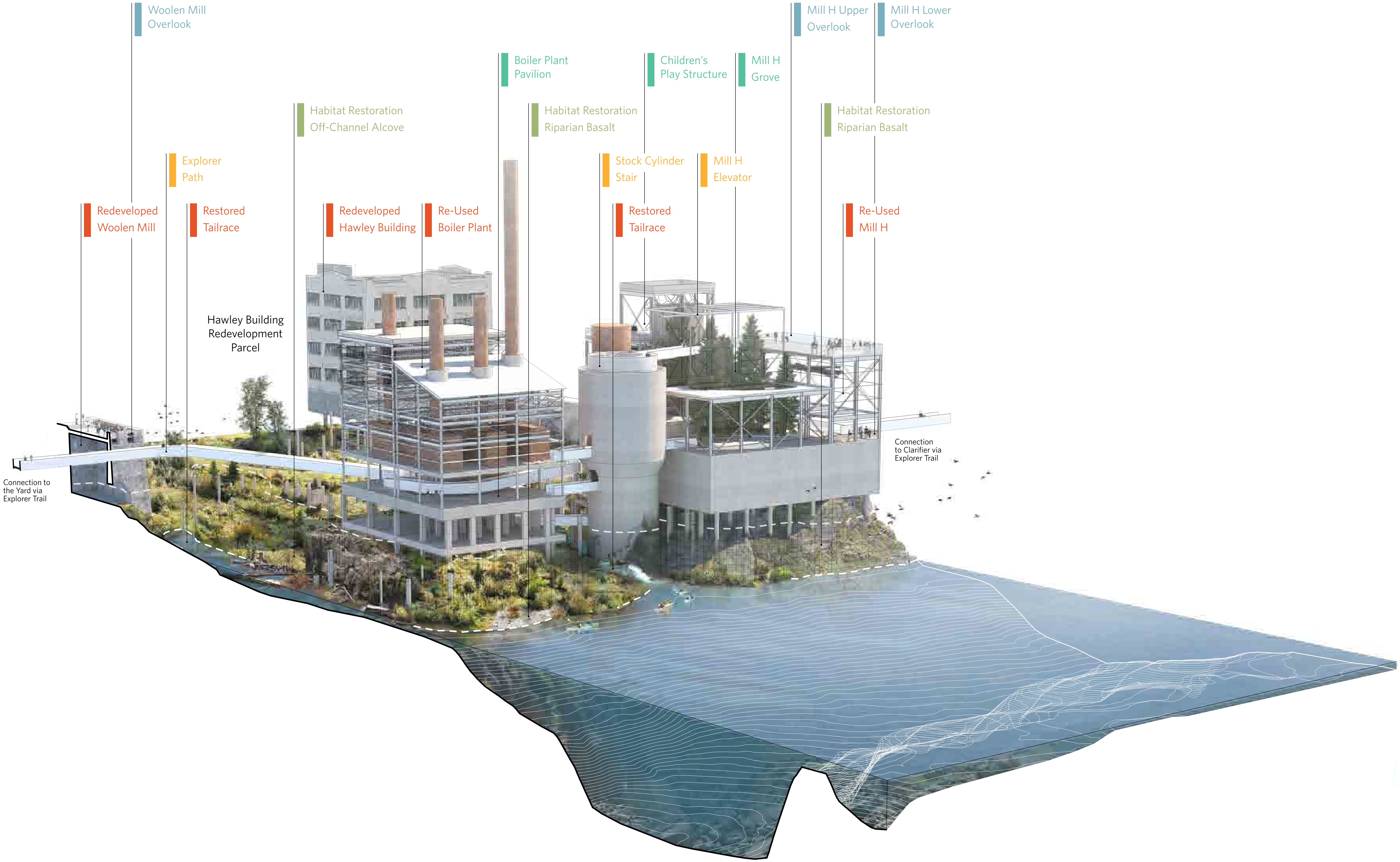


Off-channel alcove demonstrative cross-section

The Mill Reserve and Mill H Overlook: A lofted pathway passes over the restored Woolen Mill tailrace connecting to retained industrial structures that are preserved and repurposed to showcase the history of uses. Together the Boilers and Mill H structures provide an iconic destination perched at the edge of the river with a falls viewpoint, proposed as Phase 1. Selective preservation and reuse of these key structures features interpretive historic artifacts and access to the lowest and highest reaches of the built site. Minimal interventions allow the cathedral-like space of the boiler plant and its machinery to speak for itself, while Mill H is portioned into three distinct volumes – a conifer grove, a children's play tower, and a lower and upper level overlook structure. Elevated paths, an elevator and stairs provide public access to these points. The rugged topography and multiple levels of structure are ADA accessible throughout, including high level overlooks, the lofted network of catwalks, and the promenade areas along the water's edge.

The Mill Reserve area, existing condition

The Mill Reserve and Mill H Overlook



The Mill H Grove and Overlook: To offer prominent views of the falls and river valley to the south, the industrial corrugated cladding of the existing Mill H structure is peeled away. The structure is opened to light and air while revealing the reinforced steel and concrete structure of the mill. Portions of the Mill H ceiling are carved to further open the space connecting the interior to the sky. The concrete foundation of Mill H is repurposed to hold a large volume of soil to support a grove of native conifer tree species, referencing the historic wood-based papermaking processes that once took place in the structure. Upper levels of the structure provide falls viewing vantage points, while lower levels draw visitors to the Clarifier path and the Hawley Powerhouse Foundation falls overlook beyond. The Mill H aspects of this view – the grove, the overlook, and improvements to the structure, are planned to be included as part of Phase 1 of the riverwalk.

One potential redevelopment scenario proposed by Falls Legacy LLC illustrates a hotel along the northern leg of the PGE dam, reusing the Hawley Building and Mill E, and building above Paper Machine #1 and Mill H. The proposed concept would capitalize on views of the falls and would be integrated with the riverwalk to offer additional activity, commerce and activation of the intake basin edge.

The Mill H Grove and Overlook

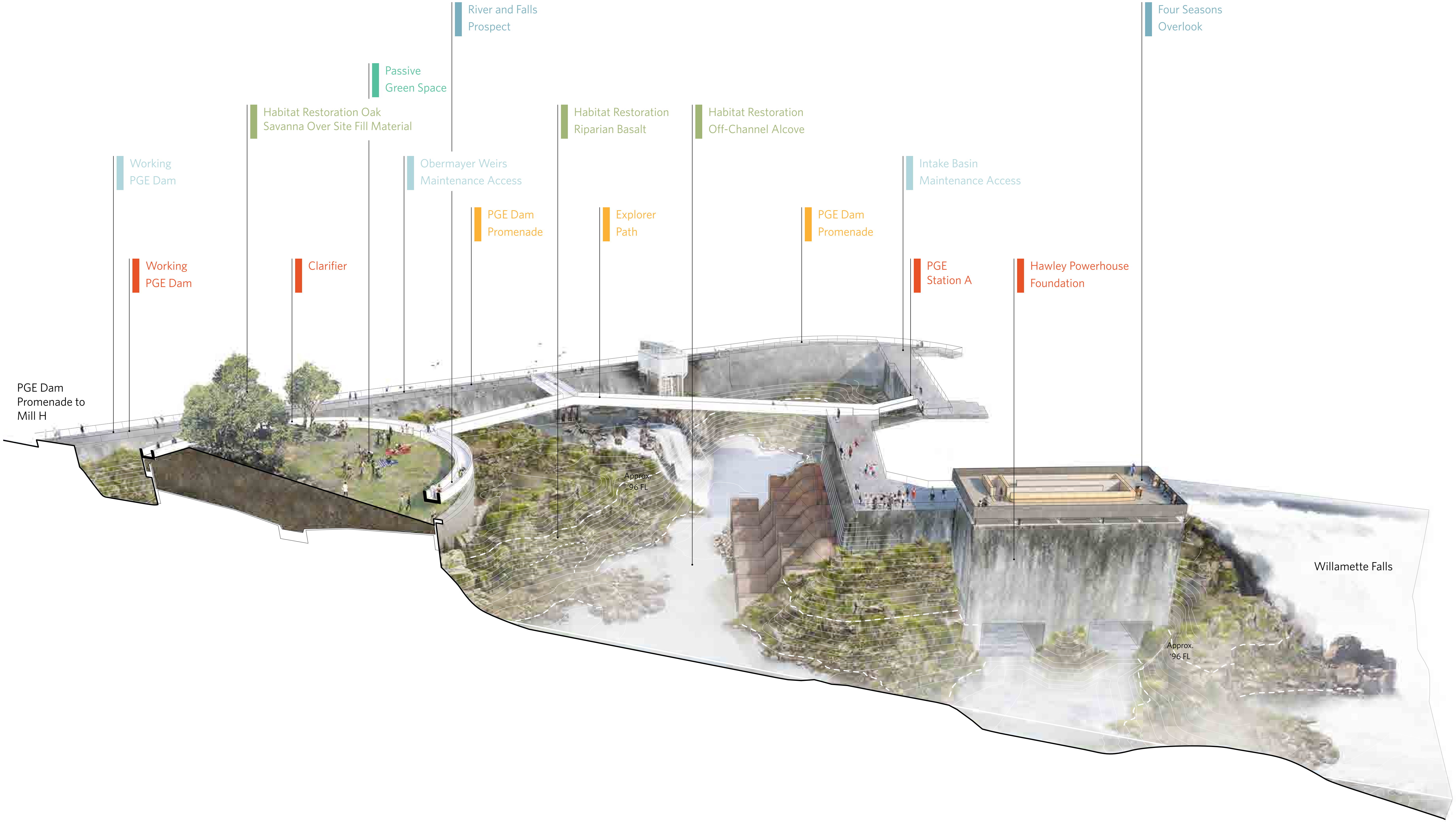
Riverwalk Design

Area 3: PGE Dam and Mill E

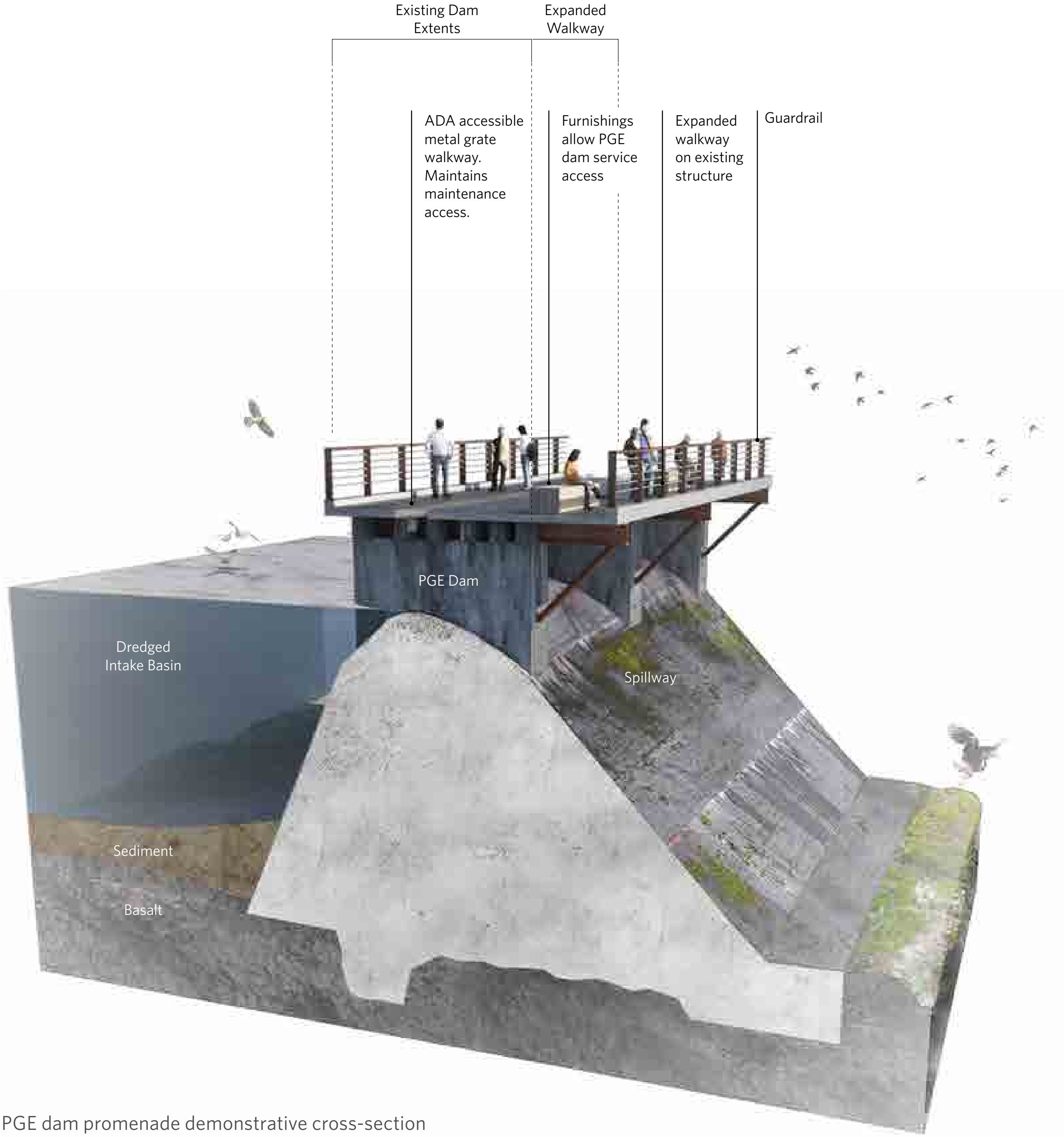
The sequence of elevated Explorer Trails extends south like stepping stones, connecting Mill H to the Clarifier, to PGE dam at Station A, to the overlook at the Falls at the historic Hawley Powerhouse Foundation. The paths are designed to accommodate PGE dam closures for operations and maintenance, providing access to the Falls year-round. The paths in this area are designed to reveal the full height of the Falls, as the ground drops away before reaching the final Falls overlook destination. The pathway structures are engineered to take advantage of existing site structures for support, minimizing the use of vertical construction and reducing impacts to the restored riparian basalt habitat below. Arriving at the overlook, visitors experience a 360 degree view from its privileged position at the center of the river and the Falls.

The PGE Dam and Mill E, existing condition

PGE Dam, The Clarifier and The Falls Overlook



PGE Dam Promenade: The existing, historic PGE dam still functions as part of PGE power generating operations today. With recent installment of modern weir structures, regulation of the intake basin water level has become, in part, automated; however, PGE still requires maintenance and operations access to the dam. Public access improvements propose to expand the walkable dam surface, provide seating, replace guardrails and provide utilities. Minimum access requirements are maintained and the dam may be safely and securely closed as necessary by PGE.



PGE dam promenade demonstrative cross-section

> “I think restoring habitat is an important part of this project, the more that can be done, the better. Also more removal of the structures will open up more views of the natural beauty of the falls and river.”
>
> -Public Comment

The Clarifier Landscape and PGE Dam Promenade: A proposed walkway rings the Clarifier. The landscape interior of the Clarifier is inspired by the region’s oak savanna habitat featuring characteristic Oregon white oak and camas plantings as well as basalt salvaged from the site. Visitors can gather, picnic or rest in the landscape with expansive views to the river and the former West Linn Paper Company. The clarifier pathway links Mill H to the falls overlook, allowing full public access to the falls when the PGE dam promenade is closed for operations and maintenance. At high flows, water released from the spillway surrounds the Clarifier, making it an island perched between the upper and lower basins of the falls. Improvements to the surface of the PGE dam create a public promenade, yet maintain PGE operation access to this historic working riverfront. The Mill H overlook and vertical play tower is shown in the distance.

The Clarifier Landscape and PGE Dam Promenade

Oak Woodland and Savanna: Oregon white oak woodland and savanna habitat primarily exists on the bluffs surrounding the riverwalk project site. Savanna and oak woodland habitat is proposed in the clarifier to restore Oregon white oak, camas and other native plants which may have historically been present at the site. This managed landscape will create a special gathering place and provide wildlife habitat.

> "I have spent many years looking up at these structures while fishing near the falls. From the river it is a very industrial view, so some changes to make the view skyward up from the river more natural should be considered."
>
> -Public Comment

Oak Savanna demonstrative cross-section

Oak Savanna habitat at Camassia Natural Area

The overlook at the Hawley Powerhouse Foundation

View from the Hawley Powerhouse Foundation

The Falls: The destination overlook of the riverwalk takes advantage of the precipitous location of the historic Hawley Powerhouse Foundation. The overlook is composed of two levels, each ADA accessible. Above, a new platform opens up an unimpeded 360 degree view of the surrounding region from the center of the river and falls. The viewing platform offers integrated seating, places to pause and provides two routes of entry to ease circulation. In addition to the panoramic, outward-looking views, the platform design focuses visitors inward, with grating and openings, allowing experiential glimpses into the industrial turbine chamber below. At dam level, the underside of the upper viewing platform provides shelter and compresses visitors as they approach the second falls viewpoint. At the brink of the falls, a few steps down and the shelter of the upper platform pulls away, leaving the power, mist and exposure of the location to play upon the senses.

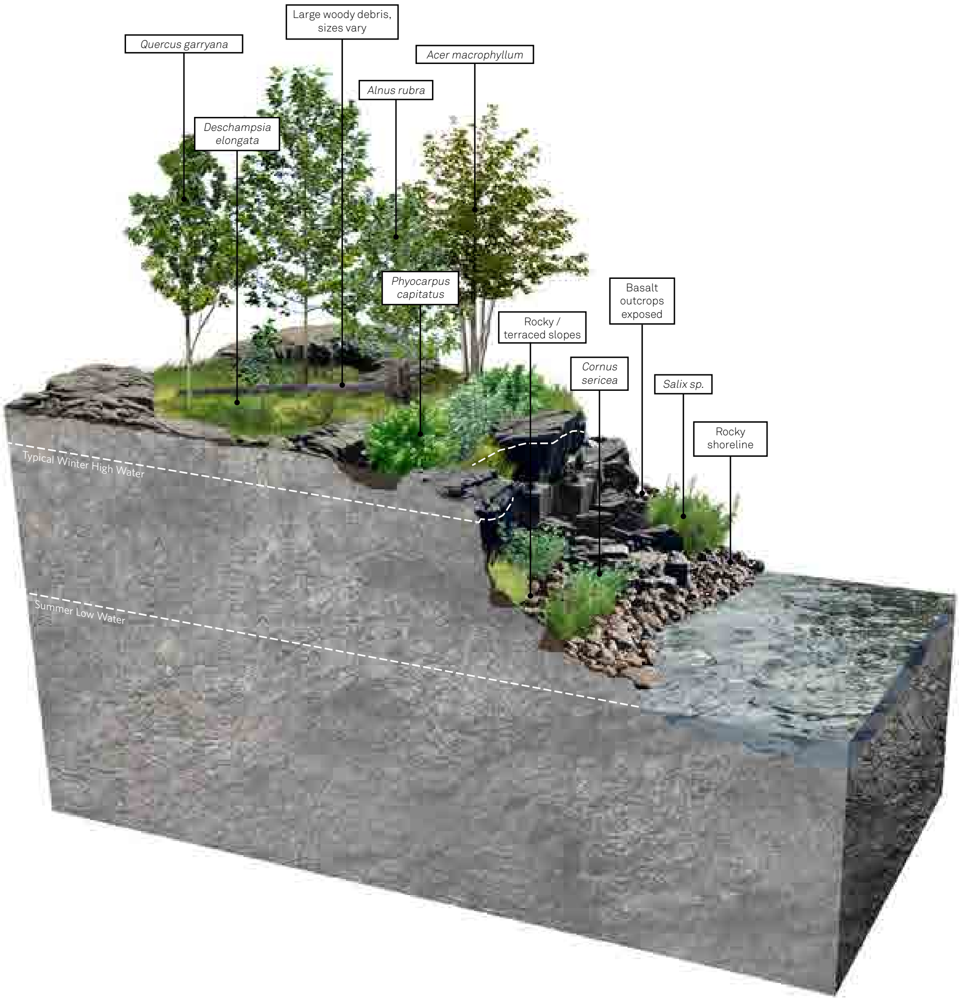
Rail spur adjacent to the Union Pacific railroad and Hwy 99E above

Riverwalk Design

Area 4: Canemah Connection

The Canemah connection is a pedestrian route, that when combined with Mill E development opportunities, can create a vibrant experience along the shoreline above the falls. The future connection will likely require significant investment in an overpass of the Union Pacific Railroad; however further study is required. The connection would link to the sidewalk on Hwy 99E, close to Hedges Street in the Canemah neighborhood.

Riparian Forest: Healthy riparian forests are relatively wide (typically 100-200+ feet each side of the stream) with a dense mix of native trees and shrubs with rich native species diversity in all layers. Downed wood and snags are important components of riparian forest composition to support wildlife diversity. Riverwalk plans include removal of invasive species, removal of structures and industrial debris not necessary for re-use or historic preservation and planting native trees and shrubs to shade the river and off-channel alcove habitats. Preservation of views is important for redevelopment and will need to be balanced with tree placement, habitat value and permitting requirements.



Riparian Forest demonstrative cross-section

PART V: IMPLEMENTATION

Cost Estimates

A high level cost estimate was prepared based on elements shown in the final plan, see Appendix H. Assumptions were made for materials, quality and construction. The construction estimate is based on 2016 unit costs for each specific work item and is organized by public access elements, habitat restoration and re-use and removals of specific structures.

The estimate uses an aggregate of 60 percent markup on all work elements and a 20 percent contingency to cover unforeseen costs. The costs are not all-inclusive of investment needed. There will be other capital costs associated with the riverwalk, such as:

- Upgrades including re-use options
- Operations and maintenance
- Soft costs for permitting, additional studies and engineering

A third party cost review was completed and determined that the major work elements were identified and included in the estimate, however the reviewer was not able to determine cost reasonableness of the estimate without knowing the estimate classification and the applicable accuracy range. The recommendation is to prepare an estimate in greater detail that includes crew productions based on the unique site character and the surgical nature of the demolition and construction likely to be required.

As the plan is refined, the estimate will be updated to reflect the level of completion.

> "It turns out that the hard things to do are really what matter in the end. Think about all the people who came acorss the Oregon Trail in wagons. And they thought it was worth it. People have already done a lot of hard things here at the Falls. This is one more."
>
> -Public Comment

Main Street, looking north toward downtown Oregon City

Mill H building

Willamette Falls viewpoint from the top of the north end of the Pipe Chase

No. 2 Paper Machine

Permitting

Local Land Use Process

The former Blue Heron mill site is located in Oregon City and falls under its jurisdiction. In 2004, Oregon City adopted a Comprehensive Plan that requires any future development of the mill site to undergo a Master Plan process, which is a land use process that applies to large phased developments in Oregon City. In 2014, after the mill declared bankruptcy, the City approved the Framework Master Plan and a Comprehensive Plan Amendment and Zone Change to allow mixed use development on the site. The Framework Master Plan established a street network, open space, development space and design guidelines for the entire site. It also established a review process for future development, requiring all new development (save most demolition and construction projects less than 1,000 square feet) to be approved through a Type III land use process.

Federal and State Section 106/ORS 358 Process

Removal of potentially eligible buildings, potential archeological work and in or over-water work requires compliance with state and federal permitting processes. Section 106 of the National Historic Preservation Act of 1966 requires federal agencies to take into account the effects of their undertakings on historic properties, and allow the Advisory Council on Historic Preservation a reasonable opportunity to comment. Because of the historic nature of the project site, a Section 106 review is necessary, along with the submission of the Joint Permit Application for wetland fill/removal on the project site. This process will be guided by the U.S. Army Corps of Engineers (USACE) with assistance from the State Historic Preservation Officer (SHPO). The consultation process will result in a Memorandum of Agreement (MOA) to guide the project over time, identifying mitigation and allowing for check-ins with consulting parties. There will be an MOA with USACE and with SHPO and they each may cover different “permit areas.” MOAs can be signed and finalized even if there is an appeal over a decision about who gets to be a consulting party.

Metro will prepare permit applications, drawings and narratives that comply with all local, state and federal regulations, on behalf of the four Project Partners.

Demolition

Development of the riverwalk will require significant demolition of structures on the site. The design team has inventoried building materials and intends to repurpose or recycle as much as possible.

The Framework Master Plan contains a provision that prior to demolition, each building must have an intensive level survey following the guidelines set forth by SHPO (if potentially eligible for the National Register of Historic Places) or a reconnaissance level survey (if not deemed potentially eligible) which shall include at a minimum photos of all interior floors/rooms and exterior context. These surveys will be produced at each phase of the riverwalk for the buildings or structures that are being demolished.

Demolition will only begin after building permits are obtained and an MOA through the Section 106 process is signed.

Due to the presence of hazardous materials, a brownfield assessment and abatement plan is also needed for each building.

Brownfield Remediation

Brownfields, which are former industrial sites with real or perceived contamination, can be difficult to redevelop due to cleanup costs. While many industrial sites suffer from contaminated soil, the riverwalk site is relatively clean due to lack of soil – most of the site was built on basalt. Phase I and II Environmental Site Assessments have been completed for portions of the property, with a focus on soil and groundwater, but the existing structures on the property have not yet been formally assessed. Based on the existing studies, ground contamination will be manageable with just a few areas with heavy metal contamination.

Due to the presence of dozens of old industrial buildings, there is a large amount of lead and asbestos on the site. Each building will be tested and assessed for contamination areas and levels and will be abated according to DEQ and EPA standards when it is demolished or renovated.

The project site is part of the McLoughlin Corridor Brownfield Assessment Area and will benefit from EPA funding obtained by Metro, Clackamas County, and Oregon City. This funding will go toward onsite building assessments related to the Phase 1 riverwalk construction.

Contractors visually inspecting the old industrial buildings

Infrastructure

The mill operated largely on a private infrastructure system, most of which was removed after bankruptcy. To be redeveloped, the site needs new water, sewer, stormwater and street infrastructure, as well as private utilities such as electric, natural gas and fiber. Simultaneous to riverwalk design processes, the Willamette Falls Legacy Project has worked with the site owner to develop site-wide infrastructure and utility plans. Sharing of infrastructure systems to serve both the riverwalk and private development will be the most efficient way to provide infrastructure on the site.

Additional Planning and Community Engagement Efforts

While the master planning process for the riverwalk is complete, the Partners have several bodies of work that will continue into the future. These efforts will allow for continued community engagement in the riverwalk project in preparation for riverwalk construction and operations.

- **Transportation Plan Coordination:** The Parking, Access and Transportation Plan calls for an implementation committee charged with assisting in the coordination and implementation of the plan. This committee will be formed in the near future and will meet at least twice annually to coordinate and oversee projects and programs that are identified in the Parking, Access and Transportation Plan.

Volunteers posing next to the pile of garbage hauled out of the river during the 9th Annual Great Willamette Clean Up

- **Interpretive Implementation Committee:** A strong recommendation that came out of the Interpretive Framework Plan involves creating an interpretive review board or committee as a means to determine future interpretive activities and physical additions to the site. This board or committee will be responsible for reviewing all proposed interpretive elements for alignment with the Interpretive Framework Plan prior to funding and design approval.
- **Programming Plan:** Whichever agency or entity will be responsible for programming and operations of the riverwalk will create a programming plan that identifies activities and events that will be provided for riverwalk visitors. For example, guided tours, educational programs and special events and celebrations will take place on site. The seasonal calendar shown on page 48 is the beginning of a programming plan.
- **River Clean Ups:** Project partners and stakeholders are committed to supporting river cleanup events such as the Great Willamette Clean Up. There are multiple opportunities along the site's shoreline to clean debris, refuse and invasive plants.
- **Riverwalk Naming:** As discussed on page 39, the riverwalk is designed as more than just a walk. Project Partners have considered a naming process to give the riverwalk an official name that better communicates its purpose. A naming process would involve the public and would likely take place before or at the grand opening of the Phase 1 riverwalk.

Phasing

The overall riverwalk is an aspirational plan that anticipates future funding commitments, grants and fundraising efforts. It is anticipated that the design of the riverwalk will be built in phases as funding becomes available.

Phase 1 detailed design and engineering is the next step for the Project Partners, with Phase 1 construction planned to begin as soon as design engineering and permitting are complete.

Goals for Phase 1 include providing a prominent view of the falls, safe and secure interim access and building demolition that will prepare the site for future phases of the riverwalk. See Figure 7. Phase 1 will include habitat restoration work, historic and cultural interpretive elements and public access closer to the Falls. The project will focus demolition and site preparation in the Yard and Mill Reserve areas and provide a viewing area in the Mill H building and Boiler Plant Complex.

The sequence in which riverwalk elements are constructed is dependent upon multiple factors, including private development coordination, fundraising, permitting requirements and community support. The Willamette Falls Legacy Project remains flexible in the timing of each riverwalk element or phase in an effort to be fiscally responsible and to leverage the project to achieve economic development and fundraising dollars.


Contractors treat invasive weeds in the intake basin, Sept. 2017

Restoration

Habitat restoration work will be combined with each phase of implementing the riverwalk project. Phase 1 restoration work may include the following actions:

- Removing industrial debris and other structures not necessary for re-use or historic interpretation
- Removal of small dams and impoundments on tailraces to eliminate entrapment of fish
- Collecting native seed from onsite plants that are rare or unique to the area and propagating them for future plantings


Oregon City concert in the park

Operations and Maintenance

The four Public Partners - Oregon City, Clackamas County, Metro and the State of Oregon - will continue to work together for operations and maintenance of the riverwalk. While one or more of the Partners will likely take on ownership itself, all four agencies have committed to funding the operations and maintenance of the riverwalk. Metro has skill and expertise in the management of habitat areas and will take on the care of these areas of the riverwalk. Oregon City's Parks and Recreation Department may play a role in operations and maintenance of public spaces and pathways.

Operations and maintenance can be partially funded by revenues generated from parking fees, event rental fees and vendors. With ample public gathering space, the site will be a compelling place to hold events and rental revenue could be significant.

Private development will also be contributing to operations and maintenance as based on the agreement with the site owner. Other funding sources include funds from each of the four Public Partners and donations.

Security and Interim Access

Even after Phase 1 of the riverwalk project is complete, large portions of the site may remain unchanged from today's conditions. These areas will need to be secured once public access is provided into the site. Security on the site is of high importance due to deteriorating buildings, toxic materials and safety hazards. The Phase 1 project will include security fencing and other security measures to restrict access in non-riverwalk and undeveloped areas of the site, but will need to be further explored during design engineering to finialize the accessible, safe and secure alignment. The Partners will continue to work with Falls Legacy to identify the appropriate safety and security measures necessary.

Funding

The riverwalk concept design assumed a total riverwalk cost of $60 million, with approximately $12.5 million available to fund the initial phase of the riverwalk. This effort represents the responsible expenditure of funds contemplated in the Project Partners' Intergovernmental Agreement (IGA), including:

- $12.5 million: State lottery bonds dedicated by the Oregon State Legislature
- $5 million: Metro Natural Areas Bond Measure Program
- $1.2 million: A combination of City, County, and site owner contributions
- Roughly $8 million is expected to be raised through private fundraising by 2022

Future phases of the riverwalk are anticipated and will be funded by a combination of sources including future public investment, private fundraising and investment from private development. Private fundraising is led by the nonprofit friends group, Rediscover the Falls. Formed in 2015, this group is launching its first fundraising campaign, seeking $10 million to contribute to development of the riverwalk.

The City of Oregon City has added the riverwalk to its Transportation System Plan and Trails Master Plan, making it eligible for System Development Charges funding sources. The riverwalk has also been added to the Metro's Regional Transportation Plan and Regional Trails Plan, making it eligible for federal and state funding allocated to the Portland metropolitan region. Other potential funding sources for future riverwalk phases could include:

- Federal grants
- State grants
- Hotel tax revenues
- Funding from public and private partners
- Private foundations
- Private development

Security measures will need to be in place before the public can safely access the site

Rediscover the Falls

In 2015, the Willamette Falls Legacy Project Partners created Rediscover the Falls, a 501c(3) nonprofit organization to build friends and fundraise for the project. Rediscover the Falls is helping make the riverwalk vision a reality.

Over the last year, Rediscover the Falls has been working in collaboration with the Partners to ensure the public is well informed and engaged in the riverwalk project. Rediscover the Falls is launching a major capital campaign designed to help bring experiential elements of the riverwalk to life. This effort is being led by an executive director and board of directors. Together, the Willamette Falls Legacy Project and Rediscover the Falls are working to ensure that all Oregonians and visitors have access to a world-class experience at Willamette Falls while also enjoying the natural beauty of the Willamette River.

Catalytic Impact and Economic Benefits

The riverwalk will be a catalyst for economic development and job creation on the site and in the surrounding area. The 2014 Vision Plan estimated the benefits of redevelopment at the site to be significant and could result in the following gross economic benefits:

- During construction: a total of about 1,460 new jobs, including direct construction jobs, indirect (business-to-business) jobs, and induced jobs created from increased household spending
- Once construction ends: a total of about 1,480 permanent full-time equivalent positions, including people with jobs at the site (direct jobs) and in businesses that support the people and businesses that are located at the site (indirect and induced jobs)
- $2.3 million in estimated annual tax revenue, benefitting the City of Oregon City, Clackamas County, school districts and others
- $14 million in estimated annual spending from visitors arriving from outside of the Portland region

Additional benefits are less quantifiable, but are equally important to Oregon City and Clackamas County's ongoing economic development

Rediscover the Falls Mission Statement

Our mission is to champion and sustain a world-class Willamette Falls experience that offers year-round access to the grandeur of the Falls, historic and cultural interpretation, healthy habitat, public open spaces, and that showcases the hospitality of historic Oregon City.

Website:

www.friendsofwflp.org

REDISCOVER The Falls

efforts. Redevelopment of the site transforms Oregon City's downtown into an attraction that is important at the national level, bringing new energy and more people to downtown Oregon City's existing businesses, and creating a completely unique place that all can enjoy.

Tourism opportunities

The site has the potential to become a significant tourist destination in Oregon. The Crown Point Vista House in the Columbia River Gorge offers an especially good comparison for the Blue Heron site. It has historical significance, scenic views, free entry, and is located about 30 minutes from downtown Portland. The Vista House receives an estimated 775,000 to 1,290,000 visitors annually. That level of visitation could catalyze development of other tourism assets such as new hotels, shops, recreational attractions, and restaurants. Already, Oregon City boasts several outdoor recreation-related small businesses. Additional tourists could foster the creation of new small businesses to complement these, both on and off the site.

Future riverwalk visitors could include:

- Oregon City and West Linn residents, friends and family who visit frequently
- Portland metro area residents who visit often
- National and international travelers who visit occasionally
- School and educational field trips
- Families
- A range of age, race and socio-economic status
- Primarily English speakers. Non-English speakers may increase as visitation grows
- Physically challenged individuals or groups
- Economically disadvantaged individuals or groups

Development Opportunities in Surrounding Areas

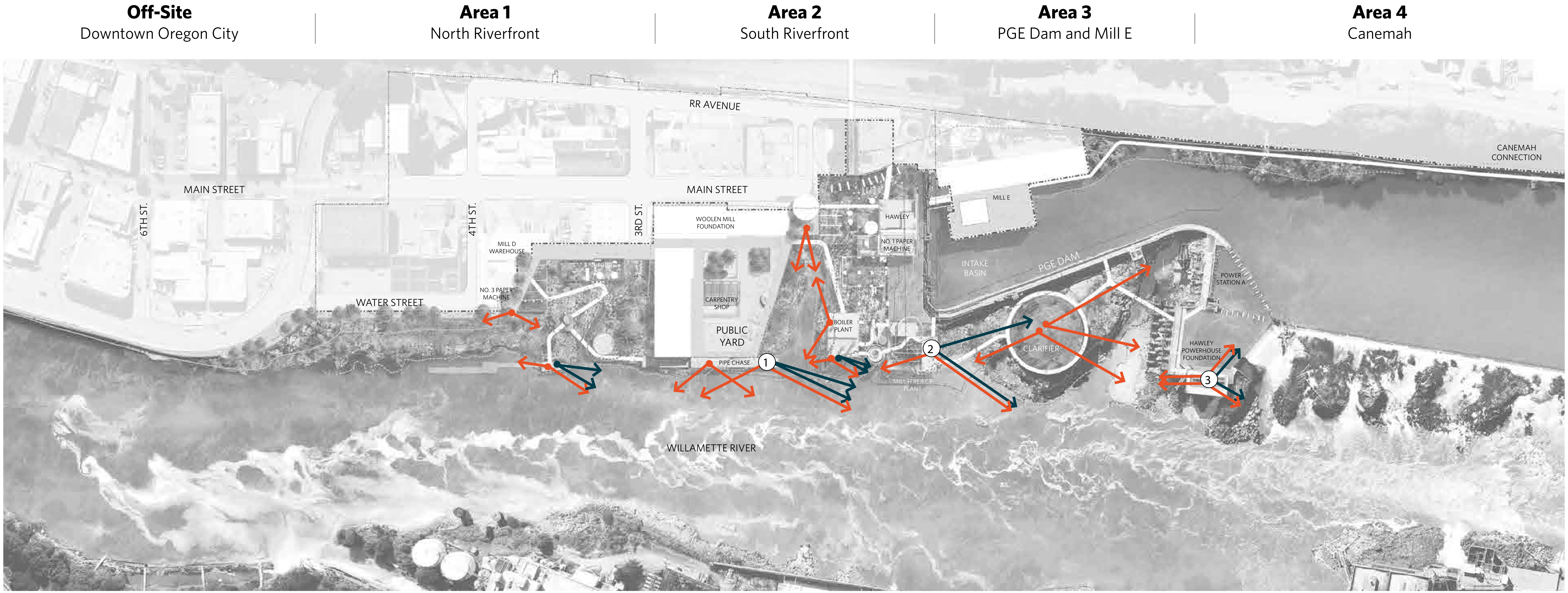
The Framework Master Plan adopted in 2014 plans for extension of the downtown street grid into the site, reconnecting the falls to historic Main Street in Oregon City. Downtown Oregon City has seen tremendous growth in small businesses in recent years, boasting dozens of new restaurants and shops that are popular with locals and those who work in downtown. The City has seen success in attracting traded-sector jobs downtown as well. A small but growing cluster of creative firms in the filmmaking, media production and gaming fields call downtown Oregon City home. Jobs at these businesses tend to pay above average wages and bring in new dollars to the local economy. In order to attract more housing into the downtown area, the City also adopted a vertical housing tax credit. Developers are beginning to recognize the opportunity and have proposed several new projects in the area that include housing on upper stories. The riverwalk will be a world-class amenity for future residents living downtown, and for new businesses and workers.

Potential redevelopment opportunity sites surrounding the riverwalk include city-owned properties downtown, undeveloped downtown sites between the mill site and 15th Street, areas on the bluff above the site zoned for mixed use, the Clackamas Cove area which is currently being developed with housing, the former landfill site just north of downtown and the portion of West Linn just across Abernathy bridge. The riverwalk is expected to boost opportunities for these sites, making them more attractive to the private development community.

Undeveloped lot in downtown Oregon City on 12th and Main Street

FIGURES

Figure 1: Falls Viewing Access



Legend

🟦 Falls Viewpoints

🟥 River Viewpoints

(X) Prominent Falls Viewpoints

① Pipe Chase Viewpoint

② Mill H Viewpoint (Phase I Viewpoint)

③ Hawley Powerhouse Viewpoint

Assumptions

- Redevelopment areas not shown on key use diagrams. Refer to illustrated site plans for potential redevelopment parcels, and supporting information.

Figure 2: Paths, Walkways and Biking Trails

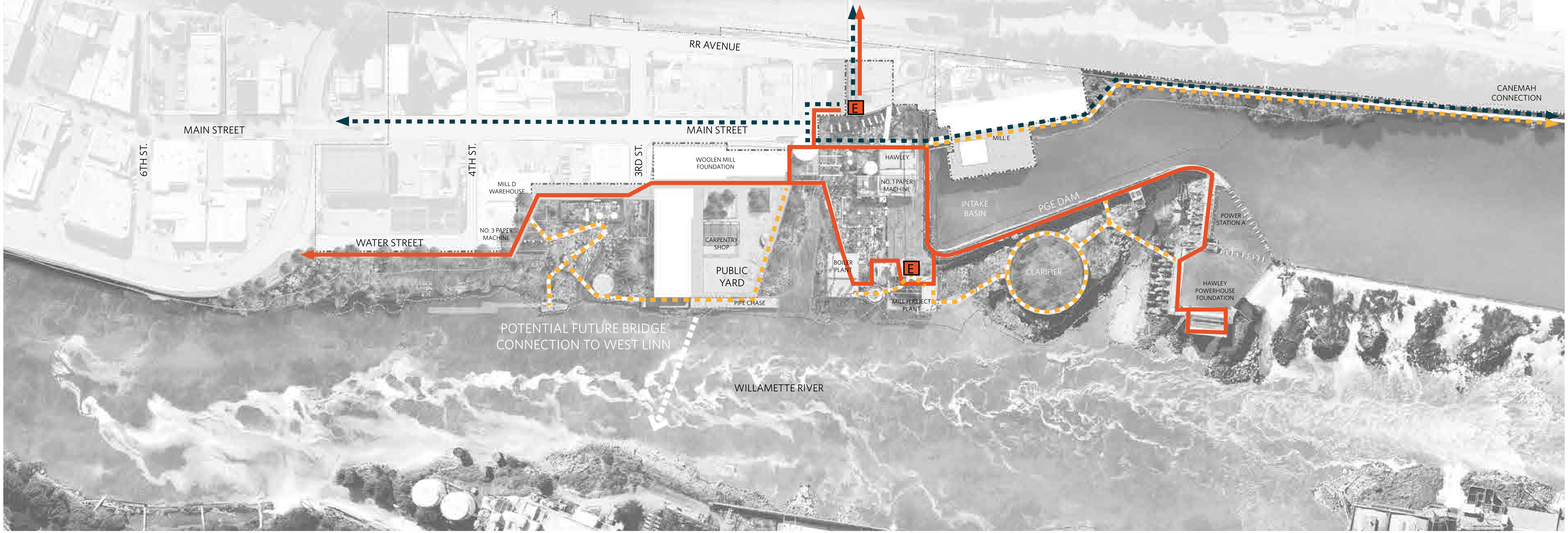
Off-Site
Downtown Oregon City

Area 1
North Riverfront

Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah



Legend

▬ Riverwalk Primary Path

▪▪▪ Riverwalk Secondary Paths

▪▪▪ Cycling Route

E Public Elevators

Assumptions

- Hawley Powerhouse and PGE Dam listed as eligible for the National Register, work done associated with them must consider recommendations and guidelines from State Historic Preservation Office (SHPO). (PGE)
- Main Path routes to be classified as an Oregon City ‘Regional Trail’ and meet associated requirements (Metro). This means:
  - Users include bicyclists, pedestrians, wheelchairs, baby strollers, equestrians, and skaters. Additional clarification regarding bicyclists, skaters, and equestrians will occur in future phases.
  - Width = 10-12’ minimum
  - Surface is to paved or other smooth rolling surface.
  - Primary and Secondary path slope less than 4.5%, or no greater than 8.3% with ramps and landings.
  - 10’ vertical clear sight line zone
- Redevelopment areas not shown on key use diagrams. Refer to illustrated site plans for potential redevelopment parcels, and supporting information.

Figure 3: Collective Gathering and Event Spaces

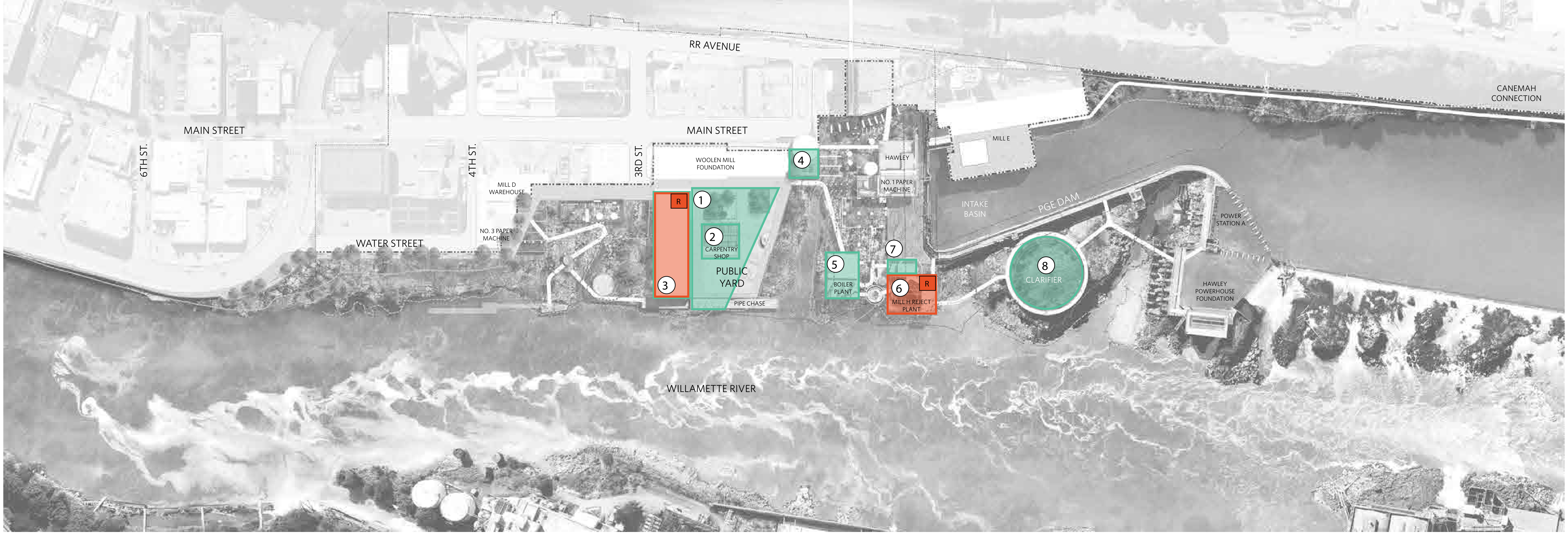
Off-Site
Downtown Oregon City

Area 1
North Riverfront

Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah



Legend

🟩 Flexible Use and Events
🟥 Riverwalk Support - Storage, Office
R Restrooms

① Public Yard - 30,300 SF
② Carpentry Shop - 5,300 SF
③ Mill O - 16,500 SF
④ Main Street Overlook - 3,400 SF
⑤ Boiler Plant - 18,900 SF (3 Levels)
⑥ Mill H Overlook - 10,400 SF
⑦ Mill H Play Tower - 6,400 SF (4 Levels)
⑧ Clarifier Meadow -17,000 SF

Assumptions

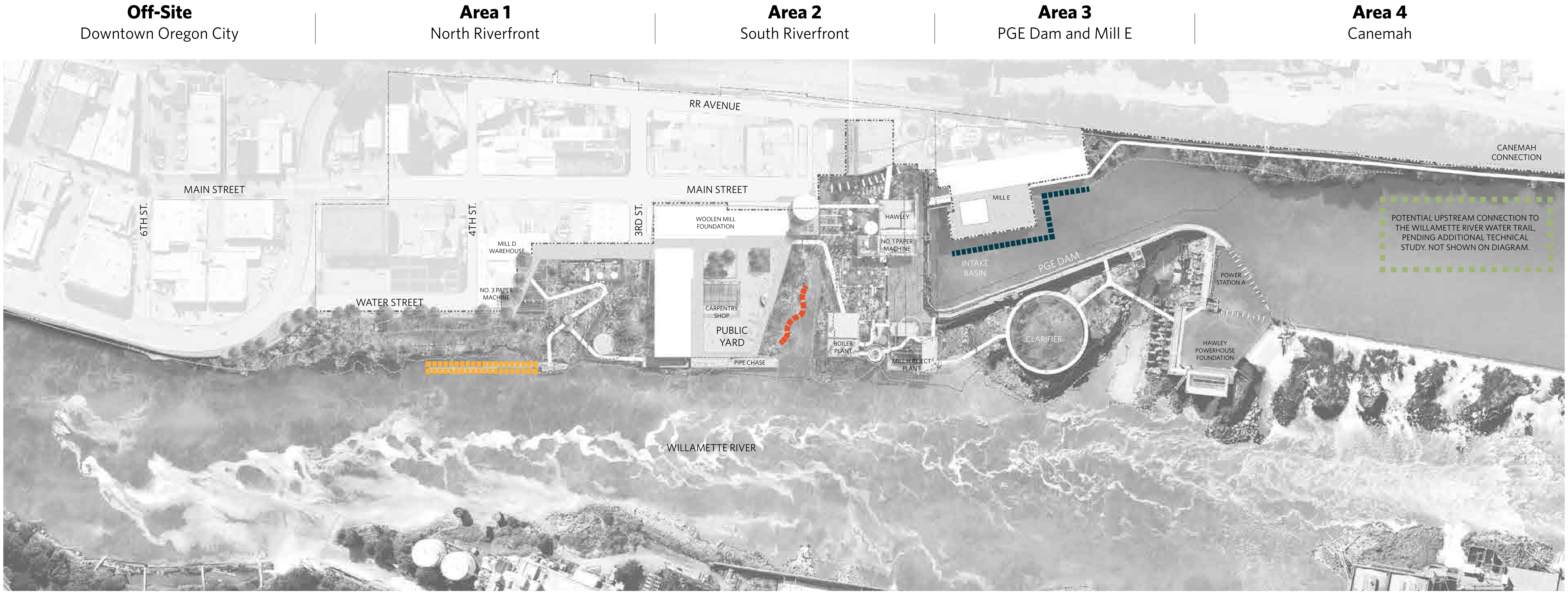
- Identified flexible use, riverwalk support elements, and events structures and surfaces listed here to be quantified as part of 90% submission.
- Mill O to provide support services to Riverwalk, including restrooms, flexible use spaces, exhibit and/or classroom space, storage, maintenance space, and kitchen. Additional services and amenities to be coordinated with redevelopment.
- Mill H to provide support services including restrooms, storage, maintenance space, and potential vending.
- Redevelopment areas not shown on key use diagrams. Refer to illustrated site plans for potential redevelopment parcels, and supporting information.

Figure 4: Habitat Restoration and Natural History Interpretation

Assumptions

- Off-Channel Alcove, Riparian Basalt, and Riparian Forest are priority conservation targets for habitat restoration on the site.
- Baseline habitat conditions and restoration concept designs provided by Stillwater Sciences.
- Further resolution of habitat restoration strategies to be coordinated with Metro.

Figure 5: River Access and Activities



Legend

🟥 Shoreline under consideration for light watercraft tie-up and 'toes in water' access.

🟨 Area under consideration for shared, transient dock (Motorized and light watercraft). Reliant upon many factors.

■ Shoreline area to be considered for potential commercial boat access as part of redevelopment of Mill E structure and PGE safety and operations requirements. Reliant upon many factors.

🟩 Potential connection to the Willamette River Water Trail, pending additional technical study. Not shown on diagram.

Assumptions

- Portage trail through site and portage connection point above falls contingent upon resolution of alcove and north riverfront river access.
- Potential river access locations to consider PGE safety and operations requirements, applicable permitting requirements, and hydraulic modeling.
- Redevelopment areas not shown on key use diagrams. Refer to illustrated site plans for potential redevelopment parcels, and supporting information.

Figure 6: Economic Redevelopment

Legend

- ━ Riverwalk Primary Path
- Ⓧ Development Block Numbers per Framework Masterplan
- 🟩 Public Space
- 🟨 Development Parcel
- ⬜ Hybrid Development and Public Access
- ▪▪▪▪▪ Riverwalk and Riverview frontage

Assumptions

- Redevelopment areas to be further refined as part of future phases. Refer to illustrated site plans for additional potential redevelopment parcels and supporting information.

Figure 7: Phase 1 Diagram

APPENDICES

Appendix A:

Baseline Habitat Conditions Report

Appendix B:

Habitat Restoration Concept Design Report

Appendix C:

Hydraulic Model Development Characterization of Existing Conditions Report

Appendix D:

Geotechnical Drilling Report

Appendix E:
Cultural Landscape Report
(Draft coming soon!)

Appendix F:

Interpretive Framework Plan

Appendix G:

Transportation Demand Management Plan

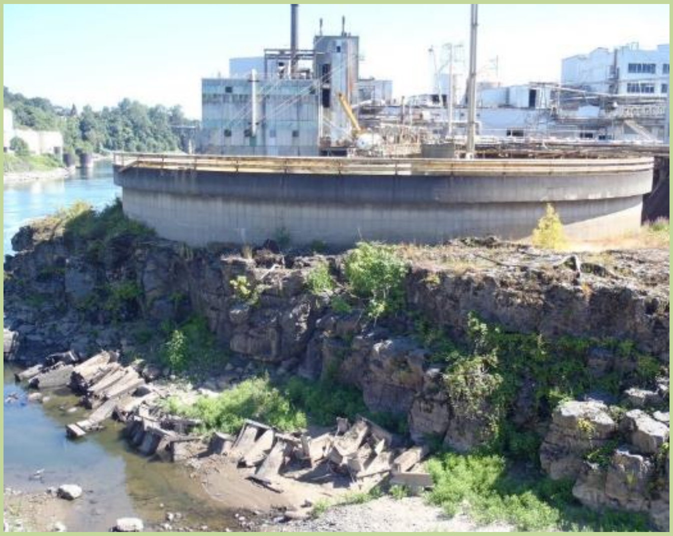
(Draft coming soon!)

Appendix H:

Cost Estimate

TECHNICAL REPORT ◦ OCTOBER 2017

Willamette Falls Legacy Project Baseline Habitat Conditions



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Stillwater Sciences

Suggested citation:
Stillwater Sciences. 2017. Willamette Falls Legacy Project: baseline habitat conditions. Prepared by Stillwater Sciences, Portland, Oregon for Metro, Portland, Oregon.

Cover photos: Northern face of basalt outcroppings at the Willamette Falls Legacy Project site (top left); adult lamprey (top right); juvenile steelhead (bottom left), *Sedum stenopetalum* observed at Willamette Falls Legacy Project site (bottom right).

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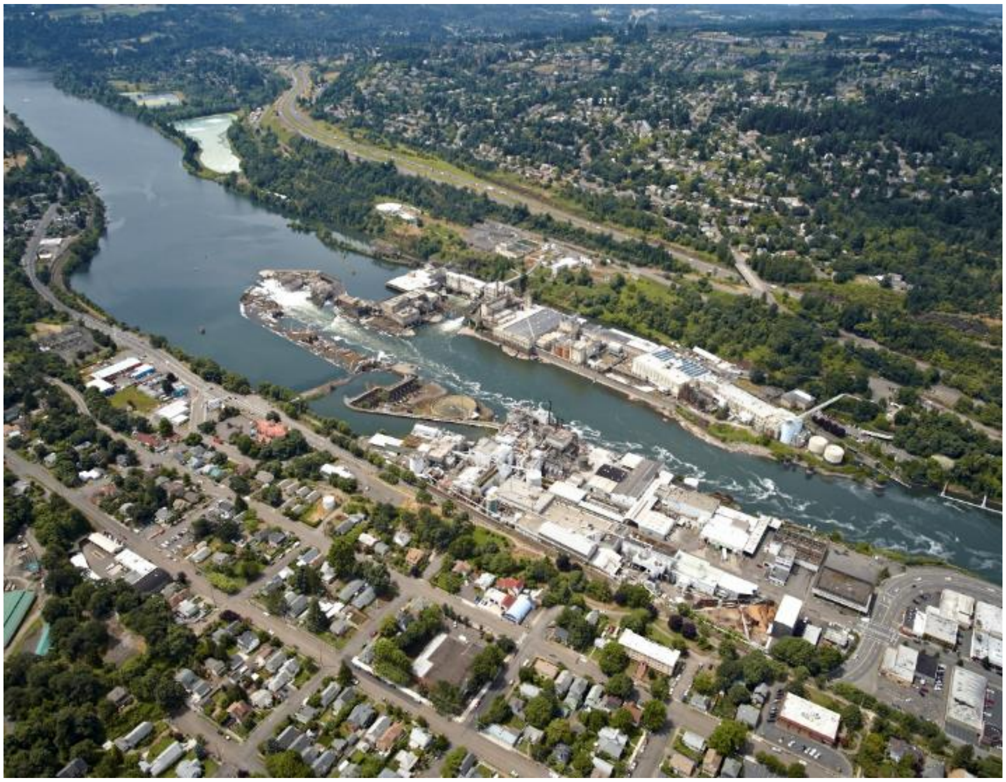
1 INTRODUCTION AND PURPOSE

The following report provides a documentation of existing environmental conditions and species known to occur at the Willamette Falls Legacy Project site (Project site). Developed in support of the Riverwalk Project, the report is based on the compilation of existing studies, site visits, agency consultation and professional expertise. It also highlights regional conservation priorities and key environmental factors to be considered in the conceptual design process for the Riverwalk. The report purpose is to deepen the scientific knowledge of the site habitat, species and priorities in support of future site restoration and development alternatives.

2 EXISTING CONDITIONS

Situated along the Willamette River's right bank, the Project site is located just downstream of the Willamette Falls, the largest waterfall by volume in the Pacific Northwest dropping 42 feet in a horseshoe with a crest length of approximately 1,700 feet (World Waterfall Database, http://www.worldwaterfalldatabase.com/waterfall/Willamette-Falls-4074/). The site encompasses the 23-acre former Blue Heron Paper Company plus an existing Portland General Electric (PGE) dam.

The Project site has a history of commercial and industrial uses going back more than 100 years. The site is characterized by a riprap shoreline, tailraces used to power various mill operations, a dam, lagoon, clarifier, buildings and associated infrastructure. The site operations have altered all native habitat with the exception of a limited extent of basalt outcroppings.



As described in the 2014 Vision document, the Riverwalk Project will provide public access to the riverfront and Willamette Falls for the first time in over 100 years, thereby becoming a driver for future site development and private investment. It will create public access to view and experience the river and an opportunity to improve fish and wildlife habitat and water quality. In order to appropriately design the Riverwalk Project, it is essential to understand the physical and biological conditions of the site and species it supports. The following sections of the report document site geology and soils, hydrology, key habitats, vegetation, and fish and wildlife species known to date.

2.1 Geology and Soils

The Willamette Falls area expresses the sequential effects of two catastrophic geologic events—the eruption of many hundreds of cubic miles of flood basalts that blanketed much of what is now the states of Washington and Oregon about 15 million years ago; and the voluminous release of floodwaters across much of the same region, previously impounded by the melting North American ice sheet between about 18,000 and 13,000 years ago. Subsequent erosion by the Willamette River, localized landsliding, and human modification of the landscape have resulted in only modest changes to this geologic template (Figure 1).

The Columbia River Basalts are a sequence of lava flows that erupted from vents in eastern Washington and Oregon, mainly between about 17 and 14 million years ago. In total they cover more than 60,000 mi^2 in Idaho, Washington, and Oregon, extending from the Sawtooth Range in Idaho to the Pacific Ocean. In the Project site, two distinct flow sequences of Columbia River Basalts have been mapped (Madin 2009):

- The Grande Ronde Basalt, whose primary flow within the Project site (the Sentinel Bluffs Member, unit Tgsb on the geologic map, Figure 1) underlies the northwest shore of the Willamette River and the falls itself;
- The Wanapum Basalt-Frenchman Springs Basalts (units Twfs and Twfg on the map), which sit immediately on top of the Grand Ronde Basalts and form much of the southeast shore of the Willamette River.

The contact between the Wanapum and Sentinel Bluffs flows is only slightly above river level, where more rapid erosion of the overlying Wanapum has left an exposed bench of the (presumably more resistant) Sentinel Bluffs rocks, over which the river spills to form the falls. Madin (2009) speculates that the falls originated about a mile downstream where the river crosses the trace of the episodically active Bolton Fault, with their present position reflecting progressive headward erosion since their initial formation.

At the close of the last global glacial era, the ice sheet that covered much of northwestern North America began retreating from its terminal position in northeastern Washington state. The Columbia River and its tributaries, long-dammed by the ice to form a voluminous lake in eastern Washington and Idaho, discharged catastrophically beneath the thinning ice margin to create the Missoula Floods, best known for their formation of the Channeled Scablands of eastern Washington. Although the primary flood bore continued down the Columbia River to the Pacific Ocean, discharges were so great that water backed up the Willamette River up to and well south of the project site, depositing extensive terraces of silt, sand, and gravel. Because of the dynamics of ice-dammed lakes, this flooding occurred many dozens of times over a period of at least several thousand years, with multiple iterations of scour and deposition resulting from them. In the Project site, deposits are recognized that lie up to 380 feet above modern river level, mantling hilltops and high terraces (unit Tff on the geologic map).

Modern geologic processes in the Project site include ongoing river erosion and deposition (which has left floodplain deposits in the less confined reaches of the river immediately downstream) (unit Qal); landslides (unit Qls) associated with failures at the eroded edge of basalt flows, possibly triggered primarily by saturation from Missoula Floods (Madin 2009); and artificial fill (unit af), of which the right-bank landfill downstream of the project site is the most prominent. Soil formation has also proceeded in the area, with lower elevations seeing significant development only since the last of the Missoula Flood backwater deposits were laid down. Soils types along the Willamette River are reported as being of the Newberg series (Natural Resources Conservation Service 2009 – new reference), silt loams to gravelly loams that are reportedly common throughout the Willamette Valley (ESA 2012) and presumably developed on the regionally extensive Missoula Flood backwater sediments. Their Hydrologic Soil Groups are predominantly types "D" and "C," indicating very slow infiltration rates for these shallow soils derived from silty sandy deposits and overly the low-permeability basaltic material (ICF 2010).

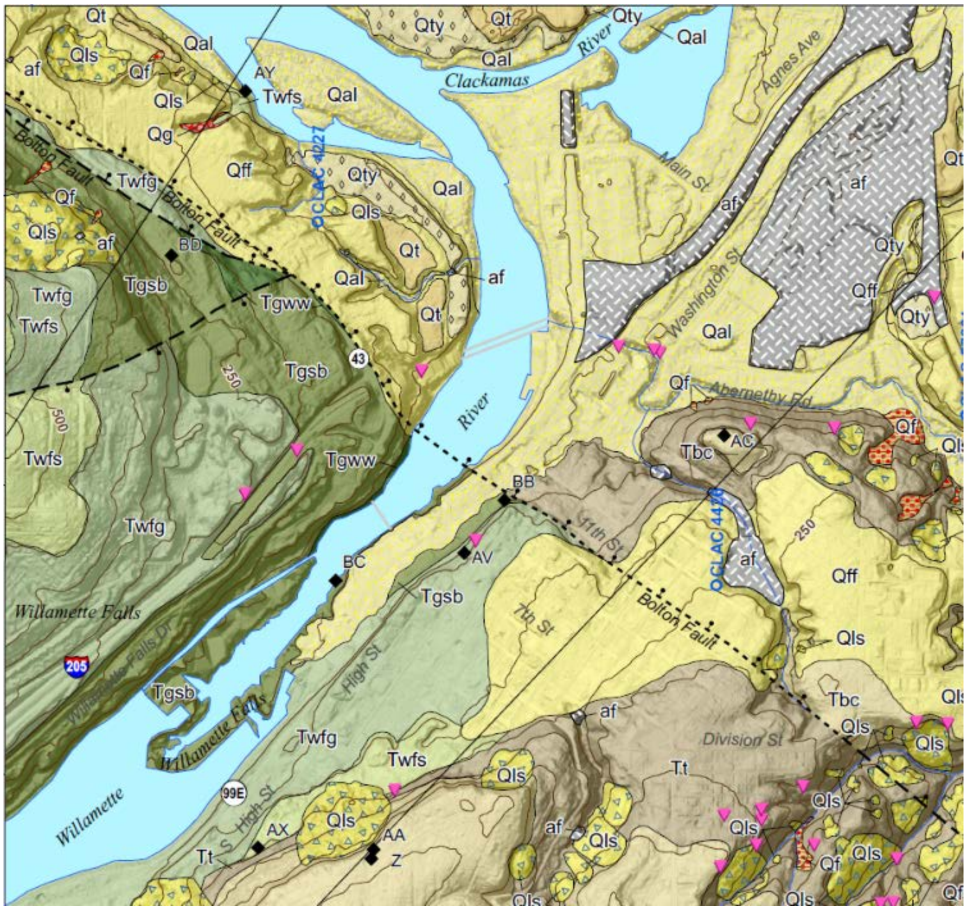


Figure 1. Geologic map of the Project site (excerpted from Madin 2009). Units are as follows (oldest to youngest): Tbc = ; Tgww and Tgsb = flow members of the Grande Ronde Basalt; Twfs and Twfg = flows of the Wanapum Basalt-Frenchman Springs Basalt; Tt = mudstone and sandstone of the Troutdale Formation, alluvial sediments of paleo-Cascade Range drainages; Qg = conglomerate of an ancestral Willamette River; Qff = backwater deposits of the Missoula Floods; Qls = landslide deposits; Qt and Qty = terraces deposits lying 30 to 50 feet above the modern Willamette River (i.e., too high to be modern floodplain deposits, but likely too low to be Missoula Flood deposits); Qal = modern alluvial deposits; af = artificial fill from human activity.

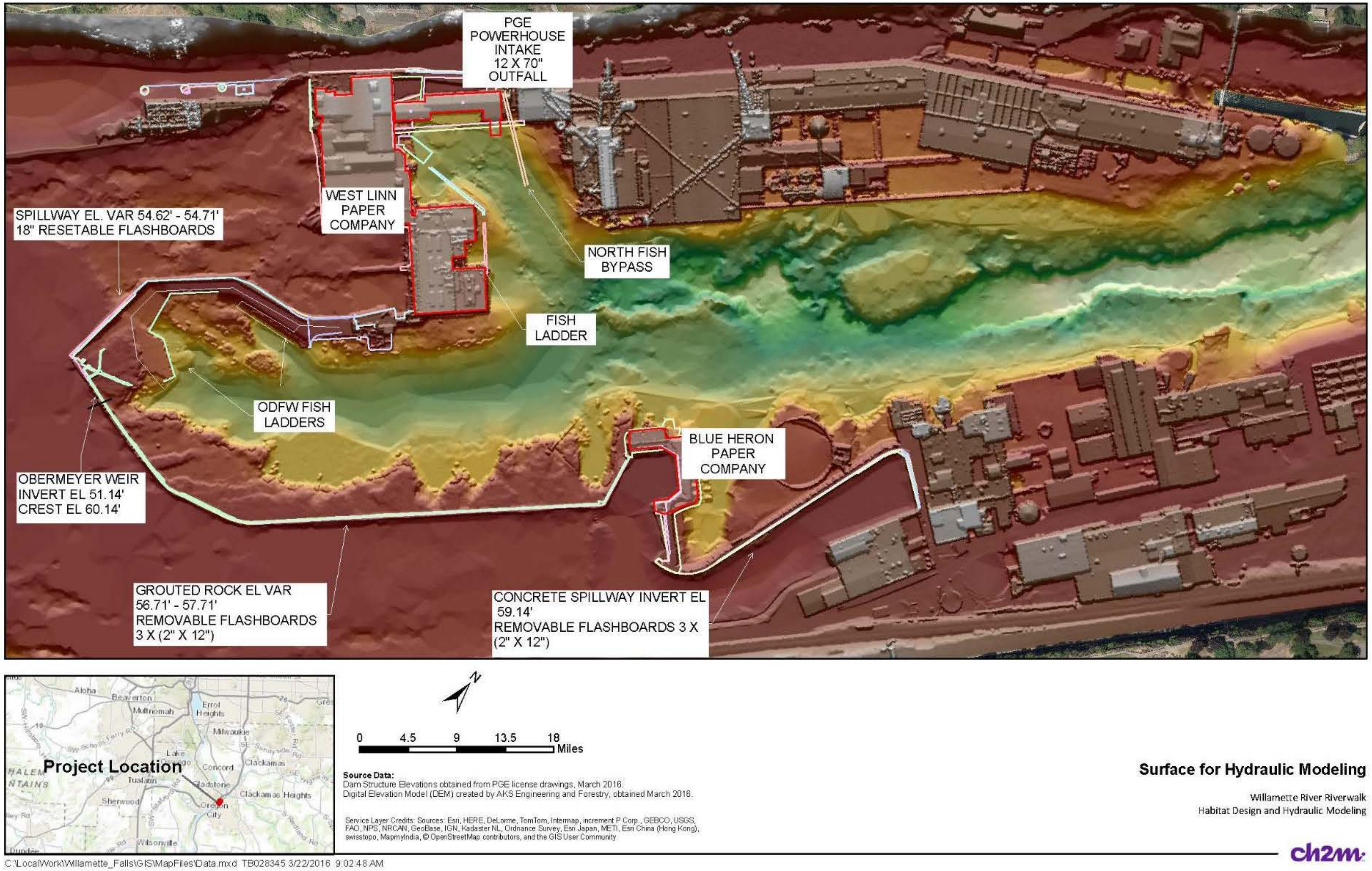
2.2 Hydrology and Water Quality

The Willamette River is tidally influenced up to the Willamette Falls and flow rates downstream of the project site (which includes Clackamas River) range from an average of 8,390 cfs in August to 76,100 cfs in December (SGS Station 14211720, Calculation Period 1972-10-01: 2016-09-30). Located on the right bank of the Willamette River, a significant portion of the Project site, 12.5 acres, is within a City-designated flood management area (WFLP 2014). The southern portion is subject to flooding and last experienced a major flood event in 1996, and 1964 before that. Site bathymetry and topography are illustrated in Figure 2 along with key site features known to affect flow.

The Project site itself is largely impervious being directly underlain by basalt bedrock. It also contains areas of historical grading and filling completed to facilitate the large, flat property parcel containing the manufacturing facility. Surface water is generally the result of treated stormwater that flows through historic channels, small waterfalls, and alcoves. Seepage below outcrops and spillways are additional hydrologic characteristics of the site (ESA 2012, Christy 2015) and these springs and seeps could provide cold water input to the Willamette River (WFLP 2014).

Groundwater, obtained from aquifers in the terrace deposits (ERM 2012), is relatively shallow across much of the site with an inferred flow to the northwest based on the local topography and adjacent surface water body (Mudge and Ipsen 2012). The occurrence and movement of groundwater is difficult to predict on a small scale due to the erratic nature of the secondary openings that control ground water flow in bedrock. Small surface water features generally do not provide an accurate indication of the direction of ground water movement in bedrock. However, on a regional scale, the direction of ground water movement will generally be from upland areas to major surface streams downgradient (ERM 2012).

After over a hundred years of industrial and agricultural use along the Willamette's length, the Environmental Protection Agency (EPA) started a clean-up program in the 1960s and 1970s to reduce point source pollution, improve water quality, and protect beneficial uses of the river. Though efforts have been made to reduce point and non-point source pollution and improve its water quality, currently the Willamette River is 303(d) listed for biological criteria, aldrin, dieldrin, DDT/DDE, iron, and PCBs (ODEQ 2010). Though not effective for Clean Water Act purposes until final review and approval by the Environmental Protection Agency (EPA), the Oregon Department of Environmental Quality (DEQ) modified the state's 2012 303(d) list to include copper, cyanide, lead, PAHs, chlorophyll a, mercury for the lower Willamette River (ODEQ website). Increased levels of sodium, dissolved oxygen, pH, temperatures, and dissolved gas are additional effects caused by an adjacent Portland General Electric (PGE) dam and operations of it facilities (ESA 2012).



Source Data:
Dam Structure Elevations obtained from PGE license drawings, March 2016.
Digital Elevation Model (DEM) created by AKS Engineering and Forestry, obtained March 2016.

Service Layer Credits: Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Surface for Hydraulic Modeling

Willamette River Riverwalk
Habitat Design and Hydraulic Modeling

C:\LocalWork\Willamette_Falls\GIS\MapFiles\Data.mxd TB028345 3/22/2016 9:02:48 AM

Figure 2. Site bathymetry and topography (source: CH2M 2016).

2.3 Primary Habitat Types

The site is located within the Willamette Greenway and serves as a linkage to other natural areas in the lower Willamette such as the Canemah Bluff Natural Area, Camassia Nature Preserve, Coalca Landing, West Linn Oak Savanna, the Willamette islands, and the Willamette Narrows. These natural areas, including the project site, provide linkages from central and south valley woodlands and savanna to the Puget Trough area and are essential to regional biodiversity conservation in an area of urbanization.

Currently, habitats on the site are relatively small and highly fragmented due to the presence site development, highways (I-205 and SR 99E) and the adjacent railroad. Historic fill and grading of the site have further decreased the amount of natural habitat available at the site. Remaining habitat in natural or semi-natural condition includes areas hydrated by tidal action of the Willamette River, areas of seasonal or perennial seepage below spillways, and basalt outcrops with varying exposures. (Allen et al. 1986).

Due to these processes and physical characteristics, six main major habitats types are present/potentially present (*pp*) at the site; in-channel river; off-channel aquatic; riparian basalt; riparian forest; upland forest (*pp*); and oak woodland and savannah (*pp*). These habitat types are depicted in the Riverwalk Milestone 2 report (Figure 3).

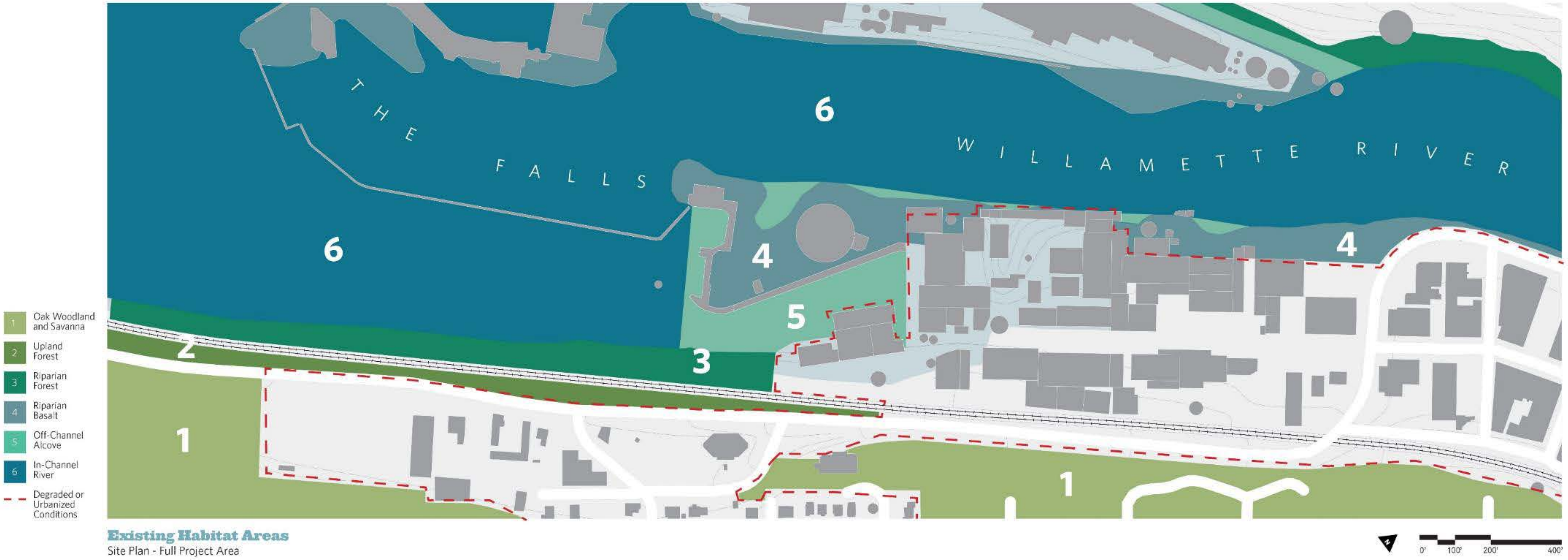


Figure 3. Habitat types known to occur at the Project site (source: Riverwalk Milestone 3 report. Snohetta and Mayer Reed 2016).

2.3.1 In-channel river

In-channel river habitat areas on the Willamette River are important to a wide range of native fish and wildlife species. Integrating tributary headwaters down to the valley floor, this habitat type serves as an iconic feature of the Northwest landscape. It includes open water riverine areas with no vegetation and islands of basalt rock formed in-channel at low water. In general rivers, streams, and open waters provide multiple ecological services, including: attenuating flood flows, recharging ground water, sediment storage and transport, diluting and converting harmful nutrients, water delivery and atmospheric heat moderation. Mainstem rivers such as the Willamette also support high levels of biodiversity and provide critical migration and movement corridors for fish, wildlife and birds (Intertwine Alliance 2012).

Figure 4. In-channel river habitat adjacent to the northern end of the Project site.

2.3.2 Off-channel alcove

Off-channel alcove habitat areas on the Willamette River are important to native fish. Emergent native wetland and floating aquatic plant communities are associated with off-channel alcove areas. (Milestone 2 report)

In the lagoon, vegetation covers an estimated 5–10% of its extent and is a mix of floating aquatic plants, algae, and weedy herbs and forbs along the fringes as well as a few shrubs and saplings growing out of a berm in the lagoon. A dense mat of vegetation has formed at the north end of the lagoon and consists of water primrose (*Ludwigia hexapetala*), marsh pennyroyal (*Hydrocotyle ranuncuuloides)*, an introduced aquatic perennial; water-parsley (*Oenanthe sarmentosa*), a semi-aquatic plant; and yellow touch-me-not (*Impatiens capensis*) (ESA 2012).

Figure 5. Off-channel alcove habitat on the Project site.

2.3.3 Riparian basalt

The basalt outcrops and rocky substrate along the shoreline contribute to the mosaic of rocky habitats located to the north and south of the project site in and along the Willamette River. The outcrops are a relic of the Bretz or Missoula Floods, and exposures along this part of the Willamette River provide outlier habitat for both mesic and xeric species more common in the Columbia River Gorge. (Christy 2015). The vegetation assemblages found on basalt outcropping of the site are similar to those found in neighboring oak habitat and key habitat for pollinators and birdsProject site. Such linkages enhance biodiversity and resilience within the Willamette Greenway.

In riparian basalt habitat, bryophytes are critical keystone ecosystem builders because of their ability to create soils and trap sediments on these otherwise barren substrates. Establishment and spread of bryophyte mats is an essential first step in creating habitat for vascular plants. This could be accomplished by transplanting moss mats and excluding trampling from foot traffic. With proper management, the basalt bluffs at Blue Heron could become a showcase for all of these plants (Christy 2015).

Native herbs and forbs adapted to rocky, dry conditions would have grown in the crevices and pockets in the cliff faces. Native plant diversity is relatively high on some of the undeveloped rock islands in the area upstream of the site, which support drought-tolerant species such as Oregon white oak, Pacific madrone as well as native wildflowers and other herbaceous plants including delphinium, sedums, and cluster lilies (ESA 2012). Additional species diversity is achieved in shallow depressions of the basalt layer that hold water and thereby form unique wetland habitats.

Preserving habitat and increasing the diversity of native historical species on basalt outcrops at Willamette Falls is a primary restoration target. Although portions of the rocks are subject to periodic scouring by high river flows, higher ledges and cliffs are free of scour and could support an array of species that probably once occurred there (Christy 2015).

Figure 6. Riparian basalt habitat adjacent to the clarifier on the Project site.

2.3.4 Riparian forest

Riparian forest plant community areas are associated with alluvial soil and springs and seeps emerging from the site. Large areas of the Project site may have been historically dominated by this habitat but due to significant alterations and industrial development, this habitat has been reduced to small patches.

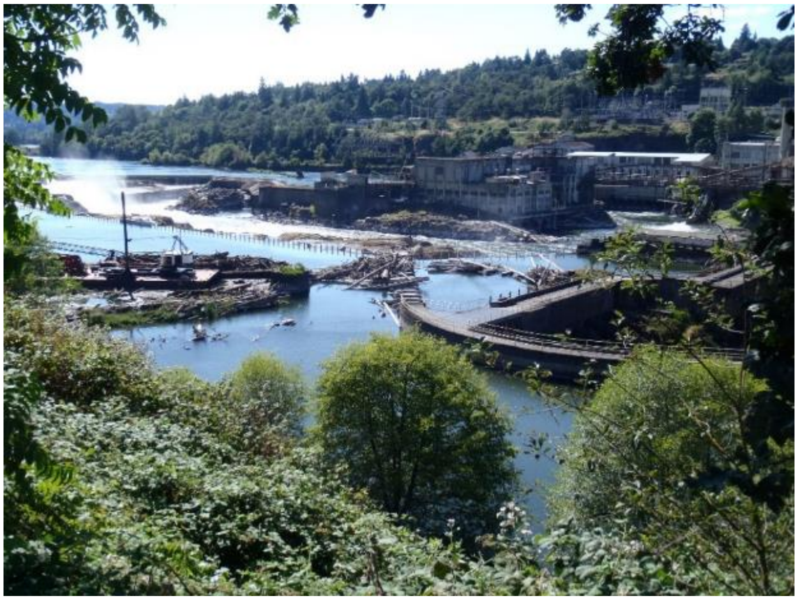


Figure 7. Riparian forest habitat of the Project site near the lagoon. Willamette Falls in the background.

2.3.5 Upland forest

Upland forest areas with large conifer and deciduous trees are found on mid to toe of slopes on valley floors as exemplified at the Canemah Bluff and Willamette Narrows natural areas immediately upstream of the site. The interior portions of the Project site may have been historically dominated by this habitat but due to significant alterations and industrial development this habitat is now limited to a narrow corridor alongside the railroad spur.

2.3.6 Oak woodland and savannah

Oak woodland and savannah is an Oregon Department of Fish and Wildlife (ODFW) conservation strategy habitat and known to occur on the nearby Canemah Bluffs and Camassia Preserve. Hilltops and slopes of dry to mesic grasslands along with patches of shrubs and Oregon white oak (*Quercus garryana)*, this habitat type does not current exist at the Project site. Nevertheless, similar vegetation and associated pollinators and birds are found onsite in the riparian basalt habitat.

Though the historical landscape of the Willamette Valley preceding settlement was once characterized by a matrix of prairie and Oregon white oak vegetation, oak savannas are in decline throughout major portions of their range with estimates of habitat loss as high as 85 percent in some areas (Buechling 2008). The open nature of the oak savanna results in the establishment of numerous kinds of prairie plants, both grasses and forbs, providing biodiversity and resiliency of the landscape.

2.4 Vegetation

Historical and current site vegetation was documented in a 2015 site survey and report (Christy and Gaddis 2015). Although the site is highly altered, the survey reports native vegetation as being in good condition relative to elsewhere in the metro area. At least sixteen plant species rare to the Portland metropolitan area were observed at the Blue Heron mill site in 2015 (Christy and Gaddis 2015). *Cystopteris fragilis* and *Penstemon richardsonii* are the most significant finds at these rocky outcrops because few sightings are known from the Portland metro area, particularly for the *Penstemon* that had not been seen since 1976, and otherwise is known locally only from Elk Rock. Four historically documented bryophyte species within this habitat are the only known occurrences in the Portland metropolitan area or are known from only one other site in the metro area (Christy and Gaddis 2015). Appendix B provides additional detail on key species documented at the site

2.5 Fish and Wildlife Species

To evaluate existing wildlife and fish use at the Riverwalk Project, an initial desktop exercise was conducted. A data source review of the sources listed below identified species with the potential to occur within the Project site.

- Species list provided by ODFW (Susan Barnes, wildlife biologist) on 24 August 2016.
- Federal or state listed as threatened or endangered, federal species of concern, and state sensitive (critical or vulnerable) as identified by Oregon Biodiversity Information Center (ORBIC 2016) for Clackamas County (http://inr.oregonstate.edu/sites/inr.oregonstate.edu/files/2016-rte-book.pdf)

- Special and/or non-special-status species identified in ESA 2012, Riverwalk Milestone Report 2, Willamette River Basin Planning Atlas (Hulse et al. 2012), the Willamette Subbasin Plan (NWPCC 2004), and Canemah Bluff Natural Area Plan (Metro 2011).

The desktop exercise resulted in identifying the potential for special and non-special-status species to occur in the Project site, and by habitat type (Appendix A). To evaluate the likelihood for a species to occur in the Project site, the following categories were identified:

- High: The species has been documented in the Project site and/or its required habitat occurs in the Project siteand is of high quality.
- Moderate: The species' known distribution or elevation range overlaps with the Project site and/or the species' required habitat occurs in the Project site.
- Low: The species' known distribution or elevation range overlaps with the Project region but not the Project site, and/or the species' required habitat is of very low quality or quantity in the Project site.

Fish and wildlife species that were considered to have no potential to occur in the Project site(either outside the species' current distributional or elevation range and/or the species' required habitat is lacking from the Project site) were noted in a footnote, and were not assessed further.

The purpose of compiling the list was to provide a compilation of species that may be present; however, the results are not comprehensive of all species present. Fish and wildlife species and use of associated habitat types, identified within the Project site, are summarized below.

2.5.1 Fish

2.5.1.1 Fish population

The Willamette River Basin contains 31 native fish species and 29 exotic or introduced species (Hulse et al. 2002). Appendix A contains a list of species classified as occurring in the mainstem Willamette River. Seven native species (more than a fifth of the total) are listed by either the federal or state government as threatened, endangered, or sensitive. Willamette Falls is located in the Tanner Creek subwatershed (6th field Hydrologic Unit Code 170900070405) a subset of the Mid-Willamette and Abernathy Creek watersheds. Within the Tanner Creek subwatershed, there are 31 to 35 fish species, of which 21 to 25 are native. Only two subwatersheds (of 170 total subwatersheds) within the Willamette Basin have a higher number of fish species, and only one subwatershed has a higher number of native species (Hulse et al. 2002).

ODFW conducted an extensive study of the Lower Willamette through Portland in 2000 – 2004, collecting fish with beach seines and electrofishing (Freisen 2005). Although the survey did not extend upstream as far as Willamette Falls, the fish assemblage at the falls is expected to be similar. Electrofishing surveys revealed that suckers, Chinook (and unidentified) salmonids, and peamouth were the most commonly present native species, while yellow perch and smallmouth bass were the most commonly present non-native species. Native three-spine stickleback were patchily distributed, but when present were highly abundant, with more total individuals captured than all other species except unidentified suckers and salmonids. Results indicated extensive use of the lower river by juvenile salmonids with most (87%) being Chinook salmon, while 13% were steelhead, and nine percent were coho salmon. Other salmonids present, but at much lower densities, included mountain whitefish, sockeye salmon, and cutthroat trout (Freisen 2005).

Juvenile salmonids were present in every month sampled from May 2000 to July 2003. Outmigrating juvenile Chinook increased in late autumn and persisted into the next summer. Juvenile coho salmon and steelhead were generally present only during winter and spring (ODFW 2005). Studies conducted in the mainstem Willamette by the City of Portland from 2014 to 2016 (Portland BES 2016) as far upstream as Lake Oswego, show similar results to the ODFW surveys, with largescale sucker and Chinook salmon being the most commonly encountered species. Likewise, smallmouth bass, yellow perch and carp were the most commonly encountered and abundant non-native species. However, contrary to the earlier results, prickly sculpin (a native species) was more commonly found than in the ODFW surveys.

2.5.1.2 Significance of Willamette Falls with respect to fish species

Historically, Willamette Falls was an impassable barrier to upstream movement for all freshwater species, and all but a few anadromous species. Upper Willamette River (UWR) winter steelhead Distinct Population Segment (DPS) and UWR spring Chinook Evolutionarily Significant Unit (ESU)migration timing was (and is) such that they arrive at the falls when discharge was consistently high, allowing them to ascend the falls. The UWR Chinook ESU includes naturally spawned spring-run Chinook salmon originating from the Clackamas River and from the Willamette River and its tributaries above Willamette Falls, along with spring-run Chinook salmon from six artificial propagation programs (79 FR 20802, http://www.westcoast.fisheries.noaa.gov/publications/frn/2014/79fr20802.pdf). The UWR steelhead DPS includes naturally spawned anadromous winter-run *O. mykiss* (steelhead) originating below natural and manmade impassable barriers from the Willamette River and its tributaries upstream of Willamette Falls to and including the Calapooia River (*ibid*.).

Pacific lamprey were also able to pass the falls, even though they arrive during lower flow periods of the year, by clinging to the rocks with their mouths and ascending the falls in a stepwise fashion. Because lamprey historically congregated at the falls in large numbers, native peoples also gathered at the falls to harvest lamprey and engage in trade. Native American lamprey harvest continues at Willamette Falls although declining lamprey numbers have significantly reduced that harvest.. Tribal harvest is primarily focused at Willamette Falls during the springtime when water levels drop in the river.

Prior to human alteration of the falls beginning in mid-1800s, coho salmon, sea-run cutthroat trout, fall Chinook, and other temporal runs of steelhead, were unable to pass the falls and there were thus no populations of any of these species in the Willamette or any of its tributaries above the falls. Significant stocking operations (which were curtailed in the 1990s) established a self-sustaining population of coho upstream of Willamette Falls in many tributaries. Likewise, fall Chinook, and early winter and summer steelhead have also become established with returning adults now ascending the falls via fish ladders.

In addition to its importance as a significant impediment, and thus gatekeeper, for what anadromous species could occur above the falls, investigators have recently discovered that the falls also provide unique habitat that is important for white sturgeon spawning.

2.5.1.3 Selected species descriptions

From an historical, recreational, cultural and economic perspective, the most “important” species that traverse or are affected by Willamette Falls include: UWR steelhead, UWR Chinook, coho salmon, Pacific lamprey, and white sturgeon. Timing of each of these species at the falls is presented in Table 1, and each of these species is discussed in detail below.

Table 1. Timing of anadromous species and life stages in the Lower Willamette River to Willamette Falls (ODFW 2003 unless otherwise noted).

Species ESU/DPS	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Chinook Salmon																								
Upper Willamette River (Spring)																								
Adult Migration		▒	▒	▒	▒	■	■	■	■	■	▒	▒												
Adult Holding					▒	■	■	■	■	■	■	■	■	■	■	■	▒	▒						
Juvenile Rearing	▒	▒	▒	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	▒	▒	▒	▒	▒	▒
Juvenile Migration				▒	▒	▒	■	■	■	■	■	▒	▒	▒										
Steelhead Trout																								
Upper Willamette River (Winter)																								
Adult Migration	▒	■	■	■	■	■	■	■	▒	▒	▒	▒										▒	▒	▒
Adult Holding	▒	■	■	■	■	■	■	■	▒	▒														
Juvenile Rearing	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░
Juvenile Migration				▒	■	■	■	■	■	■	■	■	■	■	■	▒	▒	▒	▒	▒	▒	▒		
Coho Salmon																								
Unlisted Hatchery Origin Stock																								
Adult Migration															▒	▒	▒	■	■	■	■	▒	▒	▒
Juvenile Rearing	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤
Juvenile Migration				▒	▒	■	■	■	■	■	■	▒	▒											
Lamprey																								
Pacific Lamprey[a]																								
Adult Migration			▒	▒	■	■	■	■	■	■	■	■	▒	▒	▒	▒								
Juvenile Rearing	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤
Juvenile Migration	▒	▒	▒	▒	▒	▒	■	■	▒	▒	▒	▒									▒	▒	▒	▒

■ Represents peak level of use.

▒ Represents lesser level of use.

▤ Represents known presence with uniform or unknown level of use.

[a] Beamish, 1980; Starke and Dalen, 1995; Moser and Close, 2003; Kostow, 2002.

UWR Chinook. UWR Chinook were listed under the endangered species act as threatened in March 1999. Fish counts at Willamette Falls indicate that adult spring Chinook begin passing the falls in February and the migration continues through June, with the peak occurring from mid-March through May (ODFW 2003). Wild spring Chinook smolts typically pass Willamette Falls from January to July, with peak migration occurring from mid-April to mid-June (Domina 1997, 1998). A smaller out-migration occurs later in the year (peaking in October and November). This smaller outmigration is not included on Table 1 above.

The 2005 status review (Good et al. 2005) stated that "most natural-origin spring-run Chinook populations [in the upper Willamette River ESU] are likely extirpated, or nearly so. The only population considered potentially self-sustaining is the McKenzie River population. However, its abundance has been relatively low (low thousands), with a substantial number of these fish being of hatchery origin." McElhany et al. (2007) analyzed the population criteria (diversity, spatial structure, and abundance and productivity) for UWR Chinook salmon and found that the risk of extinction is high. Due to the location of the falls, the entire population of UWR Chinook salmon, minus those that occur in the Clackamas River, migrate over the falls. The population of fish passing Willamette Falls has fluctuated widely since 1950, generally around a mean of 40,000 fish (most of which are likely hatchery-origin). Figure 8 illustrates the total spring Chinook over Willamette Falls from 1980 to 2015.

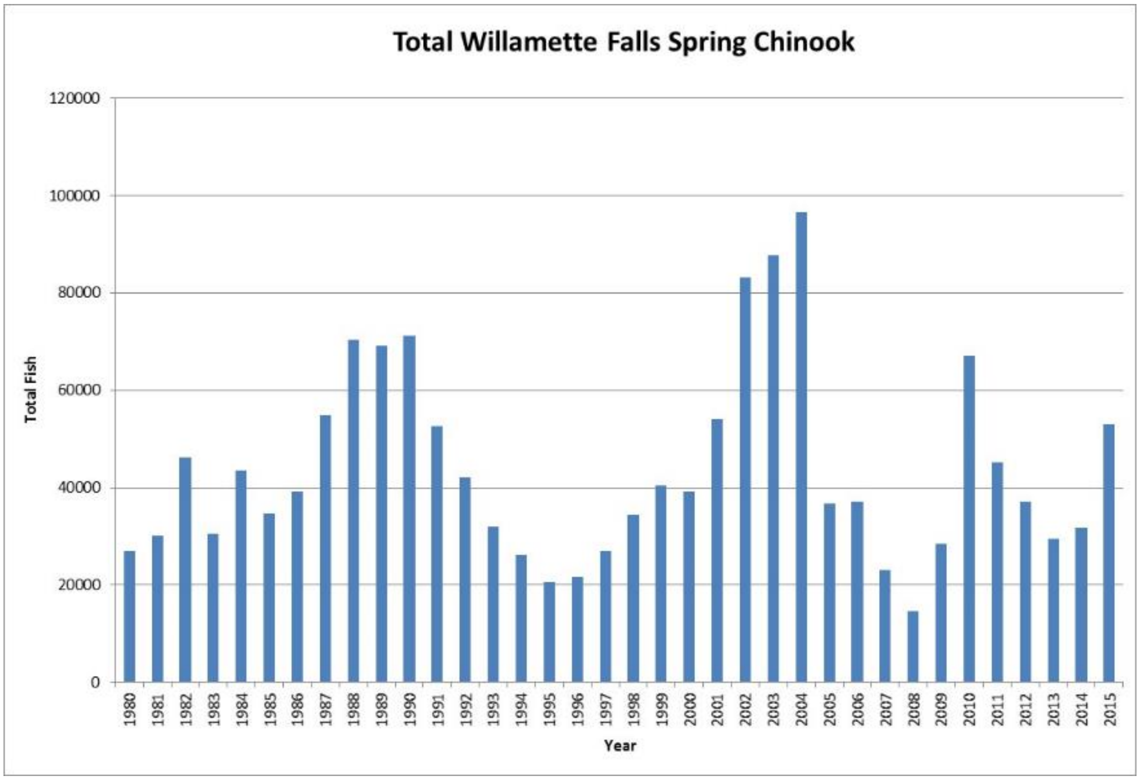


Figure 8. Total UWR Spring Chinook over Willamette Falls, 1980–2015.

UWR steelhead. Like UWR Chinook, UWR steelhead were listed as threatened under the endangered species act in March 1999. Of the three steelhead temporal runs (winter, late winter and summer) currently found in the Upper Willamette River, only the late winter steelhead is considered to be native. Adult steelhead that pass Willamette Falls from 15 February through mid-May of each year are considered wild, winter UWR steelhead. UWR steelhead adults enter the Willamette River beginning in January and February, but they do not ascend to their spawning areas until late March or April through mid-May (Myers et al. 2006). Wild steelhead smolt out-migration starts in mid-February, peaks in May, and is essentially complete by mid-July (Domina, 1997, 1998).

The entire population of UWR steelhead pass over Willamette Falls. Good et al. (2005) could not conclusively identify a single population that was naturally self-sustaining. All populations were described as relatively small, with the recent mean abundance of the entire ESU at less than 6,000. Over the period of the available time series, most of the populations were in decline. At

Willamette Falls between 1980 and 2015, late winter steelhead returns ranged from 1,322 in 1996 to 16,097 in 1980. Figure 9 illustrates adult returns at Willamette Falls from 1971 to 2015.

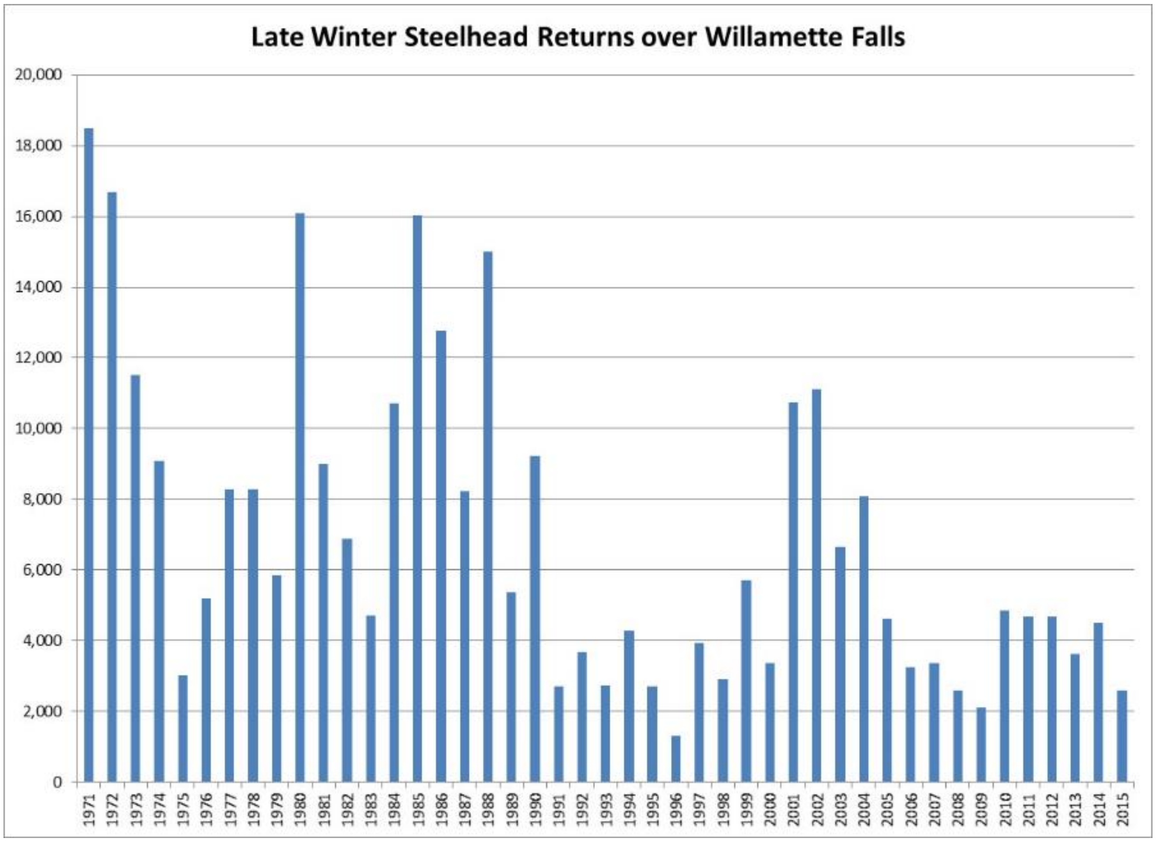


Figure 9. Total UWR Steelhead over Willamette Falls, 1971–2015.

Coho salmon. Most adult coho salmon migrate through the lower Willamette River from August through December, with the peak occurring from mid-September through mid-November (ODFW 2003).

Juveniles generally spend about one year in fresh water before migrating to the ocean. Juvenile coho salmon migrate through the lower Willamette River throughout their downstream migration, which begins in late March, peaks in April and May, and declines through June (Domina 1997, 1998; ODFW 2003).

As stated above, coho salmon did not historically occur above Willamette Falls. However, beginning in the early 1950s, ODFW began to release coho fry and presmolts widely throughout Willamette River tributaries above the falls. Stocking upstream of the falls dropped significantly through the 1980s but continued until the last release was made in the Tualatin River in 1997. The reduced releases resulted in much reduced migration of adults over the falls, to less than 1,000 fish annually through 1999 (Alsbury and Murtagh 2012). Counts increased noticeably in 2000 when 2,839 adults moved upstream. Numbers peaked in 2009 at over 25,000 fish and have been generally high but variable since that time (Figure 10).

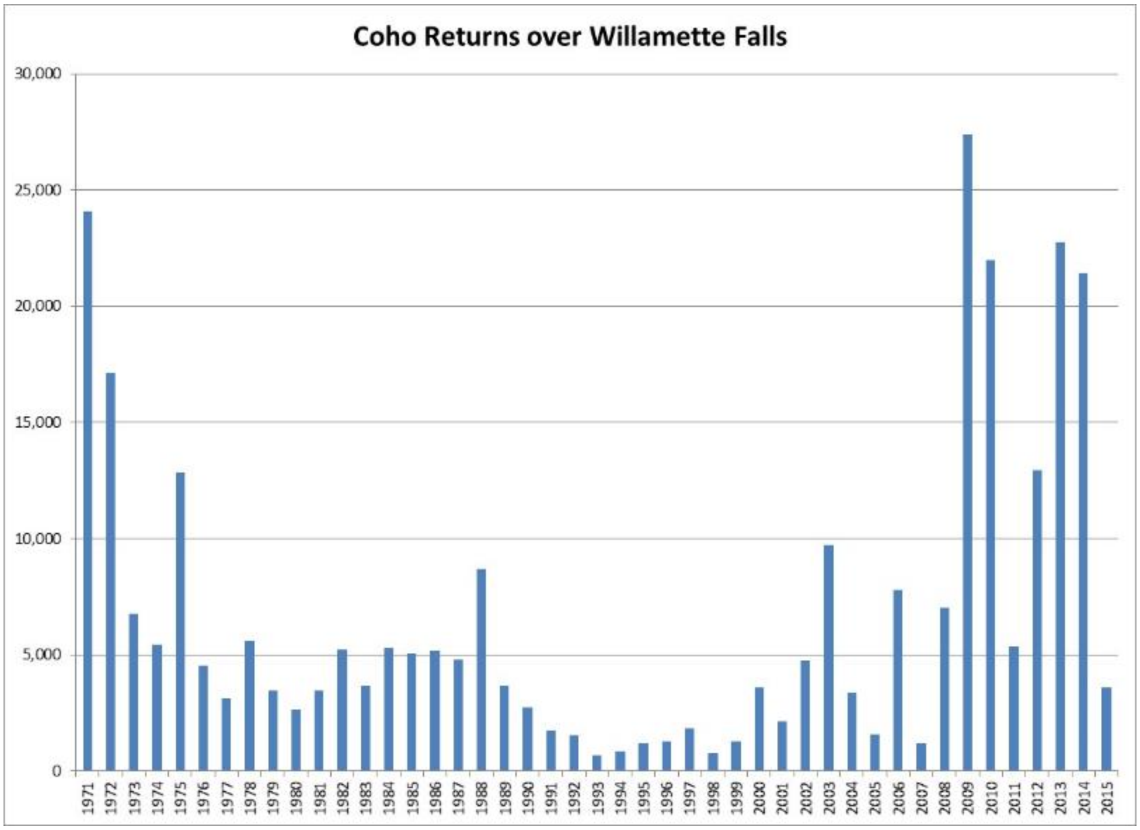


Figure 10. Total coho salmon over Willamette Falls, 1971–2015.

Pacific Lamprey. The Pacific lamprey is a large, widely distributed anadromous species that rears in fresh water before outmigrating to the ocean, where it grows to full size (approximately 400–700 mm [16–28 in]) prior to returning to freshwater streams to spawn and ultimately die. The species is distributed across the northern margin of the Pacific Ocean, from central Baja California north along the west coast of North America to the Bering Sea in Alaska and off the coast of Japan (Ruiz-Campos and Gonzales-Guzman 1996, Lin et al. 2008). Adults migrate into and spawn in a wide range of river systems, from short coastal streams to tributaries of the Snake River in Idaho, where individuals may migrate over 1,450 km (900 mi) (Claire 2004).

Pacific lampreys typically spawn from March through July depending on water temperatures and local conditions such as seasonal flow regimes (Kan 1975, Brumo et al. 2009, Gunckel et al. 2009). More inland, high-elevation, and northerly populations generally initiate spawning considerably later than southerly populations (Kan 1975, Beamish 1980, Farlinger and Beamish 1984, Chase 2001, Brumo et al. 2009), presumably due to cooler water temperatures. Spawning generally occurs at daily mean water temperatures from 10–18°C (50–64°F), with peak spawning around 14–15°C (57–59°F) (Stone 2006, Brumo 2006). Redds are typically constructed by both males and females in gravel and cobble substrates within pool and run tailouts and low gradient riffles (Stone 2006, Brumo et al. 2009, Gunckel et al. 2009). During spawning, eggs are deposited into the redd and hatch after approximately 15 days, depending on water temperatures (Meeuwig et al. 2005, Brumo 2006). Pacific lampreys are highly fecund: depending on their size, females lay between 30,000 and 240,000 eggs (Kan 1975). Adults typically die within a few days to two weeks after spawning (Pletcher 1963, Kan 1975, Brumo 2006).

After hatching, the egg-sac larval stage, known as prolarvae, spend another 15 days in the redd gravels, during which time they absorb the remaining egg sac, until they emerge at night and drift downstream (Brumo 2006). After drifting downstream, the eyeless larvae, known as ammocoetes, settle out of the water column and burrow into fine silt and sand substrates that often contain organic matter. Within the stream network they are generally found in low-velocity, depositional areas such as pools, alcoves, and side channels (Torgensen and Close 2004). Depending on factors influencing growth rates, they rear in these habitats from 4 to 10 years, filter-feeding on algae and detrital matter prior to metamorphosing into the adult form (Pletcher 1963, Moore and Mallatt 1980, van de Wetering 1998). During metamorphosis, Pacific lampreys develop eyes, a suctoral disc, sharp teeth, and more-defined fins (McGree et al. 2008). After metamorphosis, smolt-like individuals known as macrophthalmia migrate to the ocean—typically in conjunction with high-flow events between fall and spring (van de Wetering 1998, Goodman et al. 2015). In the ocean, Pacific lampreys feed parasitically on a variety of marine fishes (Richards and Beamish 1981, Beamish and Levings 1991, Murauskas et al. 2013). They are thought to remain in the ocean, feeding for approximately 18–40 months before returning to fresh water as sexually immature adults, typically from winter to early summer (Kan 1975, Beamish 1980, Starcevich et al. 2014, Stillwater Sciences and WNRD 2016). In the Klamath and Columbia rivers, they have been reported to enter fresh water year-round (Kan 1975, Larson and Belchik 1998, Petersen Lewis 2009). Notably, recent research suggests that two distinct life history strategies, analogous to summer and winter steelhead, may occur in some river systems: one, an “ocean maturing” life history that likely spawns several weeks after entering fresh water, and two, a “stream-maturing” life history—the more commonly recognized life history strategy of spending one year in fresh water prior to spawning (Clemens et al. 2013). The adult freshwater residence period for the stream-maturing life history can be divided into three distinct stages: (1) initial migration from the ocean to holding areas, (2) pre-spawning holding, and (3) secondary migration to spawning sites (Robinson and Bayer 2005, Clemens et al. 2010, Starcevich et al. 2014).

White Sturgeon. White sturgeon, the largest fish species found in North American rivers, occur in the ocean inside the 50-fathom line (500 feet depth) and in estuaries and rivers along the Pacific coast. In Oregon, they are an important recreational and commercial fishery resource in the mainstem Columbia and Willamette Rivers. White sturgeon adults, juveniles and sub-adults can be found in the Willamette River year round. White sturgeon spawning in the greater Columbia River system was previously known to occur in only one location: downstream of Bonneville Dam. Spawning ground characteristics include swift, turbulent, moderately deep water (2.5–3 feet/second, 6–80 feet in depth); temperatures of 50–64 F (Peak is 57 F), and bedrock, boulder or cobble substrates—conditions which are found immediately downstream of Willamette Falls. And indeed, in 2009, researchers discovered sturgeon spawning in that location (Chapman and Jones 2010).

White sturgeon broadcast spawn in close proximity to bottom structures during May and June. It has been estimated that white sturgeon reach maturity in 15 to 25 years, with females spawning every 4 to 11 years, producing from 100,000 to several million eggs per spawning event as they grow older (ODFW, 2005). Their fertilized eggs sink rapidly and adhere to cobble, rocks, and other bottom structure. The eggs hatch in 4 days to 2 weeks, depending on water temperature. The young fry move into the water column to feed and may be found in the Willamette River throughout the year.

2.5.1.4 Fish use in proximity to the Project site

The Project site has a number of aquatic habitats and features that are important to fish. These include the in-channel river and off channel alcove habitats. Fish species at various lifestages from juvenile to adult likely use each of these habitat areas during at least some portions of the year. The river immediately below the dam is an important holding area for adult salmon, steelhead and lamprey before they ascend the falls. As noted above, the area downstream of the falls has also recently been identified as a spawning area for white sturgeon. The alcove habitats are likely important off-channel habitat where juvenile salmonids can find food resources and refuge during high flow events. The lagoon has been shown to have some water quality problems, but nonetheless may contain fine sediments and could be an important rearing area for Pacific lamprey ammocoetes.

2.5.2 Birds

Numerous bird species are likely to be present throughout the Project site. Within the in-channel river habitat of the Willamette River, bald eagles, gull spp., and double-crested cormorants may be foraging for fish and using the river as a daily migration corridor. Within the shallow and slow-moving off-channel alcove habitat, shorebirds including, but not limited to spotted sandpiper, green heron and great blue herons may be wading and foraging for fish or aquatic invertebrates in the water or sediment. Along the rocky riparian basalt outcrops, ledges may provide nesting habitat for cliff dwelling species (e.g., peregrines) and a vantage point while foraging along the Willamette River. The diversity of vegetation of shrubs and trees within the riparian forest habitat has the greatest potential to support nesting of numerous passerines. Birds are also known to nest in man-made structures, and species such as barn swallows and european starlings may be found roosting underneath eves, in gaps of rooflines, and within buildings.

2.5.3 Reptiles and Amphibians

Suitable habitat for reptiles and amphibians includes slow-moving lagoon and seep habitat found within the off-channel alcove habitat and at in-channel river habitat, along the edge of the Willamette River. Floating logs within the warm lagoon habitat provide basking habitat for turtles (e.g., Western Painted and Western Pond Turtle). The Western toad and common garter snake may also be found basking along the riprap shoreline of the Willamette River. Breeding habitat for Northern red-legged and Pacific chorus frogs may be found in any backwater ponded habitat. These reptiles and amphibians may disperse from the off-channel alcove and lagoon habitats into adjacent riparian basalt and riparian forest habitats to find cover under rocks, logs, or vegetation.

2.5.4 Invertebrates

In-channel river habitat and off-channel alcove habitats support aquatic invertebrates while upland habitats (e.g., riparian forest) may support terrestrial invertebrates. Although not identified in Table A-1 (Appendix A), in-channel river species may include crayfish and daphnia, which in a Lower Willamette River dominated diets of Northern pikeminnow and Chinook salmon, respectively (https://www.portlandoregon.gov/bes/article/79249). Off-channel alcove habitat may provide low-flow, cold-water habitat for Oregon fairy shrimp while upland habitats (e.g., riparian forest) may provide habitat for earthworms in addition to aerial pollinators such as butterflies and bees.

2.5.5 Mammals

All habitat types present within the Project site provide opportunities to support mammals. Along the off-channel alcove area, the Northern river otter, American beaver and common raccoon are expected to use the site for foraging or loafing as they move through the Willamette Basin and into tributary drainages. Denning sites for furbearers are limited along the cliffs and rocky shore of the riparian basalt and riparian forest. Bats may forage for emerging aquatic insects over the in-channel river and Off-channel Alcove habitats, or glean prey from foliage, tree trunks, and rocks along the riparian basalt and riparian forest habitats. Roosting habitat for bats may be found in riparian basalt cracks and within crevices or on walls of man-made structures. Some of the bats in the area that may roost in these buildings include California myotis, Yuma myotis, long-eared myotis, fringed myotis, long-legged myotis, and Townsend's big-eared bat.

2.5.6 Marine Mammals

The in-channel river habitat provides seasonal foraging opportunities for marine mammals, including primarily California sea lions, but also smaller numbers of Stellar sea lions and harbor seals. According to ODFW, California sea lions have expanded along the West Coast over the past four decades to a population of nearly 300,000 animals coast-wide. Steller sea lions are becoming more frequent visitors to the falls, and are seen sporadically. Pacific harbor seals are abundant in coastal areas, but relatively rare at upriver sites such as Willamette Falls (Wright et al., 2016). During studies in 2016, the maximum single-day observation totals were 35 California sea lions on April 22, and one Steller sea lion (many dates from February 4 to April 16); no harbor seals were observed in 2016 (ibid). Sea lions were present from at least February to May. Consequently, sea lions will likely rest or haul out in the adjacent slow-moving waters of the off-channel alcove habitat or along riprap lining the Willamette River from late Winter through Spring.

3 CONSERVATION PRIORITIES

Species recovery plans, conservation strategies, local and regional watershed plans, and other conservation documents have been created for multiple regions and species, by multiple governmental and non-governmental entities. Many of these plans either encompass the project site or involve species that are present at the project site. Willamette Falls is the head of tide in the Willamette River and its unique geographic location and physical features make it an important habitat element delineating the upper and lower mainstem Willamette River. The falls also historically severely restricted upstream movement of fish and other aquatic biota, creating one-of-a-kind habitat elements that have been significantly altered over years of modification for human use. Below is a discussion of how the habitat elements present at the site and the proposed habitat enhancements relate to selected planning and framework documents.

