

# **A Guide to Understanding the US Army Corps of Engineer's Feasibility Study of the Portland Metropolitan Levee System**

**An Overview produced by Multnomah County Drainage District on behalf of the Columbia Corridor Drainage Districts**

January 6, 2020



**This document is not an official part of the US Army Corps of Engineers Draft Integrated Feasibility Report.**



**This document is not an official part of the US Army Corps of Engineers (USACE) Draft Integrated Feasibility Report.**

This document was assembled by Multnomah County Drainage District (MCDD), on behalf of the Columbia Corridor Drainage Districts (CCDD), the four drainage districts that maintain and operate the 27-mile levee system that runs along the Columbia River in Multnomah County. The views and opinions expressed in this document are solely those of the MCDD, in order to summarize the key points of the study and highlight issues of local interest. USACE's official Draft Feasibility Report can be accessed online at [www.nwp.usace.army.mil/levees/pmls/](http://www.nwp.usace.army.mil/levees/pmls/)

# Introduction

This overview was developed jointly by the four drainage districts that manage the 27-mile levee system that protects 12,500 acres along the Columbia River in Multnomah County. The purpose of this guide is to help members of the community digest the recommendations presented by the US Army Corps of Engineers (USACE) as part the feasibility study that is being



conducted of our local flood management system.

Following Hurricanes Maria and Irma in 2017, Congress created a supplemental funding package to aid in disaster recovery. A small portion of this funding was designated for preventative measures to help communities in flood-prone areas prevent future damages. The local study of our levee system was funded under this supplemental package, along with 37 other feasibility studies around the country that are all currently working through the same process. The final report produced as a part of the feasibility study process will be used by Congress to determine if there is federal interest in reinvesting in local flood safety infrastructure like our levee system.

**The local levee system along the Columbia River helps protect places like the Portland International Airport, over 7,500 residents, 59,000 jobs, and important natural and recreational areas.** The USACE study focuses on alternatives that address system vulnerabilities, better meet current levee safety standards, and improve the resilience and reliability of the system under changing water flow conditions.

For the last year, USACE has leveraged data collected through the

recent geotechnical investigation of the levee system that was conducted by Levee Ready Columbia, a local partnership of over twenty public, private, nonprofit, and neighborhood organizations that are working collaboratively to modernize the levee system and the way it is managed. The Corps conducted additional analysis and developed concepts to address vulnerabilities and improve the system. Now, they are ready to share their analysis and initial ideas to hear your thoughts and feedback before doing any further design, and to inform a final recommendation to Congress.

**The USACE public comment period will be open from Monday, January 6<sup>th</sup> until 11:59 p.m. on Friday, February 14, 2020.**

Following the comment period, the USACE's local project team will consider the feedback they've received and potentially refine their recommendations before presenting them to decision makers with USACE's Northwestern Division office in early April of 2020. Once a set of recommendations has been presented and approved by Division, the local project team will spend a year designing the plan, which will be transmitted to Washington, DC in April 2021 for approval by the head of USACE, the Chief of Engineers, in October of 2021.

## How to Participate

This is a critical moment in the study process and your feedback is important to ensuring that the development of this flood safety plan meets our local needs and values. You can weigh in by:



**Submitting written comments directly to the Corps**



**via their website**

[www.nwp.usace.army.mil/levees/pmls/](http://www.nwp.usace.army.mil/levees/pmls/)



**by sending an email to**

[PMLS-Feasibility@usace.army.mil](mailto:PMLS-Feasibility@usace.army.mil)



**by sending mail to**

U.S. Army Corps of Engineers

ATTN: Laura Hicks

P.O. Box 2946

Portland, OR 97208



Or join us for an upcoming community meeting:

***Fairview Community Meeting***

**Thurs., January 16th, 2020**

**6:00 p.m. to 8:00 p.m.**

**Fairview City Hall**

1300 NE Village Street

Fairview, OR 97024

***Portland Community Meeting***

**Thurs., January 23rd, 2020**

**6:00 p.m. to 8:00 p.m.**

**Expo Center**

2060 N. Marine Drive

Portland, OR 97211

***NE Portland Drop-In Session***

**Sat., January 25th, 2020**

**9:00 a.m. to 12:00 p.m.**

**Café Eleven**

435 NE Rosa Parks Way

Portland, OR 97211

***East County Drop-in Session***

**Sat., February 1, 2020**

**9:00 a.m. to 12:00 p.m.**

**Stomping Ground Coffee**

21825 NE Halsey Street

Fairview, OR 97024

## Why This Study Matters

Although local farmers built some early levees prior to 1939, the 27-mile levee system in place today was first constructed by USACE during the late 1930's and early 1940's. USACE made some additional investment in the system between the 1950's and late 1970's, including assisting with repairs after the tragic 1948 flood that took the lives of at least 15 people and destroyed the city of Vanport, leaving over 18,500 people without homes. With the construction of the levees, the land use in the area changed dramatically over time. Today, the region along the Columbia River and Columbia Slough in Multnomah County is a cornerstone of the regional economy. Once a natural floodplain and then farmland, this area is now densely developed, containing:

