USCG General Bridge Permit Navigation Channel and Turning Basin Report

Additional Information – April 17, 2013

Columbia River CROSSING

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF EXHIBITS

LIST OF ATTACHMENTS

1. INTRODUCTION

This document captures the additional information necessary, related to the turning basin and navigation channel alignment, for the USCG's continued evaluation of the General Bridge Permit for the Columbia River Crossing (CRC) project.

The information contained in this document does not substitute for the current United States Army Corps of Engineers (USACE) Navigation 408 process. The USACE process is moving forward on a different, yet parallel path, with an expected conclusion date of July 30, 2014 as per President Obama's "We Can't Wait" initiative. A ship simulation will be conducted as part of the navigation 408 process, but is not a requirement for the United States Coast Guard (USCG) General Bridge Permit process. Based on the project's analysis by industry experts there are no significant impacts from realigning the navigation channels and reducing the Vancouver Turning Basin (VTB) area by approximately 18%. The project assessed current and potential future use as part of the analysis, as well as geometric considerations for the turning basin and the navigation channels. The analysis conducted follows the guidance and design parameters set forth through USACE guidance, and is similar, if not wholly the same methodology used to designate the original channels and basin configuration in their current positions.

2. EXISTING NAVIGATION CHANNELS AND VANCOUVER TURNING BASIN

The following information, as provided by USACE, describes the existing federal navigation projects, the criteria by which they were designed, and potential impacts to these federal projects. US Congress authorized three navigation channels on the Columbia River through the existing I-5 bridges (see Exhibit 1 – Existing Federal Navigation Channels) which are named the Primary Channel, authorized by the Rivers and Harbors Act of August 26, 1937 (see Attachment 1); the Barge Channel, authorized under Section 107 of the Rivers and Harbors Act of July 14, 1960 (see Attachment 2); and Alternative Barge Channel, authorized by the Water Resources Development Act of August 17, 1999 (see Attachment 3). These channels are federally authorized for the USACE to maintain the Primary Channel to 27 feet below zero Columbia River Datum (CRD) (currently maintained to 17 feet below zero CRD), the Barge Channel and Alternate Barge Channel are authorized to 15 feet below zero CRD. According to USACE, through discussions, these channels are virtually self-maintained and they have not been dredged in this location for over 25 years. The future maintenance of these channels is uncertain, but the USACE has indicated that it does not currently have funding or future plans to dredge the Primary Channel to the authorized depth of 27 feet below zero CRD.

2.1 EXISTING NAVIGATION CHANNELS

As described briefly above, there are three federally authorized navigation channels under the I-5 bridges: 1) Primary Navigation Channel, 2) Barge Channel and 3) Alternate Barge Channel, (see Exhibit 1). Historically, the need to transport fuel, fertilizer and grains to and from the Snake and Columbia basin agricultural area led to developing the navigation channels above the I-5 Bridge. Today the primary use of all

the channels is related to tug boat and recreational traffic. CRC has completed boat surveys for this reach of the river to document current usage of the navigation channels.

2.1.1 Primary Navigation Channel

The existing Primary Navigation Channel, the northern channel, is generally oriented towards the northwest for downbound transit. At approximately river mile 108.4 the centerline of the channel deflects approximately 10.9 degrees to the north in order for downbound traffic to align with the lift span on I-5. The channel continues on that bearing through the lift span and ends at the upstream edge of the Vancouver Turning Basin at river mile 106.5. The existing Primary Navigation Channel has a width of 300 feet, however, as the channel passes through the existing I-5 bridge vessels are limited to 263 feet of horizontal clearance between the edges of the pier walls. For reference, the existing lift span allows for 178 feet of vertical clearance above zero CRD. As stated previously in this document, the existing Primary Navigation Channel is currently maintained to a depth of 17 feet below zero CRD. Annual soundings have been provided by USACE in the I-5 bridge vicinity for the years 2000 through 2012. Soundings taken in 2012 indicate that the depth of the channel in this reach generally exceeds 17 feet below zero CRD and go as deep as 40 feet below zero CRD in some areas.

2.1.2 Current Use of Primary Navigation Channel

The Primary Navigation Channel is currently used for upbound and downbound tug/barge traffic requiring vertical clearances exceeding the limits of the Barge Channel and the Alternate Barge Channel. The use of bridge lifts for the Primary Navigation Channel is strictly limited between 6:30 a.m. and 9 a.m. and from 2:30 p.m. to 6:00 p.m. weekdays by the Code of Federal Regulations (CFR) 33.117.869.

The majority of the vessels that use the primary channel are tug boats with barges. These barges normally transport fuel, fertilizer and grains. The other vessel types that would use the primary channel are recreational vessels that require clearances greater than available in the Barge and Alternate Barge Channels.

When the draw bridge is in the down position the clearance is limited to about 39 feet at a stage of zero CRD. Tug boat required clearance is 52 feet plus 5 feet of air draft for a total clearance of 57 feet. This requires use of the other channel whenever possible. Bridge lifts are performed, but are not the preferred method of passage for tug boats. Large sail boats occasionally require the use of this channel due to a clearance requirement of greater than 69 feet at zero CRD stage.

2.1.3 Barge Channel

The existing Barge Channel, the central channel, is generally oriented towards the west northwest for downbound transit. At river mile approximately108 the centerline of the Barge Channel begins at the southern edge of the Primary Channel at a bearing approximately 4 degrees south of the Primary Channels alignment. The channel continues on that bearing through a span of the existing I-5 bridge to the upstream edge of the Vancouver Turning Basin at river mile 106.5, providing approximately 58 feet of vertical clearance above zero CRD and 511 feet of horizontal clearance. Tugs that operate on the upper Columbia and Snake River cannot be any taller than 52 feet.

The existing Barge Channel is authorized to a depth of 15 feet below zero CRD. Soundings taken in the year 2012 by the USACE indicate that the depth of the channel in this reach exceeds 15 feet ranging from 16 to 40 feet below zero CRD.

2.1.4 Current Use of Barge Channel

The Barge Channel is currently used for upbound and downbound tug boats with barges when vertical clearances greater than 58 feet above zero CRD are not required. Based on conversations with tow pilots it is a preferred channel when the river stage is low because it is in a more direct alignment with the downstream BNSF railroad bridge than the Alternate Barge Channel. Besides tugs with barges the only other vessels using this channel would be recreational vessels with clearance requirements of less than 58 feet.

2.1.5 Alternate Barge Channel

The existing Alternate Barge Channel, the southern channel, is generally oriented towards the west northwest for downbound transit. At approximately river mile 108, the centerline of the Alternate Barge Channel begins at the southern edge of the Primary Navigation Channel, approximately the same location as the Barge Channel. The Alternate Barge Channel diverts from the Primary Navigation Channel at a bearing of approximately 9 degrees south of the Primary Navigation Channels alignment. The channel continues downstream on that bearing to river mile 105.28 where it turns north approximately 9 degrees to align with the piers of the existing bridge. The channel passes through the center of the existing 265 foot wide span and continues to river mile 106.2 where it terminates. For reference, the span of the bridge that the Alternate Barge Channel passes through has a vertical clearance of 69 feet above zero CRD. The existing Alternate Barge Channel is authorized to a depth of 15 feet below zero CRD. The 2012 depth soundings taken by USACE indicate that the depth of the channel in this reach exceeds 15 feet below zero CRD and depths range from 16 to 38 below zero CRD feet.

2.1.6 Current Use of Alternate Barge Channel

The Alternate Barge Channel is currently used for upbound and downbound barge traffic when vertical clearances greater than 69 feet above zero CRD are not required. This channel is predominately used by tugs with barges due to clearance requirements when stages in the Columbia River are greater than 6 feet above zero CRD. Tug boats in the Lower Columbia River have a maximum clearance requirement of 57 feet above zero CRD. Tugs that operate on the upper Columbia and Snake River cannot be any taller than 52 feet. If the river stage in the Columbia River is high due to flow conditions, tugs are then required to use the Alternate Barge Channel rather than the Barge Channel due to the stated height requirements. Taller sail boats often use this channel instead of requesting a lift operation.

2.1.7 Navigation Safety Considerations of Existing Channels

The current navigation channels have many safety considerations that were evaluated during the early design concepts and addressed for the proposed I-5 bridges.

- Primary Navigation Channel requires a bridge lift which is restricted per CFR 33.117.869 and requires vessels to slow their approach and wait for the lift to occur. This also adds at least 20 minutes of time to their transit and sometimes up to one hour as tows must anchor upstream ½ mile near Ryan's Point or downstream of the BNSF railroad bridge until they obtain clearance to transit under the lift span.
- Horizontal clearance is limited to 263 feet for vessels transiting the Primary Navigation Channel through the I-5 Bridge. The authorized width of the channel in this area is 300 feet.

- Horizontal clearance is limited to 265 feet for vessels transiting the Alternate Barge Channel through the I-5 Bridge. The authorized width of the channel in this area is reduced from 300 feet to 200 feet just upstream of the bridge. Any vessel requiring a vertical clearance greater than 69 feet above zero CRD must use the Primary Navigation Channel that has restrictions on the lift.

2.2 VANCOUVER TURNING BASIN

This section is a summary of the Vancouver Turning Basin (VTB) impacts. The full technical analysis is Attachment 6 of this report.

In the early to mid part of the 20th century, the Port of Vancouver imported and exported materials such as lumber, grain, oil and bauxite (aluminum). Due to navigation issues in the reach of the Columbia River between the mouth of the Willamette River and the Pacific Highway Interstate Bridge (current location of the existing I-5 Bridge) the Port of Vancouver requested USACE to modify the navigation channel. In a letter from the Port, dated February 4, 1931 the following modifications were recommended to USACE:

- Deepen the navigation channel to 30 feet at low water,
- Widen the navigation channel to 300 feet and,
- Establish two turning basins each having the dimensions of 800 feet wide and 2,000 feet long.

At this request of the Port of Vancouver, House Document 249, the "Report from the Chief Engineers on Preliminary Examination and Survey……above the City of Vancouver, Wash" (see Attachment 4), was submitted to Congress to improve a channel along the Washington shore downstream of the I-5 Bridge and create the VTB to accommodate the expected growth in water-borne commerce. At the time, the Port had Terminal 1 (T1) (see Exhibit 3) at the location that is now the Red Lion Hotel. Terminal 1 was primarily used for lumber, grain and oil commerce. The turning basin is authorized at a depth of 35 feet, but is not currently maintained because there are no uses that warrant maintenance.

The upstream limit of the existing VTB is at river mile 106.5, just below the I-5 Bridge. The turning basin, (see Exhibit 2) is generally oriented towards the northwest in a downstream direction. The 800 foot wide turning basin continues downstream for 2,000 feet where the southern edge turns north 34 degrees and follows that alignment for approximately 1080 feet until it ties back in with the main channel. The northern edge remains in the same orientation from river mile 106.5 until the downstream limit of the basin.

The turning basin was originally sized for a T2 Tanker (Jumbo) which has a beam width of 75 feet and an overall length of 572 feet and fully loaded has a draft of 30 feet. The USACE keeps a library of all navigation design files and reports, however no design records could be found for the VTB. According to House Document 249 (see Attachment 1) the Port of Vancouver developed the plan to size the turning basin. USACE forwarded this plan to Congress for approval in February 1932. As of 2013, most if not all of the T2 Tanker fleet has been retired from service due to age.

2.2.1 Current Use of the Vancouver Turning Basin

Based on discussions with the Ports of Vancouver and Portland, terminal managers and the Columbia River Towboat Association, the only commercial vessels that transit the

VTB are tugs with barges for this reach of the Columbia River. They do not use the VTB for turning, but rather transit through the basin in about 20 minutes. They also report that no deep draft vessels have used the turning basin in over 25 years.

At the Lafarge terminal, which is just downstream of the VTB, and immediately upstream of the BNSF railroad bridge, (see Exhibit 2) ocean going barges with drafts of 20 feet dock at this terminal on a regular basis. After unloading, they either back downriver with the current until downstream of the BNSF railroad bridge and then turn; or proceed upstream in the VTB a few hundred feet and then proceed to turn in the downstream direction.

In recent history, deep draft vessels do not use the VTB. According to the Port of Vancouver and local tug boat pilots, no one remembers seeing a deep draft vessel upstream from the BNSF railroad Bridge. Many of the pilots have been transiting this reach of the river for over 25 years.

2.2.2 Projected Use of the Vancouver Turning Basin

Planned landside development adjacent to the VTB will significantly diminish its future potential use. Downstream of the current Red Lion site is a proposed Gramor Development site. The development is mixed use (commercial, business and residential) that would not allow for any port type developments in the future. Where T1 was located will be the City of Vancouver Waterfront Park in the future.

The Lafarge terminal manger has stated that if the economic conditions in the area change, they could possibly use a deep draft vessel to bring commodities (cement) to their terminal. This vessel could have a draft up to 35 feet and a length of 504 feet. A detailed written plan of the potential use of deep draft vessels is not currently available.

Due to the location of the Lafarge terminal, a deep draft vessel leaving this terminal will proceed upstream with the aide of two tug boats. The use of the VTB for turning in to the downstream direction would be used to perform the turning maneuver safely.

For additional information regarding the VTB please see Attachment 6 - Vancouver Turning Basin Evaluation Technical Memorandum dated April 15, 2013.

2.2.3 Navigation Safety Considerations of Existing Turning Basin

A constraint that currently exists in the VTB is the Interstate 5 bridge approach Buoy 2, which is located approximately 600 feet downstream (45°34’14.241”N and 122°40’33.620”W) of the existing I-5 bridge. A review of historical navigation charts shows that this buoy was installed in 1975. Buoy #2 is used by tug boat pilots to line up for safe passage under the draw bridge. Due to the location of this buoy, the upper portion of the VTB has not been available for turning maneuvers by deep draft vessels for over 35 years. The usable length of the turning basin has been about 1,400 feet in length. Terminal 1 was no longer operational at that time as the Red Lion at the Quay was then located at T1.

3. MODIFIED NAVIGATION CHANNELS AND VANCOUVER TURNING BASIN

3.1 DESCRIPTION OF CHANNELS

As displayed in Exhibit 4 there are three proposed navigation channels that are within 40 to 190 feet of the existing channels. See Exhibits 4 and 5 for information regarding the modified channels.

The northern channel will be adjusted south approximately 40 feet in order to align the minimum 300 foot wide channel within the center of the proposed piers, and will provide an overall vertical clearance of 100 feet above zero CRD. The 2012 depth soundings taken by USACE indicate that the depth of the channel in this reach averages within a range of depth from 17 to 40 feet below zero CRD.

The central channel will be adjusted towards the north approximately 190 feet in order to align the minimum 300 foot wide channel within the center of the proposed piers, and will provide an overall vertical clearance of 116 feet above zero CRD. The 2012 depth soundings taken by USACE indicate that the depth of the channel in this reach averages within a range of depth from 18 to 40 feet below zero CRD.

The southern channel will be adjusted towards the north approximately 60 feet in order to align the minimum 300 foot wide channel within the center of the proposed piers, and will provide an overall vertical clearance of 114 feet above zero CRD. The 2012 depth soundings taken by USACE indicate that the depth of the channel in this reach averages within a range of depth from 18 to 38 feet below zero CRD.

Which channels the river pilots choose to use will be based on conditions and their preference. Based on discussions with the tow pilots it is likely that the majority of barge traffic will utilize the north and central channels as they are in a more favorable alignment with the downstream BNSF railroad bridge. In a letter dated April 16, 2013 (see Attachment 5), the President of Columbia River Towboat Association stated “With the proposed clearances, and the improved alignment of the channels with the downstream BNSF bridge opening, we believe that the changes represent a definite improvement in safe navigation for the towboat community.”

3.2 SUBSTRATE AND HYDROLOGY

Based on geo-technical borings conducted in support of the project, the river bottom material is loose sand to depths of 20 to 40 feet. No zones of silts, clays, gravels, or bedrock were encountered in any of the 20 plus borings made in the vicinity of the existing and proposed navigation channels. Below is a summary of the findings:

- No differences were noted in the materials across the width of the river, and no differences were noted in materials from upstream to downstream. See the CRC Report, *Columbia River Bridge Crossing, Geotechnical Foundation and Design Report, Dec 2011.*
- Due to the homogeneity of the materials, basically sand, there will be no changes in the ability to dredge the material in the proposed channels.
- These materials appear to be the same materials that are currently and historically dredged in the Lower Columbia River.

- Based on the 2012 depth soundings taken by USACE, average depths within the channels in this reach range from 17 to 40 feet below zero CRD.
- Given the current water depths, if USACE were to dredge the proposed channel to 27 feet below zero CRD the overall impacts to the hydraulic conditions would be minor and no significant changes in sediment movement are anticipated.
- The hydraulic conditions of the proposed channels will not materially change the properties of the sediment that are in place. Therefore, the ability to dredge in the new proposed channels will not be significantly different from conditions that exist at the present time.

3.3 VANCOUVER TURNING BASIN

The Modified Vancouver Turning Basin, Exhibit 2 and 3, will generally maintain orientation and shape with the exception of an 18 percent reduction in its overall area. The upstream limit of the modified Vancouver Turning Basin will be located at river mile 106.4, just below the I-5 bridges. The turning basin will remain oriented towards the northwest but the length of the basin will be effectively reduced by approximately 480 feet. From river mile 106.4 the turning basin will continue downstream for 1,520 feet where the southern edge will turn north 34 degrees and follows that alignment for approximately 1,080 feet until it ties back in with the main channel. The northern edge remains in the same orientation from river mile 106.4 until the downstream limit of the basin. The width of the turning basin, 800 feet, would remain the same. The existing Interstate 5 bridge approach Buoy 2 will likely be relocated to the proposed CRC pier located between the northern channel and the central channel, or be removed.

The Modified Vancouver Turning Basin has been discussed with the Port of Vancouver, LaFarge terminal manager and most of the major tug/barge operators. The proposed modifications were deemed to be acceptable and did not create any navigational concerns. Letters from both Ports, the Columbia River Towboat Association and Tidewater that state no impacts to their operations are attached in Attachment 5. Additionally, none of the previously mentioned parties were aware of any future plans within the next 5 years for a deep draft vessel that would use the Vancouver Turning Basin.