Endangered species act recovery plan for Lower Columbia River Coho Salmon, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, and Lower Columbia River Steelhead (NMFS 2013)

The base of Willamette Falls is the upstream extent of multiple Evolutionary Significant Units (ESUs) of salmon and Distinct Population Segments (DPSs) of steelhead that are found in the lower Willamette and Columbia Rivers. In fact, the Columbia River Estuary is defined as extending up-river in the Willamette to the head of tide, which is at Willamette Falls. As stated in the recovery plan, estuary habitat strategies focus on providing adequate off-channel and intertidal habitats, such as tidal swamp and marsh; restoring habitat complexity in areas modified by agricultural or rural residential use; decreasing exposure to toxic contaminants; and lowering late summer and fall water temperatures. These goals will be accomplished over the long term by restoring hydrologic, sediment, and riparian processes that structure habitat in the estuary.

Representative actions include protecting and restoring high-quality off-channel habitats and riparian areas; and identifying and reducing current sources of pollutants. The enhancement of the off-channel rearing habitats, especially in areas of coldwater seeps and springs, as well as the improvement of water quality and decrease in contaminants, fits into these recovery goals.

Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (ODFW and NMFS 2011)

As stated above, UWR Chinook and steelhead were historically the only salmonids able to navigate the falls. There are many identified limiting factors for UWR Chinook and steelhead populations, including hydrograph alterations, competition, disease and food web effects, which will be unaffected by the project. However, the proposed project does have the potential to improve habitat access and physical habitat quality and quantity. Specifically, elements of the proposed project could improve floodplain connectivity and function, channel structure and complexity, channel morphology, riparian condition, large wood recruitment, sediment routing (fine and coarse sediment), and upland processes.

Oregon Conservation Strategy (ODFW, 2016).

The Oregon Conservation Strategy summarizes information on the issues facing Oregon’s species, habitats, and people. Statewide Key Conservation Issues include: Land use changes; Climate change; Water Quality and Quantity, Disruption of disturbance regimes; Invasive Species; Barriers to animal movement; and Challenges for Private Landowners to engage in voluntary conservation. The project site is located in the Lower Willamette Floodplain Conservation Opportunity Area, within which the recommended conservation actions include:

- Improve aquatic and riparian habitat complexity and diversity.
- Improve riparian buffers.
- Maintain and enhance isolated wetlands to provide habitat for amphibians and turtles.
- Maintain and expand Oregon white oak habitat
- Protect and improve water quality.
- Protect and restore shallow water and off-channel habitats.
- Remove fish and wildlife passage barriers.
- Restore floodplain function and connectivity.
- Restore riparian and wetland plant communities.

The proposed project activities will include each of these actions to at least a small degree.

Also included as “strategy habitats” are natural lakes, oak woodlands, flowing water and riparian habitats, and wetlands. Identified, “specialized local habitats” include: basalt cliffs, bottomland hardwood forest, off-channel habitat, riverine islands (Ross Island, Elk Rock Island, Rock Island, Cedar Island, Clackamette Island), and shoreline and sandy beaches.

Identified limiting factors in flowing water and riparian areas habitats include:

- Water quantity
- Pollution
- Sedimentation
- Water Temperature
- Invasive species

- Water temperature
- Sedimentation
- Passage barriers and channel complexity
- Loss of Riparian Habitat, Floodplain Function, and Habitat Complexity
- Riparian Habitat Degradation
- Invasive Plants in Riparian Areas

Limiting factors for wetlands include:

- Habitat loss
- Water Availability
- Degraded water quality
- Invasive Species

Limiting factors for oak woodlands include:

- Fires Suppression and Fir Encroachment
- Land Use Conversion and Continued Habitat Loss
- Loss of Habitat Structure
- Invasive Species
- Climate Change

The strategy also states that the lower Willamette Valley is an, important movement corridor for migratory and resident fish and wildlife, and that restoration of the Lower Willamette River and associated floodplain and uplands has important implications not only for fish and wildlife, but also for the social and economic factors resulting from restoring ecological functions such as flood control and water quality. Again, restoration at the project site will improve many of the limiting factors in each of strategy habitats where they occur at the project site.

Regional Conservation Strategy for the Greater Portland-Vancouver Region (Intertwine Alliance, 2012).

The Regional Conservation Strategy for the Greater Portland-Vancouver Region, is consistent with two statewide plans—the Oregon Conservation Strategy (discussed immediately above) and Washington Comprehensive Wildlife Conservation Strategy. However, the regional conservation strategy is unique among similar plans in its focus on urban ***and*** rural lands and its bi-state scope. It builds on existing local planning and implementation efforts and strives to strengthen regional cooperation

Both the conservation strategy and its associated Biodiversity Guide for the Greater Portland-Vancouver Region are further differentiated by taking a long view and focusing on biodiversity. The guidance documents clearly describe the biodiversity of the region, while laying out the challenges facing local wildlife and ecosystems.

The Regional Conservation Strategy does the following:

- Describes the historical, current, and desired future conditions for fish and wildlife habitat across urban and rural landscapes, both inside and outside the Portland–Vancouver metropolitan area.
- Identifies conservation opportunities within these urban and rural landscapes

- Describes the threats to potential conservation areas, and presents strategies to protect and restore biodiversity.
- Demonstrates how the greater Portland/Vancouver region fits into—and is crucial to— the larger landscape and how the Regional Conservation Strategy nests within the Oregon and Washington state conservation strategies and existing federal and local planning efforts and strategies.

One goal of the Regional Conservation Strategy is to describe the desired future conditions of natural ecosystems of the region. This would be an interconnected system of functional natural areas across the urban and rural landscapes managed in such a way as to do the following:

- Protect the water and air quality of the region
- Provide other important ecosystem services, such as flood control, water storage, and pollination
- Support at least the current level of biodiversity
- Help species and habitats recover from historical losses or degradation
- Increases natural systems' resilience and their ability to adapt to an unpredictably changing climate
- Provide opportunities for people to access natural areas for local recreation, research, and appreciation

The Willamette Falls Legacy Project has the opportunity to advance toward those desired future conditions – especially by providing a very unique opportunity for people to finally access a one-of-a-kind feature forrestoration andeducation.

Draft Willamette Subbasin Plan (NWPCC 2004)

The Willamette Subbasin Plan is a widespread and comprehensive plan with multiple focal species and habitats. It also contains many conservation guidelines and strategies for aquatic and terrestrial areas. These strategies are many and varied and are designed to benefit multiple focal species. Those strategies relevant to the project site include:

1. Aquatic strategies:
    - Restore physical habitats
        - Increase interaction of rivers and floodplains by removing or altering:
            - selected revetments and
            - selected off-channel blockages
        - Increase supply and recruitment of large wood by improving riparian composition and extent and providing for flows to capture wood.
        - Improve water quality, especially temperature problems, by
            - Improve riparian shading
            - Increasing extent and duration of flow interaction with hyporheic zone.
    - Conserve and restore biological communities
        - Control the most damaging terrestrial and aquatic invasive species
        - Control temperatures which favor nonnative species
    - Connect favorable habitats
        - Connect fish to off-channel habitat by reconnecting rivers with floodplains and improved flow management

2. Terrestrial strategies
   - Increase extent and distribution of focal habitats by:
     - Increase interaction of rivers and floodplains by removing or altering:
       - selected revetments and
       - selected off-channel blockages
     - Improve extent and composition of riparian areas
     - Achieve an adequate and sustainable supply of standing and downed dead wood in upland and streamside environments
   - Conserve and restore biological communities
     - Protect existing high quality habitats and consider restoration, including
       - Maintaining or improving existing land use and forest practice laws, mitigation requirements, and landowner conservation incentives
       - Remove and control the most harmful invasive species, including by responding rapidly to new plant pathogens.
     - Increase supply and recruitment of large wood by improving riparian composition and extent and providing for flows to capture wood.
     - Maintain natural water level and soil moisture regimes
   - Connect Favorable Habitats
     - Avoid barriers to wildlife movement.
     - Minimize extent of new road construction

Willamette Valley-Puget Trough Ecoregional Assessment (Floberg et al. 2004)
The Willamette Falls Legacy site lies within the Willamette Valley-Puget Trough-Georgia Basin ecoregion, a long ribbon of broad valley lowlands and inland sea flanked by the rugged Cascade and coastal mountain ranges of British Columbia, Washington, and Oregon. It encompasses some 21,431 square miles of Pacific inlet, coastal lowlands, islands, and intermontane lowland, and extends from the Sunshine Coast and eastern lowland of Vancouver Island along Georgia Strait, south through Puget Sound and the extensive plains and river floodplains in the Willamette Valley. Relative to its size, the Willamette Valley-Puget Trough-Georgia Basin ecoregion has a large number of species (526 species targets) that are imperiled, declining, or endemic to the ecoregion and of conservation concern. It is highly likely that many more species for which we lack distribution and abundance data (especially invertebrates, fungi and non-vascular plants) are of concern. The ecoregion also has an exceptional diversity of habitats including 217 nearshore, terrestrial, and freshwater ecological systems, and 90 imperiled terrestrial plant communities.

Oregon/Washington Partners in Flight (PIF) Conservation Strategy for Landbirds in Lowlands and Valleys of Western Oregon and Washington. (Altman 2000)
PIF has identified priority species and completed a conservation strategy that relies on four principal components:

- identify habitats and habitat attributes important to landbirds,
- describe the desired habitat conditions based on the habitat relationships of a select group of priority species,
- provide interim management targets (i.e., biological objectives) to achieve the desired conditions, and
- recommend management actions (i.e., conservation strategies) that can be implemented by various entities at multiple scales to achieve the biological objectives

The diversity of landbird species and habitats in the Westside Lowlands and Valleys, required a conservation strategy for an array of habitat conditions. Management goals would be designed and integrated across multiple species and landscapes. The authors stated that landbird conservation would require reserves, and areas with variety of management activities in differing landscapes. Their suggested conservation focus included:

- initiate conservation actions in accordance with the ecological potential of the site (i.e., within the framework of potential natural vegetation and natural ecosystem processes),
- emphasize conservation within high priority designated conservation areas and where opportunities exist (i.e., receptive land owners and land managers), and
- emphasize conservation at multiple scales such that habitat conditions for one or a few species are nested within a landscape that provides a mosaic of conditions for multiple species.

Toward that end, the authors selected four priority habitats:

- grassland-savanna
- oak woodland
- riparian
- chaparral

Restoration and enhancement of these habitats where present at the project site will mesh with the landbird conservation strategy.

4 CONSIDERATIONS FOR CONCEPTUAL DESIGN

In the process of developing this report and in consultation with key project stakeholders, the following considerations have been identified as important for the development of a Riverwalk Project design. The points below are evolving alongside our understanding of the site constraints, conditions and opportunities.

4.1 General Concepts

- Maintain and improve existing habitats
- Prioritize preservation of riparian basalt areas with unique native plants.
- Add new habitat for native fish and riparian dependent speciesWhere feasible, connect the Riverwalk Project site to adjacent open areas such as the Canemah Bluffs and Camassia Preserve to benefit pollinators and migratory bird species
- Remove invasive species and alter conditions at site to encourage native species over non-native species
- Avoid direct impacts to key species during construction by timing activities to occur when species are not present or breeding
- Minimize impact to existing recreational salmon fishing and tribal lamprey harvest during construction activities and resulting from changes to the site
- Avoid unintended consequences to migratory fish behavior (e.g., stranding, entrainment, or increased predation risk) through alteration of “attraction” flows. e.g., new tail races, construction impacts

- Seek opportunities to educate the public with respect to the ecological value of the site, key habitats, fish and wildlife use of the site and elements that make it unique such as riparian basalt outcroppings, lamprey passage, sturgeon spawning.

4.2 Increase Shoreline Complexity

- Create vertically and horizontally complex river margins
- Create alcove-like habitat features
- Create of shallow edgewater habitats
- Create more gradually sloped banks, including replacing riprap with native soils where possible
- Encourage low flow velocities along channel margins.
    - Resting and holding for native adult migratory fish
    - High velocity refuge and cover from predators for native juvenile fish
    - Improved turtle and amphibian habitats (e.g., stillwater areas, basking structure)
    - Improved waterfowl and wading bird habitats (e.g., improved water quality, nesting and foraging habitat)

4.3 Fish Passage and Behavior

- Evaluate potential consequences of altered hydraulics related to designs on fish passage ability and behavior at the falls.
- Look for opportunities to add slow water resting habitat for migratory fish, especially salmon and steelhead. Lamprey are able to rest in fast water areas by latching onto rocks and cement, and therefore cover is a more important habitat element for lamprey resting.
- Remove metal and debris in off-channel alcove habitat that may pose adverse impacts to lamprey and other fish species
- In any instance where water flow direction and velocities are altered, it may alter existing fish behavior or migrator pathways. This can be both beneficial (e.g., providing resting or alternative migration pathways) and detrimental (attracting fish to undesirable areas or creating predation hot-spots). Another important element of altering flow pathways and hydrology is that it may change preferred Pacific lamprey holding and migrating locations, potentially impacting Tribal harvest. An adaptive approach, whereby fish behavior and habitat use are monitored and flow paths and velocities (as well as potential use of fish screens) are refined as needed in response is recommended.
- Avoid building structures that could be used by California sea lion for resting (e.g., accessible docks and walkways). Consider seasonal and tidal variation in flow levels.

4.4 Improve Water Quality

As noted in the Vision document, the Willamette River is identified under the Clean Water Act for violations of water quality standards including temperature, bacteria, and mercury. As such, the following objectives should be considered:

- Minimize sedimentation associated with construction to avoid impacts on water quality and fish and amphibian habitat particularly in off-channel alcove habitat.

- Ensure storm water pollution prevention plan is developed and followed during construction
- Locate point source and non-point source pollution (e.g., municipal storm water) at site.
    - Water temperature: promote water temperature refuges for fish by identifying coldwater springs and seeps and promoting fish access and habitat improvements. Provide shade through riparian plantings.
    - Potential soil contamination – ensure soil toxicity levels (current or during construction) do not pose a risk to water quality resulting from urban runoff
- Improve water circulation within the lagoon to improve water quality, allow downstream passage and reduce invasive plant species. Be sure to avoid the attraction of both upstream and downstream migrating fish (salmon, steelhead, and lamprey) that may be trapped and subject to increased predation.

4.5 Protect and Restore Riparian Habitat

Restoration of riparian habitat has a number of benefits. In addition to creating conditions that allow more natural plant communities to establish, including rare plants native to the site, healthy riparian habitat are important for native birds, amphibians, reptiles, insects, and small mammals. Furthermore, riparian restoration complements other key habitat restoration strategies by promoting shoreline complexity (i.e., roughness) and improving important fish habitat elements (e.g., shade for cooler water temperature, low velocity refuge alcoves, additional substrate for cover).

Potential habitat restoration opportunities for riparian habitats are described below.

4.5.1 Riparian forest

- Much of the natural bank habitat along some areas of the Willamette have been replaced by artificial habitats including riprap, which previous studies have shown to decrease aquatic species richness and diversity in the middle Willamette River (Friesen 2005).
- Riparian scrub/forest habitat is degraded, patchy or absent along the shoreline terraces adjacent to the Riverfront and riparian areas above the falls. It would be beneficial to preserve and enhance this habitat. Along the shoreline downstream of the falls is mostly a narrow band of riprap, rock, and concrete between the water’s edge and industrial buildings (not including the rip habitats listed described below).
- Presence of various willows, Pacific ninebark, and red-osier dogwood were a likely component of the original riparian vegetation at the Project. Invasive plants including Himalayan blackberry, morning glory, English ivy and other invasive plants occur in patches along the shoreline.
- The removal of invasive plants and replanting with native plants will increase the habitat value.
- The narrow band of riparian vegetation above the falls can be widened where possible, with non-natives removed and a native shrub layer encouraged.
- Industrial debris should be removed and pavement disassembled.
- Opportunities for improving future raptor habitat are available on-site and include installing native trees along the upper shoreline or erecting a nesting platform for use by osprey.

- Increasing the shrub and tree layer along the shoreline would also improve foraging and stop-over habitat for songbirds such as Wilson’s warbler, yellow warbler, evening grosbeak, and western tanagers.
- Riprap and concrete should be removed where feasible above the falls, especially in locations where soils exist over bedrock and infiltration could be encouraged. Revegetating with native trees, such as red alder, big-leaf maple, black cottonwood, and native shrubs such as red-osier dogwood, salmonberry, or Douglas hawthorne can reduce impervious surface area on the site, provide a place for localized stormwater infiltration, and provide shade along the bank.
- Expose and Restore Historic Shoreline – Restoration and enhancement of existing shoreline habitat could best be achieved by making available as much of the historic shoreline as possible and restoring the riparian forest habitat along the shoreline. By removing buildings and platforms along the shoreline, valuable shoreline habitat would be exposed below the falls for fish, invertebrates, small mammals and birds.

4.5.2 Riparian basalt

Protection and restoration of the unique rocky basalt outcrops and associated plant and animal species is a high priority for the project area.

- Riparian basalt outcrops surround the Falls and PGE Dam Area.
- Basalt and rock outcroppings (balds and bluffs) are a habitat feature along the Willamette River, and are listed as a specialized and local habitat for the Willamette Valley ecoregion in the Oregon Conservation Strategy. These habitats are critical for many species including red-legged frogs, salamanders, herons, migratory songbirds, water voles, weasels, native turtles and pollinators.
- At the site many of these outcrops have been impacted by industrial development, and presumably by decades of poor air quality. However, there are significant remnants of undisturbed cliff faces.
- Native vegetation on the cliffs and outcrops is well preserved at the Project site. This greatly increases their conservation value.
- Increasing the diversity of native historical species on basalt outcrops at Willamette Falls is a desirable restoration target. Although portions of the rocks are subject to periodic scouring by high river flows, higher ledges and cliffs are free of scour and could support an array of species that probably once occurred there. In this habitat, bryophytes are critical keystone ecosystem builders because of their ability to create soils and trap sediments on these otherwise barren substrates. Establishment and spread of bryophyte mats is an essential first step in creating habitat for vascular plants. This could be accomplished by transplanting moss mats and excluding trampling from foot traffic. With proper management, the basalt bluffs at Willamette Falls Legacy site could become a showcase for all of these plants.
- Native plant diversity is relatively high at the Willamette Narrows natural area upstream of the site, which support drought-tolerant species such as Oregon white oak, Pacific madrone as well as native wildflowers and other herbaceous plants including state listed *Delphinium leucophaeum,* sedums, and *Brodiaea* (Houck and Cody 2000).
- Records from Willamette Narrows and Elk Rock Island natural areas indicate that a number of vascular species are missing from today's Willamette Falls Legacy site, but could be targets for restoration. These would include *Agrostis pallens, Allium amplectens,*

Allium acuminatum, Arctostaphylos uva-ursi, Arnica amplexicaulis, Bolandra oregana, Brodiaea coronaria, Castilleja hispida, Cascadia nuttallii, Ceanothus cuneatus, Delphinium leucophaeum, Grindelia integrifolia, Heuchera micrantha, Lithophragma parviflorum, Lomatium dissectum, Lomatium triternatum, Micranthes gormanii, Micranthes integrifolia, Micranthes fragosa, Micranthes marshallii, Micranthes rufidula, Penstemon serrulatus, Rupertia physodes, Silene antirrhina, Silene douglasii, Silene menziesii, Sullivantia oregana, and *Viburnum ellipticum*. Because Willamette Falls is the type locality of *Arnica amplexicaulis*, special effort should be made to reestablish this species at the falls (Christy and Gaddis 2015).

- Bryophyte species suitable for reintroduction at Willamette Falls Legacy site include *Racomitrium, Grimmia, Dicranum howellii*, *Polytrichum juniperinum*, and *Homalothecium megaptilum* (Christy and Gaddis 2015).
- Removal of the clarifier and exposing other riparian basalt areas would restore unique basalt rock outcroppings along the shoreline at the site. With removal of industrial structures, there may be opportunities to promote shorebird habitat and local native wildflower species diversity on the outcroppings (ESA 2012).

4.5.3 Off-channel alcove habitat and river shoreline

- Off channel alcoves are situated throughout both the Project site, within the falls and adjacent to the PGE dam.
- The off-channel alcoves contain industrial structures, concrete and debris, some of which are of considerable cultural interest. However, sand and cobble substrates, as well as areas hydrated by springs and seeps at the site support a diverse array of native wetland plants, although they are subject to considerable disturbance during peak river flows.
- Removal of some buildings would allow for the day lighting of historic tailraces and the establishment of a riparian community and off channel alcoves. Tailrace #2 is already the location of a small alcove, which can be enhanced to provide resting places for fish, as well as habitat for small mammals, amphibians, and invertebrates.
- The river shoreline rocks are surprisingly devoid of bryophyte species. Above ordinary high water, moist and shaded rock habitats are dominated by dense monocultures by one bryophyte species. At other, more protected sites outside the project area, similar habitats are densely covered with many bryophyte species. This community type can be several inches deep and support habitat for many vascular plants of conservation concern such as *Comandra umbellata*, *Allium acuminatum*, *Allium amplectens, Brodiaea coronaria*, *Piperia transversa*, *Lomatium triternatum*, and *Lomatium utriculatum* (Christy and Gaddis 2015)
- Wetland invasive species of particular concern include *Iris pseudacorus*, *Ludwigia hexapetala*, *Lythrum salicaria*, and *Phalaris arundinacea*. The *Lythrum* is quite abundant on cobble areas of river alcoves among the basalt bluffs, and can easily spread downstream by seed and fragmentation. *Carduus pycnocephalus* and *Verbena brasiliensis* may be weeds of emerging concern, the latter also on cobble and capable of dispersal downstream. *Verbena brasiliensis* needs verification, but seems distinct from *V. bonariensis* that has also been found in the metro area. Treatment of these species in advance of development would be an early action item to improve habitat at the site.

5 SUMMARY OR CONCLUSION

The next phase of work will focus on refining design ideas and concepts for the Riverwalk Project and continuing engagement with interested stakeholders. As the conceptual designs are advanced, it would be valuable to engage staff from the ODFW, National Marine Fisheries Service, U.S Fish and Wildlife Service and others in a site survey to further document restoration opportunities and constraints. During that survey, it would be beneficial to map basalt outcroppings and bat use at the site, as well as the presence of amphibian and reptiles.

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Appendices

Appendix A

Special-status and Non-special Status Species that Have the Potential to Occur or Have Been Documented within or Adjacent to the Project site

Table A-1. Special-status and non-special status species that have the potential to occur or have been documented within or adjacent to the Project site.

Species	Status[1] Federal/State	Source	Habitat type						Likelihood of Occurrence (none, low, mod, high) [2]	
			In-channel River	Off-channel Alcove	Riparian Basalt	Riparian Forest	Upland Forest	Oak woodland and Savannah		
INVERTEBRATES										
Oregon Giant Earthworm *Driloleirus macelfreshi*	SOC/–	ORBIC 2016	--	--	--	X	X	--	Low	
Oregon Fairy Shrimp	–/–	Milestone 2	--	X	X	--	--	--	Moderate	
Oregon Snail (Dalles Sideband) *Monadenia fidelis minor*	SOC/–	ORBIC 2016	--	X	X	--	--	--	Low	
FISH									**Above Falls**	**Below Falls**
Sand Roller *Percopsis transmontana*	–	Hulse et al. 2002	X	X	--	--	--	--	Moderate	Moderate
Starry Flounder *Platichthys stellatus*	–/–	Hulse et al. 2002	X	X		--	--	--	Low	None
Pacific Lamprey *Entosphenus tridentatus*	SOC/SV	ESA 2012 Milestone 2 ORBIC 2016	X	X	--	--	--	--	High	High
Western Brook Lamprey *Lampetra richardsoni*	–/SV	ORBIC 2016	X	X		--	--	--	Moderate	High
River Lamprey *Lampetra ayresi*	SOC/–	Hulse et al. 2002	X	X		--	--	--	Low	Low
White Sturgeon *Acipenser transmontanus*	–/–	ESA 2012	X	X	--	--	--	--	Moderate	High
Northern Pikeminnow *Ptychocheilus oregonensis*	–/–	Hulse et al. 2002	X	X	--	--	--	--	High	High

Species	**Status[1] Federal/State**	**Source**	**Habitat type**						**Likelihood of Occurrence (none, low, mod, high)** [2]	
			In-channel River	**Off-channel Alcove**	**Riparian Basalt**	**Riparian Forest**	**Upland Forest**	**Oak woodland and Savannah**	**Above Falls**	**Below Falls**
Leopard Dace *Rhinichthys falcatus*	–/–	Hulse et al. 2002	X	X	--	--	--	--	Low	Low
Longnose Dace *Rhinichthys cataractae*	–/–	Hulse et al. 2002	X	X	--	--	--	--	Moderate	Moderate
Speckled Dace *Rhinichthys osculus*	–/–	Hulse et al. 2002	X	X	--	--	--	--	High	High
Redside Shiner *Mylocheilus caurinus*	–/–	Hulse et al. 2002	X	X	--	--	--	--	Moderate	Moderate
Largescale Sucker *Catostomus macrocheilus*	–/–	Hulse et al. 2002	X	X	--	--	--	--	High	High
Mountain Sucker *Catostomus platyrhynchus*	–/–	Hulse et al. 2002	X	X	--	--	--	--	High	High
Chinook Salmon (Lower Columbia River ESU [fall and spring run] *Oncorhynchus tshawytscha*	T/SC	Milestone 2 ORBIC 2016 ESA 2012	X	X		--	--	--	Low	None
Chinook Salmon (Unlisted hatchery origin) *Oncorhynchus tshawytscha*	–/–	Hulse et al. 2002	X	X					High	High
Chinook Salmon (Upper Willamette River ESU [spring run]) *Oncorhynchus tshawytscha*	T/SC	Milestone 2 ORBIC 2016 ESA 2012	X	X		--	--	--	High	High
Coho Salmon (Lower Columbia River ESU) *Oncorhynchus kisutch*	T/E	Milestone 2 ORBIC 2016 ESA 2012	X	X		--	--	--	Moderate	None

Species	Status[1] Federal/State	Source	Habitat type						Likelihood of Occurrence (none, low, mod, high)[2]	
			In-channel River	Off-channel Alcove	Riparian Basalt	Riparian Forest	Upland Forest	Oak woodland and Savannah	Above Falls	Below Falls
Coho Salmon (unlisted hatchery stock) *Oncorhynchus kisutch*	–/–	Hulse et al. 2002	X	X					High	High
Coastal Cutthroat Trout (Southwestern Washington/Columbia River ESU) *Oncorhynchus clarkii*	SOC/SV	ORBIC 2016 ESA 2012	X	X		--	--	--	Low	None
Coastal Cutthroat Trout (Upper Willamette River ESU) *Oncorhynchus clarkii*	SOC/–	ORBIC 2016 ESA 2012	X	X		--	--	--	Moderate	Moderate
Steelhead (Lower Columbia River ESU [summer and winter run] *Oncorhynchus mykiss*	T/SC	Milestone 2 ORBIC 2016	X	X		--	--	--	Moderate	None
Steelhead (Upper Willamette River ESU) *Oncorhynchus mykiss*	T/SV	Milestone 2 ORBIC 2016	X	X		--	--	--	High	High
Bull Trout (Coastal population) *Salvelinus confluentus*	T/SC	ESA 2012 ORBIC 2016	X			--	--	--	Low	Low
Mountain Whitefish Prosopium williamsoni	–	Hulse et al. 2002	X	X		--	--	--	High	High
Rainbow Trout *Oncorhynchus mykiss*	–	Hulse et al. 2002	X	X		--	--	--	Low	Low

Species	Status[1] Federal/State	Source	Habitat type						Likelihood of Occurrence (none, low, mod, high) [2]	
			In-channel River	Off-channel Alcove	Riparian Basalt	Riparian Forest	Upland Forest	Oak woodland and Savannah		
									Above Falls	Below Falls
Sockeye Salmon *Oncorhynchus nerka*	–/–	ESA 2012	X	X		--	--	--	Low	Low
Threespine Stickleback *Gasterosteus aculeatus*	–	Hulse et al. 2002	X	X	--	--	--	--	High	High
Paiute Sculpin *Cottus beldingi*	–/–	Hulse et al. 2002	X		--	--	--	--	Low	Low
Prickly Sculpin *Cottus asper*	–/–	Hulse et al. 2002	X		--	--	--	--	High	High
Reticulate Sculpin *Cottus perplexus*	–/–	Hulse et al. 2002	X		--	--	--	--	High	High
Torrent Sculpin *Cottus rhotheus*	–/–	Hulse et al. 2002	X		--	--	--	--	High	High
Chiselmouth *Acrocheilus alutaceus*	–/–	Hulse et al. 2002	X	X	--	--	--	--	High	High
Peamouth *Mylocheilus caurinus*	–/–	Hulse et al. 2002	X	X	--	--	--	--	High	High
Eulachon *Thaleichthys pacificus*	T/–	Hulse et al. 2002	X	X	--	--	--	--	Low	None
Non-native species[3]	–/–	Hulse et al. 2002	X	X		--	--	--	High	High
AMPHIBIANS										
Larch Mountain Salamander *Plethodon larselli*	SOC/SV	ORBIC 2016	--	--	X	X	X	--	Low	
Clouded Salamander *Aneides ferreus*	–/SV	ORBIC 2016	--	--	--	X	X	--	Low	

Species	Status[1] Federal/State	Source	Habitat type						Likelihood of Occurrence (none, low, mod, high)[2]
			In-channel River	Off-channel Alcove	Riparian Basalt	Riparian Forest	Upland Forest	Oak woodland and Savannah	
Oregon Slender Salamander *Batrachoseps wright*	SOC/SV	ORBIC 2016	--	--	--	--	X	--	Low
Pacific Chorus Frog *Pseudacris regilla*	–/–	Milestone 2	--	X	X	X	X	--	High
Northern Red-legged Frog *Rana aurora*	SOC/SV	Milestone 2 ODFW 2016 ORBIC 2016	--	X	X	X	X	--	Moderate
Western Toad *Anaxyrus boreas*	–/SV	ORBIC 2016	X	X	X	X	--	--	Low
American Bullfrog *Lithobates catesbeianus*	–/–	ESA 2012	X	X	--	--	--	--	Moderate
REPTILES									
Western Painted Turtle *Chrysemys picta*	–/SV	Milestone 2 CDFW 2016 ORBIC 2016	X	X	X	X	--	X	Moderate
Western Pond Turtle *Actinemys marmorata*	SOC/SV	ESA 2012 ORBIC 2016	X	X	X	X	--	X	Moderate
Common Garter Snake *Thamnophis sirtalis*	–/–	Metro 2011	X	X	X	X	X	X	Moderate
Rubber Boa *Charina bottae*	–/–	Metro 2011	--	--	--	X	X	X	Moderate
BIRDS									
Double-crested Cormorant *Phalacrocorax auritus*	–/–	Milestone 2	X	X	--	--	--	--	High
Green Heron *Butorides virescens*	–/–	Milestone 2	--	X	--	X	--	--	High

Species	**Status[1] Federal/State**	**Source**	**Habitat type**						**Likelihood of Occurrence (none, low, mod, high)** [2]
			In-channel River	**Off-channel Alcove**	**Riparian Basalt**	**Riparian Forest**	**Upland Forest**	**Oak woodland and Savannah**	
Great Blue Heron *Ardea herodias*	–/–	Milestone 2 ESA 2012	--	X	--	X	--	--	High
Canada Goose *Branta canadensis*	–/–	ESA 2012		X	--	--	--	--	High
Wood Duck *Aix sponsa*	–/–	Milestone 2		X	--	X	--	--	Moderate
Osprey *Pandion haliaetus*	–/–	Milestone 2 ESA 2012	X	--	--	X	X	--	High
Bald Eagle *Haliaeetus leucocephalus*	–/–	Milestone 2 ORBIC 2016 ESA 2012	X	--	--	--	X	--	Moderate
American peregrine falcon *Falco peregrinus anatum*	–/SV	ORBIC 2016	--	--	X	X	X	X	High
Spotted Sandpiper *Actitis macularius*	–/–	Milestone 2	--	X	--	--	--	--	Moderate
Ring-billed Gulls *Larus delawarensis*	–/–	Milestone 2	X	X	--	--	--	--	Moderate
Band-tailed Pigeon *Patagioenas fasciata*	SOC/–	ORBIC 2016	--	--	--	X	X	X	High
Yellow-billed Cuckoo *Coccyzus americanus*	T/SC	ORBIC 2016	--	X	--	X	--	--	Low
Common Nighthawk *Chordeiles minor*	–/SC	ODFW 2016 ORBIC 2016	--	X	--	X	?	?	Moderate
Belted Kingfisher *Megaceryle alcyon*	–/–	ESA 2012	--	X	--	X	--	--	High
Anna's Hummingbird *Calypte anna*	–/–	Milestone 2	--	X	--	X	X	X	Moderate
Acorn Woodpecker *Melanerpes formicivorus*	SOC/SV	CDFW 2016 ORBIC 2016	--	--	--	--	X	X	Moderate

Species	Status[1] Federal/State	Source	Habitat type						Likelihood of Occurrence (none, low, mod, high)[2]
			In-channel River	Off-channel Alcove	Riparian Basalt	Riparian Forest	Upland Forest	Oak woodland and Savannah	
Lewis's Woodpecker *Melanerpes lewis*	SOC/SC	ORBIC 2016	--	--	--	--	X	X	Moderate
Downy Woodpecker *Picoides pubescens*	–/–	Milestone 2	--	--	--	--	X	X	Moderate
Black-backed Woodpecker *Picoides arcticus*	–/SV	ORBIC 2016	--	--	--	--	X	X	Moderate
Pileated Woodpecker *Dryocopus pileatus*	–/SV	ORBIC 2016	--	--	--	--	X	X	Moderate
American Three-toed Woodpecker *Picoides dorsalis*	–/SV	ORBIC 2016	--	--	--	--	X	X	Moderate
Red-breasted Sapsucker *Sphyrapicus ruber*	–/–	Metro 2011	--	--	--	--	X	X	Moderate
Willow Flycatcher *Empidonax traillii*	SOC/SV	Milestone 2 ODFW 2016	--	X	--	X	X		Low
Olive-sided Flycatcher *Contopus cooperi*	SOC/SV	ORBIC 2016	--	--	--	X	X	x	Low
Little willow Flycatcher *Empidonax traillii brewsteri*	–/SV	ORBIC 2016	--	X	--	X	--	x	Low
Cliff Swallow *Petrochelidon pyrrhonota*	–/–	EPIC 2012	--	X	--	X	--	--	Low
Purple Martin *Progne subis*	SOC/SC	ORBIC 2016	--	X	--	?	?	?	Low
Black-capped Chickadee *Poecile atricapillus*	–/–	Metro 2011	--	--	--	X	X	x	Moderate
Bushtit *Psaltriparus minimus*	–/–	Metro 2011	--	--	--	X	X	x	Moderate

Species	Status[1] Federal/State	Source	Habitat type						Likelihood of Occurrence (none, low, mod, high) [2]
			In-channel River	Off-channel Alcove	Riparian Basalt	Riparian Forest	Upland Forest	Oak woodland and Savannah	
Slender-billed Nuthatch (also known as white-breasted nuthatch) *Sitta carolinensis aculeata*	–/SV	Milestone 2 ODFW 2016 ORBIC 2016	--	--	--	--	X	X	Moderate
House Wren *Troglodytes aedon*	–/–	Metro 2011	--	--	--	X	X	X	High
Ruby-crowned Kinglet *Regulus calendula*	–/–	Milestone 2	--	--	--	X	X	X	Low
Evening Grosebeak *Coccothraustes vespertinus*	–/–	ESA 2012	--	--	--	X	X	x	Low
Lesser Goldfinch *Spinus psaltria*	–/–	Milestone 2	--	X	--	X	X	x	Low
Cedar Waxwing *Bombycilla cedrorum*	–/–	Milestone 2	--	X	--	X	X	X	Moderate
Yellow Warbler *Setophaga petechia*	–/–	Milestone 2 ESA 2012	--	X	--	X	X	X	Moderate
Wilson's Warbler *Cardellina pusilla*	–/–	Milestone 2. ESA 2012	--	X	--	X	X	X	Moderate
Yellow Warbler *Setophaga petechia*	–/–	Milestone 2 ESA 2012	--	X	--	X	X	X	Moderate
Wilson's Warbler *Cardellina pusilla*	–/–	Milestone 2. ESA 2012	--	X	--	X	X	X	Moderate
Orange-crowned Warbler *Oreothlypis celata*	–/–	Metro 2011	--	X	--	X	X	X	Moderate
Black-throated Gray Warbler *Setophaga nigrescens*	–/–	Metro 2011	--	X	--	X	X	X	Moderate
Yellow-breasted Chat *Icteria virens*	SOC/SC	ORBIC 2016	--	X	--	X	--	--	Low

Species	Status[1] Federal/State	Source	Habitat type						Likelihood of Occurrence (none, low, mod, high) [2]
			In-channel River	Off-channel Alcove	Riparian Basalt	Riparian Forest	Upland Forest	Oak woodland and Savannah	
Western Tanager *Piranga ludoviciana*	–/–	Milestone 2 ESA 2012	--	--	--	--	X	--	Low
Oregon Vesper Sparrow *Pooecetes gramineus affinis*	SOC/SC	ORBIC 2016	--	--	--	--	--	X	Low
Chipping Sparrow *Spizella passerina*	–/CS	ODFW 2016 ORBIC 2016	--	--	--	X	X	X	Moderate
Lesser Goldfinch *Spinus psaltria*	–/–	Milestone 2	--	X	X	X	X	x	Low
MAMMALS									
California Myotis *Myotis californicus*	–/–	CDFW 2016	X	X	X	X	X	X	High
Yuma Myotis *Myotis yumanensis*	SOC/–	ORBIC 2016	X	X	X	X	X	X	High
Long-eared Myotis *Myotis evotis*	SOC/–	ORBIC 2016	X	X	X	X	X	X	High
Fringed Myotis *Myotis thysanodes*	SOC/SV	CDFW 2016 ORBIC 2016	X	X	X	X	X	X	High
Long-legged Myotis *Myotis volans*	SOC/SV	ORBIC 2016	X	X	X	X	X	X	High
Hoary Bat *Lasiurus cinereus*	–/SV	CDFW 2016 ORBIC 2016	X	X	X	X	X	X	High
Silver-haired Bat *Lasionycteris noctivagans*	SOC/SV	CDFW 2016 ORBIC 2016	X	X	X	X	X	X	High
Townsend's Big-eared Bat *Corynorhinus townsendii*	SOC/SC	CDFW 2016 ORBIC 2016	X	X	X	X	X	X	High
Black-tailed Jack Rabbit *Lepus californicus*	–/SV	ORBIC 2016	--	--	--	X	X	X	Low

Species	**Status[1]** **Federal/State**	**Source**	**Habitat type**						**Likelihood of Occurrence (none, low, mod, high)** [2]
			In-channel River	**Off-channel Alcove**	**Riparian Basalt**	**Riparian Forest**	**Upland Forest**	**Oak woodland and Savannah**	
Western Gray Squirrel *Sciurus griseus*	–/SV	CDFW 2016	--	--	--	X	X	X	Low
American Beaver *Castor canadensis*	–/–	Milestone 2	X	X	X	x	--		High
Common Muskrat *Ondatra zibethicus*	–/–	ESA 2012	?	X	X	--	--	--	High
Coyote *Canis latrans*	–/–	Metro 2011	--	X	X	X	X	X	Moderate
Sierra Nevada Red Fox *Vulpes vulpes necator*	–/–	ORBIC 2016	--	X	--	X	X	X	Low
Common Raccoon *Procyon lotor*	–/–	ESA 2012	--	X	X	X	X	X	High
Long-tailed Weasel *Mustela frenata*	–/–	ESA 2012	--	--	--	--	X	X	Moderate
Northern River Otter *Lontra canadensis*	–/–	Milestone 2 ESA 2012	X	X	X	x	--	--	High
California Sea Lion *Zalophus californianus*	–/–	CDFW 2106	X	X					High

Species	Status[1] Federal/State	Source	Habitat type						Likelihood of Occurrence (none, low, mod, high) [2]
			In-channel River	Off-channel Alcove	Riparian Basalt	Riparian Forest	Upland Forest	Oak woodland and Savannah	
Black-tailed Deer *Odocoileus hemionus*	–/–	Metro 2011	--	X	X	X	X	X	Low

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[1] Status:
– None
Federal
SOC Species of Concern
T Threatened
C Candidate
State
SC Sensitive – Critical
SV Sensitive – Vulnerable

[2] Species with no likelihood of occurring in the project area: Beller's Ground Beetle (*Agonum belleri*), Scott's Apatanian Caddisfly (*Allomyia scotti*), Cascades Apatanian Caddisfly (*Apatania tavala*), Mt. Hood Brachycentrid Caddisfly (*Eobrachycentrus gelidae*), Mt. Hood Farulan Caddisfly (*Farula jewetti*), Cascade Torrent Salamander (*Rhyacotriton cascadae*), Cope's Giant Salamander (*Dicamptodon copei*), Cascades Frog (*Rana cascadae*), Coastal Tailed Frog (*Ascaphus truei*), Oregon Spotted Frog (*Rana pretiosa*), Harlequin Duck (*Histrionicus histrionicus*), Mountain Quail (*Oreortyx pictus*), American Peregrine Falcon (*Falco peregrinus anatum*), *G*reat Gray Owl (*Strix nebulosi*), Northern Spotted Owl (*Strix occidentalis caurina*), Northern Goshawk (*Accipiter gentilis*), Streaked Horned Lark (*Eremophila alpestris strigata*), Western Bluebird (*Sialia Mexicana*), American Pika (*Ochotona princeps*), Fisher (Martes pennant), Canada Lynx (Lynx canadensis), Gray Wolf (Canis lupus), Camas Pocket Gopher (*Thomomys bulbivorus),* Red Tree Vole (*Arborimus longicaudus). G*rizzly Bear (*Ursus arctos horribilis)*

[3] Non-native species known to occur in the lower Willamette River include*:* Black crappie *(Pomoxis nigromaculatus),* Bluegill *(Lepomis macrochirus),* Largemouth bass *(Micropterus salmoides),* Pumpkinseed *(Lepomis gibbosus),* Smallmouth bass *(Micropterus dolomieui),* Warmouth *(Lepomis gulosus),* White crappie *(Pomoxis annularis),* American shad *(Alosa sapidissima),* Goldfish *(Carassius auratus),* Banded killifish *(Fundulus diaphanous),* Brown bullhead *(Ameiurus nebulosus),* Yellow bullhead *(Ameiurus natalis),* Black bullhead *(Ameiurus melas),* Yellow perch *(Perca flavescens),* Walleye *(Stizostedion vitreum),*Western mosquitofish *(Gambusia affinis).*

Appendix B

Important Plant Species Present or Historically Present at the Site (Christy 2015)

Important plant species present or historically present at the site (Christy 2015).

Status	Latin Name
Present	*Agrostis pallens* *Eriogonum compositum* *Eriophyllum lanatum* *Festuca roemeri* *Penstemon richardsonii* *Philadelphus lewisii* *Physocarpus capitatus* *Poa secunda,* *Saxifraga mertensiana* *Sedum spathulifolium* *Sedum stenopetalum* *Selaginella wallacei* *Symphyotrichum subspicatum Tolmiea menziesii* *Triteleia hyacinthina.* Five species of willows: (*Salix exigua, S. hookeriana, S.lasiandra, S. scouleriana, S. sitchensis)*
Historically present and potential target species to restore	*Agrostis pallens* *Allium amplectens* *Allium acuminatum* *Arctostaphylos uva-ursi* *Arnica amplexicaulis* [1] *Bolandra oregana* *Brodiaea coronaria* *Castilleja hispida* *Cascadia nuttallii,* *Ceanothus cuneatus* *Delphinium leucophaeum* *Grindelia integrifolia* *Heuchera micrantha,* *Lithophragma parviflorum* *Lomatium dissectum* *Lomatium triternatum* *Micranthes gormanii,* *Micranthes integrifolia* *Micranthes fragosa* *Micranthes marshallii* *Micranthes rufidula* *Penstemon serrulatus* *Rupertia physodes* *Silene antirrhina* *Silene douglasii* *Silene menziesii,* *Sullivantia oregana* *Viburnum ellipticum.* Bryophyte species suitable for reintroduction at Project site include *Racomitrium, Grimmia, Dicranum howellii*, *Polytrichum juniperinum*, and *Homalothecium megaptilum.*

[1] Because Willamette Falls is the type locality of *Arnica amplexicaulis*, special effort should be made to reestablish this species at the falls.

FINAL REPORT ◦ MARCH 2017

Willamette Falls Riverwalk, Habitat Restoration Conceptual Design

PREPARED FOR

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1 INTRODUCTION

The conceptual design for habitat restoration of the Willamette Falls Legacy Project site and riverwalk project provides key information to support and guide one of the four core values—healthy habitat. Development of the habitat restoration design entailed a series of site visits, engagement and consultation from stakeholders and the documentation of baseline conditions. The resulting information was then distilled into a useful form for the core design team (Snøhetta, Mayer/Reed and DIALOG) to incorporate into riverwalk conceptual design and master plan.

The following elements are being developed to support the habitat conceptual design: conservation planning, desired future habitat conditions, typical details and cross sections for habitat types, and mapping of natural riparian basalt features. These products, contained herein, will serve to inform, engage discussion and facilitate the riverwalk conceptual design.

2 PROJECT LOCATION AND HISTORY

Situated in Oregon City south of Portland, OR, the Project site is located on the riverbank right just downstream of the Willamette Falls (Figure 1), the largest waterfall by volume in the Pacific Northwest dropping 42 feet in a horseshoe with a crest length of approximately 1,700 feet.

The Project site has a history of commercial and industrial uses going back more than 100 years. It encompasses the 23-acre former Blue Heron Paper Company plus an existing Portland General Electric (PGE) dam. Characterized by a riprap shoreline and tailraces used to power various mill operations, the site also includes a backwater lagoon, clarifier, buildings and associated infrastructure. The intensive, industrial site operations have altered native habitat with the exception of a limited portion of the riparian basalt outcroppings.

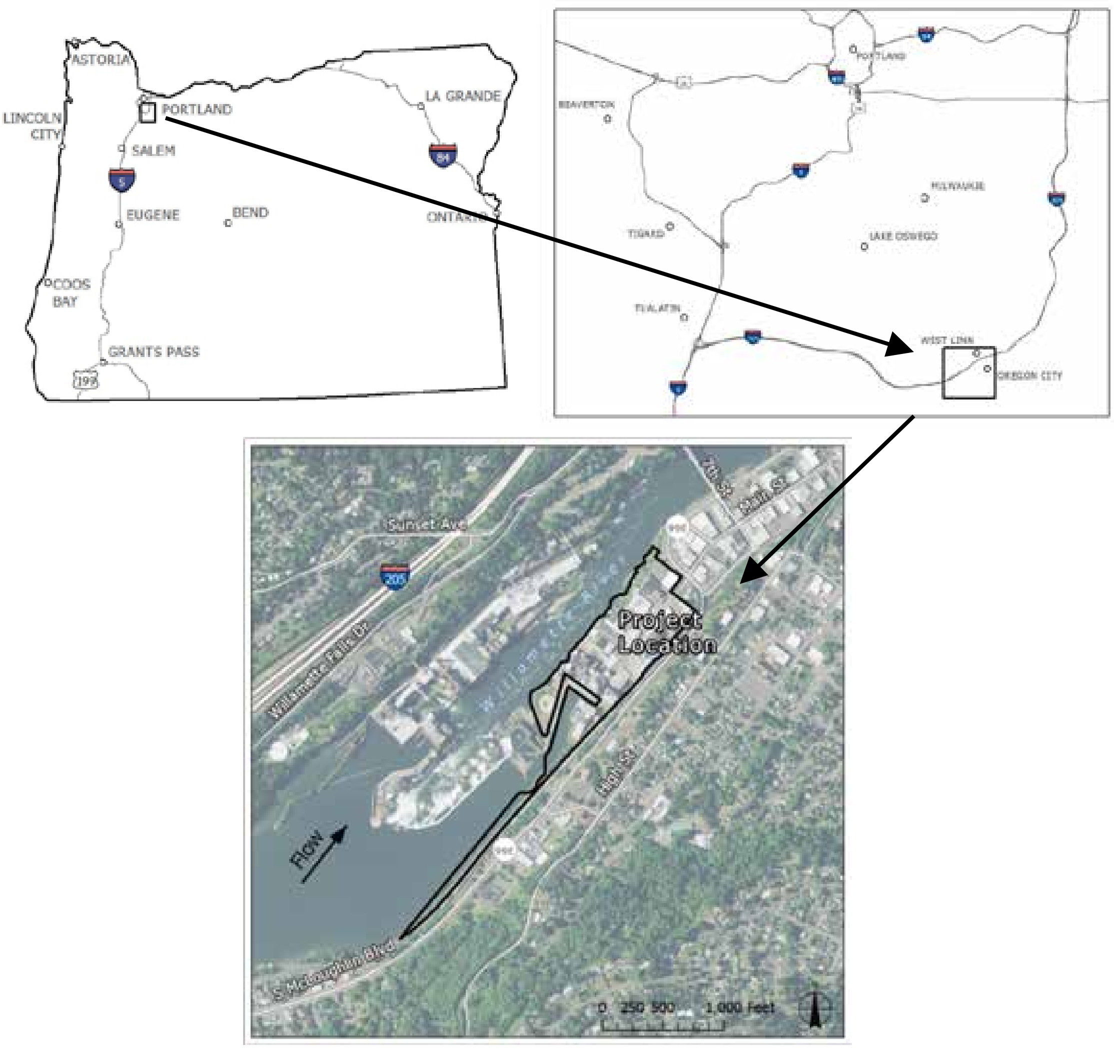

Figure 1. Regional location, vicinity and project location maps.

3 EXISTING CONDITIONS

Existing environmental conditions and species known to occur at the Willamette Falls Legacy Project site were documented in a baseline report (Stillwater Sciences 2016) with an overview and key species provided below. The report purpose was to deepen the scientific knowledge of site habitat, species and priorities in support of future site restoration and public access. It additionally highlighted regional conservation priorities and key environmental factors to be considered in the conceptual design process.

3.1 Terrestrial Habitat Types

Existing habitats on the project site are relatively small and highly fragmented due to the presence site development, highways (I-205 and SR 99E) and the adjacent railroad. Historic fill and grading of the site have further decreased the amount of natural habitat available at the site. The following terrestrial habitat types are found on the project site or immediate vicinity. Examples of plants, invertebrates, fish, amphibians, reptiles, and mammals that have a moderate to high likelihood of occurrence in terrestrial habitats are provided below. It is worth noting that species are not always exclusive to a singular habitat type, as each habitat may provide multiple life requirements for individual species. For example, bats may forage for aquatic and terrestrial insects in each of the habitats, while roosting in basalt cracks, riparian forest and upland forests.

3.1.1 Riparian basalt

The project site and vicinity are predominantly underlain with basalt bedrock similar to the falls and bluff. As such, nearly all habitat types found on site intersect with the occurrences of exposed or soil-mantled basalt bedrock. Industrial developments within the project area have significantly altered these habitats primarily through fragmentation from the many facilities whose construction covered, removed, and filled large portions of the basalt-dominant floodplain-terrace between the river and the bluffs (Stillwater Sciences 2016). The locations of basalt bedrock exposures were mapped to assist with identifying existing and desired future habitat conditions throughout the project area. The methods and results of the basalt mapping are presented on Appendix A.

Native plant diversity is relatively high for some of the riparian basalt habitat found on site including drought-tolerant and herbaceous plant species such as delphinium, sedums, and cluster lilies. Additional species diversity is achieved in shallow depressions of the basalt layer that hold water and thereby form unique wetland habitats.

Key plant species: Idaho fescue (formerly Roemer’s fescue), arrow-leaf wild buckwheat, Richardson’s penstemon, broadleaf stonecrop, wild mock orange, various mosses

Key wildlife species: *special-status* Western pond turtle and fringed myotis (bat). *non-special status* Oregon fairy shrimp, Pacific chorus frog, and American beaver.

Figure 2. Riparian basalt habitat adjacent to the clarifier and along the shoreline of the project site.

3.1.2 Riparian forest

Riparian forest habitat is found along the streambank and channel margins of the Willamette River and subject to moist, saturated conditions and associated with alluvial soil.

Figure 3. Riparian forest habitat of the Project adjacent to the lagoon. Willamette Falls in the background.

Key plant species: red alder, white alder, big-leaf maple, Pacific ninebark, Oregon ash, various willows (Pacific, Sitka, Scouler's), American dogwood, Douglas spirea

Key wildlife species: *special-status* band-tailed pigeon, chipping sparrow. *non-special status* wood duck, Anna's hummingbird, black-capped chickadee, coyote, and common raccoon.

Large areas of the Project site may have been historically dominated by this habitat but due to significant alterations and industrial development, this habitat has been reduced to small patches.

3.1.3 Upland forest

Upland forest areas with large conifer and deciduous trees are found on mid to toe of slopes on valley floors as exemplified at the Canemah Bluff and Willamette Narrows natural areas immediately upstream of the site. The interior portions of the Project site may have been historically dominated by this habitat but due to significant alterations and industrial development this habitat is now limited to a narrow corridor alongside the railroad spur.

Figure 4. Mature upland forest habitat typical of conditions historically found in the Willamette Valley.

Key plant species: Douglas fir, Western red cedar, big-leaf maple, oso berry, thimbleberry, holly-leaved Oregon grape

Key wildlife species: *special-status* acorn woodpecker, slender-billed nuthatch, silver-haired bat. *non-special status* house wren, orange-crowned warbler, red-breasted sapsucker, and long-tailed weasel

3.1.4 Oak woodland savanna

Oak woodland savanna is an Oregon Department of Fish and Wildlife (ODFW) conservation strategy habitat and known to occur on the nearby Canemah Bluffs and Camassia Preserve. Comprised of hilltops and slopes of dry to mesic grasslands along with patches of shrubs and Oregon white oak (Quercus garryana), this habitat type does not current exist at the Project site. Nevertheless, similar vegetation and associated pollinators and birds are found onsite in the riparian basalt habitat.

Key plant species: Oregon white oak, slender hair grass, Idaho fescue

Key wildlife species: *special status* American peregrine falcon, Lewis's woodpecker, and long-legged myotis (bat). *non-special status* Wilson's warbler, rubber boa, and bush tit.

3.2 Aquatic Habitat Types

The following aquatic habitat types are found on the project site or immediate vicinity: in-channel river and off-channel aquatic. Habitat descriptions along with examples of plants, invertebrates, fish, amphibians, reptiles, and mammals that have a moderate to high likelihood of occurrence in aquatic habitats are provided below.

3.2.1 In-channel river

In-channel river habitat areas on the Willamette River are important to a wide range of native fish and wildlife species. Integrating tributary headwaters down to the valley floor, this habitat type serves as an iconic feature of the Northwest landscape. It includes open water riverine areas with no vegetation and islands of basalt rock formed in-channel at low water. In general rivers, streams, and open waters provide multiple ecological services, including: attenuating flood flows, recharging ground water, sediment storage and transport, diluting and converting harmful nutrients, water delivery and atmospheric heat moderation. Mainstem rivers such as the Willamette also support high levels of biodiversity and provide critical migration and movement corridors for fish, wildlife and birds (Intertwine Alliance 2012).

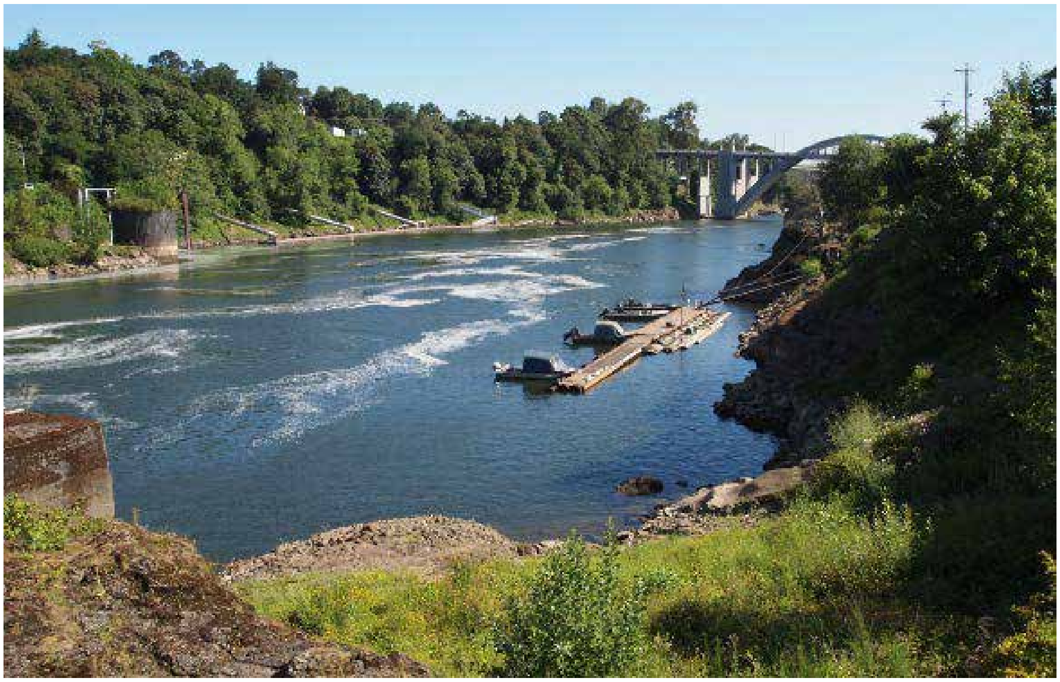

Figure 5. In-channel river habitat adjacent to northern end of the project site.

Key wildlife species: *Special status* Pacific Lamprey, Spring-run Chinook Salmon, Steelhead, and Western painted turtle. *non-special-status* white sturgeon, Osprey, double-crested cormorants, and California sea lion

3.2.2 Off-channel alcove

Off-channel alcove habitat areas on the Willamette River are important for native fish, amphibians and birds seeking habitat diversity as well as refuge from high flow conditions. Emergent native wetland as well as floating aquatic plant communities are associated with off-channel alcove areas. In the lagoon, vegetation covers an estimated 5–10% of its extent and is a mix of floating aquatic plants, algae, and weedy herbs and forbs along the fringes as well as a few shrubs and saplings growing out of a berm in the lagoon.

Figure 6. Off-channel alcove habitat surrounded by riparian basalt and remnant infrastructure.

Key plant species: lateral sedge, marsh spike-rush, soft rush, spreading rush, rice cutgrass, Douglas spiraea

Key wildlife species: *Special-status* Pacific lamprey, coho salmon, Northern red-legged frog, common nighthawk. *Non-special status* common garter snake, green heron, great blue heron, belted kingfisher, and river otter.

4 STAKEHOLDER ENGAGEMENT

The development of habitat design ideas and conservation targets for the riverwalk project included consultation with staff from Oregon Department of Fish and Wildlife, NOAA Fisheries, Portland General Electric, U.S. Army Corps of Engineers, US Fish and Wildlife Service, City of Oregon City's Natural Resource Committee, Greater Oregon City Watershed Council, Clackamas River Basin Watershed Council (December 2016) and the public at multiple workshops. The resulting feedback was carefully considered and incorporated into the restoration approach where feasible. There will be continued opportunity for engagement and input from additional stakeholders as the design for phase one is developed.

Key stakeholder feedback included the following:

- Site development creates a unique opportunity to improve essential mainstem river habitat
- Water and basalt are key site elements
- Protection and restoration of riparian basalt habitat is a high priority
- An ideal site for public engagement and education of fish and wildlife species
- Lamprey are a significant species at this culturally important site
- Willamette Falls is a well-documented staging area for fish species with abundant opportunities to educate the public

- Willamette Falls is the only known spawning area for White Sturgeon in the Willamette River
- Enhancing riparian areas will enhance migration corridors for otter, beaver, mink, turtles and other wildlife species

In general, agency staff found the site to be an intriguing opportunity for habitat enhancements and especially public education and involvement.

5 CONSERVATION

The following sections describe the conservation planning process and resulting habitat design and details developed to support the conceptual design of the riverwalk project. The products and perspective herein are intentionally focused on conservation and restoration of priority habitat and species with limited consideration of other development priorities such as public access or economic redevelopment. Such elements will be incorporated into the conceptual design by the core design team.

5.1 Conservation Planning

Development of the Willamette Falls Legacy Project site and riverwalk project are led by an explicit and transparent conservation planning process and framework. This framework, established by Metro and based on The Nature Conservancy's Conservation Action Planning template (The Nature Conservancy 2007), includes conservation targets, key ecological attributes for each target, threats affecting conservation targets and action plans to abate serious threats.

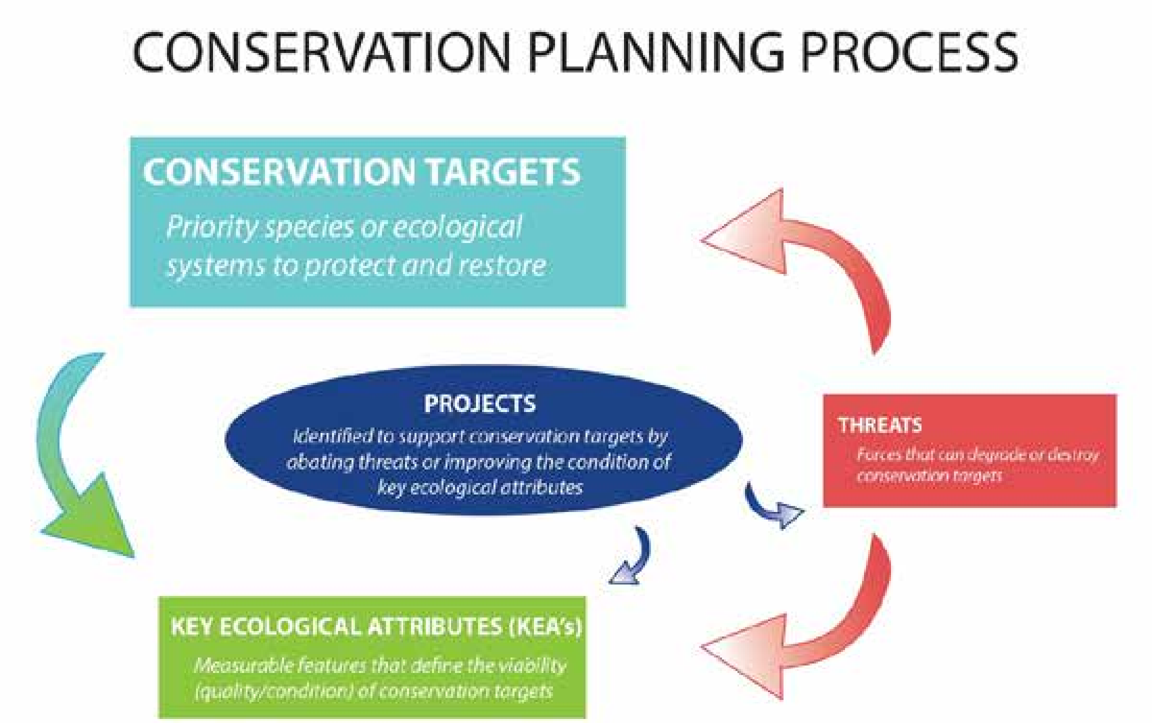

Figure 7. Metro's Conservation Planning Process.

While scientific study is ongoing at the project site, conservation targets defined below will guide the conservation planning process and development of the riverwalk project concept design.

5.2 Prioritizing Strategic Restoration and Stewardship Actions

Using onsite natural habitat types and regional conservation planning efforts as guides, conservation targets were selected that encompass the site's biodiversity values and regional conservation priorities. Prioritizing the resulting conservation targets is essential for several reasons: (1) Budgetary or time constraints are likely to limit how much work can be accomplished at a given site, and (2) Specific actions may rise to the top due to the scarce or unique nature of a habitat type or because abating a certain threat now will save time and money in the future. Table 1 identifies conservation targets, associated habitat types and assigns priority rankings to conservation targets with rationale. The rankings do not imply that the other actions are not important, simply that they are not the most important actions within the next 3–5 years.

Table 1. Priority status for riverwalk project conservation targets.

Conservation target	Habitat Type	Priority	Rationale for prioritization rank
Native Fish	Off-channel alcove/In-channel river	High	Federal and state listing of Chinook and trout species by the Endangered Species Act
Riparian Basalt	Riparian basalt	Medium–High	Unique and high value habitat (ODFW Conservation Strategy)
Riparian Forest	Riparian forest	Medium	Valued habitat, but rated lower due to site constraints
--	Upland forest	Low	Not linked to a conservation target
--	Oak woodland savanna	Low	Not linked to a conservation target

5.3 Key Ecological Attributes

An essential component of the conservation planning process, key ecological attributes (KEAs) are aspects of a conservation target's biology or ecology that, if missing or altered, would lead to the loss of that target over time (The Nature Conservancy 2007). KEAs determine the conservation target's viability. They are the biological or ecological components that most clearly define or characterize the conservation target, limit its distribution, or determine its variation over space and time. Table 2 documents the KEAs associated with conservation targets at the Willamette Falls Legacy Project Site.

Table 2. Riverwalk project conservation target and key ecological attributes.

Conservation target	Attributes of healthy habitat
Native fish	The Willamette River provides important habitat to native salmonids, sturgeon, lamprey and other resident native fish. Native fish require habitat complexity along the mainstem and alcove areas for resting during high flow conditions, an intact riparian area to provide shade and organic matter, and instream structure (large woody debris and boulders) to reduce predation.
Riparian basalt	Basalt outcrops and rocky substrate along the shoreline provide outlier habitat for both mesic and xeric species, similar to vegetation assemblages found in neighboring oak habitat and key habitat for pollinators and birds. Depressional areas within the riparian basalt surface also create unique and highly valued vernal pool habitat.
Riparian forest	Healthy riparian forests are relatively wide (typically 100-200+ feet each side of stream) with a dense mix of native trees and shrubs with rich native species diversity in all layers. Downed wood and snags are important components of riparian forest composition to support wildlife diversity.

5.4 Threats to Conservation

An effective conservation strategy requires an understanding of threats to targets and the sources of those threats. Adjacent development and subsequent disruption of natural systems place stress on the resource and its inhabitants and threaten the health of the greater ecosystem. At the Willamette Falls Legacy Project Site, the following threats are evident:

- Competition by invasive plant species
- Altered vegetation structure
- Human disturbance (historical use by industry and future development)
- Altered hydrology both at a watershed scale and reach scale
- Simplified and filled shorelines

6 RESTORATION

This restoration plan outlines strategic actions to be carried out at the Willamette Falls Legacy Project Site over the next 10 years. Actions are based on the short- and long-term goals established for each of the conservation targets. The strategic actions described herein are general courses of action to achieve objectives and should not be considered highly prescriptive. Additional and more specific prescriptions will be developed to address site-specific conditions encountered in the areas targeted for restoration action.

Approximately 9.2 acres of habitat are in need of restoration throughout the Willamette Falls Legacy Project Site.

Conservation Target: Native Fish Habitat

Short-term goals 2017–2022

- Restore habitat health and complexity along shoreline areas given current and foreseeable land use and recreational regimes.
- Increase habitat complexity within the off-channel alcove areas.
- Educate the public about the native fish populations and benefits of improved habitat.

Long-term goal

- Restore habitat suitable for native and ESA listed fish species present in the Willamette River and at the Willamette Falls Legacy Project Site.

Strategic restoration actions

- Restoration actions should be initiated to restore habitat suitable for native fish species present in the Willamette River and associated river habitats.
- Expose historic shoreline and create additional off-channel alcove habitat.
- Install large wood jams (pieces > 24 inches in DBH, length > 30 ft) and boulders (> 52cm) within off-channel alcove habitat to increase complexity.
- Remove structures and industrial debris along the shoreline and in-water areas that is not necessary for re-use or historic and cultural preservation.

Conservation Target: Riparian Basalt

Short-term goals 2017–2022

- Limit new impacts to riparian basalt habitat.
- Reduce the presence of non-native invasive species
- Increase percent cover of native herbaceous plants in all existing riparian basalt habitat areas.
- Limit or discourage public access to riparian basalt habitat areas.

Long-term goal

- Restore basalt habitat for dependent wildlife species and to protect this uncommon habitat.
- Preserve unique and visually defining geological features that provide habitat and connectivity to neighboring conservation areas.

Strategic restoration actions

- Restoration actions will be initiated to control non-native invasive species and increase the cover of native herbaceous species on riparian basalt habitat areas.
- Remove structures and industrial debris from riparian basalt habitat that is not necessary for re-use or historic and cultural preservation.
- Repair damage or altered riparian basalt habitat with concrete patches and creation of vernal pools.

Conservation Target: Riparian Forest

Short-term goals 2017–2022

- Increase percent cover of native trees and shrubs in all riparian forest habitat areas.
- Limit or discourage public access to select shoreline habitat areas to allow natural establishment of riparian forest habitat plant species.
- Limit introduction and development of invasive and undesirable plant and wildlife species populations through education and weed management.

Long-term goal

- Restore habitat suitable for riparian forest-dependent wildlife species. Healthy riparian areas are also linked to native fish conservation listed above.

Strategic restoration actions

- Restoration actions will be initiated to control non-native invasive species and increase the cover of native trees and shrubs.
    - New native tree and shrub plantings should be focused in riparian areas that have less than 30% canopy cover or less than 30% shrub cover.
- Invasive species management of reed canarygrass, blackberry, Scots broom, thistle and other common broadleaf weeds should be focused in areas of restoration plantings.
- Early detection and treatment of invasive species such as ludwigia and knotweed. Treatments would occur between 1 and 2 year intervals. Treatment on adjoining private and public lands should be explored to reduce long term risks of re-establishment.
- Install and maintain invasive species educational signage.
- Expose historic shoreline and create additional riparian forest habitat.
- Remove structures and fill from riparian forest habitat and floodplain areas that are not necessary for re-use or historic and cultural preservation.

6.1 Desired Future Conditions

The Desired Future Conditions (DFC) map (Appendix B) was developed by Metro and the core design team and then further refined by Stillwater Sciences. The map illustrates six primary habitat types and their proposed locations designed to support the conservation targets and KEAs listed above. The habitat types include (1) in-channel river, (2) off-channel alcove, (3) riparian basalt, (4) riparian forest, (5) upland forest, and (6) oak woodland and savanna (Stillwater Sciences 2016). The DFC map is currently focused on shoreline habitat, but may be expanded to the full site in future revisions. Areas on the river side of the basalt shoreline were classified as in-channel river habitat. Areas on the landward side of the basalt shoreline within known topographically low areas (i.e., on river-side of the red-lined cliff margin) were assigned as alcove. Areas on the landward side of the cliff margin were assigned as one of the other habitat types – i.e., riparian forest or upland forest. The DFC map is a living document that will be advanced throughout the course of the conceptual design. When considering other core values of the site restoration such as public access, it is important to consider the sensitivity of the proposed habitats. Where possible, public access through the restoration areas should be on restricted pathways and boardwalks that enable visitors to experience the site with minimal disturbance. Riparian basalt and the steep slopes surrounding alcove habitat are particularly vulnerable to anthropogenic impacts.

The following subsections identify the restoration priorities for each habitat type followed by site-specific revegetation recommendations in Section 6.2.

6.1.1 Off-channel alcove habitat

Alcove habitat historically existed in greater abundance along the site shoreline. Much of the former off-channel habitat has been filled in and covered by infrastructure. Restoration of alcove habitat serves as a key opportunity for enhancing slow water refuge for native fish (i.e. Chinook steelhead and Pacific lamprey) as well as other aquatic species. Appendix C illustrates elements of typical alcove habitat including revegetation with native species, increased habitat complexity with instream structure, and the addition of planting substrate on the underlying basalt to support the development of surrounding riparian and upland forest habitat. The proposed longitudinal gradient of alcove habitat has yet to be illustrated as it requires further consultation with agency staff from ODFW and NOAA fisheries. The gradient could be designed to provide pool habitat for amphibians, reptiles and birds. Such conditions currently exist in the alcove habitat south of the clarifier; however, replicating such conditions would create a stranding risk for native fish and thus a continuous slope down to the shoreline may be preferred.

6.1.2 Riparian basalt habitat

Preserving habitat and increasing the diversity of native historical species on basalt outcrops at Willamette Falls is a primary conservation and restoration target. Although portions of the rocks are subject to periodic scouring by high river flows, higher ledges and cliffs are free of scour and could support an array of sensitive species. As listed above, strategic restoration actions for this habitat include: (1) control of non-native invasive species and increase the cover of native herbaceous species on riparian basalt habitat areas, (2) removal of structures and industrial debris from riparian basalt habitat not necessary for re-use or historic and cultural preservation, (3) repair of damaged riparian basalt habitat with concrete patches and (4) creation of vernal pools.

6.1.3 Riparian forest habitat

Riparian forest, a once abundant habitat type on the banks of the Willamette River, is degraded and largely absent from the site. Proposed restoration would improve the health of existing riparian forest as well as expand the existing footprint. As listed above, strategic restoration actions for this habitat type includes: (1) control of non-native invasive species, (2) increase in cover of native trees and shrubs with a focus on riparian areas that have less than 30 percent canopy cover or less than 30% shrub cover, (3) installation and maintenance of invasive species educational signage, (4) exposure of historic shoreline and the creation of additional riparian forest habitat, and (5) removal of structures and fill from riparian forest habitat and floodplain areas that are not necessary for re-use or historic and cultural preservation

6.1.4 Upland forest habitat

Upland forest habitat is proposed in two areas of the site as shown in Appendix B and will provide important diversity and connectivity to neighboring habitats. Although it is not listed as a conservation target, restoration of this habitat type is recommended for later phases of the site development.

6.1.5 Oak woodland and savanna habitat

Oak woodland and savanna existing on the bluffs overlooking the project site as well as downstream in the Willamette Narrows. Current restoration plans for the site do not include the addition of oak woodland and savanna habitat; however, should that change, revegetation recommendations are provided in Section 6.2 of this report

6.2 Revegetation Plans

Revegetation plans were generated for the five habitats shown in the Desired Future Conditions map: riparian forest, oak woodland, upland forest, riparian basalt, and off channel alcove. Each plan provides key native plant species best suited for these habitats based on soil moisture, flood tolerance, shade competition, riparian wildlife habitat, and sediment retention/streambank protection. Native vegetation was selected for the appropriate Willamette Valley seed zone and elevation. In addition, vegetation in the physiographic region were reviewed to confirm selected species were appropriate for the site and to ensure successful establishment.

Revegetation of the five habitats is intended to restore site conditions to healthy, resilient ecosystems, a process similar to the Rapid Riparian Revegetation (R3) developed in the Portland Metro region. This approach aims to promote the rapid transition of degraded riparian areas to those characterized by high diversity and function and by lowering the unit cost of revegetation through greater efficiency in site-appropriate implementation. It includes one to three years of site preparations, largely treating invasive weeds, implementation, followed by three to five years of maintenance to establish the plantings to a free to grow state.

Prior to planting, site preparation of the planting areas will include the manual (e.g., uprooting plants, hand cutting), mechanical (e.g., mowing, flail mowing), and chemical (i.e., herbicide treatment) removal and control of nonnative and invasive weed vegetation to decrease competition for future planted native species. To the extent possible, existing patches of native trees and shrubs (*Salix* spp. [various willows]) will be retained. Soil amelioration following construction activities may be required. Prior to planting the soils surface will be inspected and surface ruts, slope, and compaction corrected while following appropriate erosion and sediment control practices. If possible, topsoil and leafy organic matter removed from these activities should be staged for later re-application. In areas of basalt substrate, soil augmentation at appropriate depths suitable herbaceous grass and wildflower establishment and sustained growth will be required. Specific soil and sediment application methods, composition, slope angle of channel margins, bank stabilization and other details will be developed in later stages of the restoration design for each habitat type. Furthermore, plantings will be appropriately matched to planting basins based on soil composition, depth to water table, and rooting depth. If planting efforts do not immediately follow site preparation, a locally sourced native grass seed mix customized for site conditions will be dispersed at roughly 8 to 12 pounds per acre to provide temporary cover, stabilize banks, minimize loss of exposed soils and suppress annual forb and weed establishment. Additional erosion control measures, (e.g., jute, straw, erosion control fabric, coir logs straw, etc.) may be installed for areas with high flood occurrence.

Plantings will consist of seeds, plugs, cuttings, bare root shrubs and trees, and container stock of shrubs and trees. Each propagule form will be planted within its associated planting window following the specific care instructions for the species. Depending on conditions, supplemental water may be required to encourage successful establishment and rooting of plantings throughout the early stages of growth. Plantings will follow a meandering row design to create more natural looking forests while still facilitating maintenance activities.

Key native plant species and their associated minimum soil depth are listed by habitat type in the following tables (Tables 3-8). A comprehensive list of recommended plant species by habitat type is provided in Appendix D.

6.2.1 Off-channel alcove habitat

Off-channel alcove habitat is situated along inlets of the shoreline and once restored will provide habitat for wildlife and other aquatic species. To increase habitat complexity and instream structure, revegetation by native, emergent plant species suitable to alcove habitat is planned. After fine sediment accumulation and infrastructure is removed from this habitat, addition of suitable substrate will be required. Key plant species selected for this habitat along with their minimum soil depth requirement is provided in Table 8. Seeds can be directly sown into the planting substrate. Plug and bare root plantings will be manually planted in a hole dug large enough to entirely contain the seedling roots including lateral roots and ensuring proper root-soil contact. Additionally, the contractor will limit exposure of the seedling, re-wet roots prior to planting, adjust planting depth based on site soils (well-drained, poorly drained), and backfill the basin with weed-free substrate. Recommended plug spacing for emergent plant species is typically 12 inches.

Table 3. Key native plant species selected for revegetation in the off-channel alcove habitat of the Willamette Falls Legacy Project Site.

Scientific name	Common name	Form	Minimum soil depth (cm)
Carex unilateralis	lateral sedge	perennial (per.) grasslike herb	-
Eleocharis palustris	marsh spike-rush	per.grasslike herb	24
Eleocharis ovata	ovate spike-rush	per. grasslike herb	-
Juncus effusus	soft rush	per. grasslike herb	33
Juncus patens	spreading rush	per. grasslike herb	22
Scirpus microcarpus	panicled bulrush	per. grasslike herb	18
Leersia oryzoides	rice cutgrass	grass	26
Apocynum cannabinum	Indian hemp	forb	45
Cornus sericea	American dogwood	shrub	32
Spiraea douglasii	Douglas spiraea	shrub	44

Based on plant tolerances for recommended species in off-channel alcove habitat, soils should have a fine and medium to coarse texture with a pH range of 4.3–8.4.

6.2.2 Riparian basalt habitat

Riparian basalt habitat is prevalent throughout the site, most visually evident along the river margin comprised of bluffs and cliff habitat. Portions of the riparian basalt is subject to scour during high river flows which will be a key consideration during revegetation. As described in Christy and Gaddis 2015, bryophytes (moss) are critical for creating habitat for successful vascular plant establishment. Various mosses associated with rocky cliffs and outcrops in the Blue Heron site (e.g., *Scleropodium*, *Racomitrium*, and *Grimmia* spp.), will be transplanted in mats throughout this habitat. To assist with the successful establishment of these transplanted moss mats, treated areas will be installed with exclusion measures (e.g., fencing, rope, signs) to protect against potential human disturbance (e.g., trampling by foot traffic). Planting native herbs and forbs adapted to rocky, dry conditions is planned along the outcrops, crevices and pockets in the cliff faces, as well as shallow depressions of the basalt layer that hold water. Application of planting substrate at depths suitable for key species (noted in Table 3) is required for vascular plant establishment in this habitat. Key plant species selected for revegetation are provided in Table 3. Plantings will be manually planted in a hole dug large enough to entirely contain the seedling roots including lateral roots while avoiding the "J-root" and "L-root" of the taproot, ensuring proper root-soil contact. Additionally, the contractor will limit exposure of the seedling, re-wet roots prior to planting, adjust planting depth based on site soils (well-drained, poorly drained), and backfill the basin with weed-free substrate. Planting densities will be determined by the contractor for each location based on individual plant spacing requirements and available area for planting.

Table 4. Key native plant species selected for revegetation in the riparian basalt habitat of the Willamette Falls Legacy Project Site.

Scientific name	Common name	Form	Minimum soil depth (cm)
Festuca idahoensis (formerly *F. roemeri*)	Idaho fescue	grass	28
Polypodium glycyrrhiza	licorice fern	fern	54
Eriogonum compositum var. *compositum*	arrow-leaf wild buckwheat	forb	-
Eriophyllum lanatum var. *integrifolium*	Oregon sunshine	forb	24
Penstemon richardsonii	Richardson's penstemon	forb	-
Saxifraga mertensiana	Mertens's saxifrage	forb	50
Sedum spathulifolium	broadleaf stonecrop	forb	16
Philadelphus lewisii	wild mock orange	shrub	35
Scleropodium, *Racomitrium*, and *Grimmia* spp.	various mosses	moss	-

Based on plant tolerances for recommended species in riparian basalt habitat, soils should range from medium to coarse texture with a pH range of 5–7.5.

6.2.3 Riparian forest habitat

Riparian forest is positioned along the streambank and channel margins of the Willamette River and is subject to moist to saturated conditions. Riparian plant species well-adapted to this setting were selected for below and above the delineation of ordinary high water (Tables 4 and 5). Multiple native and tree species will be planted to achieve a diverse plant community that will provide key habitat functions (riparian wildlife cover and forage, etc.). Riparian forest will be comprised of moderate to tall trees (up to <30 m at maturity) with at least 30% cover intermixed with shorter shrubs for an overall cover of at least 70% to provide varied vegetation structure. Tree and large shrub species will be planted with 10–15 ft spacing and smaller shrubs with ~6 ft spacing, majority in clusters of 2–5 seedlings to account for possible mortality. The interstices will be seeded or planted with various grasses and forbs well suited to riparian soil conditions (>20% relative cover). Research suggests supplementing riparian tree plantings with grasses may provide additional soil reinforcement in the early years of tree establishment (Pollen-Bankhead and Simon 2010). Streamside edge planting, selected of species with rapid root development and high tolerance to wet conditions with spacing ranging from 2–6 ft, will be applied to achieve bank stabilization and shaded stream surface and banks.

Table 5. Key native plant species selected for revegetation in the riparian forest habitat below ordinary high water of the Willamette Falls Legacy Project Site.

Scientific name	Common name	Form	Minimum soil depth (cm)
Fraxinus latifolia	Oregon ash	tree	32
Salix lasiandra	Pacific willow	tree	36
Salix scouleriana	Scouler's willow	shrub/tree	27
Salix sitchensis	Sitka willow	shrub/tree	90
Cornus sericea	American dogwood	shrub	32
Physocarpus capitatus	Pacific ninebark	shrub	41
Spiraea douglasii	Douglas spiraea	shrub	44
Agrostis exarata	spike bent grass	grass	14
Deschampsia elongata	slender hair grass	grass	26

Based on plant tolerances for recommended species in riparian forest (below OHW) habitat, soils should have a medium to coarse texture with a pH range of 5.1–7.6.

Table 6. Key native plant species selected for revegetation in the riparian forest habitat above ordinary high water of the Willamette Falls Legacy Project Site.

Scientific name	Common name	Form	Minimum soil depth (cm)
Alnus rhombifolia	white alder	tree	18
Alnus rubra	red alder	tree	47
Acer macrophyllum	big-leaf maple	tree	15
Fraxinus latifolia	Oregon ash	tree	32
Salix scouleriana	Scouler's willow	shrub/tree	27
Physocarpus capitatus	Pacific ninebark	shrub	41
Ribes sanguineum	red-flowering currant	shrub	28
Rosa pisocarpa	cluster rose	shrub	81
Deschampsia elongata	slender hair grass	grass	26
Agrostis exarata	spike bent grass	grass	14

Based on plant tolerances for recommended species in riparian forest (above OHW) habitat, soils should have a medium to coarse texture with a pH range of 4.8–8.0.

6.2.4 Upland forest habitat

Upland forest is directly up gradient to the riparian forest at dryer, higher elevations. This habitat is comprised of a mixed coniferous forest. Conifers and mixed deciduous hardwoods comprise majority of the canopy cover in this habitat type (>50% relative cover). The understory will be limited to shrub species well adapted to shade. Conifer and hardwood species will be planted 10–15 ft based on 200–440 stems per acre, with conifers at least 15 ft from the faster growing hardwoods to encourage growth for both species and decrease impacts caused by shade. To achieve a moderate cover of shrub and fern species (40–65% relative cover), seedlings will be spaced in 6–8 ft apart from one another. Herbaceous flowering and fruiting species over 1+ will be planted throughout to provide adequate ground cover (2–4 ft spacing), wildlife and pollinator habitat, and species diversity.

At both riparian and upland forest habitats, bare root, container stock, cuttings, and plugs will be manually planted in a hole dug large enough to entirely contain the seedling roots including lateral roots while avoiding the “J-root” and “L-root” of the taproot, ensuring proper root-soil contact. Additionally, the contractor will limit exposure of the seedling, re-wet roots prior to planting, adjust planting depth based on site soils (well-drained, poorly drained), and backfill the basin with weed-free topsoil. Tree shelters will be installed or ring spray treatments will be applied for species most at risk by wildlife browsing or damage, as well as to reduce competition for resources (e.g., water). The inter-planting and vegetation control (i.e., early season ring spray) at these locations should eliminate the need for irrigation, as observed in sites managed using the R3 approach in the Willamette Valley (Guillozet et al. 2014)

Table 7. Key native plant species selected for revegetation in the upland forest habitat of the Willamette Falls Legacy Project Site.

Scientific name	Common name	Form	Minimum soil depth (cm)
Acer macrophyllum	Big leaf maple	tree	15
Pseudotsuga menziesii	Douglas fir	tree	23
Thuja plicata	western red cedar	tree	41
Berberis aquifolium	holly-leaved Oregon grape	shrub	36
Oemleria cerasiformis	oso berry	shrub	13
Ribes sanguineum	red-flowering currant	shrub	28
Rosa pisocarpa	cluster rose	shrub	81
Rubus parviflorus	thimbleberry	shrub	27

Based on plant tolerances for recommended species in upland forest habitat, soils should have a medium to coarse texture with a pH range of 4.2–7.9.

6.2.5 Oak woodland savanna habitat

Oak woodland is positioned along an upper terrace with limited water availability as it is disconnected from the riparian zone by Highway 99. It is primarily composed of 30 to 70% cover of Oregon white oak. The understory includes native grasses and herbs for 30–60% relative cover with some small scattered, woody shrub plantings (<10% cover) (located between oak plantings to avoid competition) to replicate natural conditions of oak woodland (Vesley and Tucker 2004). Using container stock, Oregon white oaks will be planted approximately 15 ft apart from one another in the fall. To achieve full crowns and attain the fastest possible growth for this species, early thinning may be required as young oaks which grow under crowded conditions develop small, lopsided crowns (Vesley and Tucker 2004). The ground at each planting location will be prepared by clearing grass, thatch, and any herbaceous vegetation in a three-foot diameter circle and digging or augering a planting basin deeply enough to contain the entire rootball plus surrounding soil up to the base of the seedlings/saplings trunk. If soils are rocky, stones will be removed from planting basins and replaced with extra-fine textured soil. When planting the taproot should be directed straight down and avoid “J-rooting” which decreases chance of survival (Vesley and Tucker 2004). Planting basins will be backfilled so that the root crown is level with the ground with a weed-free topsoil mix (sand and topsoil) in order to discourage weed competition at each planting site. The 3-foot diameter area around each planting will be covered with weed inhibiting fabric and a thick layer (4–6 inches deep) of oak/manzanita chippings obtained locally. Tree shelters will be used to protect seedlings from animal browse damage, wind, and other natural occurrences. In addition, the greenhouse environment created by the shelter can promote seedling growth. Plant protectors will remain in place until saplings reach a height of approximately three feet. Unless the ground is saturated at the time of planting, all planting locations will be "watered in" with supplemental irrigation immediately following planting. Grass and herbaceous plantings (~ 2–4 ft spacing) and/or seed will be dispersed between oak plantings with special care in spacing to eliminate competition to oak seedlings. Selected herbaceous plants include those that will provide important habitat for pollinators.

Table 8. Key native plant species selected for revegetation in the oak woodland savanna habitat of the Willamette Falls Legacy Project Site.

Scientific name	Common name	Form	Minimum soil depth (cm)
Quercus garryana	Oregon white oak	tree	42
Festuca idahoensis (formerly *F. roemeri*)	Idaho fescue	grass	28
Deschampsia elongata	slender hair grass	grass	26
Achillea millefolium	common yarrow	forb	13
Balsamorhiza deltoidea	deltoid balsam-root	forb	29
Eriophyllum lanatum var. *integrifolium*	Oregon sunshine	forb	24
Plectritis congesta	rosy seablush	forb	20

Based on plant tolerances for recommended species in oak woodland savanna habitat, soils should have a fine to medium texture with a pH range of 5–7.2.

It is recommended a monitoring plan and program be developed to measure survivorship and vigor of plantings, and address any potential issues and subsequent adaptive management or remediation required to ensure the successful establishment of the revegetated habitats.

7 REFERENCES

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Appendices

Appendix A

Riparian Basalt Mapping of the Willamette Falls Legacy Project Site

1 INTRODUCTION

This appendix summarizes the methods and results from an evaluation of basalt bedrock exposures at the Willamette Falls Legacy Project Site. The Baseline Habitat Conditions report prepared for the project identified six primary habitat types as being present and/or potentially present within the project area: (1) in-channel river, (2) off-channel aquatic (alcove), (3) riparian basalt, (4) riparian forest, (5) upland forest, and (6) oak woodland and savannah (Stillwater Sciences 2016). Because the project site and vicinity are mostly underlain with basalt bedrock similar to the falls and bluff, nearly all of these habitat types intersect with the occurrences of exposed or soil-mantled basalt bedrock. The industrial developments within the project area have significantly altered these habitats primarily through fragmentation from the many facilities whose construction covered, removed, and filled large portions of the basalt-dominant floodplain-terrace between the river and the bluffs (ESA 2012, Stillwater Sciences 2016).

2 METHODS

The locations of basalt bedrock exposures were mapped to assist with identifying existing and desired future habitat conditions throughout the project area. The mapping effort primarily drew upon available historical documentation to ascertain locations of basalt bedrock that is or could readily be re-exposed at the surface following removal of existing buildings, platform structure, or urban fill areas. The information review included numerous historical topographic maps, aerial photographs, survey design sheets, technical reports, and miscellaneous untitled photographs (Table A-1). Repeat views of the project area, showing basalt bedrock exposures along the river margins based on a historical ground-based photograph taken in 1892 and contemporary imagery from 2016 is presented in Figure A-1.

The mapping effort was aided by a limited field reconnaissance of the project area conducted on November 17, 2016 by Stillwater Sciences. The field reconnaissance was conducted by Senior Ecologist Jody Lando, PhD, and Senior Geomorphologist/Geologist Glen Leverich, MS (Oregon Registered Geologist #2401). Photographs taken during the field reconnaissance are presented in Figure A-2 through A-5. Exposures of basalt bedrock and rocky debris were observed along the riverbank where existing structures were setback from the shoreline thereby allowing the exposures to be easily viewed from multiple perspectives. Other exposures were also noted beneath several buildings that were constructed above the underlying floodplain terrace as a single-level platform, such as along that section of riverbank between Mill O and the Rejects Building (i.e., “South Riverfront”). Sub-level areas were accessed beneath the Hawley Building, Mill H, Boiler Plant, Pipe Shop, Pipe Chase, Mill O, and No. 3 Paper Machine. The foundations of several of these buildings comprised vertical concrete piers. A mix of basalt bedrock and artificial fill composed of basalt rock debris and alluvial soils was observed beneath the buildings. Several of these exposures were noted in the historical ground-based photographs that pre-date construction of several of the existing buildings (see Figure A-1). The mapping effort therefore has attempted to delineate exposures of basalt bedrock that presently support any of the six habitat types, as well as areas where basalt is presently covered by existing buildings which, if removed, could enable the additional restoration of the habitat types. Areas where artificial fill, even if composed of basalt-rock debris, were not included with the mapped areas of basalt bedrock.

Table A-1. Historical and contemporary information sources reviewed to develop the basalt map.

Survey/ Publication date	Document type	Document title	Scale/ Resolution	Source
1800s–present	Oblique Aerial and Ground-based Photos	Miscellaneous Untitled Photographs	N/A	Metro Archives
1852	Map	General Land Office Survey Plat Map, Township No. 2 South, Range No. 2 East, Willamette Meridian, Oregon. John B. Preston, Surveyor General.	N/A	Bureau of Land Management General Land Office Records website: http://www.glorecords.blm.gov/
1914	Map	U.S. Geological Survey Topographic Quadrangle for Oregon City, OR	1:62,500	U.S. Geological Survey, The National Map: Historical Topographic Map Collection website: http://nationalmap.gov/historical/index.html
1936	Aerial Photo	U.S. Army Corps of Engineers Willamette Valley Project	1:15,000	Metro Archives
1952	Aerial Photo	U.S. Geological Survey Aerial Photography, July 13, 1952	1:24,000	U.S. Geological Survey Earth Explorer website: http://earthexplorer.usgs.gov/
1954	Map	U.S. Geological Survey Topographic Quadrangle for Oregon City, OR	1:24,000	U.S. Geological Survey, The National Map: Historical Topographic Map Collection website: http://nationalmap.gov/historical/index.html
1947	Map	U.S. Coast and Geodetic Survey Planimetric Map of Oregon City, Clackamas County, Oregon.	1:9600	National Oceanic and Atmospheric Administration, Office of Coast Survey Historical Map and Chart Collection website: https://historicalcharts.noaa.gov/
1980	Site Survey Design Sheets	Topographic Survey Publisher's Paper Co., Oregon City, Oregon	1:120	Jim Weddle and Associations, Inc.
2009	Map	Geologic Map of the Oregon City 7.5' quadrangle, Clackamas County, Oregon	1:24,000	Oregon Department of Geology and Mineral Industries Publications Center website: http://www.oregongeology.org/pubs/gms/GMS-119.zip

Survey/ Publication date	Document type	Document title	Scale/ Resolution	Source
2012	Site Survey Design Sheets	Blue Heron Paper Mill / Willamette Falls Survey, Oregon City, Oregon, Boundary Survey, 16 sheets	1:600–1:2400	AKS Engineering & Forestry Willamette Falls Legacy Project website: http://www.rediscoverthefalls.com/wp-content/uploads/2015/06/Boundary-Survey.pdf
2012	General Purpose Report	Willamette Falls Legacy Project Habitat and Water Resources Opportunities	N/A	ESA Willamette Falls Legacy Project website: http://www.rediscoverthefalls.com/wp-content/uploads/2015/06/Habitat-and-Water-Resources-Opportunities.pdf
2013	General Purpose Report	Willamette Falls Legacy Project Existing Conditions Report	N/A	Walker|Macy Willamette Falls Legacy Project website: http://www.rediscoverthefalls.com/wp-content/uploads/2015/06/Existing-Conditions.pdf
2014	Aerial Photo	U.S. Department of Agriculture, National Agriculture Imagery Program, Clackamas County, Oregon	1 meter	U.S. Department of Agriculture ArcGIS REST Services Directory website: https://gis.apfo.usda.gov/arcgis/rest/services/NAIP/Oregon_2014_1m/ImageServer
2015	Site Survey Design Sheets	Blue Heron Paper Mill / Willamette Falls Survey, Oregon City, Oregon, Existing Conditions Survey, 25 sheets	1:240–1:600	AKS Engineering & Forestry
2016	Aerial Photo	U.S. Department of Agriculture, National Agriculture Imagery Program, Clackamas County, Oregon	1:12,000	U.S. Department of Agriculture Geospatial Data Gateway website: https://gdg.sc.egov.usda.gov/
2016	Topographic Surface	Willamette Falls Digital Terrain Model Surface	≤1 meter	CH2M
2016	General Purpose Report	Willamette Falls Legacy Project Baseline Habitat Conditions	N/A	Stillwater Sciences
2016	Aerial Photo / Topographic Survey	Google Earth: Imagery July 23, 2016 / 3-Dimensional Buildings on 30-meter Terrain	≤1 meter	Google Earth Application https://www.google.com/earth/

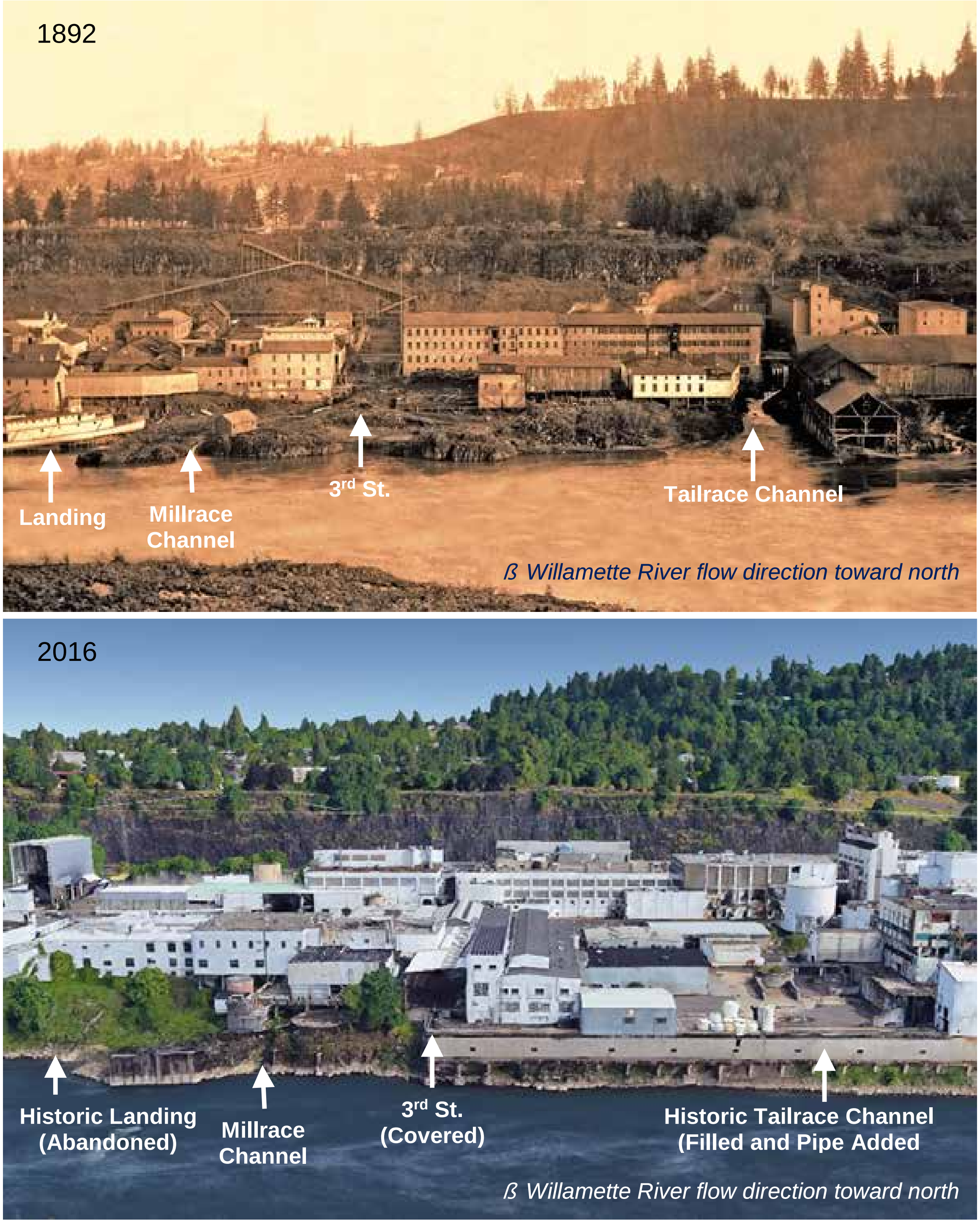

Figure A-1. Repeat views of the project area, showing basalt bedrock exposures along the river margins based on a historical ground-based photograph taken in 1892 looking toward the unpaved 3rd Street (source: Metro archives) (top), and contemporary imagery from 2016 with 3-dimensional topography and buildings rendered in Google Earth (bottom).

Figure A-2. Photographic views of basalt outcrop located near the north (downstream) end of the Project site.

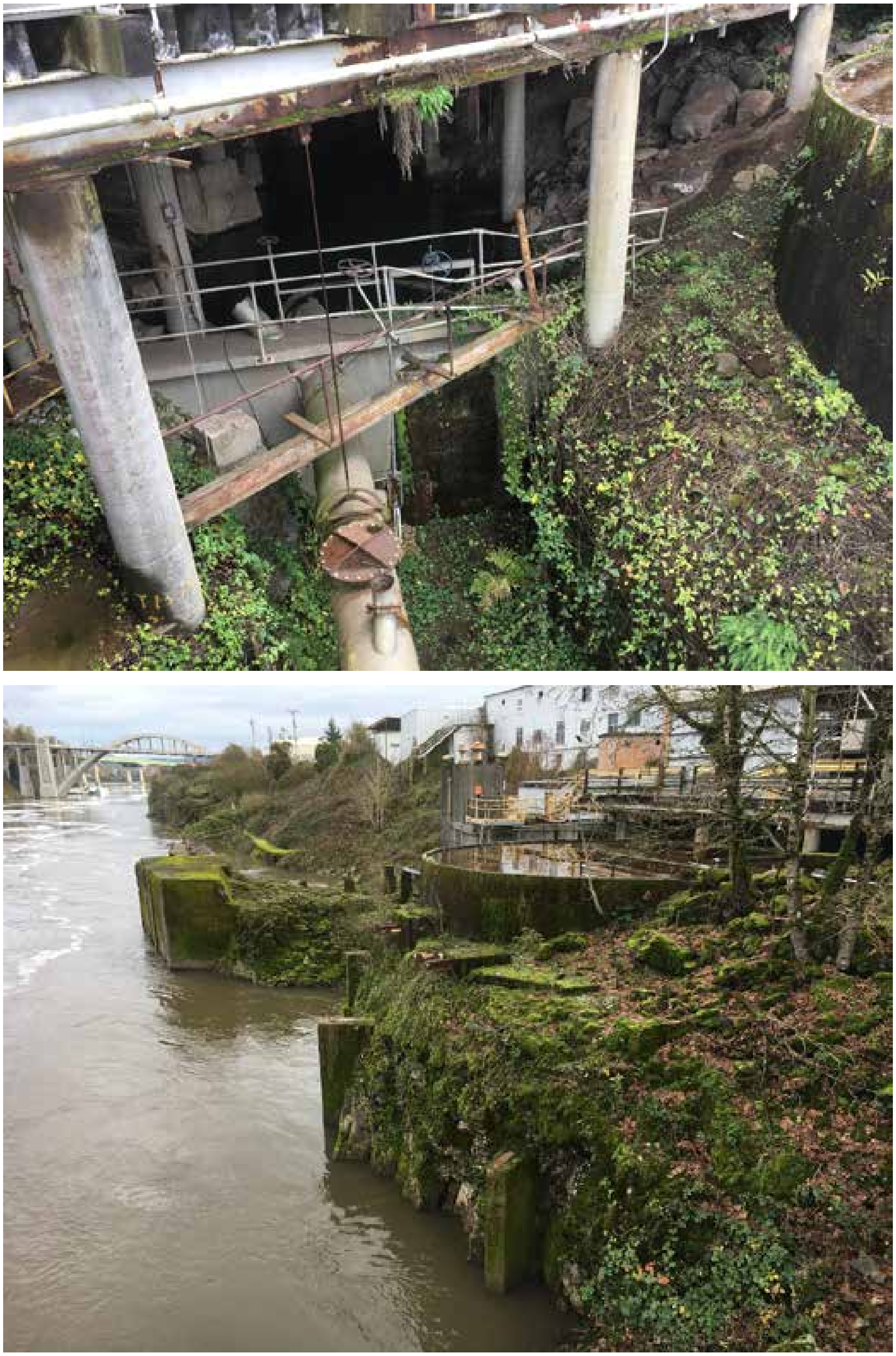

Figure A-3. Photographic views of basalt outcrops and rock debris located near the millrace outlet beneath No. 3 Paper Machine Building #2 (top) and the Circular Tank Foundation 1 (bottom).

Figure A-4. Photographic views of basalt rock debris and fill material located near the tailrace channel beneath the Boiler Plant.

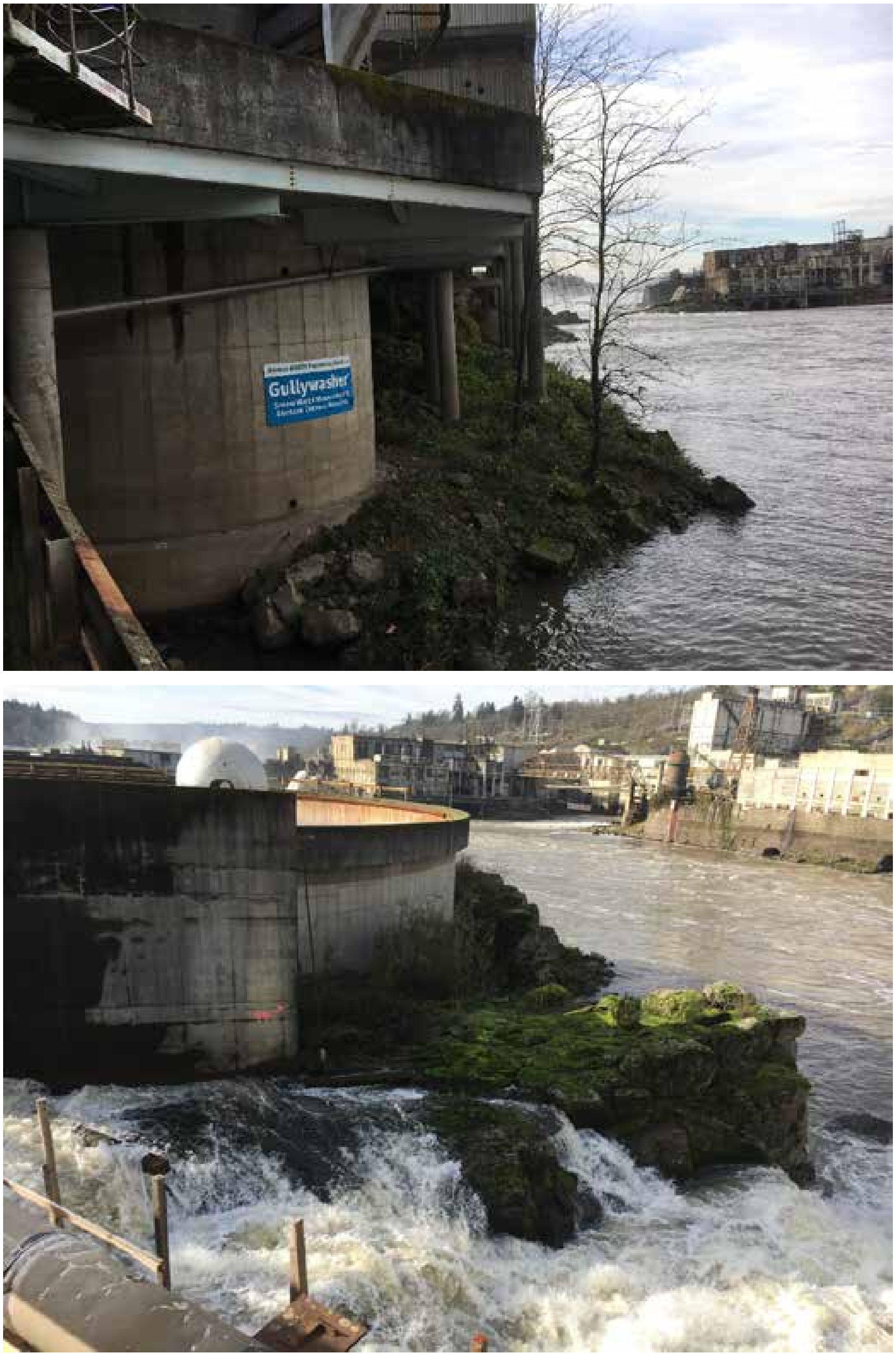

Figure A-5. Photographic views of basalt outcrop and rock debris located near the Boiler Plant and Tank 3 (top) and the Clarifier (bottom).

To the extent practical, the historical and contemporary aerial imagery and topographic survey maps were utilized in a geographic information system (GIS) to assist with delineation of basalt exposures protruding above the presumed low-water line, which was estimated to be approximately 9.0 feet in elevation, as referenced to the North American Vertical Datum of 1988, in the project reach of the Willamette River (AKS Engineering 2015). To record these areas, polygons were initially digitized around basalt features visually confirmed in the 2016 aerial imagery and topography at a scale of 1:500 in the GIS. Other areas not visible in the remote-sensing data, such as those sub-level areas beneath the existing buildings, were inferred based on interpretation of historical data and the November 2016 field reconnaissance. The polygons presented in resulting map were saved in an ESRI shapefile format (.shp), as originally digitized. Spatial errors in the polygon delineation likely resulted from unknown spatial errors inherent to the remote-sensing data and due to difficulties in interpreting features of interest. The polygon dataset was checked extensively for spatial and interpretive accuracy by a GIS supervisor who was not associated with the digitization process.

3 RESULTS

The results of the basalt mapping are presented on Figure A-6. Areas of exposed basalt are depicted with elevation contours to illustrate the local topography. The existing low-flow shoreline of the basalt exposures is demarcated with the solid black lines. In areas where the basalt shoreline was not visible in the field or remote-sensing data, a dashed black line was used to delineate the assumed water-side margin of basalt obfuscated by fill material and/or building infrastructure. The top edge of the exposed basalt cliffs are demarcated with the solid red line, which was based on an abrupt transition in the topographic elevation contours. Finally, the sub-level basalt areas are identified generally by the dark gray polygon, which represents the assumed extent of shallow basalt that is presently covered by fill material and/or building infrastructure. The landward, or southeastern, margin of this area is artificially bounded by the dashed gray line, which is artificially and only meant to indicate that the true lateral and vertical extents are not known as they are obfuscated by the existing buildings and related developments (e.g., the Hawley Building), many of which appear to have existed as early as the oldest available historical records and photographs.

The final mapping product as presented in Figure A-6 is only intended to inform the development of a conceptual-level desired future conditions map and should not be used for engineering design purposes due to the limited nature of the field reconnaissance. A more accurate characterization of the underlying bedrock and soil substrates throughout the project area will require geotechnical explorations utilizing exploratory drilling and/or near-surface geophysical methods.

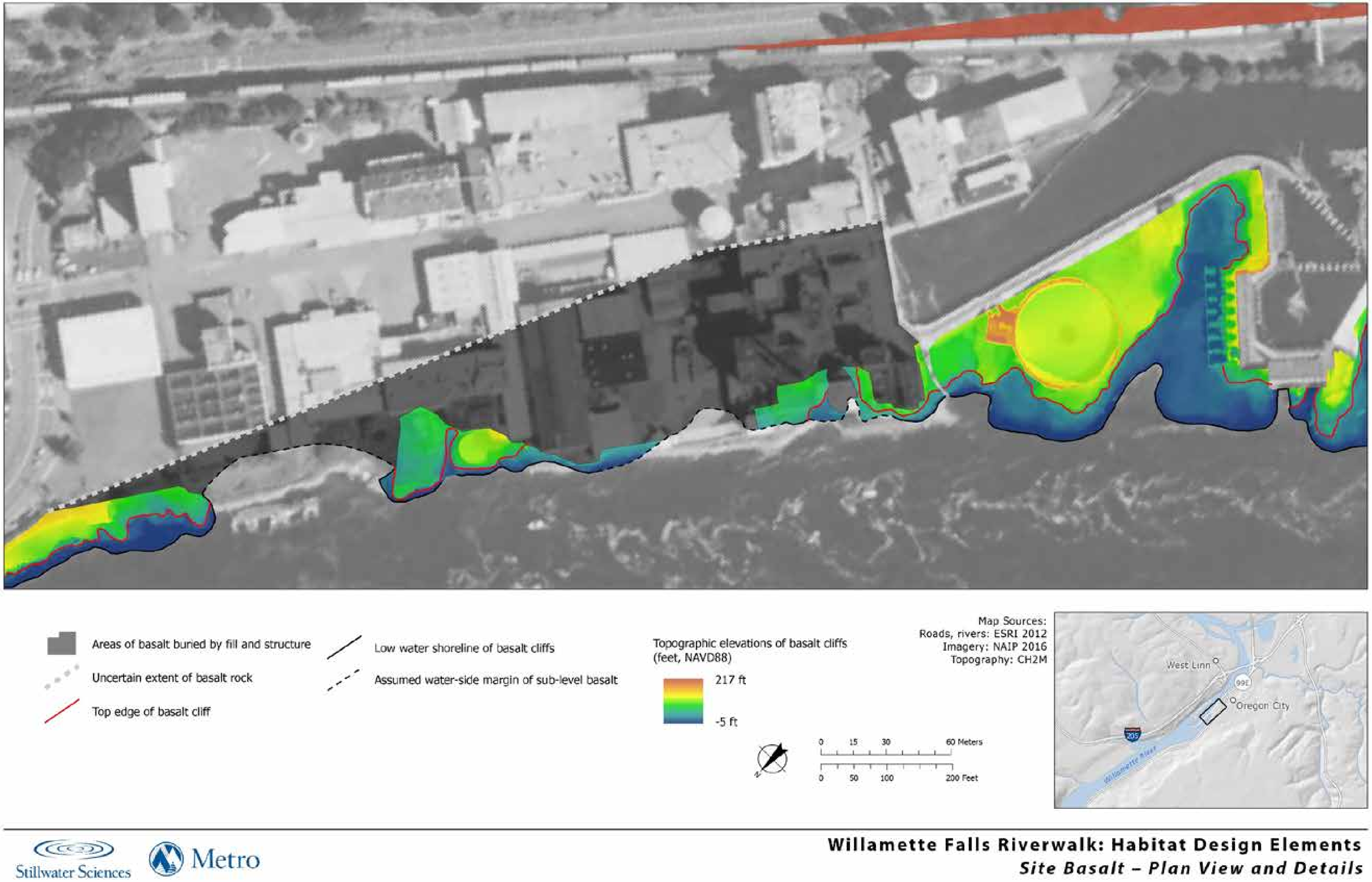

Figure A-6. Plan view map of basalt outcrops mapped at the Project site.

