STEIGERWALD RECONNECTION

Washougal, Washington

National Association of Flood & Stormwater Management Agencies

2023 Innovative Water Project Awards Submittal

Lower Columbia Estuary Partnership

WOLF WATER RESOURCES

National Association of Flood & Stormwater Management Agencies

2023 Innovative Water Projects Award Application

For Projects Started after January 1, 2018, and completed by March 31, 2023

March 31, 2023, 11:59pm EST Deadline for Application Submission

Award Applications can only be submitted electronically at
nafsma2023awards@NAFSMA2022.onmicrosoft.com

If this is a partnered project, please list both entities and contact information for both.

Agency/Company: Wolf Water Resources
Project Name: Steigerwald Reconnection
Contact Name(s): Diedra Case
Address: 1001 SE Water Ave, Ste 180 Email(s): DCcase@WolfWaterResources.com
City: Portland State: OR Zip: 97214 Phone: 503-207-6688

For Public Agencies – Service Population: ☐ More Than 250,000 ☐ Less Than 250,000 (Check One)

For Private Firms – Number of Employees: ☐ More Than 30 ■ Less Than 30 (Check One)

Please submit one combined PDF document with your completed application form, written description and supporting graphics. **Your PDF file size should be no larger than 5MB. Please note that all entries may be used in a video that will be widely distributed.**

Submission Criteria:

Submittal must be made digitally and contain each of the following:

1) Completed application form.
2) Written explanation of why the submission should be considered *(please limit to 3,000 words).*
3) Supporting graphics
   (limit is 10 items; examples: photos, diagrams, plans, charts, tables, etc.).

Please address the following points in the written explanation portion of your submission.

- Project Description (site plan or diagram required plus description; limit 500 words)
  - What was the purpose of the project – water quality, drainage or urban flooding, flood risk management, all, or other?
  - What were the requirements for the project? How did the project go above and beyond the requirements?
- What Were the Benefits – **Stress Unique Multi-Purpose Benefits** (limit 500 words)

  Examples of features and benefits that can be highlighted in project submissions include (but are not limited to) environmental justice, economic, water conservation, recreation, enhanced human health and well-being, endangered or protected species habitat creation, use of natural features and green infrastructure, and community enhancement.
  - What were the benefits?
  - What issues were addressed?
- Economic Impact (limit 400 words)
  - What constraints helped shape the project?
  - What was the cost of the project?
  - What were the funding sources for the project?
  - Is the project a retrofit or new construction?
- Outreach Efforts (limit 400 words)
  - How was the project promoted to other resource professionals and developers?
  - What creative methods were used to provide education to public audiences both short and long term?
  - How was outreach evaluated, and what audiences were most successfully reached?
  - Include copies of promotional pieces if applicable
- Results (limit 500 words)
  - What integration and/or coordination with various regulatory agencies was required for the project?
  - How does the project demonstrate an efficient use of resources?
- Maintenance (limit 400 words)
  - Describe: Monitoring , Upkeep, Costs and Reporting
- Conclusion (limit 300 words)
  - What constraints or challenges were overcome?
  - How was quality of life affected positively?

I consent that my application submission can be used in Awards Video. ■

Please contact Dusty Williams: dustyw2015@gmail.com or 951-313-0257; Sunny Simpkins sunnys@nafsma.org or 503-705-4944 with questions.