Using the dimensions of the T 2 Tanker (Jumbo), 572 feet in length and a beam of 75 feet, and current USACE EM 1110-2-1613, Hydraulic design of Deep-Draft Navigation Projects, for low to moderate flow conditions, the dimensions of the proposed turning basin meet USACE criteria without the need for tug assistance. For moderate flow conditions, tugs could be used to aide in turning a deep draft vessel in the turning basin. See Attachment 6 for calculations, narrative, exhibits, and figures related to the VTB.

The removal of Buoy 2 will need to be evaluated. Currently, the Buoy is used to line the pilots up for the lift span. The lift span will be eliminated and so will the need for that buoy. Other navigation aids might be located in the area based on conversation with the river pilots and the recommendation of the USCG, but these aides will not be in the same location and may not reduce any of the remaining VTB area.

Based on current usage, none of the tug boat operators use the Vancouver Turning Basin for turning. According to the tug boat pilots, the turning basin used as a transit lane between the I-5 and BNSF bridges (see Attachment 5).

The Lafarge terminal barges dock just upstream from the BNSF Bridge. Typically, after unloading they either back downriver with the current until downstream of the BNSF railroad bridge and then turn; or proceed a couple hundred feet upstream and then turn downstream without additional tug assistance. The Lafarge Manager commented that the proposed modification to the turning basin would have no impact to their operations.

The Lafarge Manager stated that within 5 years, depending upon the economic conditions in the area, consideration would be given to using a deep draft vessel to offload cement. The length of this vessel would be 504 feet and a beam width of less than 100 feet. This vessel, if used, would be 68 feet shorter when compared to a T 2 tanker. The Vancouver Turning Basin would be able to handle this vessel while turning downstream without any difficulty based on computations for a T 2 tanker, as discussed above.

Navigation Safety Considerations of Modified Channels

- Delays and scheduling for bridge lifts will no longer be required for use of the Primary Navigation Channel.
- The horizontal clearance between piers for the Primary Navigation Channel will be improved, exceeding the minimum 300 foot required width of the modified channel.
- The horizontal clearance between piers for the Alternate Barge Channel will be improved, exceeding the minimum 300 foot required width of the modified channel.
- All modified channels generally provide a more direct alignment with the downstream BNSF Bridge.
- CRC will require the construction contractor to remove the existing piers and buried piles of the I-5 Bridge to a depth of at least 5 feet below the authorized depth of associated channels to allow for safe dredging in the area if required.

3.4 IMMEDIATE AND FUTURE IMPACTS TO DREDGING AND MAINTENANCE

The following information is provided to illustrate that the CRC project will not have any significant impacts to USACE's current or future dredging and maintenance operations. Exhibits 4 and 5 are attached as visual aids to support the information discussed below.

Conversations with Jon Gornick (USACE Technical Manager for Dredging, Waterways Maintenance Section) regarding the current dredging and maintenance operations have indicated the following:

- The USACE maintains the Primary Navigation Channel to a minimum depth of 17 feet below zero CRD.
- The Barge and Alternate Barge Channel are maintained to a minimum authorized depth of 15 feet below zero CRD.
- USACE has not performed significant maintenance on any of the channels in the area of the I-5 Bridge since 1963. There is a record of some minor dredging occurring in 1979 but no dredged volumes were noted, indicating that it was likely dredging of a specific high spot.

- USACE has not expressed any immediate plans to dredge the Primary Navigation Channel or the Vancouver Turning Basin to their authorized depths
- Additionally, soundings provided from USACE, which were taken in 2012, indicate that current depth of the river bed generally meets or exceeds all currently maintained depths within the limits of the proposed channels.

Exhibit 5 shows a sample of the soundings provided within the modified channel limits to illustrate this condition. There is a very small area within the modified Primary Navigation Channel that indicates a depth just above the 17 foot (below zero CRD)depth; this can be seen in Exhibit 5. This would be a minor high spot and, as this is an active channel bed where depths are always changing, there is a chance that it is no longer there. Because this is an active riverbed, a soundings survey should be considered following the removal of the existing I-5 bridge in order to verify channel depths at that time and assess initial dredging requirements.

Based on the information provided above, the assessments of the modified Channel alignments indicates that there should be limited requirements for initial dredging of channels to meet maintained depths and no impact to the current long term maintenance requirements in this area.

In the future, if dredging to the authorized depth of 35 and 27 feet below zero CRD for the Vancouver Turning Basin and Primary Navigation Channel, respectively, is pursued, the proposed CRC Bridge structure provides longer spans, requires fewer piers and creates less obstructions overall. Therefore, the proposed CRB structure is not anticipated to restrict dredging to full authorized depths. Exhibit 5 shows an area within the limits of the modified Primary Navigation Channel where the river bed depths are less than 27 feet below zero CRD. Areas within the limits where no data is shown represent channel bed depths exceeding the 27 foot authorized depth. Additionally, this exhibit shows that the majority of the river bed with a depth less than 27 feet below zero CRD is relatively close with depths mostly in the range of 20 to 26 feet below zero CRD. Should the USACE determine that dredging to the authorized depth is necessary, this information indicates that limited dredging will be required. The proposed channel modifications should not impede USACE from dredging to the fully authorized channel depths.

4. CONCLUSION

Construction of the Columbia River Crossing Project will require minor shifts in the existing navigation channels to align with the new pier configuration. The shifts are an improvement over the present conditions allowing for wider channels where they pass through the new piers, providing a better alignment with the downstream BNSF Railroad bridge channel, providing greater general vertical clearances, (excluding the existing drawbridge in the raised position), with no differences in channel depths over the existing conditions, and no additional dredging required. The new bridge will encroach into the upper end of the existing Vancouver Turning Basin, but does not encroach downstream of the existing navigation buoy which presently restricts use of the upper portion of the turning basin. Computations to check the turning basin dimensions show that its present configuration meets Corps of Engineers criteria for the low flow conditions, and meets criteria for high flow conditions with tug assistance for turning.

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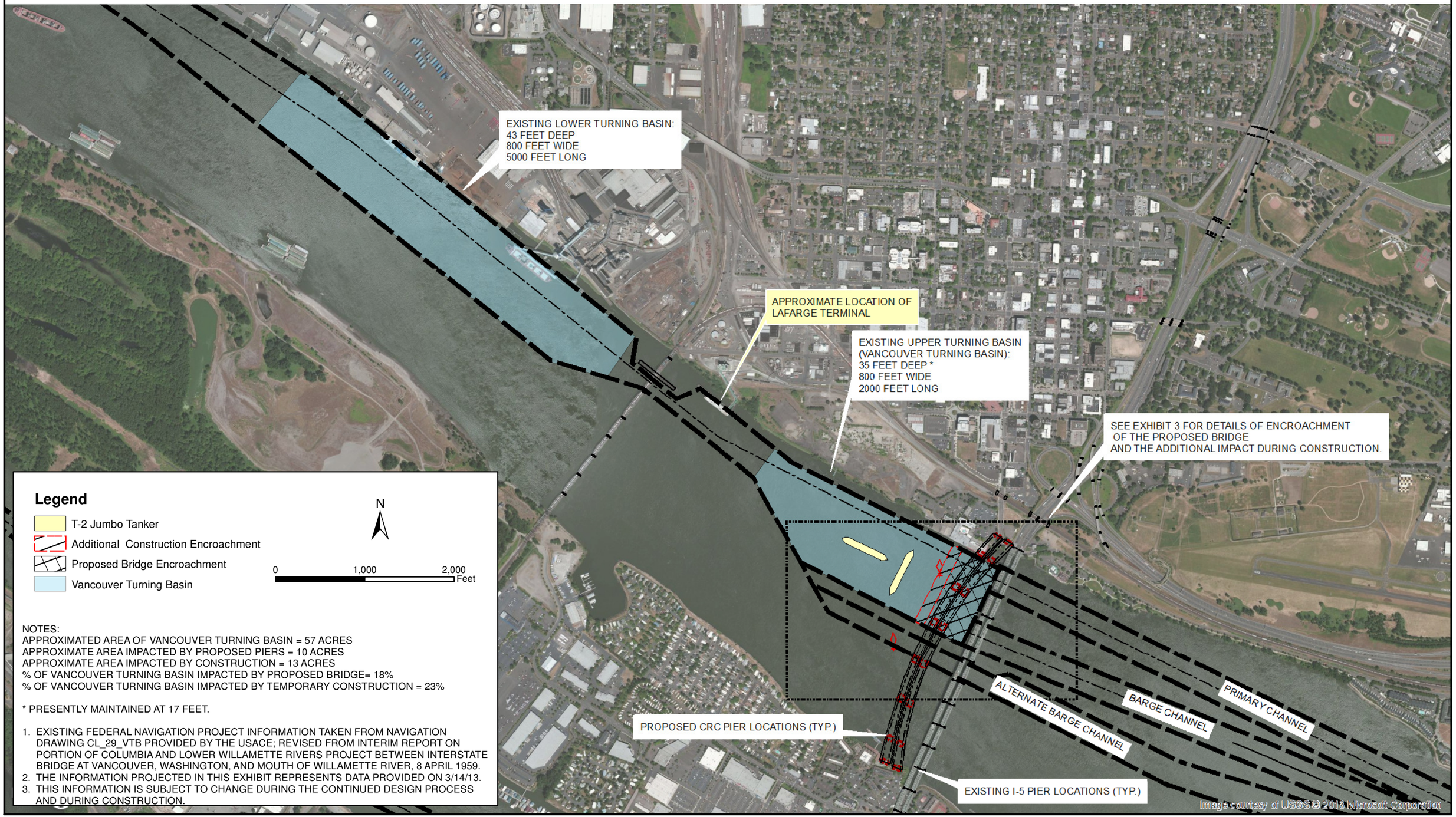
Columbia River CROSSING

Exhibit1 - Existing Federal Navigation Channels

Exhibit 2 - Vancouver Turning Basin Encroachment



Legend

- T-2 Jumbo Tanker
- Additional Construction Encroachment
- Proposed Bridge Encroachment
- Vancouver Turning Basin

N

0 1,000 2,000 Feet

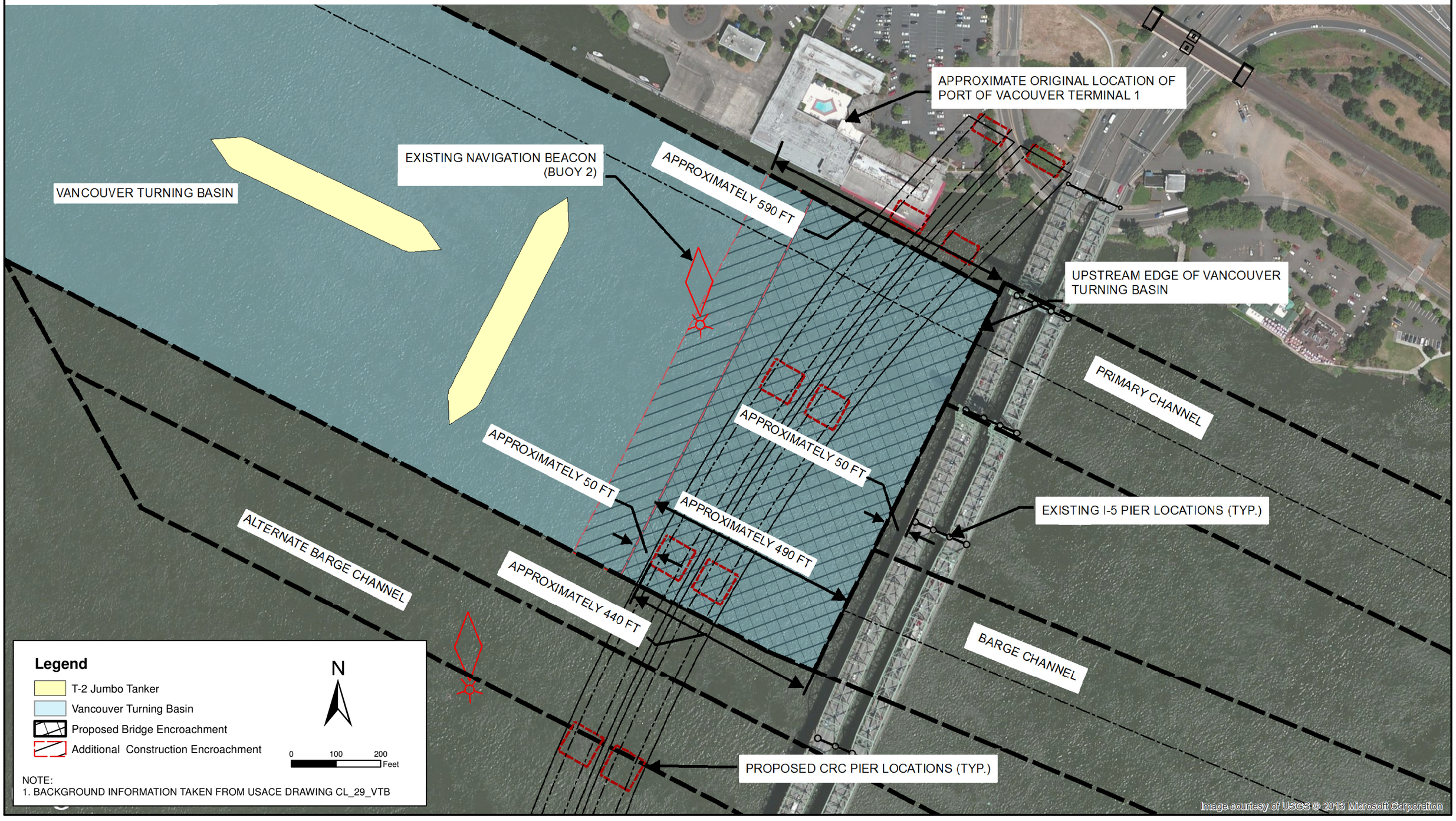
NOTES:
APPROXIMATED AREA OF VANCOUVER TURNING BASIN = 57 ACRES
APPROXIMATE AREA IMPACTED BY PROPOSED PIERS = 10 ACRES
APPROXIMATE AREA IMPACTED BY CONSTRUCTION = 13 ACRES
% OF VANCOUVER TURNING BASIN IMPACTED BY PROPOSED BRIDGE= 18%
% OF VANCOUVER TURNING BASIN IMPACTED BY TEMPORARY CONSTRUCTION = 23%

* PRESENTLY MAINTAINED AT 17 FEET.

1. EXISTING FEDERAL NAVIGATION PROJECT INFORMATION TAKEN FROM NAVIGATION DRAWING CL_29_VTB PROVIDED BY THE USACE; REVISED FROM INTERIM REPORT ON PORTION OF COLUMBIA AND LOWER WILLAMETTE RIVERS PROJECT BETWEEN INTERSTATE BRIDGE AT VANCOUVER, WASHINGTON, AND MOUTH OF WILLAMETTE RIVER, 8 APRIL 1959.
2. THE INFORMATION PROJECTED IN THIS EXHIBIT REPRESENTS DATA PROVIDED ON 3/14/13.
3. THIS INFORMATION IS SUBJECT TO CHANGE DURING THE CONTINUED DESIGN PROCESS AND DURING CONSTRUCTION.

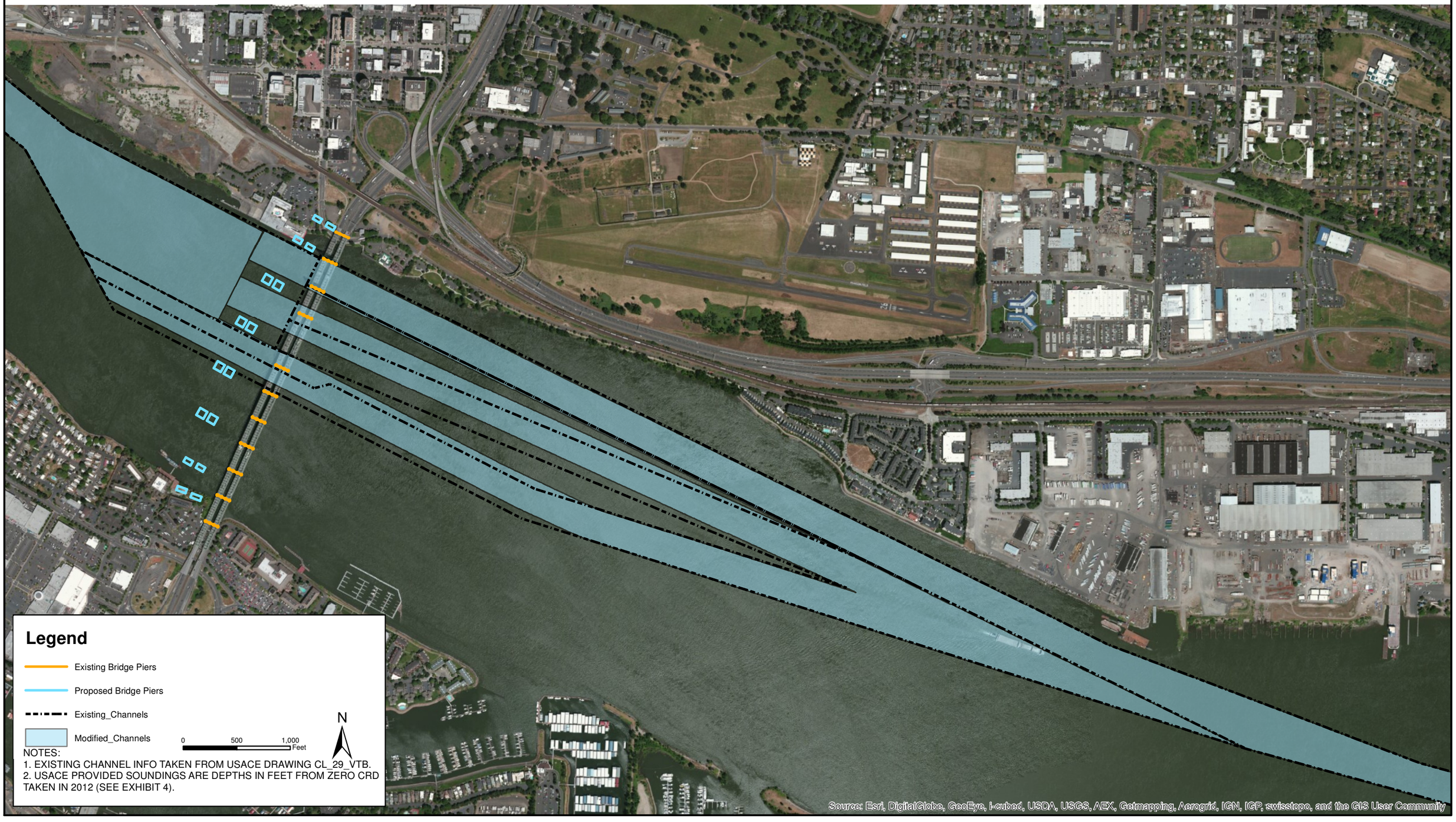
Columbia River CROSSING

Exhibit 3 - Vancouver Turning Basin Encroachment (Enlarged)