4 REFERENCES

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Appendix B

Desired Future Conditions for Habitat Restoration of the Willamette Falls Riverwalk

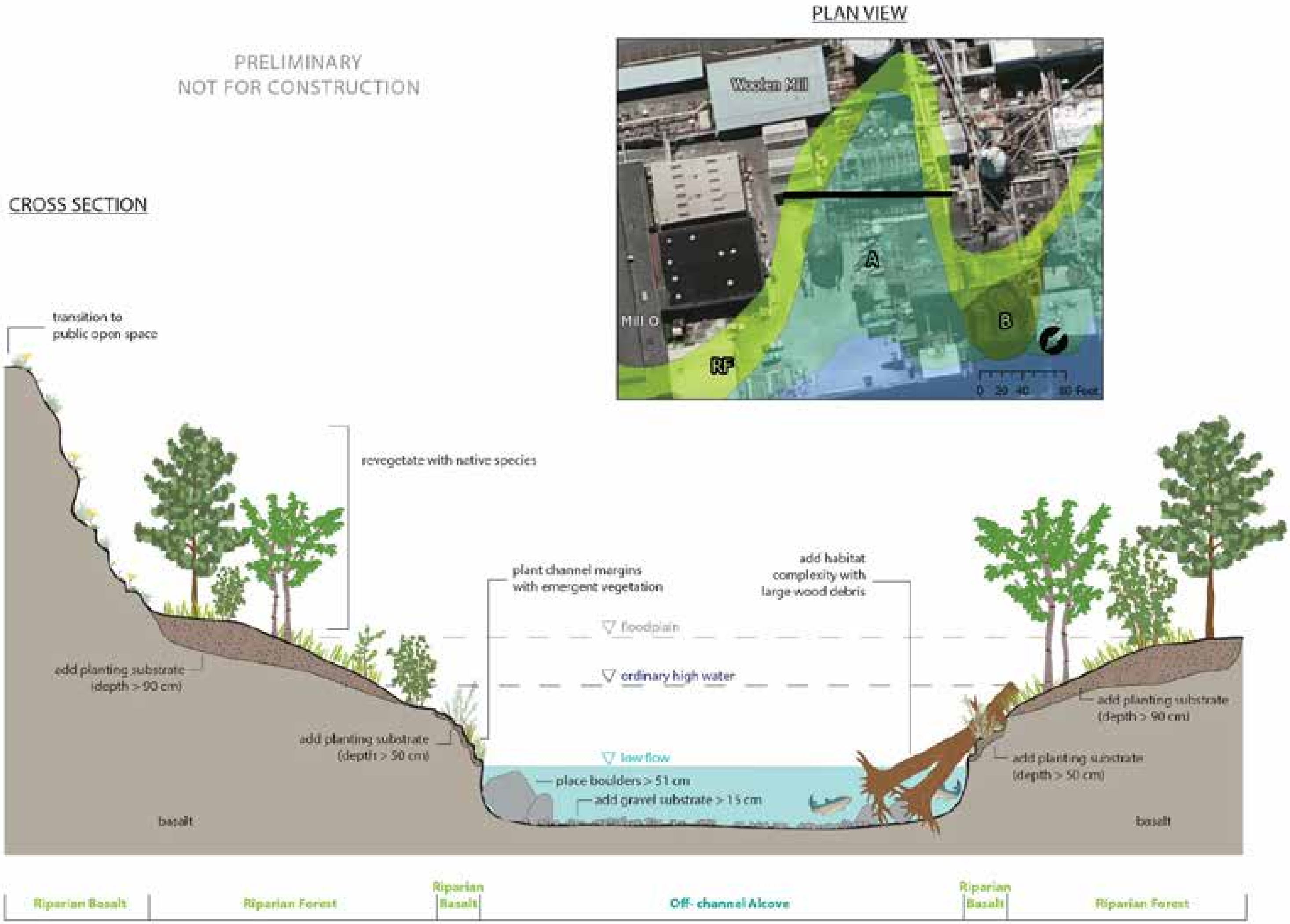
Stillwater Sciences Metro

Willamette Falls Riverwalk: Habitat Design Elements

Desired Future Conditions - Plan View

Appendix C

Typical Alcove Detail applicable to the Willamette Falls Legacy Project Site



Stillwater Sciences Metro

Willamette Falls Riverwalk: Habitat Design Elements
Typical Alcove Detail – Plan View and Cross Section

Appendix D

Comprehensive List of Plant Species Recommended for Revegetation at the Willamette Falls Legacy Project Site

Table D-1. Comprehensive list of plant species recommended for revegetation by habitat type.

Scientific name	Form	Habitat				
		Riparian basalt	Off channel alcove	Oak woodland	Upland forest	Riparian forest
Tree						
Acer macrophyllum	tree				x	x
Alnus rhombifolia	tree					x
Alnus rubra	tree					x
Frangula purshiana	tree				x	x
Fraxinus latifolia	tree					x
Populus trichocarpa	tree					x
Pseudotsuga menziesii	tree				x	
Quercus garryana	tree			x		x
Thuja plicata	tree				x	
Shrub						
Amelanchier alnifolia	shrub			x		
Berberis aquifolium	shrub	x			x	
Cornus sericea subsp. *sericea*	shrub		x		x	x
Gaultheria ovatifolia	shrub				x	
Lonicera involucrata	shrub/vine			x	x	
Oemleria cerasiformis	shrub				x	
Philadelphus lewisii	shrub	x			x	
Physocarpus capitatus	shrub				x	x
Ribes sanguineum	shrub				x	x
Rosa pisocarpa	shrub	x			x	x
Rubus parviflorus	shrub/vine				x	
Salix sitchensis	shrub					x
Salix lasiandra	shrub					x
Salix scouleriana	shrub					x
Sambucus racemosa	shrub					x
Sambucus caerulea	shrub					x
Spiraea douglasii	shrub		x			x
Symphoricarpos albus	shrub			x		
Polypodium glycyrrhiza	fern	x		x		
Polystichum munitum	fern				x	
Herbaceous						
Achillea millefolium	forb			x		
Agrostis exarata	grass				x	x
*Allium amplectens**	forb	x	x			
Apocynum cannabinum	forb		x			
Balsamorhiza deltoidea	forb			x		

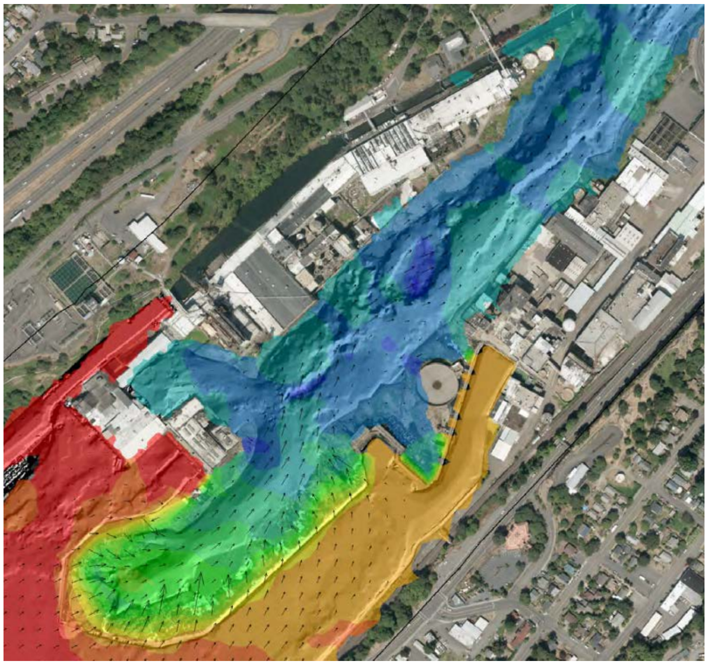
Scientific name	**Form**	**Habitat**				
		Riparian basalt	**Off channel alcove**	**Oak woodland**	**Upland forest**	**Riparian forest**
*Brodiaea coronaria**	forb	x	x			
*Brodiaea elegans**	forb	x	x			
*Calochortus tolmiei**	forb	x				
*Camassia leichtlinii**	forb	x				
*Camassia quamash**	forb	x				
Carex lenticularis var. *lipocarpa**	perennial grasslike herb		x			x
*Carex pachystachya**	perennial grasslike herb		x			x
*Carex cusickii**	perennial grasslike herb		x			
Carex unilateralis	perennial grasslike herb		x			
Clarkia purpurea ssp. *quadrivulnera**	forb	x				
*Collinsia grandiflora**	forb	x				
*Comandra umbellata ssp. californica**	forb	x				
*Crocidium multicaule**	forb	x				
*Danthonia californica**	grass	x		x		
*Daucus pusillus**	forb	x				
Delphinium leucophaeum	forb	x		x		
*Deschampsia danthonioides**	grass	x				
Deschampsia elongata	grass			x	x	x
*Drymocallis glandulosa **	forb	x				
Eleocharis palustris	perennial grasslike herb		x			
Eleocharis ovata	perennial grasslike herb		x			
*Elymus glaucus**	grass	x		x		x
*Epilobium torreyi**	forb		x			
Eriogonum compositum var. *compositum*	forb	x				
Eriophyllum lanatum var. *integrifolium*	forb	x		x		
Festuca idahoensis (formerly *F. roemeri*)	grass	x		x		
Heterotheca villosa var. *villosa**	forb	x				
*Heuchera micrantha**	forb	x		x		
Juncus effusus	rush		x			
Juncus patens	rush		x			

Scientific name	Form	Habitat				
		Riparian basalt	**Off channel alcove**	**Oak woodland**	**Upland forest**	**Riparian forest**
Leersia oryzoides	grass		x			
*Lindernia dubia**	forb		x			
*Lithophragma parviflorum**	forb	x				
*Lomatium utriculatum**	forb	x				
*Lomatium triternatum**	forb	x				
*Madia gracilis**	forb	x				
Maianthemum racemosum	forb				x	
Maianthemum dilatatum	forb				x	
Micranthes (*Saxifraga*) *integrifolia**	forb	x				
Micranthes gormanii (*occidentalis*)*	forb	x				
*Mimulus alsinoides**	forb	x				
*Mimulus guttatus**	forb	x				
*Montia parvifolia**	forb	x				
*Myosotis laxa**	forb		x			
*Navarretia intertexta**	forb	x	x			
*Navarretia squarrosa**	forb	x	x			
*Penstemon serrulatus**	forb	x				
Penstemon richardsonii	forb	x				
Plectritis congesta	forb	x		x		
Prosartes hookeri var. *oregana*	forb				x	
Saxifraga mertensiana	forb	x				
Scirpus microcarpus	sedge		x			
Sedum spathulifolium	forb	x				
Sedum stenopetalum	forb	x				
*Symphyotrichum subspicatum**	forb		x			
Trifolium willdenovii (*obtusiflorum, tridentatum*)*	forb	x				
*Triteleia hyacinthina**	forb	x	x			

* Species recommendation subject to review by Metro staff.

Riverwalk Project
Willamette Falls Legacy Site

Hydraulic Model Development and Characterization of Existing Conditions



Prepared for

Metro

May 2017

HYDRAULIC MODEL DEVELOPMENT AND CHARACTERIZATION OF EXISTING CONDITIONS

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REVISION NO.:	3
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Introduction

The purpose of this memorandum is to provide information and promote early communication regarding existing hydrologic and associated hydraulic conditions at the Willamette Falls Legacy Project site (Site). In addition, it is intended to document technical details of hydraulic model development, to present graphical hydraulic model results and interpretations of existing conditions, and to communicate key assumptions and considerations for the conceptual design phase of the Riverwalk Project (Project). A companion document titled *Willamette Falls Legacy Site Baseline Habitat Conditions* characterizes the existing aquatic and riparian habitats, discusses conservation priorities and restoration rationale, and summarizes key habitat design assumptions at the Site.

This is the third version (Version 3) of this report. Version 1 focused on characterizing existing site hydrology and physical conditions, model development, model assumptions and limitations, and next steps in the calibration process. Version 1 also presented preliminary result for the 2-year recurrence interval (RI) storm event. Version 2 documented revisions to the model that were described as next steps in Version 1, including revisions to the digital terrain model (DTM) and model-mesh configurations to improve the ability of the model to simulate high-flow conditions – that is, flood events large enough to create overland flow through the site. Version 2 also included a descriptive characterization of the 1996 flood (100-year flood). This version (Version 3) describes additional refinements to the model to improve the model's resolution and representation of the physical site conditions at the Falls, provides comparison of model results against recently acquired water level data, and includes additional hydraulic characterization results for all 5 design flows.

Existing Conditions

Hydraulic considerations at the Willamette Falls Legacy Site are important and highly complex. The Site includes many different physical features, both natural and anthropogenic, and accommodates a wide array of uses, including providing critical habitat for unique and threatened species, providing unique cultural and recreational opportunities for the public, and providing economic benefits for the community. An important first step in the Riverwalk Project is to characterize existing hydraulic features and functions of the site, and identify them early in the design process. This document is intended to provide the Design Team with an understanding of the current hydraulic characteristics and constraints for consideration in the conceptual design process.

Hydrology

Hydrology is the science of characterizing flow - the amount of water (how much), the duration (how long), the timing (when), and the frequency (how often) relationship of river discharges[1] at a given location. In contrast, the science of hydraulics focuses on characterizing the physical parameters associated with a given flow condition, such as the water depth, velocity, shear stress, and water surface elevation at points within a system. The hydrologic characteristics at the site will be essentially unaffected by Riverwalk design elements, whereas the hydraulic conditions are subject to change in response to design elements – thus the need for a predictive hydraulic model (and the absence of need for a predictive hydrologic model).

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[1] The terms discharge and flow are used interchangeably throughout the report.

The hydrologic conditions described in this report are limited to flows in the Willamette River (local stormwater runoff characteristics are described in a Technical Memorandum titled *Willamette Falls Legacy Project Existing, Hydrological Conditions)* (ESA, 2012). The influence of local stormwater runoff is nominal in terms of site hydraulics and will not be considered or included in this summary of the existing hydraulic conditions at the Site.

The Willamette River at Oregon City is a regulated system, controlled by 13 flood control projects operated by the US Army Corps of Engineers (USACE), which cumulatively controls 27% of the basin's runoff, mostly in the upper watershed (USACE, 2015). There are numerous river gages, typically operated by the United State Geologic Survey (USGS), located throughout the basin that record the river's discharge and water levels over time. Several river gages are located close to Willamette Falls which will provide the primary basis for our understanding of river hydrology at the Site. Specifically, historic gage data allow us to quantify important hydrologic conditions such as the flow-frequency relationship and the associated range of water levels (at the gage). Available hydrologic data (i.e., gages and measured parameters), flood-frequency relationships, and selected design flows are described in the sections below.

Available Stage and Discharge Data

There are 6 gages on the Willamette River within 25 miles of Willamette Falls: four upstream of the falls and two downstream. We are most interested in river discharge data at the upstream locations, as these will serve as the upstream model input. Water level, or stage, data from the downstream gage will serve as the downstream model boundary. The gage locations, period and frequency of record, data type and position relative to the Willamette Falls site are summarized in Table 1.

Table 1
Summary of USGS gages near Willamette Falls

GAGE #	Location	DATA	FREQUENCY	RM[1]	BEGIN	END
14207740	UPPER OREGON CITY, OR	STAGE	30 MIN	26.7	10/1/2007	PRESENT
14207700	UPPER OREGON CITY, OR	DISCHARGE	MEAN DAILY	26.7[2]	10/1/1978	9/30/1979
14207770[3]	LOWER OREGON CITY, OR	STAGE	30 MIN	25.9	10/1/2007	PRESENT
14198000	WILSONVILLE, OR	DISCHARGE	MEAN DAILY	37.5	10/1/1948	7/31/1973
14197900[4]	NEWBERG, OR	DISCHARGE	30 MIN	52.3	10/1/2007	PRESENT
14211720	PORTLAND, OR	DISCHARGE DISCHARGE DISCHARGE STAGE	DAILY ANNUAL PEAK[5] 5 MIN 30 MIN	12.0	10/1/1972 1973 10/7/2014 10/1/2007	1/26/2016 2016 2/3/2016 PRESENT

1: River Mile: Upstream centerline distance from confluence with Columbia River. Willamette Falls is located at River Mile 26.4

2: Exact location of distance upstream of falls is unknown, but is assumed to be at the same location as 14207740

3: Selected downstream gage for water level model boundary condition

4: Selected upstream gage for developing inflow model boundary condition

5: Lower Willamette River Restoration Project, Appendix B: Draft Hydrologic and Hydraulic Technical Memorandum (Tetra Tech, 2014)

The term “stage” refers to a height referenced to a specific local datum. These values must be adjusted to a common vertical datum so they can be directly compared. There are multiple vertical datums in the study reach: the PGE datum, NGVD29, and NAVD 88 (which is the projected). The relation of these three datums are shown in Figure 1.

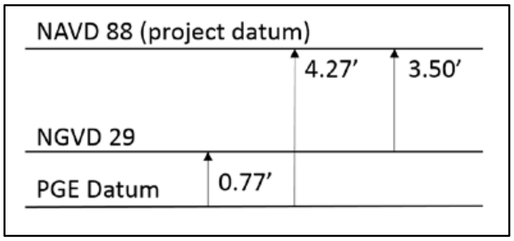


Figure 1. Datum Conversion Factors

For the hydraulic model we need to define the water level (stage) at the downstream boundary of the model and the river discharge at the upstream model boundary. The downstream model boundary will be defined using stage data recorded at USGS gage 14207770 which is located coincident with the hydraulic model boundary (by intention). The period of record for the gage is relatively short with only eight complete waters years of data recorded between 2007 and present. These data will be used to characterize the daily and seasonal variations in stage that will define the downstream boundary of the model; however, the gage record does not include historic data for extreme events such as the 1996 flood so some form of extrapolation will be needed for large flood events. The specific details of how the stage data will be applied is described in the Model Development – Boundary Conditions section of this memorandum.

River discharge at the upstream model boundary will be defined using data recorded at two of the USGS gages: 14211720 (Portland gage) and 14197900 (Newburg gage). The Portland gage has a moderately long period of record (43 years) which is needed to define the statistical flood-frequency analysis. However, the Portland gage is located 14.4 miles downstream of the Site and includes flow contributions from several large tributaries to the Willamette River, including the Clackamas and Tualatin Rivers (which enter the Willamette River downstream from the Newberg gage) – these flow contributions need to be estimated and removed from the flow data recorded at the Portland gage in order to more accurately represent the local discharge at Willamette Falls – the details of this analysis are described in the Model Develop – Boundary Conditions section of this report.

Flood-Frequency Relationships

The peak discharge recurrence interval (RI) is a useful and commonly used metric for assessing the magnitude-frequency relationship for flood events. Such flows are described in terms of the statistical frequency of occurrence of a given flow rate (i.e., a peak flow that has an annual probability of occurrence of 1/100 is defined as a “100-year” flood). The two most common ways to calculate recurrence intervals for select flood flows are: 1) through use of empirical equations such as those developed regionally by the USGS (Cooper, 2006), and 2) by performing a statistical flood frequency analysis on historic data measured at a given gage. Using statistical analysis of gaged data is always preferred when the data are available because the results are more reliable and scientifically defensible. The closest gage on the Willamette River with a period of record sufficient to perform a flood frequency analysis is located on the Morrison Bridge in Portland (USGS gage 14211720). A recent hydrologic study conducted by The City of Portland’s Bureau of Environmental Services (BES) and the USACE documents a flood-frequency analysis performed on the Portland historic gage record from 1973 to 2013 (*Lower Willamette River Ecosystem Restoration Project, Appendix B, Tetra Tech, 2014)* – the results of that analysis are considered the most recent and reliable for establishing the flow-frequency relationship at the Portland gage.

As noted above, the flows at the Portland gage must be scaled down to more accurately reflect flow rates at Willamette Falls. Flows were down-scaled using the methods described in the Oregon Department of Transportation (ODOT) Hydraulic Manual (ODOT 2014), Section 7.6.3 Statistical Analysis of Stream Gage Data. The scaling method adjusts flows at the ungaged location according to the ratio of the respective drainage areas raised to an alpha-coefficient. The drainage area at the Portland gage is 11,172 square miles compared to drainage area at the site of 10,081 square miles, resulting in a drainage area ratio of 0.90. The resulting flood flows adjusted to the project site at Willamette Falls are shown in Table 2.

Table 2.

Flood Flow Recurrence Intervals for The Willamette River in Portland (USGS gage 14211720)

			Computed Flood Frequency Curve Ordinate	
Annual Exceedance Probability	**Recurrence Interval (years)**	**Drainage Area Exponent (*α*)[1]**	**Computed Discharge[2] (cfs), Portland gage (14211720)**	**Adjusted Discharge[3] (cfs), Willamette Falls**
0.2	500	1.023	480,000	432,000
1.0	100	1.023	384,000	346,000
2.0	50	1.022	344,000	310,000
5.0	20	1.021	293,000	264,000
10.0	10	1.021	255,000	230,000
20.0	5	1.020	217,000	196,000
50.0	2	1.021	160,000	144,000

[1] Estimating Peak Discharge in Rural, Unregulated Wester Oregon, Table 11. USGS 2005.

[2] Source: Tetra Tech, 2014. Cfs = cubic feet per second.

[3] Computed discharge at Portland gage adjusted by the ratio of respective drainage areas rounded to the nearest 1,000 cfs.

Design Flows

Design flows are a selected set of flows that are chosen or used by the design team based on specific hydraulic objectives. It is typical to define the hydraulic objectives prior to conducting hydraulic analyses so that the tools and approaches can be structured to meet the defined objectives. Additional objectives and associated design flows can be added later as additional needs arise during the design process.

Design flows for the Riverwalk Project will need to serve a wide range of objectives including:

Aquatic habitat assessments:
- Evaluate habitat suitability for species over a range of flows and life-stages

Regulatory assessments:
- Evaluate impacts to the regulatory FEMA 100-year flood elevations and boundaries for both existing and proposed conditions
- Estimating the Ordinary High Water boundary

Impacts to river infrastructure and public safety:
- Several design flows are needed to evaluate impacts to Riverwalk project elements which may interact with the river at different river stages and flows.

The design flows selected for evaluation of the Riverwalk Project are summarized in Table 3.

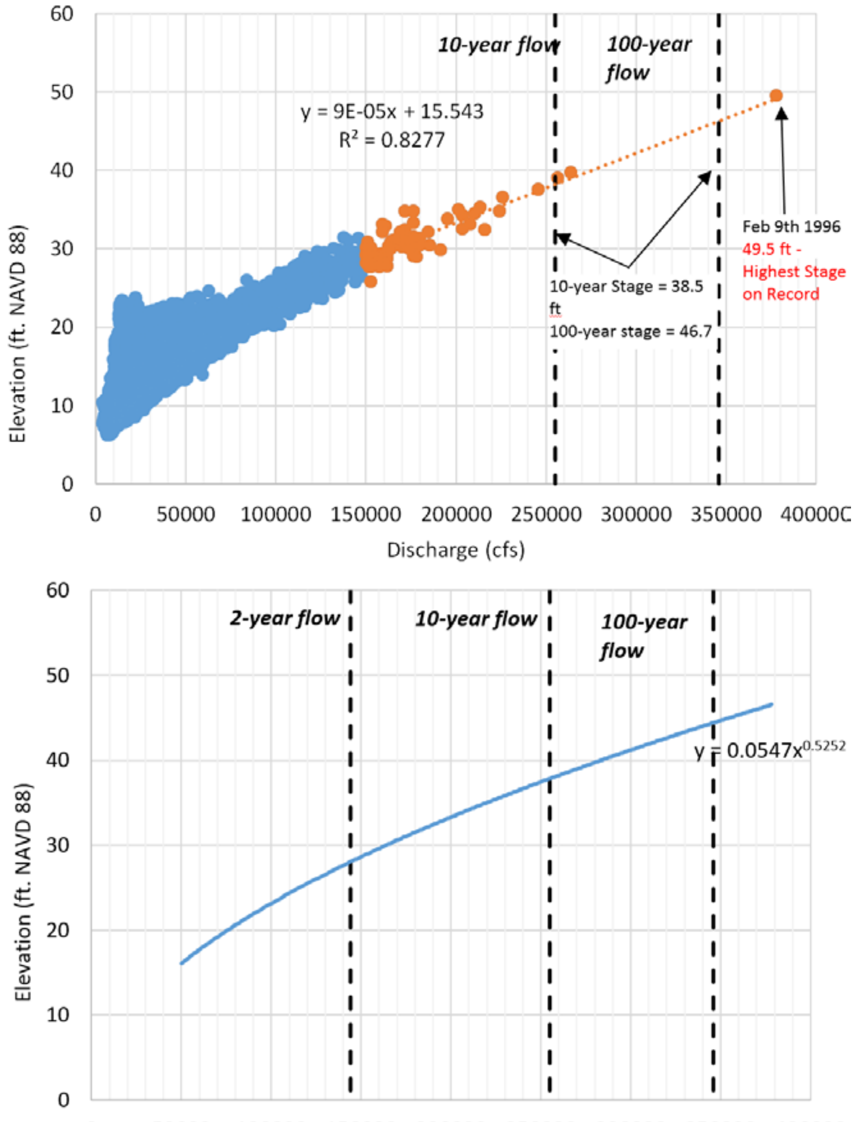
Table 3

Key Design Flows for Modeling

Design Flow (cfs)	Statistical Definition	Explanation
346,000	100-year	Major flood used to assess impacts to infrastructure and FEMA regulatory floodplain requirements.
144,000	2-year	Approximate flow for estimating Ordinary High Water, a frequent but modest flood.
53,300	10% exceedance of average daily flow, March through June	Typical high flow condition during fish passage period
11,700	90% exceedance of average daily flow, March through June	Typical low flow condition during fish passage period
3,400	Summer low (2015)	Reasonable minimum flows and levels

Design Stages

Water levels (stages) below the falls are controlled by both discharge and backwater, and therefore these factors need to be reflected in the design stages that will be used to evaluate the Riverwalk design. Low stage issues include water quality, aquatic and riparian habitat, river access, and the interactions with project elements (like restored habitat) during low water level periods in summer and fall. Water levels upstream of the falls are independent of the downstream water levels (except in extreme floods), so there no need for additional consideration of the design stages for high flow scenarios (100-year, 2-year, and 10% exceedance); these will be evaluated using the rating curve from the Lower Oregon City gage to define the downstream water level during flood flows. The rating curve is shown below in Figure 2.



Note:
1. Relationship developed over 40 year overlapping period of record - mean daily discharge/flow .
2. Power Law regression developed from flows exceeding 50,000 cfs.

Figure 2. Stage-Discharge Rating Curve Based on Data Recorded at USGS Gage 14207770 below the Falls.

Two low water levels will be evaluated, each corresponding to one of the low flow design flows. The low water level design stage selected for the 90% exceedance of average daily *flow* in March-June is the corresponding 90% exceedance average daily *stage* for March-June. The design stage selected for the summer low flow of 2015 will be the corresponding lowest recorded stage which is controlled by the lowest tidal cycle during the low flow season. The resulting design stages are shown in Table 4.

Table 4

Low Water Level Design Stages for Modeling

Design Stage at Lower Oregon City Gage (feet) NAVD88)	Statistical Definition	Explanation
10.1	90% exceedance of average daily stage, March through June	Typical low water level condition during fish passage period
7.3	Summer low (2015)	Reasonable minimum level

Hydraulics

The river at Willamette Falls is controlled by both natural and anthropogenic features. The basalt rock outcrop that creates the falls has controlled the river hydraulics in this reach for centuries. In recent history the falls have been modified for different purposes including hydro-powered mill operations and hydroelectric power generation. This section of the report documents our understanding of the existing hydraulic controls at the Site, which will inform how the hydraulic model runs are set up and applied.

Existing Flow Controls and Dam Operations

The current features that control flow over the falls include:

- the concrete dam crest and seasonally-installed wooden flash boards
- the navigation locks
- the Obermeyer weir flow control structures
- the sluice gate
- fish ladders
- penstocks
- debris lodged behind the dam
- buildings and other infrastructure on the Blue Heron paper mill site during flood conditions.

These features are shown on Exhibit 2, and the geometry and hydraulic functions of these features are described below. Portland General Electric (PGE) owns and operates the dam, and uses its own local elevation datum when referencing elevation data. The Site survey data (bathymetric and topographic) and hydraulic modeling are based on the NAVD88 datum – referred to herein as the Project Datum. The PGE datum is 4.27 feet lower than NAVD88. All elevations noted in this memorandum are in NAVD 88, US survey foot, unless otherwise noted.

PGE Dam Operations

PGE's Sullivan hydropower facility at Willamette Falls has 13 turbines that are operated with the goal of generating as much power as possible while ensuring that each turbine operates above a specified threshold efficiency. PGE operators take turbines offline when they are all not able to operate within defined efficiency limits. The specified flow rate through each turbine is 465 cubic feet per second (cfs) so with all turbines operating, the maximum flow diverted through the power house is about 6,045 cfs. In general, the operators are able run all 13 turbines during low flow conditions (summer-fall). During high flow conditions plant operators often need to take one or more turbines offline when the available head for power generation is reduced due to elevated tail water conditions, and turbine efficiency drops below threshold values.

In summer months, flashboards are installed on top of the grouted concrete crest of the falls to increase the available head and to help control the upstream water level. The flashboards are installed after spring runoff when flows are approaching summer conditions; they are usually in place by early July. The flashboards raise the headwater by 3.5 feet, but are designed to allow some flow to seep through the slats to reduce stranding of fish in pools at the base of the falls, and to aide lamprey passage. The flashboards on the crest of the falls are designed to break away in the fall or early winter when the first high flow event occurs.

The section of the wooden flashboard system that runs across the top of the spillway is scheduled to be replaced with adjustable Obermeyer weirs in summer of 2016 or 2017, with the new weirs providing the same function as the wooden flashboards. Only 17 of the 20 dam gate segments are being upgraded, with the remaining three gates, located furthest to the south, being plugged with concrete. There is a sluicegate on the far north side of the concrete dam and spillway that is also being modified in summer of 2016 or 2017. At the time this report was prepared (May 2017), the 3 southern most spillway gates were plugged with concrete but the new Obermeyer gates had not yet been installed.

There are currently three adjustable Obermeyer weirs in the center of the falls, known collectively as the Flow Control Structure (FCS). The weirs are adjusted by PGE operators to help control the headwater elevation for power generation purposes. During high flow events the weirs are typically fully lowered (crest invert elevation = 51.27’ NAVD88). In the summer there is at least one weir gate open to facilitate downstream fish passage. At intermediate flows PGE operators adjusts the gates as needed to optimize turbine efficiency.

There are three fish ladders at Willamette Falls that each carry a small amount of flow downstream year-round. The combined by-pass flow for the fish ladders is approximately 600-800 cfs. Another 400-500 cfs is bypassed around the turbines at the Sullivan Plant to facilitate fish passage. The total combined by-pass flow to support fish passage is between 1,000 cfs and 1,300 cfs.

USACE Navigation Locks

The navigation locks on the north side of the falls were closed in 2011. The lock gates may no longer be operable and there are no current plans to reopen the locks. The head gate on the upper lock is closed, though there is some seepage flow through the gates.

Blue Heron Paper Mill Site

Under normal conditions the Blue Heron site does not control or significantly affect river hydraulics, although there are seepage flows that emerge under several of the historic buildings. During large floods the river spills over the southeast end of the dam and at points along the railroad alignment allowing floodwaters to inundate portions of the property. The flow paths through (especially beneath) the Blue Heron site are highly complex due to the manner in which the historic structures have been built on top of natural and modified rock features. Many of the buildings are elevated and are somewhat pervious which allows flood waters to follow complex pathways.

Hydraulic Model Development

Hydraulic models help planners, designers, permitting specialists, and other interested stakeholders understand how water moves through the project site – this is typically referred to as hydraulic characterization of the existing system. The knowledge gained from characterization of the existing system allows planners to develop concepts to meet the design objectives and constraints. As conceptual designs advance the hydraulic models can then be used to evaluate alternative proposed actions to see if the concepts function as intended, from a hydraulic perspective. This section of the report lays out the modeling approach, describes the modeling software being used, details the methods used to parameterize and calibrate the model, and presents preliminary results for the 2-year flood event at the existing site.

Hydraulic Modeling Software

The selection of a hydraulic model, from the many types available, is typically based on the needs (objectives) of the designers, and constrained by the available data and limitations of computer resources. For the Willamette Falls Legacy Project a 2-dimensional (2D) hydraulic model was recommended, primarily because it is able to simulate and provide visualization of complex flows paths such as those that exist at the project site. In reality, flow characteristics over the falls are 3-dimensional (meaning that they vary vertically [in the z-direction] as well as horizontally), but vertical variations in flow are not currently needed for design purposes, so a 2D model can be used. A 2D model can also simulate some aspects of vertical flow in the x- and y-directions, thereby optimizing computer resources (computation times and file sizes), making the model more practical to use (by shortening run times) relative to a 3-dimensional model.

For this project CH2M recommended using a 2D hydraulic model called MIKE21FM, developed by DHI Water and Environment Inc. This software is widely used, nationally and internationally, and our team has extensive experience in its use. The “FM” acronym stands for Flexible Mesh, meaning the model resolution can be varied within the model boundaries. This flexibility is desirable since we anticipate wanting higher resolution near the Riverwalk compared to other areas.

The model software (MIKE 21FM) is proprietary and requires a license to run simulations but model input and output files can be viewed using free software (available online). The software and supporting documentation can be found at: https://www.mikepoweredbydhi.com/products/mike-21.

Modeling Approach

The approach for developing and applying the 2D hydraulic model involves several sequential steps:

1. Develop existing conditions model
    a. Model parameterization
    b. Model calibration and validation
    c. Hydraulic characterization of the existing system
    d. Document model development and existing condition model results
2. Alternatives Analysis
    a. Iterative application of the model to various design alternatives
    b. Document results

The specific details pertaining to model development, parameterization, calibration and validation are described in the following sections.

Once the model is calibrated and validated (and “ground-truthed” to the best of our ability) the model can then be applied to various design scenarios. In general, this will be done in an iterative fashion with increasing levels of detail as the design progresses. Initial concepts can be evaluated and tested with simple, low-precision, representations of proposed features – for example, evaluating what happens when a building or structure is removed or added to the site. As the design process progresses we will begin using higher precision representations of design features such as those created in AutoCAD or similar software. For preliminary evaluations the modeling team can make manual adjustments in the model based on coarse contours representing the proposed design, with greater resolution added as needed.

After the model has been developed, calibrated, and applied the modeling team will develop the associated documentation in a Hydraulic Modeling Report.

Model Parameterization

Parameterization is the process of selecting and defining the parameters used to describe specific objects and processes in a model, such as how the terrain is represented in the model mesh, how flow control structures are represented, and how flow resistance is formulated. It also includes the data inputs for the models and the choices related to spatial and temporal scale and resolution. The parameterization described below is preliminary and some aspects may need to be changed as the design advances.

Digital Terrain Model (DTM) Development

Three data sources were used to develop a seamless terrain surface, which is essential for hydraulic modeling. These data sources, merged into a terrain surface by AKS Engineering, included the following:

- highest hit LiDAR (data including ground objects: trees, rooftops, powerlines, etc.) collected in 2014 to define terrain above the waterline
- supplemental ground survey data of the former Blue Heron Paper mill where available
- bathymetry data collected in 2000.

Since Version 1 of this report, a series of updates and revisions have been made to the existing condition DTM to make it more representative of site conditions. These updates were especially focused on correctly representing flood water flow through the site during major floods. Changes to the DTM were guided by field investigations and anecdotal accounts of flood conditions during the 1996 flood. Revisions to the DTM include:

- Buildings constructed with corrugated metal walls (vacated 3rd Street building, south wall of Mill O), reported to be directly penetrated by floodwater in 1996, were removed from the DTM to allow flood water to enter the buildings as described by anecdotal observations. Flow was allowed to run along the finished floor of these structures before returning to the main channel.
- Concrete walls in inundated building such as Mill H, were left in place, and openings were inserted to represent large roller doors through which flood-waters reportedly flowed during the 1996 flood. Inside the building the floors were removed to allow water to flow downward into Tailrace #2. In actuality water would flow downward through a complex matrix of floor openings and down stairwells, but the 2D model is not able to represent such complex (and three dimensional) flow paths. Water will only be allowed to flow into the buildings through open doors (large roller doors).
- Elevations along the top of the concrete wall that surround the forebay lagoon were reviewed and revised to be consistent with the license drawings of the dam provided by PGE. This wall is a critical feature that control the amount of flood-water that enters the Site during major floods.
- The roof covering the 3rd Street access road was removed from the DTM to expose the underlying roadway, along which flood-waters reported flowed during the 1996 flood. Field survey data were used to define the topography of the roadway. The previous DTM showed this roofed area as a solid building (as seen by the LiDAR data), when in fact it is a covered roadway.
- Similar to above, the roof covering the roadway passing between Tank 2 and Building 1 Paper Mill Rewind was also removed to expose the underlying road and associated flow path. The roadway topography was defined using field survey data.

The field observations and anecdotal information describing the flow paths from the 1996 flood, used to revise the DTM, are shown in Exhibits 11A – 11D. The revised DTM is shown in Exhibit 3.

Mesh Development

Developing the model mesh involves laying out a “flexible” grid over the entire model domain – the model uses the mesh to compute water levels and fluxes between grid cells based on the elevation and roughness data assigned to each grid cell. The elevation data from the terrain model is transferred to the hydraulic model based on the average elevation of the terrain model in each node (corner of a grid cell), which are assigned a single elevation value. Important features such as the dam crest and the “flow control structure” are manually adjusted in the DTM to reflect the precise geometry as defined in the as-built drawings and site survey data.

The resolution (size and spacing) of the grid cells is an important consideration in developing the model. Higher resolution grid cell spacing provides greater resolution in the results (finer detail), but not necessarily greater accuracy. Increasing the spatial resolution is not without consequence – higher resolution means more grid cells (i.e. more computational points) which leads to increased model run-times. In developing the mesh several different resolutions were investigated to help determine an appropriate balance between resolution and run-times, and a variable grid cell spacing developed to help optimize the balance between grid cell spacing and model run times. The current model mesh has an average grid cell spacing of approximately 14 x 25 feet rectangular cells in the channel and triangular cells spaced 10 feet apart on average in the floodplain and the former mill site. The floodplain grid cell resolution of 10 feet, with break lines defining critical features, was determined to be a practical balance between higher resolution and longer model run times. The current model mesh is shown in Exhibit 4.

The mesh used in the near-future to evaluate proposed alternatives, and ultimately the final schematic design, will likely need to use a slightly modified mesh. Critical features will need to be defined with additional breaklines in order to represent the proposed terrain as accurately as possible. However, the mesh will only be modified in select areas where changes are proposed and will leave all other mesh elements unchanged: keeping the same mesh resolution between comparative models is essential when making direct comparisons between model results.

Boundary Conditions

The model solves the partial differential equations of conservation of mass and momentum (St. Venant equations) which require defined boundary conditions at all exterior open boundaries and initial conditions for all internal elements. The Willamette Falls model has two exterior boundaries, one upstream and one downstream. The upstream boundary condition will be defined by discharge and the downstream boundary will be defined by water level.

The discharge values used to define the upstream boundary are based on Portland USGS gage (14211720), scaled to the Site as described in the Flow-Frequency Relationships Section and presented in Table 2.

The downstream boundary will be defined using water levels recorded at the Oregon City USGS gage (14207770). The water levels at this location are affected by backwater from the Columbia River which means the relationship between discharge and water level is not directly proportional – water levels are influenced by more than just the local discharge. This means we cannot use a fixed rating curve where each discharge has a single water level value. For cases where we’re simulating a historic flood event we will use the gaged water levels corresponding to the time and day of the flood event, when possible. In cases where hypothetical flood events (i.e. 50-year flood, not real historic events) are being simulated, we will use the rating curve and professional judgement to guide the selection of the appropriate downstream boundary condition. There may be some cases where we need to simulate a range of downstream water levels for a single flow to characterize the range of hydraulic conditions associated with a single discharge.

Flows routed through the powerhouse and through the fish ladders are simulated with simple source/sink terms that extract the inflows from above the falls at the approximate locations for the ladders and the powerhouse intake and then re-injects the flows below the falls at their proper locations. The locations for all sources and sinks are shown on Exhibit 4.

Hydraulic Structures

In the context of this report, hydraulic structures refer to features such as weirs, flashboards, gates, and culverts. These features need special consideration since they can have a strong influence on the hydraulic conditions (and they can sometimes be challenging to represent in a model). As a general rule these features are best defined directly in the mesh geometry whenever possible – this provides the most realistic representation and allows the model to use the full 2D equations of mass and momentum instead of "inserting" a special function (often empirical) to represent a specific situation that cannot be simulated with flow over a free-surface (for example, pressure-flow in a culvert).

The most prominent hydraulic structures at Willamette Falls are those located on the crest of the falls and dam: the concrete sill crest, the Flow Control Structure, sluice gate, Obermeyer weirs, and flashboards. All of these features will be modeled directly in the model mesh with the elevations adjusted specific to each simulation scenario (i.e. grid cell elevation raised and lowered to represent each desired geometric condition).

Roughness

Water flowing in a riverine environment experiences two forms of flow resistance: form drag and skin friction. Both of these affect hydraulic conditions (such as water level, velocity, and shear stress) and the energy that is available to transport sediment. The software MIKE21FM accounts for flow resistance through a single roughness parameter – the Manning's n coefficient in this case. Unique roughness values were chosen below, above, and at the falls as well as in floodplain areas to represent different forms of resistance. The primary driver for determining in-channel resistance was the channel bed characteristics present in the bathymetry data, while in the floodplain the relative roughness of the surface over which water was flowing determined resistance values. Flow resistance coefficients were adjusted during calibration. The final roughness values for the existing condition are summarized in Table 5.

Table 5. Summary of Roughness Values used in Hydraulic Model

Location	Manning's n	Description
Main Channel	0.034	Flow over non-uniform bedrock surfaces
Flow over falls	0.083	Additional resistance over falls is necessary to maintain realistic velocities
Flow over spillway	0.2	High roughness due to debris restricting flow over the spillway

Calibration

Model calibration is the iterative process of adjusting isolated model parameters so that simulated results match observed results within a range sufficient for the intended use of the model. Calibration is part of the parameterization process, wherein some of the available data (such as water levels) may be used to guide adjustment of one or more of the model input parameters. The quality of the calibration is a function of the accuracy and reliability of both the measured field data (i.e. water levels) and the model input data (i.e. boundary conditions), as well as the complexity and scale of the processes being modeled.

This section outlines the calibration process and provides a review of the data that are available for calibration, followed by a description of the flow and water surface elevation calibrations that were performed and their results.

Calibration Process and Available Data

The model has undergone two round of calibration. The first round of calibration was documented in the last version of this report (Version 2, January 2017). A recent high flow event in February of 2017 provided an opportunity to collect additional water level data to support further model calibration. There have also been several refinements to the model mesh aimed at improving the physical representation of the dam and spillway in the model; the concrete piers separating the spillway gates have been added to the model mesh and multiple cells were added across each spillway gate so that the presence of debris can be simulated by blocking select portions of the spillway gate.

There are three sources of data that will guide the calibration process. First, PGE operates two staff gages at Willamette Falls, one upstream of the falls in the forebay and one downstream of the falls in the tailrace. Our understanding is that PGE operators manually record water levels on a daily basis but the timing and frequency of recording may vary day-to-day and may exclude periods of very high flow during large floods where it is unsafe for PGE operators to be on-site. The data recorded from PGE gages is useful in guiding the calibration for smaller, more frequent flows. Metro requested and received stage data from the PGE gages for two relatively recent floods, December 20, 2015 and February 10, 2017, that had flows approximately equal to the 2-year peak flow. The table below summarizes the available data from these events.

The second source of calibration data was obtained by Metro during the February 10, 2017 high flow event. Metro staff marked water levels on the shore at five locations on February 10, 2017 which were later surveyed by CH2M HILL and tied to local on-site survey control, established by AKS. The locations of the water levels marked by Metro and the PGE staff gages are shown in Exhibit 6 and the values are shown in Table 6.

Table 6. Summary of High Water Elevations Collected by Metro

Location	**Elevation (feet)**
ID Location 1	27.94
ID Location 2	27.95
ID Location 3	63.38
ID Location 4	63.30
ID Location 5	63.27
Base of Grotto2	46.50

The third source of calibration data are the high water marks located on some of the historic buildings, including marks from the 1996 flood along with supporting anecdotal accounts of the flood. This flood is of specific interest because it is a relatively recent major flood that occurred at the site and that community members witnessed first-hand. According to historic discharge estimates, the flood flows were larger than a 100-year flood – closer to a 250-year event - but the stage recurrence interval below the falls is closer to a 100-year recurrence interval (for stage). The high water marks from 1996 have been survey by AKS.

Calibration Parameters

Model calibration requires the accurate definition of enough known parameters such that the unknown parameters can be isolated and adjusted (calibrated) until the model–predicted water levels closely match the observed data. Unfortunately, in the case of Willamette Falls, there are too many unknown parameters (inadequate data) to allow for a direct calibration of the unknown parameters.

The unknown parameters at Willamette Falls include:

- **Discharge:** The Portland and Newberg gages help bound the range of the discharge expected at the site at a given time, but the precise value is unknown because the downstream gage is 15 miles away, with tributaries entering the Willamette River in this reach, and the upstream gage is 26 miles away, also with tributaries contributing to flow in between. The range of uncertainty estimated to be on the order of (+/-) 20%.
- **Floodplain Flow Paths:** Flow paths within the channel are well understood, but during large floods flow paths outside the channel are more uncertain. For example, flow pathways and flow rates through and beneath historic buildings at the Willamette Falls Legacy site are known to be complex but poorly understood or defined (in other words, they are highly uncertain).
- **Channel Roughness:** Riverbed form-drag and skin friction create resistance to flow, and higher resistance results in higher water levels. The roughness parameter is often adjusted during model calibration when the local discharge, velocity profile(s), and water levels are precisely and accurately known (through collection of field data during floods). In the case of Willamette Falls, local discharge, velocity profiles and water levels are not precisely known, limiting the ability to isolate channel roughness as the only calibration parameter.
- **Flow Controls on the Falls and Dam:** The characteristics of flow passing over the crest of the Falls and adjoining spillway are affected by a number of factors such as the height of the adjustable flow control structure and the presence or absence of flashboards (which are designed to break-away during high flows, this process is unpredictable and non-uniform). Flow over the dam crest and spillway during a flood is typically affected by debris snagged on the dam, and may be influenced by other structures such as the elevated walkway above the southeastern portion of the dam. It is therefore not possible to know the precise condition and influence of all controlling elements, at all times, for historic (or future) events.

The water surface elevation profile for the reach below the Falls is controlled by a combination of backwater (from the tidally-influenced Columbia River) and total flow resistance (from form drag and skin friction, which is a function of discharge and roughness height). The backwater effect is inherently accounted for in the model by using measured water level data recorded at the Lower Oregon City USGS gage to define the downstream boundary condition. The local discharge, defining the upstream model boundary condition, is not precisely known at specific times because the USGS gages immediately upstream and downstream of the falls only record stage, not discharge. Therefore, the local discharge is loosely constrained by the upstream gage at Newberg and the downstream gage in Portland.

This uncertainty in the local discharge makes it challenging to isolate other calibration parameters. A typical model calibration process often focuses on adjusting channel roughness to get water levels to match the observations, but to do that properly the local discharge must be accurately known - otherwise, there is a risk of adjusting roughness incorrectly (masking errors in the local discharge, for example). In reality, there is likely some error in the assumed channel roughness and some error is the estimated local discharge, but it is not possible to know which combination of parameter settings is correct. However, it is known that water levels through the study reach during a flood are controlled mostly by the local discharge, backwater, and the position of hydraulic structures on the dam (and the presence of debris) compared to channel roughness – this can be demonstrated with the model through sensitivity analysis. While backwater is a first-order control on water levels in the reach below the falls, it will not be adjusted during calibration since the water level that creates the backwater effect is gaged (measured) precisely at the models downstream boundary. This provides a defensible rationale for focusing on adjustments to only two parameters (the local discharge and the hydraulic structures, plus any effects from debris that may impede flow over hydraulic structures) to calibrate the water levels, rather than adjusting channel roughness; this is the approach currently used.

2-Year Flow Calibration

As described above there are two high-flow events with available calibration data. Both events had recorded flow rates close to the estimated 2-year recurrence interval peak discharge.

A summary of the PGE recorded water levels and the gaged flows and stages at the nearest USGS gages is presented in Table 5. During the December 20, 2015 event there is a 20% increase in the mean daily flow between Newberg and Portland and a 1.0 foot change in the water level at the USGS gage below the falls, with these ranges reflecting the level of uncertainty in boundary conditions. For the February 10, 2017 event the water level variation is only 0.2 foot since we know the exact time that the water levels were recorded, but there is still a 23% increase in flow between Newberg and Portland which adds uncertainty to the upstream boundary condition.

Table 5

Summary of Currently Available Calibration Data for 2-year Storm

Date and Time	Water Level in Forebay (ft, NAVD 88)	Water Level in Tailrace (ft, NAVD88)	Water Levels at Oregon City D/S gage, max./mean/min. (ft, NAVD 88)	Daily Change in Water Level at Oregon City D/S gage (ft)	Instantaneous Flow / Mean Daily Flow, Newberg gage, (cfs)	Instantaneous Flow / Mean Daily Flow, Portland gage (cfs)
12/20/2015 Exact time unknown	66.0 ft.	30.4 ft.	28.5/28.1/27.5	1.0	N.A.[1] / 129,000	N.A.[1] / 163,000
2/10/2017 14:00	64.7 ft.	28.5 ft.	26.8/26.7/26.6	0.2	107,000 / 105,000	142,000 / 143,000

[1] The instantaneous flow cannot be reported since the time of the water level measurement is not known.

Calibration for December 20, 2015

For the December 20, 2015 event, the PGE water levels are the only source of calibration data. One of the challenges of calibrating to the PGE water level data for this event is that the time of day when water levels were recorded is unknown. On December 20, 2015 the water levels at the Oregon City gage below the falls fluctuated 1.0 feet; we would expect a similar fluctuation at the PGE tailrace gage. For the purpose of this first model comparison the downstream water level was set at the mean daily value for December 20, 2015, 28.1 feet NAVD88. The local discharge was estimated from the mean daily value at the Portland gage (163,000 cfs) and scaled down based on a ratio of the drainage areas to 144,000 cfs. The initial results showed that modeled water levels were about 1.4 foot low in both the tailrace and the forebay. If all the uncertainty is assumed to be in the local discharge, it would take approximately 8,000 cfs (increasing the local discharge to 152,000 cfs) to increase the tailrace water level by one foot. This value is within the plausible range, given that the average daily value at Portland was 163,000 cfs and the peak instantaneous value was likely higher. The model results for this scenario are included in Exhibit 7A – 7D.

Without more data to better constrain the model inputs (such as a local measurement of discharge) it is not possible to conclusively know if all the uncertainty should be accounted for in the local discharge or if some adjustment to channel bed roughness is also appropriate. Upstream of the falls the water level in the forebay is still 0.9 foot too low even with the additional 8,000 cfs of inflow. As stated above, this value is within the range of water level fluctuations seen on December 20th at a discharge estimate at the falls. Water levels upstream of the falls are usually not affected by backwater from the Columbia River (that would occur only during extreme floods); instead they are controlled by local discharge and the invert elevations of the hydraulic controls on the crest of the falls and the adjoining spillway, and by debris that accumulates on the structures. For this calibration event it was assumed that the flashboards were completely gone (as they are designed to break-away during high flows) by the time the 12/20/2015 storm occurred and that all three bays of the adjustable flow control structure were fully lowered. Flow over the spillway in the model includes the 20 pier structures which are an obstruction to high flow, but the effects of the elevated walkway and any local debris build up is assumed and simulated in the model (water levels at the time of the event were high enough that the elevated walkway and railing would likely restrict flow). The increase in flow resistance from the debris that may become snagged on these features, along with the other stated uncertainties, could be enough to explain the 0.9 feet discrepancy.

While results and supporting rationale from this calibration efforts are considered reasonable, they included several potentially significant assumptions. A high flow event in early 2017 provided the opportunity to conduct a second, more accurate, calibration, as described below.

Calibration for February 10, 2017

For this calibration event there are seven total water levels measurements to consider, two from the PGE staff gages and five marked by Metro on the right shore line (see Exhibit 6 for locations). The time of day associated with all of the water level measurements is also known, which helps constrain the range of downstream water levels - there is only a 0.2 foot range in water levels at the downstream boundary during the period when water levels were marked.

The configuration of the dam crest and spillway during this event was slightly different than it was for the December 20, 2015 calibration event. Three of the spillway gates were permanently blocked-off in the fall of 2016 (the three gates furthest south). Additionally, photos of the site taken on May 1, 2017 show that a significant portion of the dam crest still had flashboards in place, meaning they were in place during the high flow event on February 10,2017. It is not possible to know exactly which flashboards were still in place but from the photos it appears that most of the flashboards between the flow control structure and the old power house remained in place (see Figure 3). There was also a large amount of accumulated debris behind the dam shown in these photos. The geometry changes were applied to the model mesh for calibration of this event but there is some uncertainty about the number of flashboards that were in place during the event (potentially significant because the flashboards increase the dam crest by approximately 2 feet).

Figure 3. Photo of dam crest on 05/01/2017 showing flashboards in place and debris accumulation.

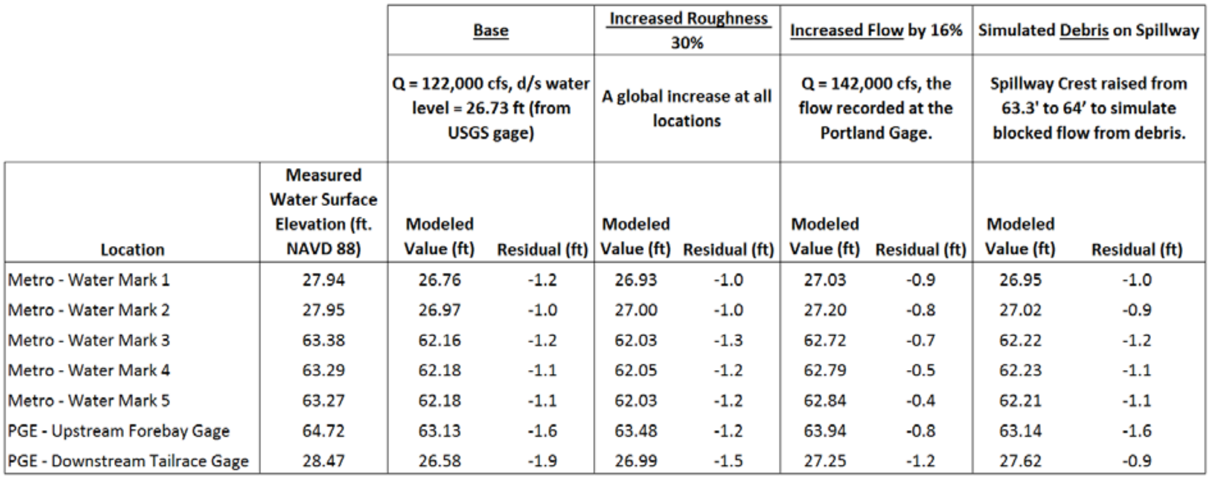
The calibration approach was to start with a “base” model which reflects our best understanding of the physical geometry of the hydraulic structures on the dam and spillway, and the expected boundary conditions (flow rate and downstream water level) at the time the water levels were recorded. To investigate and quantify the influence of each respective calibration parameter we conducted successive runs which adjusted only one parameter at a time in order to isolate its influence on the resulting water levels. Three primary parameters were examined: local flow rate, roughness, and the effect of debris on the spillway. The adjustments include:

- increasing the flow rate to that measured at the Portland USGS gage which equates to a 16% increase in flow
- increasing by 30 percent the Manning’s n values at all locations
- Increasing the invert elevation of the spillway by 0.7 foot to simulate the potential effect that debris may have had on water levels upstream of the falls.

The water level results and associated residuals for all four scenarios are shown in Table 6.

Table 6

Summary of Model Residuals for the February 10, 2017 event



		Base		Increased Roughness 30%		Increased Flow by 16%		Simulated Debris on Spillway	
		Q = 122,000 cfs, d/s water level = 26.73 ft (from USGS gage)		A global increase at all locations		Q = 142,000 cfs, the flow recorded at the Portland Gage.		Spillway Crest raised from 63.3' to 64’ to simulate blocked flow from debris.	
Location	Measured Water Surface Elevation (ft. NAVD 88)	Modeled Value (ft)	Residual (ft)	Modeled Value (ft)	Residual (ft)	Modeled Value (ft)	Residual (ft)	Modeled Value (ft)	Residual (ft)
Metro - Water Mark 1	27.94	26.76	-1.2	26.93	-1.0	27.03	-0.9	26.95	-1.0
Metro - Water Mark 2	27.95	26.97	-1.0	27.00	-1.0	27.20	-0.8	27.02	-0.9
Metro - Water Mark 3	63.38	62.16	-1.2	62.03	-1.3	62.72	-0.7	62.22	-1.2
Metro - Water Mark 4	63.29	62.18	-1.1	62.05	-1.2	62.79	-0.5	62.23	-1.1
Metro - Water Mark 5	63.27	62.18	-1.1	62.03	-1.2	62.84	-0.4	62.21	-1.1
PGE - Upstream Forebay Gage	64.72	63.13	-1.6	63.48	-1.2	63.94	-0.8	63.14	-1.6
PGE - Downstream Tailrace Gage	28.47	26.58	-1.9	26.99	-1.5	27.25	-1.2	27.62	-0.9

Results from the Base scenario show residuals (the difference between modeled and measured water levels) that are all negative (simulated levels are lower than observed) and the magnitude is quite uniform at around 1 foot. Increasing the flow rate has the greatest impact on raising the simulated water levels but the residuals are all still negative. Roughness and debris have a smaller impact on increasing water levels. Having residuals that are uniformly too low, at all locations, is suggestive of one of three typical problems: 1) the local discharge is too low, 2) the roughness is too low, or 3) there is a discrepancy in the elevation data. In this case, a difference in flow and roughness does not appear to be the root cause. There is some supporting evidence for a discrepancy in the surveyed elevation data – the surveyed elevation of Water Mark 1 is reported to be 1.2 ft higher than the elevation at the USGS gage below the falls which is located only 600 ft downstream. The elevations at those two location would be expected to be nearly identical given the low-gradient backwater condition and the close proximity to each other. The survey data suggest a water surface gradient of 0.2 percent between Water Mark 1 and the USGS gage below the falls; that is an order of magnitude higher than both the model and the PGE data show. This observation suggests that there could be a data discrepancy between the surveyed water marks and the USGS gage datum. This could be investigated by surveying the water level at the USGS gage using the survey control network established at the Willamette Falls Legacy Project Site to see if the datums are consistent.

With these findings there are no recommended adjustments to the Base model, as the available data do not definitively support any changes.

High-Flow Calibration

The flood that occurred in February of 1996 is considered a major flood (approximately equal to a 250-year flood based on flow over the Falls) and an important design event for the project because of the amount of water that could flow through the site during such extreme conditions. There are no measured water level data available for this flood but there are a few high water marks on buildings at the site and anecdotal information describing the primary flow paths through the site which were used to guide high-flow calibration, including the following:

- Aerial photograph taken on February 11, 1996 (2 days after peak flow). See Exhibit 12A.
- High water survey performed by AKS Engineering. See Exhibit 12D.
- The maximum daily average flow rate estimated at the USGS gage on the Morrison Bridge in Portland (420,000 cfs).
- Second-hand anecdotal information from site workers. See Exhibit 12C.

Calibration focused on discharge at the Falls as well as hydraulic structures affecting elevations upstream of the Falls (i.e. flow control structures, debris hindering flow over the falls), and modifications to the DTM to more accurately represent the actual flow paths during the 1996 flood. The aerial image shown in Exhibit 12A was taken on February 11, 1996 and shows water levels in the forebay above the bottom of the elevated walkway, at an elevation of 64.27 feet, but not overtopping the concrete wall at the project site, at an elevation of 67.0’. To replicate this in the model, the spillway invert was raised (along the south spillway section) and roughness was increased to simulate similar elevations in the forebay.

The downstream rating curve for the Lower Oregon City gage suggests that for a river discharge of 378,000 cfs (the flow rate estimated at the Portland gage adjusted to the site) the water level at the gage should have been between 44 feet and 49 feet, which is a large range (high uncertainty). Anecdotal reports from witnesses of the 1996 flood say that floodwaters entering the site from above the falls were routed through the site and flowed back into the river channel downstream of the falls and no flow came into the Site from the river channel below the falls. In other words, no water came into the site from the river channel below the falls, which means the water level in the channel must have been lower than the water levels through the Site. In elevation terms this means that the water level in the river must have been lower that the wall above the Pipe Chase which was surveyed to be 48.3 feet, providing some constraint as to what the downstream water levels were. An iterative process was used to determine the downstream water level (at the model boundary) that resulted in simulated water levels and flow paths consistent with the anecdotal information. The resulting water level at the model boundary was 44.5 feet which is within the range of values suggested by the rating curve. At this point the model was run and results compared to the surveyed high water marks and best estimated flow paths through the site, both of which had good general agreement, although in this version water did not flow down the vacated 3rd street building and through Mill O. In order to get this flow path to activate, the water level upstream of the dam would need to be higher. There are two possible factors that could explain what would cause water levels to be higher: 1) the local discharge could have been greater than 378,000 cfs (an estimated value based on the mean daily value at Portland) and/or 2) the presence of debris and other obstructions such as pipes and railings located above the spillway, and concrete walls that create increased flow resistance, resulting in higher water levels and thus more flow entering the site. While it is not possible to know the exact cause, iterative model runs show that a discharge of 400,000 cfs would be needed to raise the water level enough to activate the flow paths through Mill O and vacated 3rd street. For the hydraulic characterization figures included in this report the higher discharge option was used rather than making assumptions about debris accumulations and roughness associated with pipes, railings, and other obstructions. This decision does not affect future model applications – different assumptions can be made based on the objective of runs. For example, there might be a desire for a model run that includes all of the most conservative assumptions to see what the maximum possible water levels could be during an extreme flood. Hydraulic results for the 1996 flood are shown on Exhibits 8A – 8C.

Hydraulic Characterization

The hydraulic model is a tool that enables us to estimate the hydraulic conditions (WSE, depth, velocity, and shear stress) across the entire study reach over a range of flow conditions. This description is often referred to as hydraulic characterization.

2D hydraulic models compute water levels, water depths, velocities, and shear stress at each grid cell for each time-step of the simulation. Results can be viewed in many different ways and the format is typically adjusted to the needs of the end-user. The most commonly used output format from a 2D model is a color-shaded contour map showing a single hydraulic parameter for a single moment in time (for example, a velocity map at 2-year peak discharge). Color-shaded contour maps show how the results vary spatially across the site and are relatively intuitive and easy to understand. However, a single contour map only depicts a single moment in time. To see how hydraulic results change over time we can either create a series of contour maps (which can become overwhelming and difficult to readily interpret), or time-series graphs which show how the results change at a single location over time; these time-series graphs are generally easier to comprehend. Another common way to review results is with profile plots which extract results along a line and the parameter of interest is plotted as a function of distance along that line (i.e., stationing); multiple profiles can be included on one plot to either show results from different river geometries or different flow rates. For the Riverwalk project we anticipate relying mostly on color-shaded contour map output and extracted profiles. Model results can also be displayed in rendered 3D format which "drapes" the results over a 3D rendering of the terrain – these renderings are often used as visual aids in stakeholder meetings because they give the viewer a more realistic view of the results. Video animations can also be created to show dynamic conditions or fly-overs.

The following results focus on presenting the hydraulic characteristics associated with the five design discharges described in Table 3.

Existing Condition – High Flow (Feb. 1996)

The February 1996 event is of great interest since it is was a major flood that occurred in recent history, witnessed by many community members, and is the highest flow event with sufficient data available for calibration. While the 1996 event was larger than a 100-year event, the calibration process performed on the 1996 event should improve the model's ability to replicate the smaller regulatory "100-year" flood. Results of the February 1996 event can be seen in Exhibits 8A – 8C.

Existing Condition – 2-year Peak Flow

As described in the Calibration section, the model is currently calibrated to a single flood event (December 2015) which had a magnitude approximately equal to the estimated 2-year peak flow.

The 2-year peak flow condition is important for planners and designers to consider because it approximates the limits of Ordinary High Water (OHW), which is a regulatory boundary. Development actions below (within) the OHW boundary will require more rigorous permitting efforts. Exhibits 7A through 7D show the color-shaded contour maps for water level, depth, velocity, and shear stress for the 2-year peak flow from the preliminary existing condition model.

10% exceedance of average daily flow, March through June

This design flow was selected to evaluate "typical" high flows during the fish migration season (March – June). The flow rate of 53,000 cfs is only exceeding 10% of the time. The hydraulic results relating to fish passage and/or refuge habitat are symbolized in a way to highlight the hydraulic conditions that are general suitable for juvenile salmonids (i.e. low enough velocities to hold position and have sufficient flow depths). Results for the 10% exceedance of average daily flows, March – June, are shown on Exhibits 9A – 9B.

90% exceedance of average daily flow, March through June

This design flow was selected to evaluate the "typical" low flow during the fish migration season (Marsh – June). The flow rate of 11,700 cfs is exceeded 90% of the time between March and June based on historic flow patterns. Again, the depth and velocity results are symbolized to highlight suitable aquatic conditions for juvenile salmonids. Results for the 90% exceedance of average daily flows, March – June, are shown on Exhibits 10A – 10B.

Summer low flow (2015)

This design flow was selected to evaluate extreme low flow conditions. The lowest flow in the summer of 2015 was 3,400 cfs. Again, the depth and velocity results are symbolized to highlight suitable aquatic conditions for juvenile salmonids. Results for the summer low flow are shown on Exhibits 11A – 11B.

Assumptions and Considerations for Conceptual Design Phase

The Design Collective's Pre-Concept Milestone 1 document (March 2016) provides a useful example of reference "language" with which team members can describe and reference areas and features at the project site. Relevant areas for the hydraulic model may be characterized, at this phase of the project, as upstream areas, falls, and downstream areas. Greater resolution, or other categorizations, can be added as Riverwalk features and site designs evolve.

Upstream considerations may include possible impacts along the railroad alignment, habitat and public safety concerns along the shoreline, interactions with the mill site, flow (or lack of flow) in the lagoon area and debris management.

Considerations around the falls may include access and sightlines at low and high water, elevation of walkways and structures relative to the water and the falls, possible issues related to PGE dam operations, flow pathways, fish habitat considerations (both desirable and not), debris pathways, sedimentation concerns, public viewing issues and public safety.

Downstream considerations may include water surface elevations (considering backwater and tidal influences) at high and low water, eddy flows, debris and sedimentation concerns and public safety.

A variety of other topics are directly related and integrated with considerations of hydraulic flow. While not directly addressed in this document, such factors include the following:

- **Public Safety:** While encouraging the public to intimately experience the falls, how can the design provide reasonable protections, especially in a setting that emphasizes wildness and power? How does the design promote access while strategically limiting access to provide the greatest protection to natural resources, and convey to the public the greatest sense of respect of the setting and other users? A range of related issues may warrant consideration.
- **Debris Management**: Flood waters can convey large debris, including trees and unmoored houseboats. Such objects can redirect flow and stress or damage infrastructure. Lower flows typically carry a range of smaller debris that can accumulate as floating or stranded material. Both large and small objects can change the visual appearance of all areas of the falls, and may require regular maintenance to manage. Design elements that reduce the risks to infrastructure and people are desirable, as are making maintenance access and debris removal easier and more efficient.
- **Uncertainty**: While the modeling tool provides a state-of-the-art analytical resource for understanding and simulating site conditions, there is inherent uncertainty in a number of factors related to it, both in existing conditions and simulated future conditions. In addition to those factors discussed above, climate change has the potential to affect future tidally-influenced water levels below the falls, and changes to the hydrologic conditions could change the magnitude and frequency of the flood flows. Limitations of temporal and spatial representativeness of available data create uncertainty with model inputs, as do the accuracy of components of the elevation model. The model itself simulates the complex three dimensional flow as a two dimensional approximation, with additional uncertainty elements. It is important to use the model results with an understanding of these uncertainties, which exist with all simulations of complex natural systems.
- **Flow Pathways**: Restoring former flow pathways at Willamette Falls, notably through one or more “tail races” beneath the former mill site, has been discussed, as has possible removal of the clarifier structure. Similarly, the addition of new structures may be part of future development plans. These and other options may alter the flow of water at high or low stages, and careful evaluation of the effects of such changes should be conducted. Potential effects on fish, habitat and structures, and the potential for sedimentation and debris accumulation, and other factors are likely issues for consideration.

Conclusions

This report documents the hydrologic and hydraulic characteristics at the site for existing conditions and includes detailed descriptions of the hydrologic analysis, terrain model development, 2D hydraulic model development, and calibration for the 2-Year and 1996 flood events. The 2D hydraulic model has been through a calibration process, but the residuals are still relatively high (around 1 foot on average). Simulated water levels are consistently approximately 1 foot too low, and it's not possible to reasonably increase them enough through calibration adjustments. The fact that all the residuals are nearly the same magnitude, and "out of reach" of model calibration through reasonable parameter adjustment suggests that there may be a discrepancy between one of the vertical datums. This could be investigated with a field survey of datums and water levels. If the discrepancy cannot be resolved, the model can still be used in its current condition, especially in a relative application, but the uncertainty in the model will need to be acknowledge in the design process.

Results for in-channel flows at the 2-year event appear to be reasonable estimates of the general hydraulic conditions, appropriate for use at the conceptual planning level. For the 1996 flood event, the model has been calibrated to observed flow-paths but not precise water levels (which are not available), and the model results closely align with the anecdotal observations. The model can be used as a tool to support continued schematic design. Additional refinements can always be made to the model as new data become available. The most important thing to consider when applying the model is to apply the model consistently between existing condition scenarios and all proposed conditions so that the relative comparison will show only the differences associated with impacts of the proposed design.

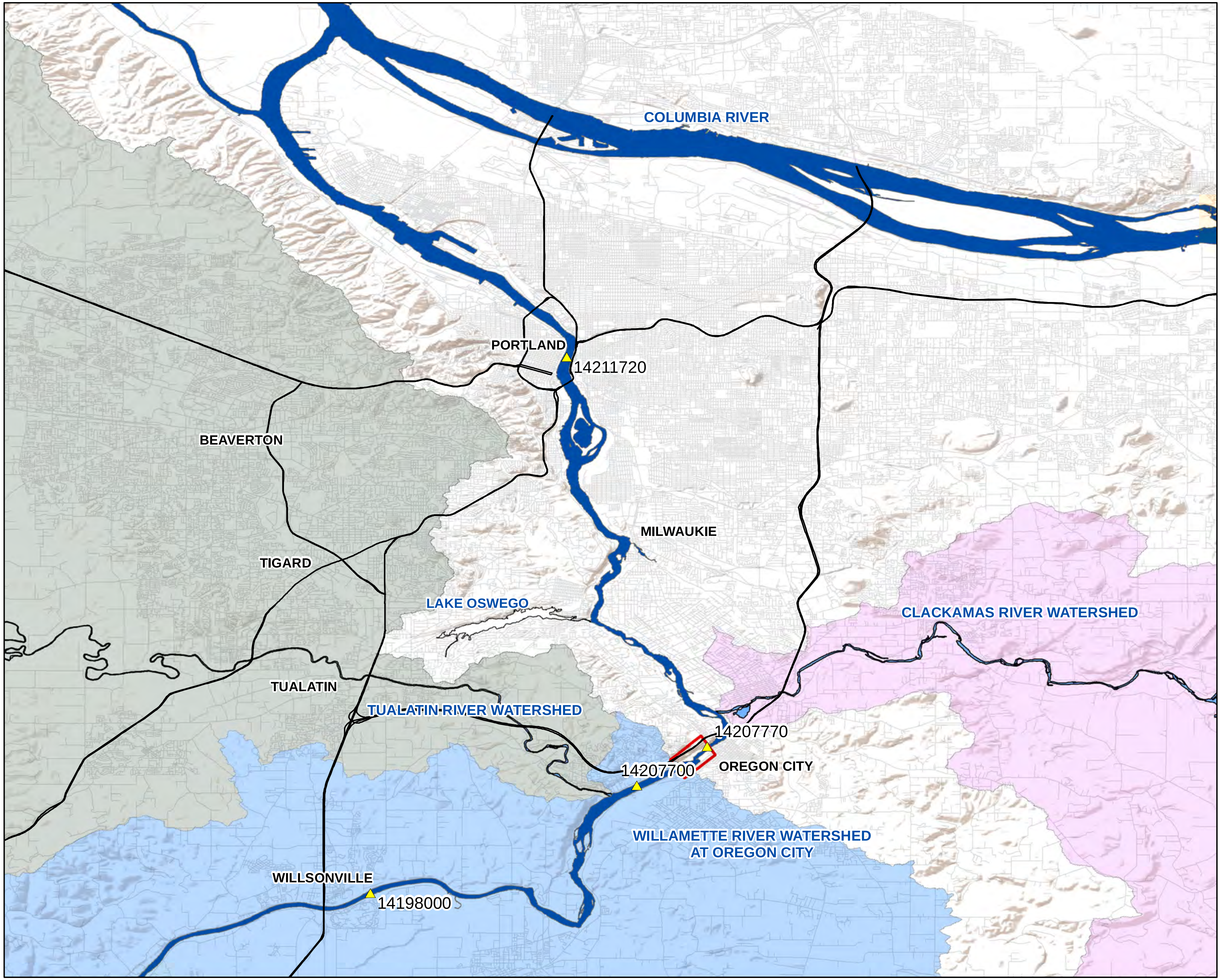
References

USACE, 2015. A Primer on Flood Risk Management. Retrieved April 07, 2016 from http://www.nwp.usace.army.mil/Locations/Willamette-Valley/

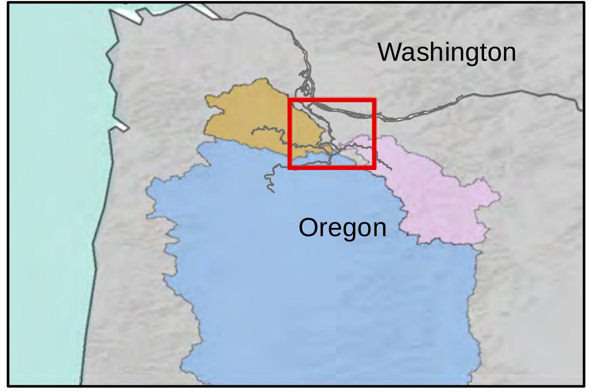
Cooper, R.M., 2005. Estimation of peak discharges for rural, unregulated streams in western Oregon: U.S. Geological Survey Scientific Investigations Report 2005-5116, 134 p

Tetra Tech. 2014. Lower Willamette River Ecosystem Restoration Project: Hydrology and Hydraulics Technical Memo. Unpublished report prepared for the U.S. Army Corps of Engineers, Portland, Oregon.

Exhibits



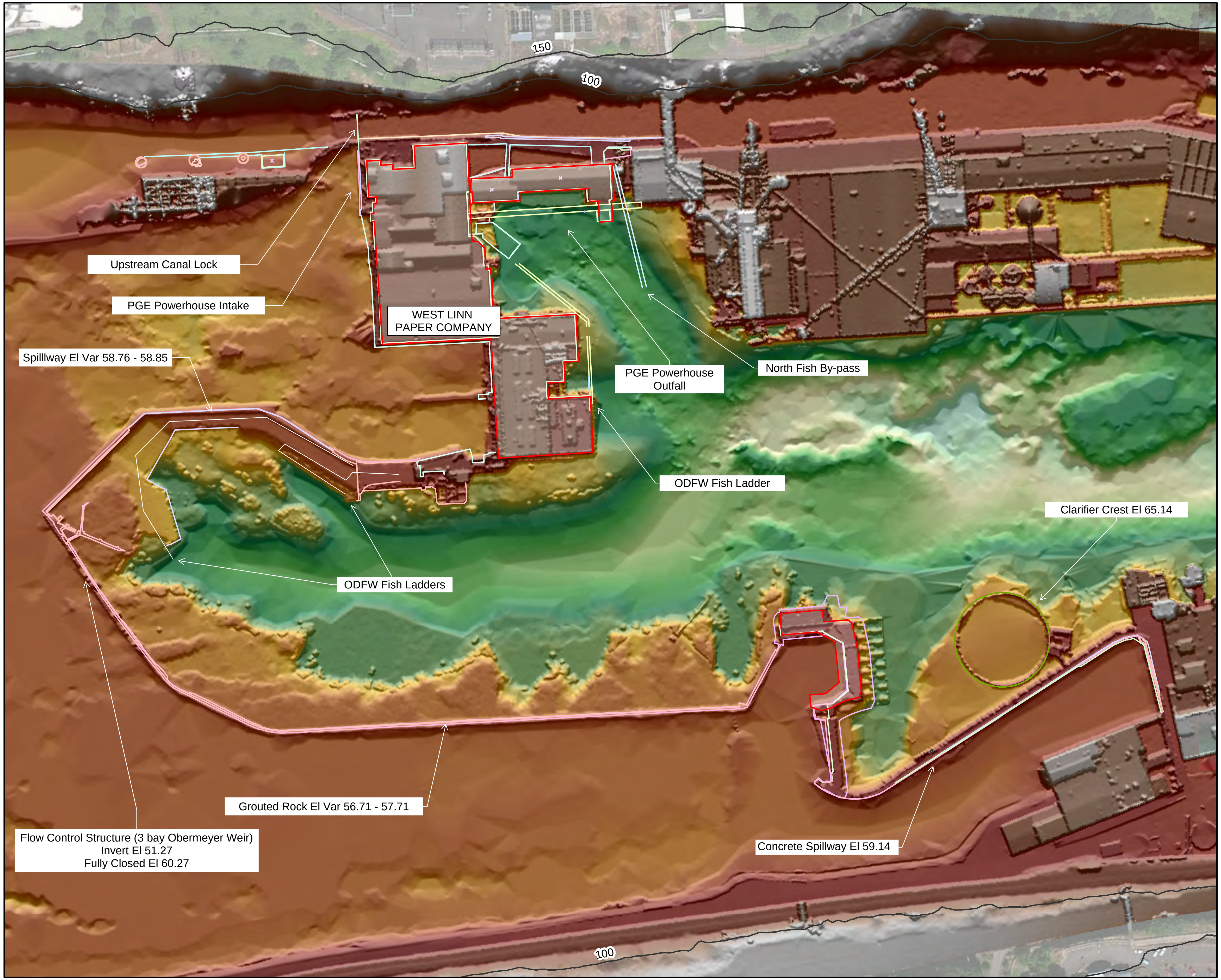
VICINITY MAP



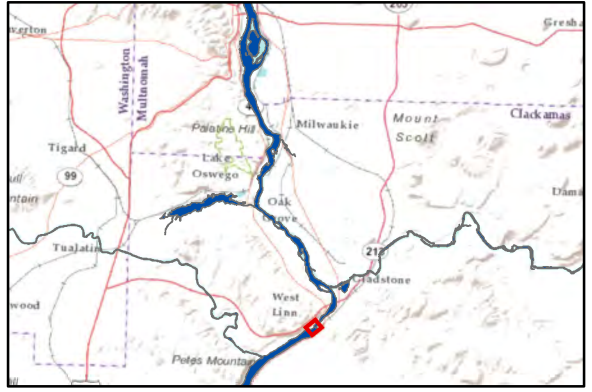
Service Layer Credits: Sources: Esri, DeLorme, USGS, NPS
Sources: Esri, USGS, NOAA

EXHIBIT 1
OVERVIEW MAP
Existing Conditions Hydraulic Model
Riverwalk Project, Willamette Falls Legacy Site

ch2m:



VICINITY MAP



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, DeLorme, USGS, NPS
Sources: Esri, USGS, NOAA

LEGEND

PGE License Drawings

— PGE License Drawings

▭ 204 - 245
▭ 172 - 203
▭ 151 - 172

■ 131 - 151
■ 113 - 131
■ 98 - 113
■ 84 - 98
■ 64 - 84
■ 45 - 64
■ 28 - 45

■ 11.0 - 28
■ -7.0 - 11
■ -30 - -7
■ -56 - -30
■ -81 - -56
■ -110 - -81

Notes:
1. Area of interest subject to change.
2. PGE license drawings provided by PGE, March 2016.
Units shown are in NAVD '88 US Survey Foot.
PGE Datum = NAVD '88 - 4.14 ft

N

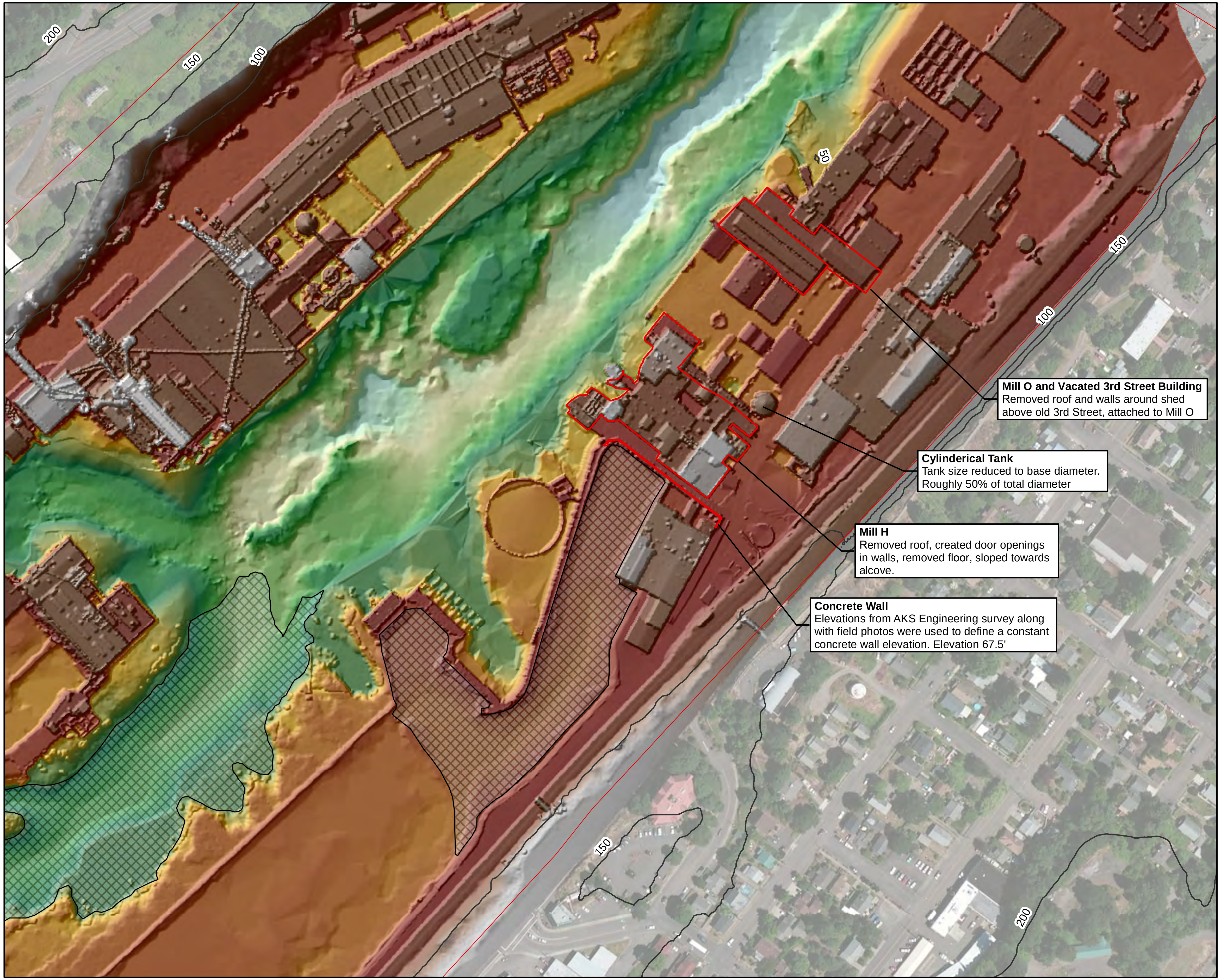
0 0.025 0.05 0.1 Miles

EXHIBIT 2
Names and Locations for Important Features at WIllamette Falls

Existing Conditions Hydraulic Model

Riverwalk Project, Willamette Falls Legacy Site

UNK \\PDXFPP01\PROJ\METRO\666097WILLAMETTEFALLS\GIS\MAPFILES\EXHIBIT_2_NAMES_AND_LOCATIONS.MXD TB028345 9/12/2016 4:18:30 PM



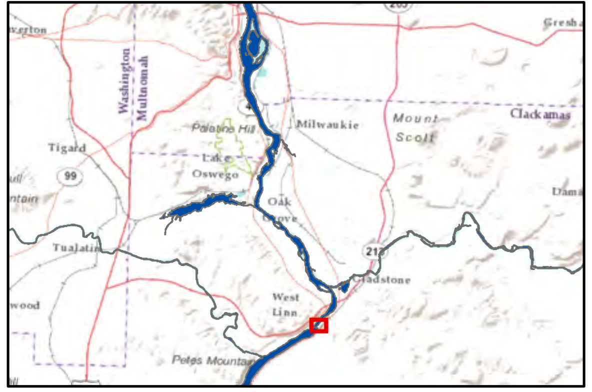
Mill O and Vacated 3rd Street Building
Removed roof and walls around shed above old 3rd Street, attached to Mill O

Cylinderical Tank
Tank size reduced to base diameter. Roughly 50% of total diameter

Mill H
Removed roof, created door openings in walls, removed floor, sloped towards alcove.

Concrete Wall
Elevations from AKS Engineering survey along with field photos were used to define a constant concrete wall elevation. Elevation 67.5'

VICINITY MAP



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, DeLorme, USGS, NPS
Sources: Esri, USGS, NOAA

LEGEND

▨ Areas of No Bathymetry Data - Interpolated by AKS

Hybrid Surface (ft)

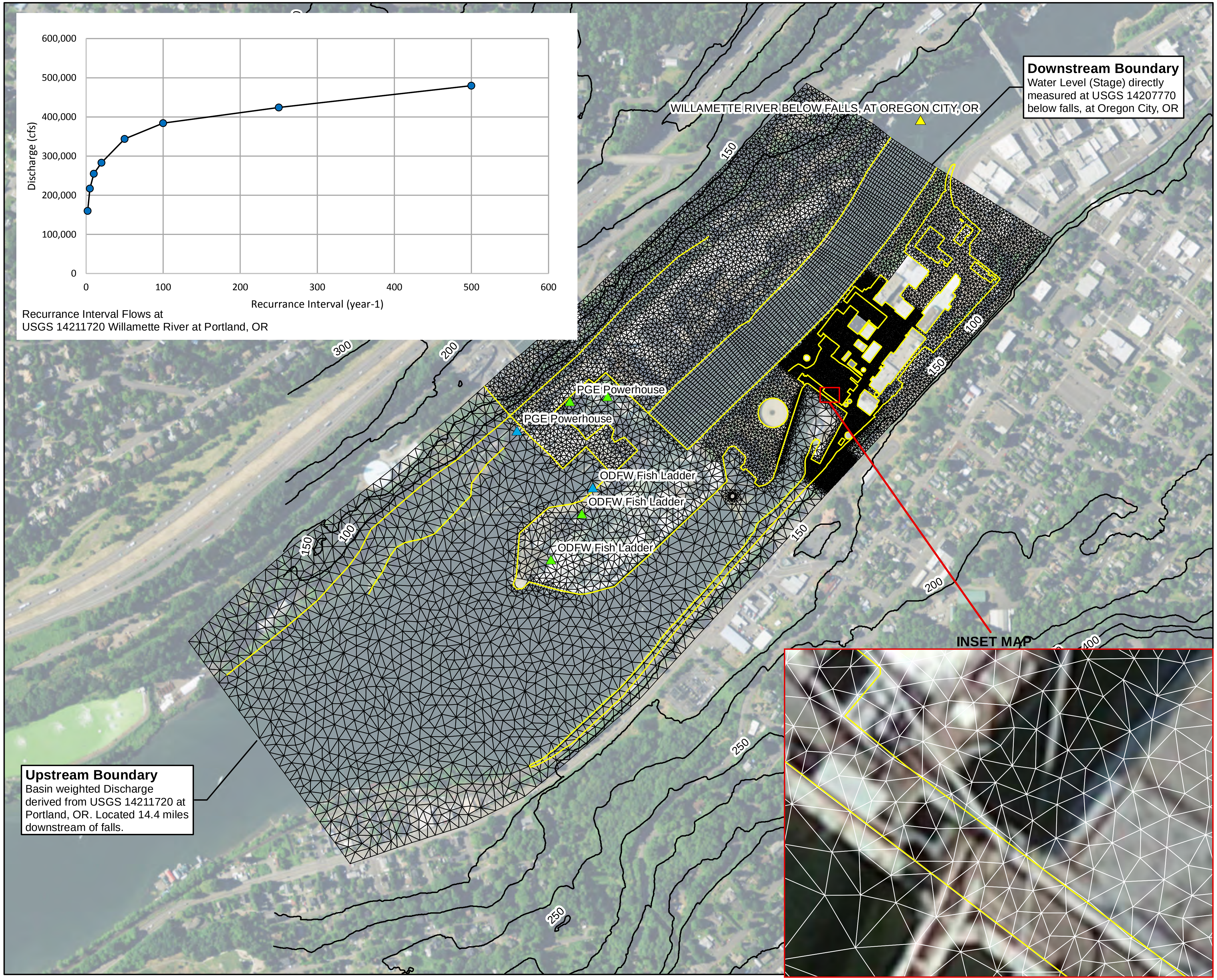
- ⬜ 204 - 245
- ⬜ 172 - 203
- ⬜ 151 - 172
- 🟫 131 - 151
- 🟫 113 - 131
- 🟫 98 - 113
- 🟫 84 - 98
- 🟥 64 - 84
- 🟧 45 - 64
- 🟨 28 - 45
- 🟩 11.0 - 28
- 🟩 -7.0 - 11
- 🟩 -30 - -7
- 🟨 -56 - -30
- 🟩 -81 - -56
- 🟦 -110 - -81

Notes:
1. Area of interest subject to change.
2. Bathymetry Survey performed by David Evans and Associates (DEA, Inc), December 2000

N

0 0.05 0.1 Miles

EXHIBIT 3
Digital Terrain Model (DTM) Surface
Existing Conditions Hydraulic Model
Riverwalk Project, Willamette Falls Legacy Site

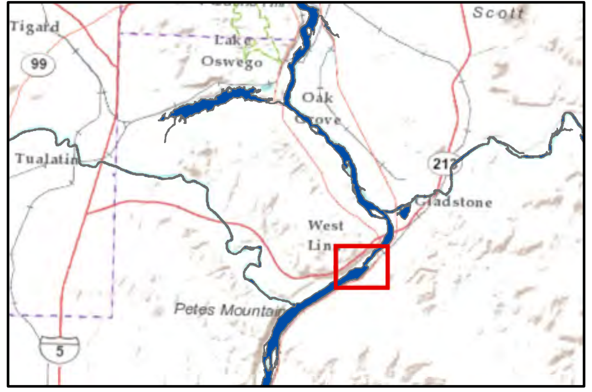


Recurrance Interval Flows at
USGS 14211720 Willamette River at Portland, OR

Downstream Boundary
Water Level (Stage) directly
measured at USGS 14207770
below falls, at Oregon City, OR

Upstream Boundary
Basin weighted Discharge
derived from USGS 14211720 at
Portland, OR. Located 14.4 miles
downstream of falls.

VICINITY MAP



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, DeLorme, USGS, NPS
Sources: Esri, USGS, NOAA

LEGEND

Source/Sink Terms

- ▲ Sink
- ▲ Source
- ▲ USGS Streamgages
- — Breaklines in Mesh
- ☐ Computational Mesh
- — 50' Contours

Notes:
1. Area of interest subject to change.
2.

N

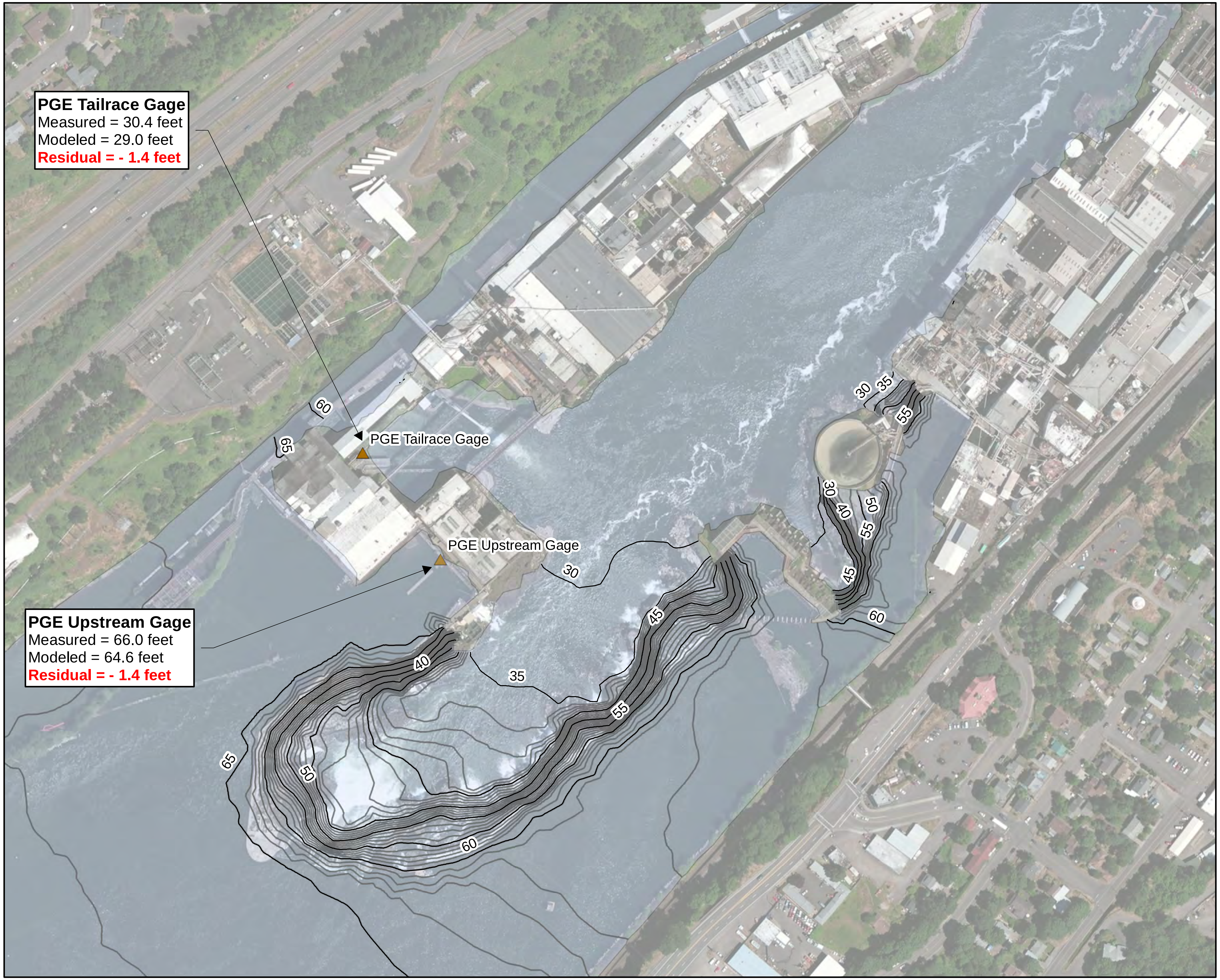
0 0.05 0.1 0.2 Miles

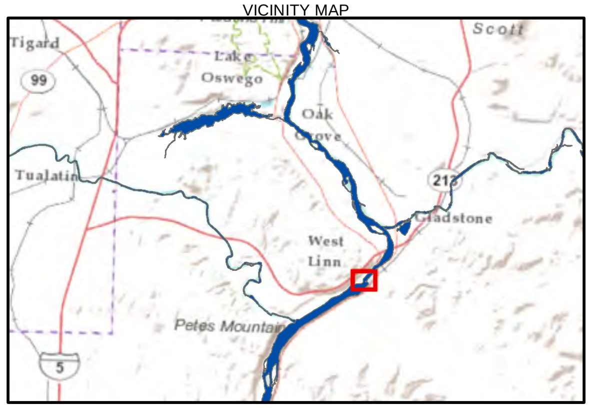
EXHIBIT 4
Computational Mesh and Boundary Conditions

Existing Conditions Hydraulic Model

Riverwalk Project, Willamette Falls Legacy Site

ch2m:





Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, DeLorme, USGS, NPS
Sources: Esri, USGS, NOAA

LEGEND

- — 5' Water Surface Contours
- — 1' Water Surface Contours
- 🟦 Extent of Inundation
- ▲ PGE Gages

Notes:
1. All elevations are in North American Vertical Datum of 1988 (NAVD '88).
2. Model calibration was done on the February 2017 event due to more observed data being available. This event is used as a validation.
2. 5' contour Interval > 35 feet. 1' contour interval < 35 feet.

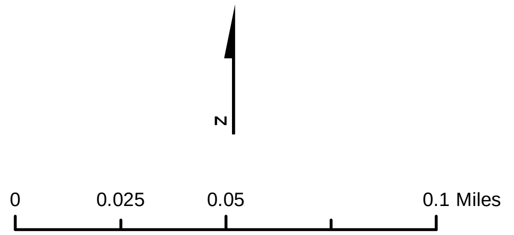
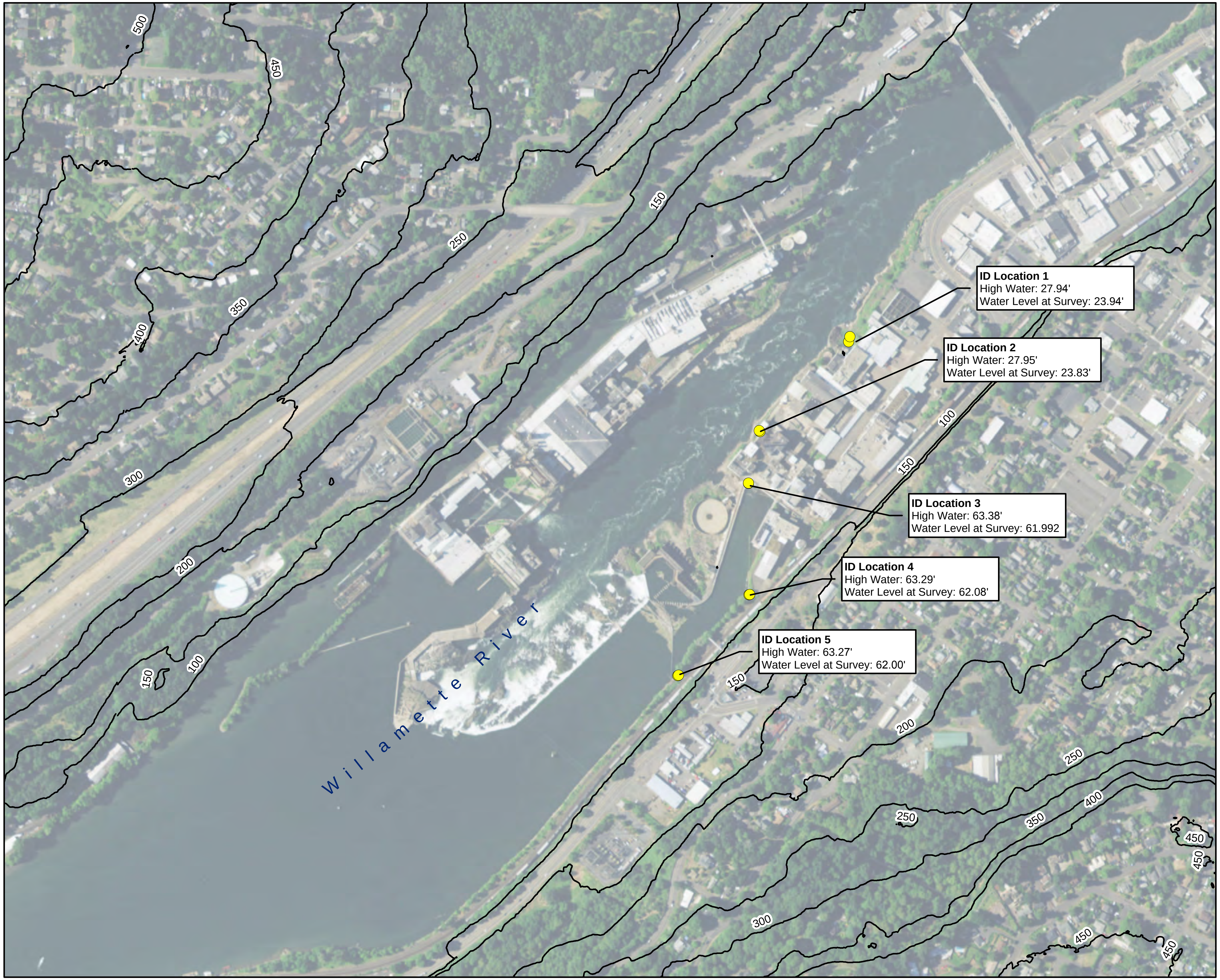


EXHIBIT 5
Results from 12/20/2015
Approximate 2-year Flood
Existing Conditions Hydraulic Model
Riverwalk Project, Willamette Falls Legacy Site

UNK \\PDXFPP01\PROJ\METRO\666097WILLAMETTEFALLS\GIS\MAPFILES\EXHIBIT_5_CALIBRATIONRESULTS.MXD TB028345 5/4/2017 12:53:05 PM



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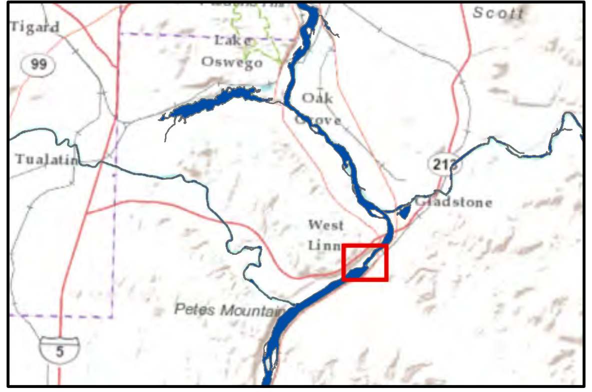


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Sources: Esri, DeLorme, USGS, NPS
Sources: Esri, USGS, NOAA

LEGEND

● CH2M-Data

— 50' Contours

Notes:

1. ID Location 2 - Horizontal GPS signal not available, location was estimated and confirmed by surveyor.
2. Survey performed on March 14, 2017.