 **7,500**  
residents

 **2,500**  
businesses

 **over 59,000** jobs

**#2** Largest source of  
**drinking water**  
in Oregon

 **20 million**  
passengers  
annually at PDX

 **3** interstate  
highways

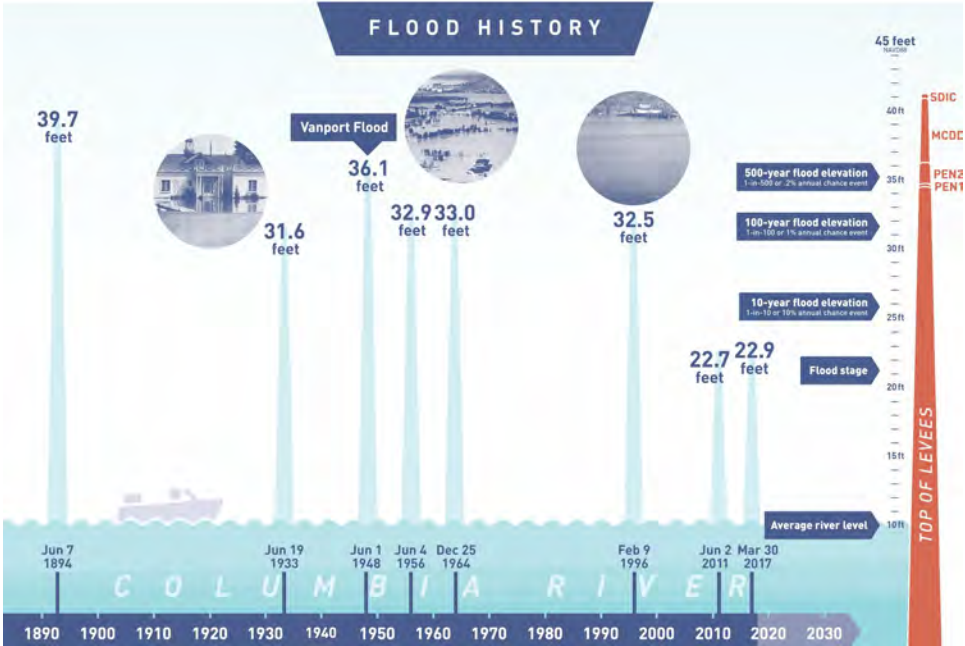
**1** natural gas pipeline  
serving two states  


 **2** TriMet  
MAX lines

 **2** Class I freight  
railroads

and much, much more.

There have been significant changes in the area since the levee system was first constructed. There is also a long history of flooding in the region that should not be overlooked.



### During Recent High Water



*Recurring boil (river water seeping through the levee) at the Columbia Edgewater Country Club & Golf Course in PEN 2*



*Levee erosion in Bridgeton in 2017*

On top of this, our levees have begun to show signs of their age during recent high water events, and with climate change, we can expect to see higher levels of precipitation during the winter and earlier snowmelt and peak river flows, which are not as effectively controlled by upstream dams as the springtime freshet (which is when the snowpack in the mountains melts into the river and is carried downstream to the sea in the late spring).

Additionally, the four local drainage districts that serve as the local sponsors of the levee system and are responsible for day-to-day operations and maintenance – Peninsula Drainage District #1 (PEN 1), Peninsula Drainage District #2 (PEN 2),



Multnomah County Drainage District (MCDD), and Sandy Drainage Improvement Company (SDIC) – would benefit from the 65% federal cost share associated with the recommended plan that would come from an approved Feasibility Study. It would be difficult, and would take a long time for the drainage districts to try to make these same improvements on their own without additional financial support. This need for ongoing capital investment in the local flood safety infrastructure is one of the reasons the Levee Ready Columbia partnership was formed to begin with, and why the coalition has worked with the state legislature to create a new special district that will ultimately take over management of the levee system. *(Learn more about local efforts to create a safer, more modern way to manage the levees in the future by visiting [www.bit.ly/a-safer-way](http://www.bit.ly/a-safer-way)).*

While this new district will be more efficient and sustainably funded, the local levee system is federally authorized infrastructure that protects an area of significant national and regional economic interest. It was Congress that originally authorized and funded the construction of this system, including tying the western end together using an existing railroad embankment that was not constructed to serve as a levee, and they should continue to help to ensure the reliability and resiliency of the system today.