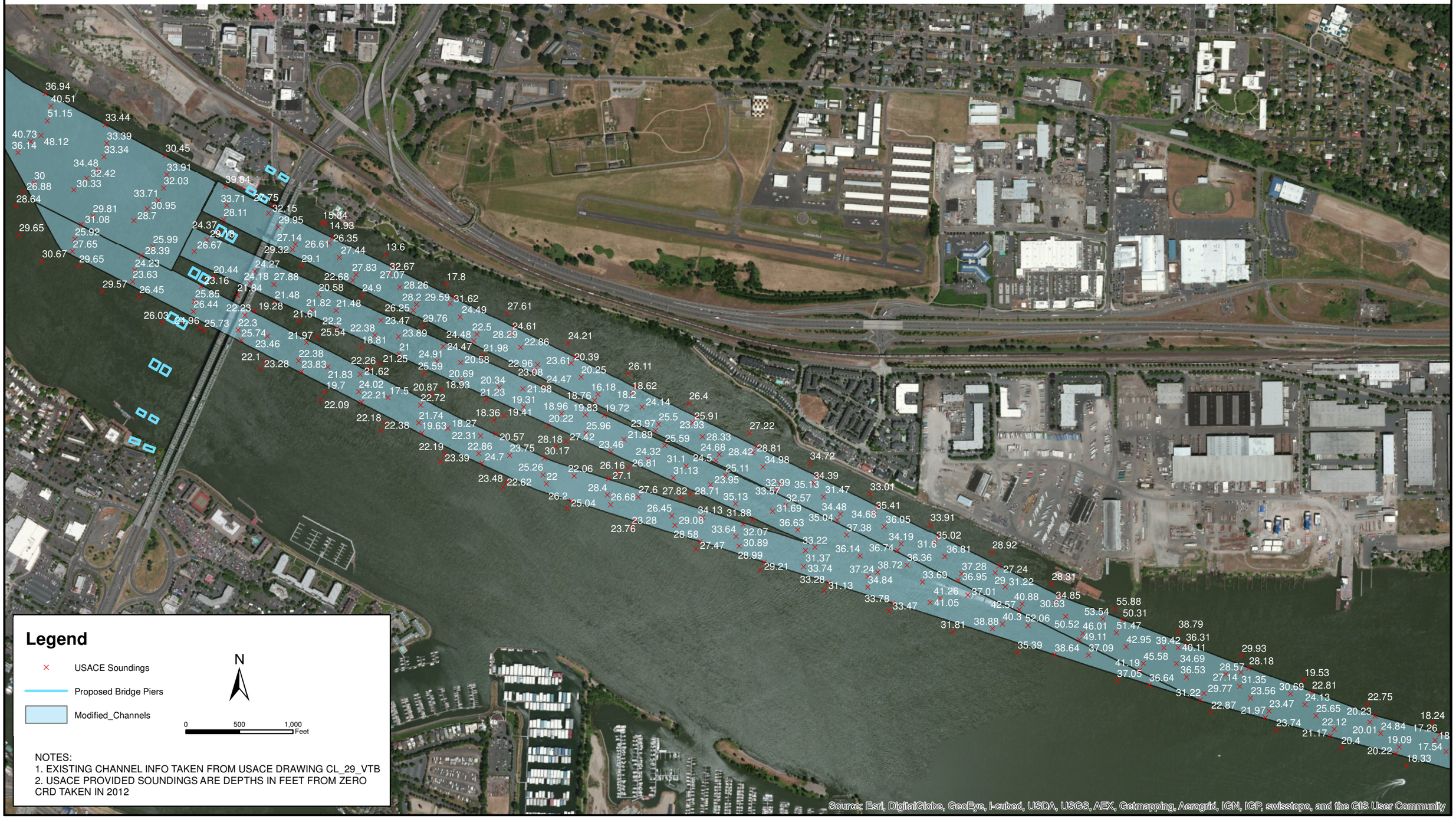
Columbia River CROSSING

Exhibit 4 - Navigation Channel Comparison



Columbia River CROSSING

Exhibit 5 - Sounding Depth at Proposed Channels



ATTACHMENT 1

[PUBLIC—No. 685—75TH CONGRESS]

[CHAPTER 535—3D SESSION]

[H. R. 10298]

AN ACT

Authorizing the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following works of improvement of rivers, harbors, and other waterways are hereby adopted and authorized, to be prosecuted under the direction of the Secretary of War and supervision of the Chief of Engineers, in accordance with the plans recommended in the respective reports hereinafter designated and subject to the conditions set forth in such documents; and that hereafter Federal investigations and improvements of rivers, harbors, and other waterways shall be under the jurisdiction of and shall be prosecuted by the War Department under the direction of the Secretary of War and the supervision of the Chief of Engineers, except as otherwise specifically provided by Act of Congress, which said investigations and improvements shall include a due regard for wildlife conservation:

Mystic River, Massachusetts; House Document Numbered 542, Seventy-fifth Congress;

Scituate Harbor, Massachusetts; House Document Numbered 556, Seventy-fifth Congress;

Westport River, Massachusetts; House Document Numbered 692, Seventy-fifth Congress;

Plymouth Harbor, Massachusetts; House Document Numbered 577, Seventy-fifth Congress;

Flushing Bay and Creek, New York; Senate Committee on Commerce Document, Seventy-fifth Congress;

Huntington Harbor, New York; House Document Numbered 638, Seventy-fifth Congress;

Hudson River, New York; House Document Numbered 572, Seventy-fifth Congress;

Great Kills Harbor, Staten Island, New York; House Document Numbered 559, Seventy-fifth Congress;

Delaware River from Allegheny Avenue, Philadelphia, Pennsylvania, to the sea; Senate Document Numbered 159, Seventy-fifth Congress;

Mantua Creek, New Jersey; House Document Numbered 505, Seventy-fifth Congress;

Annapolis Harbor, Maryland; Rivers and Harbors Committee Document Numbered 48, Seventy-fifth Congress;

Channel connecting Plain Dealing Creek and Oak Creek, Maryland; House Document Numbered 413, Seventy-fifth Congress;

Twitch Cove and Big Thoroughfare River, Maryland; Rivers and Harbors Committee Document Numbered 49, Seventy-fifth Congress;

Herring Bay and Rockhold Creek, Maryland; House Document Numbered 595, Seventy-fifth Congress;

Cape Charles City Harbor, Virginia; House Document Numbered 580, Seventy-fifth Congress;

Roanoke River, North Carolina; House Document Numbered 694, Seventy-fifth Congress;

New River Inlet, North Carolina; House Document Numbered 691, Seventy-fifth Congress;

Drum Inlet, North Carolina; House Document Numbered 414, Seventy-fifth Congress;

Belhaven Harbor, North Carolina; House Document Numbered 693, Seventy-fifth Congress;

Intracoastal Waterway from Cape Fear River, North Carolina, to Winyah Bay, South Carolina; House Document Numbered 549, Seventy-fifth Congress;

Waterway between Beaufort, South Carolina, and Saint Johns River, Florida; House Document Numbered 618, Seventy-fifth Congress;

Terry Creek and Back River, Georgia; House Document Numbered 690, Seventy-fifth Congress;

Fernandina Harbor, Florida; House Document Numbered 548, Seventy-fifth Congress;

Saint Augustine Harbor, Florida; House Document Numbered 555, Seventy-fifth Congress;

Courtenay Channel, Florida; House Document Numbered 504, Seventy-fifth Congress;

Eau Gallie Harbor, Florida; House Document Numbered 497, Seventy-fifth Congress;

Port Everglades, Florida; House Document Numbered 545, Seventy-fifth Congress;

Channel from Naples, Florida, to Big Marco Pass; House Document Numbered 596, Seventy-fifth Congress;

Tampa Harbor, Florida; Senate Document Numbered 164, Seventy-fifth Congress;

Palm Beach, Florida; Side channel and basin in accordance with report on file in the office of the Chief of Engineers;

Tampa and Hillsboro Bays, Florida; Senate Commerce Committee Document, Seventy-fifth Congress;

Apalachicola River, Florida; House Document Numbered 575, Seventy-fifth Congress;

Biloxi Harbor, Mississippi; House Document Numbered 639, Seventy-fifth Congress;

Mississippi River between Baton Rouge and New Orleans, Louisiana; House Document Numbered 597, Seventy-fifth Congress;

Grand Bayou Pass, Louisiana; Senate Document Numbered 166, Seventy-fifth Congress;

Sabine-Neches Waterway, Texas; House Document Numbered 581, Seventy-fifth Congress;

Buffalo Bayou and its tributaries, Texas; House Document Numbered 456, Seventy-fifth Congress;

Dickinson Bayou, Texas; House Document Numbered 568, Seventy-fifth Congress;

Louisiana-Texas Intracoastal Waterway; House Documents Numbered 564, 640, 641, 642, and 643, Seventy-fifth Congress;

Port Aransas-Corpus Christi Waterway, Texas; House Document Numbered 574, Seventy-fifth Congress;

Charlevoix Harbor, Michigan; Senate Document Numbered 163, Seventy-fifth Congress;

Saginaw River, Michigan; House Document Numbered 576, Seventy-fifth Congress;

Richmond Harbor, California; House Document Numbered 598, Seventy-fifth Congress;

Bodega Bay, California; House Document Numbered 619, Seventy-fifth Congress;

San Pablo Bay and Mare Island Strait, California; House Document Numbered 644, Seventy-fifth Congress;

Umpqua River, Oregon; Senate Document Numbered 158, Seventy-fifth Congress;

Columbia River, between Chinook, Washington, and the head of Sand Island; Rivers and Harbors Committee Document Numbered 50, Seventy-fifth Congress;

Neah Bay, Washington; Rivers and Harbors Committee Document Numbered 51, Seventy-fifth Congress;

Everett Harbor, Washington; House Document Numbered 546, Seventy-fifth Congress;

Iliuliuk Harbor, Alaska; House Document Numbered 543, Seventy-fifth Congress;

Skagway Harbor, Alaska; House Document Numbered 547, Seventy-fifth Congress;

Valdez Harbor, Alaska; House Document Numbered 415, Seventy-fifth Congress.

SEC. 2. That in any case in which it may be necessary or advisable in the execution of an authorized work of river and harbor improvement to exchange land or other property of the Government for private lands or property required for such project, the Secretary of War may, upon the recommendation of the Chief of Engineers, authorize such exchange upon terms and conditions deemed appropriate by him, and any conveyance of Government land or interests therein necessary to effect such exchange may be executed by the Secretary of War: *Provided further*, That the authority hereby granted to the Secretary of War shall not extend to or include lands held or acquired by the Tennessee Valley Authority pursuant to the terms of the Tennessee Valley Authority Act. This section shall apply to any exchanges heretofore deemed advisable in connection with the construction of the Bonneville Dam in the Columbia River.

SEC. 3. To provide suitable office quarters for the district engineer in charge of maintenance and operation of the Washington Aqueduct and of river and harbor improvements in the Washington District the Secretary of War is authorized to alter and remodel the pumping station building at McMillan Park in accordance with plans approved by the Chief of Engineers, the cost of such alteration and remodeling to be paid from appropriations heretofore or hereafter made by Congress for maintenance and improvement of existing river and harbor works.

SEC. 4. That any amounts collected from any person, persons, or corporations as a reimbursement for lost, stolen, or damaged property, purchased in connection with river and harbor or flood control work prosecuted under the direction of the Secretary of War and the supervision of the Chief of Engineers, whether collected in cash or by deduction from amounts otherwise due such person, persons, or corporations, hereafter shall be credited in each case to the appropriation that bore the cost of purchase, repair, or replacement of the lost, stolen, or damaged property.

SEC. 5. That the provisions of section 204 of part II of the Legislative Appropriation Act, fiscal year 1933, shall not be so construed as to prevent the employment by the Chief of Engineers under agreement as authorized by section 6 of the River and Harbor Act of July 3, 1930, of any retired civilian employee whose expert assistance may be needed in connection with the prosecution of river and harbor or flood control works: *Provided*, That during the period of such employment a sum equal to the retired pay of the employee shall be deducted from the compensation agreed upon.

SEC. 6. That the conditions of local cooperation applicable to the improvement of the Illinois Waterway (Calumet-Sag route) printed in House Document 180, Seventy-third Congress, second session, are hereby modified by eliminating therefrom the requirement that local interests will furnish "evidence satisfactory to the Secretary of War that the twenty movable bridges across the Sanitary Canal will be placed in operating condition or otherwise satisfactorily altered": *Provided*, That local interests will install operating machinery and place in operating condition the three drawbridges across the Chicago Sanitary and Ship Canal between its junction with the Calumet-Sag Channel and Lockport when directed by the Secretary of War: *Provided further*, That this resolution shall not be construed as modifying the provisions of section 18 of the River and Harbor Act of March 3, 1899 (30 Stat. 1153).

SEC. 7. That section 14 of Public Law Numbered 585, Sixty-eighth Congress, approved March 3, 1925, is hereby amended by striking out the word "Locust" and inserting in lieu thereof the word "Sipsey", so that said section 14, as amended, will read as follows:

"SEC. 14. That the portion of Black Warrior River between Dam Numbered 17 and the junction of Sipsey and Mulberry Forks, in the State of Alabama, shall hereafter be known as 'Lake Bankhead.'"

SEC. 8. The Secretary of War is hereby authorized and directed to cause preliminary examinations and surveys to be made at the following-named localities, the cost thereof to be paid from appropriations heretofore or hereafter made for such purposes: *Provided*, That no preliminary examination, survey, project, or estimate for new works other than those designated in this or some prior Act or joint resolution shall be made: *Provided further*, That after the regular or formal reports made as required by law on any examination, survey, project, or work under way or proposed are submitted no supplemental or additional report or estimate shall be made unless authorized by law: *And provided further*, That the Government shall not be deemed to have entered upon any project for the improvement of any waterway or harbor mentioned in this Act until the project for the proposed work shall have been adopted by law:

South side of the channel, South Harpswell, Maine.

Merrimack River, Massachusetts and New Hampshire, with a view to improvement for navigation, flood control, and water power.

Manchester Harbor, Massachusetts, with a view to constructing a breakwater between Magnolia Point and Kettle Island.

Menemsha Creek, Marthas Vineyard, Massachusetts.

Pond Village Landing, Truro, Massachusetts.

Marblehead Harbor, Massachusetts.

Salem Harbor, Massachusetts.

Niantic Harbor and River, Connecticut.

Catskill Creek, New York.

Jamaica Bay, New York.

Bay Shore Harbor, New York.

Beach Haven Inlet, New Jersey.

Cedar Creek, Ocean County, New Jersey.

West bank of the Delaware River, between New Castle and Delaware City, Delaware, with a view to protection from damage by overflows.

Indian River, Delaware.

Baltimore Harbor and Channels, Maryland: Cut-off channel to Inland Waterway from Delaware River to Chesapeake Bay.

Herring Creek, Saint Marys County, Maryland.

Macum Creek, at the mouth of the Chester River, Queen Annes County, Maryland.

Oyster Creek, Anne Arundel County, Maryland.

Cadle Creek, Anne Arundel County, Maryland.

South Creek and West River, Anne Arundel County, Maryland.

Broad Creek, Middlesex County, Virginia.

Scott's Creek, Virginia.

Waterway from Chesapeake Bay, through Accomac County, Virginia, to the Atlantic Ocean.

Channel from Manteo, via Broad Creek, to Oregon Inlet, North Carolina.

Channel from Pamlico Sound to Avon, North Carolina.

Channel from the Intracoastal Waterway to, and turning basin at, Cocoa, Florida.

Channel from the Intracoastal Waterway to, and turning basin at, Holly Hill, Florida.

Little Manatee River and inlets, Florida, and channel to navigable waters in Tampa Bay.

Intracoastal Waterway from Jacksonville, Florida, to Miami, Florida.

Allapatchee River (Alligator Creek), Florida.

Pithlachascotee River, Florida.

Bayou Grande, Florida.

New Pass, Florida, connecting Sarasota Bay with the Gulf of Mexico.

Waterway from Punta Rasa, Florida, by way of the Caloosahatchee River and Canal, Lake Okeechobee, and Saint Lucie Canal and River, to Fort Pierce;

Watson Bayou, Panama City, Florida, from deep water in Saint Andrews Bay to the head of navigation.

Tombigbee River, Alabama, from vicinity of Jackson Landing south, and between Lock and Dam Numbered 1 and Sunflower Bend.

Cadet Bayou, in the vicinity of Waveland, Hancock County, Mississippi.

Watts Bayou, Hancock County, Mississippi.

Chunky Creek, Chickasawhay River, and Pascagoula River, Mississippi, with a view to their improvement in the interest of navigation, flood control, and water power.

Teche-Vermillion waterway, Louisiana, with a view to improvement in the interest of navigation, flood control, and other water uses.

L'Ea Bleu Bayou, Louisiana.

Isle de Cane Bayou, Louisiana.

Kinney Coulee, Louisiana.

Portage Bayou and Delcambre Canal, Louisiana.

Indian Bayou, Louisiana.

Violet Canal Route, Louisiana.