N

0 0.05 0.1 0.2 Miles

EXHIBIT 6

February 10, 2017 High Water Marks
Location and Elevation
Existing Conditions Hydraulic Model
Riverwalk Project, Willamette Falls Legacy Site

ch2m:

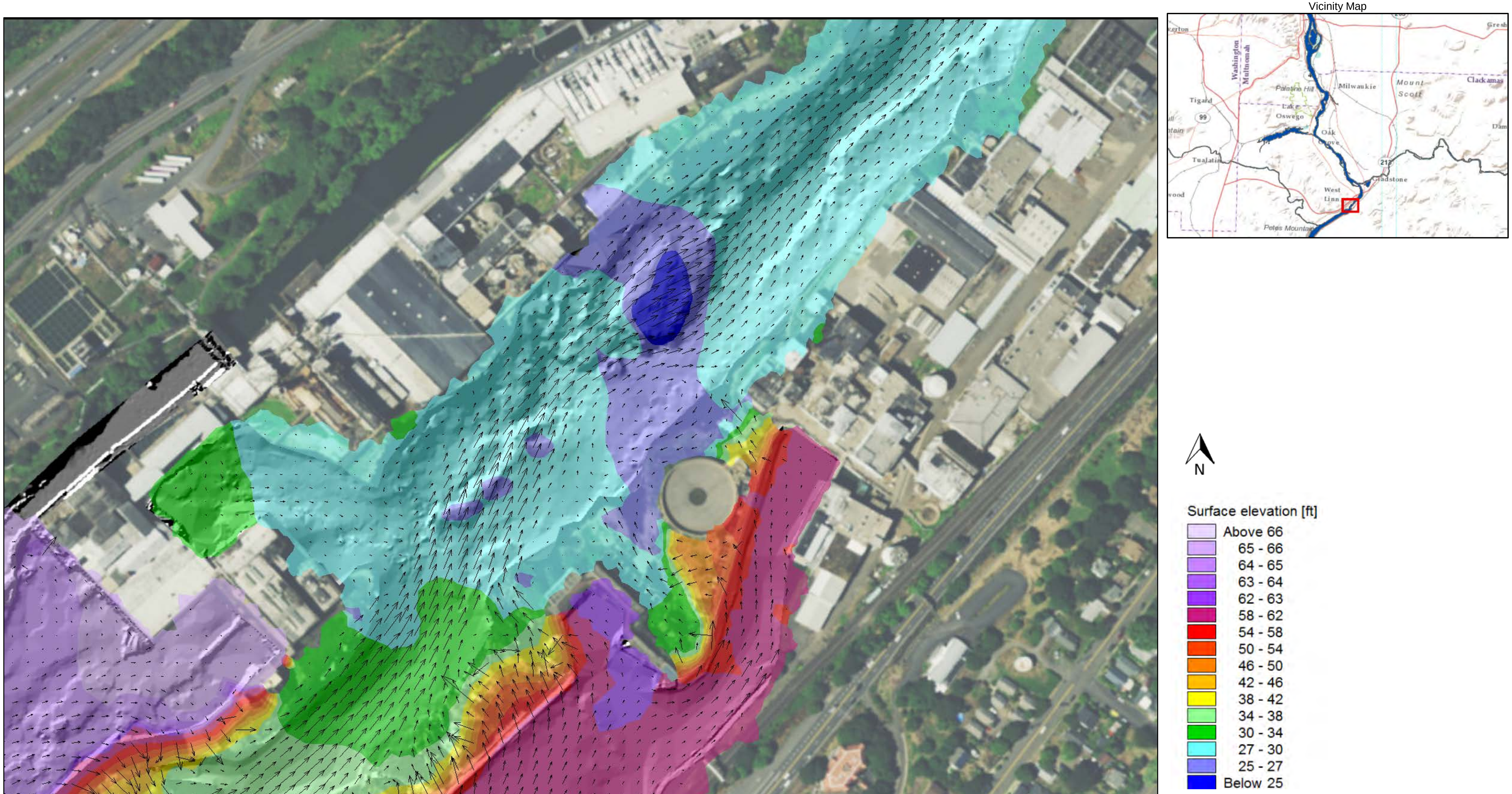
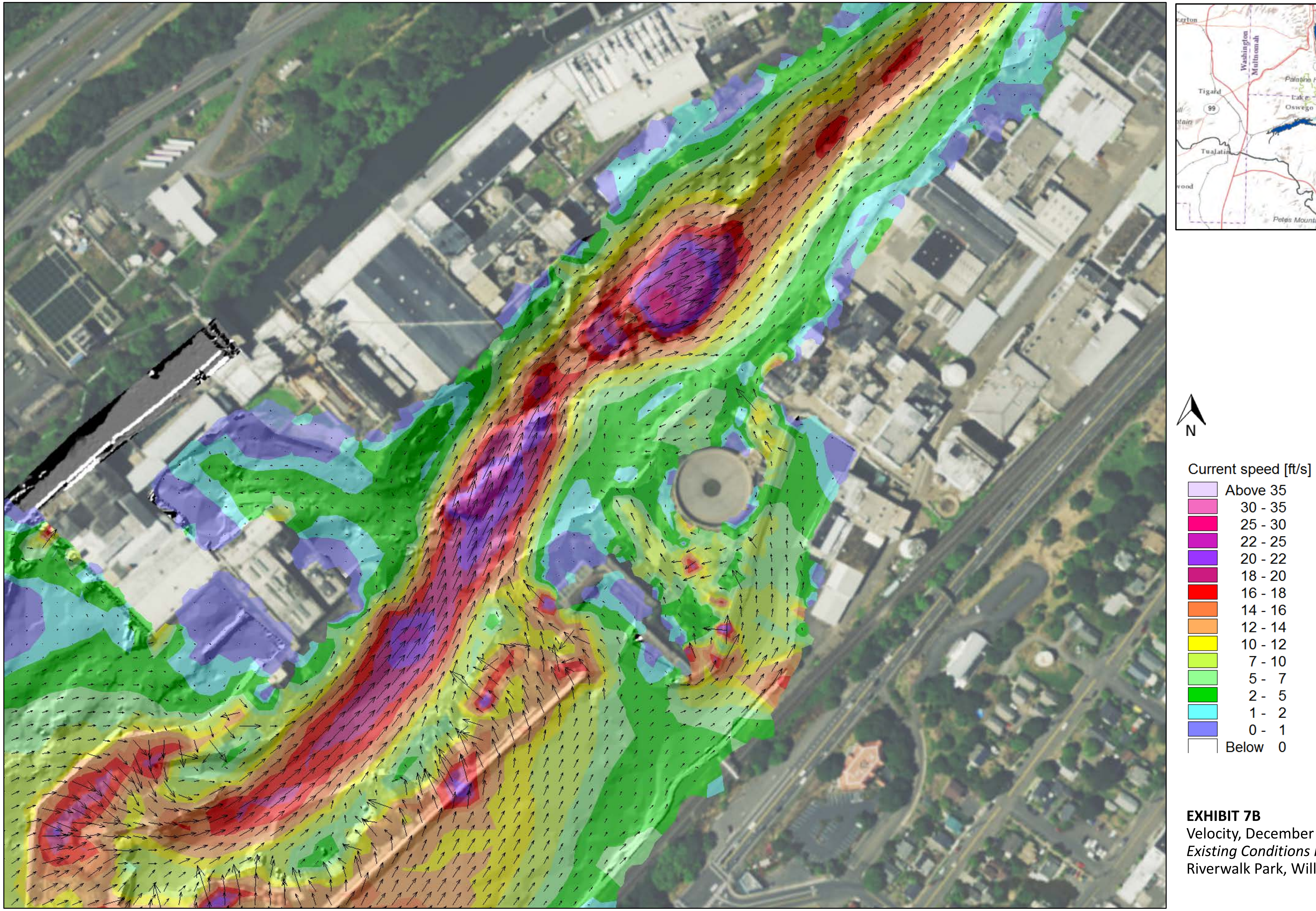


EXHIBIT 7A
Water Surface Elevation, December 20, 2015
Existing Conditions Hydraulic Results
Riverwalk Park, Willamette Falls Legacy Site



Vicinity Map

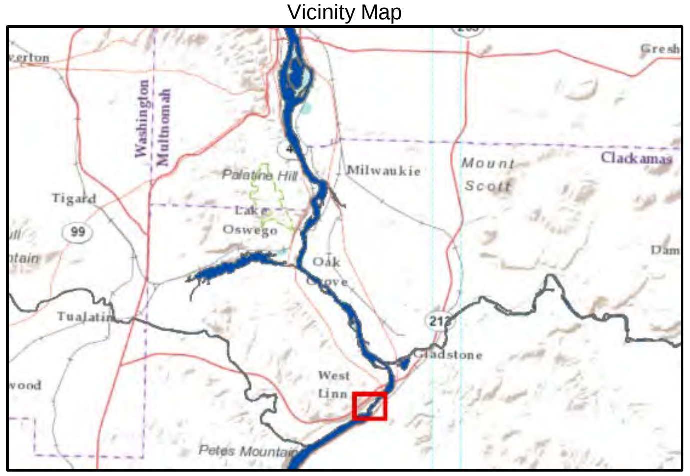


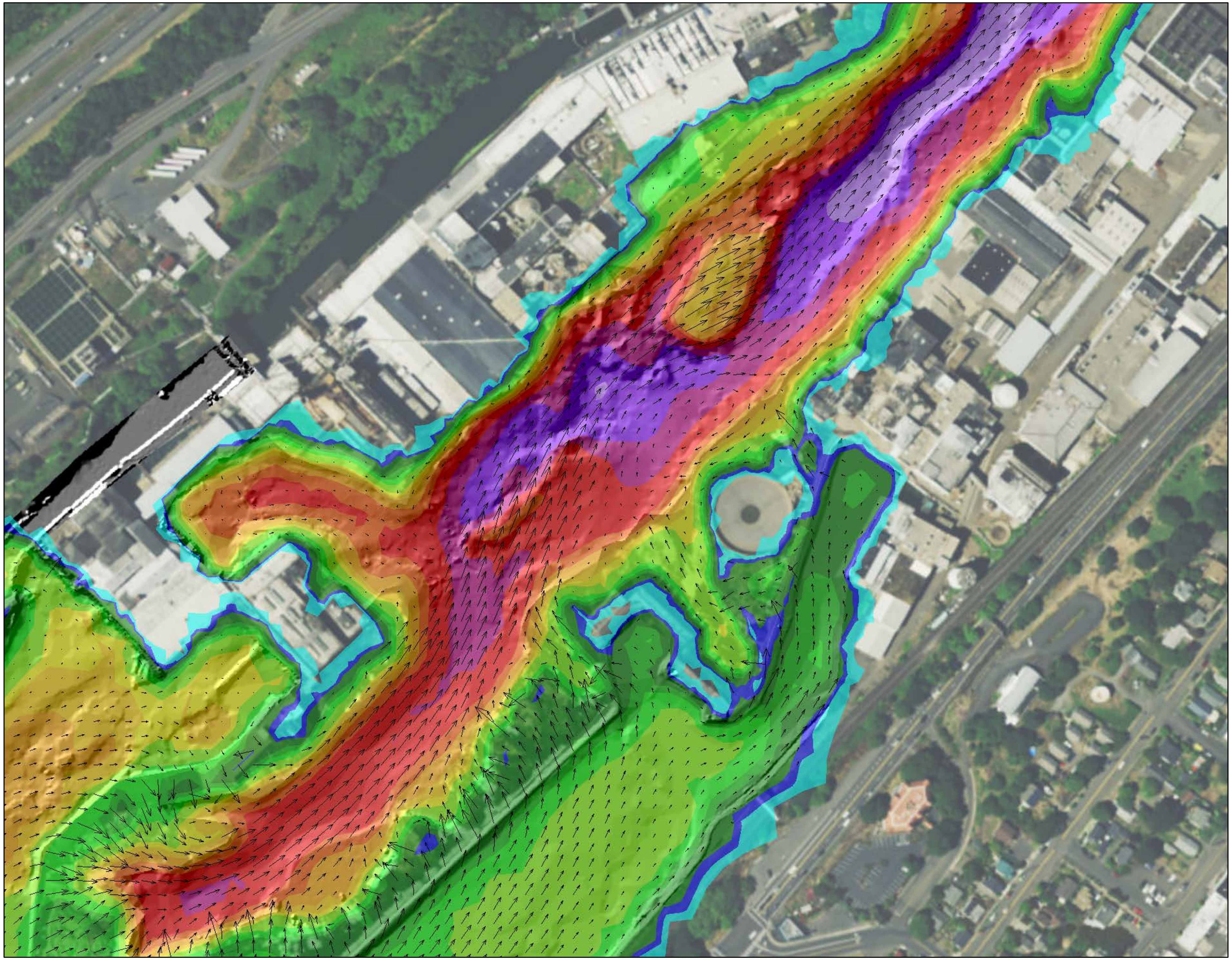
EXHIBIT 7B

Velocity, December 20, 2015

Existing Conditions Hydraulic Results

Riverwalk Park, Willamette Falls Legacy Site

ch2m



Vicinity Map

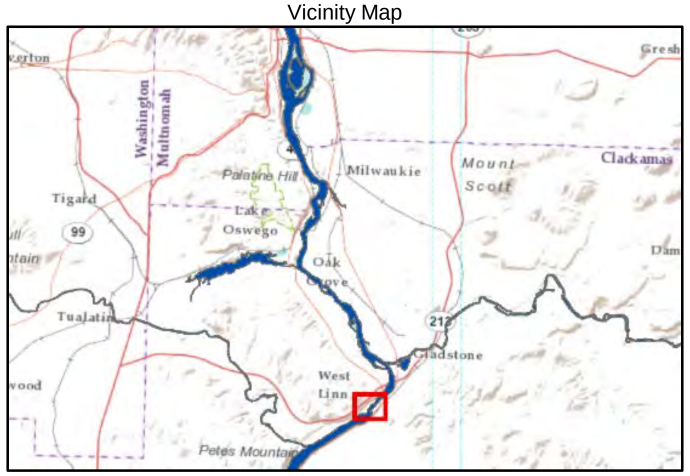
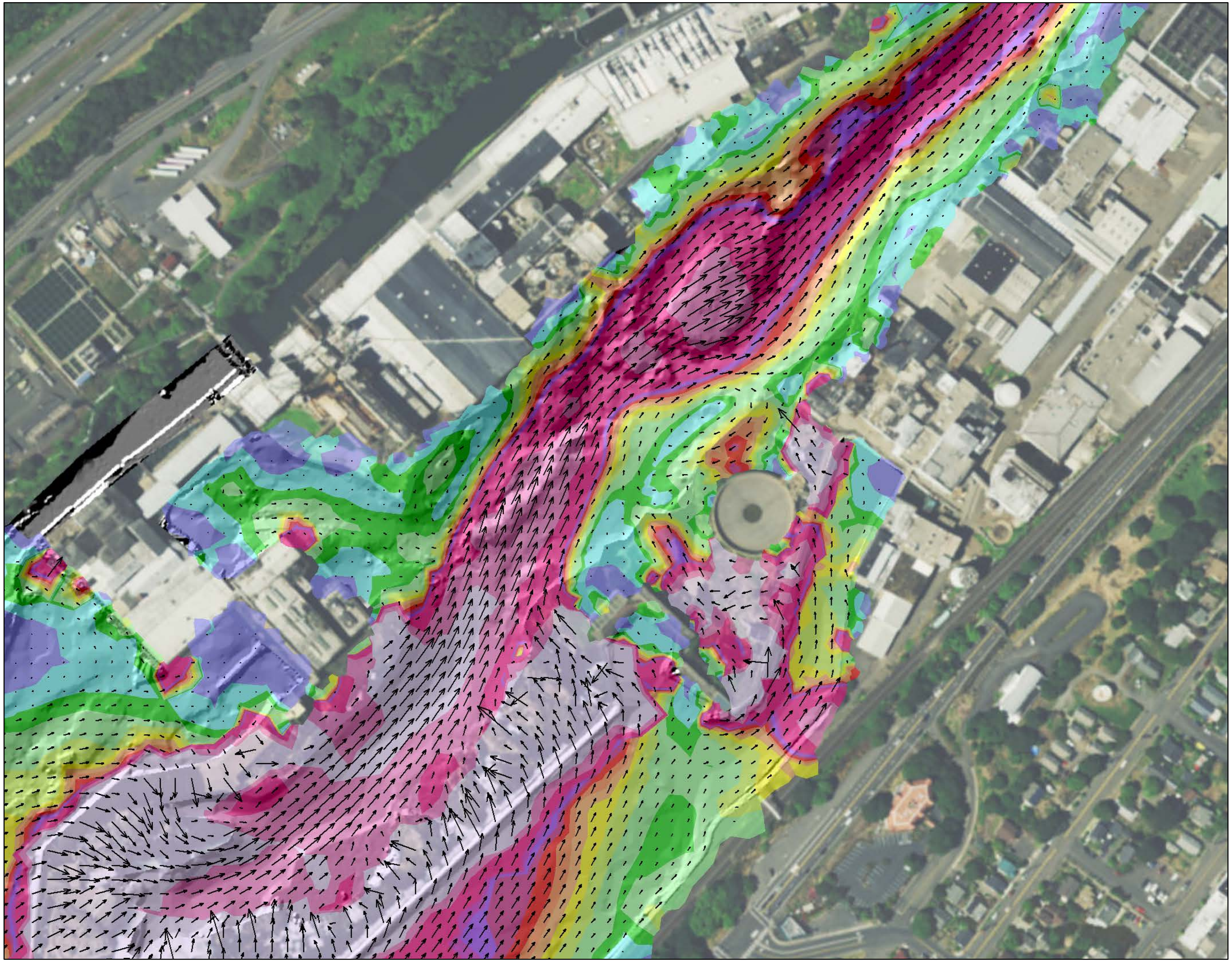


EXHIBIT 7C

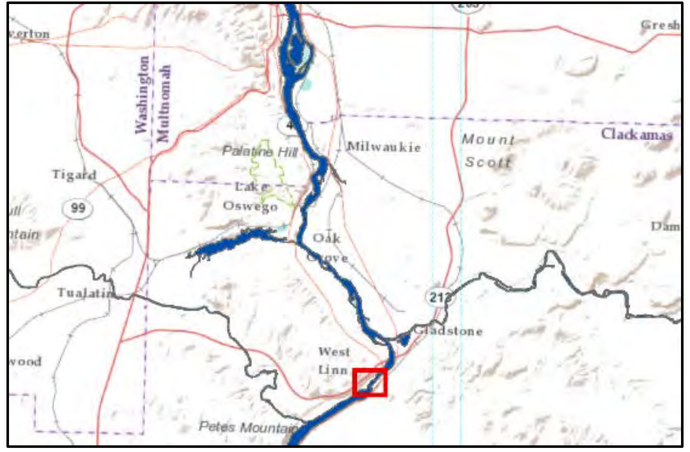
Total Water Depth, December 20, 2015

Existing Conditions Hydraulic Results

Riverwalk Park, Willamette Falls Legacy Site



Vicinity Map



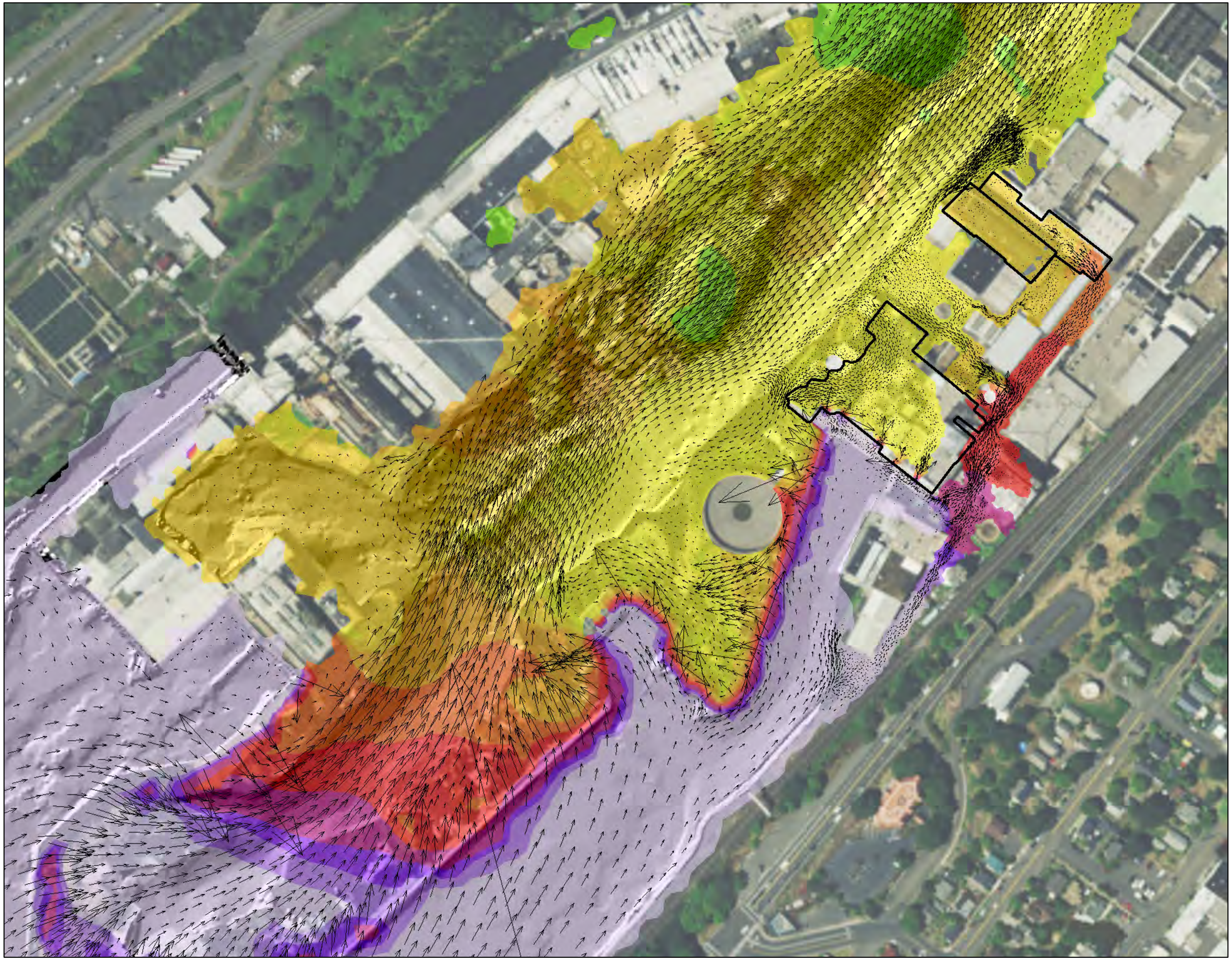
N

Shear Stress (Pa)

- Above 500
- 250 - 500
- 100 - 250
- 90 - 100
- 80 - 90
- 70 - 80
- 60 - 70
- 50 - 60
- 40 - 50
- 30 - 40
- 20 - 30
- 10 - 20
- 5 - 10
- 1 - 5
- 0 - 1
- Below 0

EXHIBIT 7D
Shear Stress, December 20, 2015
Existing Conditions Hydraulic Results
Riverwalk Park, Willamette Falls Legacy Site

ch2m:



Vicinity Map

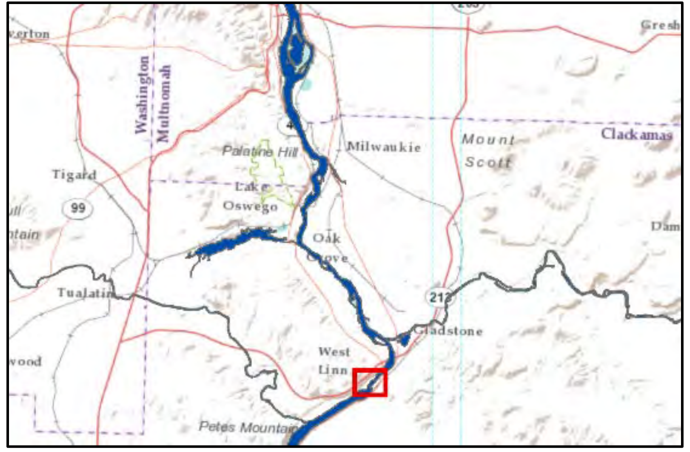
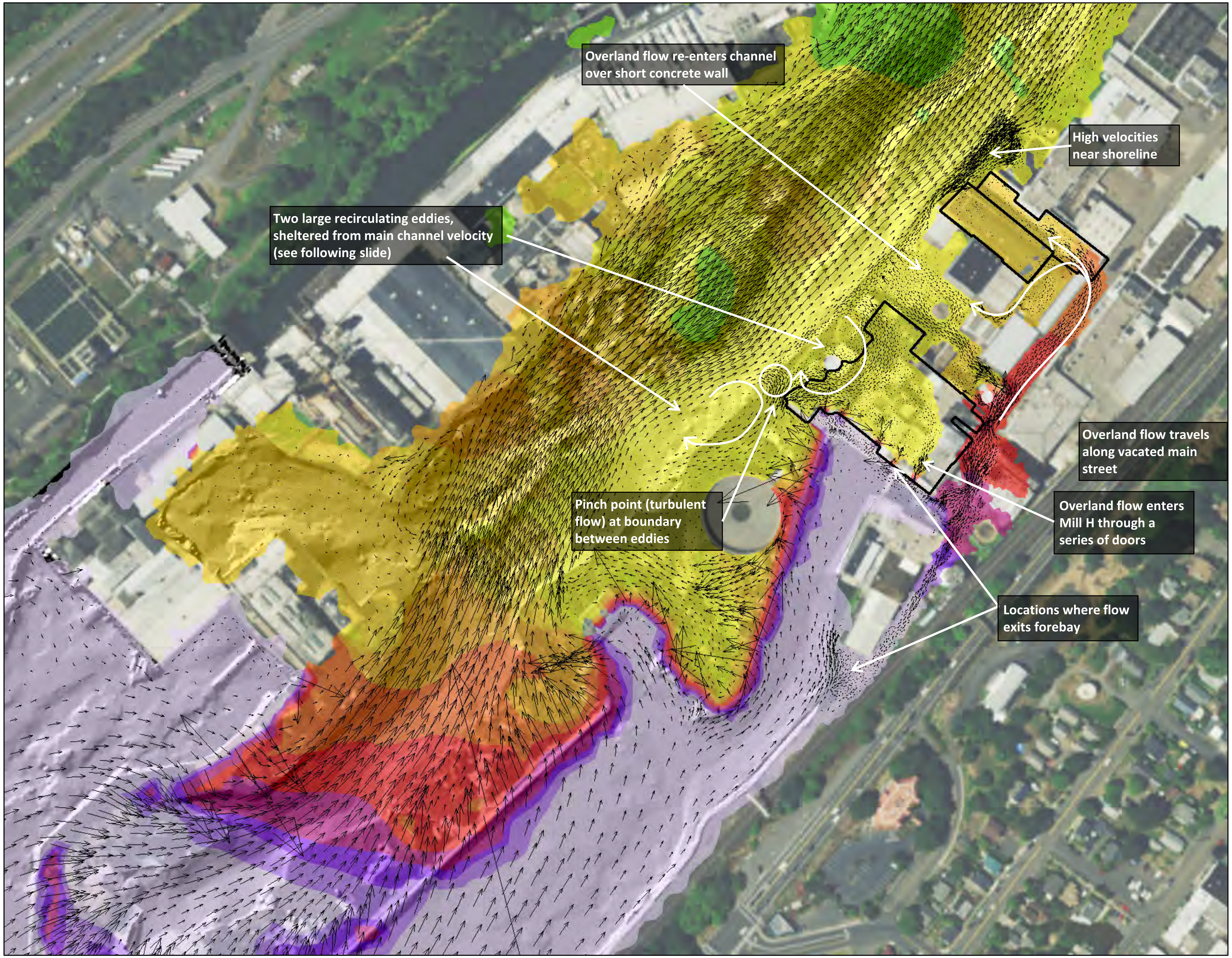
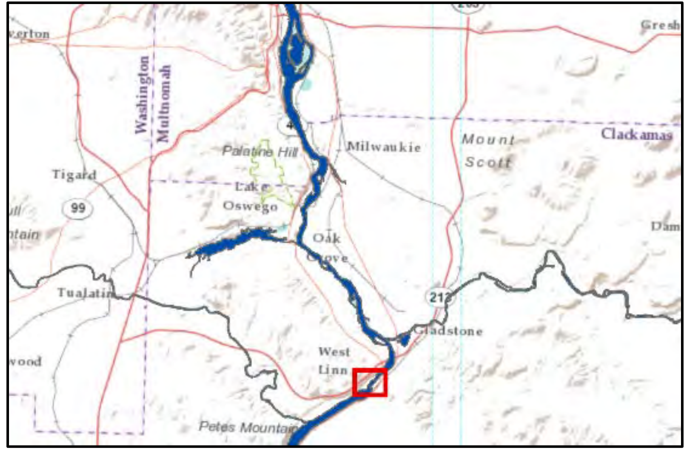


EXHIBIT 8A
Water Surface Elevation, February 1996
Existing Conditions Hydraulic Results
Riverwalk Park, Willamette Falls Legacy Site



Vicinity Map

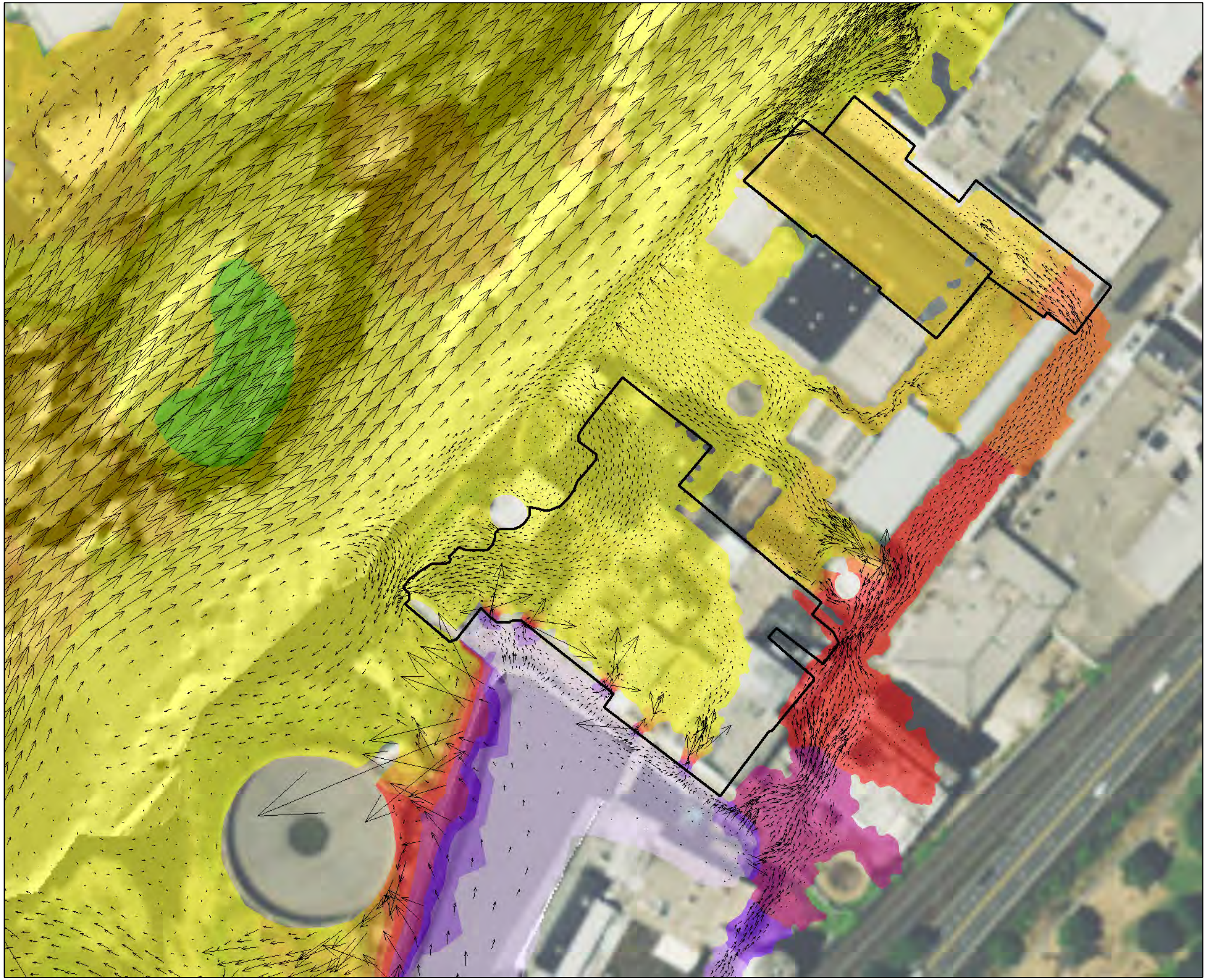


Surface elevation [ft]

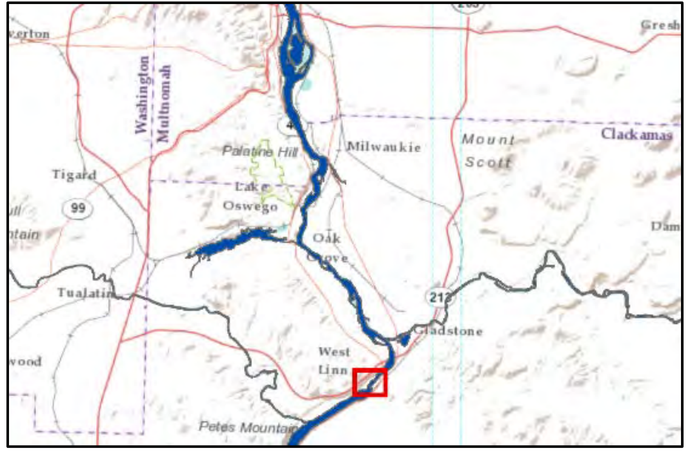
- ⬜ Above 66
- 🟪 65 - 66
- 🟪 64 - 65
- 🟪 63 - 64
- 🟪 62 - 63
- 🟪 58 - 62
- 🟥 54 - 58
- 🟧 50 - 54
- 🟧 46 - 50
- 🟧 42 - 46
- 🟨 38 - 42
- 🟩 34 - 38
- 🟩 30 - 34
- 🟦 27 - 30
- 🟦 25 - 27
- 🟦 Below 25

EXHIBIT 8B
Annotated Water Surface Elevation,
February 1996
Existing Conditions Hydraulic Results
Riverwalk Park, Willamette Falls Legacy Site

ch2m:



Vicinity Map

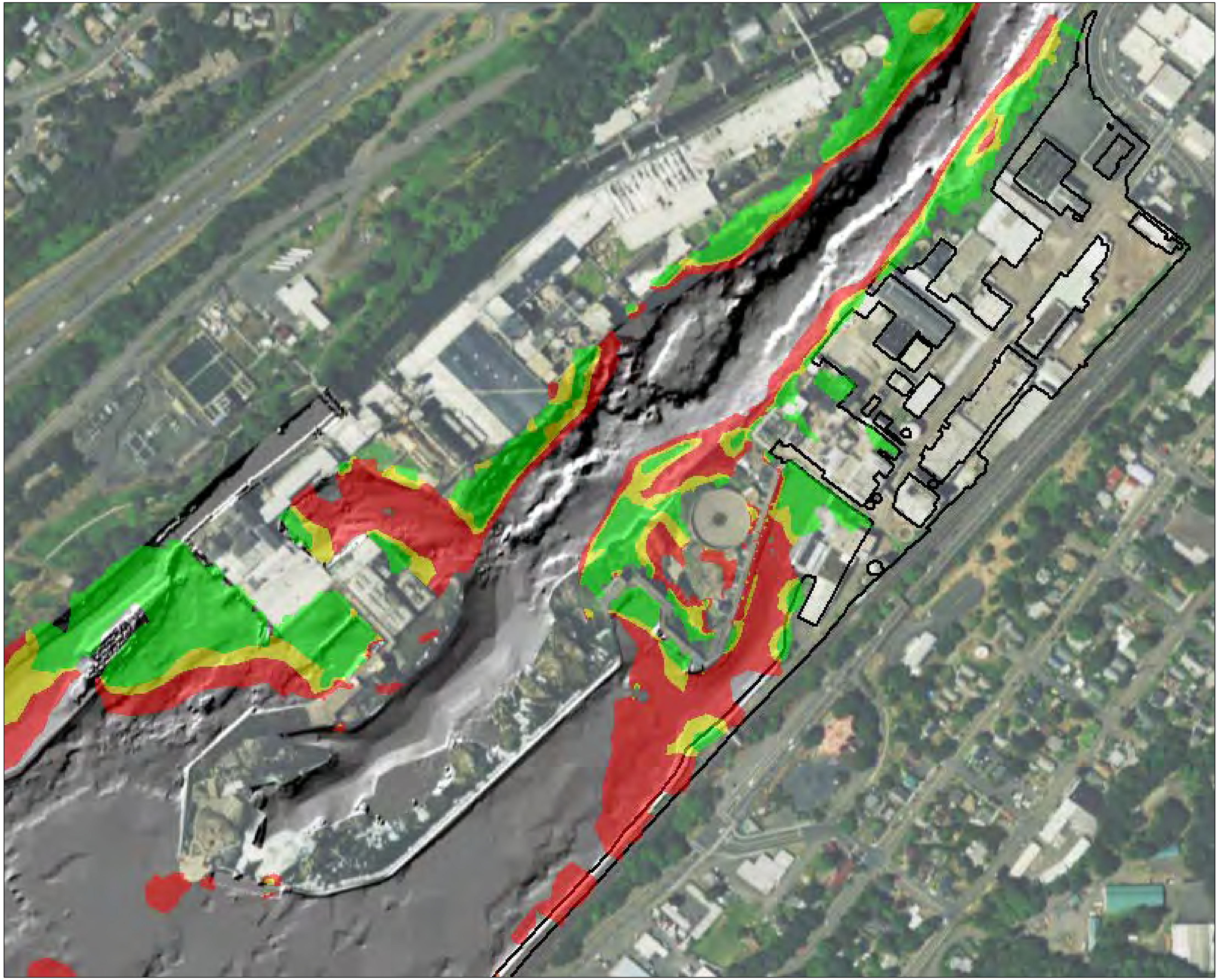


N

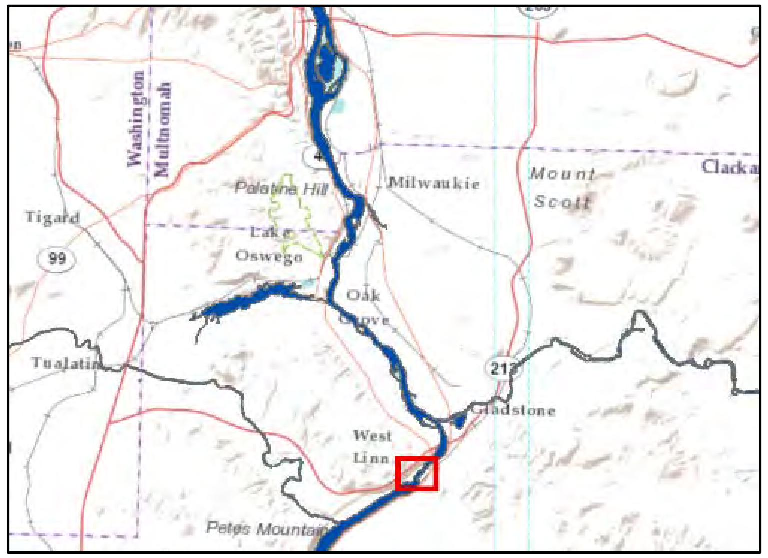
Surface elevation [ft]

■	Above 66
■	65 - 66
■	64 - 65
■	63 - 64
■	62 - 63
■	58 - 62
🟥	54 - 58
🟥	50 - 54
🟧	46 - 50
🟨	42 - 46
🟨	38 - 42
🟩	34 - 38
🟩	30 - 34
■	27 - 30
■	25 - 27
🟦	Below 25

EXHIBIT 8C
Water Surface Elevation Zoomed into
Project Site, February 1996
Existing Conditions Hydraulic Results
Riverwalk Park, Willamette Falls Legacy Site



Vicinity Map

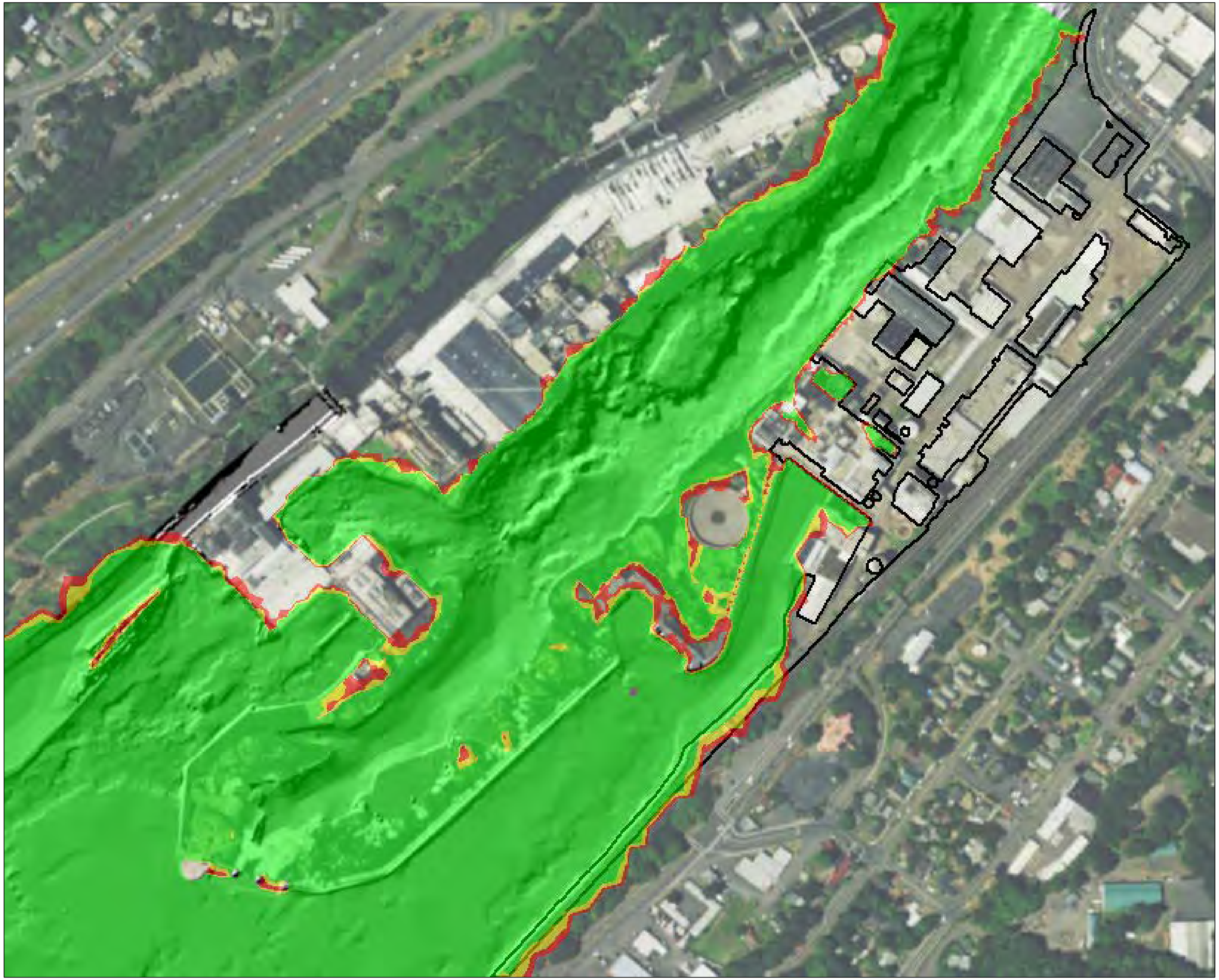


N

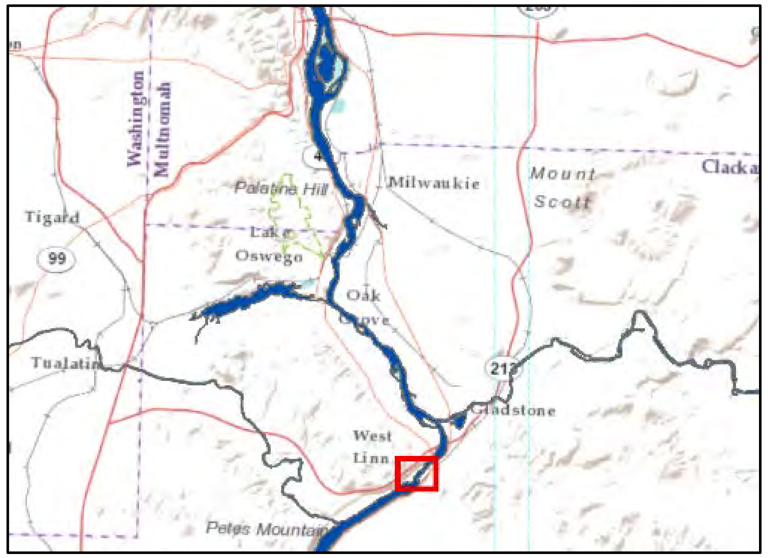
Current speed [ft/s]

⬜ Above 2.6
🟥 1.3 - 2.6
🟨 0.8 - 1.3
🟩 Below 0.8

EXHIBIT 9A
Velocity, Summer 10% Exceedance Flow 53,300 cfs
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site



Vicinity Map

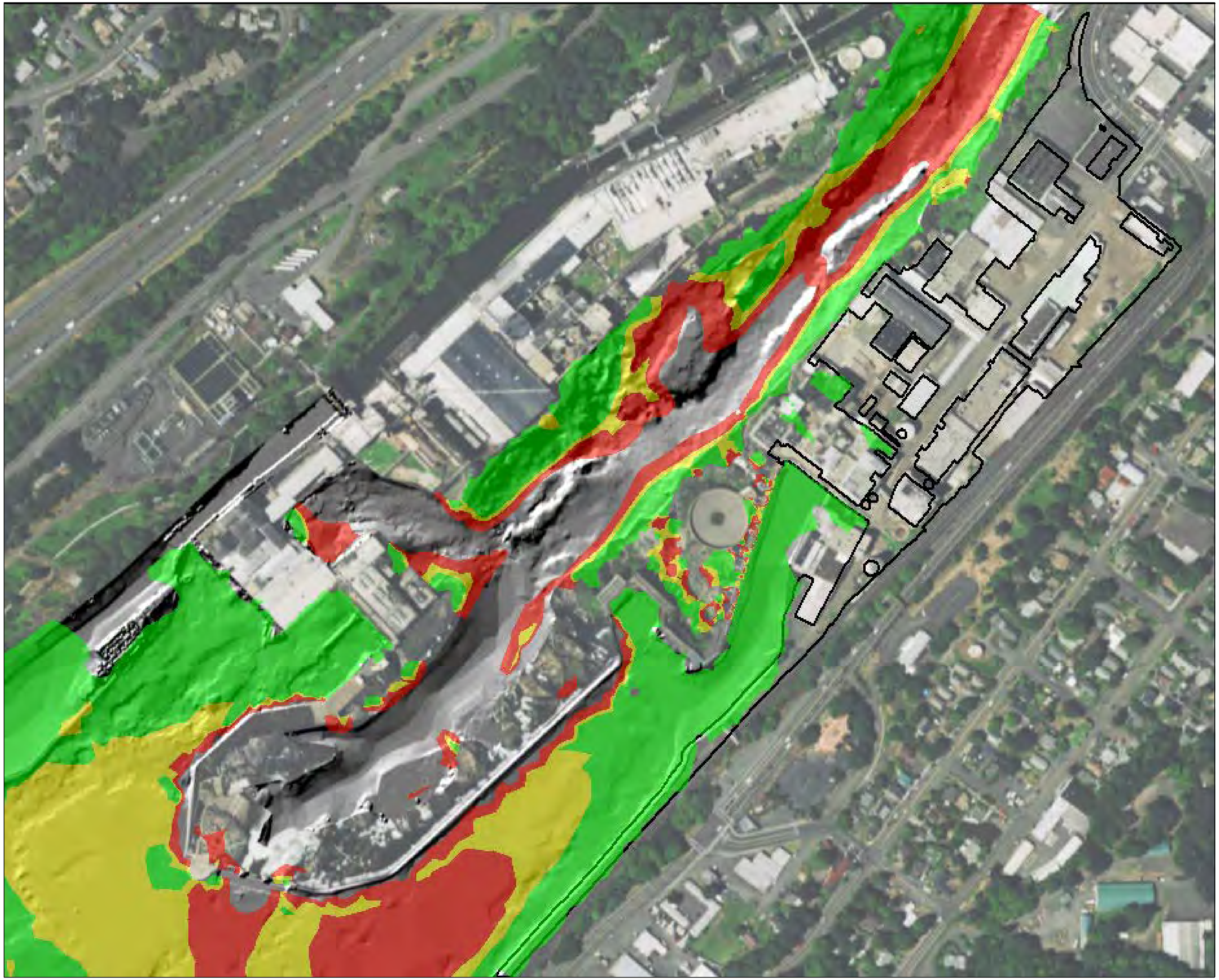


N

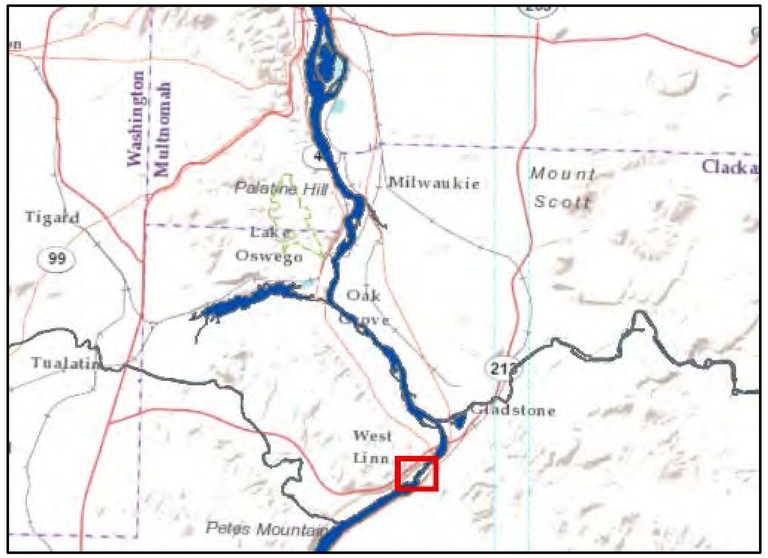
Total water depth [ft]

🟩 Above 1.0
🟨 0.4 - 1.0
🟥 0.0 - 0.4
☐ Below 0.0

EXHIBIT 9B
Water Depth , Summer 10% Exceedance Flow 53,300 cfs
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site



Vicinity Map

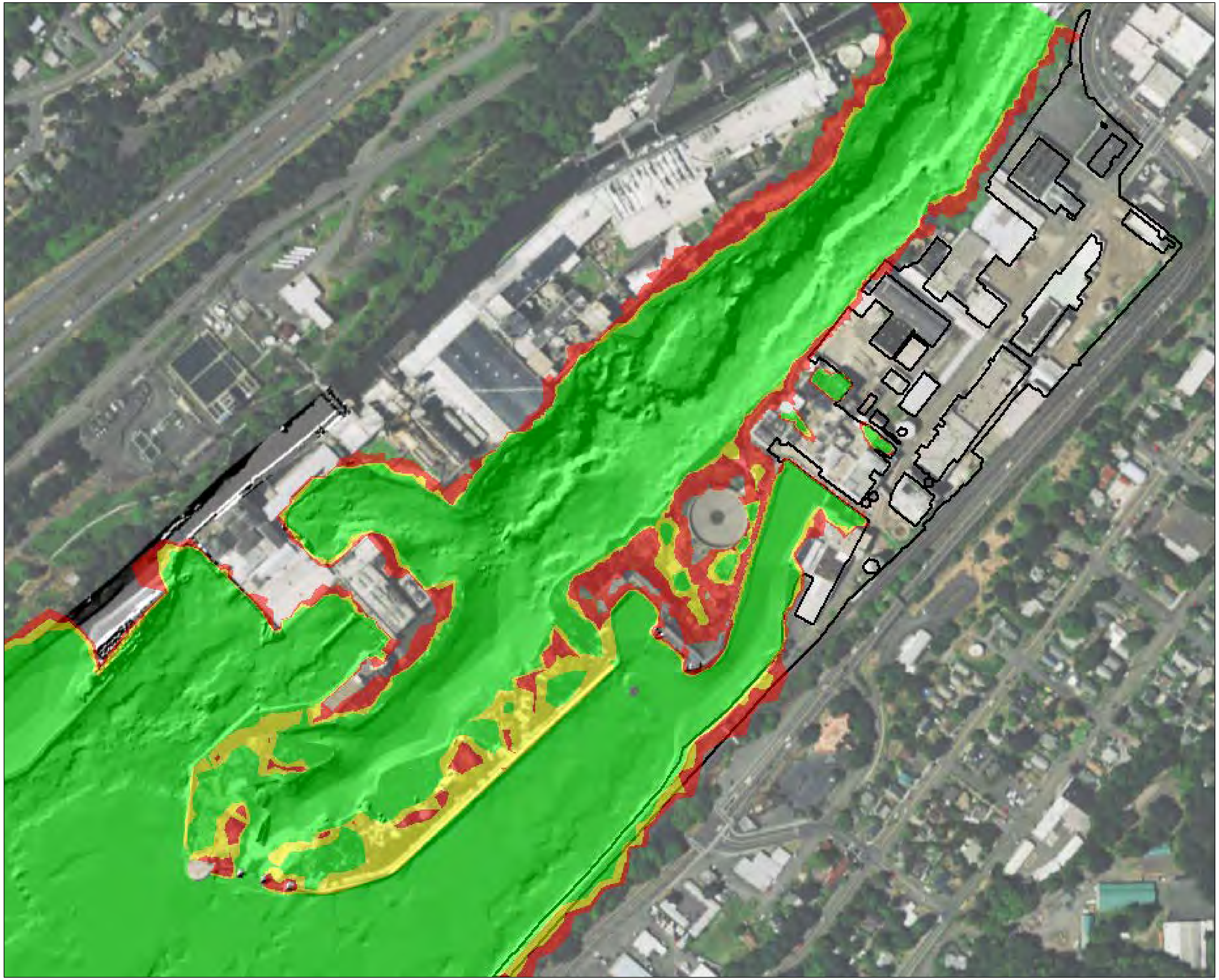


N

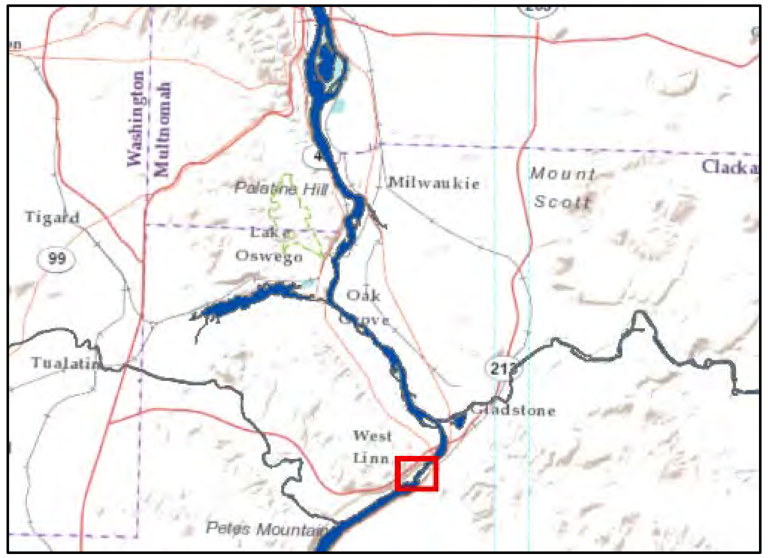
Current speed [ft/s]

☐	Above 2.6
🟥	1.3 - 2.6
🟨	0.8 - 1.3
🟩	Below 0.8

EXHIBIT 10A
Velocity, Summer 90% Exceedance Flow 11,700 cfs
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site



Vicinity Map

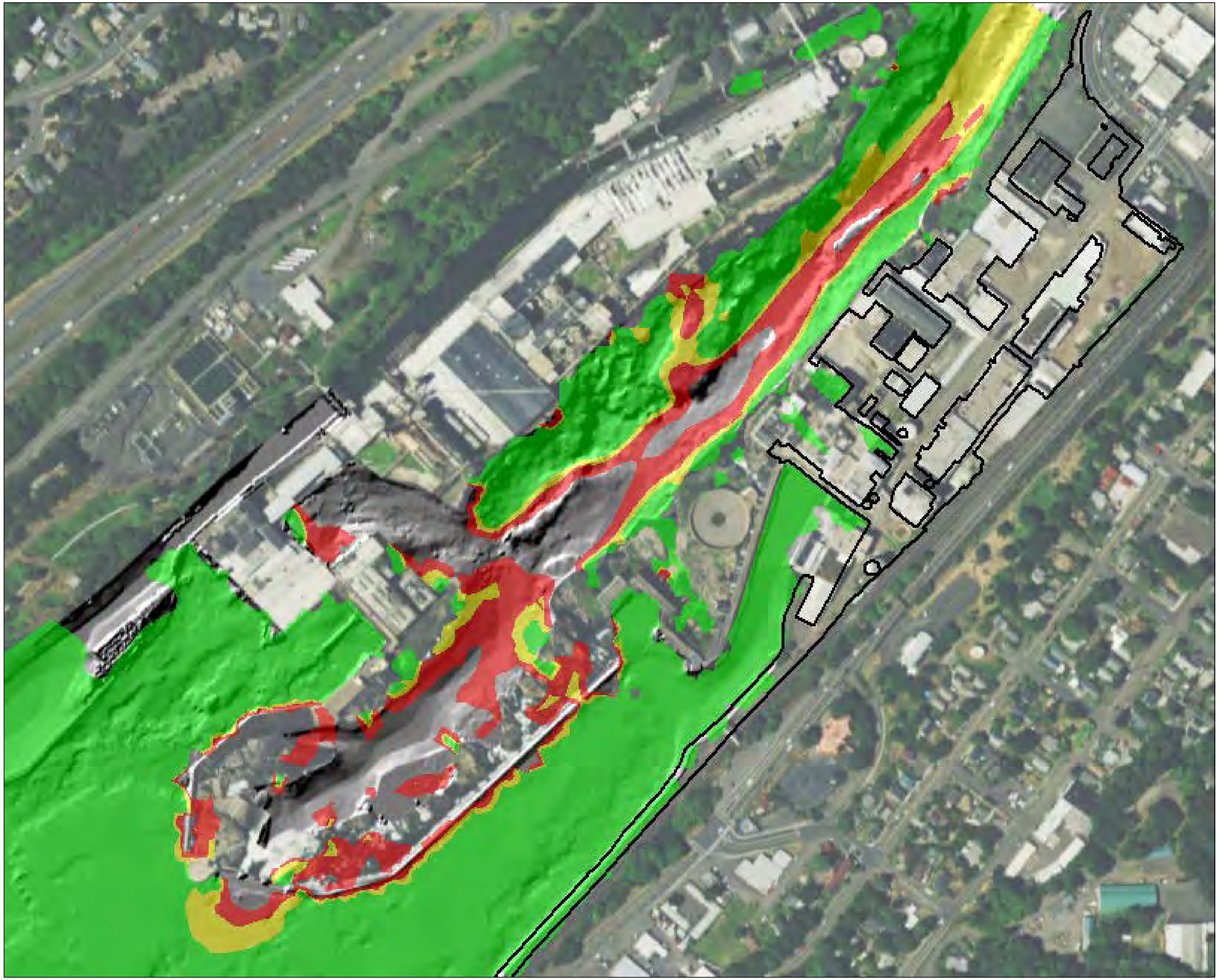
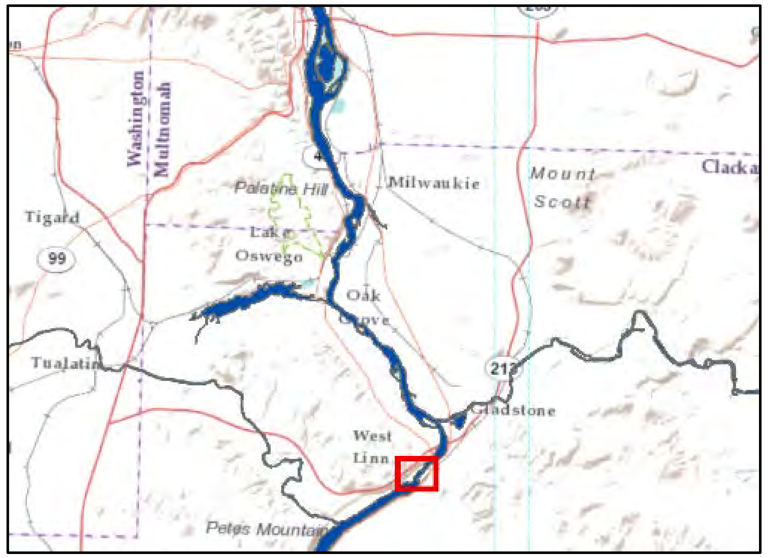


N

Total water depth [ft]

- 🟩 Above 1.0
- 🟨 0.4 - 1.0
- 🟥 0.0 - 0.4
- ☐ Below 0.0

EXHIBIT 10B
Water Depth, Summer 90% Exceedance Flow 11,700 cfs
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site

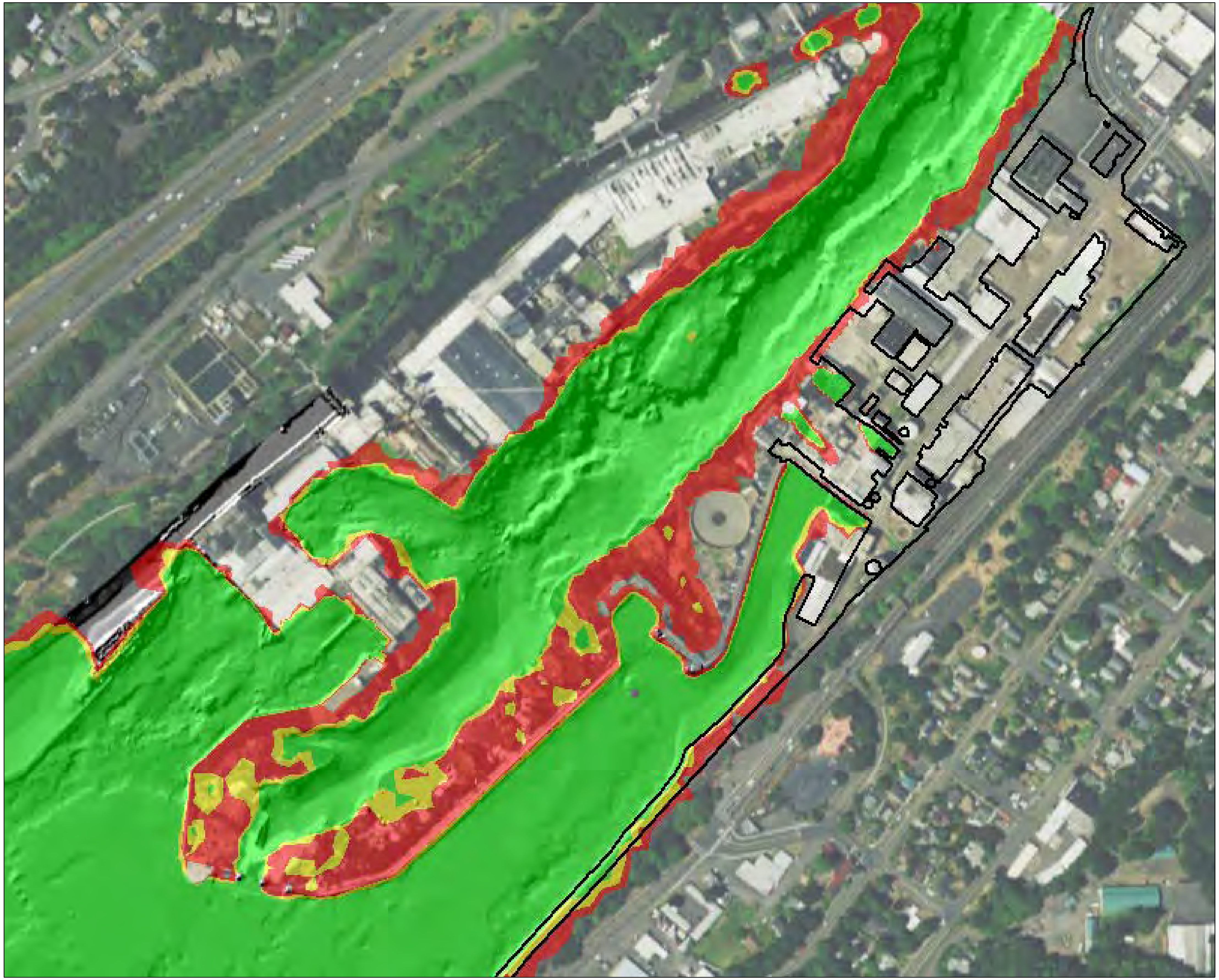

Vicinity Map

N

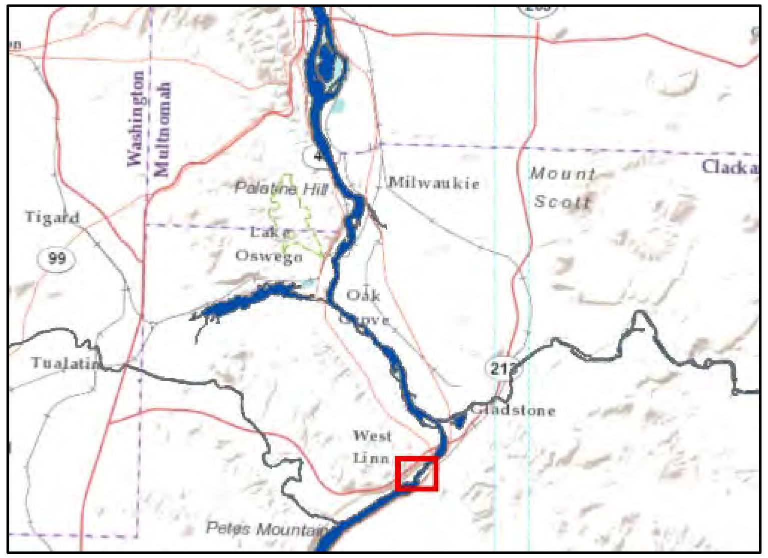
Current speed [ft/s]

⬜ Above 2.6
🟥 1.3 - 2.6
🟨 0.8 - 1.3
🟩 Below 0.8

EXHIBIT 11A
Velocity, Summer 2015 Record Low Flow 3,400 cfs
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site



Vicinity Map



N

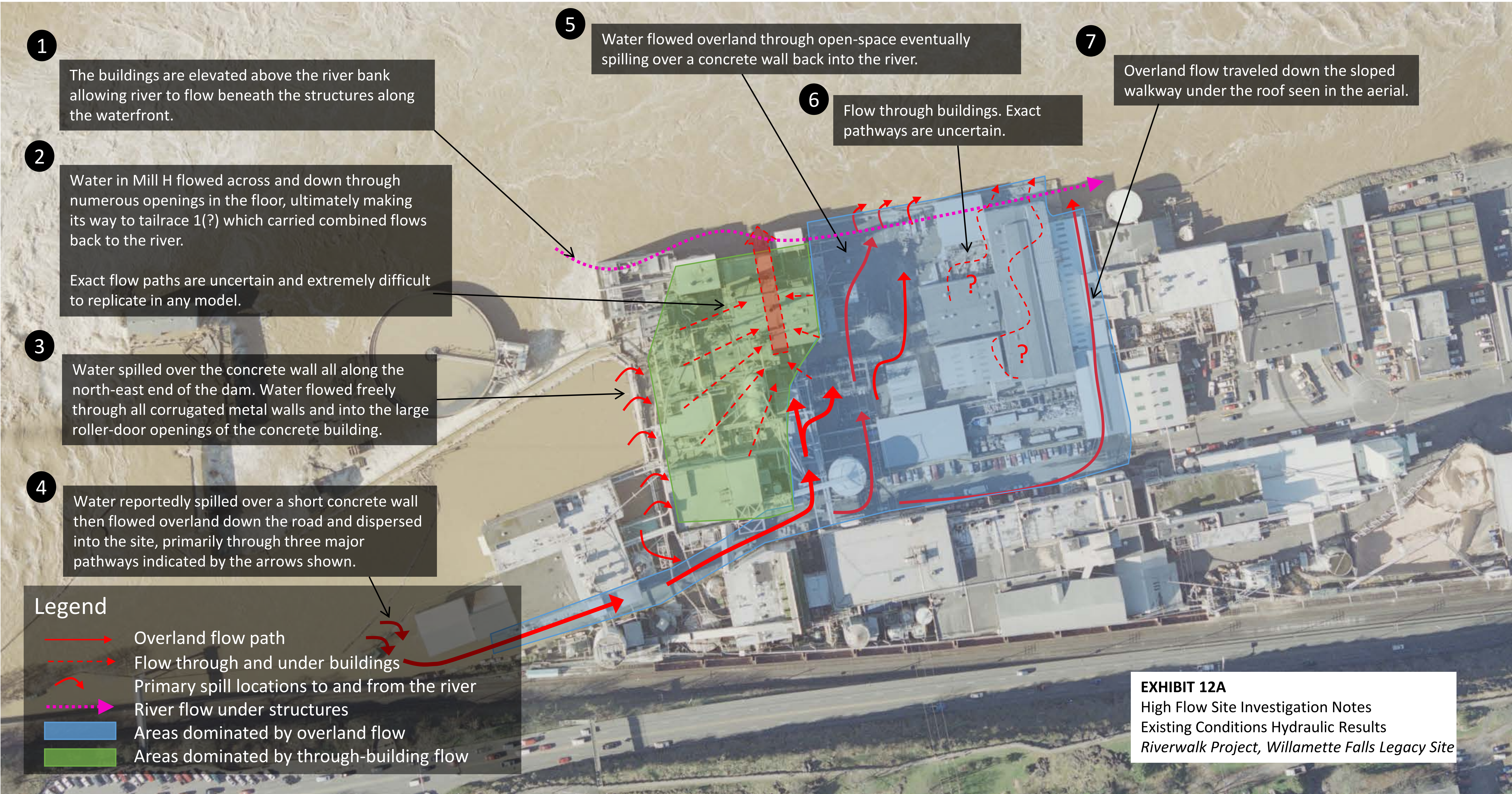
Total water depth [ft]

- 🟩 Above 1.0
- 🟨 0.4 - 1.0
- 🟥 0.0 - 0.4
- ☐ Below 0.0

EXHIBIT 11B
Water Depth, Summer 2015 Record Low Flow 3,400 cfs
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site

Flow-paths and general descriptions based on anecdotal information and site visit

Aerial taken 2/11/1996, after peak flow



1 The buildings are elevated above the river bank allowing river to flow beneath the structures along the waterfront.

2 Water in Mill H flowed across and down through numerous openings in the floor, ultimately making its way to tailrace 1(?) which carried combined flows back to the river.

Exact flow paths are uncertain and extremely difficult to replicate in any model.

3 Water spilled over the concrete wall all along the north-east end of the dam. Water flowed freely through all corrugated metal walls and into the large roller-door openings of the concrete building.

4 Water reportedly spilled over a short concrete wall then flowed overland down the road and dispersed into the site, primarily through three major pathways indicated by the arrows shown.

5 Water flowed overland through open-space eventually spilling over a concrete wall back into the river.

6 Flow through buildings. Exact pathways are uncertain.

7 Overland flow traveled down the sloped walkway under the roof seen in the aerial.

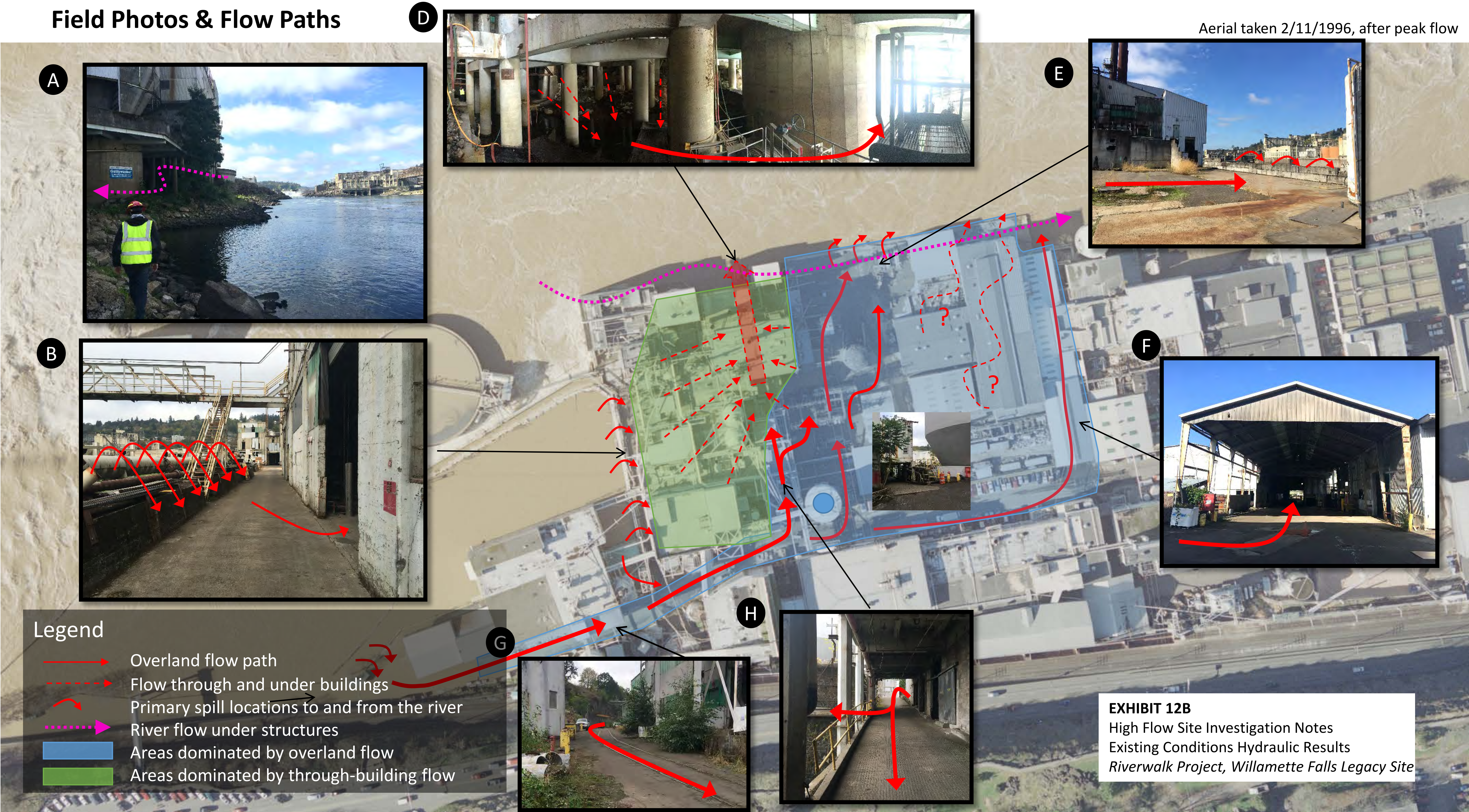
Legend

- → Overland flow path
- ⇢ Flow through and under buildings
- ↷ Primary spill locations to and from the river
- ⋯▶ River flow under structures
- 🟦 Areas dominated by overland flow
- 🟩 Areas dominated by through-building flow

EXHIBIT 12A
High Flow Site Investigation Notes
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site

Field Photos & Flow Paths

Aerial taken 2/11/1996, after peak flow



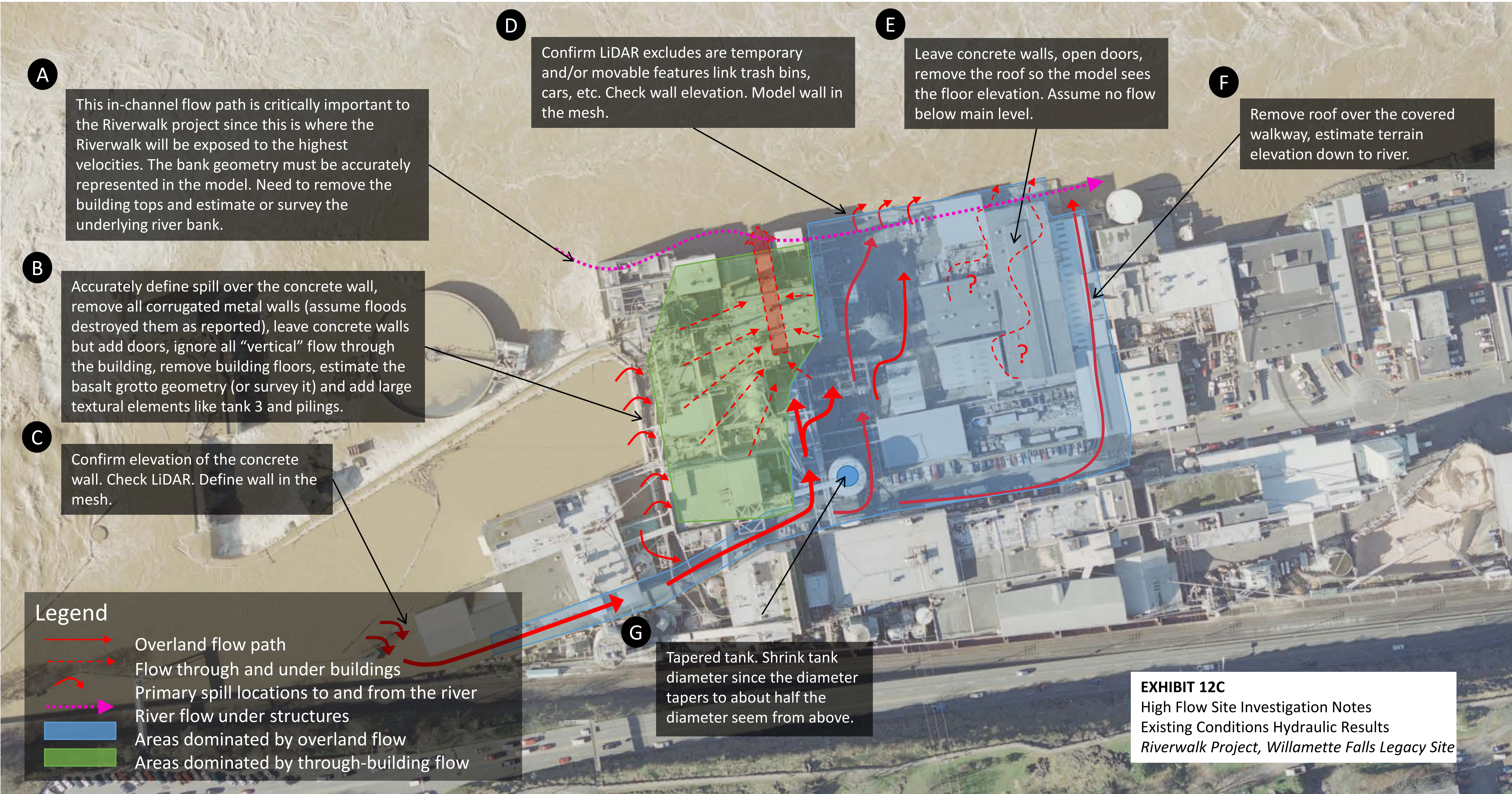
Legend

- → Overland flow path
- ⇢ Flow through and under buildings
- ↷ Primary spill locations to and from the river
- ⇢ River flow under structures
- 🟦 Areas dominated by overland flow
- 🟩 Areas dominated by through-building flow

EXHIBIT 12B
High Flow Site Investigation Notes
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site

Modeling Approach Notes

Aerial taken 2/11/1996, after peak flow



A

This in-channel flow path is critically important to the Riverwalk project since this is where the Riverwalk will be exposed to the highest velocities. The bank geometry must be accurately represented in the model. Need to remove the building tops and estimate or survey the underlying river bank.

B

Accurately define spill over the concrete wall, remove all corrugated metal walls (assume floods destroyed them as reported), leave concrete walls but add doors, ignore all “vertical” flow through the building, remove building floors, estimate the basalt grotto geometry (or survey it) and add large textural elements like tank 3 and pilings.

C

Confirm elevation of the concrete wall. Check LiDAR. Define wall in the mesh.

D

Confirm LiDAR excludes are temporary and/or movable features link trash bins, cars, etc. Check wall elevation. Model wall in the mesh.

E

Leave concrete walls, open doors, remove the roof so the model sees the floor elevation. Assume no flow below main level.

F

Remove roof over the covered walkway, estimate terrain elevation down to river.

G

Tapered tank. Shrink tank diameter since the diameter tapers to about half the diameter seem from above.

Legend

- → Overland flow path
- ⇢ Flow through and under buildings
- ↷ Primary spill locations to and from the river
- ⇢ River flow under structures
- 🟦 Areas dominated by overland flow
- 🟩 Areas dominated by through-building flow

EXHIBIT 12C
High Flow Site Investigation Notes
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site

High-water marks from 1996 flood surveyed by AKS.

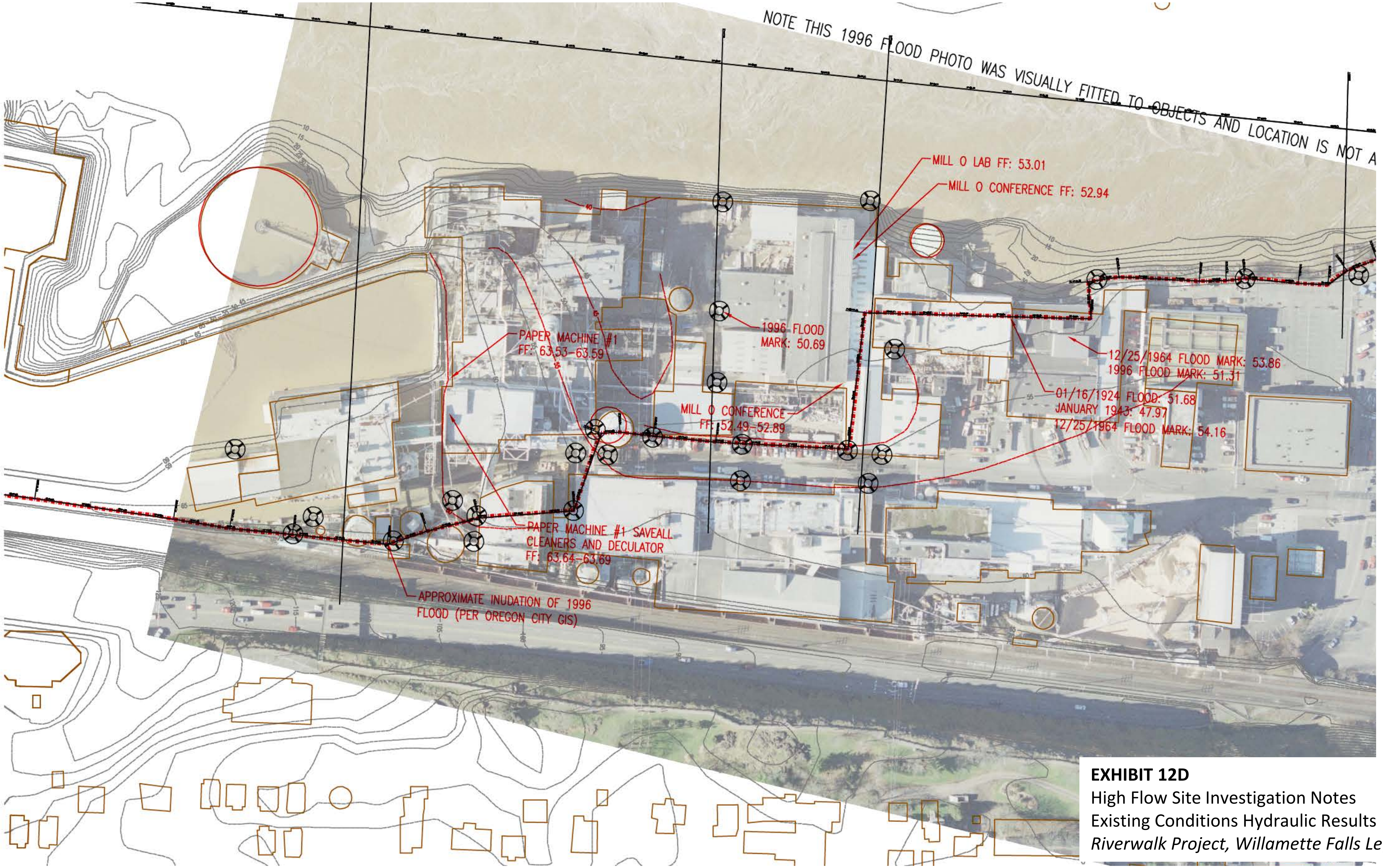


EXHIBIT 12D
High Flow Site Investigation Notes
Existing Conditions Hydraulic Results
Riverwalk Project, Willamette Falls Legacy Site

Geotechnical Data Report
Willamette Falls Riverwalk
Public Yard / Alcove Area
Oregon City, Oregon

Prepared For

Snøhetta
80 Pine Street, 10th floor
New York, NY 10005

May 19, 2017
NGI Project No. 2919.1.1

Northwest Geotech, Inc.
Northwest Testing, Inc.

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION

The purposes of this subsurface investigation and Geotechnical Data Report were limited to:

- identification of the depth to bedrock across the exploration area,
- characterization of the fill proposed to be removed,
- and data acquisition to guide future investigations, preliminary engineering and estimating.

Geotechnical Data Reports are the standard for inclusion in contract/bid documents for infrastructure projects and are focused on providing subsurface data to establish existing conditions.

2.0 SITE AND PROJECT DESCRIPTIONS

The area of investigation is located within the former Blue Heron paper mill just south of downtown Oregon City, and adjacent to the Willamette River. Figure 1 provides an approximate outline of the area explored. This general area was created by filling and is commonly referred to as the "yard" since it is relatively open. Concept design plans call for the removal of a significant portion of the historic fill to re-expose the bedrock surface and potentially create a restored habitat and expanded shoreline area. Public open space is proposed in the area north and east of the proposed fill removal. Project documents refer to this portion of the project as the Public Yard and Alcove.

3.0 SUBSURFACE EXPLORATIONS

3.1 Borings

The subsurface explorations consisted of drilling four (4) exploratory borings utilizing a sonic coring rig capable of rapidly advancing in the rocky fill and into the basalt bedrock. These borings are designated S-1 through S-4 and ranged in depth from 20.0 feet to 38.0 feet below the ground surface. The plotted locations of each boring are shown on the Exploration Plan, Figure 2. Additionally sixty seven (67) air track borings identified as B-1 through B-73 were drilled to identify the approximate elevation of bedrock and relative hardness at the locations plotted on Figure 2. Six (6) of the proposed seventy three (73) air track locations were omitted due to inadequate overhead drill clearance. All boring locations were surveyed by AKS Engineering and Forestry, and the point file was imported into the existing AKS survey file previously provided to NGI by Metro. The surveyed coordinates and elevations of each borehole are presented in Table 1.

The sonic borings were performed by Cascade Drilling utilizing the Terra Sonic TSi 150CC Compact Crawler drill rig which created a roughly 4-inch diameter hole and 3.5 inch diameter core. The air track borings were performed by Aggregate Resources Inc., utilizing a typical track mounted pneumatic percussion drill which creates a 1.5 inch diameter borehole.

Continuous coring of the site fill and underlying soil and bedrock were performed for the entire depth of each sonic boring. Penetration testing utilizing a Dames & Moore (D&M) sampler driven by a 140 pound hammer was utilized at selected locations. No samples were taken during the air-track drilling program as all materials are crushed by the drilling process. The air-track drilling does provide an indication of bedrock hardness based on the size and character of the crushed basalt and operator experience.

Environmental samples were taken at intervals of 5 feet for all soils encountered in the sonic borings. All samples were placed in glass jars and immediately labeled and placed into a cooler to prevent sample degradation and transported back to the laboratory for storage. Environmental samples were picked up by a Maul Foster and Alongi representative and a chain of custody was created.

Each boring was logged by a representative from our office who collected samples and returned them to our laboratory for more thorough logging of the samples and laboratory testing. Formal boring logs are provided in Appendix A, as Figures A-1 through A-4, and describe conditions encountered and the results of the D&M penetration testing.

4.0 GEOLOGY

A reprint of a portion of the 2009 Geologic Map of the Oregon City Quadrangle is provided in Figure 3. It is generally understood that the falls were created by faulting along the Bolton Fault. Over time, the falls regressed upriver. The site basalt has been scoured and is relatively fresh (unweathered) and mapped as the Grand Ronde Basalt, Sentinel Bluffs member of the Columbia River Basalt Group. Site explorations indicated that in general the basalt is somewhat harder above roughly elevation 30, and on the soft side of the spectrum below elevation 30, which also can be interpreted to augment the creation and regression of the falls over geologic time. Summarizing, a period of faulting forms a vertical offset and subsequently the softer underlying rock erodes more rapidly eventually undermining the harder rock layer which then topples resulting in a waterfall that slowly works its way up river. Within the project area, one can expect that changes in elevation of the upper hard basalt will be near vertical and the underlying soft basalt more gradual were the hard basalt has been removed. As an example Boring S-4 encountered a large block (toppled block/boulder or undermined hanging block) of hard basalt in the vicinity of the auto shop where several instances of abrupt changes in the bedrock elevation occur. It is important to note that some of these abrupt changes may also be man-made.

Two sequences of alluvium are interpreted to be present above the bedrock surface:

1. Recent Willamette River Alluvium which is interpreted to have two facies. An upper facies of thinly stratified silty sands deposited in back eddies where high water velocities are absent; these deposits are interpreted to have been deposited following the dam construction since prior to dam construction this area would have been subject to high water velocities prohibiting sand deposition. The underlying facie is primarily subangular to subrounded gravels with some coarse sand matrix, and may also be intermingled with historic spoils from rock excavations in some areas during the dam construction process.

2. An older, over-consolidated sequence of alluvium was encountered as a thin mantle and/or infill above underlying bedrock depressions. This alluvium is moderately weathered gravel with a stiff clay to clayey silt matrix.

A variety of fills overlay the bedrock and alluvium (where present). Fill is anticipated to directly overlay bedrock (alluvium is absent) in areas of bedrock highs, and where the slope of the bedrock steepens adjacent to the river's primary high velocity flow channel such as the northwestern corner of the yard area. Fill interpretation is discussed further in the following section.

5.0 SUBSURFACE CONDITIONS

5.1 Site Fills

The different sequences of site fills encountered can be generally described as sandy gravel with variable silt and clay content. The relative density, age/location, and quantity of construction debris helped differentiate them across the site. The most recent fill in the yard area consisted of a mass fill interpreted to have been constructed simply from dumping at the outward edge of the fill, and working the fill outward towards the river from the yard elevation. This "top-down" fill construction method results in the lowest possible density and can be characterized as a uniformly loose fill. This was evidenced by the consistent lack of a complete core return in the sonic borings as material densified due to the vibration and/or was pushed outward as the core bit progressed. In general, the length of sonic core recovery compared to the core run length provides an indirect indication of the granular fill relative density. Based on the historical photos provided in Figure 4, and the consistency of the mass fill, it appears to have been constructed in in a single phase in the 1960's or early 1970's.

Beneath the loose mass fill, two sequences of older fill were encountered, most notably in boring S-3. While debris in the loose mass fill were somewhat widely scattered and generally limited to concrete and asphaltic concrete fragments, an older sequence of fill was encountered that contained numerous small debris consisting of brick, mortar, and wood fragments and had some more compact zones within it. Sitting atop or embedded into this older fill a remnant mortared basalt boulder structure or foundation was encountered, and while it may have been spoiled there, it appeared intact and rather large at 3.5 to 4 feet thick. The construction materials appeared to be similar to the Grotto Arch.

Roughly 10 feet below the remnant a very old sequence of fill was interpreted to be present primarily based on a concentration of steel fragments such as square nails not encountered elsewhere. The steel fragments are interpreted to have collected in a depression within a prior flow line/channel, but above the oldest fill. This oldest sequence of fill was encountered below this flow line and based on material and lack of any debris it is interpreted to have been placed early in either the dam construction or other initial site development processes. For example the material resembles local basalt aggregate pit material following its excavation/break-out and prior to the crushing process. This fill was also relatively compact based on high core return and core inspection, and roughly consisted almost entirely of course angular gravel sized particles (2 to 4-inch).

Around the northern and western perimeter of the yard several lifts or sequences of older loose to medium dense fills were encountered in the vicinity of structures. At the northern sonic boring S-2 a sequence of fill encountered near an elevation of 34 feet was relatively compact resulting in a few feet of perched groundwater above it. Five interpretive cross-sections were developed to better illustrate our interpretation of site fill and bedrock conditions, and are provided as Figures 5 through 9. The locations of the sections are shown on the Exploration Plan in Figure 2. While the cross-sections depict relatively smooth bedrock elevation transitions, we would anticipate that many of the elevation transitions between elevation 30 and 45 to be more abrupt (vertical) and have a similar topography as the undeveloped portions of the existing falls.

It should be noted that all site fills may contain boulders (particles greater than 12 inches in diameter) and boulder sized concrete debris.

5.2 Soils and Bedrock

The alluvial deposits encountered were generally discussed previously in Section 3.0 Geology. The alluvial sands graded with depth to gravelly sand and sandy gravel below, some of which may be intermingled with older site fills. The more recent alluvium was encountered only in Boring S-1 and at a relatively high elevation compared to ordinary river levels. The alluvium is interpreted to be loose and anticipated to be somewhat limited in its lateral extent due to the specific lower velocity environment required for deposition and the limits/margins of elevated prior site fills.

The older, overconsolidated alluvium that was encountered directly above the bedrock is anticipated to be limited to discrete pockets in basalt depressions.

The basalt bedrock hardness was typically classified as soft to medium hard (R2-R3) where exposed below elevations 28 to 32 feet roughly. Moving inland, the basalt becomes medium hard to hard (R3-R4) in the vicinity of Boring S-4 where an unconfined compression test fell within the midrange of R3 (medium hard) near elevation 32. Elsewhere, farther inland near the Grotto, basalt hardness indicates R4 (hard) conditions. The majority of the basalt primary joint spacing is anticipated to fall into the moderately close range of 1 to 3 feet. The aggressive nature of the sonic drilling method highly disturbs or breaks the rock and as a result the Rock Quality Index (RQD) was not utilized as a descriptor.

5.3 Groundwater

Ground water measurements were taken in the air track boring locations and results are provided in Table 1, along with approximate depth and elevation of the basalt bedrock. Groundwater elevations vary widely and appear to be influenced by the depth to bedrock. When measuring the depth to water in the air-track boring holes, if the hole had collapsed to the point where only a few inches of water was present prior to encountering soil, the data was omitted from Table 1.

6.0 LABORATORY TESTING

Representative soil samples obtained during our subsurface exploration program were tested in the laboratory to assist with soil classification and engineering properties.

The laboratory testing program consisted of the following:

- Moisture Contents
- Gradation (Dry Sieve)
- Fines content (Washed over No. 200 Sieve)
- Unconfined Rock Compressive Strength

Moisture content tests are applicable or informative for fine grained samples/deposits, of which there were very few. Moisture content test results are provided on the formal boring logs in Appendix A.

Samples for dry sieve gradation testing were selected from core samples/runs that were relatively consistent in materials and representative of the fill sequences proposed for removal. Prior to performing the sieve analysis, large particles (cobbles) that had been cored through were separated; the weight of the separated particles was determined and accounted for, and is only noted herein to remind the user that the particle size content above 4 inches is not represented on the gradation plot, and scattered to numerous cobbles should be anticipated site wide. While the number of removed particles does provide some relative indication of cobble frequency, the loose condition of much of the upper mass fill may have resulted in some larger particles being simply pushed aside. The numbers of particles removed were as follows:

- S-1, 0-15 feet depth core run with low recovery, 10 basalt cobbles removed
- S-1, 20-26 feet depth, 2 basalt cobbles removed
- S-1, 20-26 feet depth, 1 basalt cobble removed
- S-3, 5-13 feet depth, 6 basalt cobbles removed
- S-3, 20-27.5 feet depth, 3 basalt cobbles removed

The results of the five dry gradation tests are provided in Appendix B.

Two samples were selected to determine the fines content (percent silt/clay passing the No. 200 sieve) based on a washed or wet method for comparison to the dry sieve method. One of the samples was selected from the typical loose gravel fill (S-1, 0-15 feet depth), and the other selected sample represented the Willamette River sand alluvium sample. Results are noted at the representative depths on the S-1 bore log in Appendix A. The results indicate that the fines content for the dry sieve gradation tests on the loose gravels is roughly 6% lower (3.4% vs. 9.8%) than that indicated by washing the sample.

The result of the unconfined compressive strength of the basalt was only possible from the S-4 boring as no solid cores long enough to be tested where recovered elsewhere. The test result indicated an unconfined compressive strength of 6,720 psi.

Appendix C presents photographs of the recovered sonic cores prior to removing samples for laboratory testing.

7.0 BOREHOLE CLEARANCE SURVEY

Prior to performing borings, NGI subcontracted GeoPotential, Inc. to clear each hole location for utilities using a variety of methods, most notably a Ground Penetrating Radar (GPR) unit. A report providing the results of the mobile GPR survey is included as Appendix D.

8.0 LIMITATIONS

Within the limitations of scope, schedule, and budget, our services have been completed in accordance with the Client Services Agreement and accepted geotechnical practices in this area at the time this report was prepared. This report was prepared for the exclusive use of NGI's client for the specific project and NGI does not authorize the segmented use of the data herein. The formal boring logs and related information depict generalized subsurface conditions at these specific locations only and at the particular time the subsurface exploration was completed. Soil and groundwater conditions at other locations may differ from the conditions at locations of explorations. Also, the passage of time may result in a change in the soil and groundwater conditions at the site. This report pertains to the subject project area only, and is not applicable to adjacent areas.

This opportunity to be of service is sincerely appreciated. If you should have any questions, please contact our office.

Respectfully submitted,

NORTHWEST GEOTECH, INC.

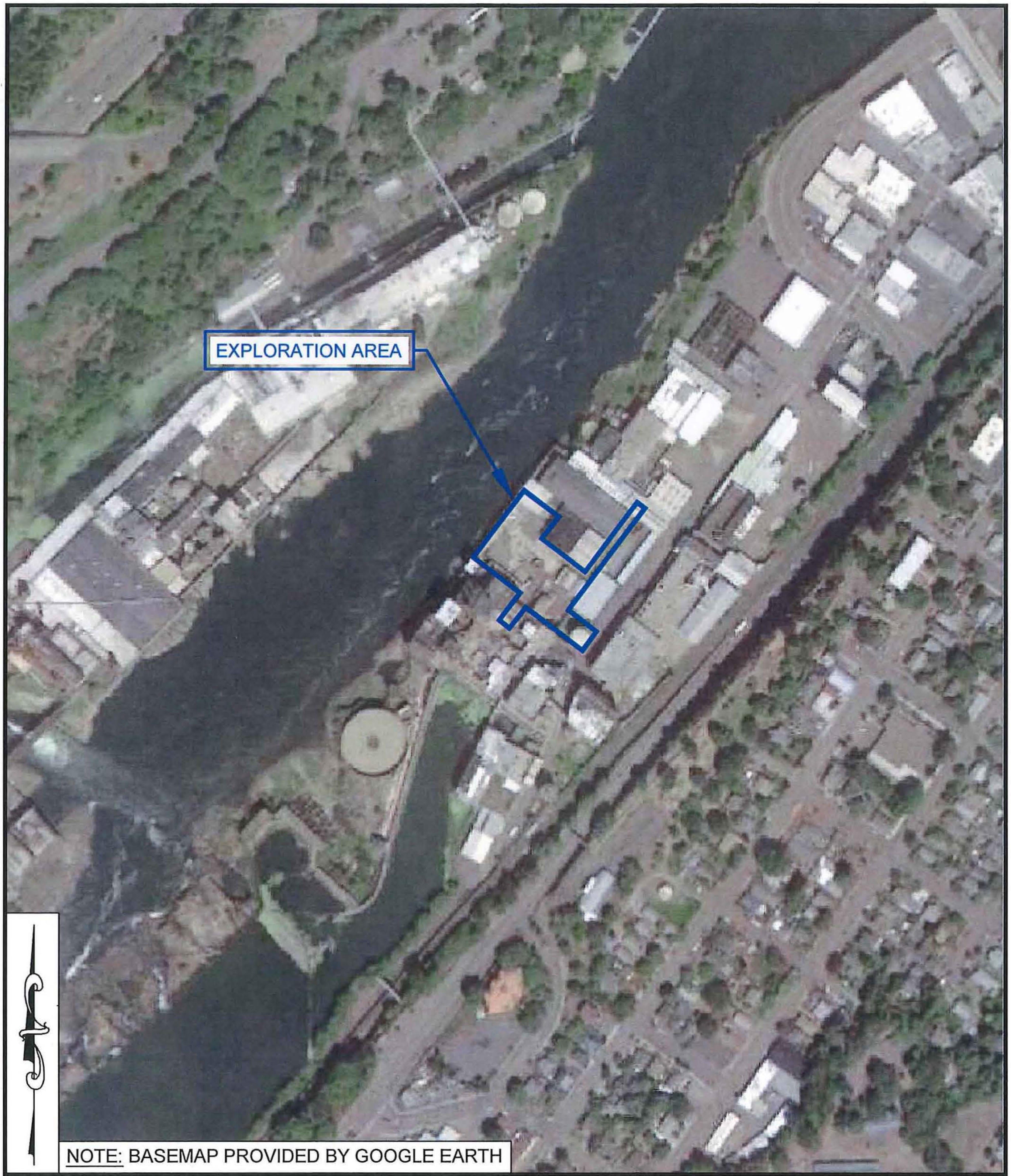
REGISTERED PROFESSIONAL ENGINEER
15,951
OREGON
JULY 21 1992
ALAN P. BEAN

Exp. 12-31-2017

Alan P. Bean, P.E., G.E
Project Engineer

Thomas S. Ginsbach, P.E., G.E.
President

Copies: (2) Addressee (E-mail and U.S. mail)

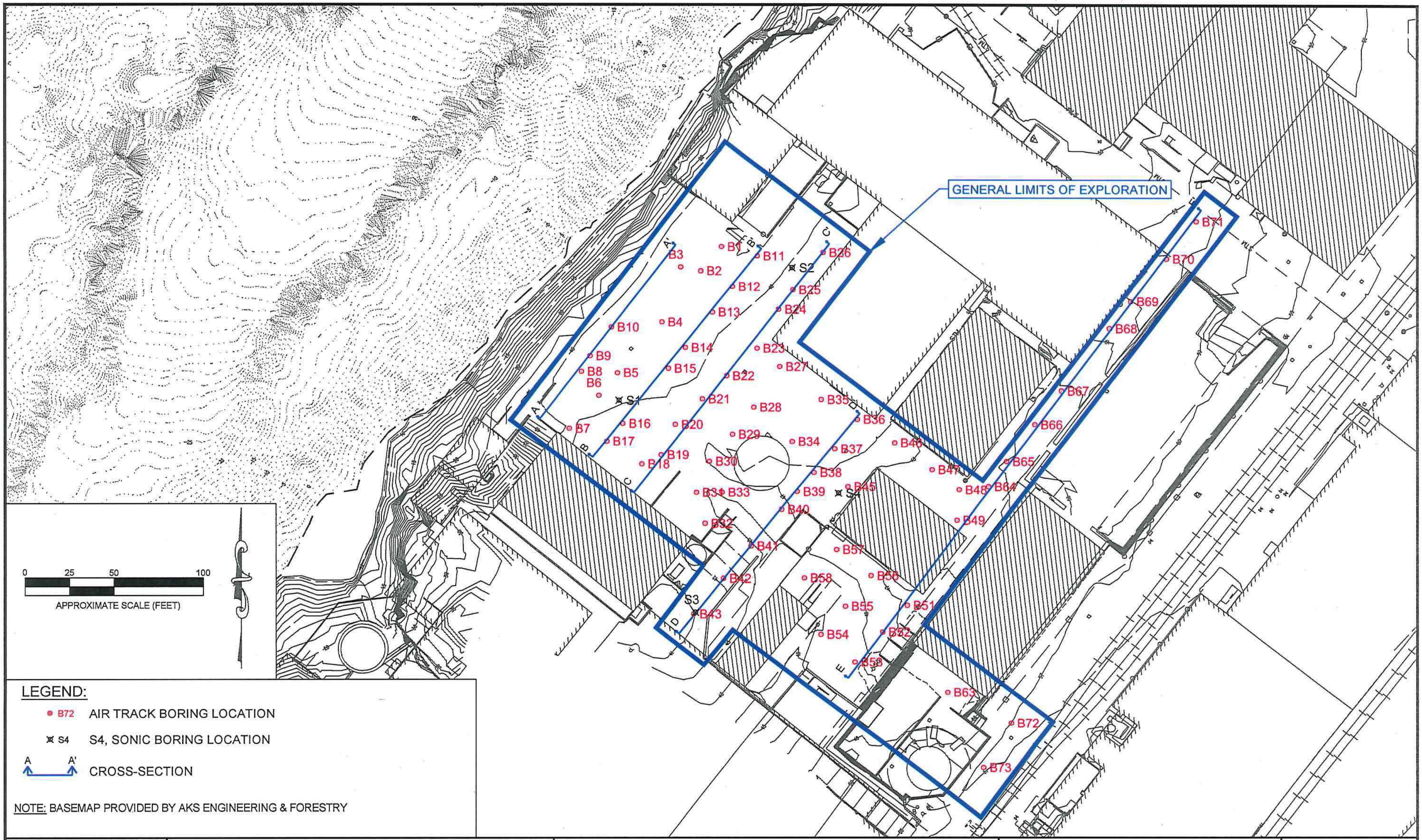


NOTE: BASEMAP PROVIDED BY GOOGLE EARTH

EXPLORATION AREA MAP

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. 1

Northwest Geotech, Inc.

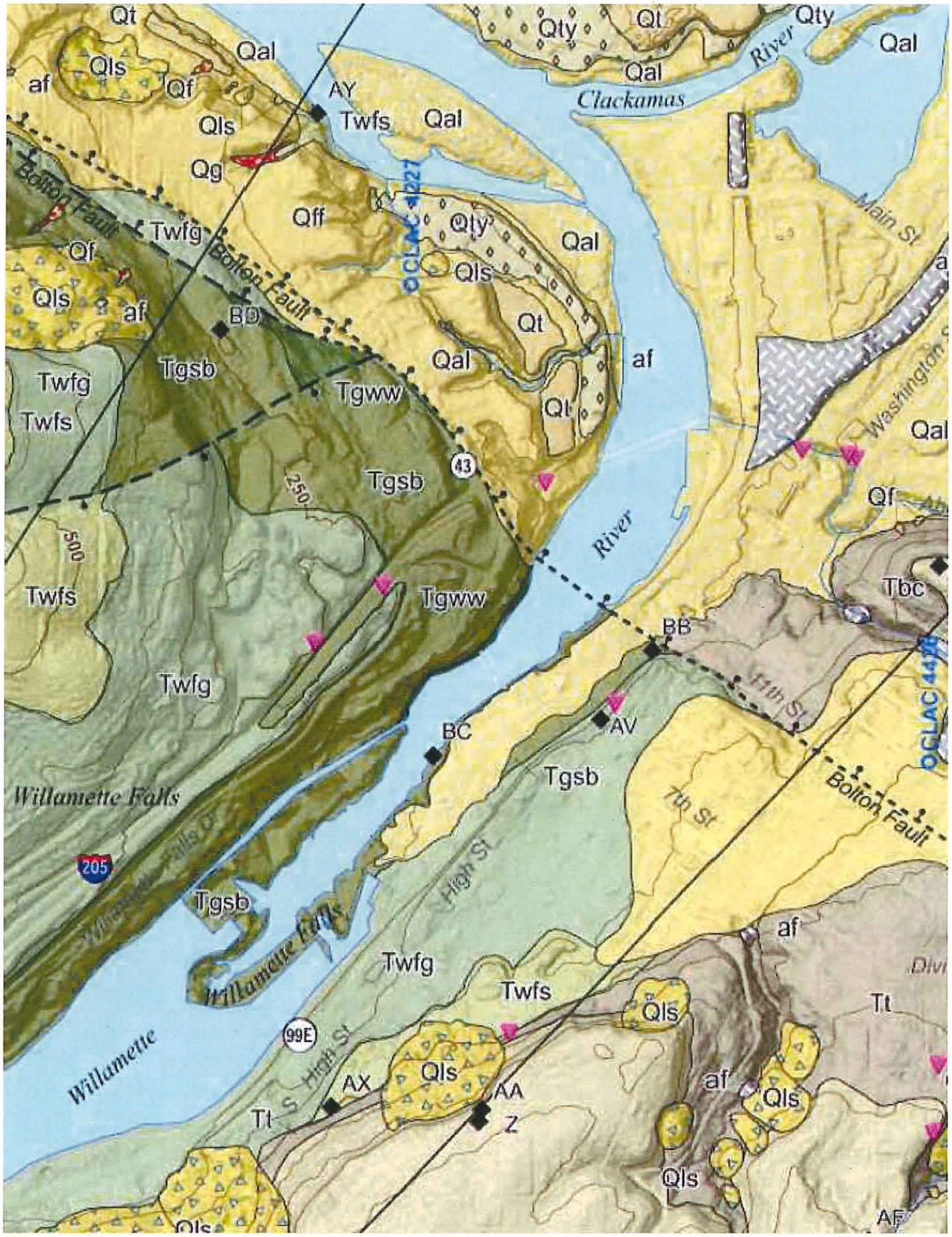


LEGEND:

- ⊙ B72 AIR TRACK BORING LOCATION
- ⊠ S4 S4, SONIC BORING LOCATION
- A A' CROSS-SECTION

NOTE: BASEMAP PROVIDED BY AKS ENGINEERING & FORESTRY

PROJECT NO. 2919.1.1	EXPLORATION PLAN	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	Northwest Geotech, Inc.	FIGURE NO. 2

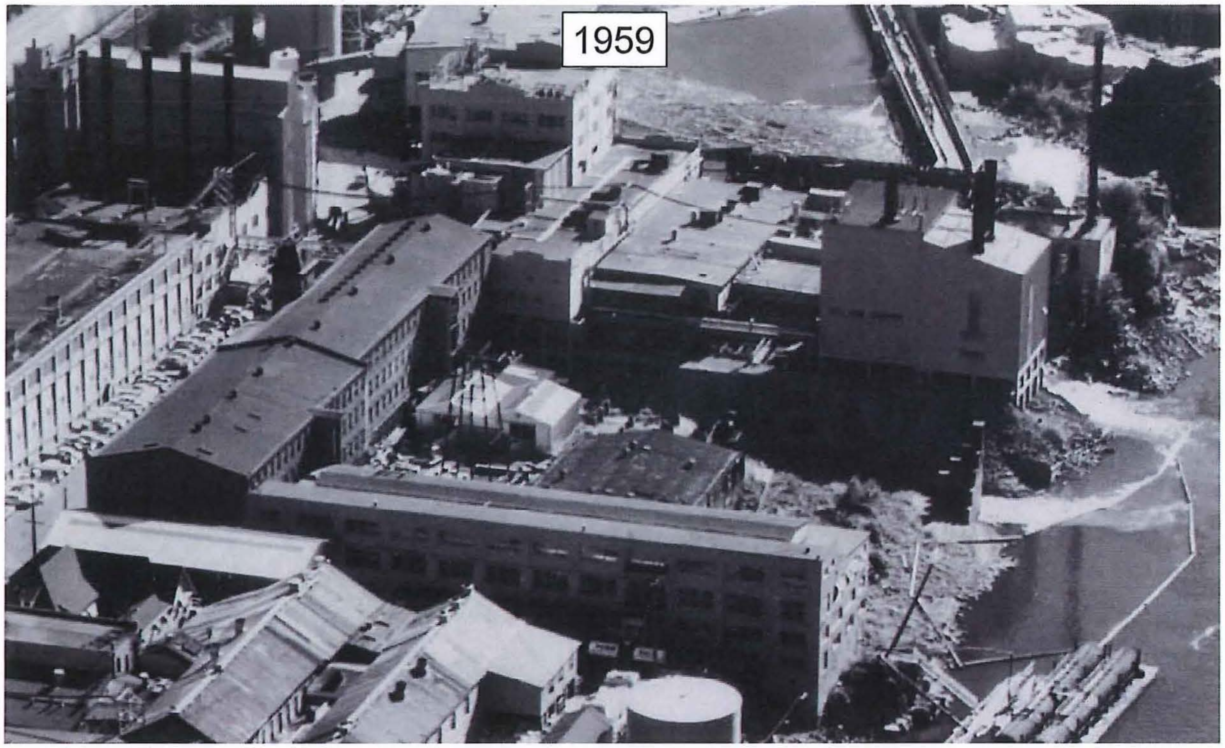


PORTION OF GMS 119-GEOLOGIC MAP OF THE OREGON CITY 7.5' QUADRANGLE, MADIN, 2009

GEOLOGIC MAP

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. 3

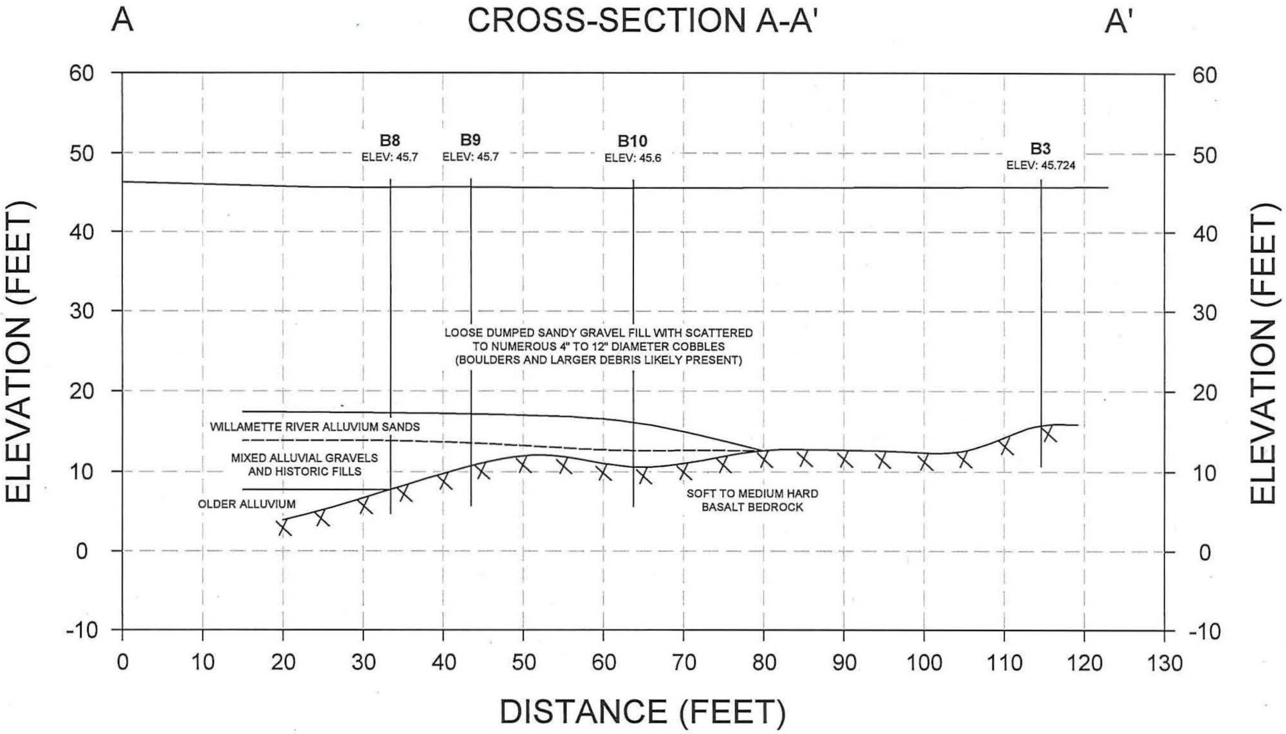
Northwest Geotech, Inc.

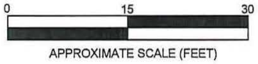


HISTORICAL AERIALS

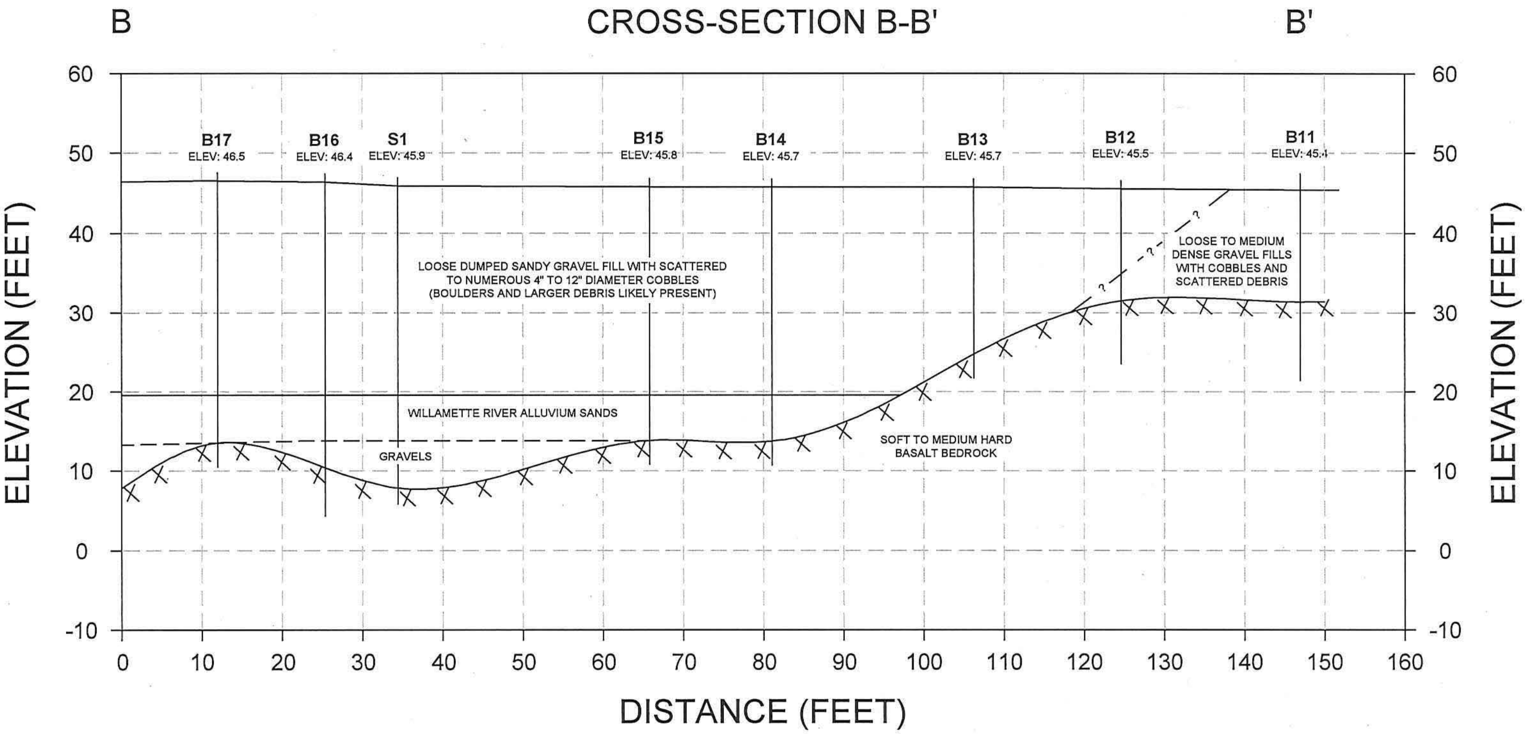
PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. 4

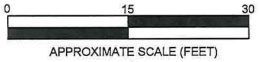
Northwest Geotech, Inc.