## Study Objectives

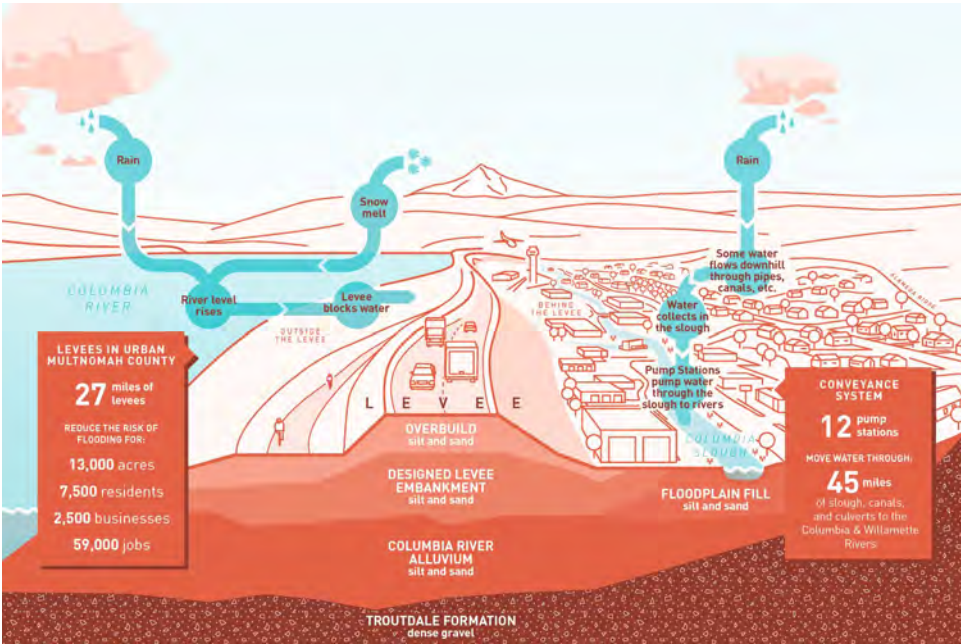
This flood risk management study was authorized by Congress under Section 216 of the Flood Control Act of 1970 (33 USC §549a). The primary purpose of the project is to improve levee performance, incorporate resilience, and reduce flood risk to the 27-mile levee system, which has seen significant land use changes since it was originally authorized.

Local levee failure would have extreme consequences due to the number of people, property, and infrastructure at risk. As such, the Corps' primary planning objective for this study is to identify ways to reduce flood risk in ways that minimize impacts on natural resources and are acceptable to the public and stakeholders. The Corps' specific planning objectives include:

- a) reducing the risk of damages due to flooding;
- b) reducing threats to life safety from flood risk;
- c) increasing resiliency, reliability, and operability of the flood management system; and
- d) to the extent practicable, providing opportunities for recreation and natural and cultural resources.

# How the System Works

Our local system includes both levees and a network of over 45 miles of slough, canals, culverts, and pump stations that move water out from behind the levees and into the Columbia Slough, Willamette and Columbia Rivers.



## Our Vulnerabilities & Weaknesses

Over the course of the last year, USACE staff have completed detailed engineering and economic evaluations of the system to identify vulnerabilities and quantify flood risk. Through this analysis, they've identified that:

- While failures during the spring are still possible, the winter season poses the larger risk to the local levee system.
- PEN 1 has the highest probability of levee failure within the system, whereas MCDD East has the lowest.
- PEN 2 is most susceptible to overtopping, which could allow floodwaters to spread through the system if the cross-levees were to fail as they did during the 1948 Vanport flood.

Although the local levee system provides better performance than most of the other levee systems in the Lower Columbia River basin, several structural vulnerabilities were identified, including:

- **Differing levels of protection and flood risk across the system:** Although the levees operate as one interconnected system, they




## Flooding along the Columbia River in Multnomah County is likely to occur in one of two ways:

### “Riverine” flooding

occurs when the adjacent rivers are running high due to large amount of rainfall and/or snow-melt. There are three potential sources of floodwaters that put pressure on our local levee system: the Columbia River, the Willamette River and Columbia Slough, and the Sandy River.

### Internal flooding

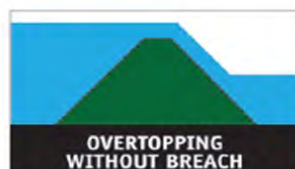
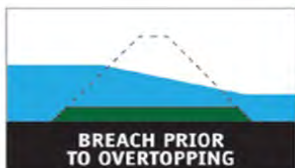
occurs when the pump stations are not able to keep up with the amount of rain and stormwater gathering behind the levees.