Waterway from Welsh, Louisiana, to the Intracoastal Waterway, by way of Bayou Lacassine; also with a view to the acquisition of the Welsh Waterway.

Chefuncte River and Bogue Falia, Louisiana, from Lake Pontchartrain to Covington.

Survey of channel for the purposes of navigation, flood control, power, and irrigation from Jefferson, Texas, to Shreveport, Louisiana, by way of Jefferson-Shreveport Waterway, thence by way of Red River to mouth of Red River in the Mississippi River, including advisability of water-supply reservoirs in Cypress River and Black Cypress River above head of navigation.

Sulphur River, Texas and Arkansas, with the view to improvement for navigation, flood control, and water power.

San Antonio River, Texas, with a view to its improvement for navigation, flood control, power, and for the prevention of erosion.

Des Moines River, Iowa; also with particular reference to the construction of a dam at or near Madrid.

Allegheny River, Pennsylvania.

Grand Marais Harbor, Minnesota.

Duck Creek, Brown County, Wisconsin.

Kawkawlin River, Michigan, with a view to dredging the outlet, with a view to its improvement in the interests of navigation and flood control.

Saint Ignace Harbor, Michigan.

Harbor Springs Harbor, Michigan.

Yacht Basin and Harbor at Menominee, Michigan.

Collinsville Cut, Solano County, California.

Tillamook Bay, Oregon, with a view to protection of Bay Ocean, and property thereon, from erosion and storms.

Salmon River, Oregon.

North slough and vicinity, Coos County, Oregon, with a view to the construction of a dam and dike to prevent the flow of tidal waters into said North slough.

Columbia River at The Dalles, Oregon, with particular reference to the improvement of Hungry Harbor.

Umpqua River, Oregon, with a view to determining the advisability of providing for navigation, in connection with power development, control of floods, and the needs of irrigation.

Bay Center Channel, Willapa Harbor, Washington, extending from Palix River to Bay Center Dock.

SEC. 9. That the times for commencing and completing the construction of a dam and dike for preventing the flow of tidal waters into North slough in Coos County, Oregon, in township 24 south, range 13 west, Willamette meridian, authorized to be constructed by the State of Oregon, acting through its highway department, the North Slough Drainage District, and the North Slough Diking District by an Act of Congress approved August 26, 1937, is extended one and three years, respectively, from August 26, 1938. The right to alter, amend, or repeal this section is hereby expressly reserved.

SEC. 10. That the Secretary of War be, and he is hereby, authorized and empowered, under such terms and conditions as are deemed advisable by him, to grant easements for rights-of-way for public roads and streets on and across lands acquired by the United States for river and harbor and flood control improvements including, whenever necessary, the privilege of occupying so much of said lands as may be necessary for the piers, abutments, and other portions of a bridge structure: *Provided*, That such rights-of-way shall be granted only upon a finding by the Secretary of War that the same will be in the public interest and will not substantially injure the interest of the United States in the property affected thereby: *Provided further*, That all or any part of such rights-of-way may be annulled and forfeited by the Secretary of War for failure to comply with the terms or conditions of any grant hereunder or for nonuse or for abandonment of rights granted under the authority hereof: *Provided further*, That the authority hereby granted to the Secretary of War shall not extend to or include lands held or acquired by the Tennessee Valley Authority pursuant to the terms of the Tennessee Valley Authority Act.

SEC. 11. That the laws of the United States relating to the improvement of rivers and harbors, passed between March 4, 1913, until and including the laws of the third session of the Seventy-fifth Congress, shall be compiled under the direction of the Secretary of War and printed as a document, and that six hundred additional copies shall be printed for the use of the War Department.

SEC. 12. That the Secretary of War is hereby authorized to continue the gathering of hydrological data, concerning the proposed Nicaragua Canal, by personnel operating continuously in Nicaragua under the supervision of the Chief of Engineers, as recommended in House Document Numbered 139, 72nd Congress, 1st Session; the cost of this work, and such incidental expenses as may be necessary in connection therewith, to be paid from appropriations hereafter made for examinations, surveys and contingencies of Rivers and Harbors.

Approved, June 20, 1938.

ATTACHMENT 2

Public Law 87-874
87th Congress, H. R. 13273
October 23, 1962

An Act

76 STAT. 1173.

Authorizing the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I—RIVERS AND HARBORS

River and Harbor Act of 1962.

SEC. 101. That the following works of improvement of rivers and harbors and other waterways for navigation, flood control, and other purposes are hereby adopted and authorized to be prosecuted under the direction of the Secretary of the Army and supervision of the Chief of Engineers, in accordance with the plans and subject to the conditions recommended by the Chief of Engineers in the respective reports hereinafter designated: *Provided*, That the provisions of section 1 of the River and Harbor Act approved March 2, 1945 (Public Law Numbered 14, Seventy-ninth Congress, first session), shall govern with respect to projects authorized in this title; and the procedures therein set forth with respect to plans, proposals, or reports for works of improvement for navigation or flood control and for irrigation and purposes incidental thereto, shall apply as if herein set forth in full: 59 Stat. 10.

NAVIGATION

Narraguagus River, Maine: House Document Numbered 530, Eighty-seventh Congress, at an estimated cost of $500,000; Maine.

Carvers Harbor, Vinalhaven, Maine: Senate Document Numbered 118, Eighty-seventh Congress, at an estimated cost of $205,000;

Searsport Harbor, Maine: House Document Numbered 500, Eighty-seventh Congress, at an estimated cost of $700,000;

Portland Harbor, Maine: House Document Numbered 216, Eighty-seventh Congress, at an estimated cost of $8,340,000;

Kennebunk River, Maine: House Document Numbered 459, Eighty-seventh Congress, at an estimated cost of $270,000;

Portsmouth Harbor and Piscataqua River, Maine and New Hampshire: House Document Numbered 482, Eighty-seventh Congress, at an estimated cost of $7,500,000; New Hampshire.

Gloucester Harbor, Massachusetts: House Document Numbered 341, Eighty-seventh Congress, at an estimated cost of $1,100,000; Massachusetts.

Marblehead Harbor, Massachusetts: House Document Numbered 516, Eighty-seventh Congress, at an estimated cost of $1,752,000;

Chelsea Harbor, Massachusetts: House Document Numbered 350, Eighty-seventh Congress, at an estimated cost of $2,843,000;

Dorchester Bay and Neponset River, Massachusetts: Senate Document Numbered 126, Eighty-seventh Congress, at an estimated cost of $7,050,000;

Plymouth Harbor, Massachusetts: Senate Document Numbered 124, Eighty-seventh Congress, at an estimated cost of $1,200,000;

Pawtuxet Cove, Rhode Island: House Document Numbered 236, Eighty-seventh Congress, at an estimated cost of $210,000; Rhode Island.

Great Lakes to Hudson River Waterway, New York: River and Harbor Committee Document Numbered 20, Seventy-third Congress, for the further partial accomplishment of the approved plan there is hereby authorized to be appropriated, in addition to sums previously authorized, $1,000,000; New York.

Little Neck Bay, New York: House Document Numbered 510, Eighty-seventh Congress, at an estimated cost of $2,185,000;

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Flushing Bay and Creek, New York: House Document Numbered 551, Eighty-seventh Congress, at an estimated cost of $1,695,000;

Buttermilk Channel, New York: House Document Numbered 483, Eighty-seventh Congress, at an estimated cost of $2,226,000;

New Jersey.

Newark Bay, Hackensack and Passaic Rivers, New Jersey (channels to Port Elizabeth): Modification of the existing navigation project authorized by the River and Harbor Act of 1954 (Public Law 780, Eighty-third Congress), House Document Numbered 252, is hereby authorized substantially in accordance with the plans being prepared by the Chief of Engineers, subject to the approval of such plans by the Secretary of the Army and the President;

68 Stat. 1248, 1249.

Raritan River, New Jersey: House Document Numbered 455, Eighty-sixth Congress, maintenance;

Virginia.

Lynnhaven Inlet, Bay, and connecting waters, Virginia: House Document Numbered 580, Eighty-seventh Congress, at an estimated cost of $1,068,000: *Provided*, That nothing in this Act shall be construed as authorizing reimbursement to local interests for the Long Creek-Broad Bay Canal Bridge;

James River, Virginia: House Document Numbered 586, Eighty-seventh Congress, at an estimated cost of $39,000,000: *Provided*, That this authorization shall expire after a period of five years from the date of approval of this Act unless the Governor of Virginia has endorsed the project within that time: *And provided further*, That prior to construction, there will be submitted to the Congress a feasibility report which takes account of possible adverse effects of the project on seed oyster production;

Report to Congress.

North Carolina.

Rollinson Channel and channel from Hatteras Inlet to Hatteras, North Carolina: House Document Numbered 457, Eighty-seventh Congress, at an estimated cost of $652,000;

Wilmington Harbor, North Carolina: Senate Document Numbered 114, Eighty-seventh Congress, at an estimated cost of $6,370,000;

Georgia.

Savannah Harbor, Georgia: Senate Document Numbered 115, Eighty-seventh Congress, at an estimated cost of $605,000;

Florida.

Canaveral Harbor, Florida: Senate Document Numbered 140, Eighty-seventh Congress, at the estimated cost of $5,076,000;

Key West Harbor, Florida: Senate Document Numbered 106, Eighty-seventh Congress, at an estimated cost of $820,000;

Tampa Harbor, Port Sutton and Ybor Channels, Florida: House Document Numbered 529, Eighty-seventh Congress, at an estimated cost of $997,000;

Pensacola Harbor, Florida: House Document Numbered 528, Eighty-seventh Congress, at an estimated cost of $424,000;

Alabama.

Walter F. George lock and dam, Alabama: Senate Document Numbered 109, Eighty-seventh Congress, at an estimated cost of $500,000;

Holt lock and dam, Alabama: The Secretary of the Army is hereby authorized and directed to cause an immediate study to be made under the direction of the Chief of Engineers with a view to providing hydroelectric power generating facilities in said dam, and his report on such study shall be submitted to the Congress by the Secretary of the Army within the first period of sixty calendar days of continuous session of the Eighty-eighth Congress;

Report to Congress.

Mississippi.

Pascagoula Harbor, Mississippi: House Document Numbered 560, Eighty-seventh Congress, at an estimated cost of $4,870,000;

Louisiana.

Mississippi River, Baton Rouge to Gulf of Mexico, Louisiana: Senate Document Numbered 36, Eighty-seventh Congress, at an estimated cost of $357,000;

The project, Mississippi River, Baton Rouge to the Gulf of Mexico, barge channel through Devils Swamp, Louisiana (Baton Rouge Harbor), authorized by the River and Harbor Act of 1946, in accord-

60 Stat. 635.

ance with the recommendations of the Chief of Engineers in House Document Numbered 321, Eightieth Congress, as amended by the Flood Control Act of 1948, is hereby further amended to provide for the provision as required, of suitable dikes and other retaining structures at a Federal cost of $299,500, for the construction and future maintenance of the project, in order to provide additional industrial sites with water frontage which are now needed to permit the normal development and expansion of the industrial and commercial activities of the locality: *Provided*, That local interests contribute the sum of $100,500 toward the cost of the work; 62 Stat. 1179.

Bayous Terrebonne, Petit Caillou, Grand Caillou, Du Large, and connecting channels, Louisiana, and Atchafalaya River, Morgan City to Gulf of Mexico: House Document Numbered 583, Eighty-seventh Congress, at an estimated cost of $45,000;

Gulf Intracoastal Waterway, Louisiana and Texas: House Document Numbered 556, Eighty-seventh Congress, at an estimated cost of $25,540,000: *Provided*, That the authority to make such modifications as in the discretion of the Chief of Engineers may be advisable, as set forth in House Document Numbered 556, Eighty-seventh Congress, shall be interpreted to apply to, but not limited to, the improvement of the existing channels at proposed channel relocation sites in lieu of such relocations; Louisiana and Texas.

Calcasieu River salt water barrier, Louisiana: House Document Numbered 582, Eighty-seventh Congress, at an estimated cost of $3,310,000: *Provided*, That the Corps of Engineers is directed to study the question of cost sharing taking into account that measures for mitigation of damages from navigation improvements will be a Federal responsibility and enhancement effects will be shared on the basis of a 50 per centum Federal and 50 per centum non-Federal; such cost sharing is hereby authorized as determined to be feasible and justified by the Chief of Engineers and Secretary of the Army within the first period of sixty calendar days of continuous session of the Congress after the date on which the report is submitted to it unless such report is disapproved by the Congress; Report to Congress.

Mississippi River at Clarksville, Missouri: House Document Numbered 552, Eighty-seventh Congress, at an estimated cost of $103,300; Missouri.

Sandy Slough, Lincoln County, Missouri: House Document Numbered 419, Eighty-seventh Congress, at an estimated cost of $195,000;

Sabine-Neches Waterway, Texas: House Document Numbered 553, Eighty-seventh Congress, at an estimated cost of $20,830,000; Texas.

Trinity River, Wallisville Reservoir, Texas: House Document Numbered 215, Eighty-seventh Congress, at an estimated cost of $9,162,000: *Provided*, That nothing in this Act shall be construed as authorizing the acquisition of additional lands for establishment of a national wildlife refuge at the reservoir;

Gulf Intracoastal Waterway, channel to Palacios, Texas: House Document Numbered 504, Eighty-seventh Congress, at an estimated cost of $818,000;

Gulf Intracoastal Waterway, channel to Victoria, Texas: House Document Numbered 288, Eighty-seventh Congress, at an estimated cost of $1,590,000;

Illinois Waterway, Illinois and Indiana: House Document Numbered 31, Eighty-sixth Congress, is approved and there is hereby authorized the sum of $40,000,000 for initiation and partial accomplishment of the project; Illinois and Louisiana.

Kaskaskia River, Illinois: Senate Document Numbered 44, Eighty-seventh Congress, at an estimated cost of $58,200,000;

Mississippi River between Missouri River and Minneapolis, Minnesota: House Document Numbered 513, Eighty-seventh Congress, at an estimated cost of $1,205,000; Minnesota.

Michigan. Ontonagon Harbor, Michigan: House Document Numbered 287, Eighty-seventh Congress, at an estimated cost of $4,741,000;
Muskegon Harbor, Michigan: House Document Numbered 474, Eighty-seventh Congress, at an estimated cost of $609,000;
Leland Harbor, Michigan: House Document Numbered 413, Eighty-seventh Congress, at an estimated cost of $485,000;
Little Bay De Noc, Gladstone Harbor and Kipling, Michigan: House Document Numbered 480, Eighty-seventh Congress, at an estimated cost of $350,000;

Wisconsin. Green Bay Harbor, Wisconsin: House Document Numbered 470, Eighty-seventh Congress, at an estimated cost of $4,270,000;
Kenosha Harbor, Wisconsin: House Document Numbered 496, Eighty-seventh Congress, at an estimated cost of $673,000;
Manitowoc Harbor, Wisconsin: House Document Numbered 479, Eighty-seventh Congress, at an estimated cost of $719,000;
Milwaukee Harbor, Wisconsin: House Document Numbered 134, Eighty-seventh Congress, at an estimated cost of $4,029,000;

Illinois. Chicago Harbor, Illinois: House Document Numbered 485, Eighty-seventh Congress, at an estimated cost of $1,505,000;

Indiana. Calumet Harbor and River, Illinois and Indiana: House Document Numbered 581, Eighty-seventh Congress, at an estimated cost of $11,464,000;

Michigan. New Buffalo Harbor, Michigan: House Document Numbered 481, Eighty-seventh Congress, at an estimated cost of $667,000;
Caseville Harbor, Michigan: House Document Numbered 64, Eighty-seventh Congress, at an estimated cost of $327,000;
Saginaw River, Michigan: House Document Numbered 544, Eighty-seventh Congress, at an estimated cost of $4,780,000;
Rouge River, Michigan: House Document Numbered 509, Eighty-seventh Congress, at an estimated cost of $257,000;

Ohio. Huron Harbor, Ohio: House Document Numbered 165, Eighty-seventh Congress, at an estimated cost of $8,557,000;
Cleveland Harbor, Ohio: House Document Numbered 527, Eighty-seventh Congress, at an estimated cost of $888,000;
Conneaut Harbor, Ohio: House Document Numbered 415, Eighty-seventh Congress, at an estimated cost of $6,179,000;

Pennsylvania. Erie Harbor, Pennsylvania: House Document Numbered 340, Eighty-seventh Congress, at an estimated cost of $671,000;

New York. Buffalo Harbor, New York: House Document Numbered 451, Eighty-seventh Congress, at an estimated cost of $2,797,000;
Great Sodus Bay Harbor, New York: House Document Numbered 138, Eighty-seventh Congress, at an estimated cost of $765,000;
Oswego Harbor, New York: House Document Numbered 471, Eighty-seventh Congress, at an estimated cost of $1,180,000;

California. Dana Point Harbor, California: House Document Numbered 532, Eighty-seventh Congress, at an estimated cost of $3,730,000;
Santa Barbara Harbor, California: House Document Numbered 518, Eighty-seventh Congress, at an estimated cost of $3,000,000;
Oakland Harbor, California, Fruitvale Avenue Bridge: Senate Document Numbered 75, Eighty-seventh Congress, at an estimated cost of $1,750,000;
Oakland Harbor, California: House Document Numbered 353, Eighty-seventh Congress, at an estimated cost of $6,775,000;
Noyo River and Harbor, California: Senate Document Numbered 121, Eighty-seventh Congress, at an estimated cost of $13,231,000;

Oregon and Washington. Columbia and Lower Willamette Rivers, Oregon and Washington: House Document Numbered 203, Eighty-seventh Congress, at an estimated cost of $493,000;

Columbia and Lower Willamette Rivers below Vancouver, Washington, and Portland, Oregon: House Document Numbered 452, Eighty-seventh Congress, at an estimated cost of $20,100,000; Washington and Oregon.

