North Shore Levee

Aberdeen & Hoquiam, Washington

FEMA CLOMR Submittal

July 2017

Prepared by:

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KPFF Project No. 41600177

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Table of Contents

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July 10, 2017

LOMC Clearinghouse
847 South Pickett Street
Alexandria, VA 22304-4605

Attention: LOMC Manager and Assigned Reviewers

Subject: Introductory Letter for CLOMR Application
North Shore Levee
Aberdeen and Hoquiam, Washington
KPFF Project No. 41600177

INTRODUCTION

This letter is provided to the reviewer as an abbreviated overview of the project and introduction to the forms, reports, and plans provided with this FEMA CLOMR submittal. We believe it is a helpful overview for the project's goals and objectives. A list of supporting materials being provided with this submittal, along with brief descriptions, is provided at the end of this letter.

Project Description

Large portions of Aberdeen and Hoquiam are located within a Special Flood Hazard Area due to coastal flooding. The North Shore Levee will protect a large area within the cities. The floodplain to be protected is bound by high ground to the north, the Port of Grays Harbor to the south, the Wishkah River to the east and the Hoquiam River to the west. The levee alignment starts at high ground on the left bank of the Hoquiam River, runs downstream to the Puget Sound & Pacific Railroad, turns eastward and runs along the north side of the railroad to the Wishkah River, then runs upstream along the right bank of the Wishkah River before terminating at high ground. The total length of the levee is approximately 5.6 miles.

This project is a larger version of a previously proposed but never constructed project called the Northside Levee. The City of Aberdeen received a CLOMR for the Northside Levee in 2016 (Case No. 15-10-1509R). This new expanded project, the North Shore Levee, is a more comprehensive levee that includes the same areas included in the Northside Levee but significantly increases the number of properties that will be protected in both Aberdeen and Hoquiam. The science and engineering utilized for the Northside Levee have been expanded and analyzed to support this larger levee project. The conclusions for the Base Flood Elevation (BFE) and associated freeboards are the same.

Purpose

The purpose of the levee is to protect East Hoquiam and a large portion of Aberdeen from damaging floods, and to reduce the financial burden of flood insurance and floodplain development regulations. The protected areas will be removed from the Special Flood Hazard Area Zone AE and placed in a Zone X.

Project Team

The North Shore Levee project is an expanded version of the Northside Levee project that began design in 2014. A CLOMR application was submitted and accepted by FEMA for the Northside Levee in 2015 (Case No. 15-10-1509R). In early 2016, the Cities expanded the scope of the levee project and renamed it the North Shore Levee. Funding for design of the North Shore Levee project has been provided through grants from the Chehalis River Basin Flood Authority.

The Cities hired KPFF Consulting Engineers to be project manager and lead consultant to design the levee and assemble the needed documentation for levee certification. Subconsultants include: Maul Foster Alongi, Watershed Science and Engineering, GeoEngineers, Wilson Engineering, and David Smith and Associates.
Design for the North Shore Levee began in spring of 2016.

EXISTING CONDITIONS

Area History

The Cities of Aberdeen and Hoquiam were originally developed over 100 years ago on a broad, flat plain adjacent to the Grays Harbor Estuary, Chehalis River, Wishkah River, and Hoquiam River. Elevations within the Cities generally range from 10 to 15 feet NAVD 88, with some areas, such as the Port of Grays Harbor, as high as 18 feet, and some areas as low as elevation 9 feet. Mean higher high tide in the adjacent water bodies is elevation 8.6 feet and the Base Flood Elevation calculated for this project is 13.2 feet (discussed more later).

Existing Protection

The project area is not currently protected by a levee system. Both cities have extensive piped stormwater conveyance systems with outfalls at the rivers and harbor. Some of these outfalls have pump stations and backflow prevention valves to promote positive drainage and prevent backwater flooding when river and harbor water levels are. However, these pumps are not sized for large storms such as the 100-year rainfall event, and they offer little to no protection from riverine or coastal flooding.