 See page 25 of USACE's full report for additional information and analysis of these flooding mechanisms and an assessment of the potential failure modes for the various levee sections.

were originally constructed to different heights and levels of protection. Currently, the flood risk increases from the upstream end of the system where the levees are the tallest to the downstream end.

- **The railroad embankment:** The railroad embankment at the western end of the system was constructed prior to the levee system and was not designed to function as a levee. Although it does hold back some water during high water events and has been bolstered to improve performance during flooding, the quality and construction of the embankment are unknown, and the railroad companies are unwilling to provide the drainage districts with access to test its condition or conduct maintenance.
- **Stability concerns:** Stability and seepage issues have been identified at the Columbia Slough levee on the south side of PEN 1, the Peninsula Drainage Canal cross-levee between PEN 2 and MCDD, and the northwest portion of the Columbia River levee in SDIC.
- **Outdated segments and inconsistencies:** There are portions of the system that are outdated and do not meet current standards. These portions of the system have deficiencies like levees with over-steepened slopes, closure valves and debris removal systems that lack automation, levees with insufficient clearance for flood-fighting, and access issues. Multiple low spots in the levees

## SOME WAYS THAT LEVEES FAIL



and missing or incomplete sections of floodwall have been identified.

- **Internal drainage issues:** The interior drainage system was designed for flows before the area was fully developed. None of the pump stations have backup power sources and a defunct "gate tower" valve along the 223<sup>rd</sup> cross-levee between MCDD and SDIC allows free flow between the leveed areas, negating the performance of the cross-levee at this location.

**On climate change:** A thorough assessment of the impacts of climate change were incorporated into USACE's analysis. Like other climate studies conducted for this region, the findings indicate that we are going to see more annual precipitation in the Columbia basin, particularly in the winter. The frequency and intensity of extreme precipitation events is also likely to grow, along with the total annual volume of water flowing through the Columbia River, which is likely to be higher in the winter with earlier spring peak flows. Even under current climate conditions, winter rain events are a greater threat to the local levee system than spring snowmelt events and climate change is expected to exacerbate this trend.

The largest risk posed to the system from climate change is the likely potential for higher river stages generated from increased wintertime flows on the Willamette and Columbia Rivers, which are likely to last longer, putting additional stress on an aging levee system.

## Project Alternatives & the "Tentatively Selected Plan"

In order to make federal investment recommendations to Congress through the feasibility study process, the local USACE project delivery team must go through a regimented, iterative planning process to identify issues that need to be resolved within the system, and potential solutions to address those issues, which they call "measures." The team then reviews the measures in various ways to meet their planning objectives. These groupings of measures are called "alternatives." Going through this process, the local project delivery team initially developed a set of five alternatives, which were then further refined to arrive at a final array of three alternatives that were equally evaluated to determine which one best met all of the planning objectives and other criteria that USACE is required to consider. The plan that best meets the objectives and criteria while providing the most economic benefit is then identified as the "Tentatively Selected Plan."

 **ous criteria used to evaluate these alternatives can be found on pages 94-102 in the Corps' Feasibility Report.**

A brief summary of each alternative has been included below, but we will primarily focus on the alternative that has been selected as USACE's "Tentatively Selected Plan."



**A far more in-depth discussion of each of the alternatives can be found in the full report beginning on page 47.**

### Alternative #1

Under this alternative, no action would be taken by the federal government to address flood risk in the local levee system. A 50-year timeframe is used for evaluation purposes. All feasibility studies develop this alternative, which is called the "Future Without Project," which is used to set a baseline and understand the flood risk and economic damages likely if nothing were done. All of the other alternatives developed are then compared against this one to assess how completely they meet the Corps' planning objectives.

### Alternative #2

Under this alternative, USACE evaluated the feasibility of only using non-structural measures to reduce flood risks within the local system. The non-structural measures included in this alternative include things like raising critical infrastructure within the managed floodplain, purchasing real estate and relocating properties to reduce flood risk, and improving flood evacuation plans. This alternative also included the construction of ring levees around the two correctional facilities in the area, the Air National Guard facilities, and the Bonneville Power Administration substation in SDIC. Many of the non-structural measures evaluated in this alternative were subsequently incorporated into Alternatives #3, 4, and 5.

## USACE Vocabulary

A **Measure** is a feature or activity that can be implemented at a specific location to address an issue at that specific site and meet one or more planning objective.

An **Alternative** is a set of one or more measures that function together to address one or more planning objective.

**Non-structural measures** are techniques that do not require construction of a new structure to reduce flood risk. Examples of nonstructural measures include actions taken to floodproof or elevate an existing building within a floodplain, installing flood warning systems, conducting flood risk education, or changing local land use regulations.