Tacoma Harbor, Port Industrial and Hylebos Waterways, Washington: Senate Document Numbered 104, Eighty-seventh Congress, at an estimated cost of $2,460,000;

Kingston Harbor, Washington: House Document Numbered 417, Eighty-seventh Congress, at an estimated cost of $428,000;

Swinomish Channel, Washington: House Document Numbered 499, Eighty-seventh Congress, at an estimated cost of $887,000;

Kaunakakai Harbor, Molokai, Hawaii: House Document Numbered 484, Eighty-seventh Congress, at an estimated cost of $7,919,000; Hawaii.

The project for Hilo Harbor, Hawaii, authorized by Public Law 645, Eighty-sixth Congress, is hereby modified to provide for adjustment of the cash contribution required of local interest in accordance with recommendations by the Secretary of the Army and approved by the President, such adjustment to be made at the earliest practicable date. 74 Stat. 483.

BEACH EROSION

State of New Hampshire: House Document Numbered 416, Eighty-seventh Congress, at an estimated cost of $88,000; New Hampshire.

Fire Island Inlet and shore westerly to Jones Inlet, Long Island, New York: Modification of the existing beach erosion control project authorized by the River and Harbor Act of 1958 (Public Law 500, Eighty-fifth Congress), House Document Numbered 411, Eighty-fifth Congress, is hereby authorized substantially in accordance with the plans, which will include a sand bypassing system at Fire Island Inlet, being prepared by the Chief of Engineers, subject to the approval of such plans by the Secretary of the Army and the President; New York. 72 Stat. 299.

Clark Point, New Bedford, Massachusetts: House Document Numbered 584, Eighty-seventh Congress, at an estimated cost of $60,000; Massachusetts.

Virginia Beach, Virginia: House Document Numbered 382, Eighty-seventh Congress, periodic nourishment; Virginia.

Fort Macon, Atlantic Beach and vicinity, North Carolina: House Document Numbered 555, Eighty-seventh Congress, at an estimated cost of $194,000; North Carolina.

Palm Beach County from Martin County line to Lake Worth Inlet and from South Lake Worth Inlet to Broward County line, Florida: House Document Numbered 164, Eighty-seventh Congress, at an estimated cost of $128,800; Florida.

Virginia Key and Key Biscayne, Florida: House Document Numbered 561, Eighty-seventh Congress, at an estimated cost of $220,000;

San Juan and vicinity, Puerto Rico: House Document Numbered 575, Eighty-seventh Congress, at an estimated cost of $65,400; Puerto Rico.

Lake Erie shoreline from the Michigan-Ohio State line to Marblehead, Ohio: House Document Numbered 63, Eighty-seventh Congress, at an estimated cost of $658,500; Michigan-Ohio.

Sheffield Lake community park, Sheffield Lake Village, Ohio: House Document Numbered 414, Eighty-seventh Congress, at an estimated cost of $100,300;

Ventura-Pierpont area, California: House Document Numbered 458, Eighty-seventh Congress, at an estimated cost of $515,000. California.

Orange County, California, House Document Numbered 602, Eighty-seventh Congress, at an estimated cost of $2,845,000.

SEC. 102. That the Secretary of the Army is hereby authorized to reimburse local interests for such work done by them on the beach erosion projects authorized in section 101, and in other sections of this Act, subsequent to the initiation of the cooperative studies which form Reimbursement of local interests.

the basis for the projects: *Provided*, That the work which may have been done on these projects is approved by the Chief of Engineers as being in accordance with the projects herein adopted: *Provided further*, That such reimbursement shall be subject to appropriations applicable thereto or funds available therefor and shall not take precedence over other pending projects of higher priority for improvements.

Protection of shores.
70 Stat. 702.

SEC. 103. (a) The Act approved August 13, 1946, as amended by the Act approved July 28, 1956 (33 U.S.C. 426e–h), pertaining to shore protection, is hereby further amended as follows:

(1) the word "one-third" in section 1(b) is deleted and the word "one-half" is substituted therefor;

(2) the following is added after the word "located" in section 1(b): ", except that the costs allocated to the restoration and protection of Federal property shall be borne fully by the Federal Government, and, further, that Federal participation in the cost of a project for restoration and protection of State, county, and other publicly owned shore parks and conservation areas may be, in the discretion of the Chief of Engineers, not more than 70 per centum of the total cost exclusive of land costs, when such areas: Include a zone which excludes permanent human habitation; include but are not limited to recreational beaches; satisfy adequate criteria for conservation and development of the natural resources of the environment; extend landward a sufficient distance to include, where appropriate, protective dunes, bluffs, or other natural features which serve to protect the uplands from damage; and provide essentially full park facilities for appropriate public use, all of which shall meet with the approval of the Chief of Engineers";

(3) the following is added after the word "supplemented" in section 1(e): ", or, in the case of a small project under section 3 of this Act, unless the plan therefor has been approved by the Chief of Engineers"; and

(4) sections 2 and 3 are amended to read as follows:

Reimbursement.

"SEC. 2. The Secretary of the Army is hereby authorized to reimburse local interests for work done by them, after initiation of the survey studies which form the basis for the project, on authorized projects which individually do not exceed $1,000,000 in total cost: *Provided*, That the work which may have been done on the projects is approved by the Chief of Engineers as being in accordance with the authorized projects: *Provided further*, That such reimbursement shall be subject to appropriations applicable thereto or funds available therefor and shall not take precedence over other pending projects of higher priority for improvements.

Small construction projects, authorization.

"SEC. 3. The Secretary of the Army is hereby authorized to undertake construction of small shore and beach restoration and protection projects not specifically authorized by Congress, which otherwise comply with section 1 of this Act, when he finds that such work is advisable, and he is further authorized to allot from any appropriations hereafter made for civil works, not to exceed $3,000,000 for any one fiscal year for the Federal share of the costs of construction of such projects: *Provided*, That not more than $400,000 shall be allotted for this purpose for any single project and the total amount allotted shall be sufficient to complete the Federal participation in the project under this section including periodic nourishment as provided for under section 1(c) of this Act: *Provided further*, That the provisions of local cooperation specified in section 1 of this Act shall apply: *And provided further*, That the work shall be complete in itself and shall not commit the United States to any additional improvement to

insure its successful operation, except for participation in periodic beach nourishment in accordance with section 1(c) of this Act, and as may result from the normal procedure applying to projects authorized after submission of survey reports."

(b) All provisions of existing law relating to surveys of rivers and harbors shall apply to surveys relating to shore protection and section 2 of the River and Harbor Act approved July 3, 1930, as amended (33 U.S.C. 426), is modified to the extent inconsistent herewith. 46 Stat. 945.

(c) The cost-sharing provisions of this Act shall apply in determining the amounts of Federal participation in or payments toward the costs of authorized projects which have not been substantially completed prior to the date of approval of this Act, and the Chief of Engineers, through the Beach Erosion Board, is authorized and directed to recompute the amounts of Federal contribution toward the costs of such projects accordingly. Project costs.

SEC. 104. The project for aquatic plant control authorized by the River and Harbor Act of 1958 (72 Stat. 297, 300) is hereby modified to provide that research costs and planning costs prior to construction shall be borne fully by the United States and shall not be included in the cost to be shared by local interests. Aquatic plant control project, modification.

SEC. 105. The Secretary of the Army is authorized to convey 17.94 acres of land located at old lock and dam numbered 7, Ohio River, to the city of Midland, Pennsylvania, after November 1, 1962, for public park and recreation purposes, without monetary consideration but subject to reversion to the United States if not utilized for public park and recreation purposes and further subject to such flowage rights as may be necessary in the operation of the New Cumberland lock and dam, Ohio River. Midland, Pa. Land conveyance.

SEC. 106. Section 110(f) of the River and Harbor Act of 1958 (72 Stat. 297) is amended by changing the period to a comma and adding the following: "and upon completion of transfer to the said State of all right, title, and interest of the United States in and to the canal in accordance with the agreement executed December 14, 1960, between the Chief of Engineers and the representatives of said State, the additional sum of $800,000 is hereby authorized to be appropriated to be expended by the Corps of Engineers, or by said State, for the repair and modification of any canal properties and appurtenances, notwithstanding the provisions of section 110(b) hereof." Illinois and Mississippi Canal. Additional funds.

SEC. 107. The Secretary of the Army is authorized and directed to prepare and transmit to Congress, at the earliest practicable date, a compilation of survey and review reports on river and harbor and flood control improvements, similar to that prepared in accordance with the Act of March 4, 1913, revised in accordance with the Acts of July 3, 1930, August 30, 1935, and May 17, 1950, and printed in House Document Numbered 214, Eighty-second Congress, first session. River and harbor survey reports. 37 Stat. 827; 46 Stat. 949; 49 Stat. 1049; 64 Stat. 168.

SEC. 108. The Chief of Engineers is authorized to perform such work as may be necessary to provide for the repair and restoration of lock and dam numbered 3 on the Big Sandy River: *Provided*, That the work authorized herein shall have no effect on the condition that local interests shall operate and maintain the structure and related properties as required by the Act of Congress approved August 6, 1956 (70 Stat. 1062): *And provided further*, That there is hereby authorized to be expended from appropriations hereafter made for civil functions administered by the Department of the Army, such funds as may be necessary for the repair and restoration of lock and dam numbered 3 on the Big Sandy River, not to exceed $200,000. Big Sandy River, Ky.

SEC. 109. The body of water designated as the Redondo Beach Harbor, California, shall be known and designated hereafter as the Redondo Beach King Harbor, California. Any law, regulation, map, Redondo Beach King Harbor, Calif. Designation.

document, record, or other paper of the United States in which such body of water is referred to shall be held to refer to it as the Redondo Beach King Harbor, California.

Surveys.

SEC. 110. The Secretary of the Army is hereby authorized and directed to cause surveys to be made at the following named localities and subject to all applicable provisions of section 110 of the River and Harbor Act of 1950:

64 Stat. 168.

Falmouth Harbor, Maine.
Channel between Point Shirley and Deer Island, Massachusetts.
Little Egg Inlet, New Jersey.
Brigantine Inlet, New Jersey.
Corsons Inlet, New Jersey.
Kings Bay Deepwater Channel, Georgia.
Auglaize River at Wapakoneta, Ohio.

Coastal areas.

Surveys of the coastal areas of the United States and its possessions, including the shores of the Great Lakes, in the interest of beach erosion control, hurricane protection and related purposes: *Provided*, That surveys of particular areas shall be authorized by appropriate resolutions of either the Committee on Public Works of the United States Senate or the Committee on Public Works of the House of Representatives.

Citation of title.

SEC. 111. Title I of this Act may be cited as the "River and Harbor Act of 1962".

TITLE II—FLOOD CONTROL

49 Stat. 1571.
33 USC 701c.
52 Stat. 1215.
33 USC 701c-1.

SEC. 201. Section 3 of the Act approved June 22, 1936 (Public Law Numbered 738, Seventy-fourth Congress), as amended by section 2 of the Act approved June 28, 1938 (Public Law Numbered 761, Seventy-fifth Congress), shall apply to all works authorized in this title except that for any channel improvement or channel rectification project, provisions (a), (b), and (c) of section 3 of said Act of June 22, 1936, shall apply thereto, and except as otherwise provided by law: *Provided*, That the authorization for any flood control project herein adopted requiring local cooperation shall expire five years from the date on which local interests are notified in writing by the Department of the Army of the requirements of local cooperation, unless said interests shall within said time furnish assurances satisfactory to the Secretary of the Army that the required cooperation will be furnished.

58 Stat. 887.
33 USC 701-1.

SEC. 202. The provisions of section 1 of the Act of December 22, 1944 (Public Law Numbered 534, Seventy-eighth Congress, second session), shall govern with respect to projects authorized in this Act, and the procedures therein set forth with respect to plans, proposals, or reports for works of improvement for navigation or flood control and for irrigation and purposes incidental thereto shall apply as if herein set forth in full.

Navigation improvement projects.

SEC. 203. The following works of improvement for the benefit of navigation and the control of destructive floodwaters and other purposes are hereby adopted and authorized to be prosecuted under the direction of the Secretary of the Army and the supervision of the Chief of Engineers in accordance with the plans in the respective reports hereinafter designated and subject to the conditions set forth therein: *Provided*, That the necessary plans, specifications, and preliminary work may be prosecuted on any project authorized in this title with funds from appropriations hereafter made for flood control so as to be ready for rapid inauguration of a construction program: *Provided further*, That the projects authorized herein shall be initiated as expeditiously and prosecuted as vigorously as may be consistent with budgetary requirements: *And provided further*, That penstocks and other similar facilities adapted to possible future use

Authorization.

in the development of hydroelectric power shall be installed in any dam authorized in this Act for construction by the Department of the Army when approved by the Secretary of the Army on the recommendation of the Chief of Engineers and the Federal Power Commission.

NEW ENGLAND-ATLANTIC COASTAL AREA

The project for hurricane-flood protection at Wareham-Marion, Massachusetts, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 548, Eighty-seventh Congress, at an estimated cost of $3,811,500.

The project for navigation and hurricane-flood protection at Point Judith, Rhode Island, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 521, Eighty-seventh Congress, at an estimated cost of $2,414,000.

The project for navigation and hurricane-flood control protection at Narragansett Pier, Rhode Island, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 195, Eighty-seventh Congress, at an estimated cost of $1,152,000.

LONG ISLAND SOUND AREA

The project for hurricane-flood control protection at New London, Connecticut, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 478, Eighty-seventh Congress, at an estimated cost of $2,401,000.

The project for hurricane-flood protection at Westport, Connecticut, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 412, Eighty-seventh Congress, at an estimated cost of $217,000.

The project for hurricane-flood protection at Mystic, Connecticut, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 411, Eighty-seventh Congress, at an estimated cost of $1,490,000.

HOUSATONIC RIVER BASIN

The project for flood protection on the Naugatuck River at Ansonia-Derby, Connecticut, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 437, Eighty-seventh Congress, at an estimated cost of $5,620,000.

HUDSON RIVER BASIN

The project for flood protection on Rondout Creek and Wallkill River and their tributaries, New York and New Jersey, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 113, Eighty-seventh Congress, at an estimated cost of $5,111,000.

NEW JERSEY-ATLANTIC COASTAL AREA

The project for hurricane-flood protection and beach erosion control on Raritan Bay and Sandy Hook Bay, New Jersey, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 464, Eighty-seventh Congress, at an estimated cost of $3,097,000.

76 STAT. 1162.

SUSQUEHANNA RIVER BASIN

The project for construction of the Fall Brook and Ayleworth Creek Reservoirs, and local flood protection works on the Lackawanna River at Scranton, Pennsylvania, is hereby authorized substantially as recommended by the Chief of Engineers, in Senate Document Numbered 141, Eighty-seventh Congress, at an estimated cost of $3,596,000.

The project for the Juniata River and tributaries, Pennsylvania, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 565, Eighty-seventh Congress, at an estimated cost of $32,150,000: *Provided*, That installation of the power generating facilities shall not be made until the Chief of Engineers shall submit a reexamination report to the Congress for authorization.

DELAWARE RIVER BASIN

The project for the comprehensive development of the Delaware River Basin, New York, New Jersey, Pennsylvania, and Delaware, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers, in House Document Numbered 522, Eighty-seventh Congress, at an estimated cost of $192,400,000.

POTOMAC RIVER BASIN

The project for the North Branch of the Potomac River, Maryland and West Virginia, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers, in House Document Numbered 469, Eighty-seventh Congress, at an estimated cost of $50,965,000.

MIDDLE ATLANTIC COASTAL AREA

The project for hurricane-flood protection at Norfolk, Virginia, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 354, Eighty-seventh Congress, at an estimated cost of $1,537,000.

The project for hurricane-flood protection and beach erosion control at Wrightsville Beach, North Carolina, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 511, Eighty-seventh Congress, at an estimated cost of $345,000.

The project for hurricane-flood protection and beach erosion control at Carolina Beach and vicinity, North Carolina, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 418, Eighty-seventh Congress, at an estimated cost of $739,000.

APALACHICOLA RIVER BASIN, GEORGIA

The project for the West Point Reservoir, Chattahoochee River, Georgia, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 570, Eighty-seventh Congress, at an estimated cost of $52,900,000.

CENTRAL AND SOUTHERN FLORIDA

62 Stat. 1176.

The comprehensive plan for flood control and other purposes in central and southern Florida approved in the Act of June 30, 1948,

and subsequent Acts of Congress, is hereby modified to include the following items:

The project for flood protection of West Palm Beach Canal is hereby authorized substantially as recommended by the Secretary of the Army and the Chief of Engineers in Senate Document Numbered 146, Eighty-seventh Congress, at an estimated cost of $3,220,000.

The project for flood protection on Boggy Creek, Florida, is hereby authorized substantially as recommended by the Chief of Engineers in Senate Document Numbered 125, Eighty-seventh Congress, at an estimated cost of $1,176,000.

The project for South Dade County, Florida, is hereby authorized substantially in accordance with the recommendations of the Secretary of the Army and the Chief of Engineers in Senate Document Numbered 138, Eighty-seventh Congress, at an estimated cost of $13,388,000.

The project for Shingle Creek, Florida, between Clear Lake and Lake Tohopekaliga, for flood control and major drainage is hereby authorized substantially as recommended by the Chief of Engineers in Senate Document Numbered 139, Eighty-seventh Congress, at an estimated cost of $3,250,000: *Provided*, That no obligation shall be incurred for development of the Reedy Creek Swamp as a wildlife management area unless the State or one or more other non-Federal entities shall have entered into an agreement in advance to assume at least 50 per centum of the cost associated with that feature of the project.

The project for flood protection in the Cutler drain area, Florida, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 123, Eighty-seventh Congress, at an estimated cost of $2,063,000: *Provided*, That local interests shall receive credit in the Contributed Fund Account of the project for moneys shown to have been spent after March 1, 1960, for construction of units of the authorized plan for Cutler Drain: *Provided further*, That such completed work must be inspected and accepted by the Chief of Engineers as constituting useful parts of the authorized plan: *And provided further*, That the credit established shall be in accordance with cost sharing arrangements for the central and southern Florida flood control project in an amount not to exceed $124,000.