FLOODING SOURCE

The Wishkah River, Hoquiam River, Chehalis River and Grays Harbor adjacent to the project area have strong tidal influence due to low gradients and proximity to the Pacific Ocean. There are four potential flooding sources in the area: Grays Harbor (coastal flooding) and the Chehalis, Wishkah, and Hoquiam Rivers (riverine flooding). Both coastal and riverine hydraulic conditions were evaluated to determine the BFE for the proposed levee. The 100-year base flood elevation along the levee is controlled by coastal flooding from Grays Harbor which has a total water level of 13.0 feet NAVD88. The 100-year riverine flood on the Chehalis, Wishkah, and Hoquiam Rivers results in water surface elevations lower than 13.0 feet NAVD88 throughout the project area.

PROPOSED LEVEE

The levee runs through low, flat, mostly developed urban and suburban areas around the Cities. Many challenges arise for the construction of a new levee, such as structures built on pilings that extend into waterways, space constraints due to dense development over the years, and maintenance access. As a result, the levee includes several design types and special features as outlined below.

Design Height

The base flood elevation along the project area is 13.0 feet NAVD88. Accounting for freeboard, settlement, the 500-year flood event, and potential sea level rise, the proposed height of the levee is 15.2 feet NAVD88.

Earthen Levees

Earthen levees are proposed where feasible due to the simplicity of their design and construction, and their effectiveness. Other design types are proposed where space constraints occur, underlying sediment settling may occur, or access issues make earthen levees infeasible.

Concrete Flood Walls

Concrete flood walls are proposed where earthen levees are not feasible. More specifically, concrete T-walls with shallow spread footings with a maximum height of approximately 5 feet are proposed. Along F Street and at other limited locations, the concrete flood walls are integrated into sidewalk planters for aesthetics and public right-of-way beautification. Due to soil conditions not conducive to required levels of structural support, the concrete flood walls have wide footings of 13 feet for standard walls and 10 feet plus planter width for walls with planters.

Sheet Pile Flood Walls

Sheet pile flood walls are proposed where earthen levees or concrete flood walls are not feasible. These sheet pile flood walls have an approximate 8-10 mm thickness with a design configuration width of 1.5 feet. Due to soil conditions not conducive to required levels of structural support, the sheet pile flood wall has an approximate minimum depth of three times the height of the flood wall for required friction value at the soil-wall interface.

Raised Streets

Raised streets are proposed where vehicle access must be provided across the levee and where temporary levee closures are not considered reasonable due to a large number of public and private property access points. Street raising procedures include demolition, redesign, and construction of streetscapes including roadways, curbs, and sidewalks.

Stoplog Closures and Pedestrian Hinged Gates for Access

Stoplog closures are proposed where space constraints do not allow acceptable vehicle and pedestrian grades to cross over the levee and where public or private access must be maintained. Stoplog closures consist of 5-foot spans of wooden stoplogs between concrete end walls with intermediate bollards for support. In some areas, pedestrian side-hinged gates are proposed to give access to private properties from main roads. These floodgates operate like a door and require little effort to be properly closed. A closure plan is included with the project's Operation and Maintenance Manual. When an appointed levee superintendent orders the levee closed, the closure plan will be executed by maintenance crews. Complete closure of the levee will be completed within an estimated 110 minutes of the closure order.

Stormwater Conveyance System

The Cities have extensive piped stormwater conveyance systems with outfalls at the rivers and harbor. Under normal conditions, city stormwater is collected and conveyed via gravity flow to the rivers or harbor. In some cases, stormwater is pump-conveyed during high tide. At times, tidal waters prevent stormwater discharge from reaching the outfall as the system is surcharged.