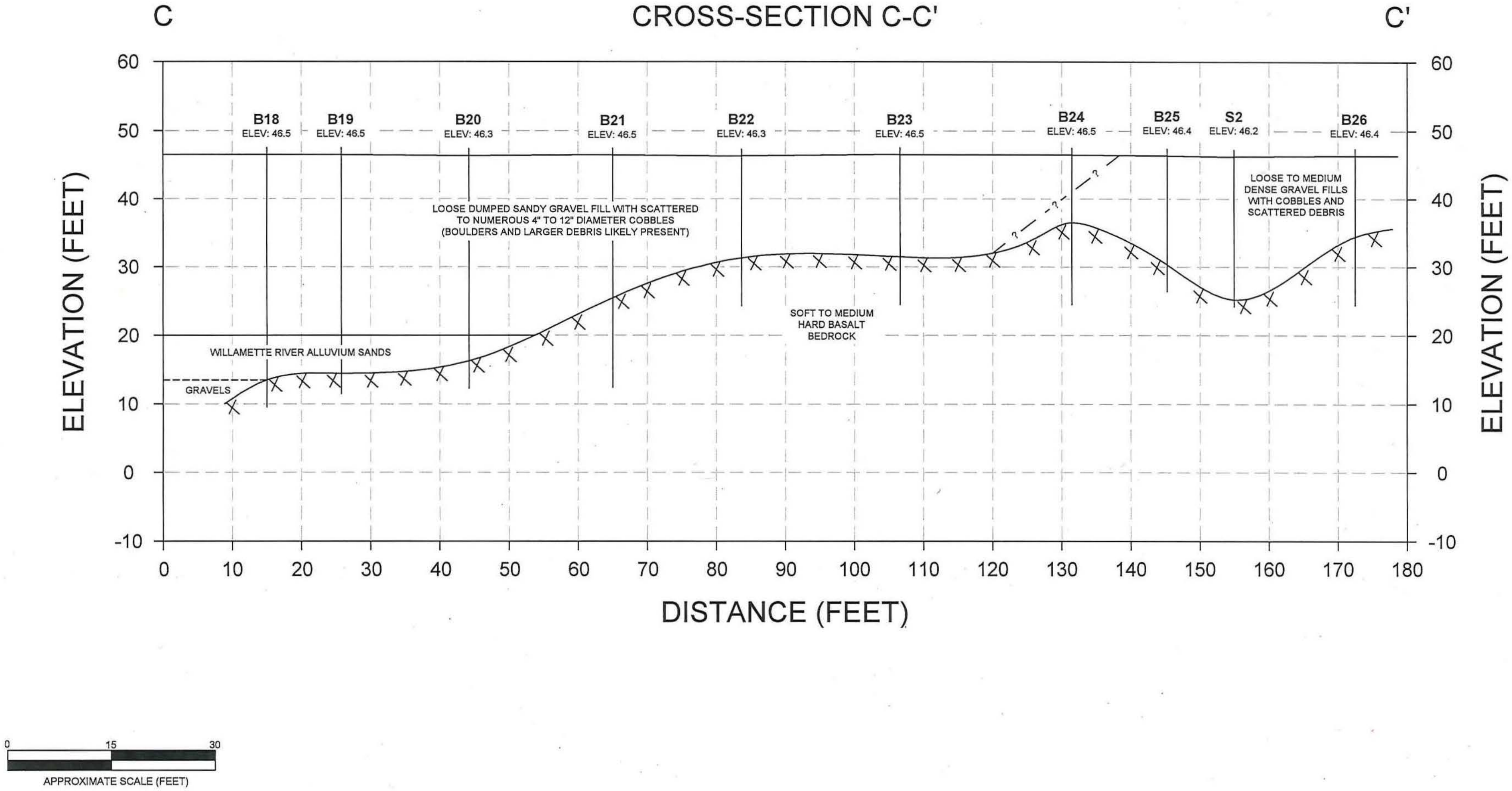


PROJECT NO. 2919.1.1	INTERPRETIVE CROSS-SECTION A-A'	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	Northwest Geotech, Inc.	FIGURE NO. 5

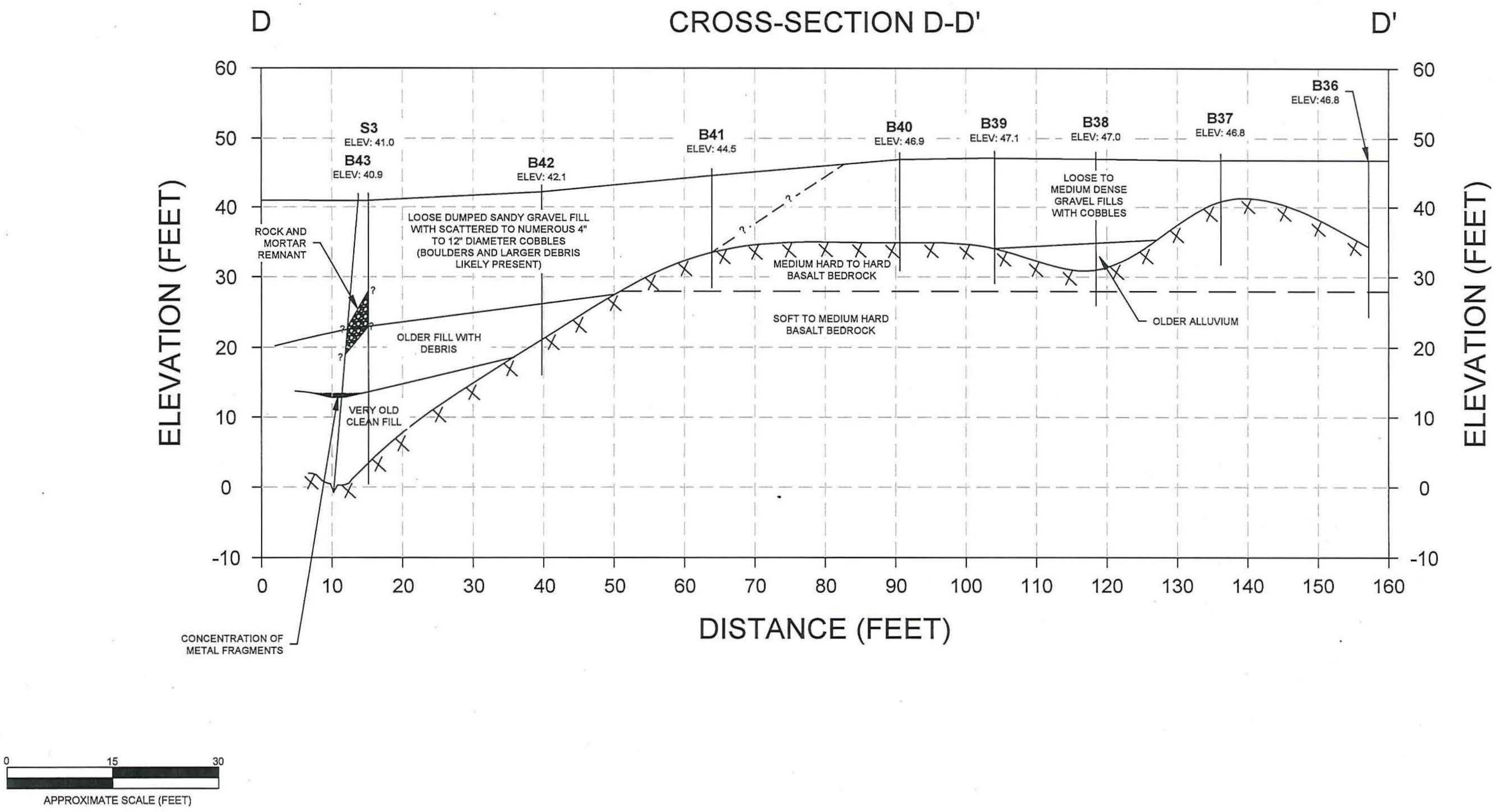




PROJECT NO. 2919.1.1	INTERPRETIVE CROSS-SECTION B-B'	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	Northwest Geotech, Inc.	FIGURE NO. 6



PROJECT NO. 2919.1.1	INTERPRETIVE CROSS-SECTION C-C'	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	Northwest Geotech, Inc.	FIGURE NO. 7



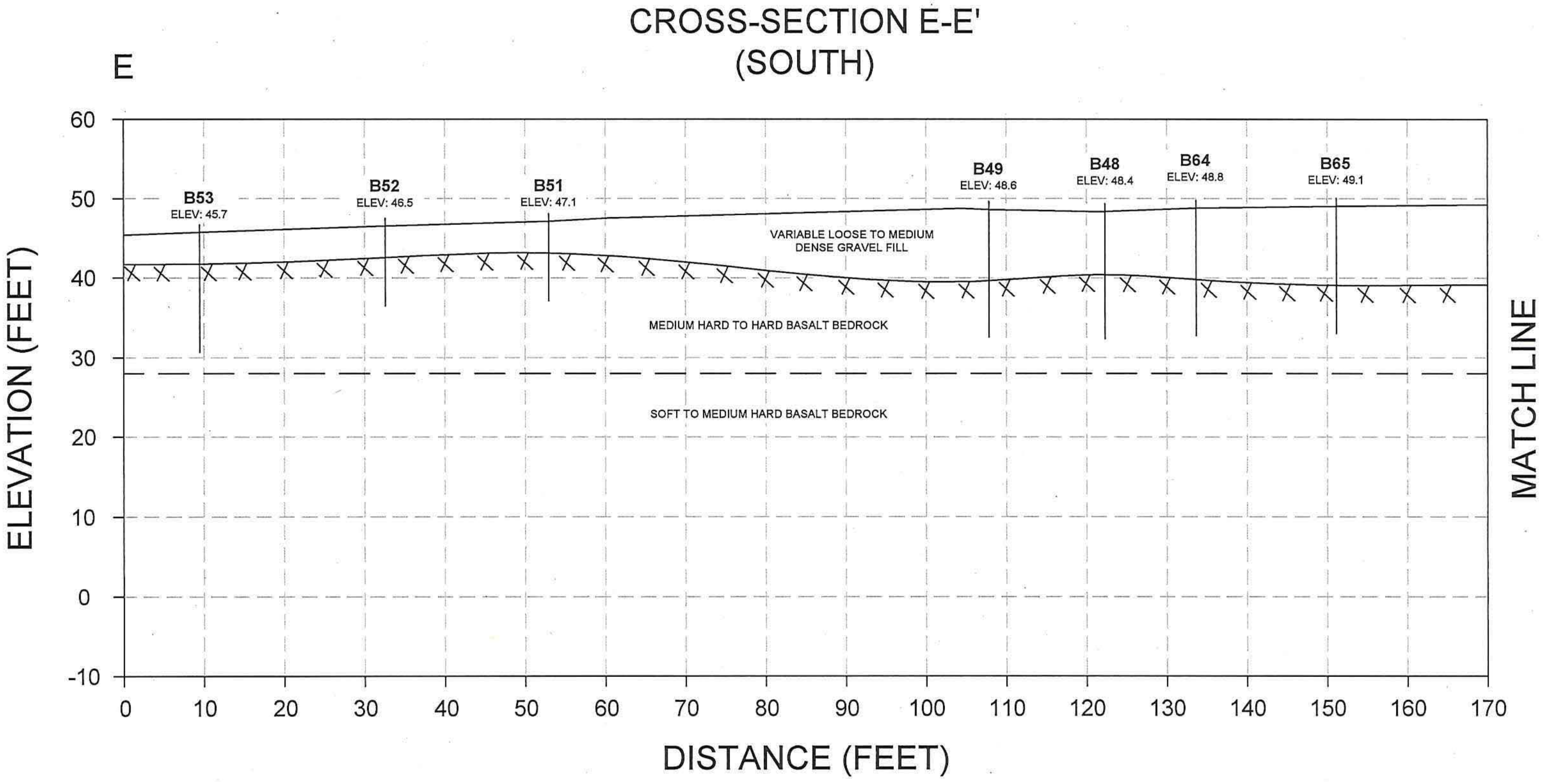
PROJECT NO. 2919.1.1

INTERPRETIVE
CROSS-SECTION D-D'

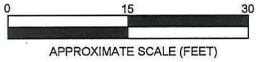
WILLAMETTE FALLS RIVERWALK
OREGON CITY, OREGON

Northwest Geotech, Inc.

FIGURE NO. 8

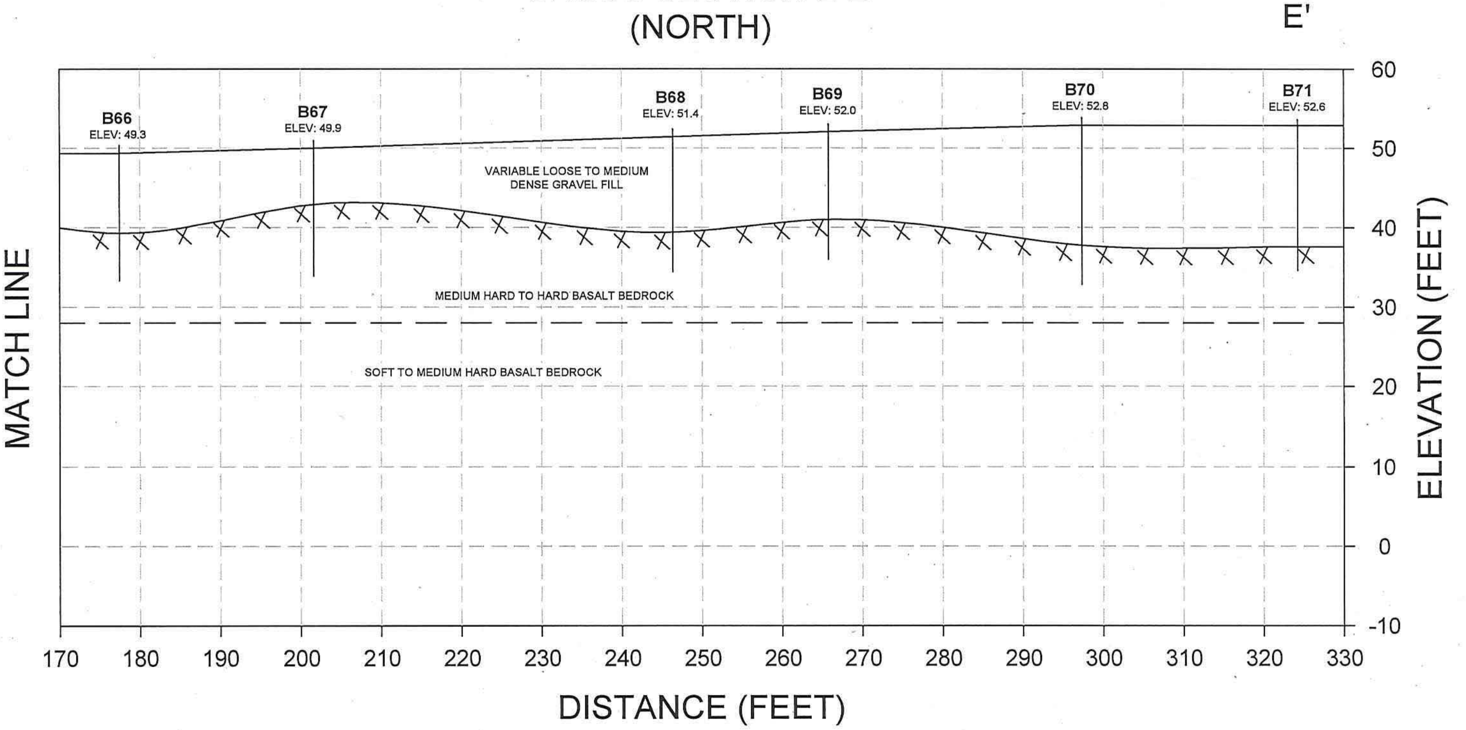


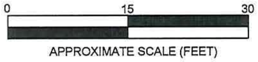
CROSS-SECTION E-E'
(SOUTH)



PROJECT NO. 2919.1.1	INTERPRETIVE CROSS-SECTION E-E'	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	Northwest Geotech, Inc.	FIGURE NO. 9 (1 OF 2)

CROSS-SECTION E-E'
(NORTH)





PROJECT NO. 2919.1.1

INTERPRETIVE
CROSS-SECTION E-E'

WILLAMETTE FALLS RIVERWALK
OREGON CITY, OREGON

Northwest Geotech, Inc.

FIGURE NO. 9
(2 OF 2)

TABLE 1
SUMMARY OF BORING LOCATIONS AND ELEVATIONS

Survey Point No.	Boring	Elevation (feet)	Approximate Depth to Bedrock (feet)	Approximate Elevation of Bedrock (feet)	Rock Hardness Description, Depth Penetrated (feet)	Groundwater Elevation (feet)
Air Track Borings						
50075	B1	45.33	30	15.3	Soft 30-35	X
50074	B2	45.39	16	29.4	Medium Hard 16-22	X
50073	B3	45.72	30	15.7	Medium Hard 30-35	X
50071	B4	45.62	22	23.6	Soft 22-30	X
50091	B5	45.43	30	15.4	Soft to Medium Hard 30-36	X
50090	B6	45.69	30	15.7	Soft to Medium Hard 30-36	X
50089	B7	45.93	33	12.9	Medium Hard 33-35	X
50086	B8	45.68	38	7.7	Medium Hard 38-41	26.6
50085	B9	45.73	35	10.7	Medium Hard 35-40,	26.5
50084	B10	45.61	35	10.6	Medium Hard 35-40, boulders 32-35	26.3
50077	B11	45.35	14	31.4	Soft 14-24	31.5
50078	B12	45.54	14	31.5	Medium Hard 14-22, boulder 6-9	32.4
50040	B13	45.72	21	24.7	Soft 21-24, boulder 6-9	33.6
50070	B14	45.73	32	13.7	Medium Hard	X
50092	B15	45.77	32	13.8	Medium Hard, boulder 24-27	26.4
50093	B16	46.36	36	10.4	Medium Hard 32, boulder 22	X
50094	B17	46.53	33	13.5	Soft to Medium Hard 33-36, Hard at 36	X
50096	B18	46.50	33	13.5	Soft to Medium Hard 33-37, Some cobbles	X
50097	B19	46.48	32	14.5	Medium Hard 32-35	X
50098	B20	46.34	30	16.3	Medium Hard 30-34	X
50105	B21	46.46	21	25.5	Soft to Medium Hard 21-34	26.7
50069	B22	46.28	15	31.3	Soft 15-22	33.7
50039	B23	46.54	15	31.5	Soft 15-22	X
50079	B24	46.48	10	36.5	Soft to Medium Hard 10-22	37.7
50080	B25	46.38	16	30.4	Soft to Medium Hard 16-20	X
50083	B26	46.35	12	34.4	Soft 12-22, boulder 9-11	37.9
50038	B27	46.63	16	30.6	Medium Hard 16-28	34.9
50068	B28	46.54	13	33.5	Medium Hard 13-22	37.3
50104	B29	46.74	16	30.7	Medium Hard 16-22	34.5
50100	B30	47.02	15	32.0	Medium Hard 15-20	X
50101	B31	46.23	22	24.2	Medium Hard 22-25, boulder 3-5	X
50102	B32	46.41	15	31.4	Medium Hard 15-20	31.9
50103	B33	46.21	10	36.2	Medium Hard 10-18	X
50067	B34	46.71	6	40.7	Medium Hard 6-15	X
50037	B35	46.66	6	40.7	Medium Hard 6-16	X
50036	B36	46.84	6	40.8	Medium Hard 6-16	X
50042	B37	46.77	6	40.8	Medium Hard 6-15	X
50043	B38	47.03	16	31.0	Medium Hard 16-21	38.6
50046	B39	47.14	13	34.1	Medium Hard 13-18	40.1
50047	B40	46.91	12	34.9	Medium Hard to Hard 12-16	38.4
50048	B41	44.54	11	33.5	Medium Hard to Hard 11-16	X
50049	B42	42.14	21	21.1	Soft to Medium Hard 21-26	X

TABLE 1
SUMMARY OF BORING LOCATIONS AND ELEVATIONS

Survey Point No.	Boring	Elevation (feet)	Approximate Depth to Bedrock (feet)	Approximate Elevation of Bedrock (feet)	Rock Hardness Description, Depth Penetrated (feet)	Groundwater Elevation (feet)
50050	B43	40.93	40+	Drill bit stuck in log near Elev. 1	Stuck in Log at 40; mortered basalt remnant 18-22	X
50045	B45	47.32	15	32.3	Medium Hard 15-20	X
50035	B46	47.29	6	41.3	Soft 6-16	X
50034	B47	48.34	18	30.3	Soft 18-21	X
50033	B48	48.36	8	40.4	Soft 8-16	X
50031	B49	48.64	9	39.6	Soft 9-16	X
50060	B51	47.10	4	43.1	Hard 4-10	X
50061	B52	46.53	4	42.5	Hard 4-10	X
50062	B53	45.74	4	41.7	Hard 4-10, Soft 10-15	X
50065	B54	45.13	11	34.1	Soft 11-18	34.7
50066	B55	45.58	8	37.6	Soft 8-16	X
50056	B56	46.39	5	41.4	Hard 5-8, Soft 8-10	43.7
50054	B57	46.34	3	43.3	Hard 3-8, Soft 8-10	X
50053	B58	45.69	12	33.7	Medium Hard 12-18	36.2
50019	B63	47.82	5	42.8	Medium Hard 5-10	43.4
50030	B64	48.81	9	39.8	Soft 9-16	X
50029	B65	49.06	10	39.1	Medium Hard 10-16	X
50028	B66	49.34	10	39.3	Medium Hard 10-16	X
50027	B67	49.95	7	42.9	Medium Hard 7-16	45.1
50026	B68	51.39	12	39.4	Medium Hard 12-17	X
50025	B69	51.99	11	41.0	Medium Hard 11-16	X
50024	B70	52.85	15	37.8	Hard 15-20	44.6
50022	B71	52.62	15	37.6	Medium Hard 15-18	43.7
50017	B72	56.89	11	45.9	Medium Hard 11-12, Soft 12-16	X
50016	B73	56.97	10	47.0	Soft 10-15, Hard 15-20	X
Sonic Borings						
50106	S1	45.8758	38	7.9	N/A	N/A
50081	S2	46.2353	21	25.2	N/A	N/A
50051	S3	40.9535	37	4.0	N/A	N/A
50044	S4	47.2534	13	34.3	N/A	N/A

APPENDIX A

DRILLING COMPANY: CASCADE DRILLING
RIG: TERRA SONIC TSI 150CC COMPACT CRAWLER
DATE: 4/4/2017
BORING DIAMETER: 8 IN.
HAMMER WEIGHT: 140 LBS
TYPE: SONIC BORING
ELEVATION: 45.9 FEET

DEPTH (FEET)	SAMPLE	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. S-1
0						4 INCHES OF ASPHALTIC CONCRETE IN POOR CONDITION
	ES-1				GP GW	SANDY GRAVEL, TRACE SILT, TRACE CLAY, BROWN, LOOSE, MOIST, GRAVEL IS SUBANGULAR TO SUBROUNDED, FINE TO COARSE, POORLY GRADED TO WELL GRADED, SCATTERED ASPHALTIC CONCRETE AND BRICK DEBRIS, NUMEROUS COBBLES (FILL)
						INCREASING CLAY CONTENT IN MATRIX FROM 3-5 FEET
5						
				8.7		FINES CONTENT TEST: 9.8% PASSING NO. 200 SIEVE
					GP GW	SANDY GRAVEL, TRACE SILT, TRACE CLAY, BROWN, VERY LOOSE TO LOOSE, MOIST, GRAVEL IS ANGULAR TO SUBROUNDED, FINE TO COARSE AND POORLY GRADED TO WELL GRADED, SCATTERED TO NUMEROUS COBBLES (FILL)
10	ES-2					2-INCH MINUS, OPEN GRADED, LOOSE GRAVEL FROM 10-12 FEET
						LOW RETURN ON 5-15 FEET CORE RUN, VERY LOOSE
15						BIT PLUGGED BY COBBLE AT 15.0 FEET, NO RETURN 15-20 FEET
	*					
20				7.2	GP GW	SANDY GRAVEL, SLIGHTLY SILTY, SLIGHTLY CLAYEY, BROWN, LOOSE, WET, GRAVEL IS ANGULAR TO SUBROUNDED, FINE TO COARSE, SCATTERED COBBLES (FILL)
	ES-3					
25						SCATTERED BRICK AND CONCRETE DEBRIS FROM 25-26 FEET
				28.0	SM	SILTY SAND WITH SANDY SILT LENSES, TRACE GRAVEL, TRACE CLAY, BROWN, LOOSE, WET, STRATIFIED, SAND PARTICLES ARE SUB ANGULAR TO SUBROUNDED AND FINE TO MEDIUM GRAINED (WILLAMETTE RIVER ALLUVIUM)
	ES-4					INCREASING GRAVEL CONTENT
30						FINES CONTENT TEST: 19.4% PASSING NO. 200 SIEVE

BORING LOG S-1

PROJECT NO. 2919.1.1

WILLAMETTE FALLS RIVERWALK
OREGON CITY, OREGON

FIGURE NO. A-1 (1 OF 2)

DRILLING COMPANY: CASCADE DRILLING	RIG: TERRA SONIC TSI 150CC COMPACT CRAWLER	DATE: 4/4/2017

BORING DIAMETER: 8 IN.	HAMMER WEIGHT: 140 LBS	TYPE: SONIC BORING	ELEVATION: 45.9 FEET

DEPTH (FEET)	SAMPLE	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. S-1
30				27.3	SM	GRAVELLY SILTY SAND, TRACE CLAY WITH SANDY CLAY LENSES, BROWN AND GRAY, LOOSE, WET, FREQUENT ORGANICS SUCH AS WOOD FRAGMENTS (WILLAMETTE RIVER ALLUVIUM)
	ES-5					
					GM	SILTY SANDY GRAVEL, TRACE CLAY, BROWN, LOOSE TO MEDIUM DENSE, WET, GRAVEL IS SUBANGULAR TO ROUND, SCATTERED SUBANGULAR COBBLES (WILLAMETTE RIVER ALLUVIUM)
35						
	ES-6				ML	GRAVELLY SANDY SILT, SLIGHTLY CLAYEY, GRAY MOTTLED, STIFF, WET, LOW TO MEDIUM PLASTICITY MATRIX, GRAVEL IS ROUND (OLDER OVERCONSOLIDATED ALLUVIUM)
						BASALT BEDROCK, GRAY, SLIGHTLY WEATHERED, MEDIUM HARD (R3), CLOSELY JOINTED, TRACE VESICLES (COLUMBIA RIVER BASALT GROUP)
40						
						TOTAL DEPTH: 40 FEET GROUNDWATER NOT ENCOUNTERED
45						
50						
55						
60						

▨ CORE RUN LENGTH WITH RECOVERY LENGTH INDICATED BY HATCH

* NO SAMPLE RECOVERY

BORING LOG S-1

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. A-1 (2 OF 2)

Northwest Geotech, Inc.

DRILLING COMPANY: CASCADE DRILLING RIG: TERRA SONIC TSI 150CC COMPACT CRAWLER DATE: 4/4/2017

BORING DIAMETER: 8 IN. HAMMER WEIGHT: 140 LBS TYPE: SONIC BORING ELEVATION: 46.2 FEET

DEPTH (FEET)	SAMPLE	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. S-2
0						4 INCHES OF ASPHALTIC CONCRETE IN POOR CONDITION
	ES-1				GP GW	SANDY GRAVEL, SLIGHTLY SILTY, BROWN, MEDIUM DENSE, MOIST, SUBANGULAR GRAVEL, NUMEROUS COBBLES AND SCATTERED 1 TO 4 INCH CONCRETE DEBRIS, FEW WOOD PARTICLES, SOME WHITE CLAY SUBSTANCE IN MATRIX (FILL)
5	S-1	10			GP SM	SANDY GRAVEL TO GRAVELLY SILTY SAND, BROWN, LOOSE, MOIST, GRAVEL IS SUBROUNDED TO ROUND AND FINE TO MEDIUM GRAINED, SCATTERED COBBLES (FILL)
	ES-2					BECOMES WET
10	S-2	34/2"				
					GM	SILTY TO SANDY GRAVEL, TRACE CLAY, GRAY-BROWN, MEDIUM DENSE, WET, GRAVEL IS SUBANGULAR TO ROUND, SCATTERED COBBLES (FILL)
	ES-3				GP	SANDY GRAVEL, SLIGHTLY SILTY, TRACE CLAY, RED-BROWN, MEDIUM DENSE, WET BECOMING MOIST TO DAMP AT 14 FEET, GRAVEL IS SUBANGULAR TO ROUND AND FINE TO COARSE, NUMEROUS COBBLES (FILL)
15	ES-4					
	ES-5				GP	SANDY GRAVEL, SLIGHTLY SILTY, TRACE CLAY, DARK BROWN TO BROWN, MEDIUM DENSE, MOIST, GRAVEL IS SUBANGULAR TO ROUND AND FINE TO COARSE, SCATTERED COBBLES (FILL)
20						
	ES-6					BASALT BEDROCK, GRAY, SLIGHTLY WEATHERED, SOFT (R2), SOME VESICLES, JOINT SPACING MAY BE WIDE (COLUMBIA RIVER BASALT GROUP)
						TOTAL DEPTH: 22 FEET GROUNDWATER NOT ENCOUNTERED
25						
30						

▥	DAMES & MOORE SAMPLER
◫	SPT SAMPLER
▨	CORE RUN LENGTH WITH RECOVERY LENGTH INDICATED BY HATCH

BORING LOG S-2

PROJECT NO. 2919.1.1

WILLAMETTE FALLS RIVERWALK
OREGON CITY, OREGON

FIGURE NO. A-2

Northwest Geotech, Inc.

DRILLING COMPANY: CASCADE DRILLING
RIG: TERRA SONIC TSI 150CC COMPACT CRAWLER
DATE: 4/4/2017

BORING DIAMETER: 8 IN.
HAMMER WEIGHT: 140 LBS
TYPE: SONIC BORING
ELEVATION: 40.9 FEET

DEPTH (FEET)	SAMPLE	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. S-3
0						5 INCHES OF ASPHALTIC CONCRETE IN POOR CONDITION UNDERLAIN BY 12 INCHES OF ALLUVIAL PIT AGGREGATE BASE
	ES-1			15.1	GP GW	SANDY GRAVEL, TRACE SILT, TRACE CLAY, BROWN, LOOSE, MOIST, GRAVEL IS ANGULAR TO ROUND, FINE TO COARSE, POORLY GRADED TO WELL GRADED, SCATTERED ASPHALTIC CONCRETE AND BRICK/TILE DEBRIS, SCATTERED TO NUMEROUS COBBLES (FILL)
5						
	ES-2					
10						
	ES-3					
						3.5 TO 4 FEET THICK REMNANT FOUNDATION AS WELL MORTARED BASALT BOULDERS, SIMILAR TO GROTTO ARCH
15						
	ES-4			18.8	GP GW	SANDY GRAVEL, SLIGHTLY SILTY, TRACE CLAY, BROWN, LOOSE TO MEDIUM DENSE, MOIST TO WET, GRAVEL IS SUBANGULAR TO SUBROUNDED AND FINE TO COARSE, NUMEROUS BRICK, MORTAR, AND WOOD FRAGMENTS, SCATTERED TO NUMEROUS COBBLES (FILL)
20						
	ES-5			21.0		
25						
						BECOMES BLACK, 12 INCH BOULDER
	ES-6					
						AN ABUNDANCE OF METAL FRAGMENTS ENCOUNTERED AT 29.5 FEET, SQUARE NAILS
30						

BORING LOG S-3

PROJECT NO. 2919.1.1

WILLAMETTE FALLS RIVERWALK
OREGON CITY, OREGON

FIGURE NO. A-3 (1 OF 2)

Northwest Geotech, Inc.

DRILLING COMPANY: CASCADE DRILLING RIG: TERRA SONIC TSI 150CC COMPACT CRAWLER DATE: 4/4/2017

BORING DIAMETER: 8 IN. HAMMER WEIGHT: 140 LBS TYPE: SONIC BORING ELEVATION: 40.9 FEET

DEPTH (FEET)	SAMPLE	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. S-3
30	ES-7	▨		17.0	GP GW	SANDY GRAVEL, SLIGHTLY SILTY, TRACE CLAY, BROWN, LOOSE TO MEDIUM DENSE, MOIST TO WET, GRAVEL IS SUBANGULAR TO SUBROUNDED AND FINE TO COARSE, NUMEROUS BRICK, MORTAR, AND WOOD FRAGMENTS, SCATTERED TO NUMEROUS COBBLES (FILL)
35		▨			GP	SANDY GRAVEL, SLIGHTLY SILTY, TRACE TO SLIGHTLY CLAYEY, DARK BROWN-GRAY, LOOSE TO MEDIUM DENSE, POORLY GRADED, GRAVEL IS ANGULAR TO SUBANGULAR AND FINE TO COARSE, SCATTERED COBBLES (OLDER CLEAN FILL)
	ES-8	▨				BASALT BEDROCK, GRAY, FRESH, MEDIUM HARD (R3), CLOSELY JOINTED, TRACE VESICLES (COLUMBIA RIVER BASALT GROUP)
40						TOTAL DEPTH: 40 FEET GROUNDWATER NOT ENCOUNTERED
45						
50						
55						
60						

▨ CORE RUN LENGTH WITH RECOVERY
☐ LENGTH INDICATED BY HATCH

BORING LOG S-3

PROJECT NO. 2919.1.1

WILLAMETTE FALLS RIVERWALK
OREGON CITY, OREGON

FIGURE NO. A-3 (2 OF 2)

Northwest Geotech, Inc.

DRILLING COMPANY: CASCADE DRILLING
RIG: TERRA SONIC TSI 150CC COMPACT CRAWLER
DATE: 4/4/2017

BORING DIAMETER: 8 IN.
HAMMER WEIGHT: 140 LBS
TYPE: SONIC BORING
ELEVATION: 47.3 FEET

DEPTH (FEET)	SAMPLE	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION BORING NO. S-4
0	ES-1				GP	5 INCHES OF ASPHALTIC CONCRETE IN POOR CONDITION SANDY GRAVEL, SLIGHTLY SILTY, TRACE CLAY, BROWN, MEDIUM DENSE, MOIST, SUBANGULAR GRAVEL WITH SCATTERED 1 TO 4 INCH CONCRETE DEBRIS (FILL)
5					SP-SM	SILTY SAND, BLACK, LOOSE, MOIST, WITH NUMEROUS PIECES OF GLASS AND WOOD AND A PIECE OF METAL WITH A STRONG OIL ODOR (FILL)
	ES-2				GP	SANDY GRAVEL, SLIGHTLY SILTY, TRACE CLAY, GRAY-BROWN, LOOSE, MOIST, UNDERLAIN BY BASALT BOULDER FROM 7 TO 10 FEET (FILL)
10	S-1	45		18.9	GP	SANDY GRAVEL, SLIGHTLY SILTY, SLIGHTLY CLAYEY, BROWN, MEDIUM DENSE, MEDIUM PLASTICITY MATRIX, MOIST, GRAVEL IS SUBANGULAR TO SUBROUNDED AND FINE TO COARSE, SCATTERED COBBLES (OLDER ALLUVIUM)
	ES-3					BASALT BEDROCK, GRAY, SLIGHTLY WEATHERED, MEDIUM HARD (R3), CLOSE TO MODERATELY CLOSE JOINTING, SOME VESICLES (COLUMBIA RIVER BASALT GROUP) UNCONFINED COMPRESSIVE STRENGTH TEST = 6720 PSI
15	ES-4					
20						TOTAL DEPTH: 20 FEET GROUNDWATER NOT ENCOUNTERED
25						
30						

◫ SPT SAMPLER

▨ CORE RUN LENGTH WITH RECOVERY LENGTH INDICATED BY HATCH

BORING LOG S-4

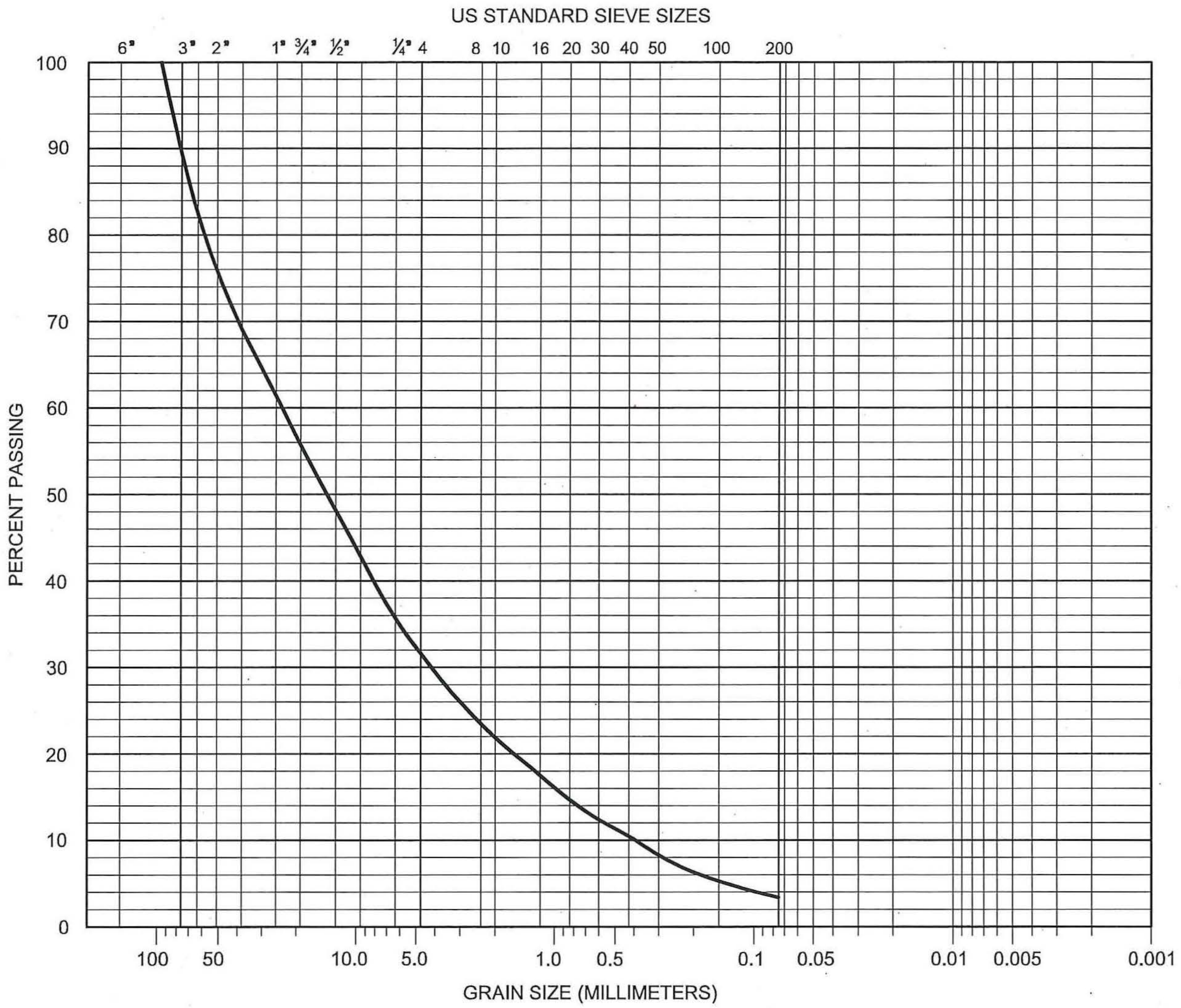
PROJECT NO. 2919.1.1

WILLAMETTE FALLS RIVERWALK
OREGON CITY, OREGON

FIGURE NO. A-4

Northwest Geotech, Inc.

APPENDIX B



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

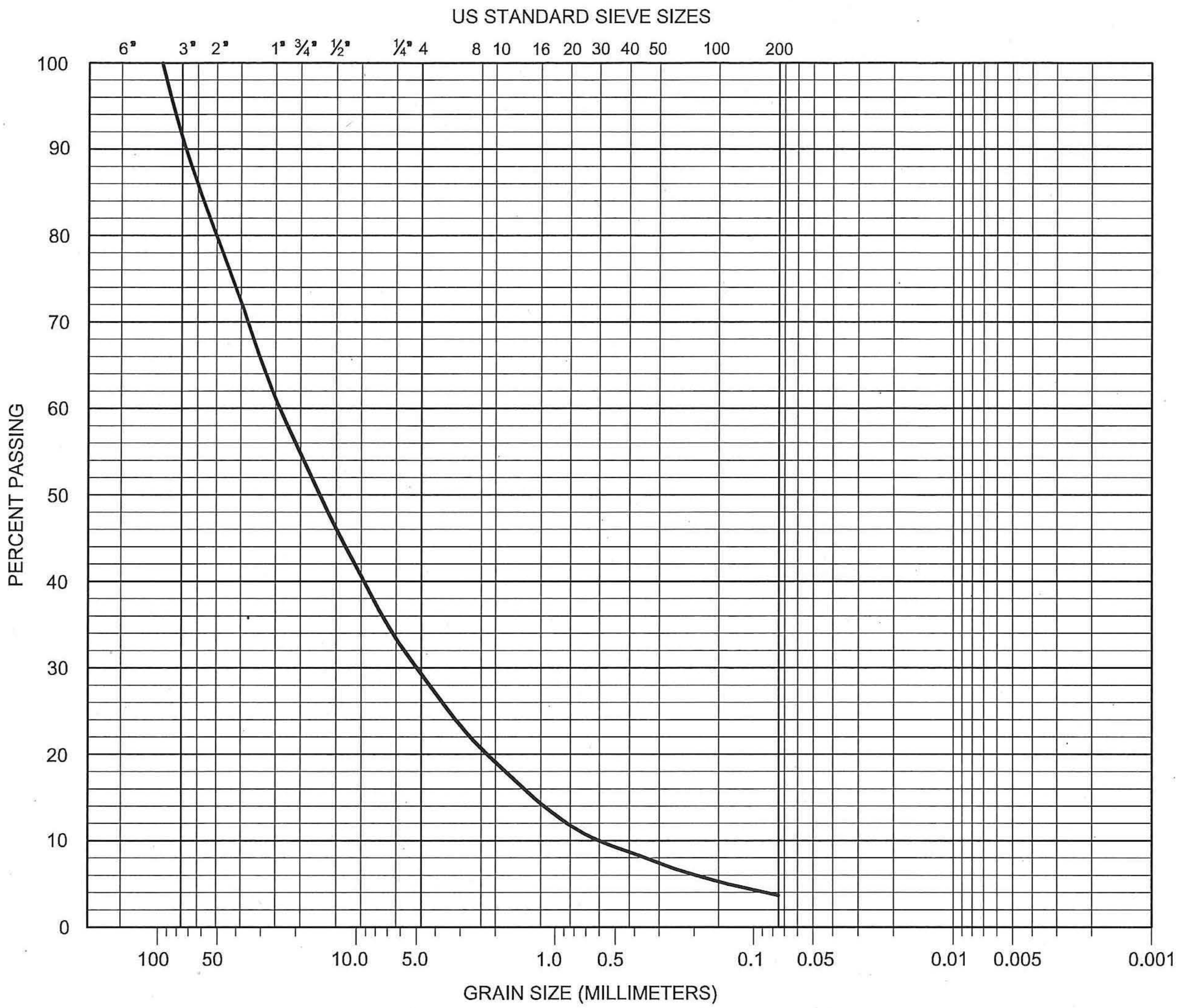
SYMBOL	SAMPLE LOCATION AND DEPTH	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 μ	UNIFIED SOIL CLASSIFICATION
——	S-1 @ 0 - 15 FT.	8.7	3.4	--	GW

NOTE: CORE DIAMETER ~ 3.7 INCHES: SAMPLE LIMITED TO PARTICLES LESS THAN 3.5 INCHES

GRADATION TEST RESULTS - ASTM C136

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. B-1

Northwest Geotech, Inc.



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

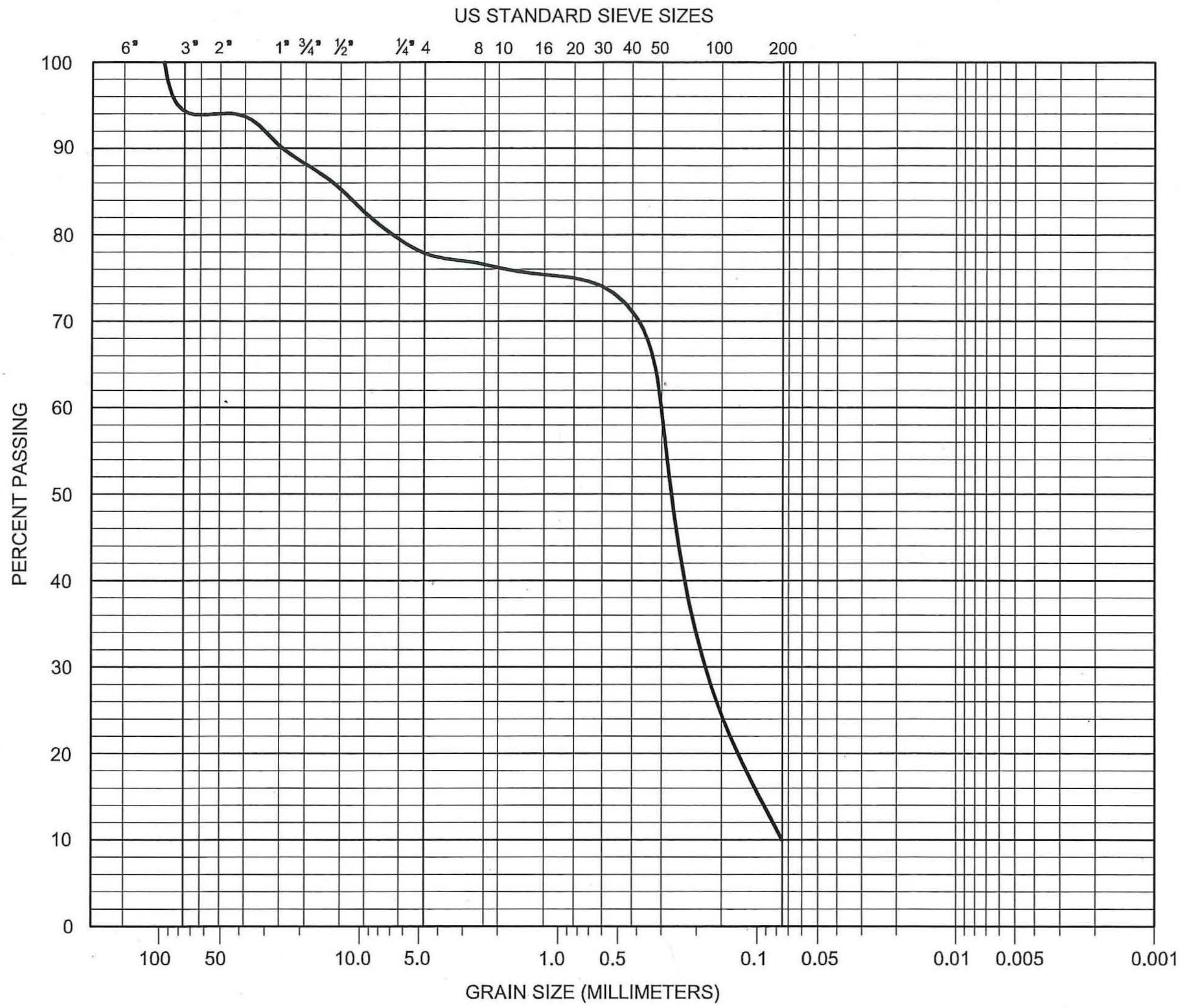
SYMBOL	SAMPLE LOCATION AND DEPTH	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 µ	UNIFIED SOIL CLASSIFICATION
———	S-1 @ 20 - 26 FT.	7.2	3.7	--	GW

<u>NOTE:</u> CORE DIAMETER ~ 3.7 INCHES: SAMPLE LIMITED TO PARTICLES LESS THAN 3.5 INCHES

GRADATION TEST RESULTS - ASTM C136

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. B-2

Northwest Geotech, Inc.



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

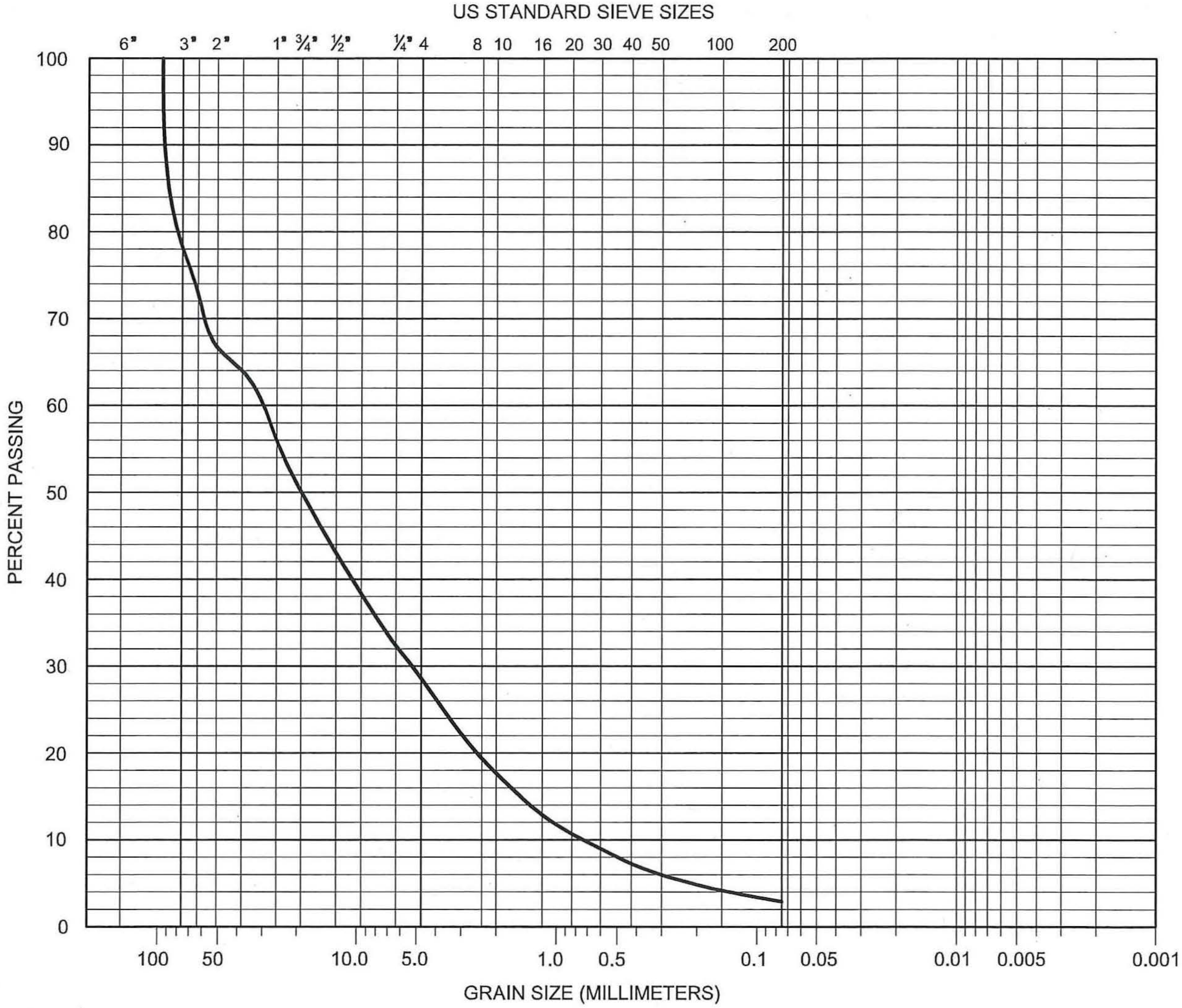
SYMBOL	SAMPLE LOCATION AND DEPTH	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 μ	UNIFIED SOIL CLASSIFICATION
———	S-1 @ 26 - 30 FT.	28.0	10.0	--	SP-SM

<u>NOTE:</u> CORE DIAMETER ~ 3.7 INCHES: SAMPLE LIMITED TO PARTICLES LESS THAN 3.5 INCHES

GRADATION TEST RESULTS - ASTM C136

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. B-3

Northwest Geotech, Inc.



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

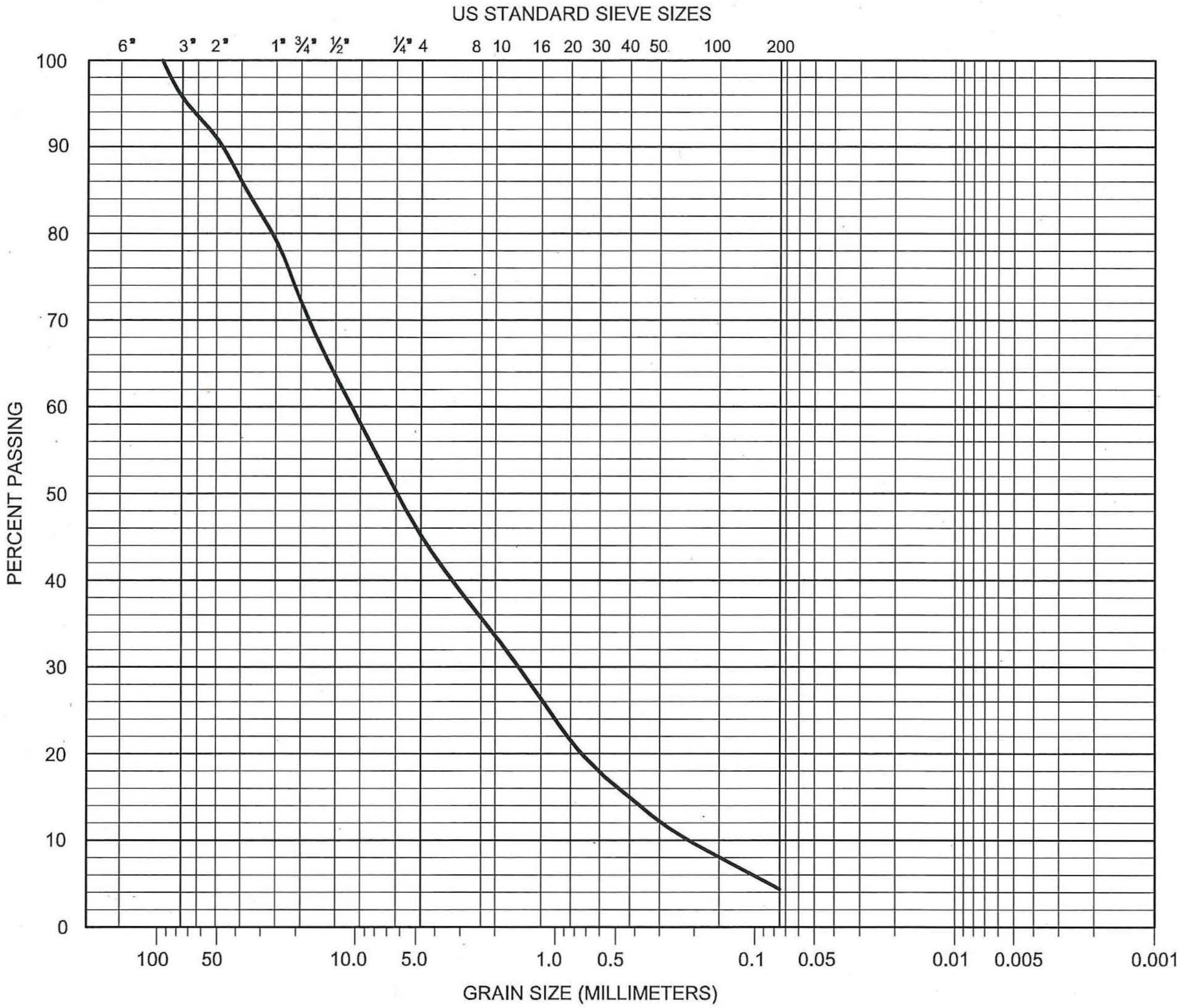
SYMBOL	SAMPLE LOCATION AND DEPTH	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 μ	UNIFIED SOIL CLASSIFICATION
———	S-3 @ 5 - 13 FT.	9.8	2.9	--	GW

NOTE: CORE DIAMETER ~ 3.7 INCHES: SAMPLE LIMITED TO PARTICLES LESS THAN 3.5 INCHES

GRADATION TEST RESULTS - ASTM C136

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. B-4

Northwest Geotech, Inc.



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	SAMPLE LOCATION AND DEPTH	FIELD MOISTURE (%)	% PASSING NO. 200 SIEVE	% PASSING 2 µ	UNIFIED SOIL CLASSIFICATION
———	S-3 @ 20 - 27.5 FT.	13.9	4.4	--	GW

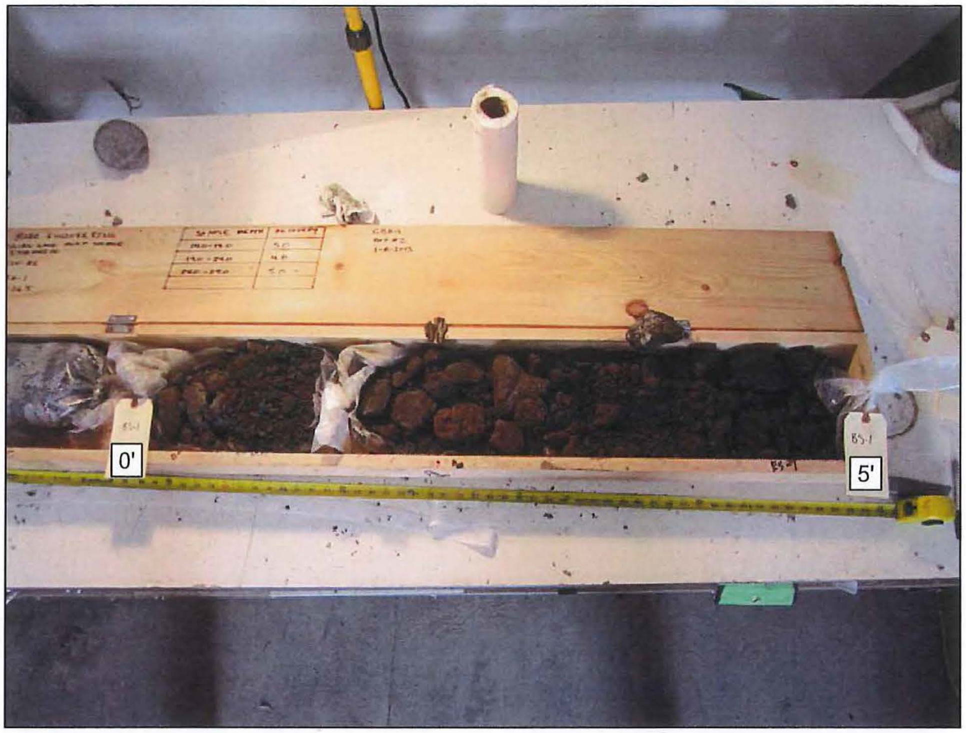
<u>NOTE:</u> CORE DIAMETER ~ 3.7 INCHES: SAMPLE LIMITED TO PARTICLES LESS THAN 3.5 INCHES

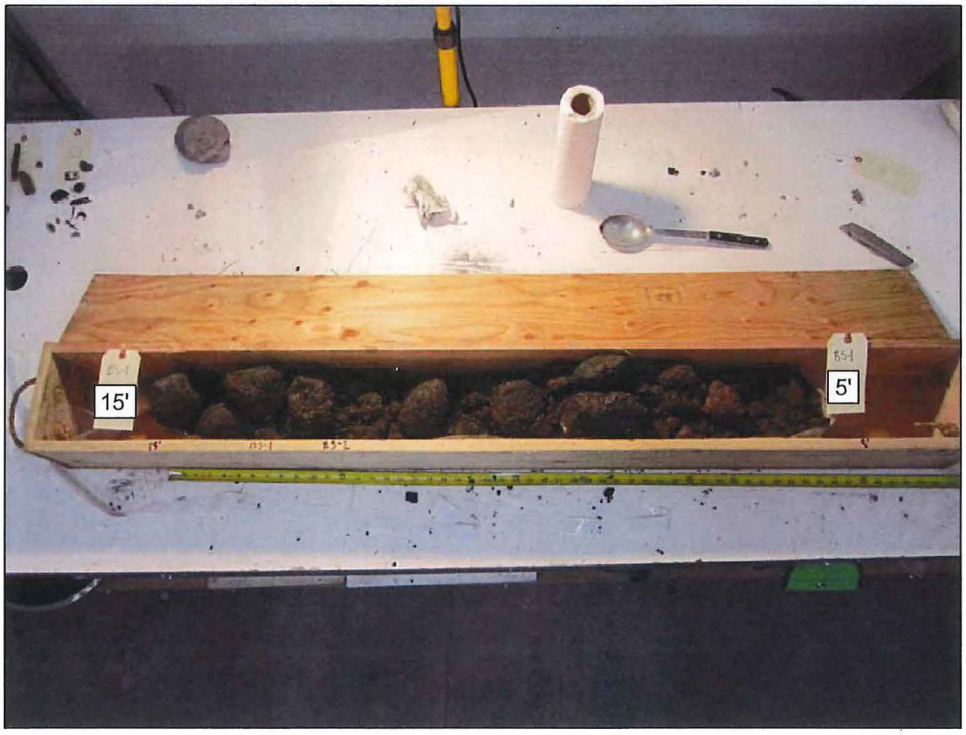
GRADATION TEST RESULTS - ASTM C136

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. B-5

Northwest Geotech, Inc.

APPENDIX C

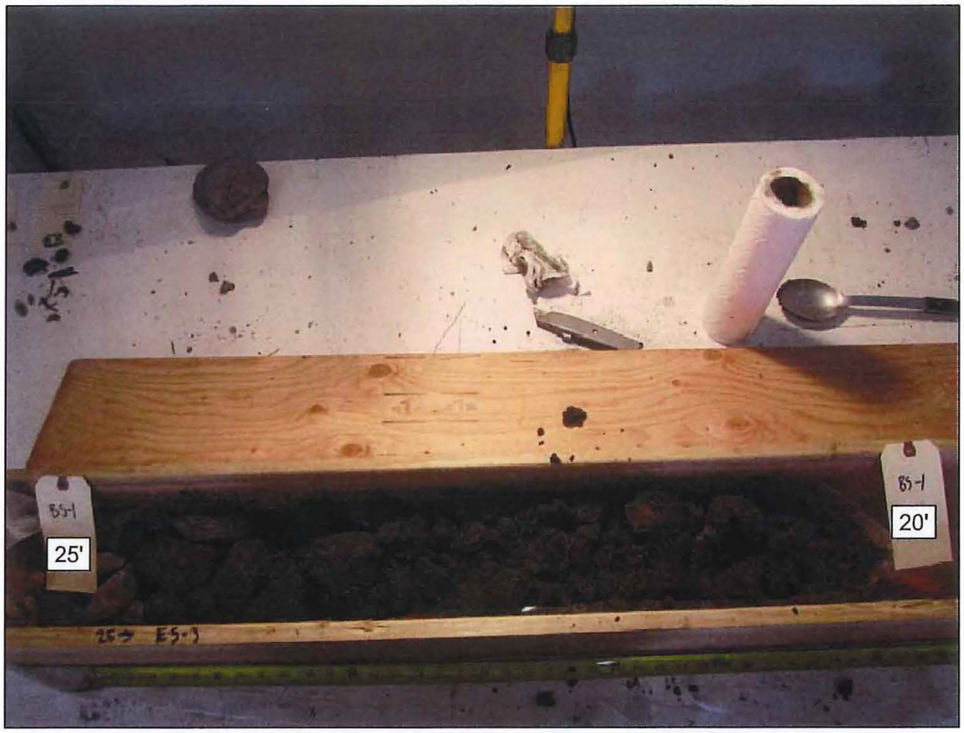




CORE LOG PHOTO S-1

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-1 (1 OF 3)

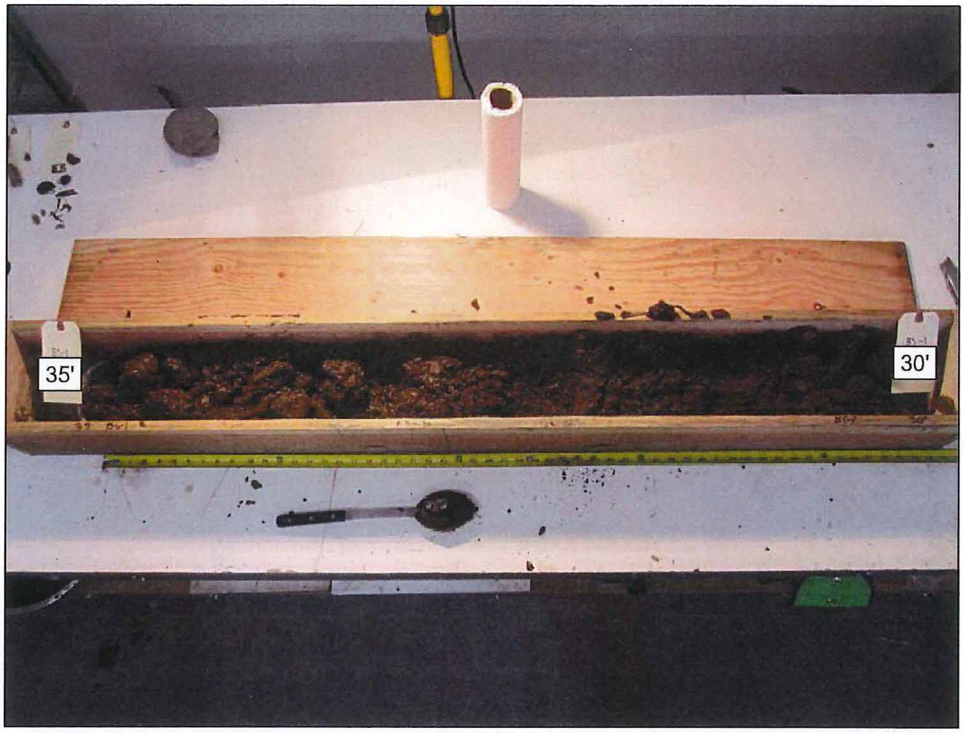
Northwest Geotech, Inc.



CORE LOG PHOTO S-1

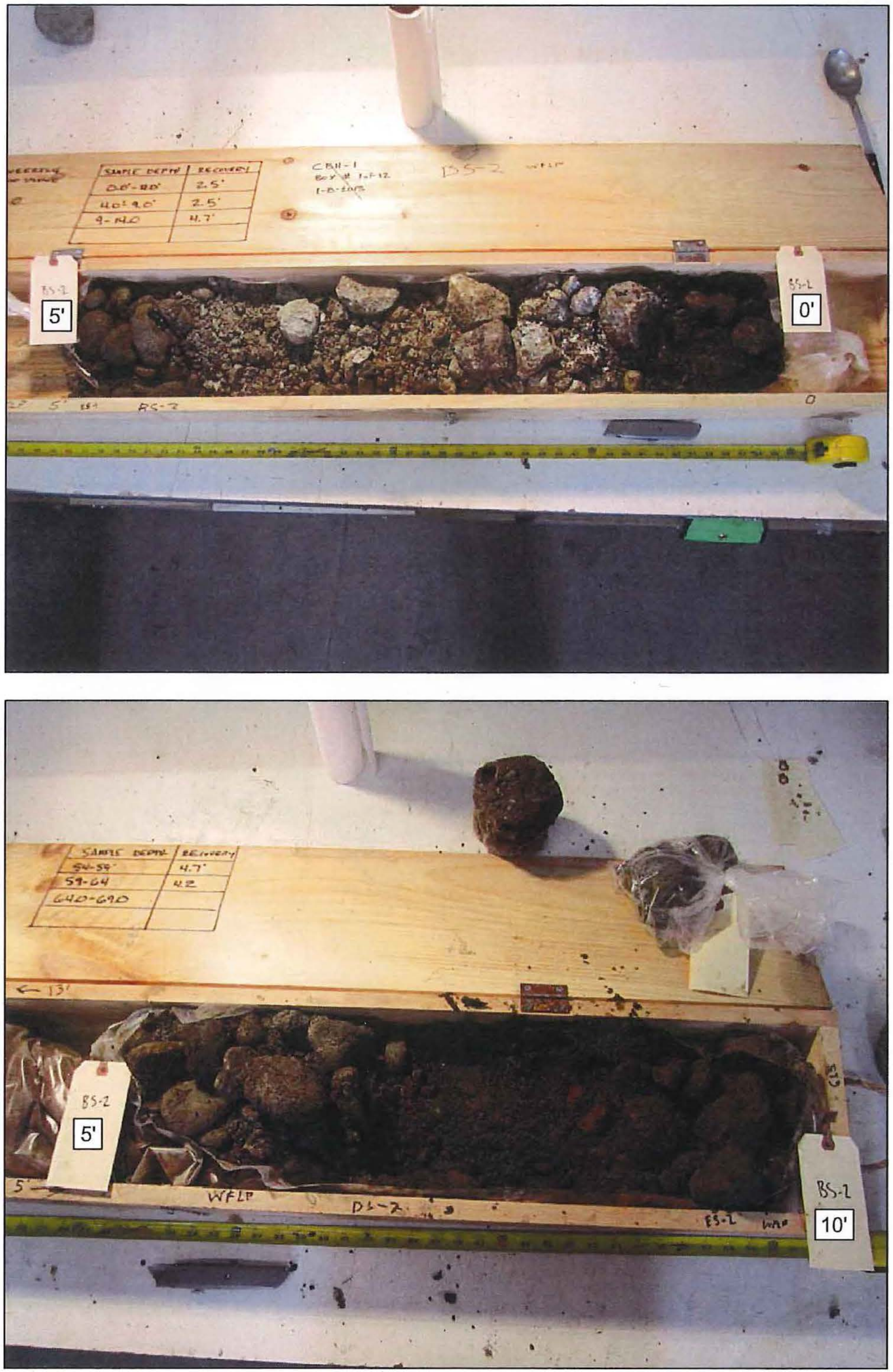
PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-1 (2 OF 3)

Northwest Geotech, Inc.



CORE LOG PHOTO S-1

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-1 (3 OF 3)



CORE LOG PHOTO S-2

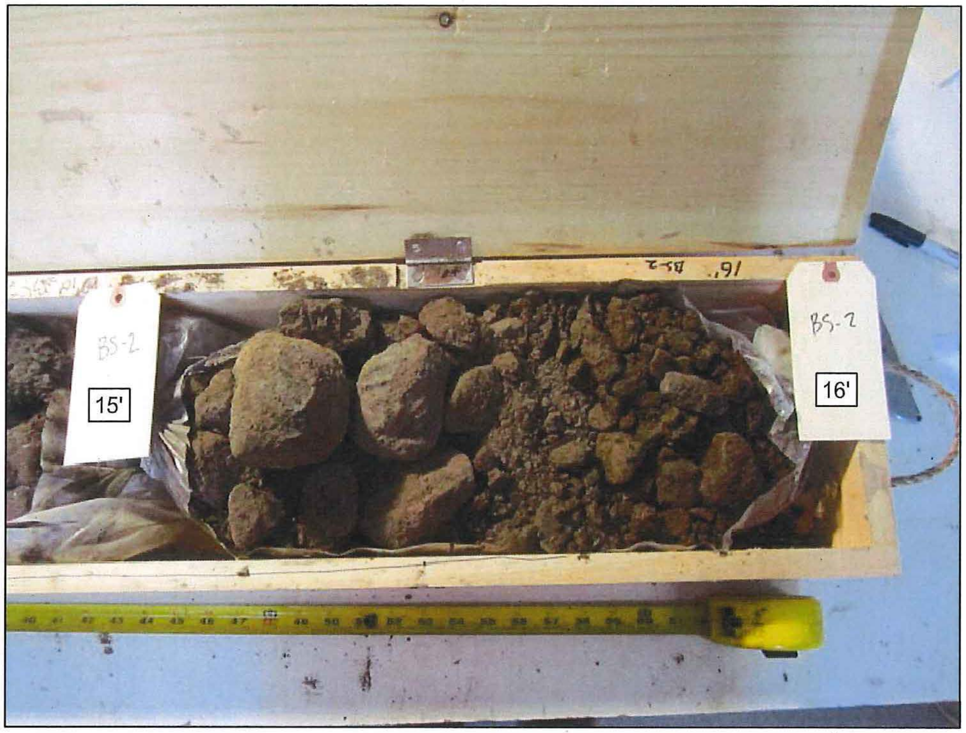
PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-2 (1 OF 4)

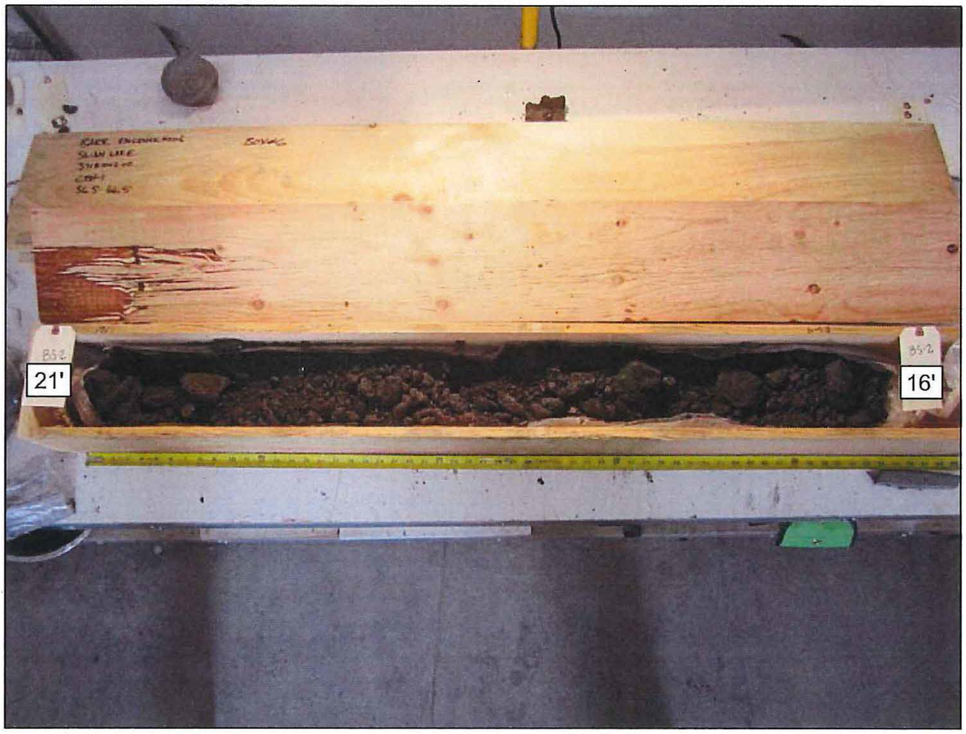
Northwest Geotech, Inc.

CORE LOG PHOTO S-2

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-2 (2 OF 4)

Northwest Geotech, Inc.





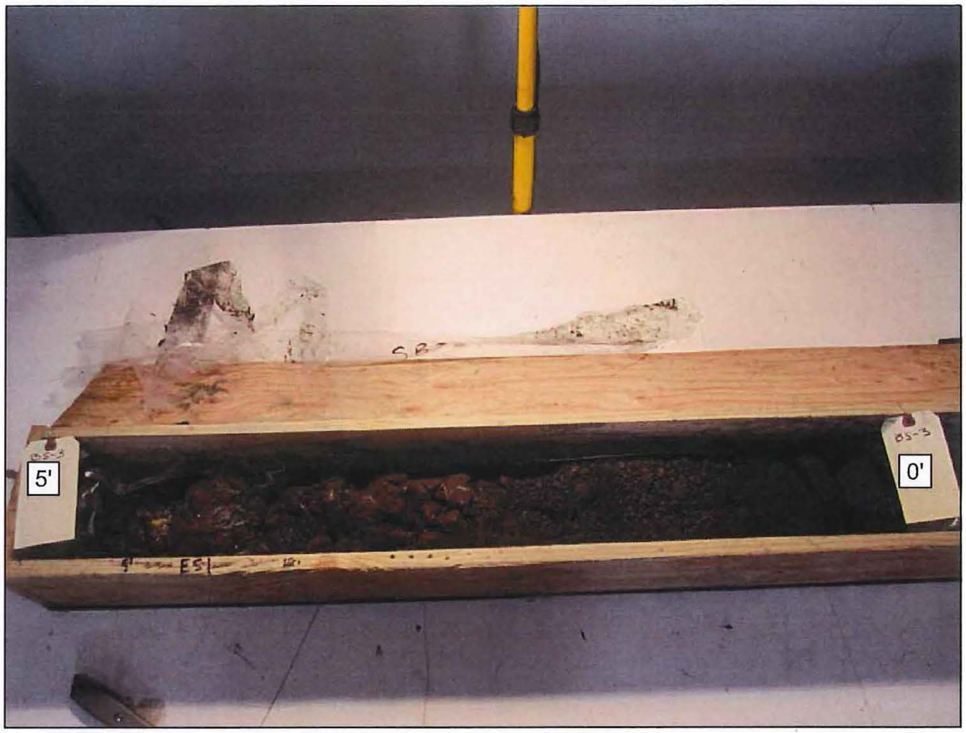
CORE LOG PHOTO S-2

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-2 (3 OF 4)

CORE LOG PHOTO S-2

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-2 (4 OF 4)

Northwest Geotech, Inc.



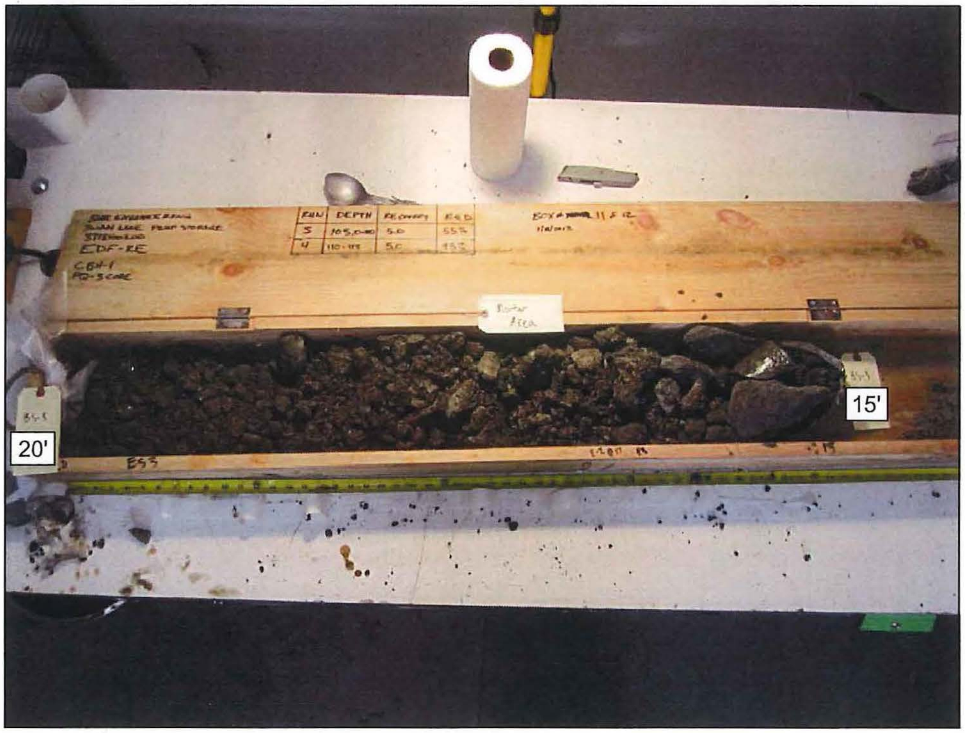
CORE LOG PHOTO S-3

PROJECT NO. 2919.1.1

WILLAMETTE FALLS RIVERWALK
OREGON CITY, OREGON

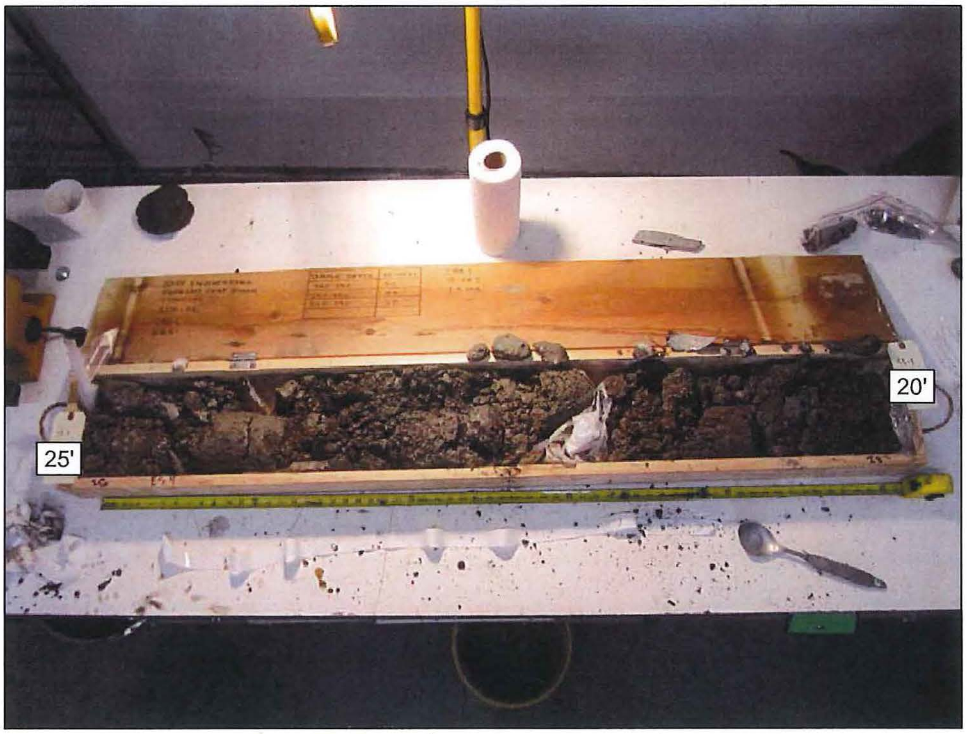
FIGURE NO. C-3 (1 OF 5)

Northwest Geotech, Inc.



CORE LOG PHOTO S-3

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-3 (2 OF 5)



CORE LOG PHOTO S-3

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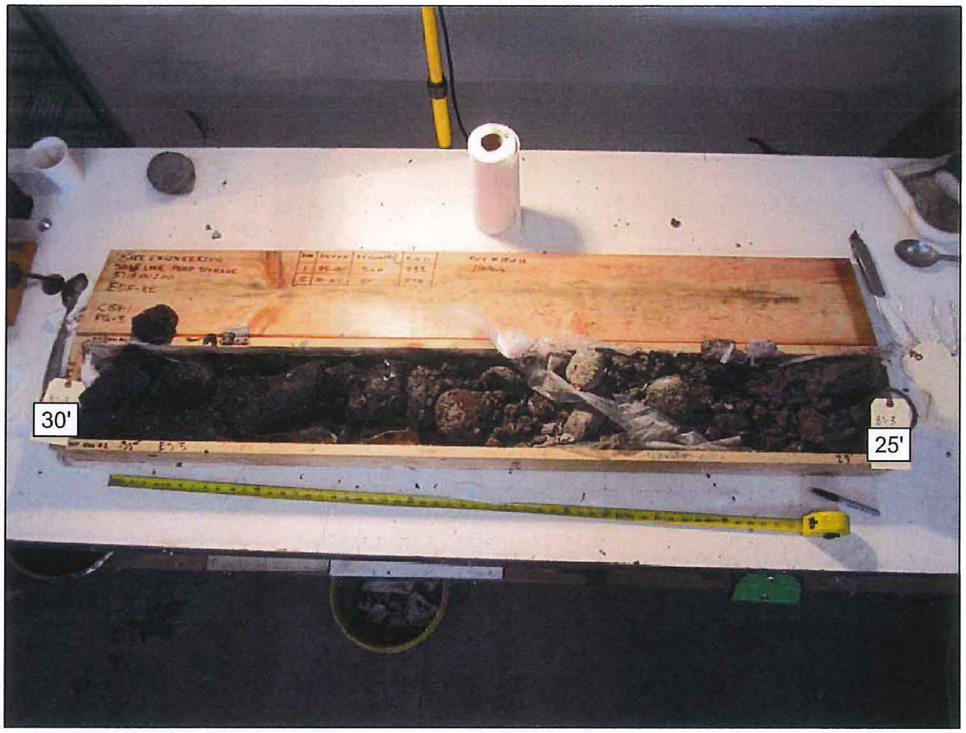
Northwest Geotech, Inc.



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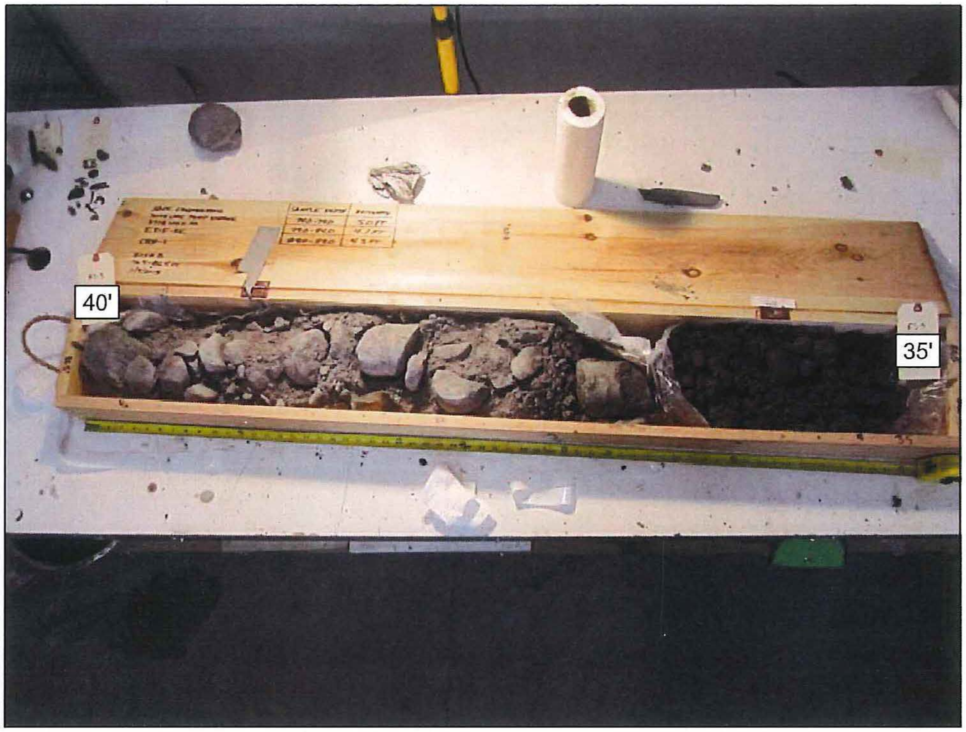

CORE LOG PHOTO S-3

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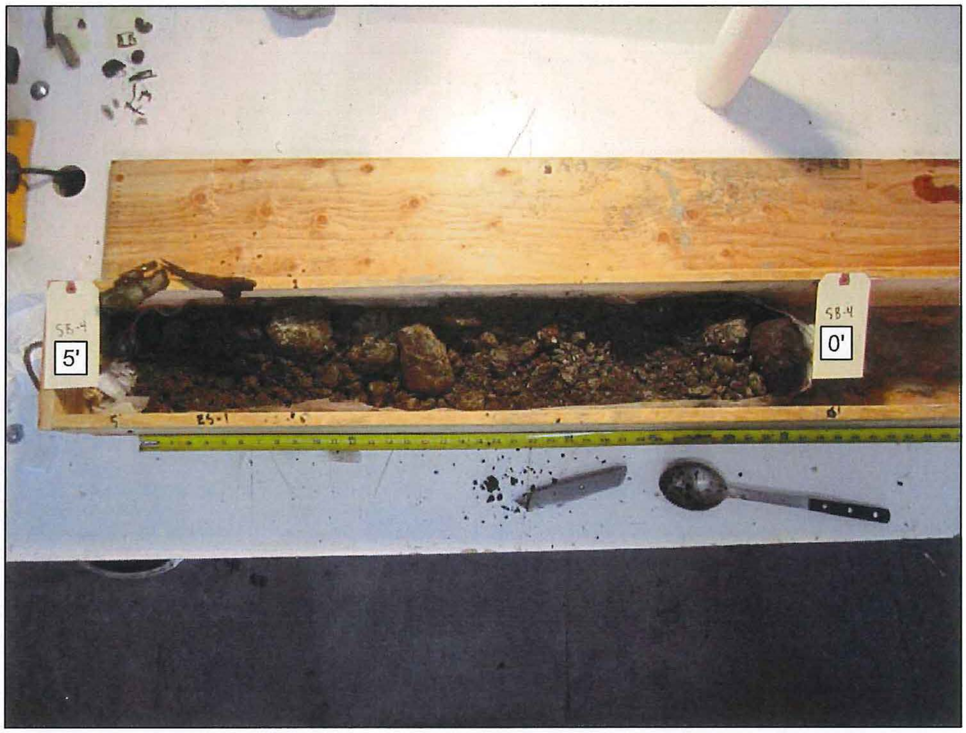
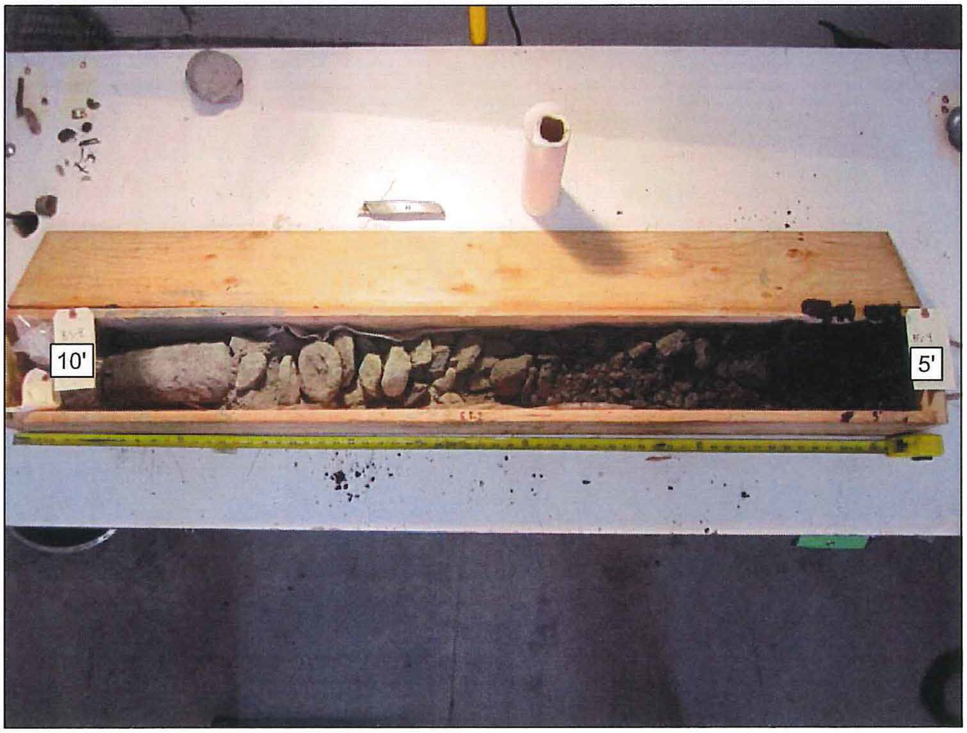
Northwest Geotech, Inc.

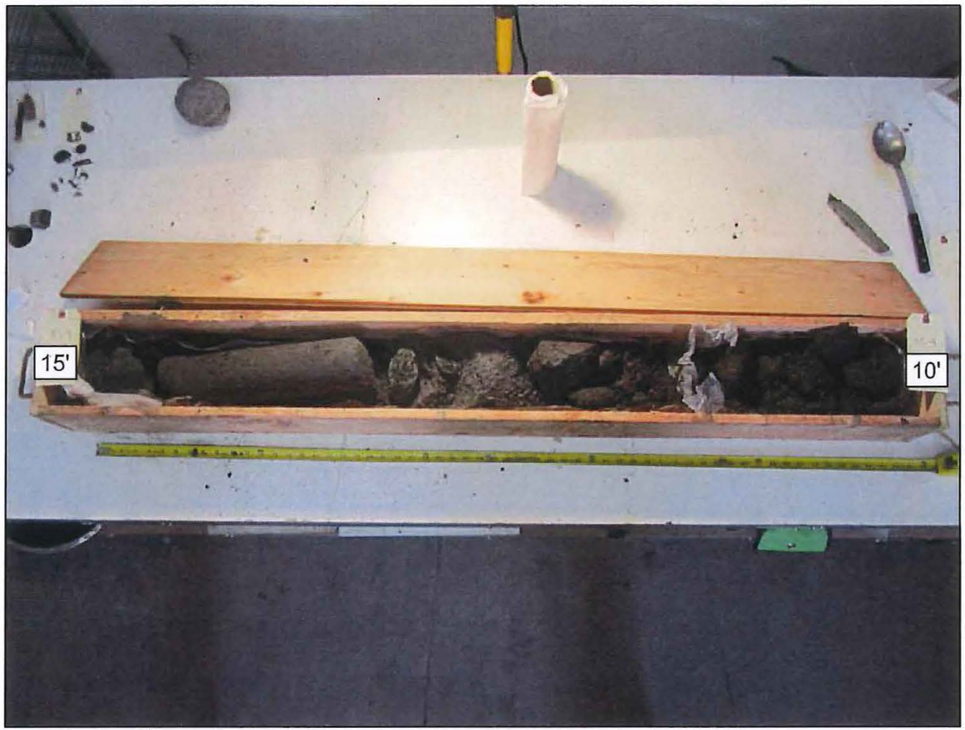




CORE LOG PHOTO S-4

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-4 (1 OF 2)

Northwest Geotech, Inc.



CORE LOG PHOTO S-4

PROJECT NO. 2919.1.1	WILLAMETTE FALLS RIVERWALK OREGON CITY, OREGON	FIGURE NO. C-4 (2 OF 2)

Northwest Geotech, Inc.

APPENDIX D

GeoPotential

ENVIRONMENTAL & EXPLORATION GEOPHYSICS

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SUMMARY REPORT

BORE HOLE CLEARANCE SURVEY

Former Blue Heron Mill
Willamette Falls Legacy Project
Oregon City, Oregon

CLIENT

Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B
Wilsonville, Oregon 97070

DATE OF SURVEY

May 27, April 3, 2017

GeoPotential Project Number: 9757

CONTENTS

FIGURES

APPENDICES

SUMMARY

A Bore Hole Clearance Survey (BHCS) was conducted over a portion of the former Blue Heron Mill site in Oregon City, Oregon as part of the Willamette Falls Legacy Project. The purpose of the survey was to assure utilities or other subsurface obstructions were not encountered during drilling of Bore Holes.

Ground Penetrating Radar (GPR) Surveys and hand held magnetic and electromagnetic scanners were used for the project.

Interpreted utilities and trenches along GPR Profiles were posted on a Map of the Site.

The results from the drilling were used to generate contour maps for Surface Elevation, Bedrock Elevation and Sediment Isopach Thickness.

INTRODUCTION

Ralph Soule & Tony Rukavina of GeoPotential conducted the Subsurface Mapping Survey. Allan Bean was the on-site representatives for Northwest Geotech. Fieldwork was conducted on May 27 & April 3, 2017. The report was completed and e-mailed to NW Geotech on April 17, 2017.

Subsurface mapping surveys are geophysical surveys utilizing geophysical methods and data to detect and locate natural and manmade subsurface features. Magnetic Surveys are used to detect and map the locations of buried **ferrous** (iron-bearing) objects . Ground Penetrating Radar (GPR) Surveys are used to map both natural and manmade subsurface features such as USTs, utilities, backfilled pits, etc. (see Appendix B.). Pipe and cable locators are used to map the locations of buried utilities and piping.

Once subsurface ferrous objects are detected from a magnetic survey then hand held scanners and GPR surveys are used to map the locations, depths, sizes and shapes of the objects.

SURVEY OBJECTIVES

The objectives of this subsurface mapping survey were:

1. Perform a BHCS over 77 proposed bore hole locations.
2. Map the locations of detected subsurface utilities & trenches along GPR Profiles.
3. Generate Contour Surface Elevation, Bedrock Elevation and Sediment Isopach Thickness maps from the results of the drilling.

SURVEY SITE

The survey Site is shown on Figures 1. through 5. The Site consisted of a portion of the former Blue Heron Mill Company.

SURVEY EQUIPMENT

The following geophysical instruments were used to conduct the survey:

- MALA RAMAC Ground Penetrating Radar System with a 200 MHz antenna (GPR Survey).
- Schonstedt GA52 Magnetic Gradiometer.
- Aqua-Tronics A6 Pipe & Cable locator.
- Heath Sure- lock Pipe & Cable locator.

This equipment and the procedures used to meet the survey objectives of this project have been proven effective in detecting metallic objects and mapping non-metallic features such as disturbed soil from backfilled pits.

Geophysical techniques are excellent at detecting changes in the subsurface caused by natural and manmade objects; however, they are poor at actually identifying subsurface features. Complementary methods may be used to assist in the interpretation; however, the only sure way of identifying a buried feature is by excavation.

Brief descriptions of the radar method is included in the Appendix.

PROCEDURE

Ground Penetrating Radar Surveys

Over areas that were designated as bore hole locations by Northwest Geotech. GPR Profiles were acquired using a 200 MHz antenna. The GPR data were processed and interpreted to locate utilities and trenches along GPR profiles as shown on Figure 2. GPR Interpretation Map.

Pipe and Cable Survey

Hand held magnetic and electromagnetic scanners were used to help identify utilities over bore hole locations.

Map Generation

The locations of 19 GPR Profiles and 77 bore hole locations were surveyed in by geodetic surveyors. Northwest Geotech provided GeoPotential with a spreadsheet (Appendix 1) showing geographic locations in Oregon State Plane coordinates, Surface Elevations, Bedrock Elevations and Depth to Bedrock. Figure 2. shows the locations of these data. This data were then used to generate contour maps of; Figure 3. Surface Elevations, Figure 4. Bedrock Elevations and Figure 5. Sedimentary Isopach Thickness Map.

RESULTS

Results are shown on Figures 2 through 5.

Figure 2 shows the interpretation of utilities from GPR anomalies along GPR Profiles. The interpretation was difficult due to disturbed sedimentary material. The locations and depths of piping is shown as blue circles or green circles where it could be determined that the pipe was a sewer pipe. Trench areas are shown as orange rectangles. One boulder was intersected during drilling along GPR Profile G2 as shown on Fig. 2.

LIMITATIONS

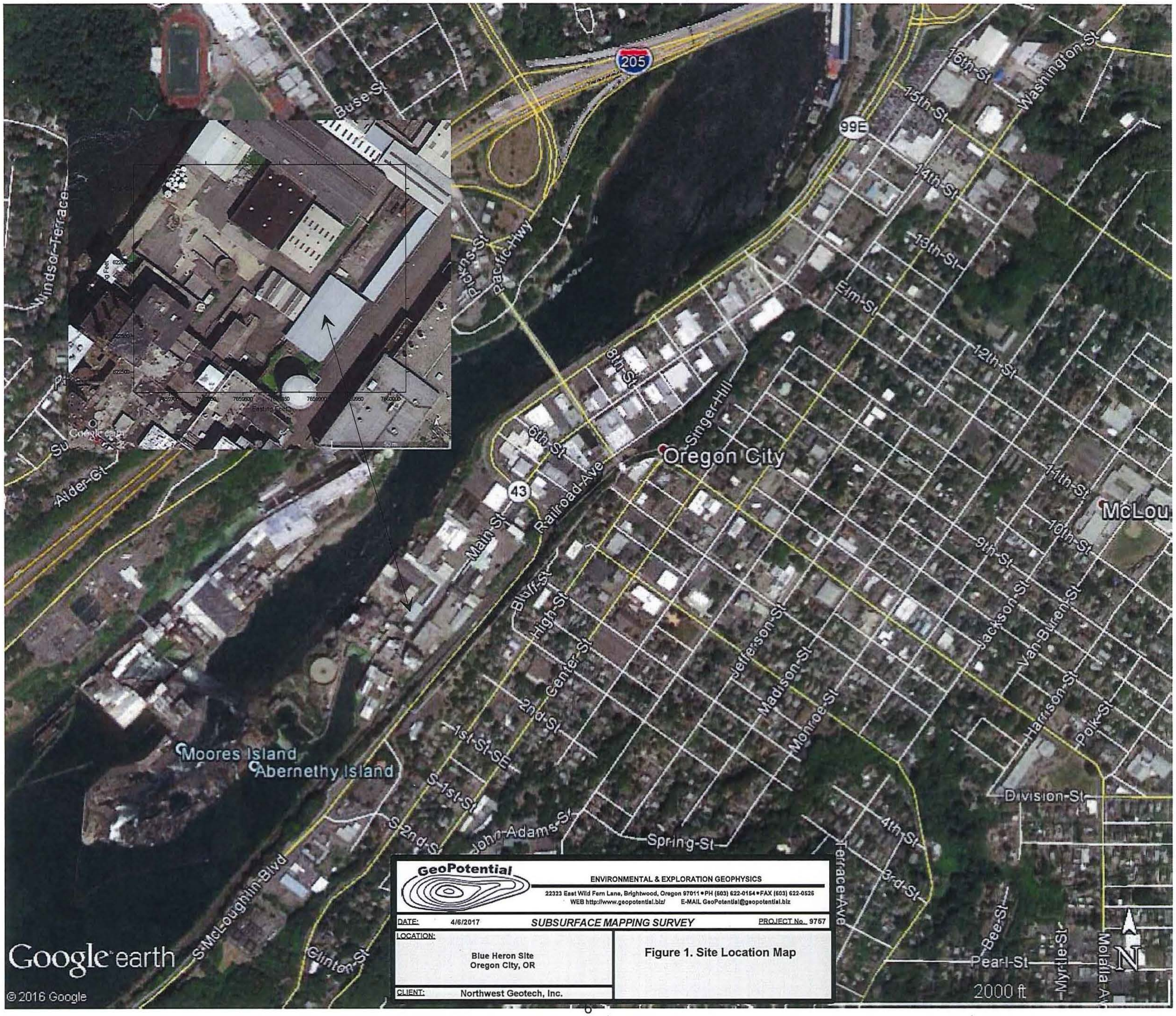
Limitations of magnetometer and GPR surveys can be seen in the Appendices.

Geophysical surveys consist of interpreting geophysical responses from subsurface features. Since a variety of subsurface features can produce identical geophysical responses, it is necessary to confirm the geophysical interpretation with intrusive investigations such as excavating or drilling. In addition, many subsurface features may produce no geophysical response.

Ralph Soule

Ralph Soule
GeoPotential

April 17, 2017



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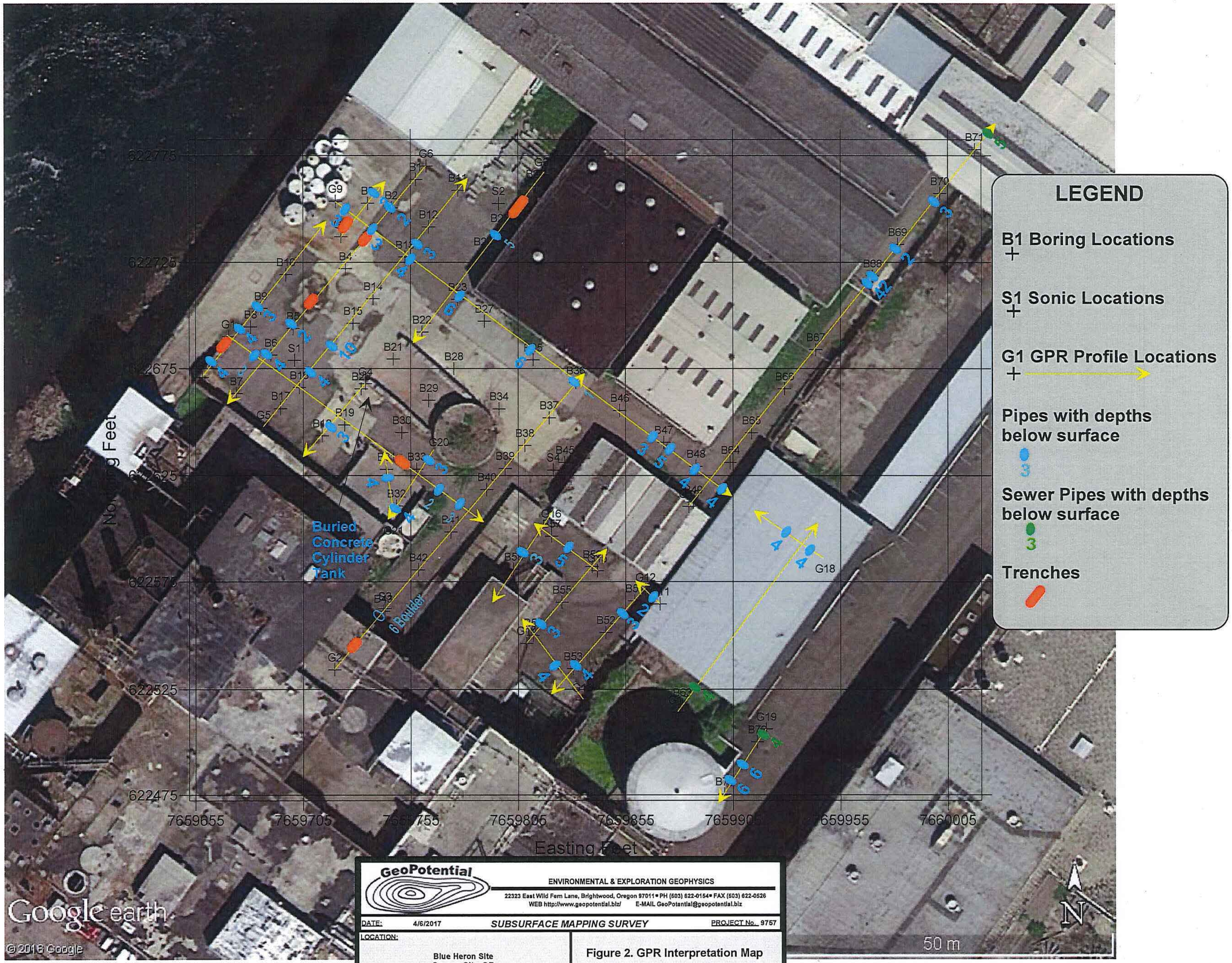
DATE: 4/6/2017	*SUBSURFACE MAPPING SURVEY*		PROJECT No. 9757
LOCATION: Blue Heron Site Oregon City, OR	Figure 1. Site Location Map		
CLIENT: Northwest Geotech, Inc.			



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DATE: 4/6/2017 *SUBSURFACE MAPPING SURVEY* PROJECT No. 9757

LOCATION:
Blue Heron Site
Oregon City, OR

CLIENT: Northwest Geotech, Inc.

Figure 2. GPR Interpretation Map

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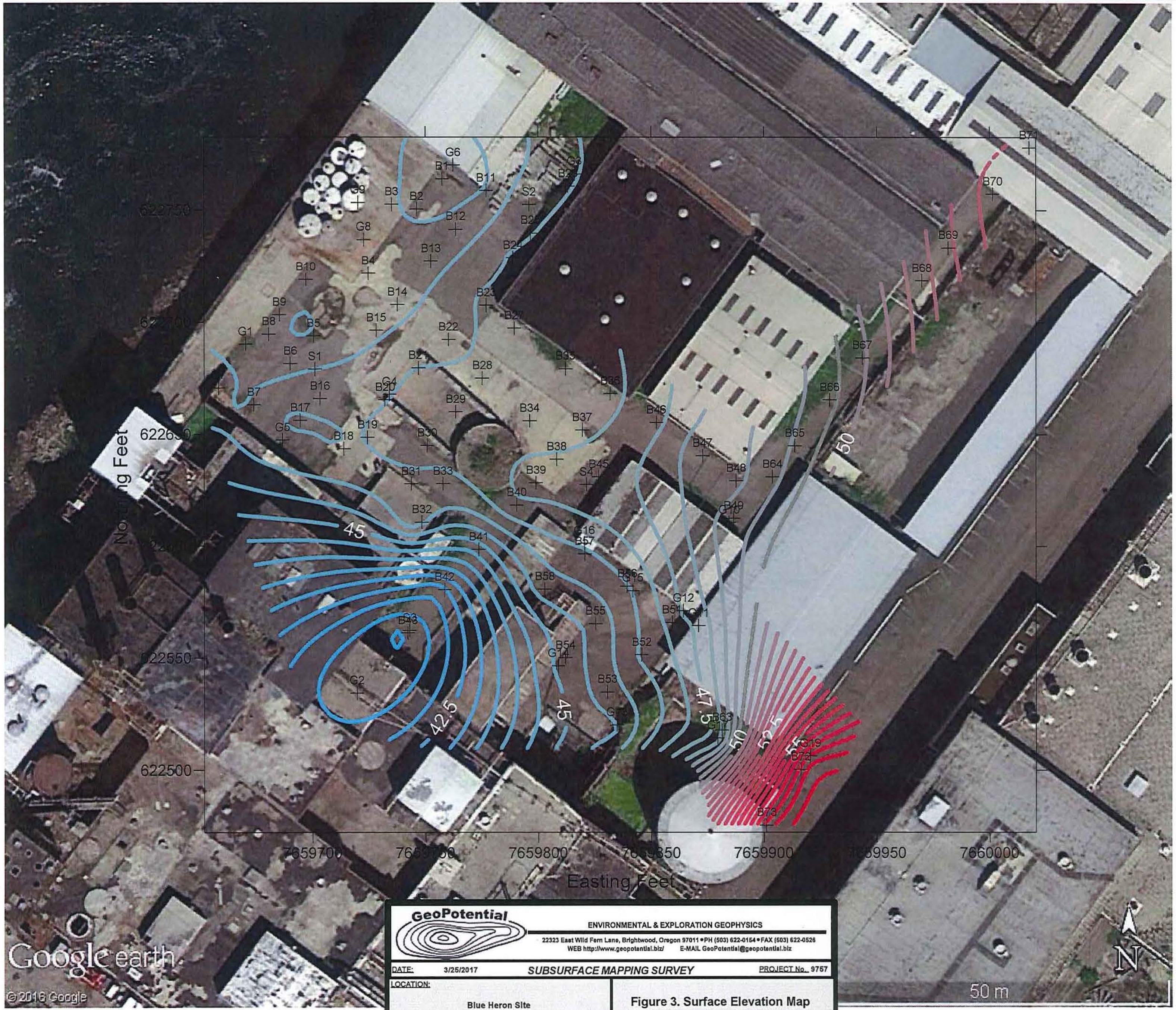

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WEB http://www.geopotential.biz/ E-MAIL GeoPotential@geopotential.biz

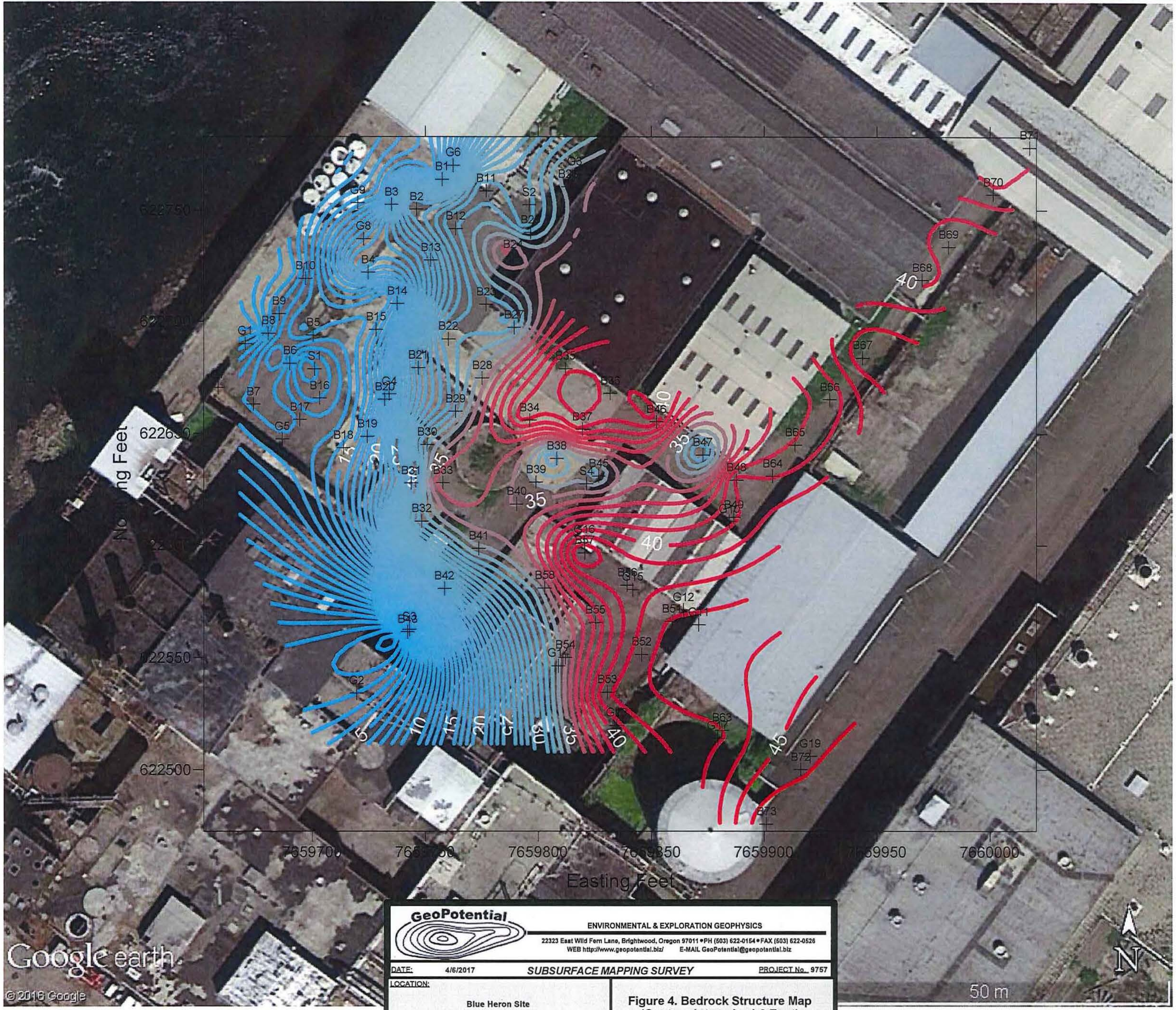
DATE: 3/25/2017 *SUBSURFACE MAPPING SURVEY* PROJECT No. 9757

LOCATION:

Blue Heron Site
Oregon City, OR

CLIENT: Northwest Geotech, Inc. 8

Figure 3. Surface Elevation Map
(Contour Interval = 0.5 Feet)



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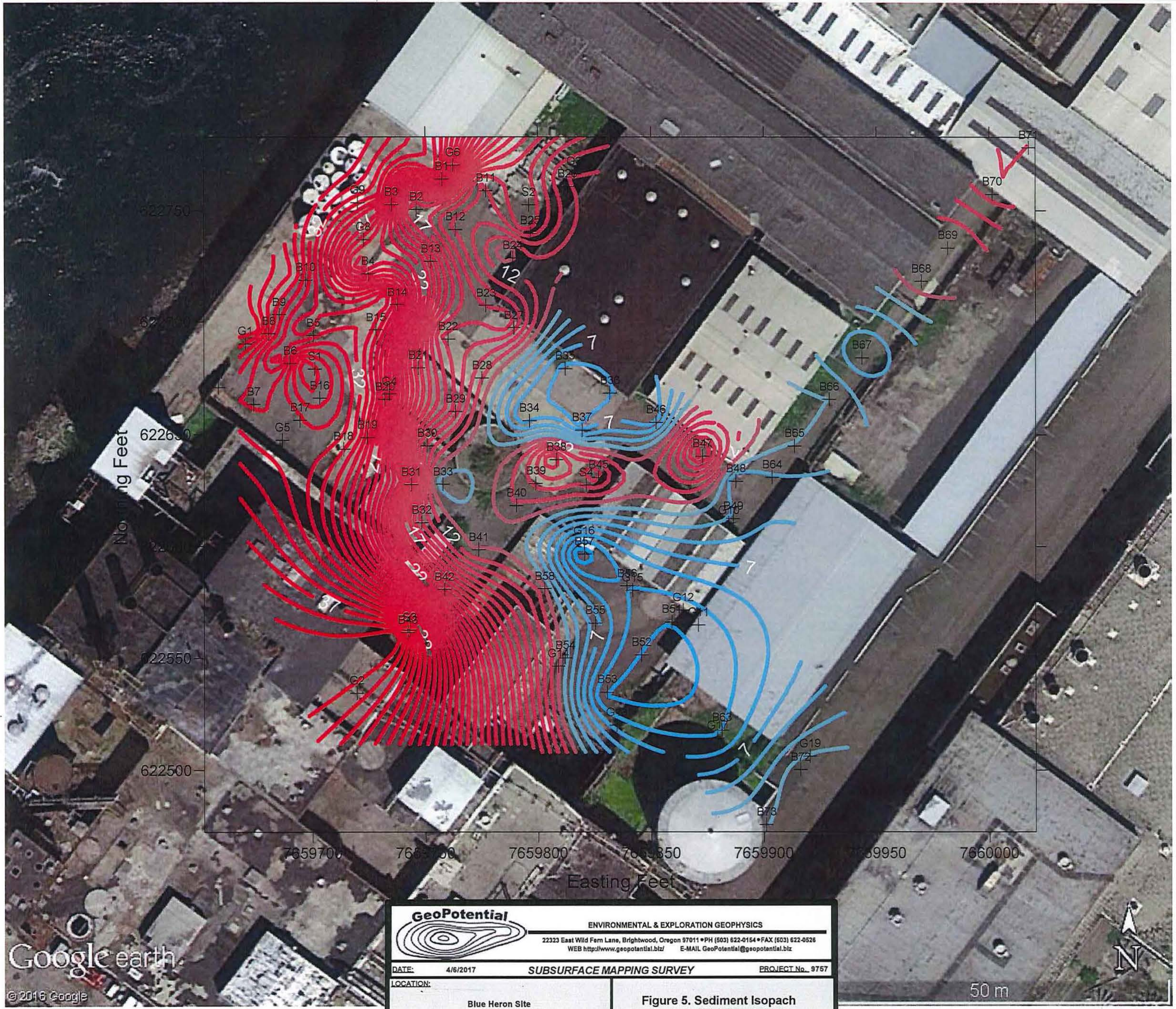
DATE: 4/6/2017 *SUBSURFACE MAPPING SURVEY* PROJECT No. 9757

LOCATION:
Blue Heron Site
Oregon City, OR

CLIENT: Northwest Geotech, Inc.