GREEN SWAMP REGION, FLORIDA

The project for the Four River Basins, Florida, namely the Hillsborough, Oklawaha, Withlacoochee, and Peace Rivers, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 585, Eighty-seventh Congress, at an estimated cost of $57,760,000: *Provided*, That the cost sharing shall be as recommended by the Secretary of the Army in House Document Numbered 585, Eighty-seventh Congress: *And provided further*, That planning and construction on the Lowery-Mattie Conservation Area and its appurtenant works is deferred until additional studies are made thereon, and a further report submitted to the Congress.

Lowery-Mattie Conservation Area. Additional studies.

PASCAGOULA RIVER BASIN

The project for flood protection on the Chunky Creek, Chickasawhay and Pascagoula Rivers, Mississippi, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 549, Eighty-seventh Congress, at an estimated cost of $6,740,000.

LOWER MISSISSIPPI RIVER BASIN

45 Stat. 534.
33 USC 702a-702m, 704.

The project for flood control and improvement of the lower Mississippi River adopted by the Act approved May 15, 1928, as amended by subsequent Acts, is hereby modified and expanded to include the following item:

(a) Monetary authorizations heretofore and hereafter made available to the project or any portion thereof shall be combined into a single sum and be available for application to any portion of the project.

The project for flood control and improvement of the lower Mississippi River, adopted by the Act of May 15, 1928, as amended, is hereby modified and expanded to include construction of certain improvements in Gin and Muddy Bayous, Yazoo River Basin, Mississippi, substantially in accordance with plans on file in the Office, Chief of Engineers, subject to the approval of such plans by the Secretary of the Army and the President, at an estimated cost of $150,000.

The project for hurricane-flood protection on the Mississippi River Delta at and below New Orleans, Louisiana, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 550, Eighty-seventh Congress, at an estimated cost of $7,502,000.

The project for flood protection on Red River in Natchitoches and Red River Parishes, Louisiana, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 476, Eighty-seventh Congress, at an estimated cost of $1,293,000.

Will M. Whittington Auxiliary Channel. Designation.

The lower auxiliary channel, Yazoo River Basin, Mississippi, a unit in the Mississippi River and tributaries project, shall hereafter be known and designated as the Will M. Whittington Auxiliary Channel in honor of the late Member of the House of Representatives from the Third District of Mississippi, and former chairman of the House Public Works Committee. The Secretary of the Army, acting through the Chief of Engineers, United States Army, is hereby authorized and directed to erect appropriate markers along the auxiliary channel designating the project "The Will M. Whittington Auxiliary Channel". Any law, regulation, document, or record of the United States in which such project is designated or referred to under the name of lower auxiliary channel, Yazoo River Basin, Mississippi, shall be held and considered to refer to such project by the name of "Will M. Whittington Auxiliary Channel".

BUFFALO BAYOU

The project for flood protection on Vince and Little Vince Bayous, Texas, is hereby authorized substantially as recommended by the Chief of Engineers in House Document Numbered 441, Eighty-seventh Congress, at an estimated cost of $2,224,000.

GULF OF MEXICO

The project for hurricane-flood protection at Port Arthur and vicinity, Texas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 505, Eighty-seventh Congress, at an estimated cost of $23,380,000.

The project for hurricane-flood protection at Freeport and vicinity, Texas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 495, Eighty-seventh Congress, at an estimated cost of $3,780,000.

TRINITY RIVER BASIN

The project for flood protection on the East Fork of the Trinity River, Texas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 554, Eighty-seventh Congress, at an estimated cost of $23,760,000.

The project for extension of the Fort Worth Floodway, Texas, is hereby authorized substantially as recommended by the Chief of Engineers in House Document Numbered 454, Eighty-seventh Congress, at an estimated cost of $5,148,000.

BRAZOS RIVER BASIN

The project for the San Gabriel River, Texas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 591, Eighty-seventh Congress, at an estimated cost of $20,250,000.

The project for flood protection on the Clear Fork of the Brazos River at and in the vicinity of Abilene, Texas, is hereby authorized substantially as recommended by the Chief of Engineers in House Document Numbered 506, Eighty-seventh Congress, at an estimated cost of $31,200,000.

TULAROSA BASIN

The project for flood protection at Alamogordo, New Mexico, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 473, Eighty-seventh Congress, at an estimated cost of $2,040,000.

RIO GRANDE BASIN

The project for flood protection at Las Cruces, New Mexico, is hereby authorized substantially as recommended by the Chief of Engineers in Senate Document Numbered 117, Eighty-seventh Congress, at an estimated cost of $3,350,000.

ARKANSAS RIVER BASIN

The Dardanelle lock and dam, Arkansas River, Arkansas, is hereby modified to provide for construction of a sewage outfall system for the city of Russellville, Arkansas, substantially in accordance with plans of said city, approved by the Chief of Engineers, at an estimated cost of $1,400,000.

The Secretary of the Army is hereby authorized and directed to cause an immediate study to be made under the direction of the Chief of Engineers of bank erosion on the Arkansas River between about river mile 455, near Muskogee, Oklahoma, and about river mile 495, near Coweta, Oklahoma. Such project or projects, because of its or their emergency nature, are hereby authorized as determined to be feasible and justified by the Chief of Engineers and Secretary of the Army with the approval of the President unless within the first period of sixty calendar days of continuous session of the Congress after the date on which the report is submitted to it such report is disapproved by the Congress: *Provided*, That the requirements for cooperation shall include provisions that local interests shall furnish all lands, easements, and rights-of-way; hold and save the United States free from damages; maintain and operate after completion; and make a cash contribution in recognition of any special benefits: ***And provided further***, That with respect to any work found justified

in the vicinity of Wybark, Oklahoma, local interests shall meet the requirements as stated and shall make a cash contribution of not less than $150,000 which shall include the value of all lands, easements, and rights-of-way required to be furnished, and the value of goods and services provided for purposes of project installation on a basis acceptable to the Chief of Engineers: *Provided*, That the cost to the Federal Government shall not exceed $2,000,000.

The project for improvement of the Verdigris River and tributaries, Oklahoma and Kansas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 563, Eighty-seventh Congress, at an estimated cost of $62,400,000.

The project for flood protection on Big Hill Creek, Kansas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 577, Eighty-seventh Congress, at an estimated cost of $3,785,000.

The project for the Kaw Reservoir, Arkansas River, Oklahoma, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 143, Eighty-seventh Congress, at an estimated cost of $83,230,000: *Provided*, That nothing in this Act shall be construed as authorizing the acquisition of additional lands for establishment of a national wildlife refuge at the reservoir.

The project for flood protection on Cow Creek, Kansas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 531, Eighty-seventh Congress, at an estimated cost of $1,560,000.

The project for flood protection on the Arkansas River at Dodge City, Kansas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 498, Eighty-seventh Congress, at an estimated cost of $2,133,000.

WHITE RIVER BASIN

The flood protection project for Village Creek, Jackson and Lawrence Counties, Arkansas, is hereby authorized substantially as recommended by the Chief of Engineers in House Document Numbered 352, Eighty-seventh Congress, at an estimated cost of $1,968,000.

The project for flood protection on Village Creek, White River, and Mayberry Levee Districts, Arkansas, is hereby modified to provide for construction of a pumping plant, substantially as recommended by the Chief of Engineers in House Document Numbered 577, Eighty-seventh Congress, at an estimated additional cost of $1,018,000.

RED RIVER BASIN

That the general plan for flood control and other purposes on Red River below Denison Dam is hereby modified to authorize the Chief of Engineers to adjust the local cooperation requirements of the McKinney Bayou, Arkansas and Texas, Maniece Bayou, Arkansas, and East Point, Louisiana, projects so as to bring such requirements in accord with the recommendations of the Secretary of the Army and approval of the President, such adjustment to be made at the earliest practicable date.

The project for Sanders, Big Pine, and Collier Creeks, Texas, is hereby authorized substantially as recommended by the Chief of Engineers, at an estimated cost of $16,100,000, subject to the recommendations of the Secretary of the Army and approval of the President.

The project for Lake Kemp, Wichita River, Texas, is hereby authorized substantially in accordance with the recommendations of the

Chief of Engineers in Senate Document Numbered 144, Eighty-seventh Congress, at an estimated cost of $6,410,000.

The modification of the Broken Bow Reservoir, Mountain Fork River, Oklahoma, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 137, Eighty-seventh Congress, at an estimated cost of $23,800,000.

The project for the Clayton and Tuskahoma Reservoirs, Kiamichi River, Oklahoma, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 145, Eighty-seventh Congress, at an estimated cost of $29,748,000.

The project providing for the construction of two experimental water quality study projects in the Arkansas-Red River Basins, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 105, Eighty-seventh Congress, at an estimated cost of $300,000.

MISSOURI RIVER BASIN

(a) The Kaysinger Bluff Reservoir, Osage River, Missouri, is hereby modified substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 578, Eighty-seventh Congress, at an estimated additional cost of $43,245,000: *Provided*, That nothing in this Act shall be construed as authorizing the acquisition of additional lands for the establishment of a national wildlife refuge at the reservoir.

(b) The project for the Kansas River, Kansas, Nebraska, and Colorado, is hereby authorized substantially in accordance with the recommendations of the Secretary of the Army and the Chief of Engineers in Senate Document Numbered 122, Eighty-seventh Congress, at an estimated cost of $88,070,000: *Provided*, That the authorization for the Woodbine Reservoir on Lyons Creek is deferred at this time, subject to submission of a new feasibility report to the Eighty-eighth Congress, which shall take into account the water and related land resource development plans of the Soil Conservation Service, the Kansas Water Resources Board, and Lyons Creek Watershed Joint District Numbered 41, and preparation of said report is hereby authorized.

Woodbine Reservoir, Kans. Authorization deferred.

Report to Congress.

The project for flood protection on White Clay Creek at Atchison, Kansas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 151, Eighty-seventh Congress, at an estimated cost of $3,495,000.

The project for flood protection on Papillion Creek and tributaries, Nebraska, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 475, Eighty-seventh Congress, at an estimated cost of $2,122,000.

The project for flood protection on Indian Creek, Iowa, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 438, Eighty-seventh Congress, at an estimated cost of $1,270,000.

The project for Grand River and tributaries, North and South Dakota, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 574, Eighty-seventh Congress, at an estimated cost of $2,670,000: *Provided*, That the project shall be constructed, operated, and maintained by the Chief of Engineers under the direction of the Secretary of the Army.

Floyd River, Iowa. Modification of project. 72 Stat. 312.

The requirements of local cooperation on the project for flood control on the Floyd River, Iowa, authorized by Public Law 85–500, as recommended by the Chief of Engineers in House Document Numbered 417, Eighty-fourth Congress, is hereby modified to read as follows: "*Provided*, That responsible local interests give assurances satisfactory to the Secretary of the Army that they will (a) furnish without cost to the United States all lands, easements, and rights-of-way necessary for construction of the project; (b) hold and save the United States free from damages due to the construction works; (c) make without cost to the United States all necessary road, highway, highway bridges other than those required to carry Interstate Highway 29 over the relocated Floyd River, and utility alterations and additions; (d) contribute in cash 0.84 per centum of the estimated first cost of the work for which the United States would be responsible, a contribution presently estimated at $65,000; (e) upon authorization of the project, to take all possible action under Iowa law, short of actual purchase, to prevent additional developments within the right-of-way that might increase the overall cost of the project; and (f) maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army."

OHIO RIVER BASIN

The project for flood protection on the Kokosing River, Ohio, is hereby authorized substantially as recommended by the Chief of Engineers in House Document Numbered 220, Eighty-seventh Congress, at an estimated cost of $2,438,000.

The project for flood protection on the Wabash River at and in the vicinity of Mount Carmel, Illinois, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 573, Eighty-seventh Congress, at an estimated cost of $1,417,000.

The project for flood protection on the Mad River above Huffman Dam, Ohio, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 439, Eighty-seventh Congress, at an estimated cost of $7,930,000.

The project for the Kentucky River, Kentucky, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 423, Eighty-seventh Congress, at an estimated cost of $26,020,000.

The project for Twelvepole Creek, West Virginia, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 520, Eighty-seventh Congress, at an estimated cost of $11,000,000.

The project for the Guyandot River and tributaries, West Virginia, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 569, Eighty-seventh Congress, second session, at an estimated cost of $60,477,000.

The project for flood protection on the Buckhannon River, West Virginia, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 43, Eighty-seventh Congress, at an estimated cost of $1,206,000.

The project for flood protection on Crab Creek at Youngstown, Ohio, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 440, Eighty-seventh Congress, at an estimated cost of $2,268,000.

The project for the Scioto River, Ohio, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 587, Eighty-seventh Con-

gress, at an estimated cost of $55,307,000: *Provided*, That nothing in this Act shall be construed as authorizing the acquisition of additional lands for the establishment of a wildlife refuge in this project.

The project for flood protection on the Allegheny River at Salamanca, New York, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 166, Eighty-seventh Congress, at an estimated cost of $1,390,000.

The project for French Creek, Pennsylvania, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 95, Eighty-seventh Congress, at an estimated cost of $23,102,000.

The project for the Saline River and tributaries, Illinois, authorized by the Flood Control Act of 1958 (Public Law 85–500) is hereby modified to authorize the Chief of Engineers to adjust the cash contribution required of local interests to such amount as is recommended by the Secretary of the Army and approved by the President, such adjustment to be made at the earliest practicable date. 72 Stat. 312.

UPPER MISSISSIPPI RIVER BASIN

The project for the Illinois River and tributaries, Illinois, Wisconsin, and Indiana, is hereby authorized substantially as recommended by the Chief of Engineers in House Document Numbered 472, Eighty-seventh Congress, at an estimated cost of $71,465,000.

The project for Rend Lake, Illinois, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 541, Eighty-seventh Congress, at an estimated cost of $35,500,000.

The project for flood protection on the Mississippi River at and in the vicinity of Guttenberg, Iowa, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 286, Eighty-seventh Congress, at an estimated cost of $729,000.

The project for flood protection on the Mississippi River between Sainte Genevieve and Saint Marys, Missouri, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 519, Eighty-seventh Congress, at an estimated cost of $2,500,000.

The project for the Harrisonville and Ivy Landing Drainage and Levee District Numbered 2, Illinois, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 542, Eighty-seventh Congress, at an estimated cost of $1,112,000.

The project for the Columbia Drainage and Levee District Numbered 3, Illinois, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 543, Eighty-seventh Congress, at an estimated cost of $986,000.

The project for the Prairie DuPont Levee and Sanitary District, Illinois, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 540, Eighty-seventh Congress, at an estimated cost of $921,000.

The project for flood protection on Richland Creek, Illinois, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 571, Eighty-seventh Congress, at an estimated cost of $4,995,000.

The project for the Joanna Reservoir, Salt River, Missouri, is hereby authorized substantially in accordance with the recommenda-

tions of the Chief of Engineers in House Document Numbered 507, Eighty-seventh Congress, at an estimated cost of $63,300,000.

The project for flood protection on the Pecatonica River, Illinois and Wisconsin, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 539, Eighty-seventh Congress, at an estimated cost of $850,000.

The project for flood protection on Rock River at Rockford, Illinois, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 142, Eighty-seventh Congress, at an estimated cost of $7,228,000.

The project for the Mississippi River urban areas from Hampton, Illinois, to mile 300, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 564, Eighty-seventh Congress, at an estimated cost of $9,289,000.

The project for the Mississippi River urban areas from Hampton, Illinois, to Cassville, Wisconsin, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 450, Eighty-seventh Congress, at an estimated cost of $5,350,000.

The project for the Kickapoo River, Wisconsin, is hereby authorized substantially as recommended by the Chief of Engineers in House Document Numbered 557, Eighty-seventh Congress, at an estimated cost of $15,570,000.

The project for flood protection on the Warroad River and Bull Dog Creek, Minnesota, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 449, Eighty-seventh Congress, at an estimated cost of $972,000.

GREAT LAKES BASIN

The project for flood protection on the River Rouge, Michigan, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 148, Eighty-seventh Congress, at an estimated cost of $8,659,000.

The project for flood protection on the Sandusky River, Ohio, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 136, Eighty-seventh Congress, at an estimated cost of $4,300,000.

GILA RIVER BASIN

The project for the Camelsback Reservoir, Gila River, Arizona, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 127, Eighty-seventh Congress, at an estimated cost of $9,770,000.

The project for flood protection on the Gila River below Painted Rock Reservoir, Arizona, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 116, Eighty-seventh Congress, at an estimated cost of $18,255,000.

The project for flood protection on Pinal Creek, Arizona, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 512, Eighty-seventh Congress, at an estimated cost of $1,300,000.

TRUCKEE RIVER BASIN

The project for flood protection on the Truckee River and tributaries, California and Nevada, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 435, Eighty-seventh Congress, at an estimated cost of $2,385,000.

SAN FRANCISCO BAY AREA

The project for flood protection on Alameda Creek, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 128, Eighty-seventh Congress, at an estimated cost of $14,680,000.

The project for Corte Madera Creek, Marin County, California, is hereby authorized substantially in accordance with the recommendations of the Secretary of the Army and the Chief of Engineers in House Document Numbered 545, Eighty-seventh Congress, at an estimated cost of $5,534,000: *Provided*, That local interests shall contribute in cash 3 per centum of the Federal construction of the Rose Valley unit with a contribution presently estimated at $158,000.

SAN JOAQUIN RIVER BASIN

The New Melones project, Stanislaus River, California, authorized by the Flood Control Act approved December 22, 1944 (58 Stat. 887), is hereby modified substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 453, Eighty-seventh Congress, at an estimated cost of $113,717,000: *Provided*, That upon completion of construction of the dam and powerplant by the Corps of Engineers, the project shall become an integral part of the Central Valley project and be operated and maintained by the Secretary of the Interior pursuant to the Federal reclamation laws, except that the flood control operation of the project shall be in accordance with the rules and regulations prescribed by the Secretary of the Army: *Provided further*, That the Stanislaus River Channel, from Goodwin Dam to the San Joaquin River, shall be maintained by the Secretary of the Army to a capacity of at least eight thousand cubic feet per second subject to the condition that responsible local interests agree to maintain private levees and to prevent encroachment on the existing channel and floodway between the levees: *Provided further*, That before initiating any diversions of water from the Stanislaus River Basin in connection with the operation of the Central Valley project, the Secretary of the Interior shall determine the quantity of water required to satisfy all existing and anticipated future needs within that basin and the diversions shall at all times be subordinate to the quantities so determined: *Provided further*, That the Secretary of the Army adopt appropriate measures to insure the preservation and propagation of fish and wildlife in the New Melones project and shall allocate to the preservation and propagation of fish and wildlife, as provided in the Act of August 14, 1946 (60 Stat. 1080), an appropriate share of the cost of constructing the Stanislaus River diversion and of operating and maintaining the same: *Provided further*, That the Secretary of the Army, in connection with the New Melones project, construct basic public recreation facilities, acquire land necessary for that purpose, the cost of constructing such facilities and acquiring such lands to be nonreimbursable and nonreturnable: *Provided further*, That contracts for the sale and delivery of the additional electric energy available from the Central Valley project power system as a result of the con-

58 Stat. 901.

43 USC 371 et seq.

Fish and wildlife preservation.