SECTION 1

Project Description

The 5.5-mile Port of Camas-Washougal (Port) Levee was constructed by the US Army Corps of Engineers (USACE) in the 1960's to protect the city of Washougal, Washington from seasonal flooding of the Columbia River. As the area grew, additional developments were constructed within the levee-protected area including the US Fish and Wildlife Service Steigerwald National Wildlife Refuge, Washington State Route 14 (SR 14), the Port's industrial complex, homes, and the City's wastewater treatment plant (WWTP). In the 1990s, the USACE diverted Gibbons Creek, a major tributary that crosses the Refuge, into an elevated canal. Unfortunately, natural, but heavy, sediment loads from the creek routinely plugged the canal, causing it to overflow into the Port's drainage area and put nearby homes, the WWTP, and SR 14 at risk from flooding. The Port routinely pumped excess water from the interior drainage throughout the winter and spring. During very large storm events the creek's discharge exceeded the capacity of the Port's pumping system, resulting in flooding of its industrial park and the WWTP. Inundation of the WWTP meant potentially contaminated floodwaters were released to the floodplain and eventually into the river. So, while the levee system was robust and able to withstand flooding from the Columbia River, it could not do the same for Gibbons Creek, resulting in high operations and maintenance costs to the Port and risk to surrounding lands. In addition to the sediment and water management difficulties, the levee system and creek diversion short-circuited river and creek hydrology, causing degraded and fragmented fish and wildlife habitat, which was particularly detrimental to federally-listed salmon and steelhead.

What was the purpose of the project – water quality, drainage or urban flooding, flood risk management, all, or other?

What were the requirements for the project? How did the project go above and beyond the requirements?

Client:

Lower Columbia Estuary Partnership

Lead consultants:

Wolf Water Resources, Inc.

Cornforth Consultants, Inc.

Supporting consultants:

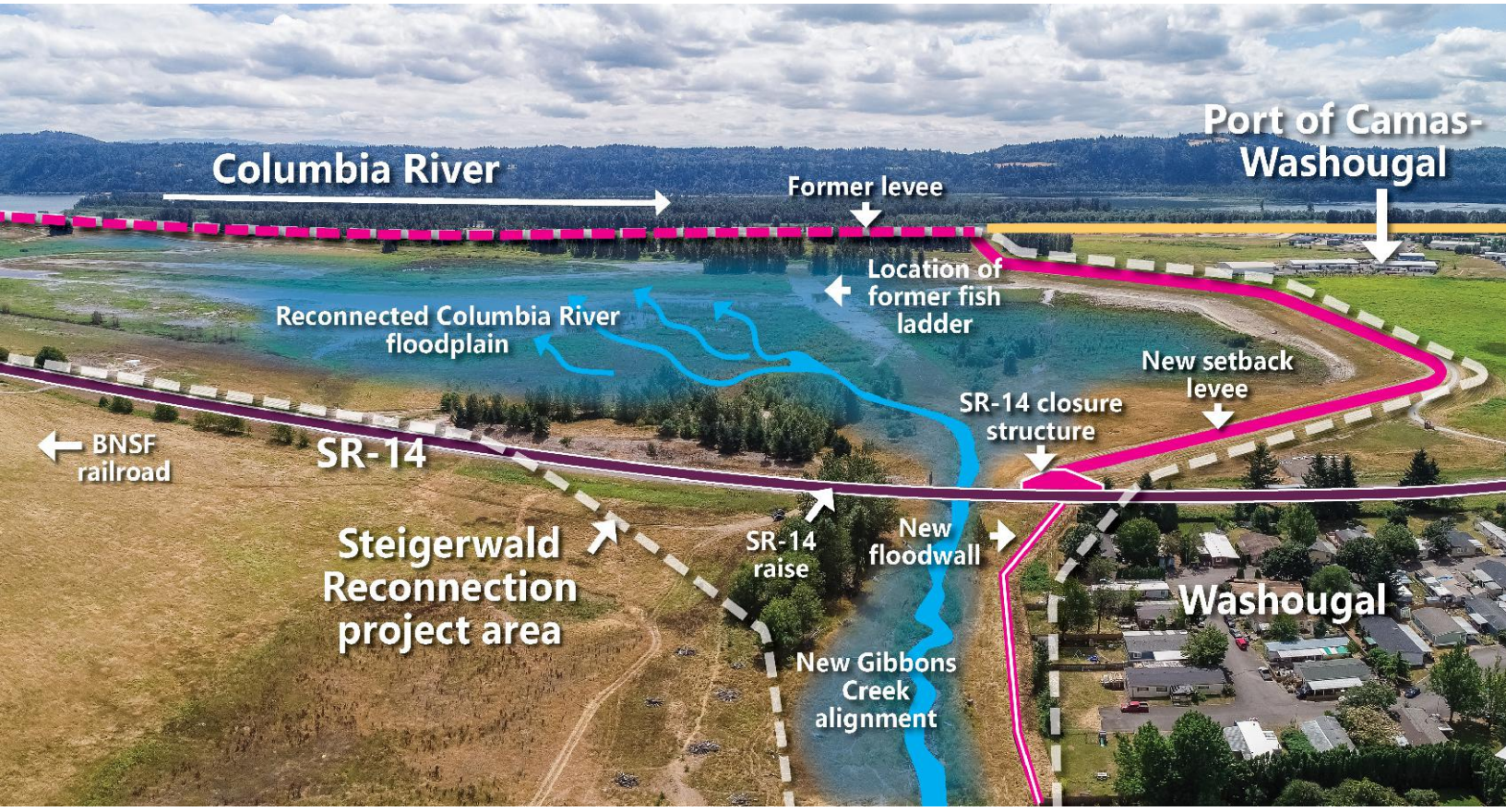
KPFF, WEST Consultants, Herbon Landscape Architecture