Figure 4. Bedrock Structure Map
(Contour Interval = 1.0 Foot)



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DATE: 4/6/2017	SUBSURFACE MAPPING SURVEY	PROJECT No. 9757

LOCATION:
Blue Heron Site
Oregon City, OR

CLIENT: Northwest Geotech, Inc.

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Figure 5. Sediment Isopach Thickness Map (Contour Interval = 1.0 Foot)

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Appendix A
Table of Surveying and Boring Results

TABLE 1
SUMMARY OF BORING LOCATIONS AND ELEVATIONS
WILLAMETTE FALLS LEGACY PROJECT

Point	Description	Northing	Easting	Elevation (feet)	Approximate Depth to Bedrock (feet)	Approximate Elevation of Bedrock (feet)
Air Track Borings						
50075	B1	622768.2211	7659753.7	45.3277	30	15.3
50074	B2	622754.4921	7659742.1	45.3877	16	29.4
50073	B3	622756.6411	7659730.7	45.7238	30	15.7
50071	B4	622725.2998	7659720.1	45.6224	22	23.6
50091	B5	622696.4345	7659695.1	45.425	30	15.4
50090	B6	622683.6378	7659684.6	45.6945	30	15.7
50089	B7	622664.8866	7659668.1	45.9325	33	12.9
50086	B8	622697.2109	7659674.9	45.6835	38	7.7
50085	B9	622706.1687	7659679.7	45.7341	35	10.7
50084	B10	622722.4481	7659691.8	45.6092	35	10.6
50077	B11	622762.8852	7659773.8	45.351	14	31.4
50078	B12	622745.4469	7659759.8	45.5426	14	31.5
50040	B13	622730.9209	7659748.5	45.7205	21	24.7
50070	B14	622710.8443	7659733.3	45.7341	32	13.7
50092	B15	622698.9876	7659723.7	45.7689	32	13.8
50093	B16	622667.7206	7659698.1	46.3632	36	10.4
50094	B17	622657.7101	7659689.2	46.5266	33	13.5
50096	B18	622644.7301	7659708.9	46.504	33	13.5
50097	B19	622649.9431	7659719.7	46.4779	32	14.5
50098	B20	622667.1718	7659727.6	46.3426	30	16.3
50105	B21	622681.667	7659742.9	46.4595	21	25.5
50069	B22	622694.7058	7659756.5	46.2766	15	31.3
50039	B23	622710.4654	7659773.7	46.5381	15	31.5
50079	B24	622732.4689	7659785.8	46.4753	10	36.5
50080	B25	622743.6593	7659793.9	46.3819	16	30.4
50083	B26	622764.8944	7659810.9	46.3543	12	34.4
50038	B27	622699.9724	7659786.4	46.6344	16	30.6
50068	B28	622676.9921	7659771.8	46.5431	13	33.5
50104	B29	622661.6252	7659759.8	46.7374	16	30.7
50100	B30	622646.2502	7659746.9	47.0167	15	32.0
50101	B31	622628.579	7659739.6	46.2343	22	24.2
50102	B32	622611.0889	7659744.4	46.4079	15	31.4
50103	B33	622628.6807	7659754	46.2125	10	36.2
50067	B34	622657.5339	7659793.4	46.714	6	40.7
50037	B35	622681.2957	7659809.7	46.6589	6	40.7
50036	B36	622670.036	7659830	46.8394	6	40.8
50042	B37	622653.3078	7659817.3	46.7735	6	40.8
50043	B38	622639.9841	7659805.7	47.025	16	31.0
50046	B39	622629.0629	7659796.2	47.1435	13	34.1
50047	B40	622618.9005	7659787.5	46.9083	12	34.9
50048	B41	622598.5639	7659770.3	44.5414	11	33.5
50049	B42	622580.2422	7659754.7	42.1394	21	21.1
50050	B43	622560.4028	7659738	40.9319	40+	Drill bit stuck in log (0.93-)
50045	B45	622631.861	7659824.7	47.3248	15	32.3
50035	B46	622656.7701	7659851	47.2942	6	41.3

TABLE 1
SUMMARY OF BORING LOCATIONS AND ELEVATIONS
WILLAMETTE FALLS LEGACY PROJECT

Point	Description	Northing	Easting	Elevation (feet)	Approximate Depth to Bedrock (feet)	Approximate Elevation of Bedrock (feet)
50034	B47	622641.5743	7659872	48.3411	18	30.3
50033	B48	622630.081	7659887.3	48.361	8	40.4
50031	B49	622612.9225	7659886	48.6387	9	39.6
50060	B51	622565.2684	7659858.1	47.1046	4	43.1
50061	B52	622550.2365	7659844.2	46.5253	4	42.5
50062	B53	622533.0585	7659828.6	45.7391	4	41.7
50065	B54	622548.8881	7659809.6	45.1305	11	34.1
50066	B55	622564.727	7659823.3	45.575	8	37.6
50056	B56	622581.7663	7659837.7	46.3921	5	41.4
50054	B57	622596.5496	7659818.4	46.3428	3	43.3
50053	B58	622580.5082	7659800.2	45.6886	12	33.7
50019	B63	622515.74	7659880.7	47.8216	5	42.8
50030	B64	622631.9116	7659903.7	48.8068	9	39.8
50029	B65	622646.1504	7659913.9	49.0618	10	39.1
50028	B66	622667.1492	7659929.7	49.3368	10	39.3
50027	B67	622686.2425	7659944.6	49.945	7	42.9
50026	B68	622721.797	7659971.7	51.3858	12	39.4
50025	B69	622737.0864	7659983.7	51.9925	11	41.0
50024	B70	622761.4216	7660003.9	52.8468	15	37.8
50022	B71	622782.5274	7660020.5	52.6169	15	37.6
50017	B72	622497.7269	7659916.5	56.8934	11	45.9
50016	B73	622472.3893	7659901	56.9744	10	47.0
Sonic Borings						
50106	S1	622681.0653	7659695.9	45.8758	37	8.9
50081	S2	622756.4733	7659793.2	46.2353	16	30.2
50051	S3	622561.5715	7659738.8	40.9535	37.5	3.5
50044	S4	622628.3248	7659819.3	47.2534	13	34.3
Ground Penetrating Radar Line Initiation Points						
50087	G1	622692.555	7659664.4	45.7443	N/A	N/A
50052	G2	622532.6244	7659714.9	41.1321	N/A	N/A
50082	G3	622770.4124	7659813.9	46.3521	N/A	N/A
50099	G4	622669.622	7659729.7	46.3641	N/A	N/A
50095	G5	622648.7624	7659681.1	46.3807	N/A	N/A
50076	G6	622774.5357	7659758.7	45.2847	N/A	N/A
50088	G7	622672.6446	7659652	46.4156	N/A	N/A
50072	G8	622740.7449	7659718	45.7545	N/A	N/A
50041	G9	622757.4391	7659715.4	45.9319	N/A	N/A
50032	G10	622610.9288	7659884	48.7471	N/A	N/A
50058	G11	622563.8224	7659870.1	47.5648	N/A	N/A
50059	G12	622570.635	7659863.2	47.5237	N/A	N/A
50063	G13	622518.0143	7659832.9	45.3785	N/A	N/A
50064	G14	622545.1156	7659806.4	44.9993	N/A	N/A
50057	G15	622579.7595	7659840.2	46.4397	N/A	N/A
50055	G16	622601.4724	7659818.2	46.5946	N/A	N/A
50020	G17	622512.1089	7659878.8	47.8787	N/A	N/A
50018	G19	622503.9003	7659920.8	56.935	N/A	N/A

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APPENDIX B
GROUND PENETRATING RADAR SURVEYS

Ground Penetrating Radar (GPR) can be a valuable tool to accurately locate both metallic and non-metallic UST's and utilities, buried drums and hazardous material at some sites. It may detect objects below reinforced concrete floors and slabs. GPR may delineate trenches and excavations and, under some conditions, it may be used to locate contaminant plumes. It has been used as an archaeological tool to look for buried artifacts. It may accurately profile fresh water lake bottoms either from a boat or from a frozen lake surface. GPR may be used to locate voids below roads and runways. GPR has numerous engineering applications. It can be used in non-destructive testing of engineering material, for example, locating rebar in concrete structures and determining the thickness of concrete and other structural material.

GPR uses short impulses of high frequency radio waves directed into the ground to acquire information about the subsurface. The energy radiated into the ground is reflected back to the antenna by features having different electrical properties to that of the surrounding material. The greater the contrast, the stronger the reflection. Typical reflectors include water table, bedrock, bedding, fractures, voids, contaminant plumes and man-made objects such as UST's and metal and plastic utilities. Materials having little electrical contrast like clay and concrete pipes may not produce strong reflections and may not be seen. Data are digitally recorded or downloaded to a laptop computer for filtering and processing.

The frequency of the radar signal used for a survey is a trade off. Low frequencies (250 MHz – 50 MHz) give better penetration but low resolution so that pipes and utilities may not be seen. Pipes and utilities may be seen using higher frequencies (500 MHz) but the depth of penetration may be limited to only a few feet especially in the wet, clayey soils found in many areas of the NW USA. The GPR frequency is dependent upon the antenna. Once an antenna is selected, nothing the operator can do can increase the depth of penetration.

Radar data is ambiguous. Many buried objects produce echoes that may be similar to the echo expected from the target object. Boulders and debris produce reflections that are similar to pipes and tanks. Subtle changes in the electrical properties along a traverse caused by changes in soil type, mineralogy, grain size, and moisture content all produce "noise" that can make interpretation difficult. Interpreting radargrams is an art as much as a science.

Under some conditions, although a UST itself may not be clearly visible in a GPR record, the excavation or trench in which the UST is buried is evident. Usually GPR data is used to compliment data from other "tools". For example, a trench-like reflection but no clear UST reflection, combined with a "tank" shaped magnetic anomaly suggests the presence of a UST. Although the UST itself could not be seen using GPR, the radar showed a trench-like reflection. The magnetic data showed a large ferrous object. We would report a possible UST at that location.

GPR is often used in conjunction with magnetometer surveys. Magnetometer Surveys are very fast and large areas can be covered cost effectively. Magnetic anomalies are marked in the field, and then may be further investigated using radar.

GPR, like other geophysical tools, is excellent at detecting changes across a site, but it is poor at actually identifying the cause of the change. **The only definite way to identify buried objects is through excavation.**

ADVANTAGES - General

- When GPR data is properly interpreted subsurface objects can usually be confidently identified. This often requires the GPR data be combined with other geophysical data, surface features and historical information.
- GPR provides continuous records along traverses which, depending on the goal of the survey, may be interpreted in the field.
- At flat, open sites, for reconnaissance purposes, the antenna can be towed behind a vehicle at several mph.
- Many GPR antennas are shielded and are unaffected by surface and overhead objects and power lines.
- GPR can be used in conjunction with magnetic or EM surveys to accurately locate buried objects.

ADVANTAGES – Site specific

- With a low frequency antenna, in clean, dry, sandy soil, reflections from targets as deep as 100 feet are possible. Geologic features such as bedrock and cross bedding may be seen at some sites.
- The resolution of data is very high particularly for high frequency antennas.
- Shallow, man-made objects generally can be detected.
- Fiberglass UST's and plastic pipes can be detected using GPR.

LIMITATIONS - General

- To acquire the highest quality data, proper coupling between the antenna and the ground surface is necessary. Poor data may be obtained at sites covered with debris, an uneven surface, tall grass and brush. Objects located at curbs are difficult to see.
- Acquiring GPR data is slow. The antenna must be over the target. The signal from the antenna is cone-shaped. Reflections from objects to the side of the antenna may be seen, but their actual location relative to the antenna is not obvious.
- Penetration of the GPR signal is "site specific" and its depth of penetration at a particular site cannot be predicted ahead of time. Near surface conductive material, such as salty or contaminated ground water and wet, clay-rich soil, may attenuate the radar signal, limiting the

effective depth of the survey to several feet. Reinforced concrete also can attenuate the signal. Rebar may produce reflections that look like pipes.

- GPR may not be cost-effective for some projects. For a detailed survey mapping underground storage tanks and utilities, it may be necessary to collect data in orthogonal directions at 5-foot line spacing.

LIMITATIONS – Interpretation

- Interpretation can be difficult. Radar data are ambiguous. Subsurface objects can be detected but, in general, they cannot be identified. USTs and utilities have a characteristic reflection; however, large rocks and boulders have a similar reflection.

- The reflection visible in a GPR record is very complex and may be caused by small changes in the electrical properties of the soil. The target in mind may not produce the reflection. Due to "noise", the target may be missed. USTs and deep utilities may be missed if they are under debris and/or other pipes.

- Other methods may be necessary to aid in the interpretation of the data (use a magnetometer to detect a large metallic mass, then GPR to determine if the object is tank-like, or a utility locator to determine if there are feed lines and fill pipes leading to the object).

- Adequate contrast between the ground and the target is required to obtain reflections. UST's may be missed if they are badly corroded. Utilities made of "earth" materials like clay and concrete may not be detected since their electrical properties are similar to the surrounding soil.

- To determine the depth to an object without "ground truth", assumptions must be made regarding soil properties. Even with ground truth at several locations on the same site, changes in material across a site (therefore changes in signal velocity) can cause errors in depth measurements at other locations.

Willamette Falls
LEGACY PROJECT

Interpretive Framework
Concept Design June 3, 2017

Snøhetta Mayer/Reed DIALOG

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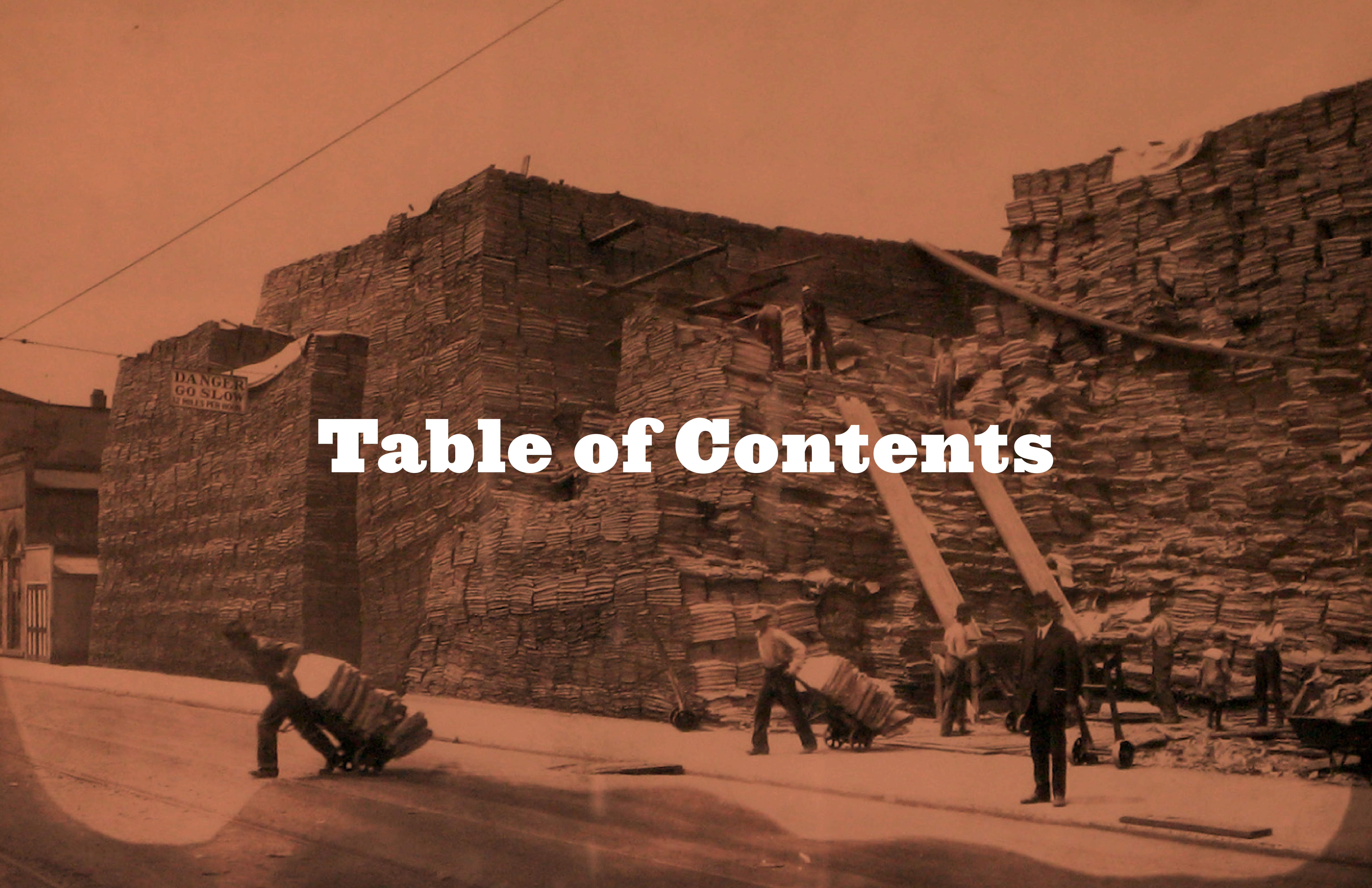

Willamette Falls
LEGACY PROJECT

Interpretive Framework
Concept Design June 3, 2017

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Cover photo, top middle: AP Photo/Rick Bowmer

Executive Summary

Willamette Falls, one of Oregon's most significant natural and historic treasures, has been hidden behind the growth of industry for well over a century. When the first phase of the planned public riverwalk is completed at the former Blue Heron mill site in Oregon City, it will offer visitors a chance to experience the second-largest waterfall (by volume) in North America and bring an abandoned industrial site back to life.

The site, rich with multiple layers of history, is about many things. It is about people and their stories: American Indians, European settlers, industrialists, workers and their families. It is about natural history and resources: The Columbia Basalt Flows that poured from eastern Washington over Oregon on their way to the Pacific Ocean and the Missoula Flood that followed an ice dam breach, creating rivers, valleys—and Willamette Falls. It's about sustenance: Fishing for salmon, harvesting lamprey, providing hydropower and jobs with sustaining wages. It's about gathering: Coming together as members of an Indian nation, a community, a place for visitors to understand the Oregon legacy and what has drawn people here, to this specific place, since time immemorial.

This point in time is remarkable in that it constitutes an entirely new era in Oregon history relative to Willamette Falls. In making plans for public access and the reinvention of the Blue Heron site, we are closing the industrial chapter of this place. We are enabling a transformation that's ripe with potential for public recreation, celebration of community, more diverse and economic prosperity and a new industry—tourism. Through the design process of the riverwalk, it is the first time that the public process has been used to determine the future of this site and the desired outcomes. The riverwalk and Blue Heron development are remarkable catalytic forces that will forever change Oregon City and the surrounding region West Linn.

While the interpretive framework has been several years in the making, it is just the beginning—there is much work to do in the years ahead. The framework will endure as a guide to creating an interpretive experience at the riverwalk that affects people on a visceral level and compels them to return, season after season. The interpretive framework, along with the Cultural Landscape Report, provides critical context to guide the riverwalk design approach and provide a lens for interpretation. It identifies three design strategies that will bring the site to life: immersion, narration and reintroduction.

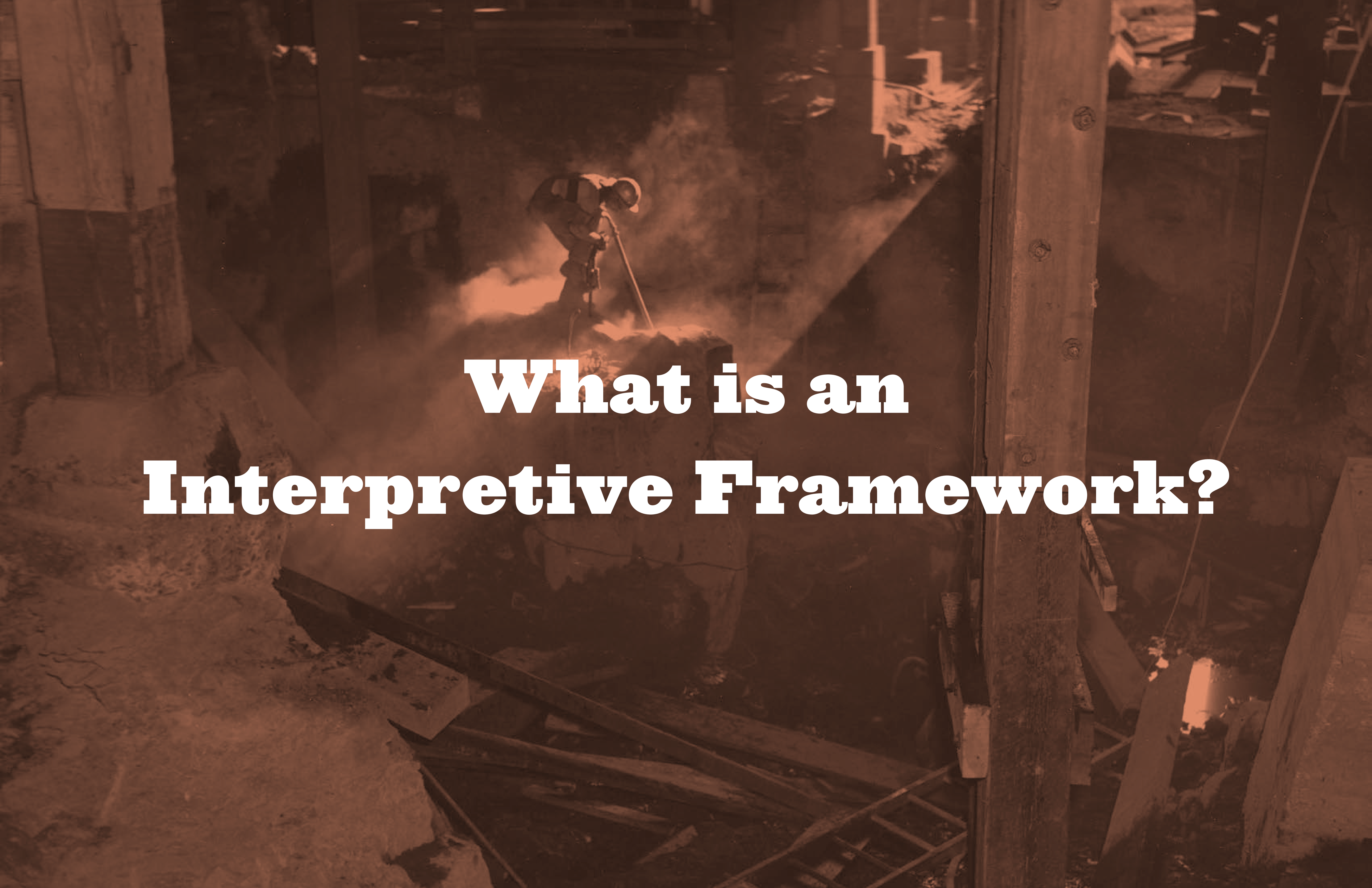
The framework is not a completed catalog of people and stories; it constitutes an approach and is a living document that will change as the phases of the riverwalk are realized. Ongoing efforts are being made to find opportunities to share stories of the site's past, present and future—highlighting its historical, cultural, ecological and economic significance. As riverwalk phases are realized, this interpretive framework will evolve, and specific supporting documents will be created to reflect the unique requirements of each phase.

The goals of the interpretive framework include:

- Creating high expectations and encouraging an innovative approach to interpretation.
- Identifying criteria for future projects to be funded or supported.
- Establishing a partnership approach that supports the work of interpretation in phases.
- Honoring native peoples' stories and relationship to Willamette Falls and planning for a long-term approach to tribal engagement and interpretation.
- Developing a framework that will celebrate, challenge and grow our understanding of the site and connection to it.

When these goals are met, people who visit the riverwalk will be able to learn, experience and imagine, and visitors from the local community, across the nation and around the world will have different but equally powerful experiences.

> *The framework will endure as a guide to creating an interpretive experience at the riverwalk that affects people on a visceral level and compels them to return, season after season.*



What is an Interpretive Framework?

Through interpretation, understanding; through understanding, appreciation; through appreciation, protection.

— Freeman Tilden
Interpreting Our Heritage, 1957

Purpose

The purpose of an interpretive framework for the Blue Heron site is to inspire and guide the inclusion of interpretive elements which enrich the visitor experience and make lasting connections to the site's heritage. The framework enables a shared understanding of placemaking through interpretation.

Although prepared specifically for the riverwalk design, the guidelines, goals, take-home messages, approaches and strategies will provide a seamless visitor experience and stronger sense of place if applied to the entire site.

This document may be used as a reference by:

- Planners
- Developers
- Architects
- Interpretive planners/writers
- Signage and experiential graphic designers
- Multi-media designers
- Artist selection committees
- Interpretive artists
- Partner program developers (tours, classes, etc.)
- Business owners
- Partner organizations

The take-home messages, interpretive approaches, strategies and measures for success described in this document provide design parameters for those proposing and developing new interpretive elements.

For planners, business owners and partner organizations, this document provides criteria and guidelines by which to measure and evaluate interpretive proposals, funding requests and design.

Process

In 2014 the Project Partners hired MIG, Inc to complete a Cultural Landscape Report (CLR). An overview is provided on page 4. The draft CLR was submitted to the Design Collective in the fall of 2016.

The Project Partners established four core values in a Willamette Falls Legacy Project Vision Document by the Walker Macy team in 2014. The core values: Public Access, Historic & Cultural Interpretation, Economic Redevelopment and Healthy Habitat are a guide to balance the complex interests and opportunities in the site design. An overview of these values is provided on page 6.

Using these resources, the Design Collective then created the Interpretive Elements Asset Plans (page 7) and established five main take-home messages (page 11) that address both the four core value's aspirations along with the Cultural Landscape Report findings.

These take-home messages and asset plans were reviewed and vetted through community events and interpretive stakeholder meetings held during the winter of 2016–2017. This work will continue to be refined throughout the design process and life of the project.

Next Steps

It is recommended that an organization be formed to adopt this document, using it as a tool to guide and implement interpretation of the site moving forward. For additional information, refer to the Next Steps section on Page 8.

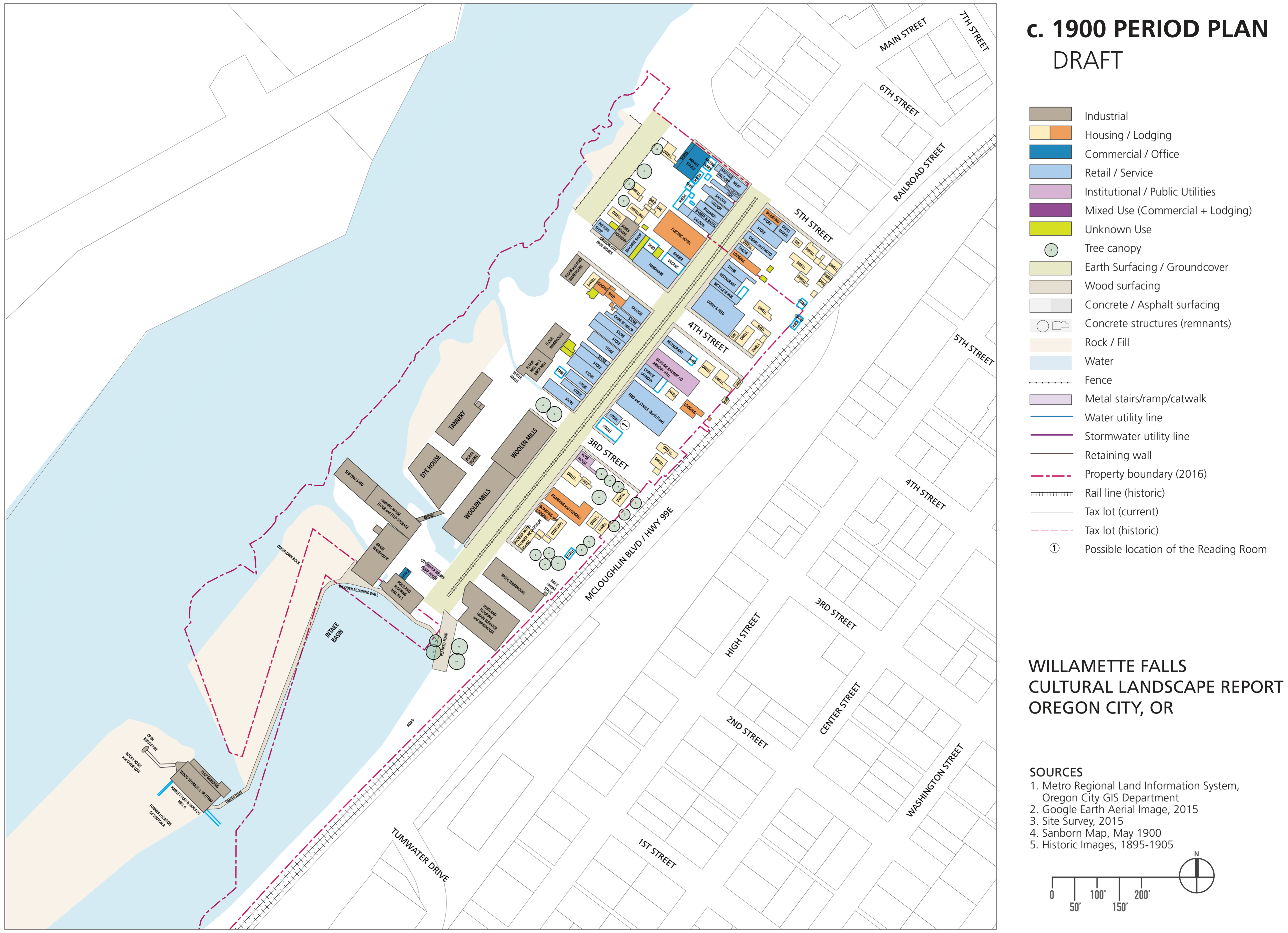
Cultural Landscape Report Overview

The following Cultural Lansdscape Report overview was provided by Oregon City consultant, MIG, Inc.

What is a Cultural Landscape Report?

Understanding multiple complex historic layers and how they can be incorporated into the future of a historic site rests on a rigorous collection of information about a site's physical historic development and the effective communication of that knowledge through the development of a Cultural Landscape Report (CLR). A CLR is a place-based research and planning document that ties information from the public record—documents, photographs, illustrations, and oral histories—to a place focusing on how it has developed and changed over time. For Willamette Falls, whose history is extraordinarily long and complex, the CLR helps us understand the people and forces that have shaped it and provides glimpses into its character at different moments in time, which is a combination of the natural environment, built environment, and people that manage and live in that environment. Developing a CLR respects and supports the task of revealing and honoring our complex history and its relationship to the landscape.

Old dam circa 1890



c. 1900 PERIOD PLAN
DRAFT

WILLAMETTE FALLS
CULTURAL LANDSCAPE REPORT
OREGON CITY, OR

SOURCES
1. Metro Regional Land Information System, Oregon City GIS Department
2. Google Earth Aerial Image, 2015
3. Site Survey, 2015
4. Sanborn Map, May 1900
5. Historic Images, 1895-1905

Interfolders being sorted in 1977

Lamprey below falls in 1913

Flood of 1953

Willamette Falls Cultural Landscape Report Methodology and Scope

The Willamette Falls CLR was developed based on guidelines established by the National Park Service, the leading agency for cultural resource planning and management. Following those guidelines, a mixture of primary and secondary research materials was gathered and key stakeholders were engaged as part of the research phase. The fruits of the research developed a solid and commonly understood contextual base of understanding about the historic development of the Willamette Falls site, formerly the Blue Heron mill property between the Willamette River and railroad tracks and between the hydroelectric dam and 5th Street in Oregon City, Oregon. In turn, the CLR serves as a primary source of information for those interested in telling the site's story, specifically through means addressed in this interpretive framework. While the interpretive framework focuses on implementation of interpretive elements along the riverwalk, the CLR focuses on the entire Willamette Falls redevelopment site and can be used as implementation of other areas commences.

The CLR includes a narrative summary of the site's history that is supported by hundreds of historic illustrations and photographs, a set of historic era plans that provide a snapshot of the site at different moments in time depicting its transformation, and an annotated chronology that provides additional details about the site's metamorphosis. Traditionally part of a CLR, the analysis, evaluation and treatment of the site are being addressed through ongoing complementary processes which is a natural approach for such a complex site that includes both public and private development. For example, the Willamette Falls Legacy Project Framework Plan (2014), including conditions of its approval, is being supplemented by the CLR, this interpretive framework plan, and complementary efforts such as the refinement and construction of the riverwalk.

Using the Cultural Landscape Report

Historic content is organized in the CLR through an illustrated linear narrative and by themes that highlight the cyclical nature of this place's story and connections, focusing on historic moments we should celebrate and those we need to continue to learn from. It is these stories that should be included in the present vision for Willamette Falls so that the circle of time and understanding of this place continues. Though tangible elements of some of the site's history may be gone, our understanding doesn't have to be absent as well. Time and time again the site's history returns to the landscape of Willamette Falls and how its very essence and character have been and will continue to be a nexus of our region. The CLR contains information both complex and simple, inspiring and tragic, nuanced and straightforward, but all of it able to be applied to our current understanding of Willamette Falls.

Four Core Values

The four core values that were identified in a Willamette Falls Legacy Project Vision Document by the Walker Macy team in 2014.

HISTORIC AND CULTURAL INTERPRETATION

Visitors will learn about the rich history of the Oregon City riverfront. Willamette Falls served as an important cultural site for Native American tribes. John McLoughlin built the Pacific Northwest's first lumber mill here. And, in 1844, Oregon City became the first incorporated city west of the Rocky Mountains.

Key Elements

- Emphasizes unique geology, Willamette River and Willamette Falls
- Honors Native Americans' presence at Willamette Falls: past, present and future
- Honors the significance of the site and the falls to the former Oregon Territory and settlement of Oregon
- Honors the significance of industrial development at Willamette Falls

Desired Outcomes

- Interactive, holistic and creative interpretation at multiple levels
- Respect and accommodate Native American salmon fishing and lamprey harvest traditions and protection of natural resources
- Increased awareness of all aspects of the cultural and historic significance of Willamette Falls
- Highlight national importance of industrial development at Willamette Falls
- Honor the past by "doing better" now
- Adaptive reuse of existing buildings to support the creation of an authentic place

PUBLIC ACCESS

Visitors will get a front-row seat to experience the majestic and truly extraordinary Willamette Falls. Inaccessible for public enjoyment and effectively removed from the public consciousness for more than 150 years, the falls are one of the most scenic places along the Willamette River.

Key Elements

- Connects people physically and emotionally with the river
- A complete sensory experience of water is incorporated throughout the site (hearing, seeing, feeling, smelling)
- The site design reflects unique aspects of the place with unifying design elements integrated throughout
- The public space emphasizes arrival by foot, bike or transit while accommodating the automobile
- Sustainability is incorporated throughout the design and the site

Desired Outcomes

- Permanent, prominent and breathtaking public access to this site, the river, cultural history and the falls
- The public space is generously sized and inviting to a diverse range of peoples, including families and children of all ages
- Multiple, creative and unexpected opportunities are provided to physically connect to the river
- Integration of the site and the pedestrian/bike circulation system into the local and regional trail system north and south
- Integrated connection to downtown Oregon City
- Protected views of intact natural habitats along the river and falls
- Diverse scenic views of the falls and river, including views of the falls that reveal themselves as one proceeds through the site
- The public space and falls access are a catalyst for economic development in Oregon City and enhance the value of development on the site

HEALTHY HABITAT

This place is critical for water quality. Fish and lamprey that travel the river pass through or around the falls. Historically, the falls were surrounded by unique plants that thrived in microclimates created by the mist. Protecting the site provides an opportunity to re-establish native plant communities, enhancing this ecologically diverse stretch of the Willamette River.

Key Elements

- Riparian habitat: opportunities to restore riparian and rocky outcrop areas along the Willamette River above and below Willamette Falls
- Native fish habitat: shoreline and river provide a mixture of habitat elements important to native fish
- Water quality: springs and seeps, stream day-lighting, clean and cool water, and returning existing water rights to in-stream use for fish and water quality
- Floodplain protection: opportunities to maintain or enhance the ability to store flood waters on site during major storm events

Desired Outcomes

- Restore native trees and shrubs along a 50- to 150-foot buffer along the Willamette River
- Protect and restore rocky outcrops to provide unique habitat for insects, amphibians and rare plants
- Restore floodwater access to its natural floodplain by removing nonessential buildings and infrastructure left from previous industrial use
- Provide important habitat for migratory birds and other wildlife species
- Improve water quality through filtration, stormwater attenuation
- Restore shoreline habitat complexity, including alcoves and inlets for cool water refuge and off-channel habitat during periods of high river flow
- Provide important resting and movement habitat for Pacific lamprey, salmon and steelhead
- Improve water temperature and chemistry over baseline of existing conditions at the site
- Support efforts by other public agencies to restore habitat in the Willamette River Greenway
- Showcase how urban development can integrate nature and ecosystem services into urban design
- Establish an urban forest canopy along streets and public spaces where suitable soil exists
- Adding flow through the Millrace will increase habitat options for migrating fish

ECONOMIC REDEVELOPMENT

The Willamette Falls property will carry on a tradition of economic development along the riverfront, where mills and industry thrived for more than a century. With the closure of the Blue Heron Paper Company, Oregon City lost 175 jobs – a blow that can be redressed through redevelopment. The project will return part of the site to private development, reinvigorating the downtown as a hub of employment, shopping, business and tourism.

Key Elements

- Public access to river and Willamette Falls serves as catalyst for the regional center/downtown
- Access to nature is emphasized throughout development
- Unique quality of the place drives investment
- Creates a synergy for downtown Oregon City, with opportunities that are complementary to the infrastructure available there
- Regional destination drives tourism to Oregon City

Desired Outcomes

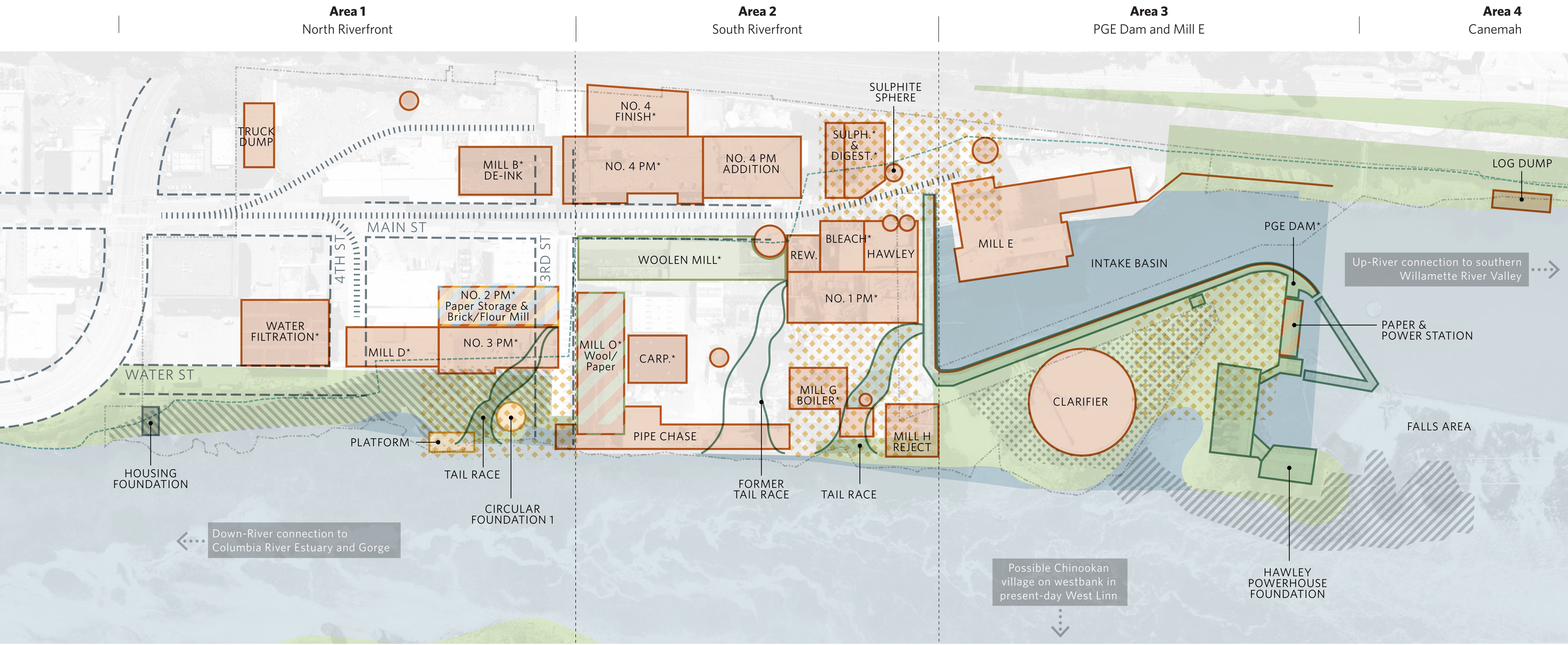
- Continued tradition of working waterfront
- Permanent and short-term job creation
- Increased opportunities for economic development
- Increased value of development on site and nearby
- A revitalized downtown Oregon City and West Linn
- Integrated with a thriving downtown Oregon City, complementing existing businesses and private enterprises
- Public space that supports an active, year-round regional center
- Increased foot and bike traffic that supports new development
- Increased opportunity for private investment
- A model of green development and sustainability
- A new Oregon landmark

Existing Site Assets Diagram

0' 50' 100' 200'

Note: This diagram is a summary of structures remaining on the whole site. Refer to the Cultural Landscape Report for detailed plans for documentation of structures no longer existing.

* Eligible buildings



NATURAL HISTORY

- 🟩 Existing viewing opportunities for flora and fauna interpretation
- ▭ Existing off-channel alcove habitat
- ■ Existing in-channel river habitat
- ┄ 1996 Flood line

SIGNIFICANCE TO NATIVE AMERICANCS

- ▨ Native vegetation - food, medical
- ▨ Falls area for harvesting salmon, lamprey and other fish species
- ⁘ Basalt area for evidence of why villages were established elsewhere
- ⇠ Connections to other villages

EUROPEAN IMMIGRATION, COLONIZATION & GOVERNANCE

- – – Street grid evidence of original land claims
- ||||| Rail
- ▭ Buildings

INDUSTRY & INNOVATION

- 🟩 Wool/garment
- 🟦 Flour
- 🟥 Paper
- 🟩 Power
- 🟨 Other
- ⁘ Additional remaining site artifacts of various sizes

Next Steps

Implementation

This document provides a framework for theme development, approach and strategies for interpretive design which must be further developed through implementation documents for each phase of the riverwalk.

As a means to intentionally program all future interpretive activities and physical additions to the site, an interpretive review board must be established. This board will be responsible for reviewing all proposed interpretive elements for alignment with this framework document prior to funding and design approval. Board members should include project partner representatives and at least one member of the riverwalk design collective.

Once approved by the interpretive review board, final design, program/content development, text writing, and image acquisition is the responsibility of the implementation design team.

The following measures for success provide criteria for evaluation of future design and interpretive proposals.

Measures for Success

How natural and cultural history are addressed on site may take many different forms, especially for a site with as complex a history as Willamette Falls. Therefore, it's essential to define success at the outset in terms of incorporating the site's heritage into its future. This is particularly important for Willamette Falls since the full realization of its implementation will be phased over many years, and by many different hands.

A successful interpretive strategy proposal should demonstrate that it is:

- Authentic
- Memorable
- Multi-layered
- Celebratory and educational

Successful themes and stories should:

- Explore one or more of the take-home messages and themes identified on page 11.
- Focus on the highlights as well as the tough stories that often touch people at a deeper level.
- Tease out what resonates from history and carry it forward to today's community. Relate stories to our current affairs or find a relationship to contemporary times.
- Be documented by an approved source including the Cultural Landscape Report and supporting bibliography, tribal board or riverwalk design.

A successful design should:

- Consider a holistic visitor experience as defined on page 13: engage multiple senses, employ universal design for learning principals, and provide emotional rewards.
- Employ various approaches (immersion, narration, reintroduction) and supporting strategies as defined on page 13 to provide a range of visitor experiences.
- Preserve the physical fabric of the site as interpretive materials and location for artistic expressions.
- Respect existing site conditions and existing interpretive elements. Consider adjacent interpretive strategies and limit saturation of a particular strategy or element type.
- Consider long term maintenance and partner funding.

Overall, success will be measured by the return of a once-vibrant place propelled forward into the future for generations to enjoy.

Take-Home Messages

Take-Home Messages

Using the Take-Home Messages

As with many historic sites, the interpretive opportunities on the Blue Heron site are plentiful. It is important to remember that not all stories can be told on the site. By defining interpretive take-home messages, thoughtful prioritization of elements which support these messages is possible.

These preliminary take-home messages provide a conceptual framework for selecting, prioritizing and organizing the interpretive visitor experience, and begin to answer the question, "What do we hope to accomplish through interpretation?"

These take-home messages are intended to be non-linear in presentation—recognizing the site's layered history and overlapping influences.

Consider the following when developing content based on the five take-home messages:

- Proposed interpretive elements should support at least one of the take-home messages, but is not required to communicate all five.
- Each implementation project should further develop each take-home message with 3-5 key points. These should drive the content development of the project.
- A rich abundance of site artifacts and narration supporting a particular take-home message should be balanced with additional interpretive elements supporting other messages.
- Themes should be presented in a non-linear, overlapping format to demonstrate the site's complexity.

NATURAL HISTORY

The unique hydrology and **geology** of the Willamette River and Falls is **critical habitat** for **fish, birds** and **animals.**

SIGNIFICANCE TO NATIVE AMERICANS

Willamette Falls is significant to **Native Americans** who have **gathered** and **fished** here **since time immemorial.**

INDUSTRY & INNOVATION

This site is significant to the birth of **industry** and **innovation** in Oregon.

EUROPEAN IMMIGRATION, COLONIZATION & GOVERNANCE

This site and Oregon City are important to **United States history** as the terminus of the **Oregon Trail** and **Oregon State history** for **colonization** and the **establishment** of **state government.**

PRESENT & FUTURE OREGON CITY

Oregon City is a great place to **live**, **work** and **recreate**. The community contributes to the **past, present** and **future** of the site.

CLR THEMES	NATURAL HISTORY	SIGNIFICANCE TO NATIVE AMERICANS	INDUSTRY & INNOVATION	EUROPEAN IMMIGRATION, COLONIZATION & GOVERNANCE	PRESENT & FUTURE OREGON CITY
FLOOD	X				X
FISHING	X	X		X	X
FLORA & FAUNA	X	X		X	X
HABITAT	X	X			X
18TH & 19TH CENTURY EXPLORATION	X		X	X	
EUROPEAN COLONIZATION		X	X	X	
CULTURAL GROUPS			X	X	X
RELIGION/SPIRITUALITY		X		X	X
GATHERING		X		X	X
TRAGEDY		X			
FLOUR			X	X	
WOOL			X	X	
WOOD	**Covered under Flora & Fauna**	X	X	X	
WATER	**Covered under Flood**		X	X	X
TRANSPORTATION		X	X	X	X
LABOR/WORKFORCE		X	X	X	X
PARTNERSHIPS		X			X
WILLAMETTE RIVER	X	X	**Covered under Water**	X	X

Interpretive Design Approaches

According to Freeman Tilden, author of *Interpreting Our Heritage,* the aim of interpretation is “to reveal meanings and relationships...rather than simply communicate factual information.” Good interpretive design provokes attention and curiosity, relates concepts and fact to visitors’ own lives, and reveals key messages in unforgettable ways.

This interpretive framework plan defines three main approaches: Immersion, Narration, and Reintroduction. Together, they aim to engage future visitors with the site, intellectually, physically, and emotionally. This holistic approach supports the overall visitor experience in the following ways:

Engage multiple senses
Provide opportunities to perceive content through sight, touch, sound and even taste; mapping site experience in multiple ways.

Employ universal design for learning principles
Support varied learning styles, comprehension levels, user type, age and interests.

Provide emotional rewards

- Social interaction
- Active participation
- Comfortable surroundings
- Challenging, new, or unusual experiences
- Opportunities to learn
- Opportunities to rest, reflect and process
- A sense of doing something worthwhile

IMMERSION

Can we engage the past without saying a word?

NARRATION

How can we explain rich and varied histories, without encumbering the site?

REINTRODUCTION

What lost histories might we reintroduce to the site?

IMMERSIVE STRATEGIES

This interpretive approach allows site elements to speak for themselves, without narration. With thoughtful design of spatial volume, direction of paths, and manipulation of stimuli, visitor's senses provide a bodily understanding of scale, temperature, sound, material, texture, light and shadow. Visitors observe and experience the environment, forming their own meaning in concert with the site.

Can we engage the past without saying a word?

Photo credit: Matt Hanson

Camassia Nature Preserve West Linn, OR

Immersive Strategies

Exploring Habitat Areas

Description

Explorer trails through areas of habitat restoration will create opportunities for immersive public experiences of enhanced wildlife and native plant environments that have long been absent from the site due to industrialization. The paths will enable visitors to observe plants' individual characteristics (leaves, bark, flowers) and the larger associations of species within the environment. Visitors will have opportunities for viewing wildlife that is attracted to the restoration areas. In addition, paths will provide opportunities for observing the juxtaposition of retained industrial artifacts and restored habitat areas, understanding that the habitat has been reclaimed from what was once a highly manipulated site with cycles of flooding, structure, transportation, and industry.

Framework Guidelines

- Design habitat restoration areas to anticipate future access routes of explorer trails that are compatible with plant establishment efforts and do not preclude proposed access routes and areas.
- Design explorer paths to minimize impact on restored plant communities while providing intimate experiential opportunities.
- Design explorer trails to guide human access and minimize disruption of restored habitat areas.

Recommended Location(s)

Immersive habitat experiences using explorer trails and habitat restoration are proposed within the Flour Mill, the Alcove, the Clarifier, and the Canemah areas of the site.

Palmisano Park
Chicago, IL

Brooklyn Bridge Park
New York, NY

Wahclella Falls
Columbia River Gorge, OR

Immersive Strategies

Exploring Habitat Areas

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1 North Riverfront	**Area 2** South Riverfront	**Area 3** PGE Dam and Mill E	**Area 4** Canemah

LEGEND

— Explorer trails

┄ Alcoves

🟩 Habitat areas

AREAS

① Flour Mill area and associated small structures
② Mill Reserve area
③ Clarifier and falls area
④ Canemah and upper falls

Immersive Strategies

Engaging Basalt Geology

Description

Basalt bedrock underlies the entire site, and much of the surrounding region—yet there are few existing locations north of PGE Dam where it is exposed, and none where it may be directly accessed. The preferred riverwalk design shows selective removals of platform and fill in large areas north of PGE Dam. An enhanced habitat and a more complex edge to the river will enable bedrock conditions to be observable in many locations on the riverwalk. The preferred design also identifies a location where visitors can directly access the basalt, to feel its surface, explore its qualities, and gain a personal understanding of the geologic features that give the falls and site its character.

Framework Guidelines

- Clearly demarcate access upon basalt surfaces to minimize disturbance to adjacent habitat restoration areas. Otherwise, access in these locations to be casual and undefined.

Recommended Access Location(s)

Access to the basalt surface is recommended to occur at the southern edge the Public Yard area.

Spokane River
Spokane Valley, WA

Elk Rock Island
Milwaukie, OR

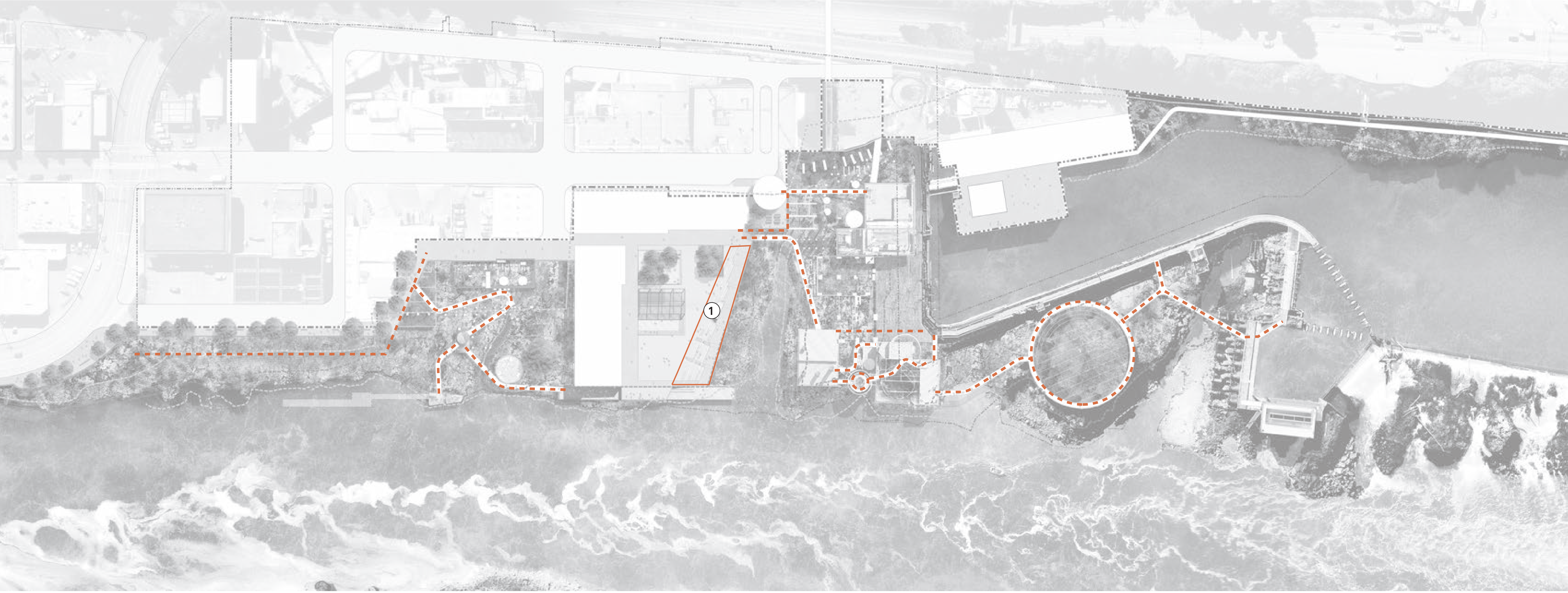
Central Park
New York, NY

Immersive Strategies

Engaging Basalt Geology

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1 North Riverfront	**Area 2** South Riverfront	**Area 3** PGE Dam and Mill E	**Area 4** Canemah



LEGEND

- - - Access over or adjacent to basalt

▭ Basalt access areas

AREAS

① Public Yard edge

Immersive Strategies

Inhabiting Industrial Structures

Description

Immersive experiences related to selectively retained industrial structures are recommended to occur as a series of "destination islands" linked together by primary paths and explorer trails. The structures serve as landmarks, destinations for site orientation and an important sense of discovery for visitors. This allows visitors to mentally map the extent and scale of the layered site and interventions that occurred over time.

These selected structures will remain largely intact, with necessary improvements to provide safe access and exploration. They introduce discovery to the sequence of paths, creating moments for pause, reflection, unique views and heightened awareness. Removal of adjacent structures will magnify the industrial scale; allowing the full height of the buildings to be seen in their entirety, from ground to sky. Inhabiting the interiors permits an immersive appreciation for the scale and layering of past industrial operations on the site.

Framework Guidelines

- Selectively retain buildings, partial buildings, footings, foundations, and artifacts in their original locations.
- Reveal layered history and stimulate curiosity for site exploration.
- Communicate the complexity of site by retaining layered artifacts. Conversely, a site stripped of its authentic industrial relics and materials misses opportunities for visitors to understand the past.
- Repurpose minor structures like low building foundations for useful site elements such as seat walls, planters and viewpoints.
- When appropriate, provide opportunities to touch existing materials and observe changes in texture, age, finish, and construction. Newly added riverwalk elements will contrast the old.

Landschaftspark
Duisberg-Nord, Germany

Le Domus Romane di Palazzo Valentini
Rome, Italy

Recommended Location(s)

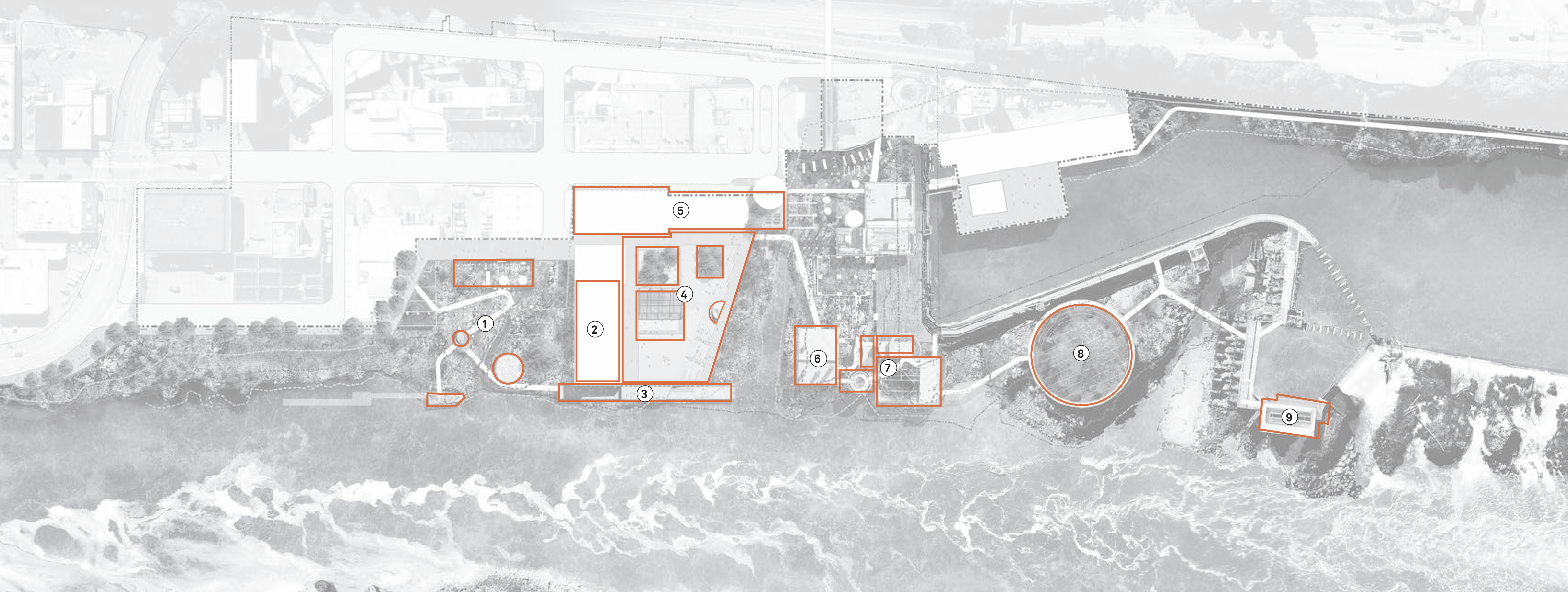
Industrial islands include: the Flour Mill; assorted small structures within the Flour Mill area; Mill O; the Yard surface (including Carpentry, Millwright, and Auto Shops); the Boiler structures; associated cylinders and platforms adjacent to Boilers; Mill H Reject Plant structures; the Clarifier; and the Hawley Powerhouse foundation.

Immersive Strategies

Inhabiting Industrial Structures

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1 North Riverfront	Area 2 South Riverfront	Area 3 PGE Dam and Mill E	Area 4 Canemah



LEGEND

— Recommended locations and structures

AREAS

① Flour Mill area and associated small structures
② Mill O
③ Pipe Chase
④ The Public Yard surface including Carpentry, Millwright and Auto Shops
⑤ Woolen Mill foundation
⑥ Boiler structures and associated cylinders and platforms
⑦ Mill H
⑧ Clarifier
⑨ Hawley Powerhouse foundation

Immersive Strategies

Imagining Removed Structures

Description

Large portions of the site will require significant removals of fill and platform to allow daylight to fall on the basalt and river shoreline for habitat restoration. Removals of structures within these areas will be purposefully incomplete, allowing for reuse of columns, walls and beams for structural support of paths and other riverwalk elements such as planters, seat walls, and guardrails. Not all retained structures must have a direct physical use; partially retained structures will enable an understanding of the historic extent of industrial activities. These retained structures will be complemented by intact remnants or structures that were obsolete or already dismantled as part of the Blue Heron operations such as the cylinder base or fuel bunker in the North Riverfront area. Many of the systems of the site have already been lost, so it's essential to retain much of the evidence that remains.

Framework Guidelines

- Selectively retain footings, foundations, and artifacts in their original locations; selectively remove some existing buildings, but retain key columns, walls, foundations, and other remnants.
- Reveal layered history and stimulate curiosity for site exploration.
- Communicate complexity of site by retaining layered artifacts. A site stripped of its authentic industrial relics and materials misses important opportunities to convey the past.
- Repurpose minor structures for site elements such as seat walls, planters, and viewpoints.
- When appropriate, provide opportunities to touch existing materials and observe changes in texture, age, finish, and construction that contrast newly added riverwalk elements.
- Ensure retained structures and site topography avoid potential fish entrapment

Landschaftspark
Duisberg-Nord, Germany

Gas Works Park
Seattle, WA

Recommended Location(s)

Assorted small structures within the Flour Mill area; the Yard surface (including Carpentry, Millwright, and Auto Shops); associated cylinders and platforms adjacent to Boilers; and retained structures within the Mill H removal area.

Immersive Strategies

Imagining Removed Structures

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1 North Riverfront	**Area 2** South Riverfront	**Area 3** PGE Dam and Mill E	**Area 4** Canemah

LEGEND

— Recommended areas for selectively retained structures

----- Potential area within Main Street option 2

AREAS

① Flour Mill area and associated small structures

② The Public Yard surface including Carpentry, Millwright and Auto Shops

③ Pipe Chase removal area

④ Boiler structures and associated cylinders and platforms

⑤ Mill H removal area

⑥ Main Street platform/trestle removal

⑦ Housing foundation

Immersive Strategies
Revealing Topography

Description

The historic geologic topography of the site was highly complex, composed of a series of rocky islands with numerous cascades and abandoned flood channels. Current site conditions prevent an understanding of the ancient extents of the falls and geology, as well as the significance of the PGE Dam structure in its containment of the upstream side of the river. The grade change—no longer visible due to the development of industrial buildings over time—is key to understanding the historic utility of the site for its water powered industries. The preferred design of the riverwalk selectively removes extensive areas of fill and platform areas to expose the full topographic cross section of the site. In addition, the routing of pathways and placement of viewpoints are designed to enhance the experience of topographic change. New elevated walks with grating will expose the ground dropping away, while viewpoints offer positions to observe the relationship between water levels, basalt, the PGE Dam structure, and the industrial structures. Observing the changes in grade offers the visitor an ability to appreciate the technical challenges of adapting industrial structures to such varied terrain within the floodway.

Framework Guidelines

- Heighten the experience of passing over major changes in elevation with elevated paths. The design of the paths will encourage visitors to acknowledge and perceive the original basalt surfaces and topography.
- Position viewpoints to take advantage of and reveal the complexity of the site.
- Design viewpoints and elevated walks with handrails and guardrails to ensure safety, while triggering sensations of discovery and drama from a perched perspective.

Steel Stacks Park
Bethlehem, PA

Mill Ruins Park
Minneapolis, MN

Recommended Location(s)

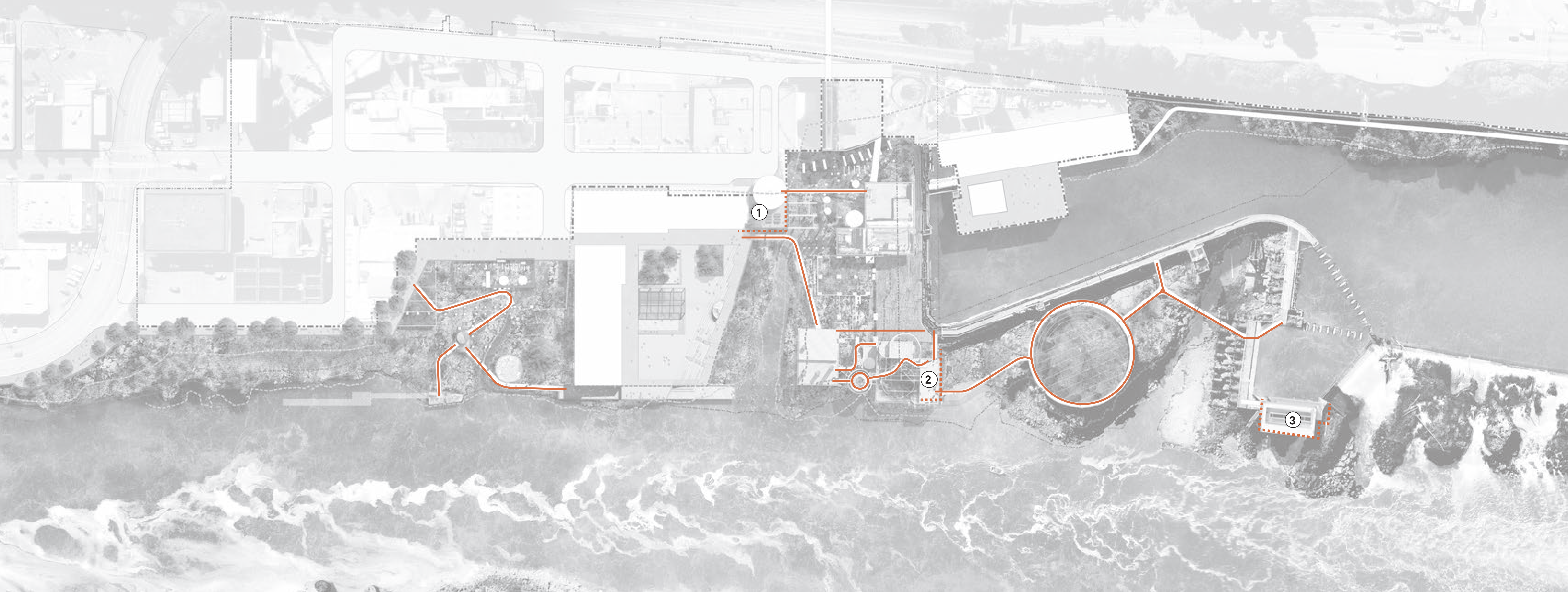
Relating changes in topography is recommended to occur in key dramatic locations where, (1) significant amounts of excavation or platform removal are recommended to occur; (2) where existing basalt topography exhibits dramatic character; or (3) within existing elevated structures. These locations are the explorer paths across the restored Yard area, Alcove and Boiler Plant to PGE Dam; the explorer paths to and from the Clarifier structure; and the Woolen Mill and Hawley Powerhouse foundation.

Immersive Strategies

Revealing Topography

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1	**Area 2**	**Area 3**	**Area 4**
North Riverfront	South Riverfront	PGE Dam and Mill E	Canemah



LEGEND

— Explorer trails

⋯ Overlook

AREAS

① Woolen Mill/Main Street terminus

② Mill H falls overlook

③ Hawley Powerhouse foundation

Immersive Strategies

Experiencing River Character

Description

The Willamette River and Willamette Falls are the defining features of the site, and the riverwalk's preferred design will heighten the experience of the river through several different means. First the historic shoreline will be uncovered, enabling water to extend deeper into the site to allow several key locations for viewing and observation of post-industrial conditions. Second, portions of the riverwalk sequence will withhold immediate views to the river, in an effort to focus on industry, habitat, or other interpretive targets, before river views are encountered. For example, the passage between the Woolen Mill and east end of Mill O is first compressed and then opens up to an expansive view of the riverfront. Specific experiential "moments" will be carefully designed to provide a sequenced, immersive relationship with the river:

- Windows in the River Theater in Mill O frame views of the water's surface where currents, movement, patterns, colors are abstracted and put on display as an artistic composition.
- The southern end of the Pipe Chase is a dramatic perch above the expanded the Alcove area where water surrounds the viewer on all sides.
- The dramatic Mill H overlook provides an elevated, 360-degree vantage point that allows for a fuller understanding of the scale of the falls, and the relationship of the site to West Linn Paper, the geology, agricultural areas to the south, and the metropolitan region to the north.
- The Clarifier and its associated paths features the face of the PGE Dam and a place where mists, flows, spray, and cascades are fully experienced when the river is high.
- The Hawley Powerhouse foundation, the southern-most viewpoint will be designed to create a dramatic, full-body immersive experience, feeling the power of the falls, the strength of the basalt, qualities of the light throughout the seasons, and the ambition of the industrial structures.

Gatineau Park
Quebec, Canada

Mill ruins on Black River
Glen Park, NY

Framework Guidelines

- Provide moments of both distance and proximity with the river to build anticipation and focus attention.
- Position viewpoints to capture the river in various states and levels.
- Design viewpoints and elevated walks with handrails and guardrails to ensure safety, but also trigger sensations of discovery and intrigue from a perched perspective.
- Allow for paths at various levels, to provide public access across all seasons and river levels.

Recommended Location(s)

Experiencing the river occurs through nearly all the recommended riverwalk design, however it is most directly felt in the following locations: Mill O, the southern end of the Pipe Chase; the Clarifier and its associated explorer paths; the Mill H overlook; and the Hawley Powerhouse foundation.

Immersive Strategies

Experiencing River Character

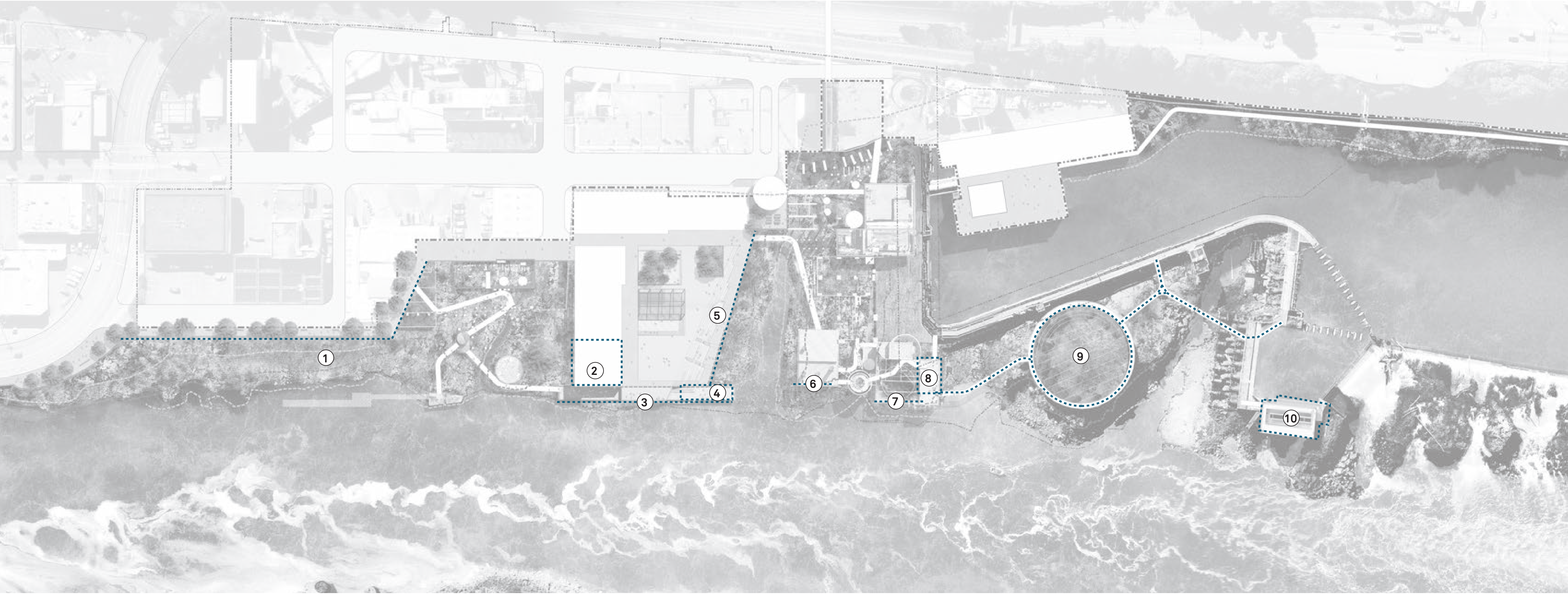
Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1
North Riverfront

Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah



LEGEND

⋯ Recommended areas for experiencing river character

AREAS

① North Riverfront Promenade
② Mill O river theater
③ Pipe Chase
④ Pipe Chase alcove overlook
⑤ Public Yard edge
⑥ Boiler Plant
⑦ Mill H art grove
⑧ Mill H overlook
⑨ Clarifier and explorer paths
⑩ Hawley Powerhouse foundation

Immersive Strategies

Viewing Working Riverfronts

Description

Unlike many post-industrial waterfront projects, the falls remains as an operational, power-generating and paper-making facility. Both PGE, West Linn Paper and the fish passage structures remain in operation as active components of the site and part of the authentic riverwalk experience. PGE requires routine access to the dam for maintenance and operations. The noises, machinery, and activities of PGE and West Linn Paper will be part of the riverwalk experience. Therefore, design of explorer trails and closure points will allow for immersive experiences of watching these operations from safe vantage points. West Linn Paper, as an active manufacturing plant, is prominent on the west, providing a perspective into the Blue Heron site's past. The sounds, smells, and visual activities related to paper manufacturing are captured as part of the riverwalk.

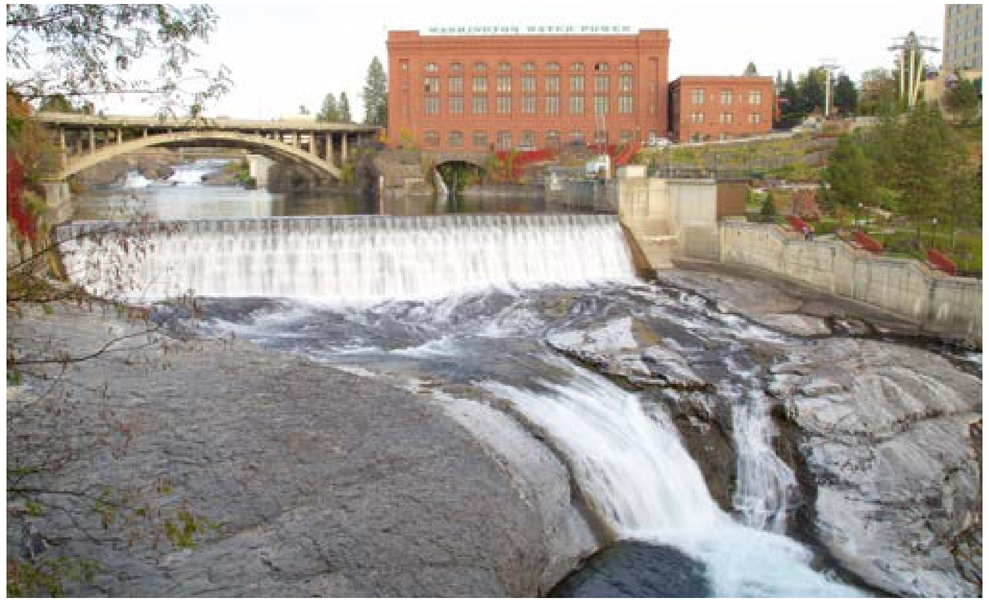
Framework Guidelines

- Provide working schedules and information of PGE activities.
- Define closure points for public or Native American ceremonies or traditions.
- Engage with West Linn Paper to demonstrate paper-making.
- Provide fish ladder information and/or video feed.

Recommended Location(s)

Immersion with PGE activities occur at a safe distance from the dam surface and the falls themselves using the explorer trails, Clarifier, the Hawley Powerhouse foundation, and Mill H Reject plant. Access to the dam when PGE activity is not taking place also allows interpretation to occur. While West Linn Paper is not physically accessible as part of the riverwalk at this time, its sounds, scents, and visual character are. These experiences occur throughout the site, but are most evident from the Pipe Chase, the west face of the Boiler Plant, and the west face of the Mill H Reject plant.

Bronx River
Yonkers, NY



Spokane River
Lower Falls, WA

Immersive Strategies

Viewing Working Riverfronts

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1	Area 2	Area 3	Area 4
North Riverfront	South Riverfront	PGE Dam and Mill E	Canemah

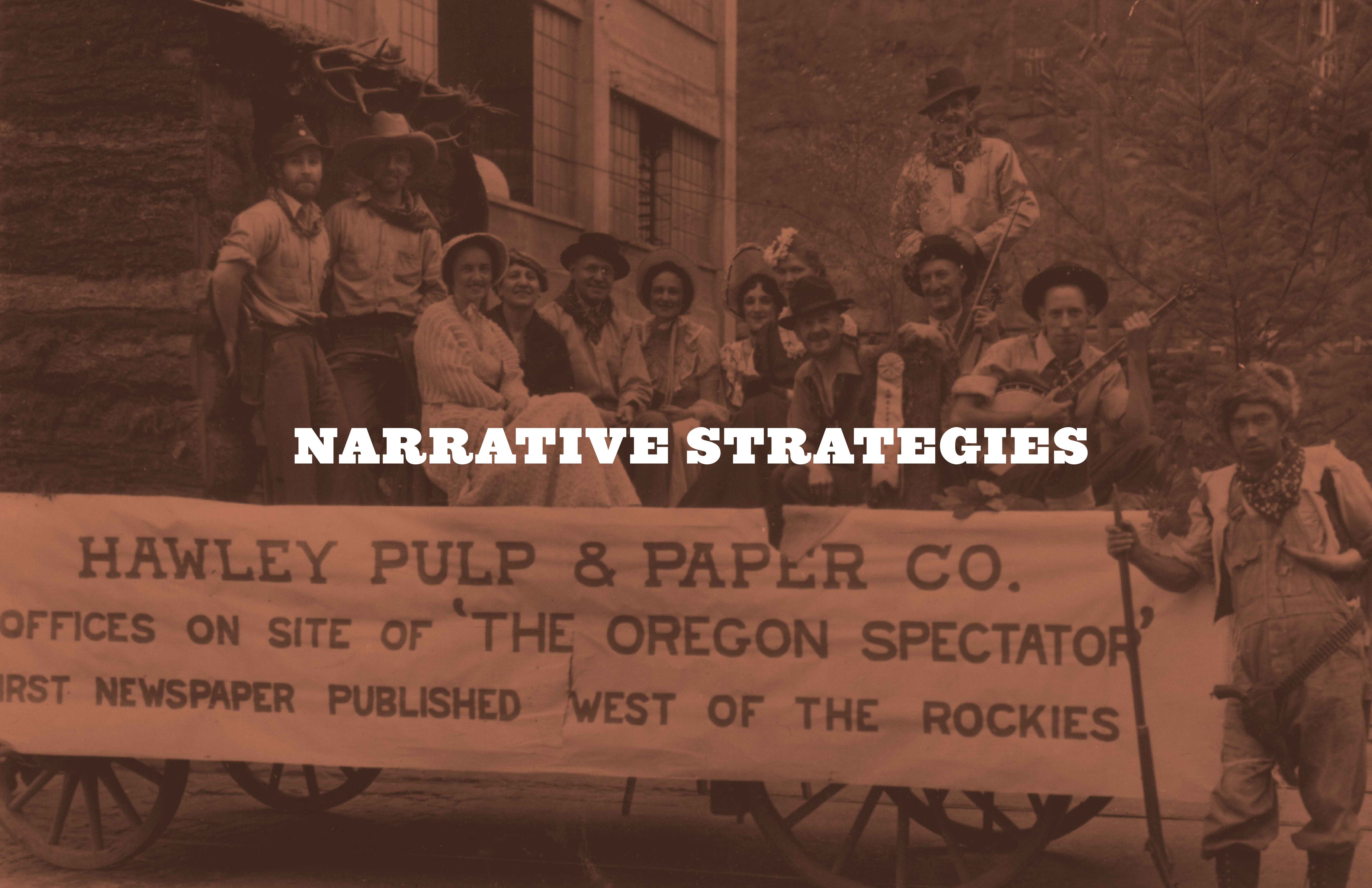
LEGEND

- ⋯ Viewing opportunities
- ▬ On-site industrial operations
- – – Off-site industrial operations

AREAS

① PGE Dam
② West Linn Paper

NARRATIVE STRATEGIES



In this interpretive approach, content is narrated to the visitor, usually through language, whether it be spoken by a docent or guide, or conveyed through text, or explained on signage, maps or pamphlets.

The riverwalk is designed with multiple points of access, explorer trails, open spaces and a promenade. The design is intended to promote exploration and demonstrate a layered, non-linear site history. The placement of narrative content should support non-linear circulation so visitors may understand the history in no particular sequence.

How can we explain rich and varied histories, without encumbering the site?

Pg **Narrative Strategies**

Blue Heron site, Oregon City, OR. *An explanation of the site's remaining sulphite sphere could be accomplished through narration using historic photographs for example.*

Narrative Strategies

Signage

Description

A comprehensive sign system including identity, wayfinding, interpretive and regulatory signs will establish a unified visual language for displaying information on the site. The sign family will define placement, typical messaging, form, scale, material, color, typography and graphic approach for a range of sign types.

Experiential graphics will create unexpected moments of discovery and intrigue through graphics and typography integrated into the landscape and architecture.

Framework Guidelines

- Locate signs to provide context for site artifacts and structures without obscuring or detracting from the context or views.
- Utilize durable, high quality materials to withstand exterior conditions, and anticipated high volumes of traffic and communicate the project permanency.
- Signage should follow interpretive, universal design and ADA best practices for type sizes, content level and amount.

Recommended Location(s)

Interpretive signage will be restricted to newly added riverwalk elements only. These elements include: explorer trails, guardrails and retaining walls, architectural elements such as kiosks and shelters, and building improvements. No existing surfaces should receive signage.

In addition, no signage should be located on the new or old structures associated with improvements to the Hawley Powerhouse foundation to enable the visitor to experience the rich and complex surroundings without interruption or distraction.

Experiential graphics: map of Willamette River interpretive paving
Vera Katz Eastbank Esplanade, Portland, OR

Weathering steel wayfinding signage
Pedra Tosca Park, Les Preses, Spain

Wayfinding signage
The Highline, New York, NY

Narrative Strategies

Signage

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1
North Riverfront

Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah

LEGEND

- ····· Explorer trails
- — Riverwalk edge
- ● Entry point

Narrative Strategies

Exhibits

Description

Site orientation and an overview of the five take-home messages will be displayed in a small exhibit within the Visitor Center. The exhibit will be free and open to the public to access at their own pace without a guide. It will compliment the overall Visitor Center experience and support a sense of arrival.

Exhibit design and content will promote site exploration—providing context to visitors at the beginning, middle or end of their site exploration.

Framework Guidelines

- Provide 200–500 sf of permanent overview exhibits.
- Provide temporary space for changing content provided by partner organizations.
- Utilize durable, high quality materials to withstand high volumes of traffic and exterior conditions, and communicate the project permanency.
- Design exhibits to follow interpretive, universal design and ADA best practices for type sizes, content level and amount.
- Design exhibits to allow for flexible use of the Visitor Center.

Recommended Location(s)

Within the Mill O Visitor Center, a flexible space will provide basic information and rotating exhibits on focused history, culture, lore and other elements related to the Blue Heron site and the falls. Larger museums and more permanent gallery-like exhibits occur off-site in concert with regional partners such as the Clackamas County Historic Museum.


Photo credit: Second Story

Photographic displays
Denver Botanic Gardens, Denver, CO

Artifact display
South SeaPort Museum of Tools, New York, NY

Hall of Biodiversity
Museum of Natural History, New York, NY

Narrative Strategies
Exhibits

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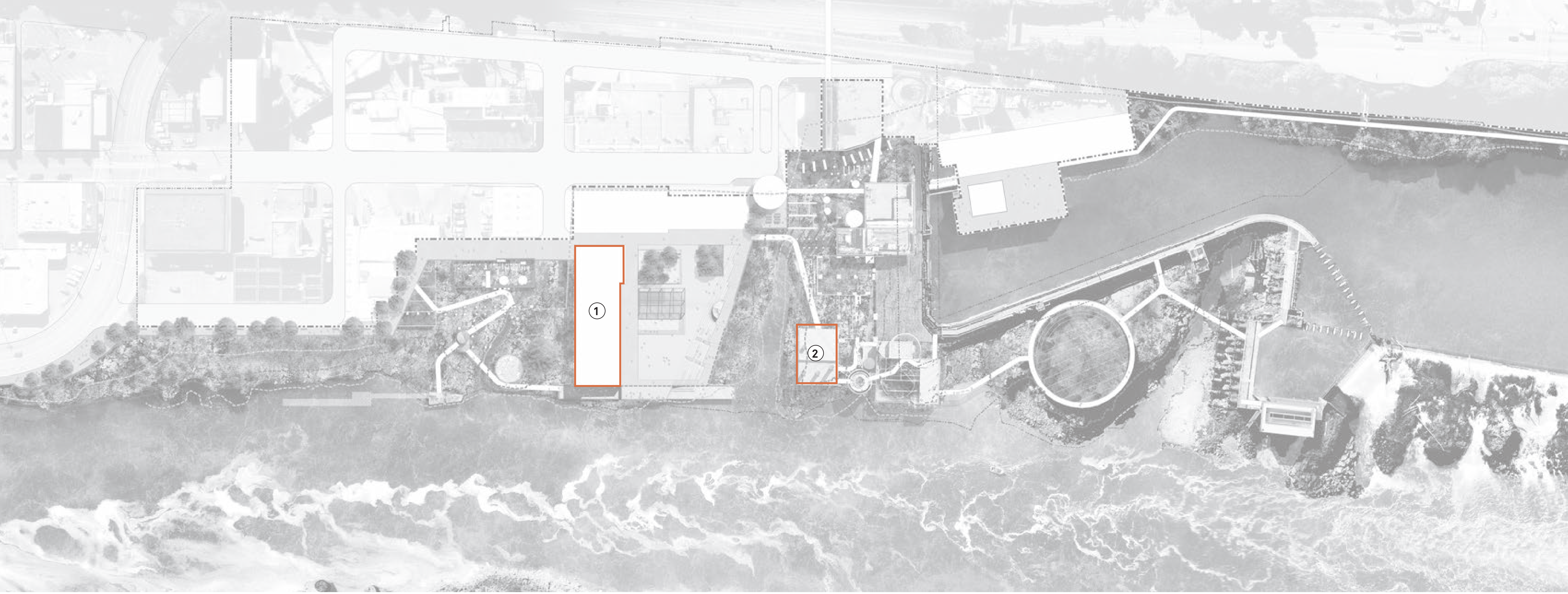
Area 1 North Riverfront	**Area 2** South Riverfront	**Area 3** PGE Dam and Mill E	**Area 4** Canemah



LEGEND

— Recommended locations

AREAS

① Mill O Visitor Center

② Boiler Plant

Narrative Strategies

Tours

Description

The tradition of oral histories are ingrained in our heritage and many visitors seek a personal connection to the stories of the site. Tours will continue to be a key interpretive program. They offer flexibility over time; allowing for the route to evolve, topics to be added, and content to be tailored to the audience.

Throughout the design process, the project partners have trained staff and volunteers and organized tours. In the future, tours may also be offered by additional organizations such as Rediscover the Falls and for-profit entities. The project partners should maintain the right to approve the size, route and timing of the all tours on the site to consider the impact to others.

Framework Guidelines

- Assign staff to manage tours; establish a tour approval process, schedule, and support needs.
- Limit the quantity, size and tour routes to ensure adjacent visitor experiences are maintained.
- Ensure that tour routes not block pedestrian pathways and major viewpoints during peak hours.
- Tours may be on foot or boat.

Recommended Location(s)

Within the Mill O, the Visitor Center River Theater space is recommended as the starting and endpoint of site tours. Some of the tours may feature the underground spaces beneath the remaining industrial buildings or the Flour Mill. Otherwise, tour groups have the same access to the other publicly accessible areas of the site.

Confluence Project tour of Maya Lin's bird blind
Sandy River Delta, OR

Forbidden zone tour led by Richard Haag
Gas Works Park, Seattle, WA

First City Festival tour
Oregon City, OR

Kayak tour
Oregon City, OR

Narrative Strategies

Tours

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

LEGEND

🟧 Recommended location for start and end point of tours

AREAS

① Mill O River Theater

Narrative Strategies

Classes

Description

The interpretive opportunities on the Blue Heron site are plentiful. It is important to remember that not all stories can be told on the site. Even those told through signage and tours may only begin to touch on a wealth of ecological, cultural, and historical issues. Classes can explore specific topics in greater depth in a format catered to particular audiences. For example:

- Understand flour, wool, paper and wood material processing with hands-on activities.
- Explore social and cultural topics in-depth through lecture and discussion series.
- Support history and social-studies courses with site visits for school-age children.

Framework Guidelines

- Assign staff to manage classes; establish a class approval process, schedules, and support needs.
- Limit the quantity and size to ensure adjacent visitor experiences are not impacted.
- Offer both free and fee based classes.
- Partner with existing organizations and educational institutions to provide class content.
- Present classes on-site to enrich content.

Recommended Location(s)

Within the improvements to Mill O the Visitor Center River Theater space is intended as a gathering location for large lecture-style classes. A conditioned, flexible, interior space may be included to support smaller classes or workshops. It is recommended that redevelopment on upper stories of Mill O be used for uses related to site administration and/or education.

Archaeology class
Fort Vancouver, WA

High school art class
Olympic Sculpture Park, Seattle, WA

Photo credit: NRCS Oregon

Botany class
Marys River Natural Area, Corvallis, OR

Narrative Strategies

Self-Guided Walking Tours

Description

Personal exploration of the site can be supported with a digital or physical guide including a site map, photos and narratives. Content should provide a general overview of the five take-home messages, orientation, and a deeper understanding of site narratives.

A walking tour provided by the project partners should include all five take-home messages. Other organizations may create walking tours on a focused topic; highlighting specific features. For example: a habitat restoration walking tour may be specifically designed for children to "find-and-seek" interesting objects throughout the site.

Framework Guidelines

- Reinforce the experiential aspects of the site and riverwalk design with graphic only material (physical prints or digital versions) and no self-led audio tours.
- Provide a download or app on the website which can be accessed on a hand-held device.
- Consider providing guides in multiple languages to support non-English speaking visitors.

Recommended Location(s)

It is recommended that this element exists digitally, and that a small selection of prints be available within the improvements to the Mill O Visitor Center for those not using smart phones.

Folding map
Witton Castle Country Park, Witton-le-Wear, UK

Phone app
Old Decatur Historic Walking Tour, Decatur, AL

Narrative Strategies

Visitor Record Keeping

Description

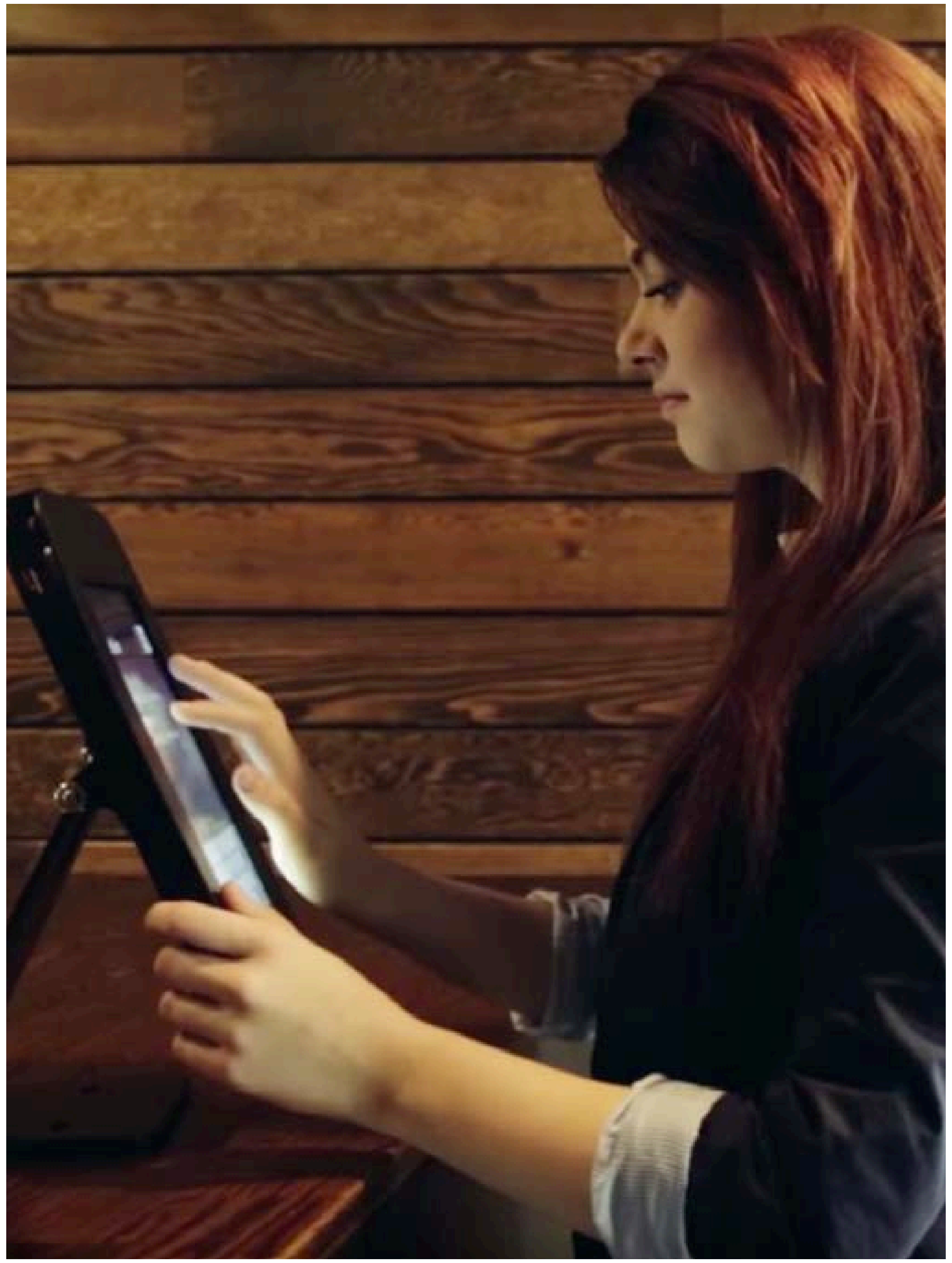
Throughout history of Willamette Falls, visitors have left their trace upon the site, through the stories they carried, the physical structures and artifacts constructed, and the lively activities they brought to the site. Riverwalk visitors will become part of the living site history by adding their observations, photos and comments to a logbook or time capsule. Plants blooming, river character, wildlife sightings, cultural events, and other experiences may all be documented by visitors. Overtime, trends emerge and visitors form a stronger connection to the site by intentionally recording observations. Likewise; a time capsule to be opening in 100 years may be buried on site for reference by future generations. The city can collect contents that provide(s) a snapshot of goals, design, culture, pictures, and other current events at the time of sealing the capsule during the project's first phase opening.

Framework Guidelines

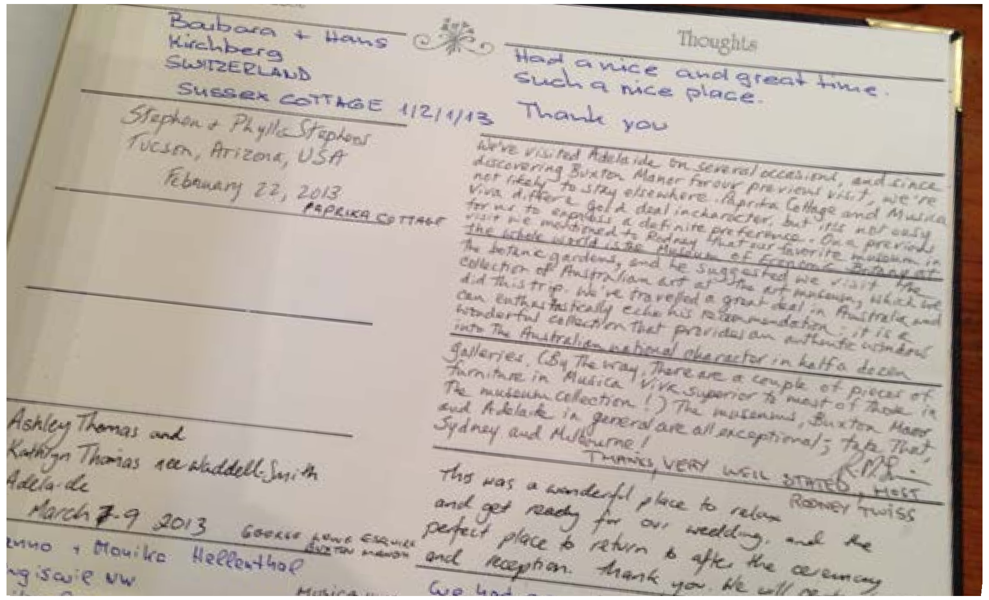
- Locate physical or digital logbook access in prominent central informational location within the project.
- Provide access to previous visitor entries for research or documentation of the site.
- Record consistent daily baseline observations – date, weather, temperature, fish migrations, and water level for instance.
- Collect an interesting variety of materials for inclusion in a water and airtight sealed container.

Recommended Location(s)

It is recommended that this element exists digitally, and that a tablet or monitor be included within the improvements to the Mill O Visitor Center for on-site access to the logbook. The time capsule can be located and marked in the Mill O foundation.



Digital tablet



Barbara + Hans
Kirchberg
SWITZERLAND
SUSSEX COTTAGE 1/2/1/13

Thoughts

Had a nice and great time.
Such a nice place.
Thank you

Stephen + Phyllis Stephens
Tucson, Arizona, USA
February 22, 2013
PAPRIKA COTTAGE

We've visited Adelaide on several occasions, and since discovering Buxton Manor for our previous visit, we're not likely to stay elsewhere. Paprika Cottage and Musica Viva differ a good deal in character, but it's not easy for us to express a definite preference. On a previous visit we mentioned to Rodney that our favorite museum in the whole world is the Museum of Economic Botany at the botanic gardens, and he suggested we visit the collection of Australian art at the art museum, which we did this trip. We've travelled a great deal in Australia and can enthusiastically echo his recommendation: it is a wonderful collection that provides an authentic window into the Australian national character in half a dozen galleries. (By the way, there are a couple of pieces of furniture in Musica Viva superior to most of those in the museum collection!) The museums, Buxton Manor and Adelaide in general are all exceptional; take that, Sydney and Melbourne!

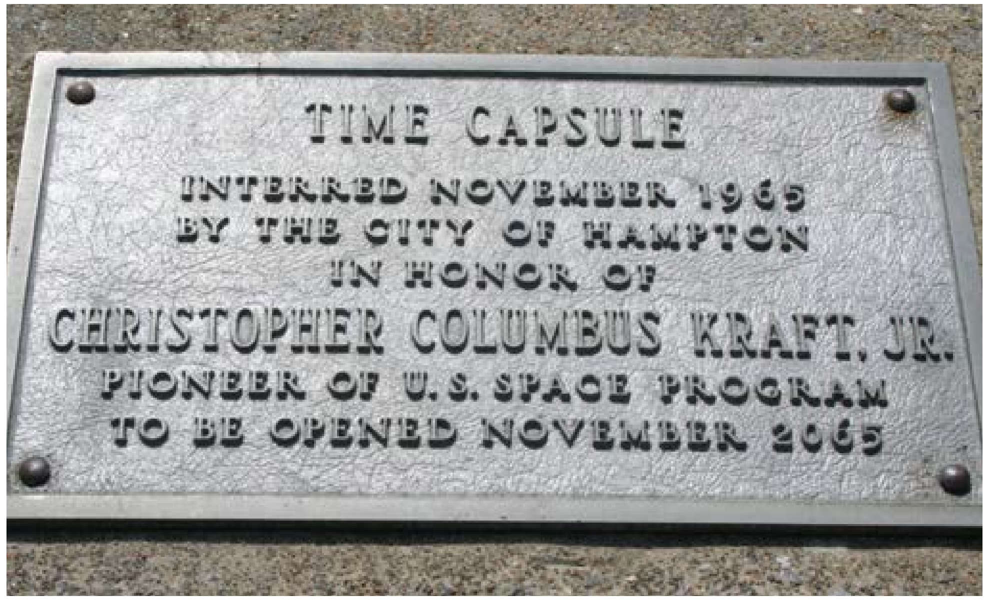
THANKS, VERY WELL STATED, HOST
RODNEY TWISS

Ashley Thomas and
Kathryn Thomas nee Waddell-Smith
Adelaide
March 7-9 2013
GEORGE ROWE ESQUIRE
BUXTON MANOR

This was a wonderful place to relax and get ready for our wedding, and the perfect place to return to after the ceremony and reception. thank you.

nno + Monika Hellenthal

Guestbook



TIME CAPSULE
INTERRED NOVEMBER 1965
BY THE CITY OF HAMPTON
IN HONOR OF
CHRISTOPHER COLUMBUS KRAFT, JR.
PIONEER OF U.S. SPACE PROGRAM
TO BE OPENED NOVEMBER 2065

Time capsule

Narrative Strategies

Website

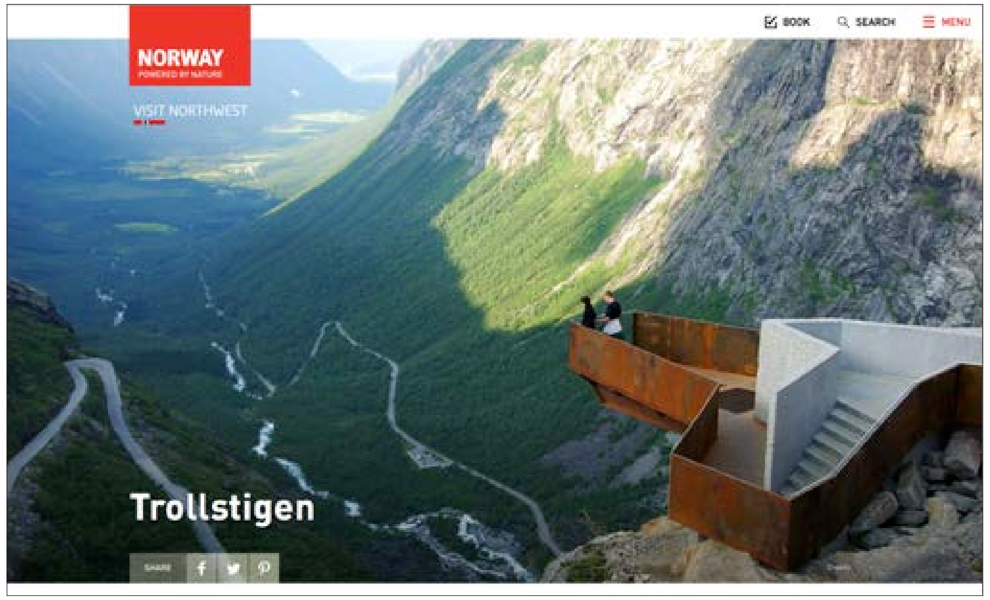
Description

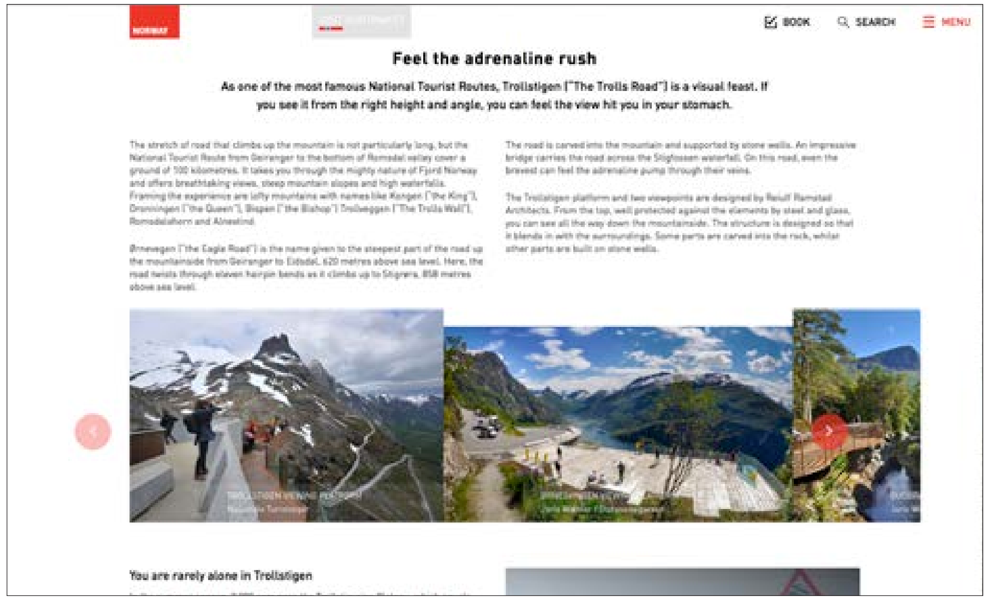
A website may be the first point of contact for a person planning to visit the Blue Heron site; especially if they are traveling. A well designed and branded website will tell visitors what to expect, how to plan and communicate the values of the project.

Content may include an interpretive overview of the five take-home messages, site map, amenity information such as seasonal expectations, parking, restrooms, and food; project history, phasing and contact information. In the future, the website may include both public and development information for a seamless visitor experience.

Framework Guidelines

- Provide an opportunity for the visitor to plan their visit by accessing information online.
- Use nomenclature consistent with language found on site wayfinding.
- Explore social media or crowd-sourcing content where visitors can add their observations, photos and comments to create a sense of community on the website.
- Build upon Rediscover the Falls website to maintain continuity and build upon previous efforts.



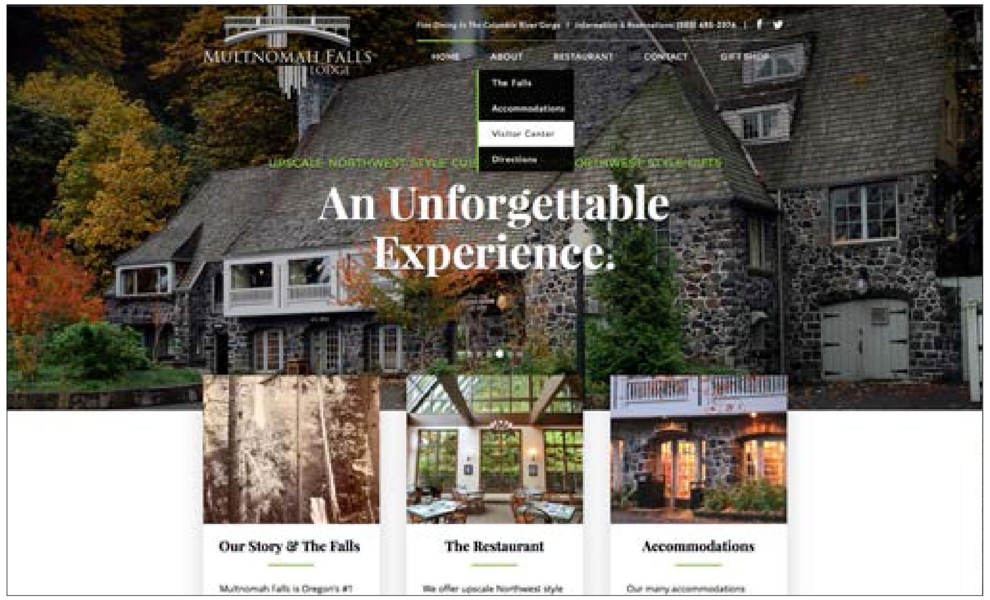


Feel the adrenaline rush

As one of the most famous National Tourist Routes, Trollstigen ("The Trolls Road") is a visual feast. If you see it from the right height and angle, you can feel the view hit you in your stomach.

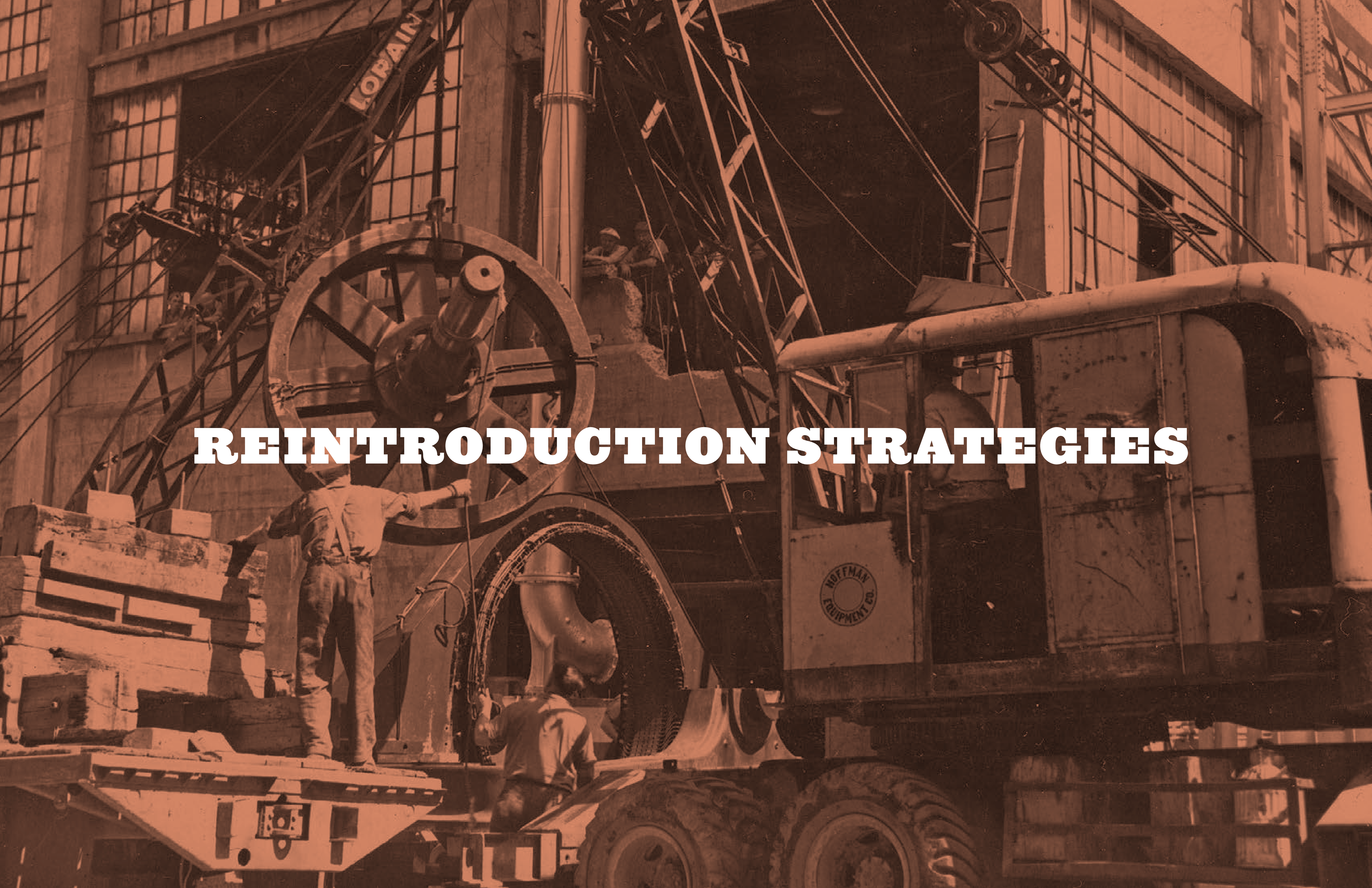
You are rarely alone in Trollstigen

Visit Norway: Trollstigen
www.visitnorway.com/places-to-go/fjord-norway/northwest/activities-and-attractions/trollstigen



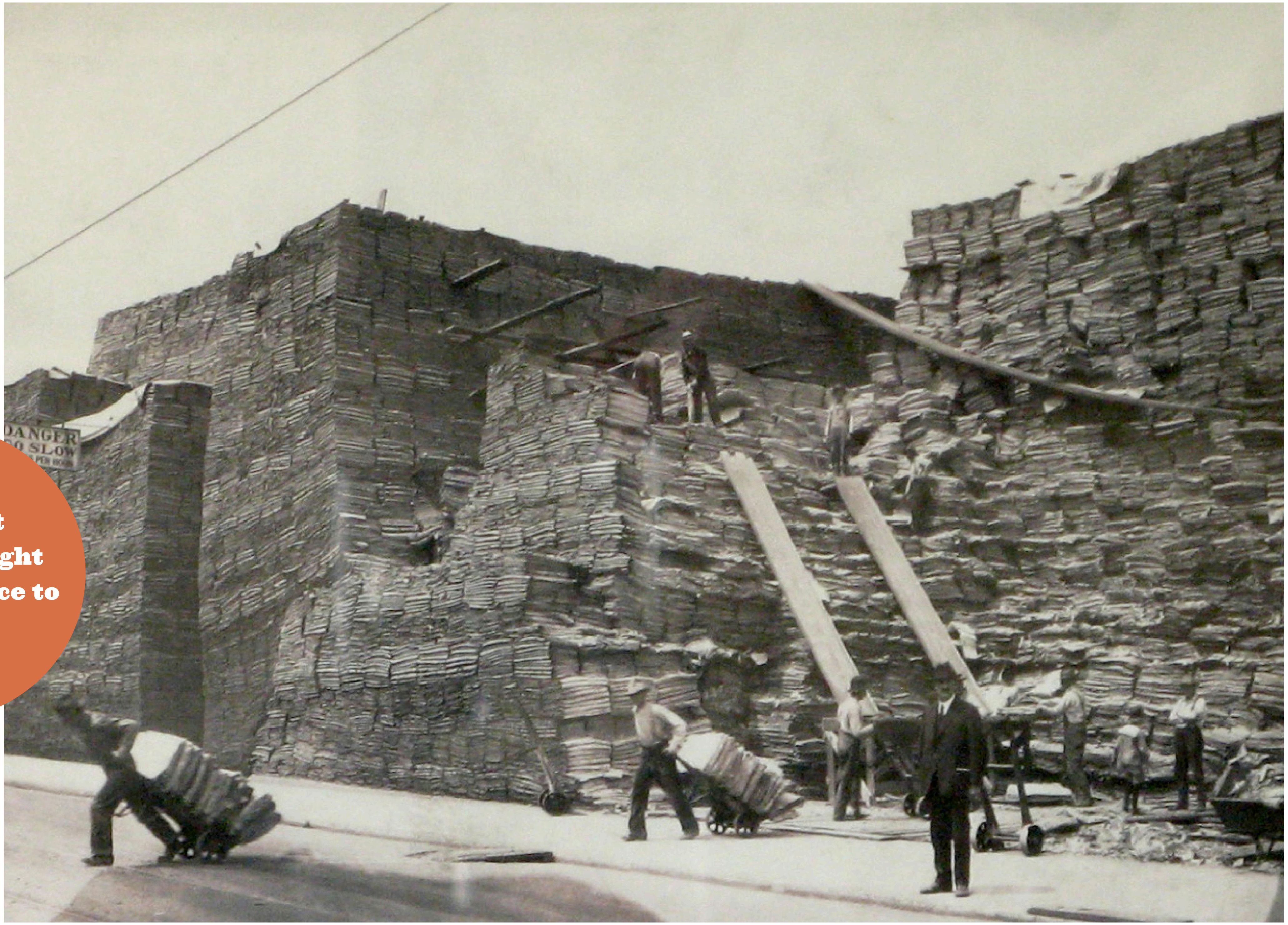
Multnomah Falls
www.multnomahfallslodge.com

REINTRODUCTION STRATEGIES



Lost memories and forgotten histories are reintroduced with careful placement of meaningful objects or materials. An object may be placed back into space in its original form to provide an experience not accessible or visible in the present. Materials may also be reinterpreted to convey complex social topics that have been forgotten or ignored.