**Structural measures** are techniques that involve construction of a new structure to reduce flood risk. Examples include building, raising, or widening levees, installing floodwalls, replacing mechanical structures, etc. These are all methods of reducing flood risk that require either improving an existing structure or building a new one.

### **Alternative #3**

For this alternative, measures were identified that would prioritize public health and safety and include measures like elevating structures; clearly labeling evacuation routes throughout the area; creating flood warning systems; removing vegetation from the levees in certain areas to minimize degradation, and widening and increasing levee heights where vulnerabilities have been identified. Of the final array of alternatives considered, this alternative has the lowest price tag at \$49,851,000. It also minimally meets the planning objectives of the study and therefore was not selected as the Tentatively Selected Plan.

### **Alternative #4**

Under this alternative, USACE prioritized structural and non-structural measures that maximize resiliency, reliability, and redundancy within the system such as: automating pumps and flood closure structures so they no longer have to be operated manually; adding backup power supplies to pump stations; replacing trash rakes that help remove debris (aquatic vegetation and garbage) from the waterways, which clog up the pumps and make it difficult to move water through the system; widening the levees in areas where there are stability issues; increasing levee heights where vulnerabilities have been identified; reshaping levee slopes to comply with current federal standards; building an additional levee or floodwall at the railroad embankment in PEN 1; adding four-season maintenance roads to improve access for flood fighting and maintenance; and developing an education program on flood risks, including installing signs throughout the managed floodplain. Of the final array of alternatives considered, this alternative is projected to cost about \$77,129,000 to implement. Although it met the planning objectives, it does not provide the same level of protection or annual benefit as Alternative 5 and therefore was not selected as the Tentatively Selected Plan.

### **Alternative #5 - the “Tentatively Selected Plan” (TSP)**

This alternative focuses on both internal and external sources of flooding and seeks to address inconsistencies to provide a more uniform level of protection across the system. As the levees in PEN 1 and PEN 2 were built to lower elevations and levels of protection than the levees upstream in MCDD and SDIC, this alternative puts a lot of emphasis on increasing the level of protection in PEN 1 and PEN 2, where there is the most risk of flooding. The structural measures proposed in PEN 1 and PEN 2 include:

- building a set-back levee adjacent to railroad embankment at the western end of PEN 1;
- extending a floodwall from the northern end of the new levee near the railroad embankment to Marine Drive and raising the

existing flood closure structures in the area to the new level of protection;

- extending a floodwall from the northern end of the new levee near the railroad embankment to Marine Drive and raising the existing flood closure structures in the area to the new level of protection;
- adding a four-season maintenance road on the levee parallel to the railroad embankment to improve access for ongoing maintenance and flood fighting activities;
- increasing the height of the levee along the Columbia River in PEN 1 and PEN 2 by adding an approximately 3 ft. floodwall;
- raising the levee along the Columbia Slough in PEN 1 and PEN 2 by up to 3 feet and widening it by approximately 15-20 feet; and
- making the floodwall under the I-5 overpass between PEN 1 and PEN 2 about 3 feet taller and extending it to fully connect PEN 1 and PEN 2.

Although not as extensive as Alternative 4, this plan also includes improvements to the internal drainage system, including:

- installing backup power at the PIR Pump Station, Schmeer Road Pump Station, 13<sup>th</sup> Avenue Pump Station, MCDD Pump Station 2, Broadmoor Pump Station, AirTrans Pump Station, and Pump Station 4;
- replacing the trash rake at the Broadmoor Pump Station and AirTrans Pump Station ; and
- elevating and replacing SDIC's only pump station, as well as installing a back-up power supply.

Several stability issues are addressed in MCDD and SDIC as well including:

- widening the levee on the eastern side of the Peninsula Drainage Canal between PEN 2 and MCDD, adding seepage controls like

### What is flood fighting?

The various emergency methods used to prevent levee failure during periods of high-water is referred to as "flood fighting." Some flood fighting techniques include placing sandbags, large concrete blocks, HESCO barriers, and/or polyethylene sheeting at the levee toe to divert water.



*HESCO barriers deployed by USACE in Fargo, ND.*



toe drains, and adding a four-season maintenance road on the levee to improve access for flood fighting activities and ongoing maintenance;

- addressing low spots in the levees along Marine Drive near the Gleason Boat Ramp, along the MCDD/SDIC cross-levee at Marine Drive, near the SDIC pump station, and at the I-84 on-ramp at Graham Road in Troutdale; and
- addressing fragility concerns in the segment of the levee that runs along the Columbia from the MCDD/SDIC cross-levee east to Sun-dial Road.