The primary purpose of the Steigerwald Reconnection Project was to restore salmonid habitat, hydrologic processes, and fish access to the 965-acre floodplain to meet mitigation requirements outlined in the Federal Columbia River Power System Biological Opinion (BiOp). The project accomplished that need by increasing the acreage of accessible floodplain habitat for outmigrating juvenile salmonids between Bonneville Dam and the Columbia-Willamette River Confluence by 19%. Considering the documented importance of floodplains to outmigrating juvenile salmonids and that most of the Columbia River floodplain in the Portland-Vancouver metro area has been permanently lost due to development, the importance of this reconnected acreage is significant.

In order to accomplish the project's objectives, the design team recognized an approach of making room for the river would be necessary—specifically, ***new thinking around flood control and water management***. This meant taking a 180-degree shift from prior project iterations of the USACE, which maintained the perimeter levee as traditional floodplain management and kept the

creek confined within the canal. It required the design team go the extra mile to obtain buy in from regulators and stakeholders than an ***integrated nature-based approach, that accommodated natural processes,*** would maintain or exceed flood protection needs. In addition to exceeding the BiOp's mitigation requirements and reducing flood risk, the project also endeavored to expand recreation opportunities, reduce O&M costs of the Port, and create family wage jobs during the height of the COVID pandemic.

Steigerwald Reconnection Project Elements:



SECTION 2

What Were the Benefits?

The Steigerwald Reconnection sets an example for integrating nature-based solutions not only for flood risk reduction, but also in achieving other environmental, social, and economic benefits. Some examples of project actions and benefits are described below.

What were the benefits?

What issues were addressed?

Removal of 2.2 miles of levee:

- As a result of the levee removal, flood waters from the creek are no longer contained like a bathtub, putting surrounding properties at risk from flooding. The Port no longer needs to pay high annual pumping costs (a savings of $40,000 to $100,000), and ***flood risk has been reduced by approximately five-fold*** to Port properties, private homes, the WWTP, and the SR 14 bridge.

Construction of 1.6 miles of setback levees:

- New setback levees protect adjacent homes from Columbia River flood events. Had the engineering approach at Steigerwald not included setback levees and instead installed operable flood gates (as conceived by prior USACE concepts), construction costs would have been significantly higher at $80 -$100M, ***compared to $21.5M*** for the recently completed project.