What lost histories might we reintroduce to the site?



Blue Heron site, Oregon City, OR. *Large scale material processing, such as wood, wool, and electricity, are possibilities for this approach since their presence is no longer felt on site.*

Reintroduction Strategies

Restoring Lost Habitat

Description

For most of its history, the site remained uninhabited with basalt and river-related plant communities defining its character. Native American uses varied in accordance with the seasons and flux of river conditions and wildlife passage. Overtime, European settlement and industrialization increasingly defined the site's use so that today, it's quite challenging for a visitor to understand that the falls, basalt, and habitat once extended much further north beyond where the PGE Dam is currently located. By selectively removing platform and fill, significant portions of historic basalt and alcoves will be reintroduced to the site. Likewise, restoration efforts in these uncovered areas, will recover plant communities that once existed on the site. These efforts, focused on habitat, will also retain vestiges of the industrial character of the site, balancing habitat-related goals with industrial ruins-inspired evidence of the transformations that have taken place on the site.

Framework Guidelines

- Apply a science-driven approach to restoration that identifies a selection of target plant communities and locations on the site for reintroduction.
- Restore plant communities in a way that is compatible with selectively retained site artifacts and structures. It is envisioned that the habitat areas are a blend of healthy functioning ecosystems, and memories of the constructed site.
- Restore habitat in coordination with explorer trails and viewpoints to allow for an appropriate degree of public access and habitat integrity (no direct access to minimize disturbance), but also allows for public education and natural history interpretation.

Recommended Location(s)

Reintroduction of historic habitat is recommended to occur through large portions of the project site, with major focus points being within the Flour Mill, the Alcove, the Clarifier, and Canemah areas of the site.

Basalt habitat and riparian forest
Willamette Narrows, OR

Reintroduced habitat at former quarry
Palmisano Park, Chicago, IL

Reclaimed shallow fish habitat
Olympic Sculpture Park, Seattle, WA

Reintroduction Strategies

Restoring Lost Habitat

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1	**Area 2**	**Area 3**	**Area 4**
North Riverfront	South Riverfront	PGE Dam and Mill E	Canemah

LEGEND

🟩 Areas

----- Alcove

AREAS

① Flour Mill and North Riverfront

② Public Yard and Mill Reserve

③ Clarifier

④ Canemah

Reintroduction Strategies

Projecting Removed Structures

Description

Due to industrial innovation, fires, and flooding, structures on the site have undergone many cycles of removal, replacement, and revision. Today, the site embodies a snapshot of an ongoing history of construction and reinvention. While new redevelopment will introduce structures and massing in line with interpretive goals, there are opportunities to reintroduce the character of lost structures using projections, whether they be lighting related installations or virtual reality in nature. Projections establish a light touch, minimal investment, and are temporal in character (such as lighting solutions that only occur nightly or during specific special events). Lighting will be in keeping with best practices for migration of fish, lamprey and other environmental considerations.

Framework Guidelines

- Deploy lighting-related interpretation as either permanent and occur nightly as part of lighting design, or be temporary in association with events or commissioned art.
- Use lighting-related projections that are well-suited for both exterior and interior consideration. If included permanently, they should be developed in coordination with future riverwalk design efforts.
- Use virtual reality-related projections that are well-suited for either interior or exterior conditions, and do not require coordination with riverwalk design. These efforts may come at later dates and fall outside the current riverwalk design process.
- Apply restraint to use of digital technology such as VR so as not to detract from the immersive and experiential qualities of the design or interfere with other users or wildlife. The boundaries of VR should be highly constrained—in specific locations and/or for only periodic moments.

Recommended Location(s)

Projected history as either virtual reality or lighting installation is recommended to occur in areas of the site that have undergone significant and multiple transformations over time, and where major historic structures no longer exist. This is recommended to occur at the Flour Mill, Woolen Mill, Paper Machine I/Hawley Building, and PGE Station A locations.

Electric light fixtures defining space at Dia:Beacon
Beacon, NY

Installation creating architectural volumes out of light at Mattress Factory
Pittsburgh, PA

Ceiling and full room projections at Le Domus Romane di Palazzo Valentini
Rome, Italy

Reintroduction Strategies
Projecting Removed Structures

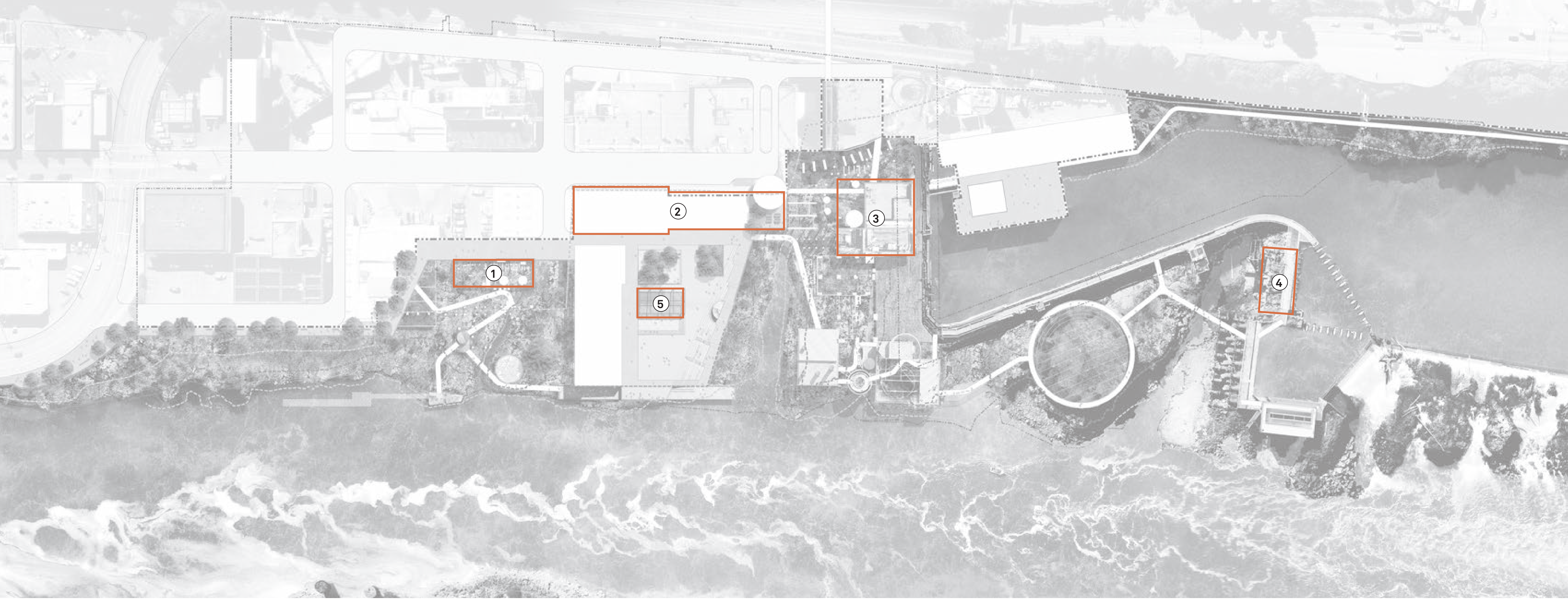
Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1
North Riverfront

Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah

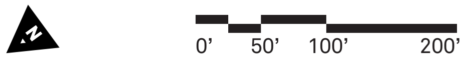


LEGEND

— Recommended areas

AREAS

① Flour Mill foundation
② Woolen Mill foundation
③ Hawley Building and No. 1 Paper Machine
④ PGE Station A
⑤ Carpentry Shop



Reintroduction Strategies

Re-Enacting Histories

Description

The public engagement process for the riverwalk revealed interest in re-enactments or period-focused interpretation. It is recommended that these interests are considered for temporary event use as part of the riverwalk and redevelopment of the site, and that they are not permanent in nature, nor too frequent, as to distract from contemporary life of riverwalk and site.

Framework Guidelines

- Treat period type re-enactments like other temporary events, and manage them as part of the programming and operations of the site.
- Ensure that while these types of activities may add complexity and richness to the site, they should also not encumber the key use and core values goals during their use of the site.

Recommended Location(s)

Period festivals should focus on the flexible use spaces provided by the Public Yard and Mill O.

- Main Street
- Public Yard
- Mill O
- River

Native American prayer flags
Devil's Tower, WY

Volunteers demonstrate historic dances from the 1840s
Fort Vancouver, Vancouver, WA

Reintroduction Strategies

Re-Enacting Histories

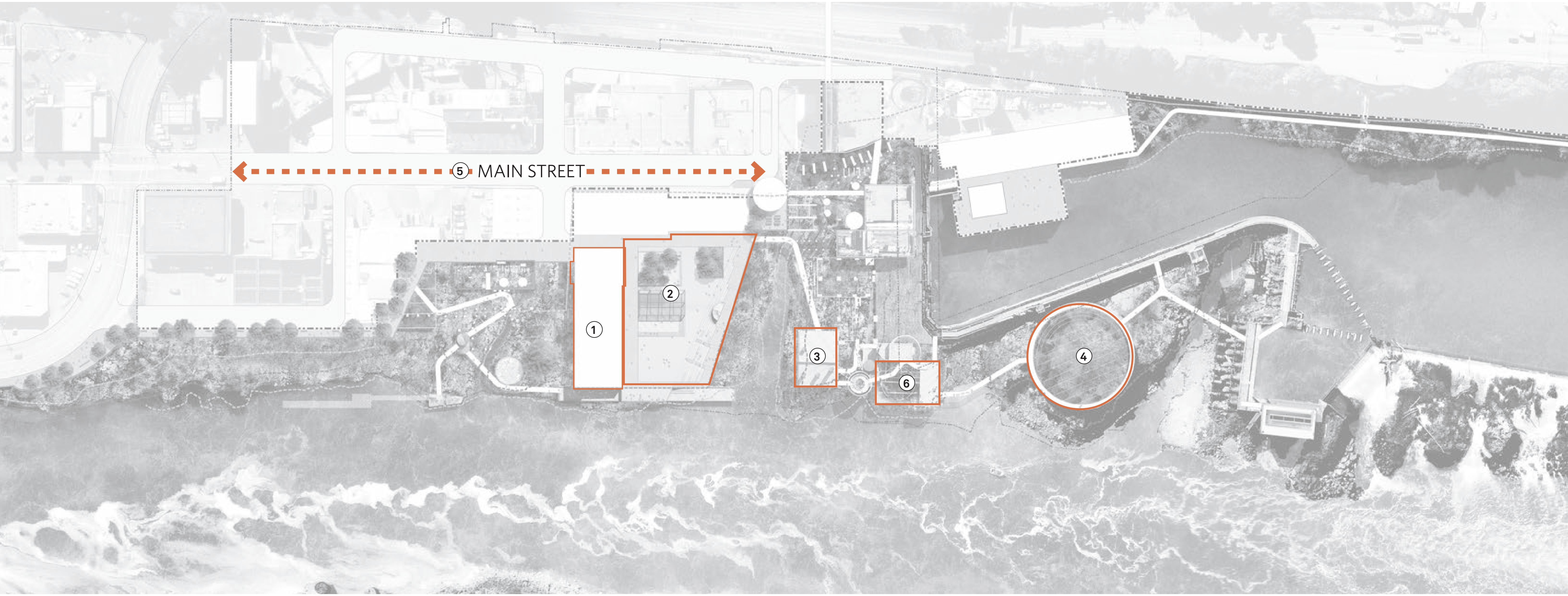
Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1
North Riverfront

Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah



LEGEND

▭ Recommended
<··> areas and locations
for period festivals

AREAS

① Mill O Visitor Center
② Public Yard
③ Boiler Plant
④ Clarifier
⑤ Main Street
⑥ Mill H

Reintroduction Strategies

Reclaiming Site Vitality & Commerce

Description

Culturally speaking, the site has drawn lively uses for thousands of years. The riverwalk and corresponding redevelopment open a new chapter of the site beyond decades of industrial use. Now the riverwalk has opportunity to reintroduce commerce and life that accompany use. When considering the uses of the riverwalk and redevelopment, care should be taken that uses are complementary to the riverwalk vision, and that, when possible, redevelopment is designed so that activity is an obvious component of the site. The project relies upon redevelopment and the riverwalk to fill the site with a contemporary version of the sights, sounds, smells, and energy that have defined the busy site over time. Care should be taken when selecting uses, and designing new redevelopment to encourage that the character of the use does not become buried behind closed doors, and that the public areas, surfaces, rooftops, and rights-of-ways, be considered as extensions of interior redevelopment spaces and uses.

Framework Guidelines

- To be determined in the future with Oregon City and potential developers.

Recommended Location(s)

Recommended to occur as part of the redevelopment areas of the site. Within the boundaries of the riverwalk redevelopment areas fall upon the Flour Mill foundation, Mill O, the Woolen Mill, and potentially the complex of structures at the terminus of Main Street; Digesters and Sulphite Plant, Hawley and Paper Machine I, and Mill E. In addition, tribal board engagement will provide further understanding of the five confederated tribes' priorities in using and accessing the site.

Buoy Beer Company
Astoria, OR

St. Anne Warehouse Theatre
Brooklyn, NY

Westergasfabriek Market Hall
Amsterdam, NL

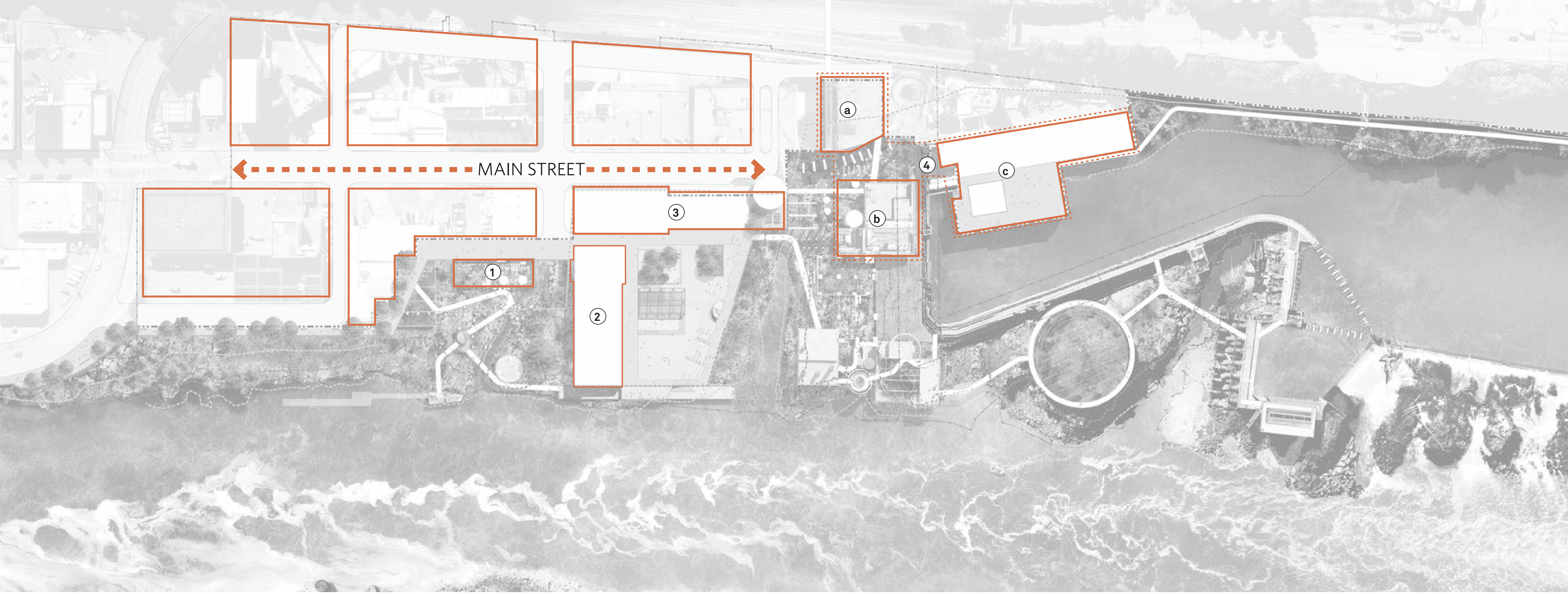
McMenamins Kennedy School
Portland, OR

Reintroduction Strategies

Reclaiming Site Vitality & Commerce

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1	Area 2	Area 3	Area 4
North Riverfront	South Riverfront	PGE Dam and Mill E	Canemah



LEGEND

Redevelopment areas

AREAS

- ① Flour Mill foundation
- ② Mill O
- ③ Woolen Mill foundation

POTENTIAL

- ④ Main Street terminus redevelopment complex
  - ⓐ Digester and Sulphite Plant
  - ⓑ Hawley and No. 1 Paper Machine
  - ⓒ Mill E

0' 50' 100' 200'

Reintroduction Strategies

Rebuilding Main Street Massing & Character

Description

Over time, the former character of Main Street has largely drifted away from its original mix of residences, commercial businesses and industry. The only significant remnant of that era is the street grid itself which was largely retained as the site underwent increasing industrialization. Balancing the interpretive themes of industry and settlement will require that the redevelopment of the site balance the existing industrial scale and reintroduce Main Street character through the addition of building massing and a clear street enclosure. Even the streetscape character should be designed as unique to the Blue Heron property's industrial character rather than a city standard. While large portions of the riverwalk area seeks to reintroduce historic geological and ecological character to the site, Main Street requires the addition of building massing to recover the historic scale that once occurred on the site prior to the industrial era. Reintroduced massing of new redevelopment should have a clear relationship to retained structures and appropriate scale.

Framework Guidelines

- Use existing structures to establish a clear distinction between old and new and set the framework for redevelopment. Distinctions should use shadow gaps, trim pieces, materials changes, and other design strategies to clearly demarcate old and new.
- Ensure that the new development be historical in scale, but not in character. Redevelopment is ‘of today’ and read as yet another layer placed upon the many existing layers of the site.
- Provide experiences of new development among the existing preserved structures, highlighting history as part of the redevelopment.

Corso building
Karlin District, Prague

192 Shorehon St.
Waterport, NY

Recommended Location(s)

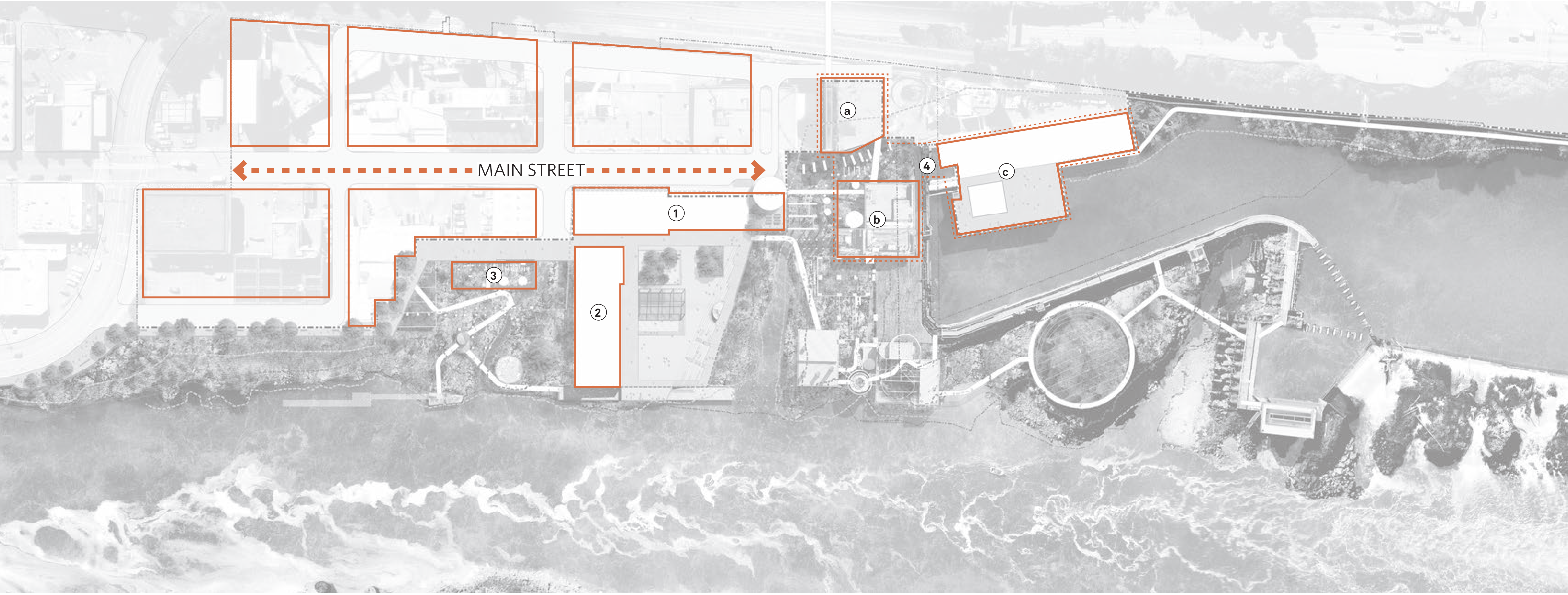
Mixed-use development is recommended to occur as part of the redevelopment areas of the site. Within the boundaries of the riverwalk, redevelopment areas fall upon the Flour Mill foundation, Mill O, the Woolen Mill, and potentially the complex of structures at the terminus of Main Street—Digesters and Sulphite Plant, Hawley and Paper Machine I, and Mill E.

Reintroduction Strategies

Rebuilding Main Street Massing & Character

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1	**Area 2**	**Area 3**	**Area 4**
North Riverfront	South Riverfront	PGE Dam and Mill E	Canemah



LEGEND

☐ ↔ Redevelopment areas

AREAS

- ① Woolen Mill foundation
- ② Mill O
- ③ Flour Mill

POTENTIAL

- ④ Main St. Terminus Redevelopment Complex
  - ⓐ Digester and Sulphite Plant
  - ⓑ Hawley and No. 1 Paper Machine
  - ⓒ Mill E

0' 50' 100' 200'

Reintroduction Strategies

Rediscovering Material Processing

Description

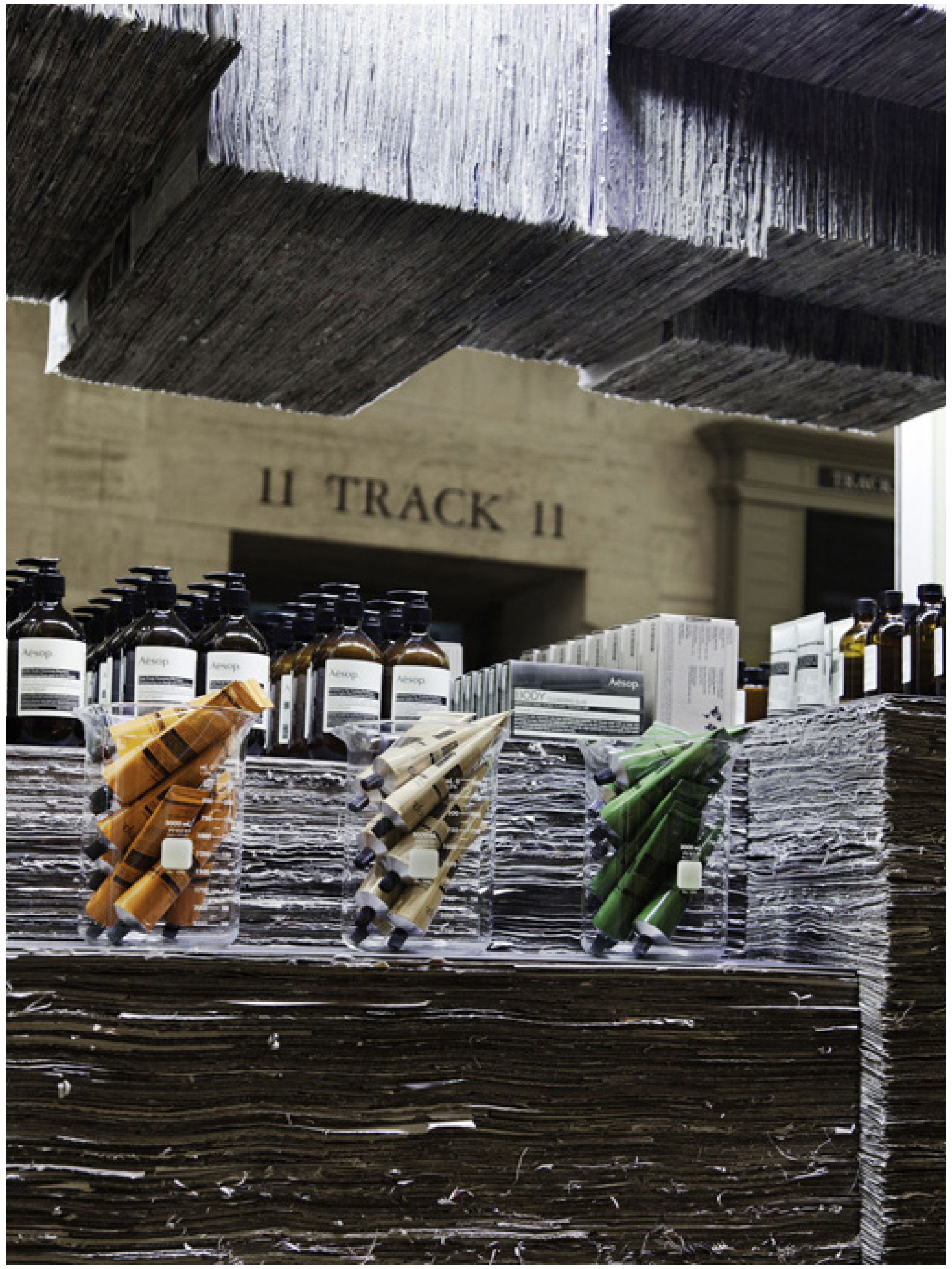
The design of newly introduced elements to the site should engage with the site's rich history to reintroduce materials, patterns, and colors that were once present. In this way, contemporary additions may consider drawing from the paper-making, woolens, transportation modes such as rail, transmission of electricity, and other lost manufacturing for material decisions on new structures and elements on site.

Framework Guidelines

- Provide incentive for redevelopment to highlight or repurpose historic materials as part of design of new structures.
- Consider novel uses of materials that tie to history of site in riverwalk kiosks and other structures.
- Provide support to developers and business to the naming of historic uses not evident on site.

Recommended Location(s)

Recommended to occur as part of any new addition to the site, both riverwalk elements such as kiosks and additions to structures; but also new construction related to redevelopment.



Reuse of newspaper print
Aesop store at Grand Central Station, New York City, NY

Motif hinting at history of business in natural, plant-based products
Ricola storage building, Laufen, Switzerland

Pendleton tribute blanket

Reintroduction Strategies

Rediscovering Material Processing

Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1	**Area 2**	**Area 3**	**Area 4**
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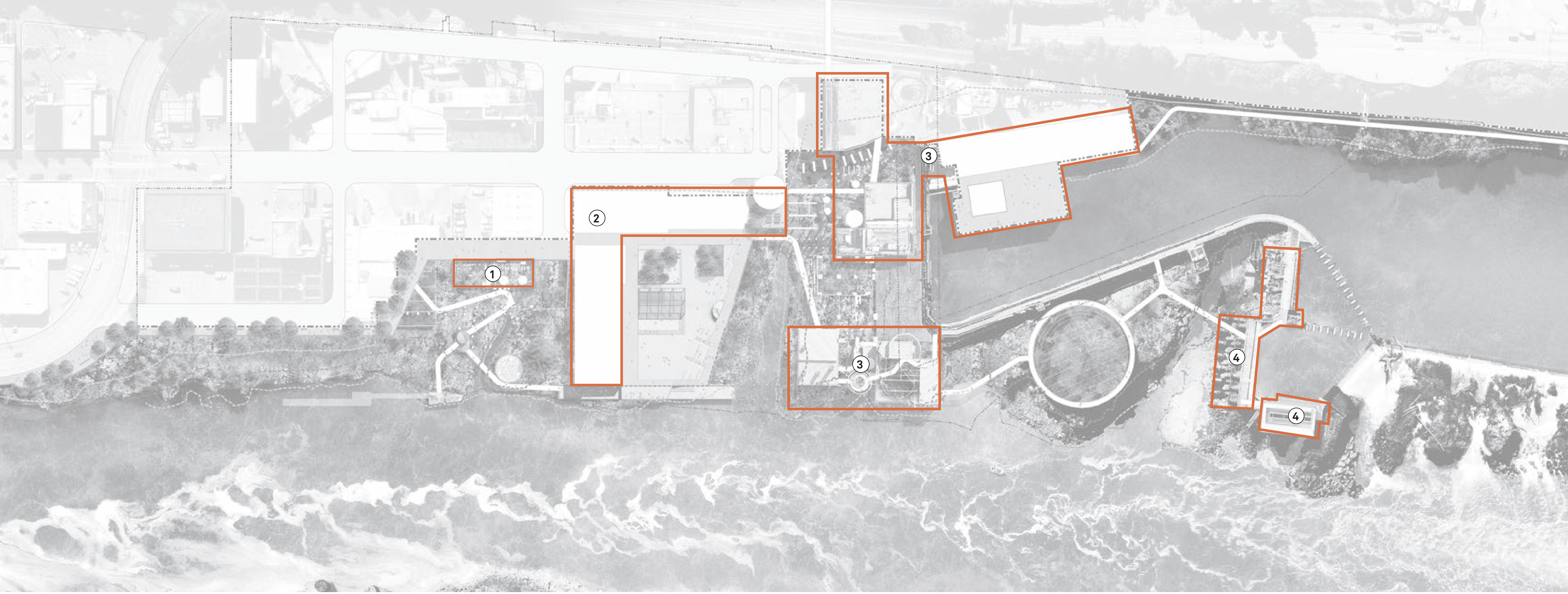


LEGEND

— Material history area

MATERIAL AREAS

① Flour

② Wool

③ Paper

④ Electricity

Reintroduction Strategies

Commissioned Site Specific Public Art

Description

Public art, if well-curated, can be used to add interpretive depth to the some of the more challenging histories that the site holds. A biannual commission of site-specific public art is recommended to be included as a focal point in one of the selected areas identified below. When commissioning work, the artists should be asked to engage with both the character and quality of a specific site as well as with the site's history.

Framework Guidelines

- Consider commissioned works that are temporary in nature. A minimum of six months to a maximum of one year is recommended for works of art to be commissioned.
- Commissioned works that are site-specific in nature; that is their creation is done with a location in mind.
- Focus works on an element of site history; they are encouraged to take on a challenging or less well documented histories that adds content and meaning to the site experience beyond what is observable or obvious, or otherwise covered by the interpretive strategies documented here.
- Set up a public art review committee to ensure that the location, content, and materials are consistent with the four core vales.

Recommended Location(s)

Recommended to periodically occur in the following locations within the proposed riverwalk areas: the Yard, Fuel Tank foundation, the Mill H Reject Plant, the Clarifier, Mill O Interior, the Boilers, and Intake Basin {check title case}. Also, may be considered for interim use areas of the site. No public art is to be located on the PGE dam or the Hawley Powerhouse foundation.

A Subtlety, Kara Walker
Domino Sugar Factory, Brooklyn, NY, 2014.

Waterline, Justin Cooper Studio
South SeaPort Museum, New York, NY

Tree, Ai Weiwei
Royal Academy of Arts, London, 2015.

Stools, Ai Weiwei
Evidence, Martin-Gropius-Bau Exhibition Hall, Berlin, 2014

Reintroduction Strategies
Commissioned Site Specific Public Art

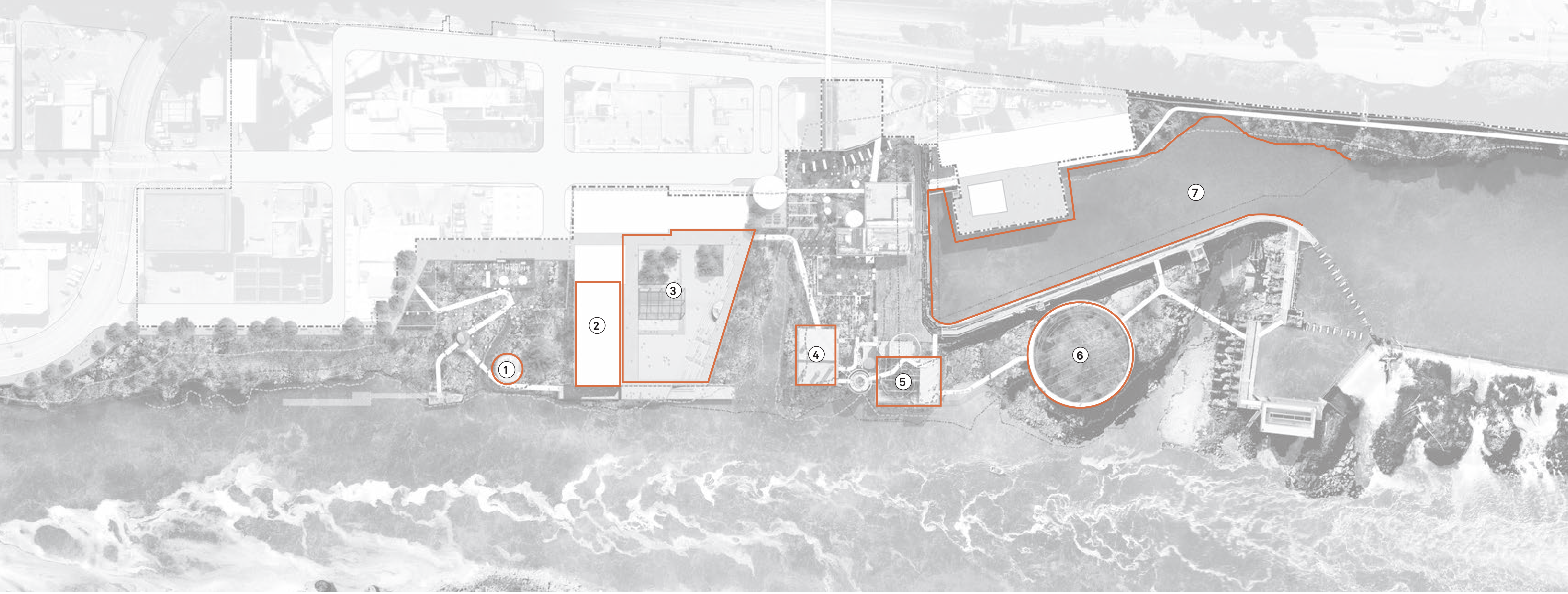
Note: It is anticipated that interpretive strategies for the Mill E and Main Street areas in this document will be updated when resolution of the easement and development options are achieved.

Area 1
North Riverfront

Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah



LEGEND

— Recommended areas and locations

MATERIAL AREAS

① Fuel Tank foundation
② Mill O
③ Public Yard
④ Boiler Plant
⑤ Mill H Reject Plant
⑥ Clarifier
⑦ Intake Basin

0' 50' 100' 200'

Appendix

Acknowledgments

Project Partners
City of Oregon City
Clackamas County
Metro
State of Oregon

Project Client Team
City of Oregon City
Clackamas County
Metro
State of Oregon
Falls Legacy, LLC
PGE

Consultant Team
Design Collective:
Snøhetta
Mayer/Reed, Inc.
DIALOG

JLA Public Involvement
KPFF Engineers
Flowing Solutions
DKS Associates
NW Geotech
DCW Cost Management

Metro
800 NE Grand Avenue
Portland, OR 97232 USA
www.oregonmetro.gov

Snøhetta
80 Pine Street, 10th Floor
New York, NY 10005 USA
www.snohetta.com

Mayer/Reed, Inc.
319 SW Washington Street, Suite 820
Portland, Oregon 97204
www.mayerreed.com

DIALOG
406, 611 Alexander Street
Vancouver, BC V6A 1E1
www.dialogdesign.ca

Visitor Center

Approaches/Principles

Framework Guidelines

The following guidelines were established for the inclusion of a Visitor Center on the riverwalk design:

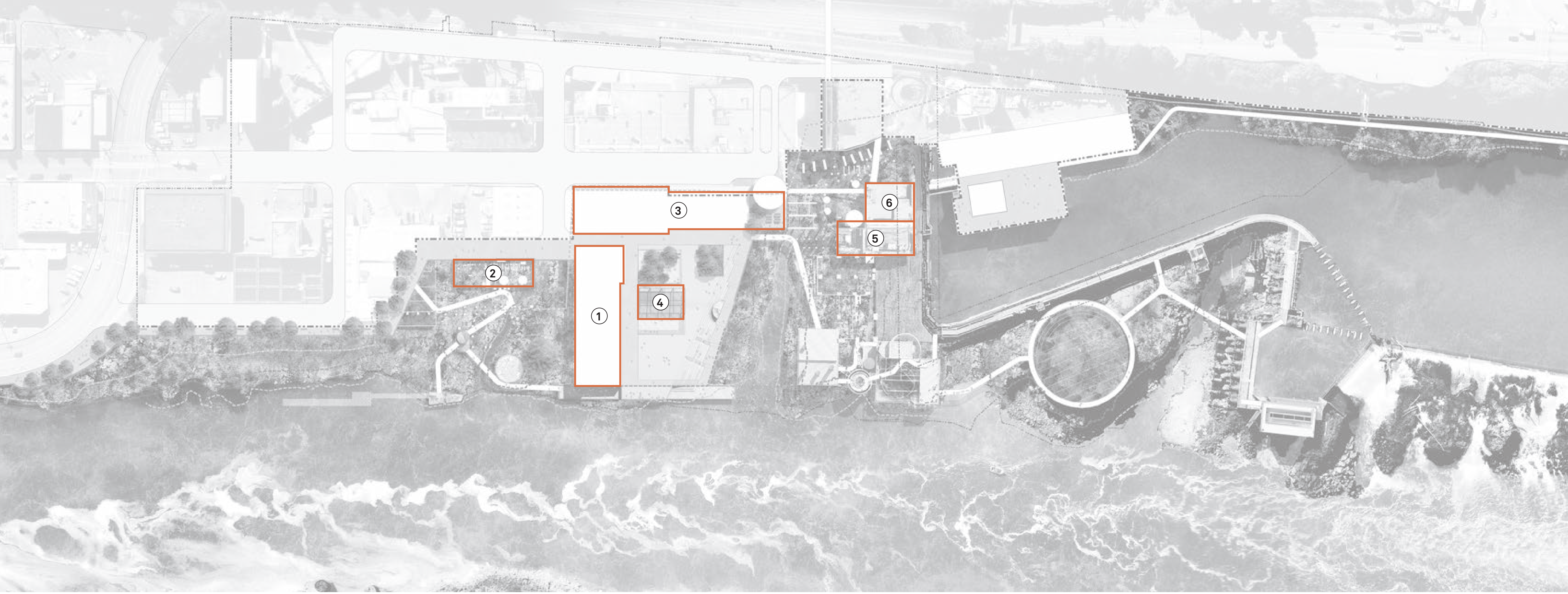
- Promote activation of the centrally located public space with a visitor amenity hub including information, food, restrooms and gathering space.
- Provide an overview of site specific interpretation.
- Support and complement established off-site interpretive institutions (McLoughlin House, Museum of the Oregon Territory, etc.).
- Promote site exploration; visitors may start or end here or stop mid-visit.
- Reuse an existing structure in part or whole.
- The design should allow for phased implementation.

Phased Implementation Options	OPTION 1 - KIOSK	OPTION 2 - SHELTER	OPTION 3 - VISITOR CENTER
Cost to visitor	Free	Free	Free
Structure	Freestanding kiosk	Open air shelter	Building
Visitor information opportunities	Permanent exterior Graphic panels	Permanent exterior Graphic panels	Permanent exterior graphic panels Interior graphic displays Brochure displays
Staff	Customer service - none Maintenance - minor	Customer service - none Maintenance - minor	Customer service - minor Maintenance/janitorial - medium
Operations	Agency, non-profit	Agency, non-profit	Agency, non-profit
Gathering space	Open space	Open-air structure with roof	Interior - informal gathering space
Amenities	None	Seating / tables	Seating / tables Restrooms

Visitor Center

Considered Locations

Area 1	Area 2	Area 3	Area 4
North Riverfront	South Riverfront	PGE Dam and Mill E	Canemah



LEGEND

— Considered areas and locations

PREFERRED LOCATION

① Mill O

CONSIDERED LOCATIONS

② Flour Mill foundation
③ Woolen Mill foundation
④ Carpentry Shop
⑤ Paper Machine 1
⑥ Hawley building

Interpretive Centers

Pacific Northwest Regional Examples

CONFLUENCE PROJECT: BIRD BLIND

Sandy River Delta Park, Troutdale, OR

Designer
Maya Lin

Area
Centre: 300–600 sf (gross)
Site: n/a

Year
opened 2006–2016

Program
Trail, interpretive signage

Operations
USDA Forest Service (confluence trail)
Confluence Project (bird blind)

Admission
Free

http://www.confluenceproject.org/

CATHLAPOTLE PLANKHOUSE

Ridgefield National Wildlife Refuge, Ridgefield, WA

Area
Centre: 2,886 sf (gross)
Site: n/a

Year
opened 2005

Program
Educational and event space

Partnership with the Chinook Indian Nation, Portland State University, The U.S. Fish & Wildlife Service

Operations
Friends of the Ridgefield
National Wildlife Refuge

Admission
Refuge day use fee includes plankhouse
Seasonal / weekends / events

https://ridgefieldfriends.org/plankhouse/

MULTNOMAH FALLS HISTORIC LODGE

Columbia River Gorge, OR

Area
Centre: 3,000 sf approx. (gross)
Site: n/a

Year
1925

Program
Information desk, gift shop, restrooms, small permanent exhibits, restaurant

Operations
USDA Forest Service (recreation area & visitor center)
Concessionaire (lodge)

Admission
Free

http://www.multnomahfallslodge.com/

http://www.fs.usda.gov/recarea/crgnsa/recreation/picnickinginfo/recarea/?recid=30026&actid=70

Interpretive Centers

National and International Examples

POMBAL CASTLE'S VISITOR CENTRE
Pombal, Portugal

Architect
COMOCO

Area
Centre: 900 sf (footprint)
Site: 1.75 acres

Year
2014

Program
Reception area, restrooms, screening area for virtual history, storage, lookout

http://www.archdaily.com/563933/pombal-castle-s-visitor-centre-comoco-arquitectos

MONT TREMBLANT DISCOVERY CENTRE
Mont Tremblant, QC, Canada

Architect
Smith Vigeant Architects

Area
Centre: 7,500 sf (gross)
Site: n/a

Year
2014

Operations
Societe des Etablissements de Plein Air de Quebec

Program
Multi-purpose room, restrooms, gift shop and snack bar, theatre, reception area, exhibition hall

http://www.archdaily.com/554477/discovery-centre-for-the-mont-tremblant-national-park-smith-vigeant-architects

WILD TURKEY BOURBON VISITOR CENTER
Lawrenceburg, KY, USA

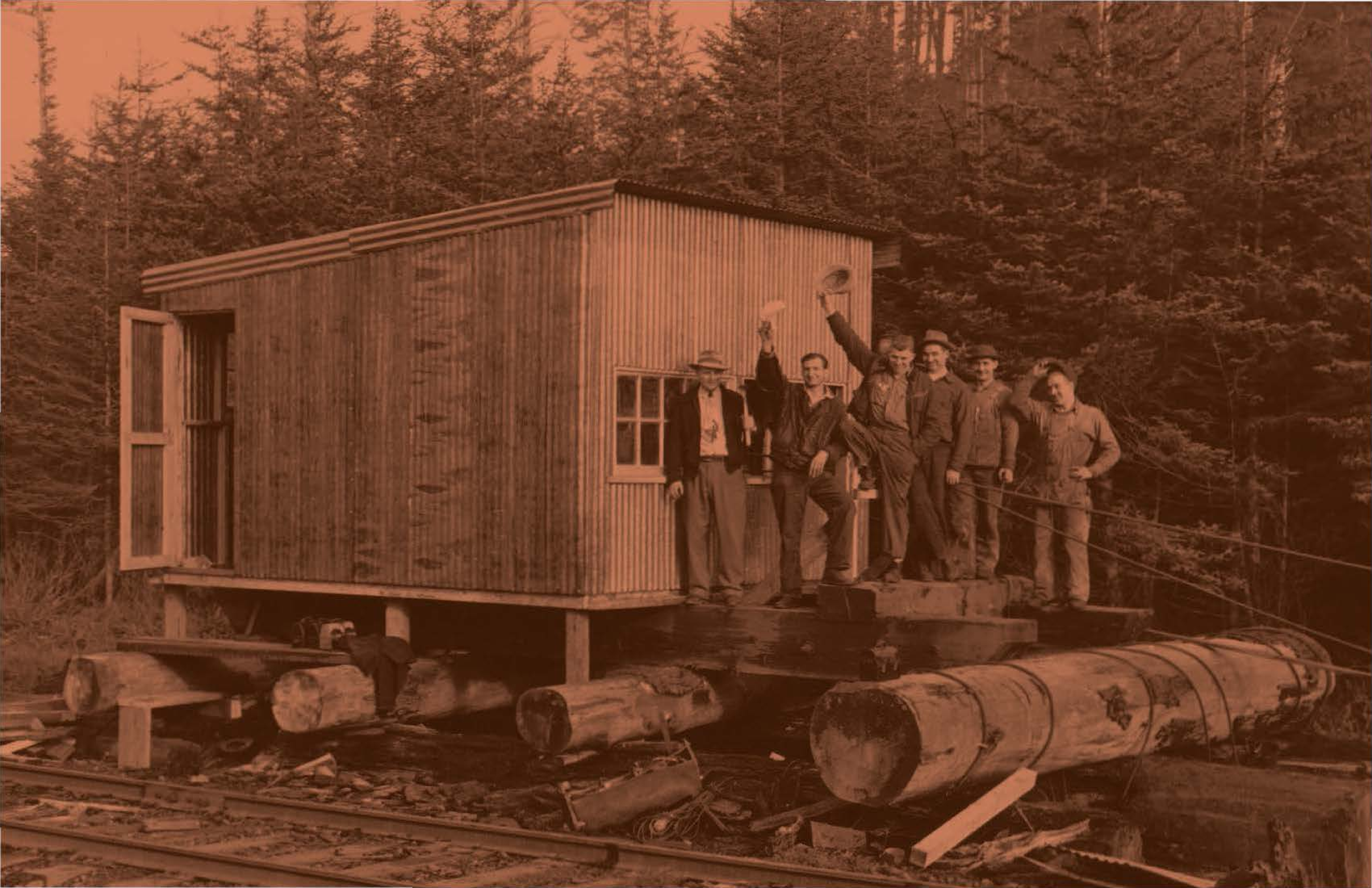
Architect
De Leon & Primmer Architecture Workshop

Area
Centre: 9100 sf (gross)
Site: 400 acre

Year
2013

Program
Tasting room, exhibit area, gift shop, restrooms, offices, multi-purpose room

http://www.archdaily.com/519812/wild-turkey-bourbon-visitor-center-de-leon-and-primmer-architecture-workshop



2017

OREGON CITY

City of Oregon City, Oregon
Transportation Demand Management Plan

PROJECT SUMMARY AND RECOMMENDATIONS FOR TRANSPORTATION DEMAND MANAGEMENT

DRAFT REPORT
September 2017 (v1)

RICK WILLIAMS CONSULTING
Parking & Transportation

TABLE OF CONTENTS

City of Oregon City: Transportation Demand Management Plan

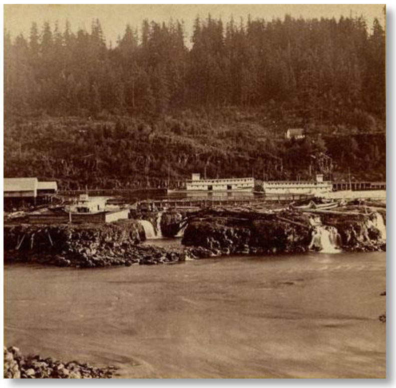
I. BACKGROUND

Figure A: Project Study Area

The City of Oregon City commissioned a Transportation Demand Management (TDM) Plan to examine opportunities and challenges in parking, access, and transportation related to the redevelopment of the Willamette Falls Legacy Project. The plan outlines and prioritizes TDM strategies for Oregon City, leveraging existing conditions and providing the flexibility to respond to opportunities for action as they arise. These strategies will help guide the City toward efficient," right sized" parking while integrating reasonable, attractive, and effective alternative mode options into the project study area. That area is bounded by the Willamette River and Oregon Route 99E, as illustrated in **Figure A**.

Incorporating industry best practices along with input from local stakeholders, the plan provides the foundation for a new multi-modal vision for the greater Oregon City downtown.

II. PROJECT SIGNIFICANCE



In addition to astounding natural beauty, Willamette Falls possesses a rich history that predates the establishment of Oregon City in 1842. Once a traditional fishing site for the Warm Springs tribe of Native Americans, by the late 1800s the Falls were home to numerous paper mills, including the Oregon City Paper Manufacturing Company. The company changed hands several times, then eventually closed. In 2014, developer George Heidgerken purchased the property with plans to redevelop it.

Recognizing the tremendous potential of the Willamette Falls Legacy Project to redefine Oregon City, community groups and partners including Oregon City, Metro, Clackamas County, and the State of Oregon have been working together to develop a vision for the site that recognizes the significance of its past while embracing a bold and innovative future. Ensuring public access to the site is one of the four core values that underpin this vision. Creating safe connections through multiple transportation modes and efficient parking standards will complement the Falls and Downtown Oregon City for years to come.

> *"It was a beautiful sight when viewed from a distance, but it became grand and almost sublime as we approached it nearer.' John Kirk Townsend, 1835*

III. DECISION-MAKING ELEMENTS

The outline of the decision-making elements below is intended to summarize the important aspects that have influenced and guided the recommended multi-phased strategies. Again, these elements have helped place parameters on achieving realistic programs and projects that would be appropriate for the development site and its intended users.

City & Regional Improvements

Capitalizing on local and regional land use and transportation improvements as they occur allows for greater efficiencies and more successful TDM programs. Creating meaningful partnerships and tracking projects will be vital to the future of the Willamette Falls Legacy Project.

Current improvements include:

- Intelligent transportation systems designed to warn traffic approaching the 99E tunnel of hazardous conditions ahead.
- Prohibition of left turns northbound from OR 99E to Main Street, and modification of the right-turn geometry from 99E to Railroad Avenue to allow turning traffic to slow and maneuver outside the travel lanes on a curve with limited sight distance.
- A pork-chop island (or raised median) at the intersection of Water Avenue and OR 99E to prevent unsafe movements and reinforce right-in, right-out access.

These three efforts have begun to create a safer traffic flow in and around the development site.

Figure B: 2016 Parking Study Area

Downtown Oregon City Parking Study (2016)

Building upon a similar effort in 2008, in 2016 Oregon City conducted a parking study that concentrated on the historic downtown area, as seen in **Figure B**. The study analyzed data for on- and off-street parking on both a weekday (Thursday, July 7th) and weekend (Saturday, July 9th). A comparison of the 2008 and 2016 findings was made, and a" high-occupancy node", a small portion of the study area demonstrating high parking use, was evaluated.

Given the proximity of the study area to the Willamette Falls Legacy Project site, findings from the study can provide valuable guidance on managing parking at the site. For additional information on the 2016 Oregon City Parking Study, please see the attached *Appendix – Parking Study Findings*.

Public Outreach Process (2017)

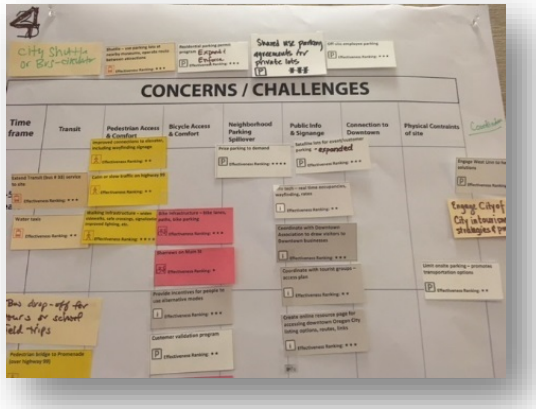
In coordination with Oregon City staff, a public outreach process was developed to understand and incorporate local stakeholders' views on transportation, access, and parking related to the Willamette Falls Legacy Project. Workshops and open houses provided a forum for local residents and business owners to share their thoughts and opinions.

Workshop Schedule

	Meeting 1	Meeting 2	Meeting 3
Date	Wednesday, April 26th	Wednesday, May 24th	Wednesday, July 26th
Time	6:00-8:00PM	6:00-8:00PM	6:00-8:00PM
Location	Oregon City, City Hall	Oregon City, City Hall	Oregon City, City Hall

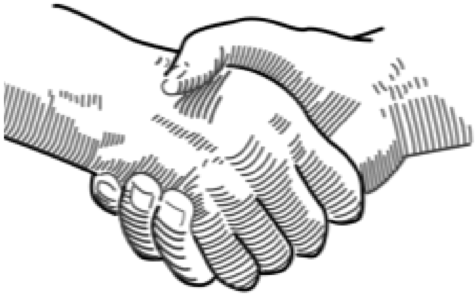
Open House Schedule

	Open House
Date	Wednesday, July 12th
Time	4:00-8:00PM
Location	Oregon City, City Hall



Outreach workshops began with an overview of the Willamette Falls Legacy Project. Participants were then given an introduction to TDM and parking best practices to help focus discussion and provide a common language from which to offer feedback on the site's strengths, weaknesses, opportunities, and challenges.

IV. INDUSTRY BEST PRACTICES



To help guide the stakeholder outreach effort, industry best practices were presented to inform the discussion on transportation, access and parking issues pertinent to the Willamette Falls Legacy Project site. An overview of applicable Transportation Demand Management (TDM) programs, projects and services were provided as a starting point from which the outreach effort evolved, with the notion that additional local ideas were welcome. Parking management best practices were also presented along with the 2016 Oregon City parking study results.

Below is an overview of both the best practices framework for TDM and parking management practices which helped guide the Oregon City outreach process for the Willamette Falls Legacy Project.

Transportation Demand Management (TDM) Strategies:

Transportation Demand Management increases the efficiency of transportation systems by shifting trips from single-occupant vehicles (SOV) to non-SOV modes, or from peak to non-peak periods. TDM seeks to reduce auto trips by increasing travel options, encouraging individuals to modify their travel behavior, or reducing the need for travel through efficient land uses. TDM programs often cost little while yielding high impacts, and are typically implemented by employers or public agencies, or via public-private partnerships.

This section provides a summary of TDM strategies for consideration as applies to the Falls Legacy Project Development Strategy and future citywide demand management initiatives. Strategies were selected based on the development potential at the site, applicability to Oregon City and direction provided by Oregon City project and design team staff. The following strategies, as well as others, are presented as an introduction to TDM and used to facilitate/create a customized implementation timeline for prioritized projects/programs/services specific to the Willamette Fall Legacy Project site. Summary of TDM Best Practices Categories

TDM Industry Best Practices	
Transit Connectivity and Frequency	🚌
Transit Incentive Programs	
Bicycle Infrastructure and Access Network	🚴
Carsharing Services	🚗
Walkability and Wayfinding	🚶
Transportation Management Association (TMA)	👥

Transit Connectivity and Frequency

Growth in employment and tourism at the Willamette Falls Legacy Project site will necessitate better connections to the regional transit network. Transit infrastructure likely cannot be provided through the project itself, and will require discussions and planning among the developers, Oregon City, Metro, and TriMet. At present, connections to transit service are not strong, with the transit center located at the eastern end of the downtown. Improved connections and frequencies between the transit center and the site could significantly augment other supportive TDM strategies that might include transit subsidies/incentives, parking pricing and right sized parking.

The following bus routes currently serve the transit center:

- 32-Oatfield
- 33-McLoughlin
- 34-River Rd
- 35-Macadam/ Greeley
- 79-Clackamas/ Oregon City
- 99-McLoughlin Express
- 154-Willamette

Opportunities	Challenges
Proximity to McLoughlin and Transit Hub. Extension of the 33 line along Main Street (DKS recommendation).	One access road to site (Main Street).

Transit Incentive Programs

Incentive programs are generally implemented at the local level by transit providers or individual employers, or through Transportation Management Associations (TMAs). The most common incentive is a discounted fare program. For example, TriMet's Universal Pass offers unlimited use of regional transit services at a highly discounted rate for employees whose employers purchase the program. The feasibility of such programs and their impact on parking demand are heavily influenced by both the amount of available parking and the out-of-pocket cost of transit versus the cost of parking for a similar trip.

Opportunities	Challenges
♦ Formation of TMA through development.	♦ Lack of high-quality transit lines currently.
♦ Downtown Business Association could potentially help coordinate an incentive program.	♦ Uncertain of employer/employee numbers.

Bicycle Infrastructure and Access Network

Successful programs to reduce auto trips through increased bicycling generally include four components:

(1) Safe access through the public right-of-way.

This includes bike lanes, sharrows and other networks of public right-of-way access that ensure a reasonable means of using bikes in a manner that connects users to local and regional origins and destinations. The Willamette Falls Legacy Project will need to evaluate how bikes are linked to adjacent areas and how bikes can access the site from external locations.

Opportunities	Challenges
♦ Create a shared street design (DKS recommendation).	♦ Auto speeds along McLoughlin.
♦ Multi-use path implementations.	♦ Narrow streets & sidewalks.
♦ Multi-modal mixed use designation.	♦ Very unsafe (28 crashes in past 5 years at Main & McLoughlin intersection).
♦ Extension of Water Avenue (DKS recommendation).	♦ Few safe bike/pedestrian crossing across McLoughlin.
♦ Implement of hawk signal at McLoughlin & 6th.	
♦ Bike/Ped bridge over McLoughlin (in TSP).	

(2) Safe and secure bike parking at the destination

Bicyclists should feel that they can access their destinations as conveniently as someone arriving by car. On-site bike parking should be tailored for both commuter and visitor bike trips, and may include ground or wall racks, lockers, or bike hubs, conveniently located and adequate to demand. Existing bike parking requirements may need to be reevaluated.

(3) On-site bike/pedestrian amenities

Amenities may include shower and locker facilities for commuters as well as bike repair stations.

(4) Information and incentives

Bike trips can be encouraged and supported through incentive programs as well as outreach and communications that inform users on how to access the site—e.g., trip planning, maps, website, etc.

Opportunities	Challenges
♦ TDM welcome packets to employees	♦ Bike/pedestrian-friendly infrastructure to encourage non-auto travel
♦ Wayfinding & information kiosks	

Carsharing

Carsharing programs provide access to a fleet of centrally owned and maintained vehicles located near homes, workplaces, or transit hubs. Members typically reserve shared vehicles for a specific timeframe and pay for use through some combination of hourly, overhead, and mileage-based rates

Carsharing offers compelling TDM and parking management benefits. By distributing the fixed costs of car ownership across the marginal cost of every trip made, carsharing reduces the total number of trips made by participants. By offering an alternative to individual ownership, carsharing contributes to lower ownership rates. By increasing the number of users per vehicle and encouraging more frequent use throughout the day, carsharing reduces parking demand while preserving the convenience and flexibility of automobile use.

In the Portland metropolitan area, services such as ZipCar, Car2Go, ReachNow, Turo, and Getaround are options to explore. For the Willamette Falls Legacy Project, carsharing programs could be offered through individual businesses, the property owner, or a Transportation Management Association (see Item 6 below). Some municipalities and developers own and operate their own carsharing service for residents through Turo or Getaround, which provide software, insurance, and customer support services.

The Willamette Legacy Falls Project development team could work with carsharing companies to provide services by reserving parking spaces in prime locations for carsharing vehicles. There are opportunities for collaborating with these companies on discounted introductory memberships for residents and businesses.

Opportunities	Challenges
♦ Partnerships with carsharing companies.	♦ Car2Go's boundaries do not extend to Oregon City.
♦ Developer or business could potentially own and operate local carshare program.	♦ Need density for the system to work.

Walkability and Wayfinding

Better pedestrian environments, including good signage and wayfinding, are essential to encouraging walking. The Willamette Falls Legacy Project will need to enhance pedestrian connections to transit, the historic downtown, and the water.

Opportunities	Challenges
◆ Unique branding opportunity on signage to create on-site circulation, as well as directing people to and from destinations.	◆ Competing transportation options-friendly infrastructure (e.g., signage, messaging, etc.).

Transportation Management Association (TMA)

A Transportation Management Association, as outlined in the *Transportation Demand Management Encyclopedia* (Victoria Transport Policy Institute, 2010), is a nonprofit, member-controlled organization that provides transportation services in a particular area, such as a commercial district, mall, campus, industrial park, or transportation corridor. A TMA's particular focus is on more efficient use of transportation and parking resources to improve access and support economic development. It is generally a public-private partnership, consisting primarily of area businesses with local government support. For the most part, TMAs form as 501(c)(4) or (6) organizations under Federal nonprofit statutes.

TMAs in the Portland metropolitan area include Go Lloyd, Explore Washington Park, South Waterfront TMA, and the Central Eastside Transportation and Parking Management Association, all in Portland, and the Westside Transportation Alliance in Washington County.

A TMA framework can create economies of scale, leverage, and equity, and enable smaller entities to provide trip-reduction services comparable to those offered by large entities. TMAs build partnerships and community within defined boundaries, which allows them to be proactive rather than reactive to transportation concerns. TMA services can include:

- Access management
- Advocacy
- Education and outreach
- Flextime support for employees
- Emergency Ride Home programs
- Incentive and reward programs

- Individualized trip-planning services
- Marketing and promotion
- Parking management
- Pedestrian and bicycle planning
- Rideshare matching and vanpool coordination
- Shared parking coordination
- Shuttle services
- Telework support
- Transit fare products and incentives
- Transit improvements
- Transportation access guides

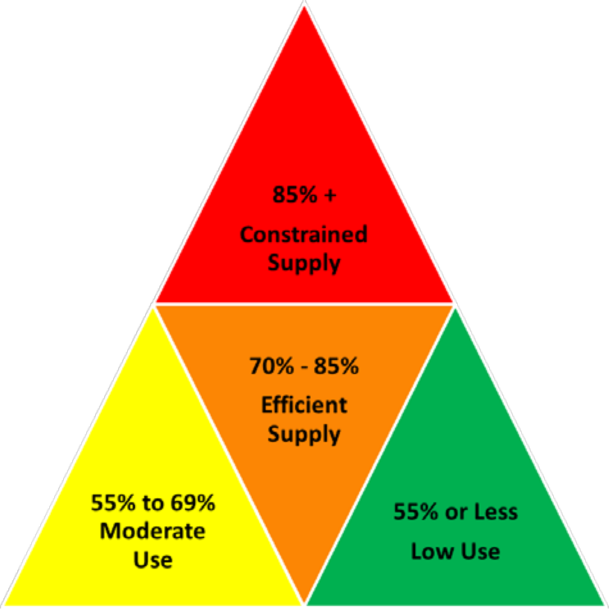
The Willamette Falls Legacy Project could be greatly facilitated by a TMA, particularly if such an organization included a partnership with the downtown, possibly through the Downtown Oregon City Association.

Opportunities	Challenges
♦ TMA could be supported through a shared LID/BID mechanism to grow with the community's needs.	♦ Creating ongoing public and private partnerships to leverage for TDM success.

Parking Management Strategies

Parking Management encourages more efficient use of parking facilities, reduces parking demand, and shifts travel to non-SOV modes. Smart management of parking helps ensure access to businesses and attractions and supports neighborhood vitality.

The availability of free or inexpensive parking is cited as a key factor in choosing to drive a personal auto rather than travel by another mode. In addition, free or inexpensive parking is often abused by long-term parkers who occupy valuable spaces at the expense of short-term parkers.



Parking demand that exceeds supply leads to the common phenomenon of circling—cars going around and around the area searching for parking, leading to congestion and delay. Several recent studies show that circling accounts for between 30% and 45% of all traffic in dense urban districts.

Parking Management strategies include:

- Shared Parking/Park Once
- Parking Ratios (Minimums and Maximums)
- Parking Districts
- Timed Parking
- Priced Parking
- Monitoring of Parking Occupancy and Turnover
- Parking Enforcement
- Unbundling Parking
- Residential Parking Permits
- Bicycle Parking
- Electronic Parking Guidance Systems
- Parking Lot/Garage Design and Placement

Shared Parking/Park Once

Shared Parking/ Park Once seeks to shift parking into shared public facilities rather than a proliferation of dedicated accessory lots, reducing the volume of parking and vehicle trips as well as the number of curb cuts on sidewalks. It allows people to park their car once and move throughout an area on transit or on foot.

This strategy can be accomplished by brokering shared-parking agreements among private lot owners[1] or through construction of public facilities in areas of dense, mixed land uses. Overall, shared parking creates an efficient parking system, allows for denser development, and reduces the amount of land required for parking.

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[1] Shared parking agreements are typically established in conjunction with new development. However, they can also be established when an existing development is redeveloped or changes use. Shared-parking agreements can be formal and documented in the deed, lease, or contract as required by city code, or informal.

Opportunities	Challenges
♦ A shared facility could allow for efficient, centralized parking that is less burdensome than individual on-site parking and lowers development costs.	♦ Determining applicable funding mechanism and shared-use agreements.

Parking Ratios (Minimums and Maximums)

Parking ratios are used to determine the minimum number of stalls needed to support new development and the maximum number of stalls allowed. Parking minimums ensure that developers provide enough parking to satisfy peak demand, while parking maximums ensure that developers do not overbuild parking. Oregon City currently has parking minimums and maximums as described in Title 17 of the municipal code (17.52.020).

As the Willamette Falls Legacy Project evolves, the City and project partners should evaluate current parking requirements to ensure that the supply of parking meets the project's needs.

Parking Districts

Parking districts can include permit programs, meters, and other programs to manage parking demand, and may place restrictions on who can park, when they can park, and for how long.

The most common types of parking districts are residential and commercial districts where parking is managed through permits and/or pricing. Priced parking and parking permits are described below. Parking benefit districts dedicate net revenue from the sale of permits or from meters to improvements such as pedestrian/bicycle amenities, information systems, or new parking supply. Parking benefit districts can also be a source of ongoing support for TDM programs (see TDM Strategies section).

Parking benefit districts are in place in Portland's Lloyd, Central Eastside, and Northwest Parking Plan districts. Revenue is shared with stakeholders, generally through a TMA format, and invested directly in transportation programs and infrastructure. Examples of investments made by Parking Benefit Districts are:

Timed Parking

Timed parking limits the amount of time a vehicle can remain in a parking space. It requires signage and enforcement to ensure that regulations are followed. Limits of 15 minutes to one hour should be used only in areas where land uses require high levels of turnover; otherwise, these shorter limits do not provide sufficient time for visitors and patrons of local businesses. Longer time limits between two and eight hours should be used in areas that require longer stays for visitors and employees.

Priced Parking

Priced parking charges motorists fees for using parking facilities. Priced parking programs can be used to manage parking demand, recover the cost of construction, and generate revenue for TDM programs and TMAs. Priced parking is already in place in the Oregon City downtown.

Priced parking is often difficult to implement, and may require a political process to transition an area from free to paid parking. However, when high demand, low turnover, and generally poor parking conditions exist, it is often the most effective way to change travel behavior, manage the available parking supply, and support alternative travel modes. The fact that pricing is already in place in the downtown supports employing a similar strategy for the Willamette Falls Legacy Project. This would create a seamless transition between areas and support TDM programs and measures to increase use of alternative modes.

Monitoring of Parking Occupancy and Turnover

Monitoring the performance of the parking system will ensure that it continues to meet the needs of its users. Monitoring programs typically involve the collection of parking data on a routine basis. Using locally derived data provides the most accurate information on parking use and need.

Monitoring programs need not be elaborate, but they should be consistent, routine, and structured to answer relevant questions about occupancy, turnover, duration of stay, patterns of use, and enforcement. A methodology for collecting and analyzing parking data is provided in *Parking Made Easy: A Guide to Managing Parking in Your Community*.

The City has already collected parking data on its downtown as part of this project. Information from that study will inform ideas, strategies, and programs for the Willamette Falls Legacy Project.

Parking Enforcement

Parking enforcement often carries a negative connotation, but when performed properly it can manage demand, improve turnover, deter habitual offenders, and improve the efficiency of the entire parking system. Proper enforcement should be focused on education and promoting behavioral change, rather than generating additional revenue.

Enforcement systems already in place in the downtown can be expanded as appropriate to the Willamette Falls Legacy Project site.

Unbundling Parking

Unbundling parking separates the cost of a parking space from the cost of a building lease or purchase agreement, often for residential or commercial uses. It monetizes the parking space, allowing tenants to pay only for the parking they need.

Requiring new developments at the Willamette Falls Legacy Project site to unbundle parking would likely necessitate changes to the municipal code. Such a requirement could also be negotiated as a part of a larger master plan or development agreement for the site.

Unbundling parking is an equitable way of distributing parking resources. It promotes alternative mode choices by equalizing the cost of parking and other modes, and reduces parking demand and vehicle miles traveled.

Residential Parking Permits

Residential parking permit programs work to distribute parking resources across a variety of users, primarily residents and commercial visitors and employees. Such programs allow permit holders to park on-street in residential areas and limit the stays of non-permit holders (e.g., employees and visitors) during enforcement hours. They are particularly effective in areas where commercial development creates parking overflow in residential neighborhoods. This could become an issue with the Willamette Legacy Falls Project, as growth in the number of employees and visitors may impact adjacent residential areas.

Bicycle Parking

Bicycle parking facilities provide safe and secure places for people to park their bikes. Bicycle parking is critical to promoting bicycling as a viable transportation option.

Bicycle parking is already required for new development in Oregon City's municipal code (17.52.040). These requirements may need to be reevaluated given the Willamette Falls Legacy Project's vision for attracting a high number of visitors and supporting increasing use of non-auto modes. Biking will be a key component of this vision.

Electronic Parking Guidance Systems

Electronic Parking Guidance Systems direct motorists from main access roads to parking facilities with available spaces. Information for a specific facility or for a defined area is displayed on signs, and may also be presented via phone, internet, or in-vehicle navigation systems. These systems are sometimes called Dynamic Parking Guidance Systems, as the numbers change every few minutes. This strategy reduces traffic, which leads to a reduction in emissions, fuel consumption and wasted time. It promotes better use of parking capacity and can direct parking traffic onto dedicated roads.

Such systems, provided at the front end of development, can effectively distribute traffic within the Willamette Falls Legacy Project site, but also offer the opportunity to link the site to parking resources in the larger downtown. For more information on these types of systems, see the SF*park* Technical Manual. http://sfpark.org/resources/docs_techmanual/

Parking Lot/Garage Design and Placement

Design standards for parking facilities can help to ensure that off-street parking will accommodate access and circulation while meeting the needs of the development. Placement standards can help to ensure that facilities do not impact existing or future development, or the sharing of parking between developments. Both standards can also help to ensure that parking facilities meet the aesthetic vision of the community.

Oregon City's current code focuses on design, placement, and landscaping of surface lots (17.52.060) but does not address the development of garages. Guidance on exterior design, access points, integration with other modes, shared parking, and ground-floor active uses is lacking. All elements of the City's code for parking facility design and location should be reevaluated to ensure that off-street parking facilities will be designed appropriately, will accommodate vehicle access and circulation, and are placed to optimize land-use efficiency.

V. APPROACH

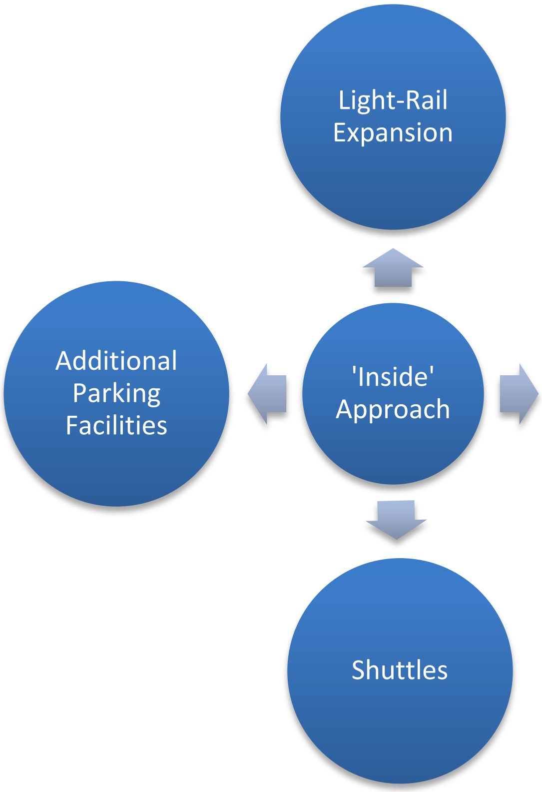
An "Inside/Outside" methodology was used to prioritize TDM and parking management strategies and create a timeline to inform decision-making and implementation.

The Inside/Outside methodology aims to maximize existing infrastructure through easy-to-implement programs, services, and projects, building on what municipalities already have "inside" their City. Stakeholders also mentioned the desire to implement strategies based upon development plans. Without a more concrete timeline and land use plan, a rigid TDM plan is difficult to determine. A key aspect of this plan is its emphasis on flexibility based on many factors including by not limited to:

- Land use development (residential vs. commercial needs)
- Local/Regional capital improvement projects (99E improvements, local street improvements)
- Downtown parking operational/management changes (time stays, permit zones, rates, etc.)
- Local transit changes (bus lines)

After "inside" strategies are implemented, "outside" TDM and parking management strategies should be explored. These are often costlier, longer-term projects requiring outside funding sources and partnerships. Examples include major capital improvements such as transit expansion and regional bicycle/pedestrian connections, and links to remote infrastructure like shuttles or additional parking facilities.

The diagram below graphically illustrates the "Inside/Out" approach.



VI. RECOMMENDATION STRATEGIES

Guided by the Inside/Outside approach and industry best practices, stakeholders prioritized the TDM and parking strategies, into near, mid and long-term solutions. Likely strategies were categorized into theme areas (i.e. Pedestrian, Information & Options, Parking, Bicycle, Transit). Additional strategies were added by stakeholders. The implementation of strategies is not meant to be completed step-by-step in order, rather the strategies work to complement each other and can be implement based on need and/or opportunities. However, the near-term strategies must be completed before the mid and long-term strategies can be effectively implemented, again reinforcing the 'inside/outside' approach.

Strategy Summary Table

	Strategy	Category	Timeline	Page
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2	Develop Ongoing Monitoring Data Collection Plan	Coordination	Near-Term	21

	Strategy	Category	Timeline	Page
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4	Develop Needs Inventory of Walking and Bicycling Infrastructure	Walking & Bicycling	Near-Term	21
5	Walking & Bicycling Infrastructure Action Plan	Walking & Bicycling	Near-Term	22
6	Wayfinding Action Plan	Info	Near-Term	22
7	Coordination with Tourism Groups	Coordination	Near-Term	22
8	Coordinate with Downtown Oregon City Association (DOCA)	Coordination	Near-Term	23
9	Shared Use Parking Agreements with Private Owners of Off-Street Supply	Parking	Near-Term	23
10	Enhance/Expand Existing Residential Parking Program (RPP)	Parking	Near-Term	23
11	Price Parking to Demand-Tiered Rate Systems for On and Off-Street Public Supply	Parking	Near-Term	24
12	Extend Bus Service from Existing Downtown Transit Center Closer to the Site	Transit	Near-Term	24
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Mid-Term Strategies				
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15	Improve Bicycling Infrastructure	Bicycling	Mid-Term	25
16	Identify Potential Remote Parking Sites to Support Future Shuttle Opportunities	Transit	Mid-Term	26
17	Customer Validation Program	Parking	Mid-Term	26
18	Calm Traffic On 99E	Walking	Mid-Term	26
19	Explore Formation of a Transportation Management Association (TMA)	Coordination	Mid-Term	27
20	Shuttles	Transit	Mid-Term	27
21	Private Development Onsite Implement TDM Tools	Info & Options	Mid-Term	27
22	Improve Information Technology	Info & Options	Mid-Term	28

	Strategy	Category	Timeline	Page
Long-Term Strategies				
23	Build Parking Garage	Parking	Long-Term	29
24	Extend High Capacity Transit (HCT) Line to Oregon City	Transit	Long-Term	29
25	Water Taxis	Transit	Long-Term	29
26	Bikeshare Program	Bicycling	Long-Term	29
27	Form a TMA	Info & Options	Long-Term	30

Near-Term Strategies

The following near-term strategies (immediate – 4 years after opening) focus on creating a baseline for ongoing monitoring, management and implementation of TDM strategies. The projects/programs aim to target 'low-hanging fruit', in other words, transportation options solutions that focus on simple changes that can be implemented in the near future.

Near Term Strategies	
1. Centralize Coordination and Implementation of the TDM Plan	
Rationale	Most strategies require ongoing monitoring, especially measurement of onsite parking usage, parking pricing, walking and bicycling access improvements, off-site parking and shuttle programs, residential parking permits, and hours of parking enforcement.
Priority	#1
Effectiveness	****
Relative Cost	$
Triggers	Plan approval/adoption. Within six months of plan adoption, designate a single staff person responsible for plan implementation.
Implementation steps: ▪ Designate a single staff person (TDM manager) responsible for plan implementation. ▪ Establish a representative TDM access plan implementation. ▪ Advisory committee to be charged with assisting in the coordination and implementation of the TDM plan ▪ Initiate routine meeting schedule, provide consultant support as needed.	

Near Term Strategies

2. Develop Ongoing Monitoring Data Collection Plan

Rationale	Ensure stakeholder coordination and forward movement of TDM plan.
Priority	#1
Effectiveness	****
Relative Cost	$$
Triggers	Plan approval/adoption.

Implementation steps:

- Review existing monitoring methods and determine what is missing (approach, level of detail).
- Include as an annual or biannual budget item.
- Identify stakeholders who can provide paid or volunteer support for data collection tasks.
- Identify staff to own and manage project.
- Determine appropriate schedule.
- Hire consultants as needed.

3. Provide Interim Onsite Parking (Pay to Park)

Rationale	Provide limited onsite parking opportunities to promote transportation options but still accommodate vehicle trips.
Priority	#1
Effectiveness	***
Relative Cost	$$$
Triggers	Opening day of Riverwalk.

Implementation steps:

- Evaluate code provisions to allow for interim conditional use of commercial parking (non-accessory) at the site.
- Identify location of interim parking (parcel or existing building) on site.
- Initiate necessary improvements (e.g., paving, striping, lighting, signage, pay stations)
- Initiate operations.

4. Develop Needs Inventory of Walking and Bicycling Infrastructure

Rationale	Need to improve access for people walking and biking. First need an inventory to identify top projects.
Priority	#1
Effectiveness	****
Relative Cost	$$
Triggers	Plan approval/adoption

Near Term Strategies

Implementation steps:

- Review existing city inventories to date for downtown area.
- Hire consultants and solicit volunteer help as needed.
- Develop report on existing conditions, identifying sidewalk, connectivity, ADA, signage, lighting and other barriers to a walkable, connected environment through site and between site and other downtown destinations. Review and provide a priority list for implementation.

5. Walking & Bicycling Infrastructure Action Plan

Rationale	Improve safe access and multimodal connections. Beneficial to existing Downtown.
Priority	#1
Effectiveness	****
Relative Cost	$$
Triggers	Plan approval/adoption

Implementation steps:

- Finalize an action plan for addressing barriers and recommended improvements in the existing conditions report, including estimated costs and potential funding sources/processes.
- Ensure plan is regional in scope and takes advantage of nearby trails such as the Trolley Trail.
- Present Action Plan to City Council for review and approval.
- Work with affected City divisions and TDM Manager to coordinate and prioritize projects with internal planning and funding.

6. Wayfinding Action Plan

Rationale	Improve wayfinding for people walking and bicycling, especially connections to elevator.
Priority	#1
Effectiveness	**
Relative Cost	$
Triggers	Opening day of Riverwalk

Near Term Strategies

Implementation steps:

- Using the walking and biking needs inventory plan, develop a plan to improve wayfinding system.
- Coordinate and partner with stakeholders currently investing in wayfinding downtown (DOCA, Tourism, Public Works, ODOT etc.).
- Develop a list of downtown destinations to be used in wayfinding signage that can be located at the elevator and repeated at strategic locations throughout the downtown.
- Procure funding to pay for plan and signage installation.
- Design signs in-house or with a firm.
- Periodically review/refine/augment the list of destinations and keep signs updated and relevant.

7. Coordination with Tourism Groups

Rationale	As the site develops, ensure visitor access is well coordinated and efficient.
Priority	#2
Effectiveness	**
Relative Cost	$$
Triggers	When on-site parking is over 85% occupancy and there is overflow ro nearby streets, OR when additional development on-site generates a significant number of new trips.

Implementation steps:

- Engage with Tourism Plan project now and continue to integrate plan goal and strategies.
- Engage with Mt. Hood Territory organization and local tourist destinations.
- Identify shared needs and goals; identify opportunities for collaboration and coordination especially around large events.
- Continue wayfinding and online resources website coordination.

8. Coordinate with Downtown Oregon City Association (DOCA)

Rationale	Creating useful and up-to-date information by coordinating with the Downtown Association is necessary and will benefit both destinations.
Priority	#2
Effectiveness	***
Relative Cost	$
Triggers	Opening day of Riverwalk

Near Term Strategies

Implementation steps:

- Set up a plan with DOCA and relevant stakeholders to identify common goals and opportunities for collaboration.
- Hold regular meetings with DOCA and stakeholders for information sharing and to monitor programs and initiatives.
- Consider DOCA position on the TDM Access Plan Implementation Committee to act as a liaison between the City's TDM effort and the Main Street association.

9. Shared Use Parking Agreements with Private Owners of Off-Street Supply

Rationale	Facilitate shared-use parking agreements for existing off-street private parking lots	🚗
Priority	#1	
Effectiveness	***	
Relative Cost	$	
Triggers	Begin process now, implement when off-street parking occupancy is regularly above 85%.	

Implementation steps:

- Evaluate and possibly amend code provisions to ensure that shared-use non-accessory parking is or becomes an allowed use downtown.
- Use data from the 2016 parking study to identify facilities that could serve as shared-use "opportunity sites." Criteria could include proximity to downtown, a meaningful supply of empty stalls, pedestrian/bike connectivity, walk distance/time, safety and security issues, etc.
- Based on the above, develop a short list of opportunity sites and identify owners.
- Establish a target goal (number) of downtown employees to transition into opportunity sites.
- Through DOCA, begin outreach to owners of private lots.
- Negotiate shared-use agreements through DOCA or an appropriate private entity.
- Obtain agreements from downtown businesses to participate in employee assignment program.
- Incorporate program information, including identified shared-use lots, on the resources website.

10. Enhance/Expand Existing Residential Parking Program (RPP)

Rationale	Expand the residential permit program to manage on-street parking in residential neighborhoods.	🚗
Priority	#2	
Effectiveness	***	
Relative Cost	$$	

Near Term Strategies

Triggers	When parking occupancy in upper neighborhoods is above 85% and/or the neighborhood requests such a program.

Implementation steps:

- Begin conversation on current protocols and processes related to existing RPP. Provide a revised outreach packet for neighborhood education.
- Reaffirm and/or revise current protocols to limit RPPs to block faces zoned Residential.
- Consider implementing a monthly or annual fee for residential permits to provide support for administration of RPP program and stronger localized enforcement.
- Implement revised program**.**

11. Price Parking to Demand-Tiered Rate Systems for On and Off-Street Public Supply

Rationale	Ensure that on- and off-street parking stalls are priced to efficiently distribute demand and encourage use of transportation options.
Priority	#1
Effectiveness	****
Relative Cost	$
Triggers	When parking occupancy is above 85%

Implementation steps:

- Evaluate distribution of parking demand in downtown per 2016 parking study.
- Conduct demand analysis of Bluff parking.
- Re-calibrate on-street parking to demand using the 85% occupancy standard.
- Consider pricing on commercial streets on Bluff, coordinated with residential permit parking re-evaluation.
- Review pricing of existing City off-street permit program to ensure market pricing of off-street permits.
- Provide outreach to visitors and business owners on benefits of demand pricing.

12. Extend Bus Service from Downtown Transit Center to the Site

Rationale	Extend bus service to the site. The current stop is too far for most people to conveniently walk.
Priority	#2
Effectiveness	***
Relative Cost	$$
Triggers	Opening day of Riverwalk

Near Term Strategies

Implementation steps:

- Begin discussions with TriMet.
- Identify location for bus stop.
- Implement necessary infrastructure (striping, shelter, signage).
- Launch service change.

13. Create Resource Website

Rationale	Create online information resource website outlining transportation options, routes, links, etc.
Priority	#1
Effectiveness	***
Relative Cost	$$
Triggers	Opening day of Riverwalk

Implementation steps:

- Convene a group of stakeholders to identify target audiences and key information.
- Develop a list of transportation resources for employers, employees, and visitors.
- Identify and procure funds for website development and maintenance.
- Link to social media to keep it fresh.
- Promote launch of website and find influential stakeholders and community leaders to drive traffic to the site.
- Regularly monitor and evaluate the site's information and usability.

Mid-Term Strategies

Mid-term strategies present a mix of infrastructure improvements and program management solutions for both TDM and parking. These strategies require a bit more time, coordination and, in some cases, funding; therefore, developing them may take more time and resources.

Mid Term Strategies

14. Improve Pedestrian Infrastructure

Rationale	Increase the number of visitors accessing the site on foot, improve safety and comfort for people walking
Priority	#2
Effectiveness	***
Relative Cost	$$
Triggers	Approval of the Walking & Biking Action Plan

Mid Term Strategies

Implementation steps:

- Using the inventory and needs plan, prioritize projects that improve pedestrian access: additional wayfinding signage, improved crossings, pedestrian scale lighting, etc.
- Review TSP for previously identified pedestrian infrastructure projects.
- Pursue funding.

15. Improve Bicycle Infrastructure

Rationale	Increase the number of bike lanes, paths, bike parking, etc.
Priority	#2
Effectiveness	***
Relative Cost	$$
Triggers	Completion of needs inventory

Implementation steps:

- Using the inventory and needs plan, prioritize projects that improve bicycle access: add bike parking, repaint sharrows, improve wayfinding and crossings, etc.
- Review TSP for previously identified bicycle infrastructure projects.
- Identify funding.

16. Identify Potential Remote Parking Sites to Support Future Shuttle Opportunities

Reason(s)/ Rationale	Work with neighboring West Linn government and businesses to ensure successful multi-modal routes and efficient parking
Priority	#2
Effectiveness	**
Relative Cost	$
Triggers	On-site and downtown parking exceeds 85% with new tiered pricing implemented

Implementation steps:

- Identify opportunity sites (e.g., West Linn, Oregon Trail Interpretative Center, Clackamette Park, Amtrak station, etc.)
- Assess actual parking use at sites to determine whether surpluses are available.
- Evaluate code provisions to allow for commercial parking (non-accessory) at opportunity sites.
- Engage property owners in agreements for use.

Mid Term Strategies

17. Customer Validation Program

Reason(s)/ Rationale	Encourage longer-term parking off-street as site/downtown develop
Priority	#1
Effectiveness	**
Relative Cost	$$
Triggers	When off-street parking remains under-used but on-street occupancies are above 85%

Implementation steps:

- Convene businesses to determine validation program parameters.
- Conduct research on best practices of validation programs.
- Through DOCA on behalf of the Implementation Committee, draft agreements on how much and how businesses will refund the city's parking fees.
- Draft marketing materials and conduct focus groups on best messaging techniques.
- Plan a program roll out media event.
- Regularly monitor program effectiveness with DOCA, businesses, etc.

18. Calm Traffic on 99E

Rationale	Vehicular traffic is felt to be unsafe for pedestrians
Priority	#1
Effectiveness	**
Relative Cost	$$
Triggers	Development of projects addressed in CP 14-02, or when funding is acquired for TSP street-calming projects downtown

Implementation steps:

- Implementation of CP 14-02 safety projects: A. Tunnel improvements at 99E, B. Railroad realignment at 99E, C. Right in and right out at 99E and Water Ave.
- Coordinate with Oregon City Public Works and ODOT on proposed and planned Transportation System Plan (TSP) projects in the downtown that support pedestrian comfort and safety.

19. Explore Formation of a Transportation Management Association

Rationale	Incentive programs encourage people to use transportation options.
Priority	#1
Effectiveness	****

Mid Term Strategies

Relative Cost	$$
Triggers	Significant development on-site and in downtown and/or continued parking contraints.

Implementation steps:

- Have TDM Implementation Committee work with DOCA, property owners, and the City to identify concerns and goals for a possible TMA.
- Conduct Business Improvement District feasibility study to be a primary funding source for the TMA.
- Research other TMAs.
- Identify project champions and empower them to lead the charge.

20. Shuttles

Rationale	Encourage a "park once" philosophy.
Priority	#1
Effectiveness	***
Relative Cost	$$$
Triggers	When on-site parking is over 85% occupancy and there is overflow to nearby streets, OR when additional development on-site generates a significant number of new trips.

Implementation steps:

- Research other shuttle programs (e.g., Explore Washington Park, BUZZ Bus in Palm Springs, Columbia River Gorge Express).
- Reach out to partners such as tourist locations (End of Oregon Trail Museum, DOCA, etc.) to gauge interest and explore possible funding opportunities.
- Identify possible routes and stop locations.
- Identify funding.
- Develop RFP for operators.
- Launch shuttle service with big media event.
- Monitor shuttle performance regularly.

21. Private Development Onsite Implement TDM Tools

Rationale	Provide incentives for employees and visitors to use alternate modes onsite and ensure full use of parking spaces
Priority	#2 & 3
Effectiveness	***
Relative Cost	$$$
Triggers	Approval of private development will require a TDM plan.

Mid Term Strategies

Implementation steps:

- Private development will provide proportional support to the TDM plan. Tools could include:
  - New employee welcome procedures explaining transportation options
  - Installing bike parking and changing rooms on-site
  - Discounted/subsidized or pre-tax transit passes for employees
  - Bike/walk bucks using the federal biking transit tax benefit program
  - Annual travel surveys of employees
  - Workplace challenges to raise awareness about options and "gamify" commuting.

22. Improve Information Technology

Rationale	Improve information technology infrastructure
Priority	#2
Effectiveness	***
Relative Cost	$$$
Triggers	Increased private development onsite. List can be developed in conjunction with shared use parking agreements and tiered parking pricing options.

Implementation steps:

- With TDM Manager, develop a list of technology applications that enhance the user experience and improve information delivery.
- Technology improvements could include:
- Pay by phone payment service
- License plate reading technology for enforcement
- Off-street sensors and real-time availability information via web and mobile apps.
- Evaluate list of technology applications for feasibility including cost, maximizing user coverage, return on investment, and ease of adoption.
- Prioritize list based on factors above.

Long-Term Strategies

Long-term strategies (10 – 20 years after opening) require the greatest amount of coordination, organization, and often, funding. Below are a number of strategies that may be applicable in the future as the Willamette Fall Legacy project is developed and as Oregon City continues to thrive.

Long Term Strategies

23. Build Parking Garage

Rationale	As the site becomes a popular destination, vehicle parking will become a concern	🚗
Priority	#1	
Effectiveness	***	
Relative Cost	$$$$	
Triggers	When new development on the site generates a significant number of additional trips.	

Implementation steps:

- Conduct market and feasibility study.
- Determine base parking rate to cover construction and operating cost.
- Identify possible locations.
- Develop pro forma for construction.
- Identify possible public and private funding sources.
- Develop RFP for operator and construction company.
- Monitor parking garage performance regularly and adjust rates.

24. Extend High Capacity Transit (HCT) to Oregon City

Rationale	Extend MAX Orange Line or Bus Rapid Transit to Oregon City	🚆
Priority	#2	
Effectiveness	***	
Relative Cost	$$$$$	
Triggers	When significant dense development generates enough trips to and from the Downtown area.	

Implementation steps:

- Oregon City continues role in regional planning for line extension.
- Collaborates with stakeholders, when needed to show support.

25. Water Taxis

Reason(s)/ Rationale	Create transit connections across the Willamette River	🚢
Priority	#2	
Effectiveness	**	
Relative Cost	$$$	
Triggers	Driven by outside investment in this mode (tourism or transportation based).	

Implementation steps:

- Build proposed boat dock onsite or provide shuttle service from Jon Storm dock.

Long Term Strategies

26. Bikeshare Program

Rationale	Create a bikeshare program to facilitate multi-modal transportation
Priority	#2
Effectiveness	**
Relative Cost	$$
Triggers	When additional dense mixed-use development on-site generates a significant number of new trips.

Implementation steps:

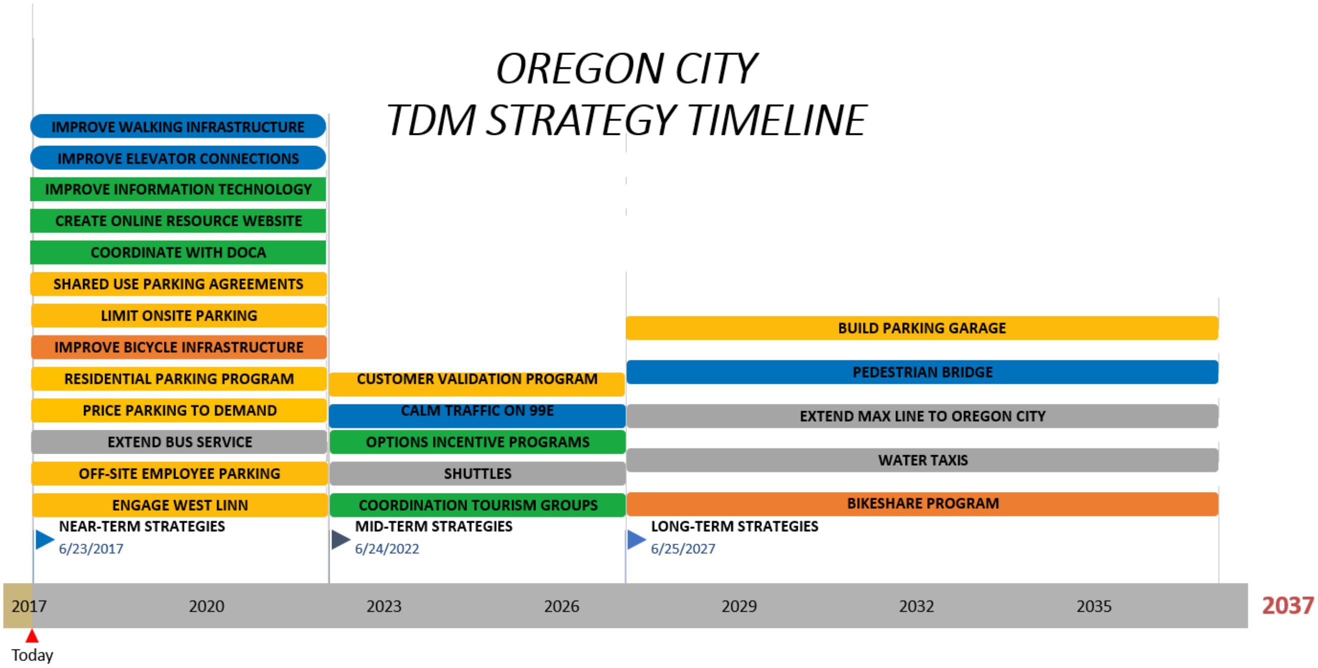
- Conduct feasibility study.
- Identify key partners (City, DOCA, tourist groups, etc.)
- Procure funding for planning (federal or regional grants, Bikeshare Foundation, etc.)
- Develop RFQ for bikeshare operator.
- Identify possible operators and negotiate contract.
- Work with operator to determine best funding mechanism and price structure.
- Work with operator to determine station locations.
- Procure necessary permits and/or agreement for station locations.
- Roll out marketing campaign and media event.
- Monitor program regularly.

27. Form a Transportation Management Association (TMA)

Rationale	Have a central organizing group responsible for implementing and monitoring transportation demand programs and access.
Priority	#2
Effectiveness	*****
Relative Cost	$$$
Triggers	When there is development on-site and continued strain on parking and transportation access.

Implementation steps:

- Use key findings from earlier feasibility study to develop strategy and work plan for a TMA, with timelines and milestones identified.
- Establish a Business Improvement District (BID) to fund TMA.
- Develop language to codify the BID.
- Recruit board members to oversee the TMA.
- Develop organizational framework, bylaws, goals, etc.



VII. TDM Strategies in Action

The following examples provide an overview summary of a Transportation Demand Management program put into practice, specifically shuttles, which the community expressed high support for through the public outreach process.

Shuttles

Shuttles can be very effective at moving people to destinations, especially popular sites such as Multnomah Falls in the Columbia River Gorge. They can, however, be expensive to operate and require both sufficient ridership demand and sustainable funding to be effective. The table below offers a few examples of shuttle programs in small cities and regional tourist destinations.

Shuttle Name -- Location	Operating Schedule	Funding Sources	Direct Operating Expenses
Columbia Gorge Express—Portland to Gorge, Oregon *Destination-based*	Pilot started in 2016 Seasonally (May-September)	A combination of: • Local and regional economic development	• $225,000 per season

Shuttle Name -- Location	Operating Schedule	Funding Sources	Direct Operating Expenses
	Friday, Saturday, Sunday only Hourly, 9am-7pm	funds (e.g. Travel Portland) • Federal Highway Administration funds • Friends of the Columbia Gorge and more • Passenger fare: $5 per person round-trip	
BUZZ Trolley–Palm Springs, California *Loop/Circulator* 	Started in 2014 Year round Thursday-Sunday Every 15 minutes from 11am-1am	• City sale & use tax passed for downtown revitalization purposes, 1% (Measure J) • Business sponsorship coming soon • Free rides to anyone	• $847,000 per year
Explore Washington Park Shuttle—Portland, OR *Loop/Circulator* 	Started in 2015 Seasonally April- October Weekends only 9am-7pm May-September Daily 9am-7pm Every 15 minutes	• On-site parking fees fund the TMA, Explore Washington Park. which operates and pays for the shuttle	• $330,000 per year

Shuttle Name -- Location	Operating Schedule	Funding Sources	Direct Operating Expenses
CCC Xpress Shuttle—Clackamas County Community College, OR *Destination-based* 	September-June Monday-Friday Every 15 minutes during peak, then every 30 minutes 6:45am-6:45pm		• $60 per Shuttle hour for 2 shuttles running daily, plus a 3rd shuttle during peak hours • $180,000 per school year

VIII. RECOMMENDATIONS

The Willamette Falls Legacy Project presents an opportunity to transform the Oregon City waterfront and write an exciting new chapter in the site's long history. Incorporating the valuable input of local stakeholders and guided by industry best practices, TDM and parking strategies provide an important set of tools with which to shape land use and infrastructure development for the betterment of the site and of Oregon City. General recommendations include:

TDM Management Plan Adoption:

- Adopt and actively manage the Oregon City Transportation Demand Management Plan to guide TDM and Parking Management strategies for the Willamette Falls Legacy site, as well as for Oregon City as a whole. Continue to collect data, coordinate with local and regional agencies and governments, and "right-size" parking.

Reactive to Opportunities:

- Use this document's strategies and recommendations not as a step-by-step prescription, but as a guide on how to react when changes occur or opportunities develop. Near-, mid-, and long-term strategies should be viewed as a set of tools to be used to when most beneficial for Oregon City, not as a chronological checklist.

Oregon City as a Whole:

- As the Willamette Falls Legacy Project evolves, TDM and parking solutions should complement and support the success of Oregon City as a whole.

IX. SUMMARY

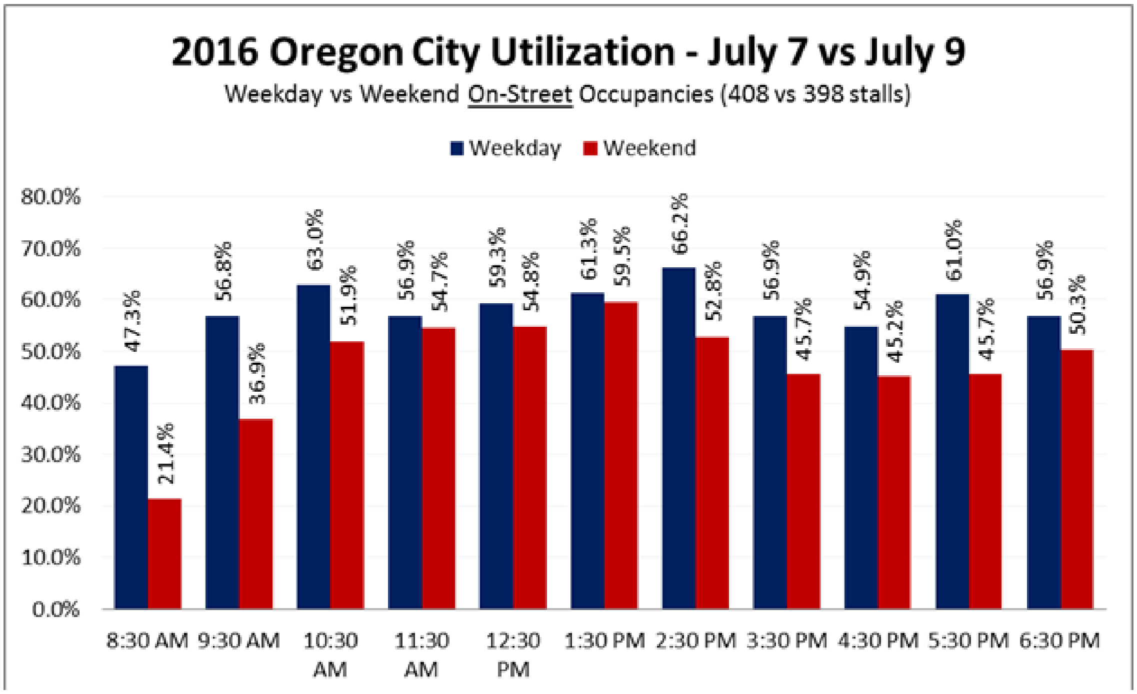
Development of the Oregon City Transportation Demand Management Plan blended local stakeholder input with industry best practices. The process yielded a list of strategies organized by category and prioritized for the near, mid and long terms. An Inside/Outside methodology was employed to create a logical progression for implementation of strategies based on existing infrastructure, programs, and projects. Incorporating these strategies will enhance the Willamette Falls Legacy Project and help establish Oregon City as a destination for visitors from throughout the region and beyond.

X. APPENDICES

Appendix I. 2016 Oregon City Parking Study

On-Street Findings:

2016 On-Street Parking



Key findings include:

Survey Period	Peak Occupancy (Peak Hour)
Peak Occupancy - Weekday	66.2% (2:00 – 3:00PM)
Peak Occupancy - Weekend	59.5% (1:00 – 2:00PM)

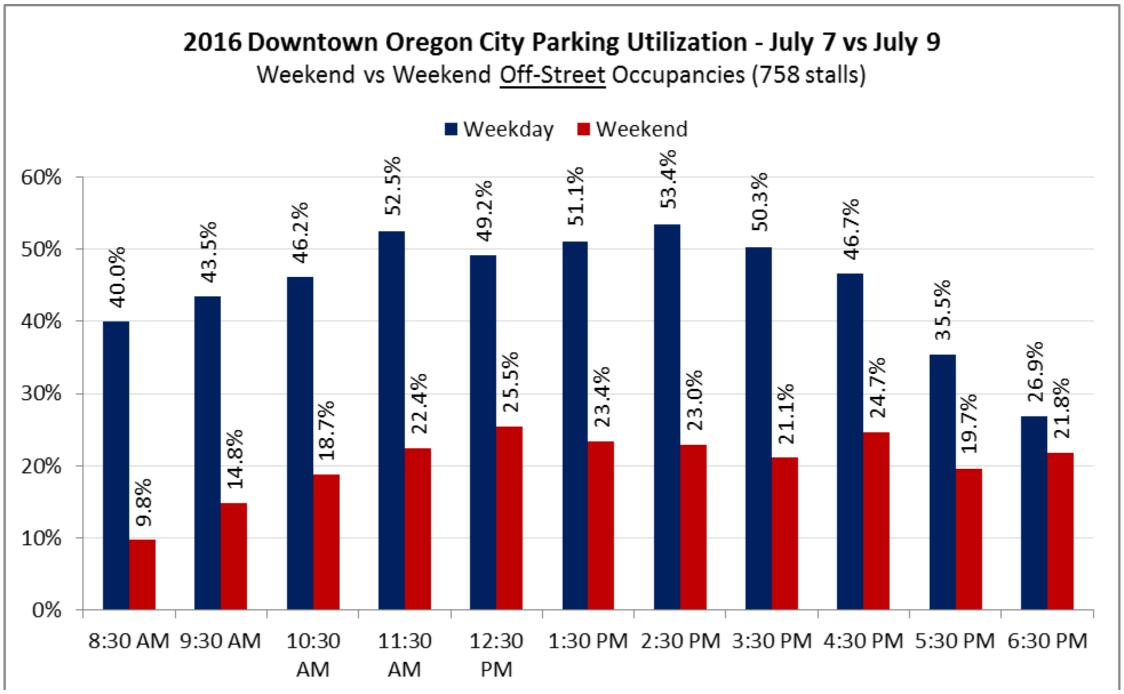
- The weekday peak hour is 2:00 to 3:00 PM, when occupancies reach 66.2%.
- The weekend peak hour is 1:00 to 2:00 PM, when occupancies reach 59.5%.
- Hourly occupancies are higher throughout the day on the weekday compared to the weekend.
- Hourly occupancies are substantially higher in the morning and late afternoon/evening on the weekday.

- Both the weekday and weekend show a small spike in the evenings after 4:00 PM, indicating that the downtown experiences a resurgence of activity at dinner time. The spike occurs earlier on the weekday (between 5:00 and 6:00 PM) than on the weekend (between 6:00 and 7:00 PM).

On-street parking in downtown Oregon City is efficient and occupancy levels are not constrained. Parking metrics indicate a vibrant downtown that is well managed through metering and enforcement. These characteristics will allow for increased parking demand from neighboring developments to be absorbed, and provide a sound baseline for on-street parking management as the downtown grows.

Off-Street Findings:

2016 Off-Street Parking



Key findings include:

Survey Period	Peak Hour Occupancy (Peak Hour)
Peak Occupancy - Weekday	53.4% (2:00 – 3:00PM)
Peak Occupancy - Weekend	25.5% (12:00 – 1:00PM)

- Weekday peak occupancy is 53.4% and occurs between 2:00 and 3:00 PM.
- Weekend peak occupancy is 25.5% and occurs between noon and 1:00 PM.

- Hourly occupancy rates are higher throughout the day on the weekday compared to the weekend.
- Hourly occupancy rates are relatively consistent on the weekday and taper off after 4:30 PM.
- Both weekday and weekend occupancy rates are not constrained and show ample room to absorb additional vehicles.
- At the weekday peak hour, 405 vehicles are parked, leaving 353 stalls empty. At the weekend peak hour, 193 vehicles are parked, leaving 565 stalls empty. Both days yield surplus space to which existing or new users could be directed.

The off-street parking supply is not constrained and, through shared-use agreements, can absorb additional vehicles throughout the week. These findings are particularly relevant as the Willamette Falls Legacy Project considers short- and long-term off-street parking facilities for the Riverwalk and related developments.

Appendix II. Stakeholder Engagement Summary

There were opportunities throughout the process for community members to provide feedback on this plan, both online and in person. There were three public meetings that acted as workshops, one open house, and two online surveys. Input from these was incorporated into the plan.

Meeting # 1 (April 26, 2017)

Challenges/Concerns

- Transit
    - No bus or transit access to site
    - No MAX connection
- Highway 99
    - High traffic speeds make it feel unsafe and unpleasant to walk or bike
- Pedestrian access & comfort
- Bicycle access & comfort
- Connection to Downtown
- Neighborhood parking overflow
- Lack of information or signage
- Constrained site generally

Tools/Ideas

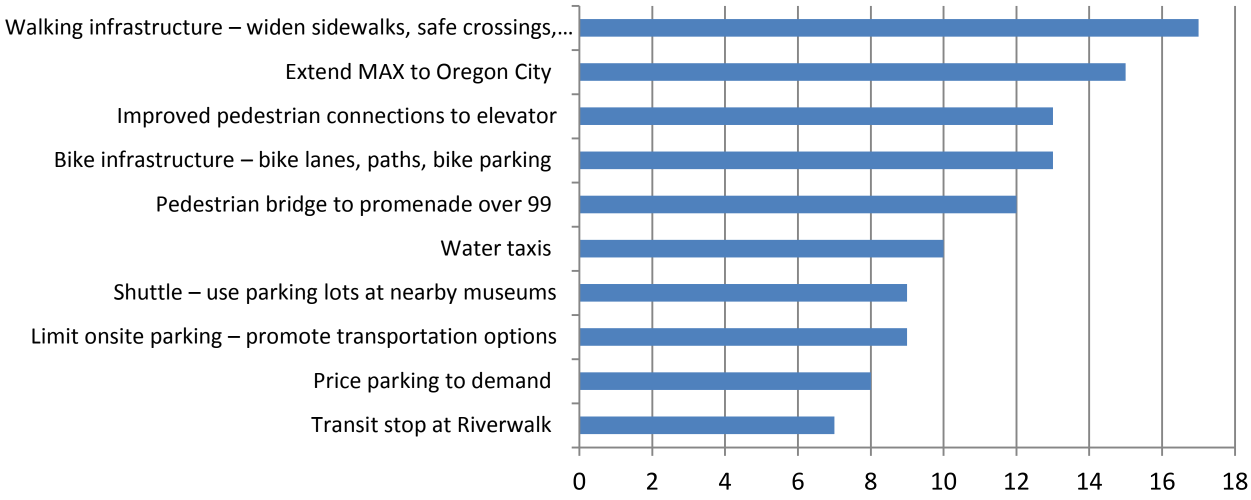
- Improve pedestrian access and comfort
    - Calm traffic on 99E
    - Pedestrian overcrossing
- Build/expand bicycle infrastructure
    - Bike lanes, paths, bike parking and wayfinding signage
    - Bikeshare or bike rental programs
- Think outside the box(car)
    - Encourage people to get there without driving, limit onsite parking
- River access
    - Water taxis
- Residential Parking Programs
    - Especially in McLoughlin and Canemah neighborhoods
- Shuttle service
- Coordinate tourist attractions and access
    - Use parking lots at nearby museums for a shuttle
- Traffic calming on Highway 99
- Smart parking pricing
- Charge for parking

- Customer validation program
- Encourage employees to park elsewhere
- Improve parking information and wayfinding signage
- Work with TriMet on expanding service to site

Meeting # 2 (May 24, 2017)

The community was asked to prioritize TDM strategies. There was strong support for most, and many community members were eager to implement them sooner rather than later. The chart below shows the top ten strategies as identified by meeting attendees and online survey respondents. Extending MAX to Oregon City was the most controversial.

Preferred TDM Strategies



Meeting # 3 (July 26, 2017)

At this meeting, the draft plan was presented to the community to ensure that all ideas and concerns had been captured. Community members were generally in agreement with the strategies and timeline. Comments included:

- Work with regional trails such as Trolley Trail to improve bike access.
- Work with Downtown Association on advisory committee and ongoing monitoring.
- Important to identify funding for city staff time early on.