Alternative 5 also includes the following non-structural measures:

- revising and updating the flood hazard and evacuation plans for the City of Portland, Port of Portland, and Multnomah County to include flood risk information resulting from the feasibility study and developing expanded communications and evacuation plans;
- developing flood risk educational materials for residents, employees, and visitors inside the managed floodplain. The materials should be coordinated with the US Geological Survey to incorporate seismic considerations, as well as emergency responders and educators to meet the needs of a broad audience;
- installing flood hazard and evacuation route signage throughout the area; and
- developing designated "safe zones" at high points within the study area for anyone who cannot safely evacuate in the event of a levee breach and flood.

## The Benefits of the TSP

Alternative 5 has been selected as the Corps' Tentatively Selected Plan because it:

- **provides the highest annual net benefit to the nation:** USACE calculates annual net benefit by comparing the anticipated flood damages of Alternative #1 – what flood risk would look like if no federal investment was made – against the anticipated flood damages of the other alternatives. At \$7,628,000 per year, Alternative 5 provides a much higher annual benefit than any of the other alternatives. **A full comparison of costs and annual net benefits for all three alternatives is available on page 94 of the full report.**



- **does the most to reduce the risk of life loss:** alternative 5 is the only alternative that addresses the potential of overtopping in PEN 2, which was identified as a significant driver of potential life

loss within the system.

- **prepares the system for climate change:** alternative 5 is the only alternative that provides a consistent increase in levee height along the Columbia River and the Columbia Slough in PEN 1 and PEN 2 which are significantly lower in elevation than the levees in MCDD and SDIC. This change does the most to prepare the system for the impacts of climate change.
- **maximizes national economic benefits:** as Alternative 5 does the most to reduce the likelihood of levee failure, it also does the most to reduce the cost of reconstruction and duration of business interruption from flooding.
- **scores the highest when evaluated for “other social benefits”:** as flooding can lead to a variety of potential social effects, USACE uses a specific approach to evaluate the social benefits of each alternative, and Alternative 5 goes the furthest to provide other social benefits. **See page 101-102 of the full USACE report to read more about the Other Social Effects analysis.**



## Potential Impacts of the TSP

The project footprint of Alternative #5 could impact some privately and publicly owned land, including the following areas, which will need to be carefully considered and addressed during the design phase of the study:

- **The railroad embankment along the western edge of PEN 1**  
Three railroads own (or lease) land and operate their lines on top of an embankment along the western edge of PEN 1. This embankment is the location of the breach that led to the destruction of Vanport in 1948. The embankment was never constructed as a levee and continues to be the largest source of uncertainty within the system. On top of this, the railroad companies that own and operate on the land do not acknowledge that the embankment functions as a part of the levee system and have been unwilling to grant the drainage districts or USACE access to test its structural integrity for decades. Although adding additional material to the existing seepage berm on the eastern side of the railroad embankment (the concept in Alternative 3) is the most affordable option, it requires full cooperation from all three railroad companies, which is highly uncertain at this time. As such, Alternative 4 and 5 include the construction of a parallel levee immediately to the east of the railroad embankment. This would leave Burlington Northern Santa Fe

(BNSF) and Union Pacific outside of the protected area. It would also require an agreement with the Peninsula Terminal Company to cross their land to connect the improved embankment with the rest of the system. These proposed improvements would also encroach on Heron Lakes Golf Course, which is owned and operated by the City of Portland and would likely require reconfiguration of multiple holes within the course.

- **The Portland Yacht Club and 15 single-family homes to the east along Marine Drive in PEN 2**

The Portland Yacht Club and the 15 single family homes next to it on Marine Drive were built directly on top of the levee. In addition to three low spots that were previously identified within this stretch of levee, the Corps has identified an elevated risk of overtopping in PEN 2, which would customarily be addressed by raising the levee to a higher elevation. In this case, however, the installation of a floodwall along the levee in PEN 2 is under consideration. Although the installation of a 3-foot floodwall will have significantly less impact than a levee raise, this concept could impact property owners.

- **The townhomes and floating homes along Bridgeton Rd in PEN 2**

The vulnerability described in the previous bullet extends west into the Bridgeton neighborhood where there are a number of condos and townhomes built on top of the levee and several marinas and moorages that use that stretch of levee as access points. The installation of a 3-foot floodwall is also under consideration along this stretch of the levee. Several specific issues that will need to be deliberated and addressed in this area include: a) driveway access for residents living on the levee; b) access to moorage parking lots and the docks from the levee; and c) preserving or replacing the parking spaces on the riverward side of the levee.