Removal of the Gibbons Creek canal and reconnection of the creek to its historic floodplain and Columbia River:

- Freeing the creek from the elevated canal ***eliminated the problem*** of the canal filling with sediment, causing the creek to overtop, and the Port having to pump floodwater from its Industrial park.
- Prior to the project, the Steigerwald floodplain was dominated by invasive vegetation. Now, with Gibbons Creek reconnected to its floodplain and flood regime, natural hydrologic, sediment, and ecosystem processes are working in concert to ***re-establish a mosaic of wetland and riparian areas*** supported by native woody and grassy vegetation (specifically, 250 acres of native riparian-forest, 155 acres of floodplain-wetland, and several hundred acres of wetland).
- Year-round floodplain connectivity over the 1,000 acre site is also expected to raise groundwater, which will help ***reduce wildfire risk*** and keep invasive vegetation from propagating.
- The addition of over 2,000 large woody debris habitat structures in the creek and floodplain create excellent habitat for native species to thrive. These efforts are estimated to increase ***off-channel habitat by 19%*** for endangered salmonids out-migrating in the Lower Columbia River.

Former elevated canal

Former fish ladder

High sediment loads in Gibbons Creek

The project removed Gibbons Creek from its elevated canal and realigned it, dredged the channel below the bridge, removed the dysfunctional fish ladder and raised 1,300 linear feet of SR 14 to above the 500-year Columbia River flood level to reduce flood risk to the bridge and highway. Scour protection near the bridge includes buried riprap with native shrubs and improves resiliency to the creek's high flow rates. Along with riparian plantings and hundreds of large woody debris structures in the creek and throughout the floodplain, native salmonids have access to rearing and spawning habitat for the first time in 60 years.

Restored Steigerwald floodplain following construction in 2021

SECTION 3

Economic Impact

Research indicates the region will see more rain in the future, and modeling studies show the Columbia River and its tributaries are expected to see significant increases in 100-year floods. Removing impairments to and improving the function of our region's floodplains helps to better prepare communities from the impacts of floods. As a result of the Steigerwald Reconnection, 120 acres were removed from its FEMA-mapped flood zone, which means an important reduction in flood impacts and costs for City, Port, and nearby private infrastructure. The reconnection of Gibbons Creek to the floodplain means it now discharges outside of the levee system, not into it, which is a big win for the Port of Camas-Washougal. No longer having to pump all of that water out to protect its industrial area and the wastewater treatment plant, the Port expects to save $40,000 to $100,000 each year.

What was the cost of the project?

What were the funding sources for the project?

Is the project a retrofit or new construction?

In addition to the annual savings for the Port, the project yielded savings for the client, the Lower Columbia Estuary Partnership. For example, the vegetated earthen overbuild (living shoreline) along both setback levees saved over $1M (net) through use of on-site soils, shrubs, trees, and grasses instead of placing 30,000 tons of riprap. By designing a seasonal stormwater pond to replace a pump station in one of the setback levee interior drainage areas, the project saved another net $1M in construction costs. The Gibbons Creek channel and floodwall design eliminated the need to replace the SR 14 bridge, saving approximately $2M. Building the levee through the City's well field saved nearly $3M. And finally, the actual construction cost of $21.5M represents a $60M to $80M savings relative to the prior project version which involved large, operable tainter-style gates at the Columbia River levee.

Economic benefits of the project ($21.5M cost of construction; $32M total project cost) were also realized in the surrounding area. It created 550 local jobs and added $75M to the local economy. As well, a local contractor was selected for construction, and the project's improvements to Refuge facilities are estimated to attract 100,000 visitors to the Refuge each year, which will benefit local businesses for years to come.

In its first year after levee removal, 600 acres of the Steigerwald floodplain were inundated in a 5-year flood event. The reconnected floodplain acreage, setback levees, and floodwalls protected adjacent properties and infrastructure while allowing floodwaters to replenish the ecosystem.

Prior to levee removal and floodplain restoration

SECTION 4

Outreach Efforts

A variety of multimedia communication tools and interactive activities were used throughout the project's lifespan to serve as a learning laboratory for the public and the scientific communities.

The Estuary Partnership produced 10 videos documenting the restoration process that served a key function in helping its many visitors stay connected to the Refuge during the two-year closure. These videos included trail cam footage, timelapses, 360-degree tours, and aerial imagery. The videos provided a glimpse into the project process and highlighted important milestones such as the fish salvage at Gibbons Creek that yielded over 45,000 lamprey!

How was the project promoted to other resource professionals and developers?