DCW COST MANAGEMENT

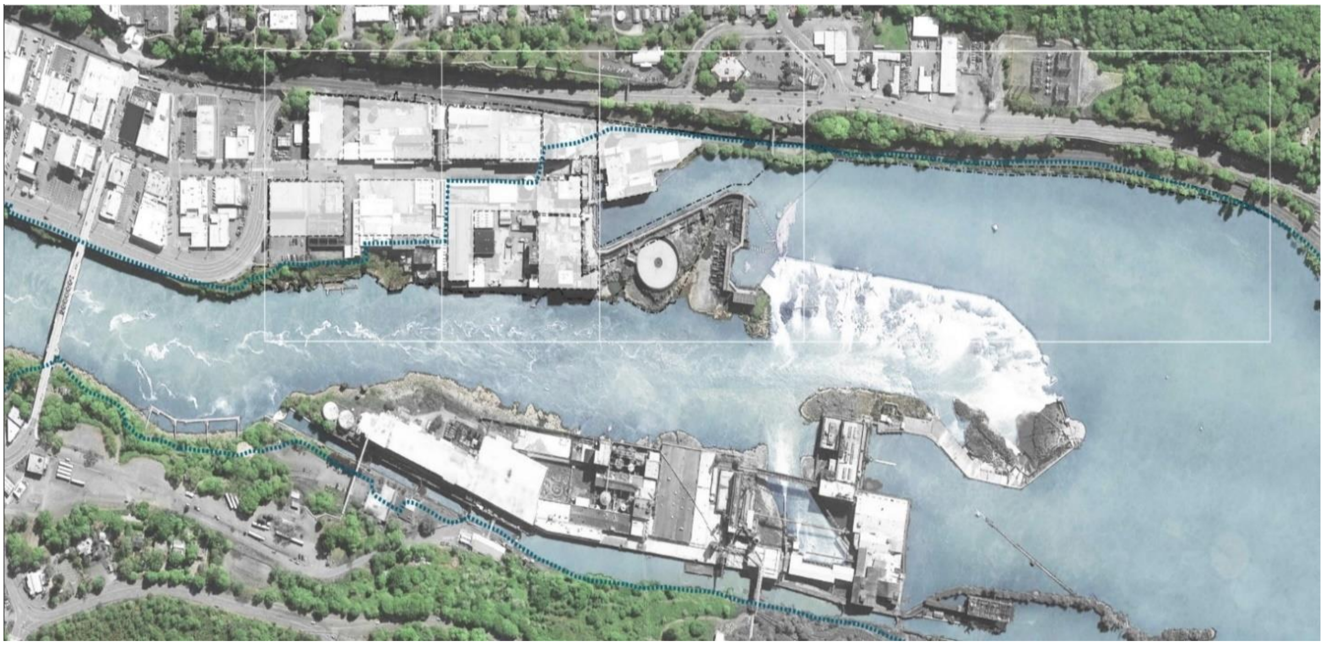
Prepared for:

Snøhetta

Mayer/Reed

Willamette Falls River Walk

100% Concept Design



Willamette Falls River Walk
100% Concept Cost Plan

Scope of Work

Project Scope Description

The scope of work includes the development of a cost model at the 75% concept level of design for the Willamette Falls Legacy Project Riverwalk. A cost study is provided for distinct areas of the site. The areas are: the Yard and Western Mill Reserve Area, the North Riverfront Area, The Eastern Mill Reserve Area, The PGE Dam Area, The Mill E Area and Bluff Connection (2 Options) and the Canemah Area. This report is organized by phase area and costs are provided for Public Access Elements, Habitat Restoration, and Re-Use and Removals of Specific Structures. Costs for structures acknowledge the prescribed steps for demolition (Selective and complete) ,Interim access, Re-use prep and re-use applications.

Project Design

This 75% Concept cost plan is based upon Willamette Falls Legacy Project Riverwalk - Habitat workbook, the 01/24/2017 Cost Report Notes and diagrams, Snohetta Concept Design 50% Materials, Snohetta's Pre-Concept Milestone III cost Report and Metro comments and structure diagram dated 1/31/2017 and the Willamette Falls Legacy Project Framework Plan, Order of Magnitude Cost Estimate dated April 23, 2014.

Cost Development Means and Methods

In preparing this cost study, multiple sources were used. The source information includes a current perspective on codes, technology, energy and water conservation, specific site elements, local general and sub construction markets and labor agreements, material costs and availability and labor efficiencies. These factors are applied to unit cost rate adjustments, considering gross square footage, constructability, access, and all construction related impacts.

Willamette Falls River Walk
100% Concept Cost Plan

Basis of Estimate

Assumptions and Clarifications

The following clarification statements were developed by Snohetta and Mayer/Reed used to develop costs:

A companion chart was provided by Snohetta in determining the extent of work for each structure. As well, many re-use options are not considered TBD and are not considered in this cost report. A Summary of Costs has not been provided at this time due to multiple options within each element within each phase.

Structural Removal and Reuse Options: Specific structures with phased areas as identified within the Snohetta 2/8/17 Memorandum.

Path A, Step 1: Strategic Demolition Structures are fully removed from the site. This path is reserved only for those structures that do not have potential benefit for access, interpretation, or potential re-use. Future work may consider salvage and re-use of materials from demolition of these structures.

Path B, Step 1: Selective Removals, Stabilization, and Safety Elements of existing structures are selectively removed and/or stabilized to minimize degradation and ensure site safety and security. As noted in narrative text, some structures will require more removals than others: some structures may be largely retained as-is, while others may be reduced to key columns, deck, and beams only. As part of this step, environmental hazards are fully addressed, and seismic concerns are addressed to the extent possible, given the level of knowledge regarding the structure's future potential re-use and proximity to public access. For most historic structures with fill and debris conditions, consider archaeological requirements. The result of this step is that the structure is retained in a stable, safe, and secure state, yet no access is available. Future work may consider salvage and re-use of materials from demolition of these structures.

Path B, Step 2: Interim Access Stabilized structures, prior to their complete and final re-use, may be used as means of access through the site. Existing structures will be modified with guardrails, handrails, lighting, fences, screens, hole coverings, safety lighting, and the like. When possible, these introductions are permanent in nature, so as to retain and preserve investment. In the case of some structures it is understood that investment ends at this step, as further re-use is not warranted.

Path B, Step 3: Re-Use Prep This step is reserved for structures that have the potential for re-use beyond basic public access described in step 2 above. Prep in this step would not only predicate public Riverwalk related elements that would be included below in step 4 (such as viewing structures, support services, restrooms, vendors, boat storage, and the like), but also potential redevelopment or private tenant re-use scenarios. Additional stabilization and fine-tuned removals, utility servicing, seismic retrofits, not covered in step one above, are implemented to support the final re-use of the given structure. The level of intervention is commiserate to the intended re-use.

Path B, Step 4: Re-Use This step represents the last in the removal and re-use sequence. Costs are determined by specific re-use strategies tailored to the particular structure. As the project advances through concept design and

Willamette Falls River Walk
100% Concept Cost Plan

Basis of Estimate

Habitat Restoration: The existing habitat consists of (6) distinct sections to identify their unique constitution and vegetation:

Closed Canopy Upland Forest
Riparian Forest
Shrubland
Emergent Wetland (Vegetation in Alcove)
Prairie (Riparian Basalt)
In-Channel Alcove Restoration

Public Access Elements: Durability built materials to support public interaction with the site. Contingency costs covers interim type elements, unforeseen conditions and provides the ability to develop the design within a determined budget..

Main Path

Secondary Paths (Secondary paths to strategically re-use existing walls, columns, and other structures for vertical structural support. Assume all secondary paths to be elevated and include handrails, guardrails.)

Retaining Walls assumed between habitat and upland areas, as well as between Union Pacific Railroad and Riverwalk Areas.

Event Surfaces (Assume re-use of existing surfaces, with minor additions, reinforcement, and seating)

Boat Access: The Yard and Western Mill Area: Accessible, non motorized boat access ramp. No vehicular access. North Riverfront Area: Dock with mooring for small motorized craft. No vehicular access, or ramp for haul out. Mill E and Bluff Connection Area: Major commercial boat mooring, no haul out, docking only. Canemah Trail: Boat access ramp. No vehicular access.

Utilities (Assume stub from primary service lines on Main Street. Costs assume Public RW utilities only: Stormwater, Electric, Data, Sewer, Gas, Water Utility costs for re-use of existing structures included within structure cost report section).

Plantings

Furnishings

Lighting

Riverwalk Support Structures - Assumed to include permanent restrooms, storage, service and the like. Cost reporting for these elements falls within Yard Area, but elements understood to be included within Mill O or Woolen Mill.

Utilities: Complete utility resizing and relocation is anticipated in this cost study. Trenching and conduit will be provided for power and technology. Wiring and site transformers will be provided by the utility franchise and are not

Willamette Falls River Walk
100% Concept Cost Plan

Basis of Estimate

Mark ups

In addition to the cost of labor and materials (Direct Costs) needed to construct the various projects identified in the Pre-Concept Phase, Mark ups are applied to cover the multitude of other related costs. Below we have included Mark Up categories with line items that are traditionally included within these groups.

Construction Cost Mark Ups

Also known as “Hard Costs” these costs are included in the Contractor’s Cost estimate. Typically, these cost include:

- Contingency- 20% For construction and design based upon level of design completion. Included within is a 'hazmat' contingency for assumed lead paint and asbestos. The contingency will be monitored and adjusted as the design develops.
- General Conditions- 10% Management staff, trailers, etc.
- General Requirements- 15% Cranes and other project specific equipment
- Overhead and Profit- 4% Contractor’s fee
- Bonds and insurance- 2% As required for the contract
- Escalation- 9% (3% per annum) Anticipated construction cost increases from one date to another. Typically, this is provided from initial pricing to the mid-point of the project.

In this exercise the Markups are 60% as a compilation of the percentages listed above.

Additional Owner costs to consider:

Typically, there are additional costs imposed on the total project budget that are not included in the costs as noted above but are necessary to provide a complete project cost perspective. These costs can include:

- Project Management
- Staff location expenses
- Site maintenance equipment
- Furniture, fixture and Equipment (FF&E)
- A/V costs
- Security Costs
- Utility Service improvements
- IT Equipment and connections
- Land acquisition and easements
- Land acquisition and easement expenses
- Contingency reserve
- Management reserves

Willamette Falls River Walk
100% Concept Cost Plan

Basis of Estimate

Soft Costs
Soft costs are not included in the cost plan. These cost are typically paid for by the owner and are in addition to the Contractor's costs. These costs can include:

- A/E fees- Architect and consultants under the Architects Contract.
- Engineering fees and studies - Other project specific consultants not under the Architect's contract (Ex: Environmental impact, location work, etc.)
- Permits and Fees- Includes MUP, building permits, Fire Department review, etc.
- Commissioning- Third Party System Commissioning
- GC Pre-construction0 Only if using CM GC (Construction Manager/General Contractor) contract
- Jurisdictional costs

Typically, these costs, when applied, add approximately 30% to the project, after full scope of the project has been determined.

Operations & Maintenance Costs
Added cost of operations and maintenance are not associated with mark ups or softs costs. Operations and Maintenance costs are independent, and include the following:

- Staff: dedicated on-site staff, home-office staff, and volunteer coordination.
- Maintenance Operations: daily facility and trash cleanup, work order maintenance, and annual operations.
- Utility Costs: operational costs of the public facilities.

Willamette Falls River Walk
100% Concept Cost Plan

NORTH RIVERFRONT AREA PHASE

Site Improvement	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**42,500**	**SF**			**60%**
Demolition and Removals				**$ 382,500**	**$ 612,000**
Fill Removal	4,722	CY	45.00	$ 212,500	$ 340,000
Miscellaneous site structure removal/stabilization	42,500	SF	4.00	$ 170,000	$ 272,000
Habitat Restoration				**$ 26,811**	**$ 42,898**
Top soil import	259	CY	35.00	$ 9,063	$ 14,501
In-Channel River	922	SF	12.00	$ 11,064	$ 17,702
Off-Channel Alcove		SF	2.00	$ -	$ -
Riparian Basalt	14,345	SF	0.28	$ 4,017	$ 6,427
Riparian Forest	12,700	SF	0.21	$ 2,667	$ 4,267
Upland Forest		SF	0.50	$ -	$ -
Oak Woodland Savana		SF	0.10	$ -	$ -
Public Access Elements				$ 1,710,339	**$ 2,736,542**
Primary path Surface	1,232	SF	75.00	$ 92,400	$ 147,840
Utilities - Water, Electric	14,533	SF	18.00	$ 261,594	$ 418,550
Non-Habitat Plantings, incl. silva cell	2,914	SF	24	$ 69,643	$ 111,429
Non-Habitat Top Soil Import	108	CY	35.00	$ 3,777	$ 6,043
Furnishings	1	LS	166,925.00	$ 166,925	$ 267,080
Lighting	41	EA	15,000.00	$ 616,000	$ 985,600
Stormwater Management Conveyance				*TBD*	*TBD*
Water Street Improvements				*TBD*	*TBD*
Water Street Entrance Improvements	1	LS	500,000.00	$ 500,000	$ 800,000

Willamette Falls River Walk
100% Concept Cost Plan

FLOUR MILL AREA PHASE

Site Improvements	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**79,500**	**SF**			**60%**
Demolition and Removals				**$ 980,500**	**$ 1,378,000**
Fill Removal	14,722	CY	45.00	$ 662,500	$ 1,060,000
Miscellaneous site structure removal/stabilization	79,500	SF	4.00	$ 318,000	$ 318,000
Habitat Restoration				**$ 50,363**	**$ 80,581**
Top soil import	526	CY	35.00	$ 18,407	$ 29,451
In-Channel River		SF	12.00	$ -	$ -
Off-Channel Alcove	10,507	SF	2.00	$ 21,014	$ 33,622
Riparian Basalt	17,438	SF	0.28	$ 4,883	$ 7,812
Riparian Forest	28,854	SF	0.21	$ 6,059	$ 9,695
Upland Forest		SF	0.50	$ -	$ -
Oak Woodland Savanna		SF	0.10	$ -	$ -
				$ -	$ -
Public Access Elements				**$ 4,186,770**	**$ 6,239,276**
Retaining Wall	2,550	SF	55.00	$ 140,250	$ 224,400
Primary Path Surface	18,056	SF	75.00	$ 1,354,200	$ 2,166,720
Secondary Paths	500	LF	2,400.00	$ 1,200,000	$ 1,920,000
Boat Access	1	LS	301,500.00	$ 301,500	$ 482,400
Utilities - Water, Electric, Sewer	79,500	SF	8.50	$ 675,750	$ 1,081,200
Non-Habitat Plantings, incl. silva cell	2,198	SF	23.90	$ 52,548	$ 84,077
Non-Habitat Top Soil Import	81	CY	35.00	$ 2,850	$ 4,560
Furnishings	1	LS	172,450.00	$ 172,450	$ 275,920
Lighting	15	EA	15,000.00	$ 229,000	$ 366,400
Stormwater Management Conveyance		LF		*TBD*	*TBD*
Stormwater Management Structure	4,800	SF	12.13	$ 58,222	$ 93,156
				$ -	$ -
Interim Access Elements				**$ 243,181**	**$ 389,090**
Interim Parking	41,180	SF	4.00	$ 164,720	$ 263,552
Interim Fencing	3,242	LF	20.50	$ 66,461	$ 106,338
Interim Restrooms	1	LS	12,000.00	$ 12,000	$ 19,200
				$ -	$ -
Structures				**$ -**	**$ -**
Flour Mill / Paper Machine 2		SF		$ -	*See Detail*
Mill D Warehouse		LF		$ -	*See Detail*
#3 Paper Machine		LF		$ -	*See Detail*
#3 Paper Machine Addition		LS		$ -	*See Detail*
3rd Street Roof Structure		LS		$ -	*See Detail*

3rd Street Road Structure	LS	$	-	*See Detail*
Butler Building	LS	$	-	*See Detail*
Mill O	LS	$	-	*See Detail*

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FLOUR MILL AREA PHASE **Flour Mill Foundation and Paper Machine 2**	Quantity	Unit	RATE	Stabilization Total	Stabilization Total w/MU
Total Area:	**14,800**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Flour Mill Foundation and Paper Machine 2					**$ -**
	14,800		**933.00**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Flour Mill Foundation and Paper Machine 2					**$ 2,517,646**
	14,800		**933**		
Shoring and equipment	14,800	SF	8.00	$ 118,400	$ 189,440
Fencing	933	LF	13.00	$ 12,129	$ 19,406
Removal of obstructions and loose equipment/materials	14,800	SF	15.00	$ 222,000	$ 355,200
Demolition structure above, artifact preservation below	14,800	SF	55.00	$ 814,000	$ 1,302,400
Make safe- Electrical, Mechanical and Plumbing	14,800	SF	9.00	$ 133,200	$ 213,120
Make-safe- Structural systems and glazed areas	14,800	SF	14.50	$ 214,600	$ 343,360
Remediate from further deterioration	14,800	SF	4.00	$ 59,200	$ 94,720
Path B, Step 2: Interim Access	**SF**		**Perim**		
Flour Mill Foundation and Paper Machine 2					**$ -**
	14,800		**933**		
N/A					$ -
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Flour Mill Foundation and Paper Machine 2					**$ 118,400**
Prep for restaurant or light retail	14,800	SF	5.00	$ 74,000	$ 118,400
Path B, Step 4: Re-Use	**SF**		**Perim**		
Flour Mill Foundation and Paper Machine 2					**$ 5,328,000**
Restaurant or Retail Retrofit	14,800	SF	225.00	$3,330,000	$ 5,328,000

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FLOUR MILL AREA PHASE

Mill D Warehouse	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**7,500**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Mill D Warehouse					**$ -**
	7,500		**550.00**		
N/A					$ -
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Mill D Warehouse					**$ 60,000**
	7,500		**550**		
Remove wood structures	7,500	SF	5.00	$ 37,500	$ 60,000
Path B, Step 2: Interim Access	**SF**		**Perim**		
Mill D Warehouse					**$ 180,000**
	7,500		**550**		
Reinforce concrete slabs and walls	7,500	SF	15.00	$ 112,500	$ 180,000
					$ -
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Mill D Warehouse					**$ 120,000**
	7,500		**550**		
Provide public utility connections to Main Street Lines	1	LS	75,000.00	$ 75,000	$ 120,000
Path B, Step 4: Re-Use	**SF**		**Perim**		
Mill D Warehouse					**$ -**
	7,500		**550**		
N/A					

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FLOUR MILL AREA PHASE

Number 3 Paper Machine	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**5,160**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Number 3 Paper Machine					**$ -**
	5,160		**475**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Number 3 Paper Machine					**$ 611,808**
Option 1	**5,160**		**475**		
Shoring and equipment	5,160	SF	3.00	$ 15,480	$ 24,768
Fencing	475	LF	12.00	$ 5,700	$ 9,120
Demolition to structure - Remove wall and roof	5,160	SF	24.00	$ 123,840	$ 198,144
Make safe- Electrical, Mechanical and Plumbing	5,160	SF	1.00	$ 5,160	$ 8,256
Make-safe- Structural systems (Columns and deck)	5,160	SF	45.00	$ 232,200	$ 371,520
Path B, Step 2: Interim Access	**SF**		**Perim**		
Number 3 Paper Machine					**$ 99,898**
	5,160		**475**		
Remove structure	3,612	SF	8.00	$ 28,896	$ 46,234
Removal of obstructions and loose equipment/materials	5,160	SF	6.50	$ 33,540	$ 53,664
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Number 3 Paper Machine					**$ -**
	5,160		**475**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Number 3 Paper Machine					**$ -**
	5,160		**650**		
N/A					

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FLOUR MILL AREA PHASE

#3 Paper Machine Addition	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**6,620**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
#3 Paper Machine Addition					**$ -**
	6,620		**475.00**		
N/A					$ -
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
#3 Paper Machine Addition					**$ 289,808**
	6,620		**475**		
Shoring and equipment	6,620	SF	3.00	$ 19,860	$ 31,776
Fencing	475	LF	12.00	$ 5,700	$ 9,120
Removal of obstructions and loose equipment/materials	6,620	SF	4.50	$ 29,790	$ 47,664
Demolition to structure -Remove Steel structure to slab	6,620	SF	16.00	$ 105,920	$ 169,472
Make safe- Electrical, Mechanical and Plumbing	6,620	SF	1.00	$ 6,620	$ 10,592
Make-safe- Structural systems	6,620	SF	2.00	$ 13,240	$ 21,184
Path B, Step 2: Interim Access	**SF**		**Perim**		
#3 Paper Machine Addition					**$ 106,979**
	6,620		**475**		
Remove structure	4,634	SF	8.00	$ 37,072	$ 59,315
Removal of obstructions and loose equipment/materials	6,620	SF	4.50	$ 29,790	$ 47,664
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
#3 Paper Machine Addition					**$ -**
	6,620		**475**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
#3 Paper Machine Addition					**$ -**
	6,620		**475**		
N/A					

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FLOUR MILL AREA PHASE

3rd Street Roof Structure	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**7,580**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
3rd Street Roof Structure					**$ 103,088**
Complete demolition	7,580	SF	8.50	$ 64,430	$ 103,088
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
3rd Street Roof Structure					**$ -**
	7,580				
N/A					$ -
Path B, Step 2: Interim Access	**SF**		**Perim**		
3rd Street Roof Structure					**$ -**
	7,580				
N/A					$ -
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
3rd Street Roof Structure					**$ -**
	7,580				
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
3rd Street Roof Structure					**$ -**
	7,580				
N/A					

Willamette Falls River Walk
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FLOUR MILL AREA PHASE

3rd Street Road Structure	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**7,580**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
3rd Street Road Structure					**$ 115,216**
Complete demolition	7,580	SF	9.50	$ 72,010	$ 115,216
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
3rd Street Road Structure					**$ -**
	7,580				
N/A					$ -
Path B, Step 2: Interim Access	**SF**		**Perim**		
3rd Street Road Structure					**$ -**
	7,580				
N/A					$ -
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
3rd Street Road Structure					**$ -**
	7,580				
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
3rd Street Road Structure					**$ -**
	7,580				
N/A					

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FLOUR MILL AREA PHASE

Butler Building	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**6,400**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Butler Building					**$ 97,280**
Complete demolition	6,400	SF	9.50	$ 60,800	$ 97,280
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Butler Building					**$ -**
	6,400		**475**		
N/A					$ -
Path B, Step 2: Interim Access	**SF**		**Perim**		
Butler Building					**$ -**
	6,400				
N/A					$ -
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Butler Building					**$ -**
	6,400				
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Butler Building					**$ -**
	6,400				
N/A					

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FLOUR MILL AREA PHASE

MILL O	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**18,855**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
MILL O					**$ -**
	18,855		**680**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Mill O- Option 1					**$ 593,790**
	18,855		**680**		
Shoring and equipment	18,855	SF	3.00	$ 56,565	$ 90,504
Fencing	680	LF	12.00	$ 8,160	$ 13,056
Removal of obstructions and loose equipment/materials	18,855	SF	2.50	$ 47,138	$ 75,420
Demolition to structure -Retaining walls and lower slab	18,855	SF	6.75	$ 127,271	$ 203,634
Make safe- Electrical, Mechanical and Plumbing	18,855	SF	1.00	$ 18,855	$ 30,168
Make-safe- Structural systems and glazed areas	18,855	SF	2.00	$ 37,710	$ 60,336
Remediate from further deterioration	18,855	SF	4.00	$ 75,420	$ 120,672
Path B, Step 2: Interim Access	**SF**		**Perim**		
Mill O					**$ 335,215**
	18,855		**680**		
Equipment	18,855	SF	1.00	$ 18,855	$ 30,168
Strtuctural reinforcement - shotcrete	680	LF	195.00	$ 132,600	$ 212,160
Provide access points (includes signage)	18,855	SF	0.45	$ 8,485	$ 13,576
Provide barriers and rails to manage grade changes	18,855	SF	0.85	$ 16,027	$ 25,643
Provide barriers to limit access to hazardous areas	24,480	SF	0.60	$ 14,688	$ 23,501
Safety lighting	18,855	SF	1.00	$ 18,855	$ 30,168
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Mill O					**$ 3,372,636**
	18,855		**680**		
Furnishings - stackable tables and chairs	42	SET	4,100.00	$ 171,790	$ 274,864
Public utility tie ins - sewer, electric, water	18,855	SF	16.50	$ 311,108	$ 497,772
Major seating stair and ramp	6,500	SF	250.00	$1,625,000	$ 2,600,000

MILL O	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**18,855**	**SF**			**60%**
Path B, Step 4: Re-Use **Mill O**	**SF**		**Perim**		**$14,077,761**
	18,855		**680**		
Restrooms	1,800	SF	265.00	$ 477,000	$ 763,200
Maintenance Closet	100	SF	85.00	$ 8,500	$ 13,600
Storage Area	300	SF	55.00	$ 16,500	$ 26,400
Kitchen/Vending Area	300	SF	350.00	$ 105,000	$ 168,000
Informational Kiosk	225	SF	250.00	$ 56,250	$ 90,000
Lighting	18,855	SF	12.50	$ 235,688	$ 377,100
AV Equipment	18,855	SF	5.00	$ 94,275	$ 150,840
Seasonal space heating equipment	27	EA	500.00	$ 13,333	$ 21,333
New Door Structure	10	EA	5,000.00	$ 50,000	$ 80,000
Service and Maintenance Room	100	SF	175.00	$ 17,500	$ 28,000
Entrance Vestibule	400	SF	225.00	$ 90,000	$ 144,000
Flexible use public rooms	600	SF	225.00	$ 135,000	$ 216,000
MEP system	18,855	SF	63.00	$1,187,865	$ 1,900,584
Replaced glazing - allow	6,800	SF	80.00	$ 544,000	$ 870,400
Redevelopment Support Elements					
Structural trusses - allow	47	TN	5,200.00	$ 245,115	$ 392,184
One-story redevelopment - office	18,855	EA	265.00	$4,996,575	$ 7,994,520
Elevators - incl. mech room	2	EA	185,000.00	$ 370,000	$ 592,000
Stairways	1	LS	156,000.00	$ 156,000	$ 249,600

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THE YARD AREA PHASE

Site Improvements	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**124,000**	**SF**			**60%**
Demolition and Removals				**$ 5,062,181**	**$ 8,099,489**
Fill Removal	28,926	CY	157.86	$ 4,566,181	$ 7,305,889
Miscellaneous site structure removal/stabilization	124,000	SF	4.00	$ 496,000	$ 793,600
Habitat Restoration				**$ 39,588**	**$ 63,340**
Top soil import	304	CY	35.00	$ 10,641	$ 17,026
In-Channel River		SF	12.00	$ -	$ -
Off-Channel Alcove	11,805	SF	2.00	$ 23,610	$ 37,776
Riparian Basalt	4,420	SF	0.28	$ 1,238	$ 1,980
Riparian Forest	14,506	SF	0.21	$ 3,046	$ 4,874
Upland Forest	2,105	SF	0.50	$ 1,053	$ 1,684
Oak Woodland Savanna		SF	0.10	$ -	$ -
Public Access Elements				**$ 3,993,118**	**$ 4,028,880**
Retaining Wall	3,500	SF	55.00	$ 192,500	$ 308,000
Primary Path Surface	19,629	SF	75.00	$ 1,472,175	$ 2,355,480
Secondary Paths	300	LF	2,400.00	$ 720,000	$ 1,152,000
Event Surfaces	13,350	SF	2.50	$ 33,375	$ 53,400
Boat Access	1	LS	100,000.00	$ 100,000	$ 160,000
Utilities - Water, Electric, Sewer	124,000	LS	8.50	$ 1,054,000	$ 1,686,400
Non-Habitat Plantings	5,451	SF	35.00	$ 190,785	$ 305,256
Non-Habitat Top Soil Import	808	CY	35.00	$ 28,264	$ 45,223
Furnishings	1	LS	186,250.00	$ 186,250	$ 298,000
Stormwater Management Conveyance				*TBD*	*TBD*
Stormwater Management Structure	1,300	SF	12.13	$ 15,769	$ 25,230
3rd Street Improvements				*TBD*	*TBD*
Interim Access Elements				**$ 243,181**	**$ 389,090**
Interim Parking	41,180	LS	4.00	$ 164,720	$ 263,552
Interim Fencing	3,242	LS	20.50	$ 66,461	$ 106,338
Interim Restrooms	1	LS	12,000.00	$ 12,000	$ 19,200
Structures				**$ -**	**$ -**
Pipe Chase					*See Detail*
Pipe Shop					*See Detail*
Carpentry Shop					*See Detail*
Millwright Shop					*See Detail*

Woolen Mill Foundation	*See Detail*
High Density Stock Cylinder 1	*See Detail*
Auto Shop	*See Detail*
South Substation	*See Detail*
Pump Station	*See Detail*
Recovery Boiler	*See Detail*
Butler Building	*See Detail*
Mill O	*See Detail*

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THE YARD AREA PHASE

PIPE CHASE	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**13,602**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
PIPE CHASE					**$ -**
	13,602		**1,202**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
PIPE CHASE					**$ 261,654**
	13,602		**1,202**		
Shoring and equipment	13,602	SF	3.00	$ 40,806	$ 65,290
Fencing	1,202	LF	12.00	$ 14,424	$ 23,078
Demolition 1/3 of structure to bedrock- water drainage	6,801	SF	9.00	$ 61,209	$ 97,934
Shore/ support upland side of structure	1,860	SF	8.50	$ 15,810	$ 25,296
Make safe- Electrical, Mechanical and Plumbing	13,602	SF	0.30	$ 4,081	$ 6,529
Make-safe- Structural systems and glazed areas	13,602	SF	1.00	$ 13,602	$ 21,763
Remediate from further deterioration	13,602	SF	1.00	$ 13,602	$ 21,763
Path B, Step 2: Interim Access	**SF**		**Perim**		
PIPE CHASE					**$ 124,542**
	13,602		**1,202**		
Equipment	13,602	SF	1.00	$ 13,602	$ 21,763
Provide access points (includes signage) to upper level	6,801	SF	0.75	$ 5,101	$ 8,161
Provide barriers and rails to manage grade changes	13,602	SF	1.55	$ 21,083	$ 33,733
Provide barriers to limit access to hazardous areas	2,404	LF	13.00	$ 31,252	$ 50,003
Safety lighting	6,801	SF	1.00	$ 6,801	$ 10,882
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
PIPE CHASE					**$ 413,501**
	13,602		**1,202**		
Rough in utilities for future use	13,602	SF	16.50	$224,433	$ 359,093
Removal of obstructions and loose equipment/materials	13,602	SF	2.50	$ 34,005	$ 54,408
Path B, Step 4: Re-Use	**SF**		**Perim**		
PIPE CHASE					**$ 1,032,912**
	13,602		**1,202**		
Seating - multiple rows	1,668	SF	250.00	$417,000	$ 667,200
Guardrail	278	LF	225.00	$ 62,550	$ 100,080
Lighting	6,801	SF	20.00	$136,020	$ 217,632
Gate	2	EA	15,000.00	$ 30,000	$ 48,000

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THE YARD AREA PHASE

PIPE SHOP	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**3,130**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
PIPE SHOP					**$ 42,568**
	3,130		**452**		
Complete Demolition	3,130	SF	8.50	$ 26,605	$ 42,568
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
PIPE SHOP					**$ -**
	3,130		**452**		
N/A					$ -
Path B, Step 2: Interim Access	**SF**		**Perim**		
PIPE SHOP					**$ -**
	3,130		**452**		
N/A					$ -
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
PIPE SHOP					**$ -**
	3,130		**452**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
PIPE SHOP					**$ -**
	3,130		**452**		
N/A					

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THE YARD AREA PHASE

Carpentry Shop	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**6,730**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Carpentry Shop					**$ -**
	6,730		**452.00**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Carpentry Shop					**$ 170,198**
	6,730		**452**		
Shoring and equipment	6,730	SF	3.00	$ 20,190	$ 32,304
Fencing	452	LF	12.00	$ 5,424	$ 8,678
Removal of obstructions and loose equipment/materials	6,730	SF	2.50	$ 16,825	$ 26,920
Demolition structure to slab- Selective and salvaged	6,730	SF	8.00	$ 53,840	$ 86,144
Make safe- Electrical, Mechanical and Plumbing	6,730	SF	0.75	$ 5,048	$ 8,076
Make-safe- Structural for access	6,730	SF	0.75	$ 5,048	$ 8,076
Path B, Step 2: Interim Access	**SF**		**Perim**		
Carpentry Shop					**$ 53,840**
	6,730		**452**		
Make footwalls and slab safe for public access	6,730	SF	5.00	$ 33,650	$ 53,840
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Carpentry Shop					**$ 177,672**
	6,730		**452**		
Rough in utilities for future use	6,730	SF	16.50	$ 111,045	$ 177,672
Path B, Step 4: Re-Use	**SF**		**Perim**		
Carpentry Shop					**$ 413,280**
	6,730		**452**		
Outdoor event space					
Earthwork and paving	5000	SF	12.00	$ 60,000	$ 96,000
Stage	800	SF	26.00	$ 20,800	$ 33,280
Pavilion - Canopy	1500	SF	95.00	$ 142,500	$ 228,000
Event Power, Vault & Lighting	1	LS	35,000.00	$ 35,000	$ 56,000

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THE YARD AREA PHASE

Woolen Mill Foundation	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**8,000**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Woolen Mill Foundation					**$ 96,000**
	8,000		**550.00**		
Remove standalone steel structures - allow	1	LS	60,000.00	$ 60,000	$ 96,000
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Woolen Mill Foundation					**$ 411,182**
	8,000		**550**		
Shoring and equipment	8,000	SF	3.00	$ 24,000	$ 38,400
Fencing	550	LF	12.00	$ 6,600	$ 10,560
Excavation of fill material	3,389	CY	55.00	$ 186,389	$ 298,222
Removal of obstructions and loose equipment/materials	8,000	SF	2.50	$ 20,000	$ 32,000
Make safe- Electrical, Mechanical and Plumbing	8,000	SF	1.00	$ 8,000	$ 12,800
Make-safe- Structural systems	8,000	SF	0.75	$ 6,000	$ 9,600
Remediate from further deterioration	8,000	SF	0.75	$ 6,000	$ 9,600
Path B, Step 2: Interim Access	**SF**		**Perim**		
Woolen Mill Foundation					**$ 76,800**
	8,000		**550**		
Equipment	8,000	SF	1.00	$ 8,000	$ 12,800
Provide access points (includes signage)	8,000	SF	1.00	$ 8,000	$ 12,800
Provide barriers and rails to manage grade changes	8,000	SF	2.00	$ 16,000	$ 25,600
Provide barriers to limit access to hazardous areas	8,000	SF	1.00	$ 8,000	$ 12,800
Safety lighting	8,000	SF	1.00	$ 8,000	$ 12,800
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Woolen Mill Foundation					**$ -**
	8,000		**550**		
Furnishings - stackable tables and chairs	18	SET	See Eastern Mill Reserve Area		
Public utility tie ins - sewer, electric, water	8,000	SF	See Eastern Mill Reserve Area		

Path B, Step 4: Re-Use Path B, Step 4: Re-Use	SF		Perim
	8,000		**550**
Storage area	600	SF	See Eastern Mill Reserve Area
Service and maintenance support room	800	SF	See Eastern Mill Reserve Area
Overlook area			See Eastern Mill Reserve Area
Exterior structural platform	4,800	SF	See Eastern Mill Reserve Area
Guardrail with integrated interp. Elements	280	LF	See Eastern Mill Reserve Area
Furnishings - stackable tables and chairs	11	SET	See Eastern Mill Reserve Area
Lighting	4,800	SF	See Eastern Mill Reserve Area
Stone paving	4,800	SF	See Eastern Mill Reserve Area

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THE YARD AREA PHASE **Millwright Shop**	Quantity	Unit	RATE	Stabilization Total	Stabilization Total w/MU
Total Area:	**6,870**	**SF**			**60%**
Path A, Step 1 Strategic Demolition **Millwright Shop**	**SF**		**Perim**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety **Millwright Shop**	**SF**		**Perim**		**$ 172,733**
	6,870		**409**		
Shoring and equipment	6,870	SF	3.00	$ 20,610	$ 32,976
Fencing	409	LF	12.00	$ 4,908	$ 7,853
Removal of obstructions and loose equipment/materials	6,870	SF	2.50	$ 17,175	$ 27,480
Demolition structure to slab	6,870	SF	8.00	$ 54,960	$ 87,936
Make safe- Electrical, Mechanical and Plumbing	6,870	SF	0.75	$ 5,153	$ 8,244
Make-safe- Structural for access	6,870	SF	0.75	$ 5,153	$ 8,244
Path B, Step 2: Interim Access **Millwright Shop**	**SF**		**Perim**		**$ 54,960**
	6,870		**409**		
Make footwalls and slab safe for public access	6,870	SF	5.00	$ 34,350	$ 54,960
Path B, Step 3: Re-Use Prep **Millwright Shop**	**SF**		**Perim**		**$ -**
	6,870		**409**		
N/A					
Path B, Step 4: Re-Use **Millwright Shop**	**SF**		**Perim**		**$ -**
	6,870		**409**		
N/A					

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THE YARD AREA PHASE

High Density Stock Cylinder 1	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**1,045**	**SF**			60%
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ -**
	1,045		**115.00**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ 46,516**
42 LF DIA	**1,045**		**115**		
Shoring and equipment	1,045	SF	3.00	$ 3,135	$ 5,016
Fencing	115	LF	12.00	$ 1,380	$ 2,208
Removal of obstructions and loose equipment/materials	1,045	SF	14.50	$ 15,153	$ 24,244
Make safe- Electrical, Mechanical and Plumbing	1,045	SF	1.00	$ 1,045	$ 1,672
Make-safe- Structural systems	1,045	SF	8.00	$ 8,360	$ 13,376
Path B, Step 2: Interim Access	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ -**
	1,045		**115**		
See Eastern Mill Area					
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ -**
	1,045		**115**		
See Eastern Mill Area					
Path B, Step 4: Re-Use	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ -**
	1,045		**115**		
See Eastern Mill Area					

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THE YARD AREA PHASE

Auto Shop	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**2,560**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Auto Shop					**$ -**
	2,560		**230.00**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Auto Shop					**$ 124,736**
	2,560		**230**		
Shoring and equipment	2,560	SF	3.00	$ 7,680	$ 12,288
Fencing	230	LF	12.00	$ 2,760	$ 4,416
Removal of obstructions and loose equipment/materials	2,560	SF	2.50	$ 6,400	$ 10,240
Demolition to structure -Remove structure to slab	7,000	SF	8.00	$ 56,000	$ 89,600
Make safe- Electrical, Mechanical and Plumbing	2,560	SF	1.00	$ 2,560	$ 4,096
Make-safe- Concrete Slab	2,560	SF	1.00	$ 2,560	$ 4,096
Path B, Step 2: Interim Access	**SF**		**Perim**		
Auto Shop					**$ 20,480**
	2,560		**230**		
Make footwalls and slab safe for public access	2,560	SF	5.00	$ 12,800	$ 20,480
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Auto Shop					**$ -**
	2,560		**230**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Auto Shop					**$ -**
	2,560		**230**		
N/A					

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THE YARD AREA PHASE **South Substation**	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**3,470**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
South Substation					**$ 47,192**
	3,470		**230.00**		
Complete Demolition	3,470	SF	8.50	$ 29,495	$ 47,192
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
South Substation					**$ -**
	3,470		**230**		
N/A					
Path B, Step 2: Interim Access	**SF**		**Perim**		
South Substation					**$ -**
	3,470		**230**		
N/A					
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
South Substation					**$ -**
	3,470		**230**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
South Substation					**$ -**
	3,470		**230**		
N/A					

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THE YARD AREA PHASE

Acid Cylinder	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**1,185**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Acid Cylinder					**$ -**
	1,185		**122.00**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Acid Cylinder					**$ 48,354**
39 LF DIA	**1,185**		**122**		
Shoring and equipment	1,185	SF	3.00	$ 3,555	$ 5,688
Fencing	122	LF	12.00	$ 1,464	$ 2,342
Removal of obstructions and loose equipment/materials	1,185	SF	2.50	$ 2,963	$ 4,740
Demolition to structure -Remove cheek walls	7,000	SF	2.50	$ 17,500	$ 28,000
Make safe- Electrical, Mechanical and Plumbing	1,185	SF		$ -	$ -
Make-safe- Structure	1,185	SF	4.00	$ 4,740	$ 7,584
Path B, Step 2: Interim Access	**SF**		**Perim**		
Acid Cylinder					**$ -**
	1,185		**122**		
N/A					
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Acid Cylinder					**$ -**
	1,185		**122**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Acid Cylinder					**$ -**
	1,185		**122**		
N/A					

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THE YARD AREA PHASE

Pump Station	Quantity	Unit	RATE		Total		Total w/MU
Total Area:	**580**	**SF**					**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**				
Pump Station						**$**	**8,816**
	580		**101.00**				
Demo all elements - preserve concrete box structure	580	SF	9.50	$	5,510	$	8,816
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**				
Pump Station						**$**	**12,611**
	580		**101**				
Shoring and equipment	580	SF	3.00	$	1,740	$	2,784
Fencing	101	LF	12.00	$	1,212	$	1,939
Removal of obstructions and loose equipment/materials	580	SF	2.50	$	1,450	$	2,320
Demolition to structure -Remove Steel structure to slab	580	SF	4.00	$	2,320	$	3,712
Make safe- Electrical, Mechanical and Plumbing	580	SF	1.00	$	580	$	928
Make-safe- Structural systems	580	SF	1.00	$	580	$	928
Path B, Step 2: Interim Access	**SF**		**Perim**				
Pump Station						**$**	**5,800**
	580		**101**				
Equipment	580	SF	1.00	$	580	$	928
Provide access points (includes signage)	580	SF	1.75	$	1,015	$	1,624
Provide barriers and rails to manage grade changes	580	SF	2.00	$	1,160	$	1,856
Provide barriers to limit access to hazardous areas	580	SF	0.50	$	290	$	464
Safety lighting	580	SF	1.00	$	580	$	928
Path B, Step 3: Re-Use Prep	**SF**		**Perim**				
Pump Station						**$**	**-**
	580		**101**				
N/A							
Path B, Step 4: Re-Use	**SF**		**Perim**				
Pump Station						**$**	**59,816**
	580		**101**				
Guardrail	101	LF	185.00	$	18,685	$	29,896
Lighting	580	SF	15.00	$	8,700	$	13,920
Fishing support structures	200	SF	50.00	$	10,000	$	16,000

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THE YARD AREA PHASE

Recovery Boiler	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**7,200**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Recovery Boiler					**$ 437,760**
	7,200		**550**		
Demo all elements - preserve concrete box structure	7,200	SF	38.00	$ 273,600	$ 437,760
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Recovery Boiler					**$ 184,320**
	7,200		**550**		
Complete Demolition	7,200	SF	16.00	$ 115,200	$ 184,320
Path B, Step 2: Interim Access	**SF**		**Perim**		
Recovery Boiler					**$ -**
	7,200		**550**		
N/A					
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Path B, Step 3: Re-Use Prep					$ -
	7,200		**550**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Recovery Boiler					**$ -**
	7,200		**550**		
N/A					

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THE YARD AREA PHASE

Butler Building	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**6,400**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Butler Building					**$ 97,280**
Complete demolition	6,400	SF	9.50	$ 60,800	$ 97,280
Path B, Step 1: Selective Removals, Stabilization, and Safetv	**SF**		**Perim**		
Butler Building					**$ -**
	6,400		**475**		
N/A					$ -
Path B, Step 2: Interim Access	**SF**		**Perim**		
Butler Building					**$ -**
	6,400				
N/A					$ -
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Butler Building					**$ -**
	6,400				
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Butler Building					**$ -**
	6,400				
N/A					

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THE YARD AREA PHASE

MILL O	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**18,855**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
MILL O					**$ -**
	18,855		**680**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Mill O- Option 1					**$ 593,790**
	18,855		**680**		
Shoring and equipment	18,855	SF	3.00	$ 56,565	$ 90,504
Fencing	680	LF	12.00	$ 8,160	$ 13,056
Removal of obstructions and loose equipment/materials	18,855	SF	2.50	$ 47,138	$ 75,420
Demolition to structure -Retaining walls and lower slab	18,855	SF	6.75	$ 127,271	$ 203,634
Make safe- Electrical, Mechanical and Plumbing	18,855	SF	1.00	$ 18,855	$ 30,168
Make-safe- Structural systems and glazed areas	18,855	SF	2.00	$ 37,710	$ 60,336
Remediate from further deterioration	18,855	SF	4.00	$ 75,420	$ 120,672
Path B, Step 2: Interim Access	**SF**		**Perim**		
Mill O					**$ 335,215**
	18,855		**680**		
Equipment	18,855	SF	1.00	$ 18,855	$ 30,168
Strtuctural reinforcement - shotcrete	680	LF	195.00	$ 132,600	$ 212,160
Provide access points (includes signage)	18,855	SF	0.45	$ 8,485	$ 13,576
Provide barriers and rails to manage grade changes	18,855	SF	0.85	$ 16,027	$ 25,643
Provide barriers to limit access to hazardous areas	24,480	SF	0.60	$ 14,688	$ 23,501
Safety lighting	18,855	SF	1.00	$ 18,855	$ 30,168
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Mill O					**$ 3,372,636**
	18,855		**680**		
Furnishings - stackable tables and chairs	42	SET	4,100.00	$ 171,790	$ 274,864
Public utility tie ins - sewer, electric, water	18,855	SF	16.50	$ 311,108	$ 497,772
Major seating stair and ramp	6,500	SF	250.00	$ 1,625,000	$ 2,600,000

MILL O		Quantity	Unit	RATE	Total	Total w/MU
	Total Area:	**18,855**	**SF**			**60%**
Path B, Step 4: Re-Use Mill O		**SF**		**Perim**		**$14,077,761**
		18,855		**680**		
Restrooms		1,800	SF	265.00	$ 477,000	$ 763,200
Maintenance Closet		100	SF	85.00	$ 8,500	$ 13,600
Storage Area		300	SF	55.00	$ 16,500	$ 26,400
Kitchen/Vending Area		300	SF	350.00	$ 105,000	$ 168,000
Informational Kiosk		225	SF	250.00	$ 56,250	$ 90,000
Lighting		18,855	SF	12.50	$ 235,688	$ 377,100
AV Equipment		18,855	SF	5.00	$ 94,275	$ 150,840
Seasonal space heating equipment		27	EA	500.00	$ 13,333	$ 21,333
New Door Structure		10	EA	5,000.00	$ 50,000	$ 80,000
Service and Maintenance Room		100	SF	175.00	$ 17,500	$ 28,000
Entrance Vestibule		400	SF	225.00	$ 90,000	$ 144,000
Flexible use public rooms		600	SF	225.00	$ 135,000	$ 216,000
MEP system		18,855	SF	63.00	$ 1,187,865	$ 1,900,584
Replaced glazing - allow		6,800	SF	80.00	$ 544,000	$ 870,400
Redevelopment Support Elements						
Structural trusses - allow		47	TN	5,200.00	$ 245,115	$ 392,184
One-story redevelopment - office		18,855	EA	265.00	$ 4,996,575	$ 7,994,520
Elevators - incl. mech room		2	EA	185,000.00	$ 370,000	$ 592,000
Stairways		1	LS	156,000.00	$ 156,000	$ 249,600

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BOILER AREA PHASE

Site Improvements	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**25,250**	**SF**			**60%**
Demolition and Removals				**$ 311,417**	**$ 498,267**
Fill Removal	4,676	CY	45.00	$ 210,417	$ 336,667
Miscellaneous site structure removal/stabilization	25,250	SF	4.00	$ 101,000	$ 161,600
Habitat Restoration				**$ 14,883**	**$ 23,813**
Top soil import	92	CY	35.00	$ 3,215	$ 5,144
In-Channel River		SF	12.00	$ -	$ -
Off-Channel River	5,237	SF	2.00	$ 10,474	$ 16,758
Riparian Basalt	3,007	SF	0.28	$ 842	$ 1,347
Riparian Forest	1,677	SF	0.21	$ 352	$ 563
Upland Forest		SF	0.50	$ -	$ -
Oak Woodland Savanna		SF	0.10	$ -	$ -
Public Access Elements				**$ 1,570,395**	**$ 2,512,632**
Secondary Paths	350	LF	2,400.00	$ 840,000	$ 1,344,000
Grated Stairwell	5	EA	35,000.00	$ 175,000	$ 280,000
Utilities - Water, Electric, Sewer	25,250	SF	18.00	$ 454,500	$ 727,200
Non-Habitat Plantings	2,500	SF	18.28	$ 45,692	$ 73,107
Non-Habitat Top Soil Import	370	CY	35.00	$ 12,963	$ 20,741
Furnishings	26	EA	1,650.00	$ 42,240	$ 67,584
Lighting				$ -	*INCL*
Interim Access Elements				**$ 104,711**	**$ 167,538**
Interim Fencing	3,242	LF	20.50	$ 66,461	$ 106,338
Intermin Temp. Scaffolding				$ -	$ -
Interim ADA Ramp	350	LF	75.00	$ 26,250	$ 42,000
Interim Restrooms	1	LS	12,000.00	$ 12,000	$ 19,200
Structures					
Boiler Plant					*See Detail*
High Density Stock Cylinder 2					*See Detail*
Brightening Tower					*See Detail*
THP Reject Refinery					*See Detail*
Platform Structures Associated with Boiler Plant					*See Detail*

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BOILER AREA PHASE

Boiler Plant	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**5,900**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Boiler Plant					**$ -**
	5,900		**550**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Boiler Plant					**$ 703,840**
	5,900		**550**		
Shoring and equipment	5,900	SF	8.00	$ 47,200	$ 75,520
Fencing	550	LF	13.00	$ 7,150	$ 11,440
Removal of obstructions and loose equipment/materials	5,900	SF	5.00	$ 29,500	$ 47,200
Demolition to structure - Remove exterior cladding system	7,000	SF	26.00	$ 182,000	$ 291,200
Make safe- Electrical, Mechanical and Plumbing	5,900	SF	9.00	$ 53,100	$ 84,960
Make-safe- Structural systems	5,900	SF	14.50	$ 85,550	$ 136,880
Remediate from further deterioration	5,900	SF	6.00	$ 35,400	$ 56,640
Path B, Step 2: Interim Access	**SF**		**Perim**		
Boiler Plant					**$ 344,560**
	5,900		**550**		
Equipment	5,900	SF	3.00	$ 17,700	$ 28,320
Provide access points (includes signage)	5,900	SF	8.00	$ 47,200	$ 75,520
Provide barriers and rails to manage grade changes	5,900	SF	7.50	$ 44,250	$ 70,800
Provide barriers to limit access to hazardous areas	5,900	SF	8.00	$ 47,200	$ 75,520
Safety lighting	5,900	SF	10.00	$ 59,000	$ 94,400
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Boiler Plant					**$ 424,800**
	5,900				
Utilities - Water, Electric, Sewer	5,900	SF	45.00	$ 265,500	$ 424,800

Path B, Step 4: Re-Use Boiler Plant	SF		Perim			$	374,016
Storage Kiosk	500	SF	250.00	$	125,000	$	200,000
Seasonal space heating elements	24	EA	500.00	$	12,000	$	19,200
Furnishings - stackable tables and chairs	24	SET	4,100.00	$	96,760	$	154,816

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BOILER AREA PHASE

Highdensity Stock Cylinder 2	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**406**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Highdensity Stock Cylinder 2					**$ 4,872**
	406				
Demolition - steel framed shed only.	406	SF	7.50	$ 3,045	$ 4,872
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Highdensity Stock Cylinder 2					**$ 90,147**
25 LF DIA	**406**		**71**		
Shoring and equipment	406	SF	8.00	$ 3,248	$ 5,197
Fencing	71	LF	13.00	$ 923	$ 1,477
Removal of obstructions and loose equipment/materials	406	SF	15.00	$ 6,090	$ 9,744
Demolition to structure -Remove skirt deck and columns at concrete base	406	SF	55.00	$ 22,330	$ 35,728
Demolition - remove concrete at water level to create openings	406	SF	35.00	$ 14,210	$ 22,736
Make safe- Electrical, Mechanical and Plumbing	406	SF	9.00	$ 3,654	$ 5,846
Make-safe- Structural systems	406	SF	14.50	$ 5,887	$ 9,419
Path B, Step 2: Interim Access	**SF**		**Perim**		
Highdensity Stock Cylinder 2					**$ 148,608**
	406		**71**		
Provide internal cantilevered, grated stair, and (4) landings	1	ALW	50,250	$ 50,250	$ 80,400
Provide lighting	406	SF	30.00	$ 12,180	$ 19,488
Provide barriers and rails to manage grade changes	406	SF	55.00	$ 22,330	$ 35,728
Provide barriers to limit access to hazardous areas	406	SF	20.00	$ 8,120	$ 12,992
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Highdensity Stock Cylinder 2					**$ -**
	406		**71**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Highdensity Stock Cylinder 2					**$ -**
	406		**71**		
N/A					

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BOILER AREA PHASE

Brightening Tower	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**150**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**	**$ -**	
Brightening Tower					**$ -**
	150				
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safetv	**SF**		**Perim**		
Brightening Tower					**$ 55,280**
	150		**50**		
Shoring and equipment	150	SF	8.00	$ 1,200	$ 1,920
Fencing	50	LF	13.00	$ 650	$ 1,040
Removal of obstructions and loose equipment/materials	150	SF	18.00	$ 2,700	$ 4,320
Make safe- Electrical, Mechanical and Plumbing	150	SF	20.00	$ 3,000	$ 4,800
Make-safe- Structural systems	150	SF	165.00	$ 24,750	$ 39,600
Remediate from further deterioration	150	SF	15.00	$ 2,250	$ 3,600
Path B, Step 2: Interim Access	**SF**		**Perim**		
Brightening Tower					**$ 720**
	150				
Stabilize for re-use	150	SF	3.00	$ 450	$ 720
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Brightening Tower					**$ -**
	150				
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Brightening Tower					**$ -**
	150				
N/A					

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BOILER AREA PHASE

THP Reject Refinery	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**8,100**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
THP Reject Refinery					**$ 362,880**
	8,100		**480**		
Demolition to structure - remove exterior cladding system	8,100	SF	28.00	$ 226,800	$ 362,880
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
THP Reject Refinery					**$ 861,216**
	8,100		**480**		
Shoring and equipment	8,100	SF	8.00	$ 64,800	$ 103,680
Fencing	480	LF	12.00	$ 5,760	$ 9,216
Removal of obstructions and loose equipment/materials	8,100	SF	15.00	$ 121,500	$ 194,400
Demolition to structure - remove roof cover	2,100	SF	15.00	$ 31,500	$ 50,400
Demolition to structure - remove all catwalks and decks	2,100	SF	65.00	$ 136,500	$ 218,400
Make safe- Electrical, Mechanical and Plumbing	8,100	SF	4.00	$ 32,400	$ 51,840
Make-safe- Structural systems	8,100	SF	18.00	$ 145,800	$ 233,280
Path B, Step 2: Interim Access	**SF**		**Perim**		
THP Reject Refinery					**$ 1,845,600**
	8,100		**480**		
Clean and weatherize existing steel structural elements	1	ALW	15,000	$ 15,000	$ 24,000
Equipment	8,100	SF	9.00	$ 72,900	$ 116,640
Remove and replace damaged structural steel critical to structure.	1	ALW	40,000	$ 40,000	$ 64,000
Interim access stair to upper levels, (13 flights)	1	LS	715,000	$ 715,000	$ 1,144,000
Interim access viewing platform	1	LS	100,000	$ 100,000	$ 160,000
Provide access points and stairs (includes signage)	8,100	SF	8.00	$ 64,800	$ 103,680
Provide barriers and rails to manage grade changes	8,100	SF	5.00	$ 40,500	$ 64,800
Provide barriers to limit access to hazardous areas	8,100	SF	3.00	$ 24,300	$ 38,880
Safety lighting	8,100	SF	10.00	$ 81,000	$ 129,600
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
THP Reject Refinery					**$ 233,280**
	8,100		**480**		
Utilities - sewer and electricity	8,100	SF	18.00	$ 145,800	$ 233,280

Path B, Step 4: Re-Use **THP Reject Refinery**	**SF**		**Perim**				**$ 3,875,600**
	8,100		**480**				
#1 Structure - Vertical Playground	1,500	SF					
Elevator, (2 stops)	1	LS	190,000.00	$	190,000	$	304,000
Roof-type play structure (5 story)	1	LS	500,000.00	$	500,000	$	800,000
3 tube slide structure (various ht.)	1	LS	750,000.00	$	750,000	$	1,200,000
Lighting	1,500	SF	88.00	$	132,000	$	211,200
Overlook locations (Kid play)	5	EA	40,000.00	$	200,000	$	320,000
#2 Structure - Overlook	2,100	SF					
Overlook - incl. guardrails and benches	1	ALW	178,500.00	$	178,500	$	285,600
Architectural kiosk							
Unisex bathroom	2	EA	76,500.00	$	153,000	$	244,800
Vending area - coffee	1	ALW	45,000.00	$	45,000	$	72,000
Storage space	1	ALW	18,750.00	$	18,750	$	30,000
#3 Structure - Art Grove	4,500	SF					
Demo concrete slab	4,500	SF	30.00	$	135,000	$	216,000
Sub drainage and materials	4,500	SF	20.00	$	90,000	$	144,000
Fill - existing materials from site excavation	2,500	CY	12.00	$	30,000	$	48,000
Topsoil - see Sitework							*INCL*
Planting - see Sitework							*INCL*

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BOILER AREA PHASE

Platform Structures	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**1,000**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Platform Structures					**$ -**
	1,000		**50**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Platform Structures					**$ 112,240**
	1,000		**50**		
Fencing	50	LF	13.00	$ 650	$ 1,040
Stabilize for re-use	1,000	SF	20.00	$ 20,000	$ 32,000
Removal of obstructions and loose equipment/materials	1,000	SF	18.00	$ 18,000	$ 28,800
Make-safe- Structural systems	1,000	SF	16.50	$ 16,500	$ 26,400
Remediate from further deterioration	1,000	SF	15.00	$ 15,000	$ 24,000
Path B, Step 2: Interim Access	**SF**		**Perim**		
Platform Structures					**$ -**
	1,000		**50**		
N/A					
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Platform Structures					**$ -**
	1,000		**50**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Platform Structures					**$ -**
	1,000		**50**		
N/A					

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EASTERN MILL RESERVE AREA PHASE

Site Improvements	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**30,500**	**SF**			**60%**
Demolition and Removals				**$ 376,167**	**$ 601,867**
Fill Removal	5,648	CY	45.00	$ 254,167	$ 406,667
Miscellaneous site structure removal/stabilization	30,500	SF	4.00	$ 122,000	$ 195,200
Habitat Restoration				**$ 21,561**	**$ 34,497**
Top Soil Import	250	CY	35.00	$ 8,761	$ 14,018
In-Channel River		SF	12.00	$ -	$ -
Off-Channel River	3,795	SF	2.00	$ 7,590	$ 12,144
Riparian Basalt	4,706	SF	0.28	$ 1,318	$ 2,108
Riparian Forest	18,533	SF	0.21	$ 3,892	$ 6,227
Upland Forest		SF	0.50	$ -	$ -
Oak Woodland Savanna		SF	0.10	$ -	$ -
Public Access Elements				**$ 21,833**	**$ 34,933**
Retaining Wall					*N/A*
Secondary Paths					*N/A*
Utilities - Water, Electric					*N/A*
Non-Habitat Plantings					*N/A*
Non-Habitat Top Soil Import					*N/A*
Furnishings					*N/A*
Lighting					*N/A*
Stormwater Management Conveyance				*TBD*	*TBD*
Stormwater Management Structure	1,800	SF	12.13	$ 21,833	$ 34,933
Main Street Improvements				*TBD*	*TBD*
Mill H					*See Detail*
Woolen Mill					*See Detail*
Rewind Building					*See Detail*
High Density Stock Cylinder 1					*See Detail*
#1 Paper Machine					*See Detail*

Willamette Falls River Walk
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EASTERN MILL RESERVE AREA PHASE

Mill H	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**13,700**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Mill H					**$ 186,320**
	13,700		**512**		
Demolition to steel structure	13,700	SF	8.50	$ 116,450	$ 186,320
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Mill H					**$ 546,870**
	13,700		**512**		
Shoring and equipment	13,700	SF	3.00	$ 41,100	$ 65,760
Fencing	512	LF	12.00	$ 6,144	$ 9,830
Removal of obstructions and loose equipment/materials	13,700	SF	4.50	$ 61,650	$ 98,640
Make safe- Electrical, Mechanical and Plumbing	13,700	SF	1.00	$ 13,700	$ 21,920
Demolition of structure to Slab	13,700	SF	16.00	$ 219,200	$ 350,720
Remediate from further deterioration	13,700	SF	4.00	$ 54,800	$ 87,680
Path B, Step 2: Interim Access	**SF**		**Perim**		
Mill H					**$ 865,840**
	13,700		**512**		
Equipment	13,700	SF	3.00	$ 41,100	$ 65,760
Provide access points (includes signage)	13,700	SF	8.00	$ 109,600	$ 175,360
Provide barriers and rails to manage grade changes	13,700	SF	7.50	$ 102,750	$ 164,400
Provide barriers to limit access to hazardous areas	13,700	SF	8.00	$ 109,600	$ 175,360
Safety lighting	13,700	SF	10.00	$ 137,000	$ 219,200
Stabilize for re-use	13,700	SF	3.00	$ 41,100	$ 65,760
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Mill H					**$ -**
	13,700		**512**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Path B, Step 4: Re-Use					**$ -**
	13,700		**512**		
N/A					

Willamette Falls River Walk
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EASTERN MILL RESERVE AREA PHASE

Woolen Mill Foundation	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**8,000**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Woolen Mill Foundation					**$ -**
	8,000		**550.00**		
N/A					*See Yard Area Phase*
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Woolen Mill Foundation					**$ -**
	8,000		**550**		
N/A					*See Yard Area Phase*
Millwright Shop	**SF**		**Perim**		
Woolen Mill Foundation					**$ -**
	8,000		**550**		
N/A					*See Yard Area Phase*
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Woolen Mill Foundation					**$ 327,822**
	8,000		**550**		
Furnishings - stackable tables and chairs	18	SET	4,100.00	$ 72,889	$ 116,622
Public utility tie ins - sewer, electric, water	8,000	SF	16.50	$ 132,000	$ 211,200
Path B, Step 4: Re-Use	**SF**		**Perim**		
Woolen Mill Foundation					**$ 894,400**
	8,000		**550**		
Storage area	600	SF	100.00	$ 60,000	$ 96,000
Service and maintenance support room	800	SF	125.00	$ 100,000	$ 160,000
Overlook area					
Exterior structural platform	4,800	SF	15.00	$ 72,000	$ 115,200
Guardrail with integrated interp. elements	280	LF	225.00	$ 63,000	$ 100,800
Stone paving	4,800	SF	55.00	$ 264,000	$ 422,400

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EASTERN MILL RESERVE AREA PHASE

Paper Rewind	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**3,000**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Paper Rewind					**$ -**
	3,000		**210.00**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Paper Rewind					**$ 140,832**
	3,000		**210**		
Shoring and equipment	3,000	SF	3.00	$ 9,000	$ 14,400
Fencing	210	LF	12.00	$ 2,520	$ 4,032
Removal of obstructions and loose equipment/materials	3,000	SF	4.50	$ 13,500	$ 21,600
Selective demolition to remove structure and save columns and beams	3,000	SF	16.00	$ 48,000	$ 76,800
Make safe- Electrical, Mechanical and Plumbing	3,000	SF	1.00	$ 3,000	$ 4,800
Make-safe- Structural systems	3,000	SF	2.00	$ 6,000	$ 9,600
Remediate from further deterioration	3,000	SF	2.00	$ 6,000	$ 9,600
Path B, Step 2: Interim Access	**SF**		**Perim**		
Paper Rewind					**$ 189,600**
	3,000		**210**		
Equipment	3,000	SF	3.00	$ 9,000	$ 14,400
Provide access points (includes signage)	3,000	SF	8.00	$ 24,000	$ 38,400
Provide barriers and rails to manage grade changes	3,000	SF	7.50	$ 22,500	$ 36,000
Provide barriers to limit access to hazardous areas	3,000	SF	8.00	$ 24,000	$ 38,400
Safety lighting	3,000	SF	10.00	$ 30,000	$ 48,000
Stabilize for re-use	3,000	SF	3.00	$ 9,000	$ 14,400
Path B, Step 2: Interim Access	**SF**		**Perim**		
Paper Rewind					**$ -**
	3,000		**210**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
	3,000		**210**		
N/A					

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EASTERN MILL RESERVE AREA PHASE

High Density Stock Cylinder 1	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**1,045**	**SF**			60%
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ 14,212**
	1,045		**115.00**		
Complete Demolition	1,045	SF	8.50	$ 8,883	$ 14,212
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ 46,516**
42 LF DIA	**1,045**		**115**		
Shoring and equipment	1,045	SF	3.00	$ 3,135	$ 5,016
Fencing	115	LF	12.00	$ 1,380	$ 2,208
Removal of obstructions and loose equipment/materials	1,045	SF	14.50	$ 15,153	$ 24,244
Make safe- Electrical, Mechanical and Plumbing	1,045	SF	1.00	$ 1,045	$ 1,672
Make-safe- Structural systems	1,045	SF	8.00	$ 8,360	$ 13,376
Path B, Step 2: Interim Access	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ 66,044**
	1,045		**115**		
Equipment	1,045	SF	3.00	$ 3,135	$ 5,016
Provide access points (includes signage)	1,045	SF	8.00	$ 8,360	$ 13,376
Provide barriers and rails to manage grade changes	1,045	SF	7.50	$ 7,838	$ 12,540
Provide barriers to limit access to hazardous areas	1,045	SF	8.00	$ 8,360	$ 13,376
Safety lighting	1,045	SF	10.00	$ 10,450	$ 16,720
Stabilize for re-use	1,045	SF	3.00	$ 3,135	$ 5,016
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ 27,588**
	1,045		**115**		
Public utility tie ins - sewer, electric, water	1,045	SF	16.50	$ 17,243	$ 27,588
Path B, Step 4: Re-Use	**SF**		**Perim**		
High Density Stock Cylinder 1					**$ 418,000**
	1,045		**115**		
Interior retrofit	1,045	SF	250.00	$ 261,250	$ 418,000

Willamette Falls River Walk
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EASTERN MILL RESERVE AREA PHASE

Number One Paper Machine	Quantity	Unit	RATE		Total		Total w/MU
Total Area:	**11,662**	**SF**					**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**				
Number One Paper Machine						**$**	**-**
	11,662		**550.00**				
N/A							
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**				
Number One Paper Machine						**$**	**728,939**
	11,662		**550**				
Shoring and equipment	11,662	SF	3.00	$	34,986	$	55,978
Fencing	550	LF	12.00	$	6,600	$	10,560
Removal of obstructions and loose equipment/materials	11,662	SF	4.50	$	52,479	$	83,966
Demolition to structure -Remove 1/2 of structure -retain columns and beams	11,662	SF	26.00	$	303,212	$	485,139
Make safe- Electrical, Mechanical and Plumbing	11,662	SF	1.00	$	11,662	$	18,659
Make-safe- Structural systems	11,662	SF	2.00	$	23,324	$	37,318
Remediate from further deterioration	11,662	SF	2.00	$	23,324	$	37,318
Path B, Step 2: Interim Access	**SF**		**Perim**				
Number One Paper Machine						**$**	**114,626**
	11,662		**550**				
Equipment	11,662	SF	1.00	$	11,662	$	18,659
Provide access points (includes signage)	11,662	SF	1.00	$	11,662	$	18,659
Provide barriers and rails to manage grade changes	11,662	SF	2.00	$	23,324	$	37,318
Provide barriers to limit access to hazardous areas	11,662	SF	0.50	$	5,831	$	9,330
Secure gate	1	LS	7,500		7,500		12,000
Safety lighting	11,662	SF	1.00	$	11,662	$	18,659
Path B, Step 3: Re-Use Prep	**SF**		**Perim**				
Number One Paper Machine						**$**	**-**
	11,662		**550**				
							Incl. Above
Path B, Step 4: Re-Use	**SF**		**Perim**				
Number One Paper Machine						**$**	**-**
	11,662		**550**				
TBD							

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PGE DAM AREA PHASE

Site Improvements	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**170,000**	**SF**			**60%**
Demolition and Removals				**$ 895,655**	**$ 1,433,047**
Fill Removal	12,593	CY	45.00	$ 566,667	$ 906,667
Miscellaneous site structure removal/stabilization	82,247	SF	4.00	$ 328,988	$ 526,381
Habitat Restoration				**$ 102,049**	**$ 163,278**
Top soil import	762	CY	35.00	$ 26,654	$ 42,647
In-Channel River		SF	12.00	$ -	$ -
Off-Channel River	30,869	SF	2.00	$ 61,738	$ 98,781
Riparian Basalt	40,961	SF	0.28	$ 11,469	$ 18,351
Riparian Forest	10,417	SF	0.21	$ 2,188	$ 3,500
Upland Forest		SF	0.50	$ -	$ -
Oak Woodland Savanna		SF	0.10	$ -	$ -
Public Access Elements				**$ 4,767,890**	**$ 7,628,623**
PGE Dam Path	1,255	LF	1,720.23	$ 2,158,890	$ 3,454,223
Secondary Paths	485	LF	2,400.00	$ 1,164,000	$ 1,862,400
Utilities - Water, Electric	170,000	SF	8.50	$ 1,445,000	$ 2,312,000
Non-Habitat Plantings					*See Clarifier*
Non-Habitat Top Soil Import					*See Clarifier*
Furnishings					*Incl. Above*
Lighting					*Incl.*
Structures					
Clarifier					*See Detail*
Hawley Powerhouse Foundation			-		*See Detail*

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PGE DAM AREA PHASE

Clarifier	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**21,601**	**SF**			60%
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Clarifier					**$ 839,866**
	21,601		**541**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Clarifier					**$ 839,866**
	21,601		**541**		
Shoring and equipment	21,601	SF	3.00	$ 64,803	$ 103,685
Fencing	541	LF	12.00	$ 6,492	$ 10,387
Removal of obstructions and loose equipment/materials	21,601	SF	8.00	$ 172,808	$ 276,493
Make safe- Electrical, Mechanical and Plumbing	21,601	SF	1.00	$ 21,601	$ 34,562
Make-safe- Structural systems	21,601	SF	9.00	$ 194,409	$ 311,054
Remediate from further deterioration	21,601	SF	3.00	$ 64,803	$ 103,685
Path B, Step 2: Interim Access	**SF**		**Perim**		
Clarifier					**$ -**
	21,601		**541**		
N/A					
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Clarifier					**$ 1,734,110**
	21,601		**541**		
Demolition - additional portion of clarifier wall	1,785	SF	20.00	$ 35,706	$ 57,130
Structural reinforcement - shoring	1,785	SF	24.00	$ 42,847	$ 68,556
Structural support - columns, bases, and footings	43	TN	10,500.00	$ 454,440	$ 727,104
Water collection system	21,601	SF	2.00	$ 43,202	$ 69,123
Irrigation system	21,601	SF	2.50	$ 54,003	$ 86,404
Electric and water connections	21,601	SF	16.50	$ 356,417	$ 570,266
Drainage and overlow systems to existing structure	21,601	SF	4.50	$ 97,205	$ 155,527

Clarifier		Quantity	Unit	RATE		Total		Total w/MU
	Total Area:	**21,601**	**SF**					60%
Path B, Step 4: Re-Use		**SF**		**Perim**				
Path B, Step 4: Re-Use							**$**	**2,221,277**
		21,601		**541**				
Import fill material		5,600	CY	35.00	$	196,009	$	313,615
Import landform - existing basalt		9,896	CY	12.00	$	118,757	$	190,012
Habitat restoration		21,601	SF	0.50	$	10,801	$	17,281
Pathway		720	LF	1,188	$	854,802	$	1,367,683
Railing		720	LF	150.00	$	107,930	$	172,687
Interpretive Signage		1	LS	100,000.00	$	100,000	$	160,000

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PGE DAM AREA PHASE

Hawley Powerhouse Foundation	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**4,250**	**SF**			60%
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Hawley Powerhouse Foundation					**$ -**
	4,250		**275**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Hawley Powerhouse Foundation					**$ 280,680**
	4,250		**275**		
Shoring and equipment	4,250	SF	3.00	$ 12,750	$ 20,400
Fencing	275	LF	12.00	$ 3,300	$ 5,280
Removal of obstructions and loose equipment/materials	4,250	SF	2.50	$ 10,625	$ 17,000
Make safe- Electrical, Mechanical and Plumbing	4,250	SF	1.00	$ 4,250	$ 6,800
Make-safe- Structural systems	4,250	SF	34.00	$ 144,500	$ 231,200
Remediate from further deterioration	4,250	SF	4.00	$ 17,000	$ 27,200
Path B, Step 2: Interim Access	**SF**		**Perim**		
Hawley Powerhouse Foundation					**$ -**
	4,250		**275**		
N/A					
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Hawley Powerhouse Foundation					**$ 112,200**
	4,250		**275**		
Public utility tie ins - electric, water	4,250	SF	16.50	$ 70,125	$ 112,200
Path B, Step 4: Re-Use	**SF**		**Perim**		
Hawley Powerhouse Foundation					**$ 4,876,000**
	4,250		**275**		
Prefabricated structure	4,250	SF	320.00	$ 1,360,000	$ 2,176,000
Substructure - steel grate	4,250	SF	350.00	$ 1,487,500	$ 2,380,000
Concrete steps and view landings	1	LS	150,000.00	$ 150,000	$ 240,000
Preservation of historic artifacts	1	LS	50,000.00	$ 50,000	$ 80,000

Willamette Falls River Walk
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MILL E AND BLUFF CONNECTION PHASE OPTION 1

Site Improvements	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**72,000**	**SF**			**60%**
Demolition and Removals				**$ 2,360,270**	**$ 3,923,340**
Fill Removal	13,333	CY	45.00	$ 600,000	$ 960,000
Dredge removal	9,499	CY	155.00	$ 1,472,270	$ 2,355,633
Miscellaneous site structure removal/stabilization	72,000	SF	4.00	$ 288,000	$ 460,800
Habitat Restoration				**$ 70,305**	**$ 112,488**
Top soil import	615	CY	35.00	$ 21,512	$ 34,420
In-Channel River		SF	12.00	$ -	$ -
Off-Channel Alcove	15,872	SF	2.00	$ 31,744	$ 50,790
Riparian Basalt	12,926	SF	0.28	$ 3,619	$ 5,791
Riparian Forest	18,490	SF	0.21	$ 3,883	$ 6,213
Upland Forest	19,093	SF	0.50	$ 9,547	$ 15,274
Oak Woodland Savanna		SF	0.10	$ -	$ -
Public Access Elements				**$ 2,707,734**	**$ 4,332,375**
Retaining Wall		LS		$ -	$ -
Primary Path Surface	1	LS	1,533,734	$ 1,533,734	$ 2,453,975
Secondary Paths	130	LF	2,400.00	$ 312,000	$ 499,200
Boat Access	1	LS	250,000.00	$ 250,000	$ 400,000
Utilities - Water, Electric, Sewer	72,000	SF	8.50	$ 612,000	$ 979,200
Lighting				*Incl. in Secondary Paths Above*	
Stormwater Management Conveyance				*TBD*	*TBD*
Stormwater Management Structures				*Incl. with East Mill Reserve*	
Main Street Improvements				*TBD*	*TBD*
Mill E					*See Detail*
Chip Cylinder					*See Detail*
Bleach Plant					*See Detail*
Main Street Platform Area - Replacement Platform				*TBD*	*TBD*
Main Street Platform Area - Replacement Retaining Wall		LS		*TBD*	*TBD*

Willamette Falls River Walk
100% Concept Cost Plan

MILL E and BLUFF CONNECTION PHASE OPTION 1

Mill E	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**30,000**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Mill E					**$ 768,000**
	30,000		**550**		
Complete demolition	30,000	SF	16.00	$ 480,000	$ 768,000
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Mill E					**$ -**
Option 1	**30,000**		**550**		
TBD					
Path B, Step 2: Interim Access	**SF**		**Perim**		
Mill E					**$ -**
	30,000		**550**		
TBD					
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Mill E					**$ -**
	30,000		**550**		
TBD					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Mill E					**$ -**
	30,000		**550**		
TBD					

Willamette Falls River Walk
100% Concept Cost Plan

MILL E and BLUFF CONNECTION PHASE OPTION 1

Chip Cylinder	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**1,149**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Chip Cylinder					**$ -**
	1,149		**120**		
N/A					$ -
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Chip Cylinder					**$ 81,355**
38 LF DIA	**1,149**		**120**		
Shoring and equipment	1,149	SF	3.00	$ 3,447	$ 5,515
Fencing	120	LF	12.00	$ 1,440	$ 2,304
Removal of obstructions and loose equipment/materials	1,149	SF	15.00	$ 17,235	$ 27,576
Selective Demolition for access	1,149	SF	16.00	$ 18,384	$ 29,414
Make safe- Electrical, Mechanical and Plumbing	1,149	SF	1.00	$ 1,149	$ 1,838
Make-safe- Structural systems	1,149	SF	8.00	$ 9,192	$ 14,707
Path B, Step 2: Interim Access	**SF**		**Perim**		
Chip Cylinder					**$ 28,511**
	1,149		**120**		
Equipment	1,149	SF	1.00	$ 1,149	$ 1,838
Provide access points (includes signage)	1,149	SF	1.00	$ 1,149	$ 1,838
Provide barriers and rails to manage grade changes	1,149	SF	2.00	$ 2,298	$ 3,677
Provide barriers to limit access to hazardous areas	1,149	SF	0.50	$ 575	$ 919
Provide barriers and rails to manage grade changes	5,750	SF	2	11,500	18,400
Safety lighting	1,149	SF	1.00	$ 1,149	$ 1,838
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Chip Cylinder					**$ 45,960**
	1,149		**120**		
Utility service and support for structure	1,149	SF	25.00	$ 28,725	$ 45,960

Chip Cylinder	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**1,149**	**SF**			**60%**
Path B, Step 4: Re-Use **Chip Cylinder**	**SF**		**Perim**		**$ 8,297,829**
Elevator and Stair to Bluff Connection					
Bridge Structure	143	LF	$ 1,820.23	$ 260,293	$ 416,469
Full Enclosed Railing	143	LF	$ 950.00	$ 135,850	$ 217,360
Foundation	3100	CY	$ 750.00	$2,325,000	$ 3,720,000
Stair set & Enclosure	1	LS	$ 1,265,000	$1,265,000	$ 2,024,000
Elevator - 2 Stop	1	LS	$ 1,200,000	$1,200,000	$ 1,920,000

Willamette Falls River Walk
100% Concept Cost Plan

MILL E and BLUFF CONNECTION PHASE OPTION 1

Bleach Plant	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**3,800**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Bleach Plant					**$ -**
	3,800		**250**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Bleach Plant					**$ 117,280**
	3,800		**250**		
Shoring and equipment	3,800	SF	3.00	$ 11,400	$ 18,240
Fencing	250	LF	12.00	$ 3,000	$ 4,800
Removal of obstructions and loose equipment/materials	3,800	SF	2.50	$ 9,500	$ 15,200
Selective demolition to remove structure and save columns and beams	3,800	SF	8.00	$ 30,400	$ 48,640
Make safe- Electrical, Mechanical and Plumbing	3,800	SF	1.00	$ 3,800	$ 6,080
Make-safe- Structural systems	3,800	SF	2.00	$ 7,600	$ 12,160
Remediate from further deterioration	3,800	SF	2.00	$ 7,600	$ 12,160
Path B, Step 2: Interim Access	**SF**		**Perim**		
Bleach Plant					**$ 45,440**
	3,800		**250**		
Equipment	3,800	SF	1.00	$ 3,800	$ 6,080
Provide access points (includes signage)	3,800	SF	1.00	$ 3,800	$ 6,080
Provide barriers and rails to manage grade changes	3,800	SF	2.00	$ 7,600	$ 12,160
Provide barriers to limit access to hazardous areas	3,800	SF	0.50	$ 1,900	$ 3,040
Secure gate	1	LS	7,500	7,500	12,000
Safety lighting	3,800	SF	1.00	$ 3,800	$ 6,080
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Bleach Plant					**$ -**
	3,800		**250**		
N/A					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Bleach Plant					
	3,800		**250**		
N/A					

Willamette Falls River Walk
100% Concept Cost Plan

MILL E AND BLUFF CONNECTION PHASE OPTION 2

Site Improvements	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**72,000**	**SF**			**60%**
Demolition and Removals				**$ 888,000**	**$ 1,567,708**
Fill Removal	13,333	CY	45	$ 600,000	$ 960,000
Dredge removal	9,499	CY	155		
Miscellaneous site structure removal/stabilization	72,000	SF	4	$ 288,000	$ 460,800
Habitat Restoration				**$ 70,305**	**$ 112,488**
Top Soil Import	615	CY	35.00	$ 21,512	$ 34,420
In-Channel River		SF	12.00	$ -	$ -
Off-Channel Alcove	15,872	SF	2.00	$ 31,744	$ 50,790
Riparian Basalt	12,926	SF	0.28	$ 3,619	$ 5,791
Riparian Forest	18,490	SF	0.21	$ 3,883	$ 6,213
Upland Forest	19,093	SF	0.50	$ 9,547	$ 15,274
Oak Woodland Savanna		SF	0.10	$ -	$ -
Public Access Elements				**$ 4,407,581**	**$ 7,052,129**
Retaining Wall	11,283	SF	175.00	$ 1,974,525	$ 3,159,240
Primary Path Surface	1	LS	1,259,056	$ 1,259,056	$ 2,014,489
Secondary Paths	130	LF	2,400.00	$ 312,000	$ 499,200
Boat Access	1	LS	250,000.00	$ 250,000	$ 400,000
Utilities - Water, Electric, Sewer	72,000	SF	8.50	$ 612,000	$ 979,200
Lighting				*Incl. in Secondary Paths Above*	
Stormwater Management Conveyance				*TBD*	*TBD*
Stormwater Management Structures				*Incl. with East Mill Reserve*	
Main Street Improvements				*TBD*	*TBD*
Mill E					*See Detail*
Bleach Plant					*See Detail*
Digesters and Sulphite Plant					*TBD*
Hawley Building					*TBD*
#1 Paper Machine					*TBD*

Willamette Falls River Walk
100% Concept Cost Plan

MILL E AND BLUFF CONNECTION PHASE OPTION 2

Mill E	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**30,000**	**SF**			**60%**
Path A, Step 1 Strategic Demolition	**SF**		**Perim**		
Mill E					**$ 456,000**
	30,000		**Perim**		
Complete demolition	30,000	SF	9.50	$ 285,000	$ 456,000
Path B, Step 1: Selective Removals, Stabilization, and Safetv	**SF**		**Perim**		
Mill E					**$ -**
	30,000		**550**		
TBD					
Path B, Step 2: Interim Access	**SF**		**Perim**		
Mill E					**$ -**
	30,000		**550**		
TBD					
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Mill E					**$ -**
	30,000		**550**		
TBD					
Path B, Step 4: Re-Use	**SF**		**Perim**		
Mill E					**$ -**
	30,000		**550**		
TBD					

Willamette Falls River Walk
100% Concept Cost Plan

MILL E AND BLUFF CONNECTION PHASE OPTION 2

Bleach Plant	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**3,800**	**SF**			**60%**
Path A, Step 1 Strategic Demolition **Bleach Plant**	SF		Perim	**$ -**	**$ -**
	3,800		**250**		
N/A					
Path B, Step 1: Selective Removals, Stabilization, and Safety **Bleach Plant**	**SF**		**Perim**		**$ 117,280**
	3,800		**250**		
Shoring and equipment	3,800	SF	3.00	$ 11,400	$ 18,240
Fencing	250	LF	12.00	$ 3,000	$ 4,800
Removal of obstructions and loose equipment/materials	3,800	SF	2.50	$ 9,500	$ 15,200
Selective demolition to remove structure and save columns and beams	3,800	SF	8.00	$ 30,400	$ 48,640
Make safe- Electrical, Mechanical and Plumbing	3,800	SF	1.00	$ 3,800	$ 6,080
Make-safe- Structural systems	3,800	SF	2.00	$ 7,600	$ 12,160
Remediate from further deterioration	3,800	SF	2.00	$ 7,600	$ 12,160
Path B, Step 2: Interim Access **Bleach Plant**	**SF**		**Perim**		**$ 51,840**
	3,800		**250**		
Equipment	3,800	SF	1.00	$ 3,800	$ 6,080
Provide access points (includes signage)	3,800	SF	1.00	$ 3,800	$ 6,080
Provide barriers and rails to manage grade changes	3,800	SF	2.00	$ 7,600	$ 12,160
Provide barriers to limit access to hazardous areas	3,800	SF	0.50	$ 1,900	$ 3,040
Provide barriers and rails to manage grade changes	5,750	LS	2	11,500	18,400
Safety lighting	3,800	SF	1.00	$ 3,800	$ 6,080
Path B, Step 3: Re-Use Prep **Bleach Plant**	**SF**		**Perim**		**$ -**
	3,800		**250**		
N/A					
Path B, Step 4: Re-Use **Bleach Plant**	**SF**		**Perim**		**$ -**
	3,800		**250**		
N/A					

Willamette Falls River Walk
100% Concept Cost Plan

MILL E AND BLUFF CONNECTION PHASE OPTION

Digesters and Sulphite Plant	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**10,500**	**SF**			**60%**
Path A, Step 1 Strategic Demolition				**$ -**	**$ -**
TBD					
Path B, Step 1: Selective Removals, Stabilization, and Safety	**SF**		**Perim**		
Digesters and Sulphite Plant					**$ 731,424**
	10,500		**470**		
Shoring and equipment	10,500	SF	3.00	$ 31,500	$ 50,400
Fencing	470	LF	12.00	$ 5,640	$ 9,024
Removal of obstructions and loose equipment/materials	10,500	SF	15.00	$ 157,500	$ 252,000
Selective Demolition for access	10,500	SF	16.00	$ 168,000	$ 268,800
Make safe- Electrical, Mechanical and Plumbing	10,500	SF	1.00	$ 10,500	$ 16,800
Make-safe- Structural systems	10,500	SF	8.00	$ 84,000	$ 134,400
Path B, Step 2: Interim Access	**SF**		**Perim**		
Digesters and Sulphite Plant					**$ 101,600**
	10,500		**470**		
Equipment	10,500	SF	1.00	$ 10,500	$ 16,800
Provide access points (includes signage)	10,500	SF	1.00	$ 10,500	$ 16,800
Provide barriers and rails to manage grade changes	10,500	SF	2.00	$ 21,000	$ 33,600
Provide barriers to limit access to hazardous areas	10,500	SF	0.50	$ 5,250	$ 8,400
Equipment	5,750	SF	1	5,750	9,200
Safety lighting	10,500	SF	1.00	$ 10,500	$ 16,800
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Digesters and Sulphite Plant					**$ 420,000**
	10,500		**470**		
Utility service and support for structure	10,500	SF	25.00	$ 262,500	$ 420,000
Path B, Step 3: Re-Use Prep	**SF**		**Perim**		
Digesters and Sulphite Plant					**$ 5,180,000**
	10,500		**470**		
Bridge Structure	250	LF	$ 800.00	$ 200,000	$ 320,000
Full Enclosed Railing	250	LF	$ 950.00	$ 237,500	$ 380,000
Foundation	3100	CY	$ 750.00	$ 2,325,000	$ 3,720,000
Elevator - 2 Stop, existing shaft	1	LS	$ 475,000	$ 475,000	$ 760,000

Willamette Falls River Walk
100% Concept Cost Plan

MILL E AND BLUFF CONNECTION PHASE OPTION 2

Hawley Building		Quantity	Unit	RATE	Total	Total w/MU
	Total Area:	**5,750**	**SF**			**60%**
Path A, Step 1 Strategic Demolition					**$ -**	**$ -**
TBD						

Willamette Falls River Walk
100% Concept Cost Plan

CANEMAH AREA PHASE

Site Improvements	Quantity	Unit	RATE	Total	Total w/MU
Total Area:	**115,000**	**SF**			**60%**
Demolition and Removals				**$ 842,175**	**$ 1,869,856**
Fill Removal	8,519	CY	45.00	$ 383,333	$ 613,333
Fill removal - Expanded water area	8,223	CY	45.00	$ 370,033	$ 592,053
Miscellaneous site structure removal/stabilization	22,202	SF	4.00	$ 88,808	$ 142,093
Habitat Restoration				**$ 292,453**	**$ 467,924**
Top Soil Import	972	CY	35.00	$ 34,033	$ 54,453
In-Channel River	19,174	SF	12.00	$ 230,088	$ 368,141
Off-Channel Alcove		SF	2.00	$ -	$ -
Riparian Basalt		SF	0.28	$ -	$ -
Riparian Forest	50,308	SF	0.21	$ 10,565	$ 16,903
Upland Forest	35,534	SF	0.50	$ 17,767	$ 28,427
Oak Woodland Savanna		SF	0.10	$ -	$ -
				$ -	$ -
Public Access Elements				**$ 7,382,600**	**$11,812,160**
Retaining Wall Improvements and Safety Barrier	2,250	SF	58.00	$ 130,500	$ 208,800
Primary Path Surface	22,500	SF	75.00	$ 1,687,500	$ 2,700,000
Secondary Paths	50	LF	1,352.00	$ 67,600	$ 108,160
Boat Access	1	LS	12,000.00	$ 12,000	$ 19,200
Utilities - Water, Electric	1	LS	250,000.00	$ 250,000	$ 400,000
Furnishings	45	EA	3,000.00	$ 135,000	$ 216,000
Lighting	45	EA	15,000.00	$ 675,000	$ 1,080,000
RR Overpass and roadway improvements	800	LF	5,531.25	$ 4,425,000	$ 7,080,000

Materials following this page were distributed at the meeting.

Willamette Falls Riverwalk Master Plan

November 21, 2017

Willamette Falls Legacy Project

OREGON CITY

CLACKAMAS COUNTY

Metro

STATE OF OREGON

1859

Four Core Values

PUBLIC ACCESS

HISTORICAL &
CULTURAL
INTERPRETATION

ECONOMIC
REDEVELOPMENT

HEALTHY
HABITAT

Greater Regional Context

Newell Creek Canyon

Canemah Bluff Nature Park

Willamette Narrows

Celebrating the Riverwalk Design

Willamette Falls: A Natural Treasure

Project Background

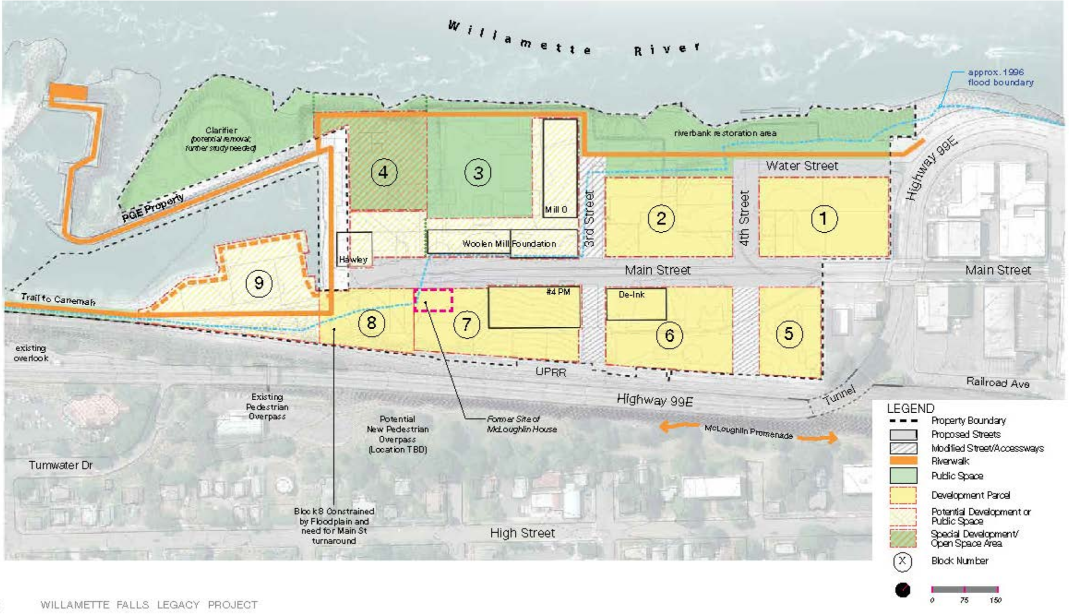
Project Background

PUBLIC ACCESS

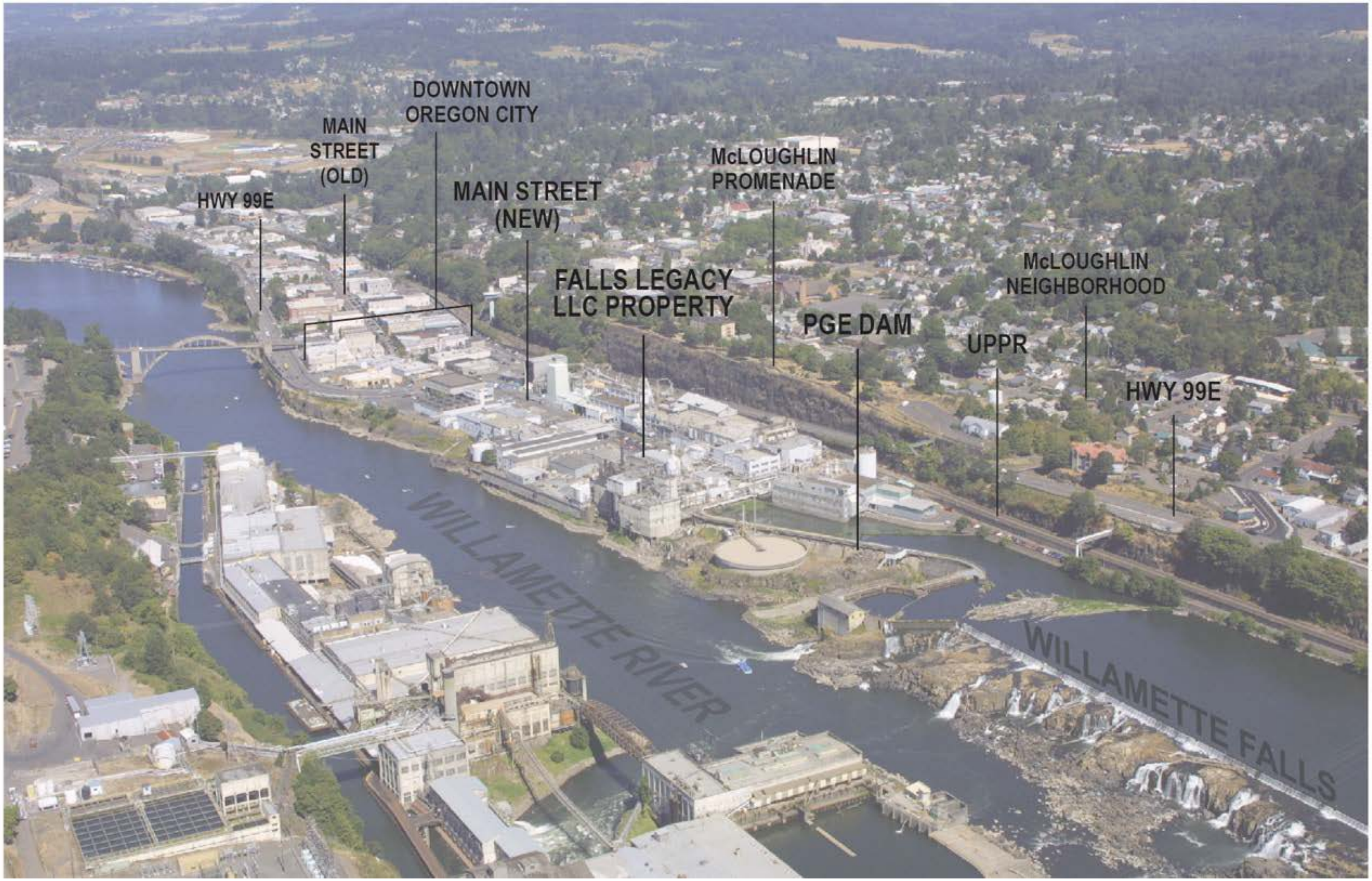
HISTORICAL & CULTURAL INTERPRETATION

ECONOMIC REDEVELOPMENT

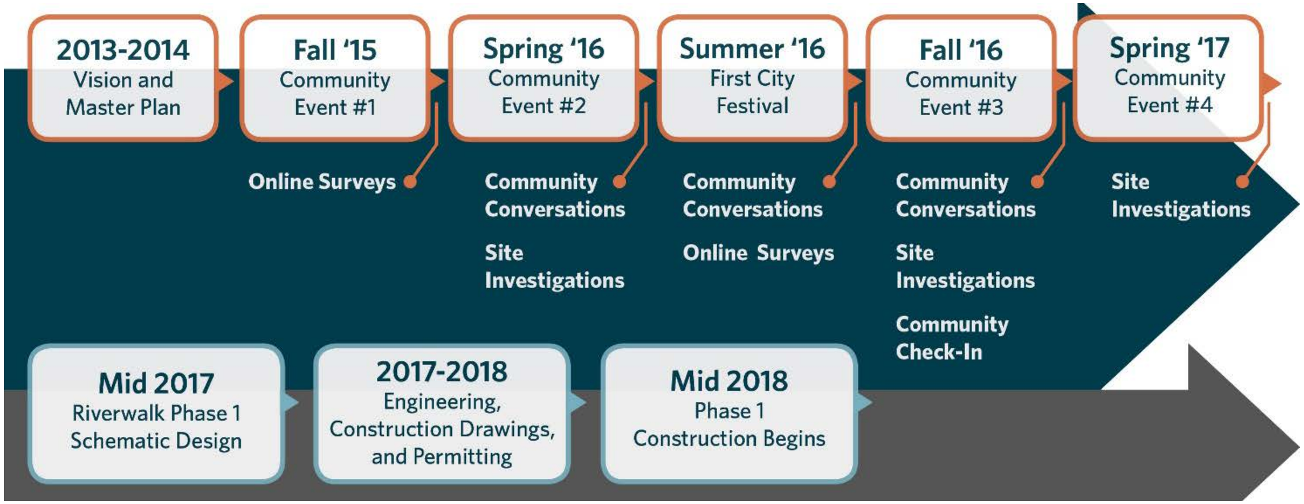
HEALTHY HABITAT



About the Site



Concept Planning



2013-2014
Vision and Master Plan

Fall '15
Community Event #1

- Online Surveys

Spring '16
Community Event #2

- Community Conversations
- Site Investigations

Summer '16
First City Festival

- Community Conversations
- Online Surveys

Fall '16
Community Event #3

- Community Conversations
- Site Investigations
- Community Check-In

Spring '17
Community Event #4

- Site Investigations

Mid 2017
Riverwalk Phase 1 Schematic Design

2017-2018
Engineering, Construction Drawings, and Permitting

Mid 2018
Phase 1 Construction Begins

Community Engagement

What we heard

What we learned

- The four core values and the framework master plan
- Public input
- Construction phasing needs
- Budget
- Results of technical investigations
- Accessibility of people with mobility constraints
- Cultural considerations
- Conservation priorities, and more…

Recommended Riverwalk Concept Design

FALLS VIEWING ACCESS

RIVER ACCESS & ACTIVITIES

COLLECTIVE GATHERING & EVENT SPACES

HABITAT RESTORATION & NATURAL HISTORY INTERPRETATION

HONOR NATIVE AMERICAN PRESENCE: PAST, PRESENT, & FUTURE

PGE DAM OPERATIONS

PATHS, WALKWAYS, & BIKING TRAILS

HISTORIC RE-USE & CULTURAL INTERPRETATION

UNPROGRAMMED SPACES

ECONOMIC REDEVELOPMENT

Recommended Riverwalk Concept Design

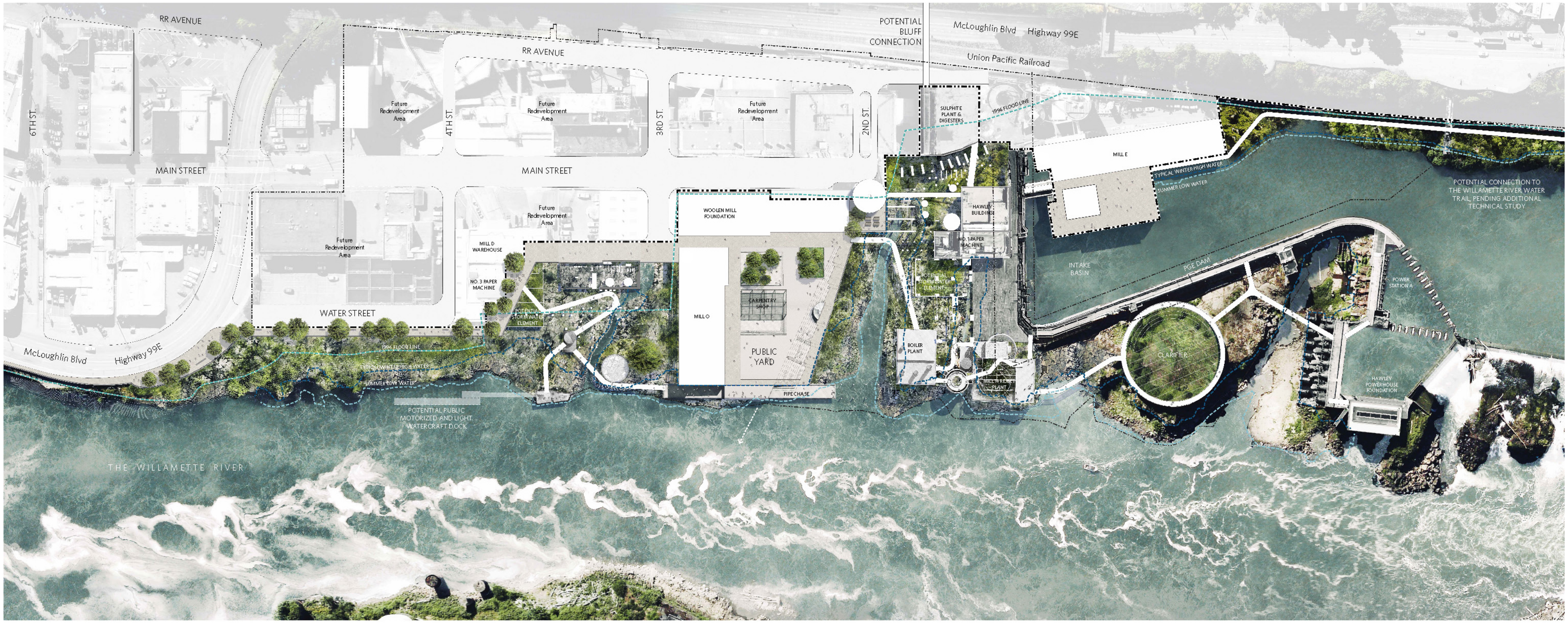
Off-Site
Downtown Oregon City

Area 1
North Riverfront

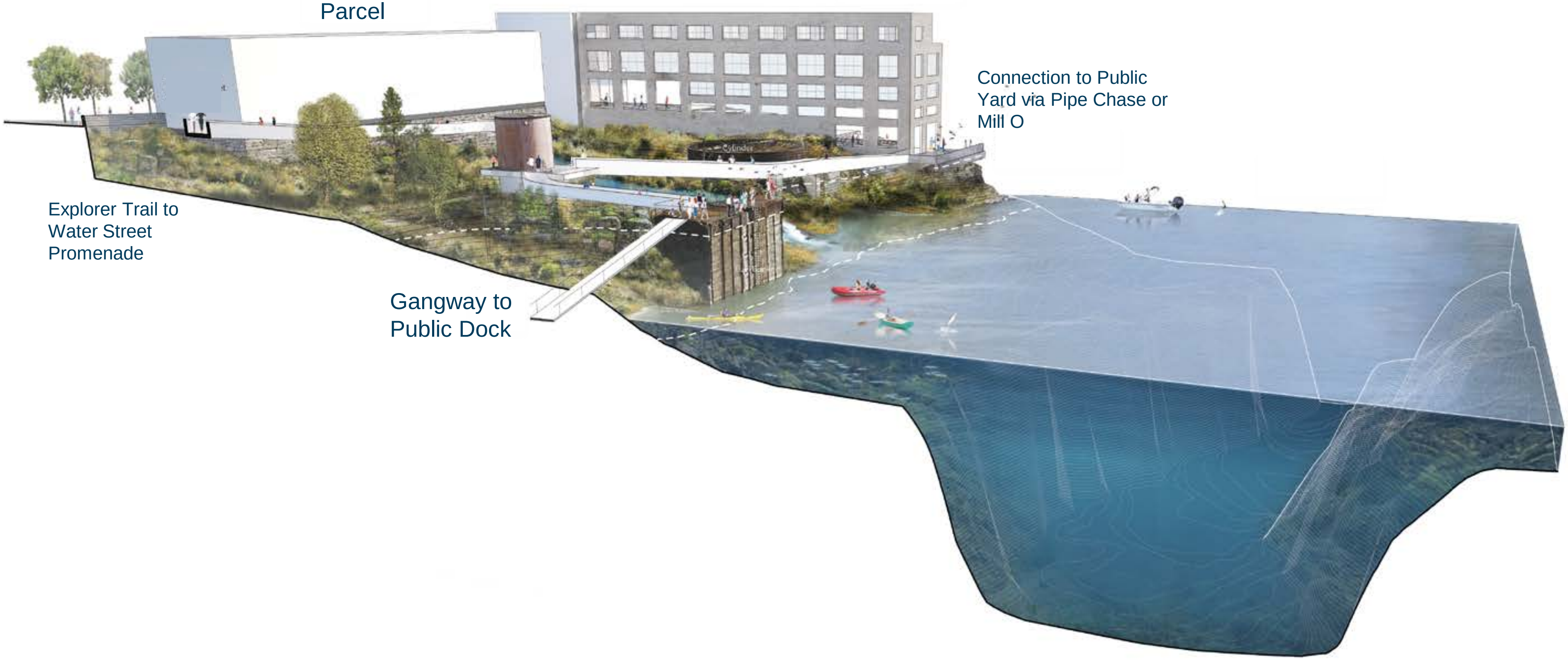
Area 2
South Riverfront

Area 3
PGE Dam and Mill E

Area 4
Canemah



The North Riverfront and Flour Mill Foundation



Flour Mill
Redevelopment
Parcel

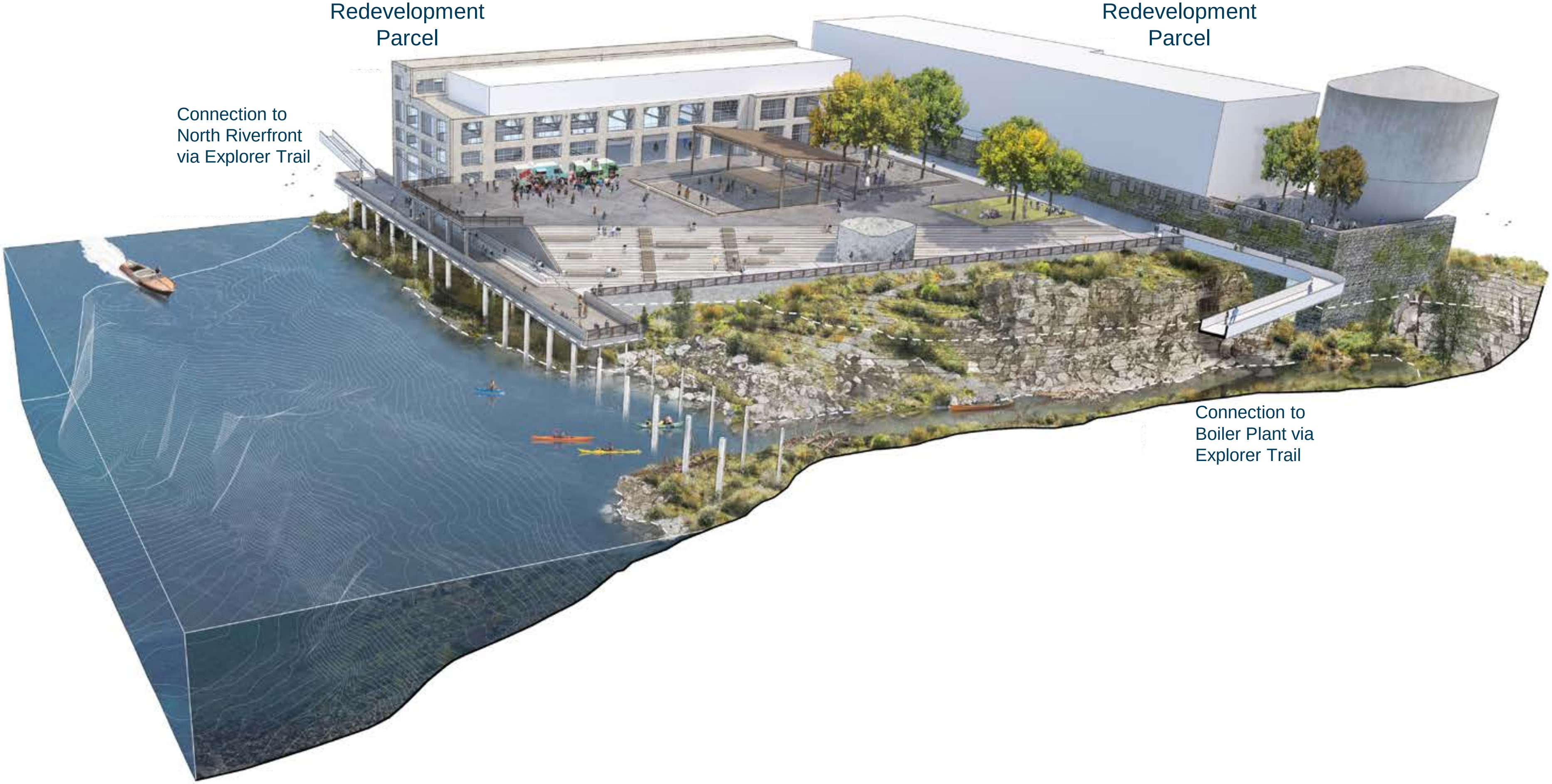
Mill O

Connection to Public
Yard via Pipe Chase or
Mill O

Explorer Trail to
Water Street
Promenade

Gangway to
Public Dock

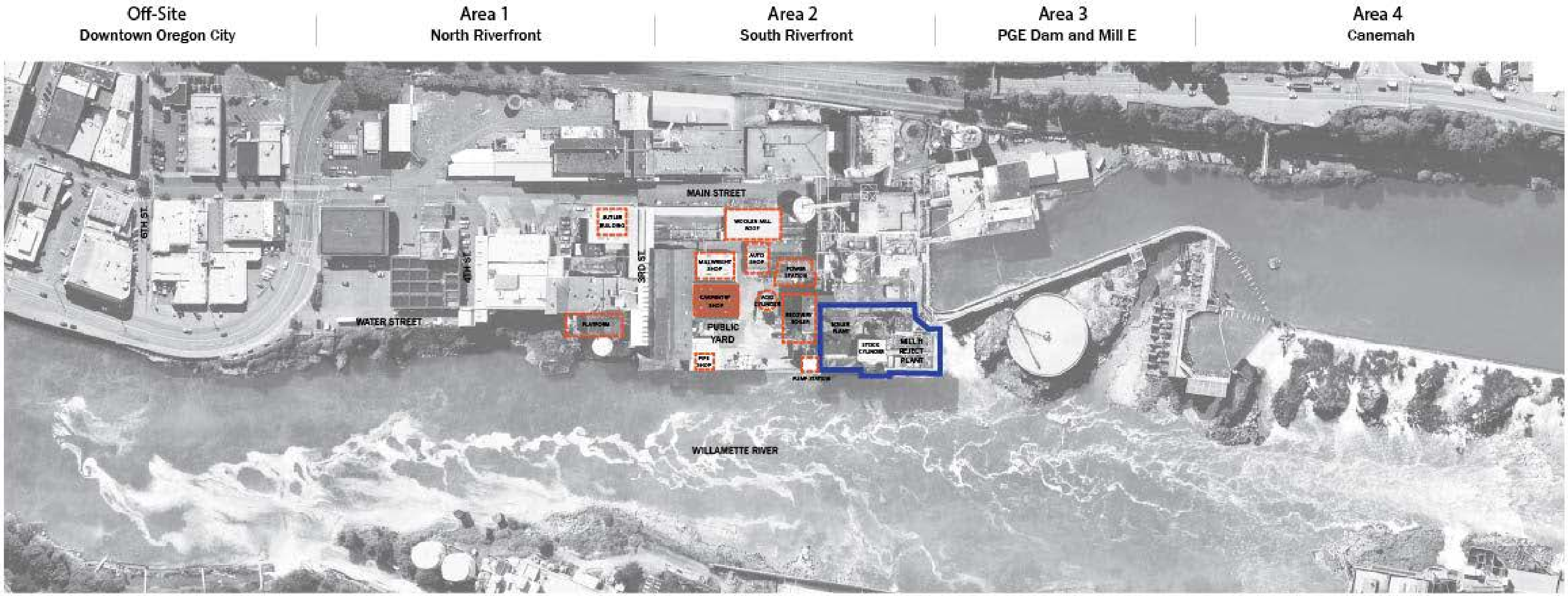
The Public Yard and Woolen Mill Alcove



The Mill Reserve and Mill H Overlook

PGE Dam, the Clarifier and the Falls Overlook

Phasing



Legend

- 🟦 Phase 1 boundary (buildings or structures for re-use)
- ⬚ Phase 1 additional demolition boundaries
- 🟧 Phase 1 partial deconstruction

Funding: $19 million and counting

- **$12.5 M:** State lottery bonds dedicated by the Oregon Legislature
- **$5 M:** Metro Natural Areas Bond Measure
- **$1.5 M:** A combination of City, County and site owner contributions
- Roughly **$8 M** is expected to be raised by private fundraising by 2022

Next Steps

Late November: Public comment period

December 6: Willamette Falls Legacy Project Partners quarterly meeting

December 12: Oregon City, City Commission work session

January 4, 2018: Metro Council meeting

Discussion

- Does Council have any questions, comments or concerns related to the draft Willamette Falls Riverwalk Master Plan?

Willamette Falls Riverwalk Master Plan

Alex Gilbertson

Parks and Nature Planning

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