**Examples of ~3 foot floodwalls in residential areas:**



## The Environment

USACE has conducted its environmental analysis in accordance with the National Environmental Policy Act (NEPA). The local project team has taken all practicable means to avoid or minimize adverse environmental effects in the development of the alternatives, a strategy which will continue to be employed as the Tentatively Selected Plan is further developed. Several impacts and avoidance and minimization measures identified by USACE are highlighted below. **A complete list**



**of the potential environmental impacts and the corresponding avoidance and minimization measures that have been developed to reduce the intensity of the impacts can be found on pages 103-107 of the full feasibility study report.**

- **Water Resources** (i.e., rivers, sloughs, lakes, etc.)  
USACE does not anticipate there will be significant ongoing or long-term impacts to the water resources in the area as a result of their recommended improvements. The short-term impacts that have been identified are all construction related and include temporary minor erosion and turbidity in areas adjacent to levees. These temporary impacts will be avoided and offset by developing and implementing a Spill Prevention Control & Countermeasures Plan and an Erosion Control Plan; applying best management practices for erosion control measures during construction, staging, and access areas; and limiting staging areas, storage sites, and potentially polluting activities to areas that would preclude erosion into or contamination of the river, slough, or wetlands.
- **Air Quality & Greenhouse Gases**  
No long-term changes are anticipated as a result of the alternatives under consideration. The potential short-term impacts to air quality and greenhouse gasses will be a minor temporary increase of emissions in the area from construction equipment, which will be offset by applying water to excavation areas, access and haul roads, and staging areas as needed to control fugitive dust; setting low speed limits on access roads to reduce dust mobilization; and limiting idling of construction vehicles and machinery.
- **Physical Resources** (i.e., land within the managed floodplain)  
The long-term impacts of the TSP include the widening of the levee with 365,000 cubic yards (cy) of fill in PEN 1, 100,000 cy in PEN 2, 135,000 cy in MCDD, and 124,400 cy in SDIC. It is also anticipated that about ½ an acre of new impervious surface will be created, which will have very small effect on the amount of stormwater runoff in the area. Short-term impacts during construction may include temporary minor erosion and dust generation at staging,

clearing, grubbing, and work sites, particularly along Marine Drive. These impacts can be offset in various ways, Erosion Control Plan and Sediment Control Plan; using sediment barriers like silt fences and straw matting and water trucks to control dust during construction; reseeding exposed soil areas to reduce erosion and dust post-construction; and sequencing construction to minimize soil exposure and erosion potential.

- **Biological Resources** (i.e., wildlife, plants, wetlands, etc.)

The long-term impacts on biological resources that have been identified by USACE include the permanent fill of up to  $\frac{3}{4}$  of an acre of aquatic resources and the removal of trees. In the short-term temporary minor disturbance to terrestrial wildlife is anticipated at the Heron Lakes Golf Course and along Marine Drive. No in-water work is currently anticipated. These impacts will be offset in various ways, including establishing staging and refueling areas more than 150 ft. away from wetlands and other waterbodies; using clean fill materials and washing construction equipment to control the spread of non-native species; replanting with native seed mix; replacing trees that are removed during construction; avoiding riparian vegetation; and operating machinery used for in-water work from top of bank to the extent possible.

- **Noise**

None of the alternatives under consideration involve any long-term increase in operational noise. The temporary impacts during construction include a moderate increase in noise over a construction period of approximately 42 months. This would primarily take place in PEN 1 and PEN 2. The noise will be offset by limiting hours of construction; using noise barriers; and phasing construction to minimize the duration of particularly noisy activities.



**Aesthetic, land use, recreation, transportation, utility, socioeconomic, social justice, and cultural resource related impacts and their accompanying avoidance measures can be found on pages 109-111 of the full report.**

## **A Note on Recreation**

As the project continues, some consideration can be given to recreational measures where compatible. For example, an opportunity identified during the early discussions was to provide recreation trails where practical. At this time, the project team has considered and identified several locations where recreational measures could potentially be added in conjunction with flood risk reduction measures. For



instance, recreational trails could be provided where there are plans to install maintenance access roads on top of the levees at the parallel level adjacent to the railroad embankment in PEN 1, along the Peninsula Drainage Canal between PEN 2 and MCDD, and along the levee improvements along Marine Drive from 223<sup>rd</sup> Avenue to Sundial Road in SDIC. Some of these additions could potentially add connectivity to the 40-mile loop trail (40mileloop.org). Additionally, where the SDIC pump station is proposed to be elevated and replaced there is a potential opportunity to add a viewing platform allowing for bird and wildlife viewing in the nearby wetlands. On top of this, areas to access to the river and the slough may be identified as more details are developed. If recreation measures are ultimately added, the concepts would need to be analyzed. If justified, those additions would be cost-shared at a rate of 50% federal, 50% local.