What creative methods were used to provide education to public audiences both short and long term?

How was outreach evaluated, and what audiences were most successfully reached?

The project utilized an earned media strategy to inform partners and the public about the project. Project milestones were constantly promoted to members of the press; in 2022 alone, 38 news outlets published a story about the Steiger-wald Reconnection.

During the Refuge closure volunteer planting events were the primary way people could access the site. Nearly 1,000 students and over 500 community volunteers planted over 20,000 trees and shrubs during these popular events!

Engaging tribal partners in the project was also a core component of its outreach plan. Tribal members and staff from the Chinook Indian Nation, Cowlitz Indian Tribe, and the Confederated Tribes of the Grand Ronde were provided regular project updates and often participated in site tours and events such as the planting of Wapato, an important First Food.

Removing a federal levee and restoring nearly 1,000 acres of floodplain is a significant undertaking, and the project is positively impacting the way flood-plain function and traditional flood protection infrastructure is perceived. In all, the Estuary Partnership hosted nearly 50 tours of the project and for those who could not visit the site, an online Storymap was created to provide a comprehensive overview of the project's activities and accomplishments. Tours helped educate local, state, and federal political leadership, water management districts, university groups, and various public groups on project aspects. As an example, the Multnomah County Drainage District, Floodplains by Design (WA Dept. of Ecology), Puget Sound Partnership, Bonneville Environmental Founda-tion, and masters students from Portland State University have toured the site.

Youtube:

https://www.youtube.com/playlist?list=PL6P14W9l-AJmSu0spmWvWSLWJ1khWnE7Y

Key posts from Refuge 20/20 blog:

https://www.estuarypartnership.org/our-work/habitat-restoration/steigerwald-reconnection-project

Selection of news stories:

https://www.vbjusa.com/opinion/op-ed/steigerwald-reconnection-project-was-an-enormous-and-ambitious-undertaking/

https://www.opb.org/article/2021/11/26/restoring-wetlands-columbia-river-tribes-harvest-wapato/

https://www.columbian.com/news/2022/jun/15/columbia-river-overtops-banks-sweeps-into-restored-flood-plain/

Storymap:

https://arcg.is/9b9uK

SECTION 5

Results

Coordination with Agencies

What integration and/or coordination with various regulatory agencies was required for the project?

How does the project demonstrate an efficient use of resources?

- The USACE Section 408 process served as the umbrella regulatory framework for the project. It is required when a project proposes to alter a USACE Civil Works project (such as modifying or removing levees). Obtaining 408 permission requires that project actions will not be injurious to the public. To address USACE concerns that reconnection of Gibbons Creek would cause new flood risks to private landowners, W2r performed hydraulic and sediment transport modeling to forecast streambed evolution over the next 50 years. These changes were simulated over multiple hydrologic scenarios to assess a range of potential outcomes and associated risks. Combined with extensive coordination with USACE, these analyses yielded their acceptance of the creek reconnection approach.

  USACE was also concerned about how flood protection would be maintained, given the proposal to remove 2.2 miles of levee. To meet USACE flood protection criteria, the project had to construct its two 33-foot-tall setback levees before breaching the existing levee, and construct them in two short seasons. This required geotechnical engineers to overcome challenges due to shallow groundwater, wet soil conditions, and soil compaction.

- WSDOT initially cited the levee removal would subject SR 14 to additional flood risk from the Columbia River. In response, the design team demonstrated the greatest flood risk was from Gibbons Creek due to heavy sediment deposits accumulating below the bridge in the canal. The team proposed removing Gibbons Creek from its canal, realigning and reestablishing its full-depth channel below the bridge, and raising 1,300 linear feet of SR 14 to be above the 500-year Columbia River water level. These actions ultimately gained WSDOT's support for the project.

- To obtain BNSF buy-in on a new setback levee abutting their tracks the project team had to assure BNSF that doing so would not encumber their ability to install utilities across the new levee.