This stormwater conveyance system will be slightly modified to separate the stormwater system into two systems: drainage inside the levee and drainage outside the levee. Gravity conveyance will continue to be the primary source of stormwater discharge; however, pump stations will be provided and will be sized to convey the 100-year stormwater runoff from the corresponding tributary basin when tidal water influences the capacity of the gravity conveyance. Some existing pump stations will be replaced with new pump stations to update technology, improve management options and/or increase capacity. Some existing basins will be combined into one regional basin based on predicted stormwater routing. This will cause some outfalls to be decommissioned and abandoned. New outfalls will be installed where existing outfalls are inadequate.

Tidally-influenced Fry Creek is the only creek that flows through and crosses the proposed levee alignment. An existing culvert is located where the creek passes the proposed levee. This crossing is proposed to contain a tide control structure and pump station with fish screen.

UNIQUE CONDITIONS

Urban Setting

A variety of design types have been proposed to accommodate space constraints and access requirements, and to avoid loading settlement-prone soils.

Stoplog Closures

There are a total of 55 stoplog closures and 6 pedestrian hinged gates to span openings in the levee for vehicular and pedestrian access to public and private properties. Closures have been proposed where acceptable grades over the levee could not be achieved, or where providing the grades would mean placing fill on settlement-prone soils that could damage nearby buildings via subsidence. A plan to close the levee within 110 minutes of an order to do so has been prepared. Ability to forecast closure events is aided by the tidal nature of the flooding.

Pipe Penetrations

The levee passes through an urban environment and thus there are a large number of existing pipes that the levee will be constructed over.

- Water and gas pipes are pressurized and will not directly transport water across the levee.
- The sanitary sewer system will utilize locking lids to prevent seepage into the system.
- Storm pipes will be retrofitted with backflow valves and pump stations.
- Other conduits such as telephone and power will be sealed based on risk assessment and feasibility.

MT-2 Forms

Some fields and questions within the MT-2 forms do not or only partially apply to this project. The rationale for excluding some responses is included in the submittal forms and attachments.

SUBMITTAL CONTENTS

1. North Shore Levee Introductory Letter, KPFF Consulting Engineers
    - Introductory letter outlining the project and CLOMR submittal package
2. MT-2 Forms, compiled by KPFF Consulting Engineers
3. Memo: Hydraulics Analysis and Floodplain Mapping and Associated GIS Data, Watershed Science & Engineering
    - Analysis and discussion of flooding sources, identification of highest flooding source, establishment of base flood elevation and minimum freeboard height
4. Biological Assessment and Essential Fish Habitat Evaluation, GeoEngineers
    - Analysis and discussion of species and habitat for Endangered Species Act compliance
5. Geotechnical Analysis and Levee Certification Report, GeoEngineers
    - Analysis and discussion of soil conditions, including bearing capacity, settlement, seismic loading, and other soil properties
6. Letter: Design and Construction Recommendations for Floodwalls and Embankment Levees for North Shore Levee, GeoEngineers
    - Recommendations for the construction of earthen levees and concrete floodwalls
7. Calculations: Structural Calculations for Flood Walls FEMA Submittal, KPFF Consulting Engineers
    - Calculations for concrete floodwalls
8. Interior Drainage Analysis for North Shore Levee, KPFF Consulting Engineers
    - Analysis and discussion of interior drainage, including delineation, characterization, and runoff modeling of outfall basins for pump station sizing.

9. Plans: North Shore Levee 60% Plans, KPFF Consulting Engineers
    - Half-size 11x17-inch plan set showing proposed levee and pump stations
    - Full-size 22x34-inch plan set showing proposed levee and pump stations
10. North Shore Levee Operations and Maintenance Manual, KPFF Consulting Engineers
    - Outline and instructions for the operation and maintenance of the levee

Please direct any content matters to either Kris Koski, City Engineer, Aberdeen, WA 360-537-3218 or Brian Shay, City Administrator, Hoquiam, WA 360-538-3966.

Sincerely,

Mark R. Steepy, PE
Principal

MRS:DP