## Estimated Costs

Current cost estimates for Alternative #5 are:

Item	Cost (in 1,000s)
Construction Costs	\$75,562
Preconstruction Engineering/Design	\$9,068
Construction Management	\$7,557
Contingency*	\$46,352
Real Estate	\$19,018
Total Cost	\$157,557

*\*At this point in the process, the cost estimates include a contingency of 50% applied to construction costs. This contingency will be reduced as the concepts are fleshed out during the design phase of the study process.*

## Funding & Cost Sharing

As one of 38 feasibility studies funded through the special storm supplemental appropriations package enacted by Congress, there is a very small chance that some of the costs outlined above could be fully federally funded. This will likely depend on how quickly the study is completed, how the economic benefits of this study compare against other feasibility studies that are completed around the same time, and other factors. At this point, however, we believe it is more likely that there will be a local cost-sharing requirement. Generally, USACE expects the non-federal sponsor, which would be the four local drainage districts in this case, to take on the cost of providing any lands, easements, rights of way, relocations, or disposal sites (LERRDs) needed to complete the projects. Any remediation of

Hazardous materials or toxic waste is also considered the responsibility of the non-federal sponsor, along with providing 35% of the total project cost, and continuing to operate and maintain the project.

A standard cost-sharing ratio of 65% federal/35% local is used for this type of project. Any recreational features added and justified would be cost shared at a rate of 50% federal and 50% local. At the 35% cost-sharing rate, we would need to fund approximately \$49,700,000 of the total project costs at the local level through a combination of cash and in-kind contributions of land and/or services. The Levee Ready Columbia partners, including the four local drainage districts, will continue to work collaboratively to find a way to meet the 35% match if required.

## Study Process & What's Next

- 1

**Study begins**      October 3, 2018
- 2

**Scoping & Initial Alternative Formation:** Project team identifies a comprehensive list of problem areas and potential solutions.
- 3

**Alternative Milestone:** A broad set of strategies & progress to date are reviewed and approved by NW Division.  
January 9, 2019
- 4

**Analysis & Evaluation:** Data is collected, models are developed, and a focused array of strategies are compared.
- 5

**Tentatively Selected Plan Milestone:** Preliminary plan is reviewed by NW Division before being released for public review.  
October 3, 2019
- 6

**Concurrent Review:** Draft plan is released for independent external and public review & comment.  
January 6, 2020
- 7

**Analysis & integration:** Feedback on the draft plan is addressed and the TSP is revised.
- 8

**Agency Decision Milestone:** NW Division reviews plan and progress to date. Authorized transmittal to Washington, DC.  
April 6, 2020
- 9

**Plan Optimization:** The plan is fleshed out and optimized prior to being sent to Washington, DC.
- 10

**Study transmitted to DC:** where the report is honed to present final science-based decisions and rationale  
April 3, 2021
- 11

**Chief's Report Signed:** following additional review, the report is finalized and signed by the Chief of Engineers.  
October 3, 2021
- 12

**Review by Assistant Secretary of the Army & Office of Management & Budget:** ASA determines if the proposed plan is feasible and consistent with congressional policy. OMB review report and approves release to Congress.
- 13

**Congressional Authorization:** Congress considers and authorizes the improvements in the plan through the Water Resources Development Act (WRDA).
- 14

**Pre-engineering & design:** 2-3 years to complete Pre-Engineering, Design & Construction (PED) once funding is secured in the USACE workplan.
- 15

**Construction begins:** funding is approved and authorized improvements begin.

# Maps of the TSP

What follows are several pages of maps of the structural measures that are included in Alternative #5—the Tentatively Selected Plan (TSP). To provide more detail, the maps are divided by drainage district, with MCDD split in half. Similar maps for the final array of three alternatives that were evaluated are available online at [bit.ly/usace-study](http://bit.ly/usace-study).





## Alternative #5 - Peninsula Drainage District #2 (PEN 2)





Alternative #5 - Multnomah County Drainage District West (MCDD-W)





Alternative #5 - Multnomah County Drainage District East (MCDD-E)





## Alternative #5 - Sandy Drainage Improvement Company (SDIC)



**The Final Draft Feasibility Study Report is available online at [www.nwp.usace.army.mil/levees/pmls/](http://www.nwp.usace.army.mil/levees/pmls/)**

**Your feedback is important! Please weigh in by 11:59 p.m. on Friday, February 14, 2020.**

Submit written comments to the Corps at [PMLS-Feasibility@usace.army.mil](mailto:PMLS-Feasibility@usace.army.mil) or join us for one of the upcoming events listed on page 3.

If you would like to have someone join your neighborhood association or community group to discuss this feasibility study or other local efforts to modernize the levee system along the Columbia River, please contact Levee Ready Columbia at [leveeready@gmail.com](mailto:leveeready@gmail.com).

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