16 USC 661-666c.

struction of the plants herein authorized and their integration with that system shall be made in accordance with preferences expressed in the Federal reclamation laws except that a first preference, to the extent as needed and as fixed by the Secretary of the Interior, but not to exceed 25 per centum of such additional energy, shall be given, under reclamation law, to preference customers in Tuolumne and Calaveras Counties, California, for use in that county, who are ready, able, and willing, within twelve months after notice of availability by the Secretary of the Interior, to enter into contracts for the energy and that Tuolumne and Calaveras County preference customers may exercise their option in the same date in each successive fifth year providing written notice of their intention to use the energy is given to the Secretary not less than eighteen months prior to said dates: *And provided further*, That the Secretary of the Army give consideration during the preconstruction planning for the New Melones project to the advisability of including storage for the regulation of streamflow for the purpose of downstream water quality control.

The Hidden Reservoir, Fresno River, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 37, Eighty-seventh Congress, at an estimated cost of $14,338,000.

The Buchanan Reservoir, Chowchilla River, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 98, Eighty-seventh Congress, at an estimated cost of $13,585,000.

The project for flood protection on Mormon Slough, Calaveras River, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 576, Eighty-seventh Congress, at an estimated cost of $1,960,000.

RUSSIAN RIVER BASIN

The project for Russian River, Dry Creek, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 547, Eighty-seventh Congress, at an estimated cost of $42,400,000.

REDWOOD CREEK BASIN

The project for flood protection on Redwood Creek, Humboldt County, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 497, Eighty-seventh Congress, at an estimated cost of $2,580,000.

LOS ANGELES RIVER BASIN

In addition to previous authorizations, there is hereby authorized to be appropriated the sum of $3,700,000 for the prosecution of the comprehensive plan for the Los Angeles River Basin approved in the Act of August 18, 1941, as amended and supplemented by subsequent Acts of Congress.

55 Stat. 647.

ROGUE RIVER BASIN

The project for the Rogue River, Oregon and California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 566, Eighty-seventh Congress, at an estimated cost of $106,700,000, subject to the conditions of local cooperation specified in said report: *Provided*, That the project is to be located, constructed, and operated to accomplish the benefits as set forth and described in the report and appendixes: *And provided further*, That in the years of short water supply all

water users will share the available water in the same proportions that they would share the total full supply when it is available, and that no further water-use allocations will be made from the authorized storage so as to retain the maximum possible benefits to authorized uses during the periods of adversity when storage shortages occur.

COLUMBIA RIVER BASIN

The projects and plans for the Columbia River Basin, including the Willamette River Basin, authorized by the Flood Control Act of June 28, 1938, and subsequent Acts of Congress, including the Flood Control Acts of May 17, 1950, September 3, 1954, July 3, 1958, and July 14, 1960, are hereby modified to include the projects listed below for flood control and other purposes in the Columbia River Basin (including the Willamette River Basin) substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 403, Eighty-seventh Congress: *Provided*, That the depth and width of the authorized channel in the Columbia-Snake River barge navigation project shall be established as fourteen feet and two hundred and fifty feet, respectively, at minimum regulated flow. 52 Stat. 1222; 64 Stat. 177, 178; 68 Stat. 1264; 72 Stat. 315; 74 Stat. 499.

Asotin Dam, Snake River, Idaho and Washington;

Bruces Eddy Dam and Reservoir, North Fork, Clearwater River, Idaho;

Strube Reregulating Dam and Reservoir, South Fork, McKenzie River, Oregon;

Gate Creek Dam and Reservoir, Gate Creek, Oregon;

Fern Ridge Dam and Reservoir modification, Long Tom River, Oregon;

Cascadia Dam and Reservoir, South Santiam River, Oregon.

The project for the Ririe Dam and Reservoir, Willow Creek, Idaho, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 562, Eighty-seventh Congress, at an estimated cost of $7,027,000.

The project for the Blackfoot Dam and Reservoir, Blackfoot River, Idaho, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 568, Eighty-seventh Congress, at an estimated cost of $829,000.

WYNOOCHEE RIVER

The project for the Wynoochee River, Washington, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 601, Eighty-seventh Congress, at an estimated cost of $40,211,000: *Provided*, That the installation of the power-generating facilities shall not be made until the Chief of Engineers shall submit a reexamination report to the Congress for authorization.

Reexamination report to Congress.

COOK INLET, ALASKA

The project for Bradley Lake, Cook Inlet, Alaska, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 455, Eighty-seventh Congress, at an estimated cost of $45,750,000.

SEC. 204. (a) For the purpose of developing hydroelectric power and to encourage and promote the economic development of and to foster the establishment of essential industries in the State of Alaska, and for other purposes, the Secretary of the Army, acting through the Chief of Engineers, is authorized to construct and the Secretary of the

Alaska. Hydroelectric power development.

Interior is authorized to operate and maintain the Crater-Long Lakes division of the Snettisham project near Juneau, Alaska. The works of the division shall consist of pressure tunnels, surge tanks, penstocks, a powerplant, transmission facilities, and related facilities, all at an estimated cost of $41,634,000.

Sale of power and energy.

(b) Electric power and energy generated at the division except that portion required in the operation of the division, shall be disposed of by the Secretary of the Interior in such a manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles. Rate schedules shall be drawn having regard to the recovery of the costs of producing and transmitting the power and energy, including the amortization of the capital investment over a reasonable period of years, with interest at the average rate (which rate shall be certified by the Secretary of the Treasury) paid by the United States on its marketable long-term securities outstanding on the date of this Act and adjusted to the nearest one-eighth of 1 per centum. In the sale of such power and energy, preference shall be given to Federal agencies, public bodies, and cooperatives. It shall be a condition of every contract made under this Act for the sale of power and energy that the purchaser, if it be a purchaser for resale, will deliver power and energy to Federal agencies or facilities thereof within its transmission area at a reasonable charge for the use of its transmission facilities. All receipts from the transmission and sale of electric power and energy generated at said division shall be covered into the Treasury of the United States to the credit of miscellaneous receipts.

Contract authority.

(c) The appropriate Secretary is authorized to perform any and all acts and enter into such agreements as may be appropriate for the purpose of carrying the provisions of this Act into full force and effect, including the acquisition of rights and property, and the Secretary of the Army, when an appropriation shall have been made for the commencement of construction or the Secretary of the Interior in the case of operation and maintenance of said division, may, in connection with the construction or operation and maintenance of such division, enter into contracts for miscellaneous services for materials and supplies, as well as for construction, which may cover such periods of time as the appropriate Secretary may consider necessary but in which the liability of the United States shall be contingent upon appropriations being made therefor.

Small projects. 64 Stat. 183; 70 Stat. 522.

SEC. 205. Section 205 of the Flood Control Act of 1948, as amended (33 U.S.C. 701s), is amended (a) by striking out "$10,000,000" and inserting in lieu thereof "$25,000,000", (b) by striking out the term "small flood control projects" and inserting in lieu thereof the term "small projects for flood control and related purposes", and (c) by striking out "*Provided*, That not more than $400,000 shall be allotted for this purpose at any single locality from the appropriations for any one fiscal year" and inserting in lieu thereof "*Provided*, That not more than $1,000,000 shall be allotted under this section for a project at any single locality and the amount allotted shall be sufficient to complete Federal participation in the project".

Flood emergency preparation. 69 Stat. 186.

SEC. 206. The first sentence of section 5 of the Flood Control Act approved August 18, 1941, as amended (33 U.S.C. 701n), is hereby further amended to read as follows: "That there is hereby authorized an emergency fund in the amount of $15,000,000 to be expended in flood emergency preparation, in flood fighting and rescue operations, or in the repair or restoration of any flood control work threatened or destroyed by flood, including the strengthening, raising, extending, or other modification thereof as may be necessary in the discretion of the Chief of Engineers for the adequate functioning of the work for flood

control; in the emergency protection of federally authorized hurricane or shore protection being threatened when in the discretion of the Chief of Engineers such protection is warranted to protect against imminent and substantial loss to life and property; in the repair and restoration of any federally authorized hurricane or shore protective structure damaged or destroyed by wind, wave, or water action of other than an ordinary nature when in the discretion of the Chief of Engineers such repair and restoration is warranted for the adequate functioning of the structure for hurricane or shore protection."

Public park and recreational facilities. 68 Stat. 1266. 16 USC 460d.

SEC. 207. Section 4 of the Act entitled "An Act authorizing the construction of certain public works on rivers and harbors for flood control, and for other purposes", approved December 22, 1944, as amended by section 4 of the Flood Control Act of July 24, 1946, and by section 209 of the Flood Control Act of 1954, is hereby further amended to read as follows:

"SEC. 4. The Chief of Engineers, under the supervision of the Secretary of the Army, is authorized to construct, maintain, and operate public park and recreational facilities at water resource development projects under the control of the Department of the Army, to permit the construction of such facilities by local interests (particularly those to be operated and maintained by such interests), and to permit the maintenance and operation of such facilities by local interests. The Secretary of the Army is also authorized to grant leases of lands, including structures or facilities thereon, at water resource development projects for such periods, and upon such terms and for such purposes as he may deem reasonable in the public interest: *Provided*, That leases to nonprofit organizations for park or recreational purposes may be granted at reduced or nominal considerations in recognition of the public service to be rendered in utilizing the leased premises: *Provided further*, That preference shall be given to Federal, State, or local governmental agencies, and licenses or leases where appropriate, may be granted without monetary considerations, to such agencies for the use of all or any portion of a project area for any public purpose, when the Secretary of the Army determines such action to be in the public interest, and for such periods of time and upon such conditions as he may find advisable: *And provided further*, That in any such lease or license to a Federal, State, or local governmental agency which involves lands to be utilized for the development and conservation of fish and wildlife, forests, and other natural resources, the licensee or lessee may be authorized to cut timber and harvest crops as may be necessary to further such beneficial uses and to collect and utilize the proceeds of any sales of timber and crops in the development, conservation, maintenance, and utilization of such lands. Any balance of proceeds not so utilized shall be paid to the United States at such time or times as the Secretary of the Army may determine appropriate. The water areas of all such projects shall be open to public use generally, without charge, for boating, swimming, bathing, fishing, and other recreational purposes, and ready access to and exit from such areas along the shores of such projects shall be maintained for general public use, when such use is determined by the Secretary of the Army not to be contrary to the public interest, all under such rules and regulations as the Secretary of the Army may deem necessary. No use of any area to which this section applies shall be permitted which is inconsistent with the laws for the protection of fish and game of the State in which such area is situated. All moneys received by the United States for leases or privileges shall be deposited in the Treasury of the United States as miscellaneous receipts."

Public use of water areas.

Protection of fish and game.

76 STAT. 1196.

Utilization of public roads. 33 USC 701r-1.

SEC. 208. Section 207 of the Flood Control Act of 1960 (74 Stat. 501) is hereby amended to read as follows:

"SEC. 207. (a) When used in this section—

"(1) The term 'Agency' means the Corps of Engineers, United States Army or the Bureau of Reclamation, United States Department of the Interior, whichever has jurisdiction over the project concerned.

"(2) The term 'head of the Agency concerned' means the Chief of Engineers or the Commissioner, Bureau of Reclamation, or their respective designees.

"(3) The term 'water resources projects to be constructed in the future' includes all projects not yet actually under construction, and, to the extent of work remaining to be completed, includes projects presently under construction where road relocations or identifiable components thereof are not complete as of the date of this section.

"(4) The term 'time of the taking' is the date of the relocation agreement, the date of the filing of a condemnation proceeding, or a date agreed upon between the parties as the date of taking.

"(b) Whenever, in connection with the construction of any authorized flood control, navigation, irrigation, or multiple-purpose project for the development of water resources, the head of the Agency concerned determines it to be in the public interest to utilize existing public roads as a means of providing access to such projects during construction, such Agency may improve, reconstruct, and maintain such roads and may contract with the local authority having jurisdiction over the roads to accomplish the necessary work. The accomplishment of such work of improvement may be carried out with or without obtaining any interest in the land on which the road is located in accordance with mutual agreement between the parties: *Provided*, (1) That the head of the Agency concerned determines that such work would result in a saving in Federal cost as opposed to the cost of providing a new access road at Federal expense, (2) that, at the completion of construction, the head of the Agency concerned will, if necessary, restore the road to at least as good condition as prior to the beginning of utilization for access during construction, and (3) that, at the completion of construction, the responsibility of the Agency for improvement, reconstruction, and maintenance shall cease.

Substitute roads.

"(c) For water resources projects to be constructed in the future, when the taking by the Federal Government of an existing public road necessitates replacement, the substitute provided will, as nearly as practicable, serve in the same manner and reasonably as well as the existing road. The head of the Agency concerned is authorized to construct such substitute roads to design standards comparable to those of the State, or, where applicable State standards do not exist, those of the owning political division in which the road is located, for roads of the same classification as the road being replaced. The traffic existing at the time of the taking shall be used in the determination of the classification. In any case where a State or political subdivision thereof requests that such a substitute road be constructed to a higher standard than that provided in the preceding provisions of this subsection, and pays, prior to commencement of such construction, the additional costs involved due to such higher standard, such Agency head is authorized to construct such road to such higher standard. Federal costs under the provisions of this subsection shall be part of the nonreimbursable project costs."

Flood control surveys, authorization.

SEC. 209. The Secretary of the Army is hereby authorized and directed to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and floods aggravated

by or due to wind or tidal effects, to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its territorial possessions, which include the following named localities: *Provided*, That after the regular or formal reports made on any survey are submitted to Congress, no supplemental or additional report or estimate shall be made unless authorized by law except that the Secretary of the Army may cause a review of any examination or survey to be made and a report thereon submitted to Congress, if such review is required by the national defense or by changed physical or economic conditions: *Provided further*, That the Government shall not be deemed to have entered upon any project for the improvement of any waterway or harbor mentioned in this title until the project for the proposed work shall have been adopted by law:

Valenciana River, Puerto Rico.

Waccasassa River (Levy County and Gilchrist County), Florida.

Lake Pontchartrain, North Shore, Louisiana.

Peytons Creek and tributaries, Texas.

Clear Creek, Texas.

San Bernard River, Texas.

Arkansas River Basin, with reference to the effect of the Eufaula and Keystone Reservoirs, Oklahoma, on the water supply facilities of the cities of McAlester and Yale, respectively, with a view to determining the extent, if any, of Federal participation in the replacement of the cities' water supply facilities in equity without regard to limitation contained in existing Corps of Engineers protective and relocation plans.

Cumberland River, Kentucky and Tennessee, with reference to the effect of the Barkley Dam project, on the water supply and sewage treatment facilities of the cities of Cadiz, Kuttawa, and Eddyville, Kentucky, and the State penitentiary at Eddyville, Kentucky, respectively, with a view to determining the extent, if any, of Federal participation in the replacement of their water supply and sewage treatment facilities in equity without regard to limitation contained in existing Corps of Engineers protective and relocation plans.

Missouri River Basin, with reference to the effect of Oahe and Garrison Reservoirs, North Dakota and South Dakota, on the sewage treatment facilities of the cities of Bismarck and Mandan, North Dakota, respectively, with a view to determining the extent, if any, of Federal participation in the sewage treatment facilities in equity without regard to limitation contained in existing Corps of Engineers protective and relocation plans.

All streams in Santa Barbara County, California, draining the Santa Ynez Mountains, except Santa Ynez River and tributaries.

Sacramento River Basin and streams in northern California draining into the Pacific Ocean for the purposes of developing, where feasible, multiple-purpose water resource projects, particularly those which would be eligible under the provisions of title III of Public Law 85–500. 72 Stat. 319. 43 USC 390b.

Battle Creek, Sacramento River, California.

Kaskaskia River levees, Illinois; review of requirements of local cooperation.

Puget Sound, Washington, and adjacent waters, including tributaries, in the interest of flood control, navigation, and other water uses and related land resources.

Harbors and rivers in Hawaii, with a view to determining the advisability of improvements in the interest of navigation, flood control, hydroelectric power development, water supply, and other beneficial water uses, and related land resources.

Waimea River, Kokee Area, Kauai, Hawaii, for multiple purposes.

Waipio River, Kohala-Hamakua coast, Island of Hawaii, for multiple purpose development.

Iao River, Wailuku, Maui, Hawaii.

Chicot County, Ark. Bridge replacement authorized. 58 Stat. 894.

SEC. 210. The Secretary of the Army acting through the Corps of Engineers is hereby authorized to replace with adequate floodway capacity the bridge over Boeuf River, Chicot County, Arkansas, approximately three miles north of the county line, and the bridge over Big Bayou, Chicot County, Arkansas, approximately two miles upstream from its confluence with the Boeuf River which were altered as part of the project for Boeuf and Tensas Rivers and Bayou Macon, authorized by the Flood Control Act of December 22, 1944, and which were recently destroyed by floods, at an estimated cost of $115,000.

W. Kerr Scott Dam and Reservoir. Designation. 60 Stat. 645.

SEC. 211. The Wilkesboro Reservoir flood control project, Yadkin River, North Carolina, authorized by the Flood Control Act of 1946, shall hereafter be known and designated as the W. Kerr Scott Dam and Reservoir, in honor of the late Senator W. Kerr Scott of North Carolina. Any law, regulation, document, or record of the United States in which such project is designated or referred to shall be held and considered to refer to such project by the name of the W. Kerr Scott Dam and Reservoir.