- Coordination with the Cities of Camas and Washougal was required to build one of the setback levees through their municipal drinking water well field. Obtaining their buy-in on this approach saved the project nearly $3M. The project team worked with the Cities to fine tune the levee alignment so they could achieve full production on all 10 of their proposed wells (and with no added cost).

Efficient Use of Resources

- All 1.7 million cubic yards of levee material were sourced from on-site native soils.
- Over 300 trees removed for levee construction were reused as habitat features on the site.
- Preliminary analysis shows the project will achieve carbon neutrality (from an estimated 13,713,500 pounds of carbon dioxide to move and compact over 1.7M cubic yards of soil) in 5-10 years from the planting of over 600,000 trees and shrubs. Beyond that, planted vegetation at Steigerwald will continue to sequester additional carbon far into the future, while the natural succession of trees and shrubs will capture even more carbon.

SECTION 6

Maintenance

Monitoring, Upkeep, Costs and Reporting

The Port of Camas-Washougal operates the federally-regulated levee under USACE and FEMA jurisdiction, and in that capacity is responsible for the operation, maintenance, and repair of all system components, including mowing the levee, surfacing its access roads, and repairing flood damage (typically erosion of the earthen embankment). USACE performs annual inspections of all system components, and the Port is periodically required to recertify the system to maintain its flood insurance through FEMA.

During the Steigerwald project, the team worked closely with the Port during design to ensure the proposed modifications not only would reduce flood risk to Port infrastructure, but also reduce its O&M costs and the risk of flood damage (and subsequent repairs) as described below.

- The setback levees replaced a 2.2-mile section of existing levee along the Columbia River that was the most prone to erosion and required numerous costly repairs over its lifespan (including 0.6 miles of rip-rap stabilization). With this section of levee eliminated, and the new setback levee located within the floodplain away from the river, the Port's future repair costs are greatly reduced. In total, the revised levee system is 27% (0.6 miles) shorter than the original configuration, resulting in less levee overall to maintain.
- Since the revised levee alignment crosses SR 14, it requires a closure structure to close the gap in the levee during large (>100-year) flood events. The project team designed this feature in close coordination with WSDOT, the Port, the City of Washougal, and Clark County. The team not only secured the rights for the Port to shut down the highway during installation of the closure structure, it also established traffic detour systems, provided all required equipment and signage, and conducted the detour.
- Eliminating the elevated canal and disconnecting Gibbons Creek from the interior of the levee system is anticipated to reduce annual pumping requirements (and costs) for the Port by at least 80% (at least $40,000 per year). Additionally, without the need for repairs to the interior drainage system, the Port will save several more million dollars (over this decade).

SECTION 7

Conclusion

The increasing need for flood-resilient infrastructure, combined with the dire prospects of Pacific Northwest salmonid runs, necessitate thinking beyond traditional engineering approaches that control nature. Completed in 2022, the Steigerwald Reconnection is a first-of-its-kind project for our region and demonstrates how engineering solutions that ***work with***, ***rather than be constrained against***, ***natural processes*** can offer varied and significant benefits to all parties.

What constraints or challenges were overcome?

How was quality of life affected positively?

Prior to the Steigerwald Reconnection, the Port of Camas-Washougal levee system and channel confinement at the Steigerwald National Wildlife Refuge caused excessive yearly sediment and water management costs and other challenges for the Port, WSDOT, City, and others. The Columbia River was disconnected from 1,800 acres of its historic floodplain and fish and wildlife habitat was fragmented.

The Steigerwald Reconnection was constructed on-schedule and under budget at $21.5 million, which was within 1 percent of the engineer's estimate. It is the largest single-phase habitat restoration project in the Pacific Northwest to date, and in addition to freeing Gibbons Creek and boosting accessible floodplain habitat for endangered Columbia River salmonids by 19%, the project has yielded significant economic, social, and environmental outcomes and offers true climate change adaptability. It has alleviated flood risks to the Port, City of Washougal, and WSDOT lands, restored fish passage through Gibbons Creek, provided real benefits for adjacent landowners, and significantly improved recreational opportunities for Portland-Vancouver metropolitan area residents.