Short title.

SEC. 212. Title II of this Act may be cited as the "Flood Control Act of 1962".

Approved October 23, 1962.

ATTACHMENT 3

Public Law 106–53
106th Congress

An Act

To provide for the conservation and development of water and related resources, to authorize the United States Army Corps of Engineers to construct various projects for improvements to rivers and harbors of the United States, and for other purposes.

Aug. 17, 1999
[S. 507]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Water Resources Development Act of 1999.
Inter-governmental relations.
33 USC 2201 note.

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Water Resources Development Act of 1999".

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

SEC. 357. UPPER JORDAN RIVER, UTAH.

The project for flood control, Upper Jordan River, Utah, authorized by section 101(a)(23) of the Water Resources Development Act of 1990 (104 Stat. 4610) and modified by section 301(a)(14) of the Water Resources Development Act of 1996 (110 Stat. 3709), is further modified to direct the Secretary to carry out the locally preferred project, entitled "Upper Jordan River Flood Control Project, Salt Lake County, Utah—Supplemental Information" and identified in the document of Salt Lake County, Utah, dated July 30, 1998, at a total cost of $12,870,000, with an estimated Federal cost of $8,580,000 and an estimated non-Federal cost of $4,290,000, if the Secretary determines that the project as modified is technically sound, environmentally acceptable, and economically justified.

SEC. 358. ELIZABETH RIVER, CHESAPEAKE, VIRGINIA.

Notwithstanding any other provision of law, after September 30, 1999, the city of Chesapeake, Virginia, shall not be obligated to make the annual cash contribution required under paragraph 1(9) of the Local Cooperation Agreement dated December 12, 1978, between the Government and the city for the project for navigation, southern branch of the Elizabeth River, Chesapeake, Virginia.

SEC. 359. COLUMBIA RIVER CHANNEL, WASHINGTON AND OREGON.

(a) IN GENERAL.—The project for navigation, Columbia River between Vancouver, Washington, and The Dalles, Oregon, authorized by the first section of the Act of July 24, 1946 (60 Stat. 637, chapter 595), is modified to authorize the Secretary to construct an alternate barge channel to traverse the high span of the Interstate Route 5 bridge between Portland, Oregon, and Vancouver, Washington, to a depth of 17 feet, with a width of approximately 200 feet through the high span of the bridge and a width of approximately 300 feet upstream of the bridge.

(b) DISTANCE UPSTREAM.—The channel shall continue upstream of the bridge approximately 2,500 feet to about river mile 107, then to a point of convergence with the main barge channel at about river mile 108.

(c) DISTANCE DOWNSTREAM.—

(1) SOUTHERN EDGE.—The southern edge of the channel shall continue downstream of the bridge approximately 1,500 feet to river mile 106+10, then turn northwest to tie into the edge of the Upper Vancouver Turning Basin.

(2) NORTHERN EDGE.—The northern edge of the channel shall continue downstream of the bridge to the Upper Vancouver Turning Basin.

SEC. 360. GREENBRIER RIVER BASIN, WEST VIRGINIA.

Section 579(c) of the Water Resources Development Act of 1996 (110 Stat. 3790) is amended by striking "$12,000,000" and inserting "$47,000,000".

SEC. 361. BLUESTONE LAKE, OHIO RIVER BASIN, WEST VIRGINIA.

Section 102(ff) of the Water Resources Development Act of 1992 (106 Stat. 4810) is amended by striking "take such measures as are technologically feasible" and inserting "implement Plan C/G, as defined in the Evaluation Report of the District Engineer dated December 1996,".

ATTACHMENT 4

72D CONGRESS
1st Session
HOUSE OF REPRESENTATIVES
DOCUMENT
No. 249

COLUMBIA RIVER, BETWEEN MOUTH OF WILLIAMETTE RIVER AND A POINT ONE MILE ABOVE VANCOUVER, WASH.

LETTER

FROM

THE SECRETARY OF WAR

TRANSMITTING

REPORT FROM THE CHIEF OF ENGINEERS ON PRELIMINARY EXAMINATION AND SURVEY OF COLUMBIA RIVER BETWEEN THE MOUTH OF THE WILLAMETTE RIVER AND A POINT ONE MILE ABOVE THE CITY OF VANCOUVER, WASH.

FEBRUARY 16, 1932.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration

WAR DEPARTMENT,
Washington, February 15, 1932.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

DEAR MR. SPEAKER: I am transmitting herewith a report dated February 12, 1932, from the Chief of Engineers, United States Army, on preliminary examination and survey of Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash., authorized by the river and harbor act approved July 3, 1930, together with accompanying papers and illustration.

Sincerely yours,

PATRICK J. HURLEY,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, February 12, 1932.

Subject: Preliminary examination and survey of Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash.

To: The Secretary of War.

1. I submit for transmission to Congress, my report with accompanying papers and illustration, on preliminary examination and

survey of Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash., authorized by the river and harbor act approved July 3, 1930.

2. The city of Vancouver is at the head of present deep-draft navigation on the Columbia River and is 4½ miles above the mouth of the Willamette River. Under the project authorized for the improvement of the Columbia and lower Willamette Rivers below Vancouver, Wash., and Portland, Oreg., a channel 300 feet wide and 25 feet deep at low water has been provided between the mouth of Willamette River and Vancouver, and dikes have been constructed for the economical maintenance of this channel. The port of Vancouver has already contributed $134,000 toward channel improvement, and is obligated under the conditions of the present project to an additional contribution of $16,000, if required for further dike construction. Below the mouth of the Willamette the project provides for a channel 35 feet in depth and 500 feet wide. The mean range of tide at low water stage is about 2 feet. The annual freshet rise is about 21 feet. The improvement desired is a channel 30 feet deep and 300 feet wide from the mouth of Willamette River to a point 1 mile above Vancouver, with two turning basins each 800 feet wide and 2,000 feet long on the Vancouver waterfront. Local interests urge that the improved channel follow along the Washington shore instead of crossing to the opposite side below the city.

3. The commerce transported by ocean-going vessels through the port of Vancouver increased from 67,521 tons in 1925 to 153,160 tons in 1929, dropping to 95,604 tons in 1930. The shipments consist principally of lumber, paper products, and canned goods; receipts consist largely of sugar and sulphur. The ships used in this trade have drafts up to 23 feet. The local traffic, largely rafted timber, amounts to about 500,000 tons. Vancouver is well situated as to rail connections and has ample space for industrial growth and the enlargement of its shipping facilities. With a channel of adequate depth and the necessary turning basins, the growth of the water-borne commerce of the port is expected to continue. The present channel is not adequate for deep-draft ocean shipping. Eight vessels have grounded near Vancouver during the last six years, with a loss of time varying from a few hours to as much as four days. The channel is so narrow that the ships of deeper draft calling at the port do not ordinarily attempt to turn around but are towed downstream stern foremost at a cost of from $75 to $125 per ship. Because of these conditions certain steamship lines refuse to call at the port, and about 20 per cent of the tributary tonnage is transferred to Portland for reshipment at considerable expense. The estimated benefit from an adequate channel through the elimination of this transfer and reshipment is $37,000 per annum, to which should be added the direct saving in towing charges, and other benefits, running to several thousand dollars per year.

4. The district engineer presents several alternative plans for improvement, all terminating at the Interstate Highway Bridge near the upper limits of the port. Since no industries or terminals are now located above this bridge, the improvement of the channel upstream manifestly is not justified at this time. These plans include a turning

basin at the head of the channel and a second turning basin immediately below the railroad bridge at the downstream end of the port. The estimated cost of improvement with a channel 300 feet wide and 28 feet deep following the present channel alignment is $57,000, with $35,000 annually for maintenance; the estimated cost with a channel of the same dimensions adjacent to the Washington shore as desired by local interests is $183,700, with $50,000 annually for maintenance; the estimated cost with a 30-foot channel of the same width following the present alignment is $160,000, with $50,000 annually for maintenance, and on an alignment adjacent to the Washington shore $251,000 (exclusive of dike construction) with $60,000 annually for maintenance. The district engineer recommends a channel 300 feet wide and 28 feet deep on the present alignment with the turning basins, provided local interests contribute $13,000 per annum to cover the estimated increased cost of maintenance.

5. The division engineer concurs in the views of the district engineer except as to local cooperation. He regards it as unwise to make the upkeep of a Federal project dependent on annual cash contributions by local interests, as this procedure results in controversies and may result in lack of a project depth at a time when most badly needed. In view of the large contribution already made by the port of Vancouver for channel improvement, he recommends the modification of the existing project to provide a channel 300 feet wide and 28 feet deep on the present channel alignment, with 2 turning basins as proposed, without local contribution.

6. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors. Its report, concurring with the recommendation of the division engineer, is appended.

7. After due consideration of these reports, I concur in the recommendation of the board. Further improvement of the channel from the mouth of the Willamette to Vancouver is obviously necessary to afford the requisite facilities for deep-draft vessels, and the reduced costs of transportation amply justify the improvement proposed. In view of the large general benefits and the prior local contributions to the improvement, the United States is justified in assuming the entire cost. I therefore report that the modification of the existing project for the Columbia and Lower Willamette Rivers below Portland, Oreg., and Vancouver, Wash., is deemed advisable to provide a channel 300 feet wide and 28 feet deep from the mouth of the Willamette River to the Interstate Highway Bridge at Vancouver, with two turning basins, each generally 2,000 feet long, 800 feet wide and 28 feet deep, all at an estimated cost of $57,000, with $35,000 annually for maintenance; this annual maintenance cost being $13,000 in excess of the present maintenance cost.

LYTLE BROWN,
Major General, Chief of Engineers.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

SYLLABUS

The board of Engineers for Rivers and Harbors concurs with the division engineer in recommending modification of the existing project so as to provide for a channel 300 feet wide and 28 feet deep at low water from the mouth of the Willamette River to the Interstate Highway Bridge at Vancouver, together with two turning basins, each 2,000 feet long, 800 feet wide, and 28 feet deep, all at an estimated cost of $57,000, with $13,000 annually for maintenance, in addition to that now required.

[Second Indorsement]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 18, 1932.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the reports on preliminary examination and survey of Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash., authorized by the river and harbor act approved July 3, 1930.

2. The reports herewith contain information as to the growth of ocean shipping at Vancouver since the existing project was adopted, the handicaps encountered by shipping, and the further improvement desired. The reporting officers believe an increase in depth to 28 feet and the provision of two turning basins are justified.

3. The territory tributary to the port of Vancouver is extensive and produces large crops of fruit, potatoes, grain, and livestock. The principal industries are the manufacture of lumber, shingles, sash and doors, brooms, furniture, woolens, patterns, butter, pulp, and paper. There are three large packing plants for fruit and vegetables. A considerable commerce in ocean vessels has developed, it having been more than 150,000 tons in 1928 and 1929. The traffic was lighter in 1930 on account of the depression. The principal ocean shipments consist of lumber, paper products, and canned goods outbound, and sugar and sulphur inbound. Vancouver has recently been granted terminal rail rates from interior points, the same as those for Portland. It is claimed that deeper draft vessels do not attempt to turn around at Vancouver, but are towed, stern first, downstream at a cost of from $75 to $125 per ship. These conditions have led certain steamship lines to refuse to call at the port, and it is stated that about 20 per cent of the potential Vancouver tonnage is transferred to Portland for reshipment, at considerable extra expense. It is estimated that the tonnage of freight affected is about 30,000 tons, and the extra cost of transfer is placed at $37,500. In 1930, there were 4 ships of from 26 to 28 feet draft, and 20 of 24 to 26 fe[illegible]t, a total of 24 ships with a draft of more than 24 feet. In 19[illegible] re were 12 ships with drafts of from 26 to 28 feet. Lumber pric[illegible] Vancouver are depressed somewhat on account of the limited [illegible]nel dimensions and lack of maneuvering facilities. These los[illegible]an not be accurately evaluated, but probably amount to seve[illegible]thousand dollars per year. There appears to be no occasion for ex[illegible]ing the channel above the Interstate Highway Bridge, there being [illegible]o developments along the Vancouver front above that point. The cost of providing a channel following along the Washington shore is greater than can be justified by the resulting benefits. This is true also of a channel 30 feet deep. A channel following the present alignment and having

two turning basins, all with a depth of 28 feet, appears to be economically justified and probably will be ample to accommodate practically all vessels which may desire to call at Vancouver for many years. The board therefore concurs with the division engineer and recommends modification of the existing project for the Columbia and Lower Willamette Rivers below Portland, Oreg., and Vancouver, Wash., so as to provide for a channel 300 feet wide and 28 feet deep at low water from the mouth of the Willamette River to the Interstate Highway Bridge at Vancouver, together with two turning basins, each 2,000 feet long, 800 feet wide, and 28 feet deep, all at an estimated cost of $57,000, with $13,000 annually for maintenance, in addition to that now required.

4. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

WM. J. BARDEN,
Colonel, Corps of Engineers, Senior Member.

PRELIMINARY EXAMINATION OF COLUMBIA RIVER BETWEEN THE MOUTH OF THE WILLAMETTE RIVER AND A POINT 1 MILE ABOVE THE CITY OF VANCOUVER, WASH.

SYLLABUS

The district engineer is of the opinion that further improvement of the Columbia River between the mouth of Willamette River and the Interstate highway bridge at Vancouver is justified, to the extent of providing two turning basins 28 feet deep, 800 feet wide and 2,000 feet long, and increasing the channel depth to 28 feet at low water, provided the local interests will pay one-half the initial cost and will contribute $5,000 annually for use on maintenance work.

Extension of the improvement "to a point 1 mile above Vancouver" is not considered justified.

An estimate of cost is recommended.

WAR DEPARTMENT,
OFFICE OF THE DISTRICT ENGINEER,
Portland, Oreg., February 25, 1931.

Subject: Preliminary examination of the Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash.

To: The Chief of Engineers, United States Army
(Through the Division Engineer).

1. In accordance with an item in the river and harbor act approved July 3, 1930, and instructions contained in letter from the Chief of Engineers dated July 15, 1930, the following report of preliminary examination of Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash., is submitted.

GENERAL DESCRIPTION

2. Vancouver, Wash., is situated on the Columbia River about 104 miles from the sea and 4½ miles above the mouth of the Willamette River. The drainage area of the Columbia is about 259,000

square miles. In front of Vancouver the river is about 3,000 feet wide, with depths of water varying from 10 to 25 feet at low water. The banks, about 20 feet high, are of sandy loam along Hayden Island, while on the Washington shore there is a fairly stiff clay substratum under the top soil. The bottom is principally coarse sand, with an area of clay and gravel along the Washington side below the Spokane, Portland & Seattle Railway bridge. Land along the banks of the river is devoted to dairying and fruit raising, with general farming and timbering in the territory back from the river, in the State of Washington. Hayden Island, which has a heavy growth of willow and cottonwood brush, is not used to any extent, except for an area near the east end where there is a pleasure resort. The locality is shown on Coast and Geodetic Survey charts Nos. 6154 and 6155 and map [1] submitted herewith.

2. The low-water flow of the Columbia River past Vancouver is about 55,000 second-feet, in addition to about 15,000 second-feet which passes down Oregon Slough on the west side of Hayden Island. During annual freshets, in May, June, and July, the river rises to an average crest height of about 21 feet, at which time the discharge is estimated at 543,000 second-feet, in addition to about 137,000 second-feet carried by Oregon Slough. At low-water stages the tidal rise and fall at Vancouver varies from about 1 to 2.5 feet for neap and spring tides, respectively. The water is generally low during the fall and winter months and high in the spring and summer. The rise is due principally to melting snows in the interior. Floating ice in the winter at times obstructs the movement of river craft, but is rarely heavy enough to interfere with the movement of ocean-going vessels. The ice generally lasts for 10 days, but may occur more than once during the winter. The interstate highway bridge obstructs the movement of ice floes, so that above the bridge the ice is sometimes packed to a depth of several feet.

ORIGINAL CONDITION

3. A survey made in 1895 (S. Doc. No. 54, 54th Cong., 1st sess.) showed a governing depth of about 8 feet at low water on the bar between Vancouver and the foot of Hayden Island. There were two channels of this depth with a sand bar between them. The depths along the water front at Vancouver were about the same as at present.

PREVIOUS EXAMINATIONS AND SURVEYS

4. Reports of previous examinations and surveys are printed in the following documents:

Document	Recommendation	Cost	Remarks
H. Ex. Doc. No. 248, 50th Cong., 1st sess.	Indefinite		
H. Ex. Doc. No. 36, 52d Cong., 1st sess.	Favorable	$33,000	Dike construction and dredging.
Sen. Doc. No. 54, 54th Cong., 1st sess.	do	67,000	Dike construction.
H. Doc. No. 56, 58th Cong., 2d sess.	do	60,000 10,000	Complete dike work.
H. Doc. No. 42, 62d Cong., 1st sess.	Unfavorable		
H. Doc. No. 879, 63d Cong., 2d sess.	do		
H. Doc. No. 126, 68th Cong., 1st sess.	Favorable	123,000	For dredging and dike work; contributed by local interests.
H. Com. Doc. No. 6, 70th Cong., 1st sess.	do		Amount of contributed funds changed from $30,000 to $20,000 per annum

[1] Not printed.

PREVIOUS PROJECTS

5. The river and harbor act of July 13, 1892, authorized construction of a dike across the head of Hayden (Oreg.) Slough, with a view to scouring away the bar below Vancouver by retaining a greater part of the discharge of the river in the main channel. The act of March 3, 1905, provided for dredging a channel 20 feet deep and 150 feet wide.

6. A pile, brush, and stone dike was constructed across the head of Oregon Slough, the work being completed in 1898. The total cost of this work was $109,440.99. Under the act of March 3, 1905, a channel 20 feet deep at low water and 150 feet wide was dredged through the bar below Vancouver. This channel was maintained by the United States until work was started under the existing project.

EXISTING PROJECT AND WORK

7. The existing project for the improvement of the section of Columbia River between the mouth of Willamette River and Vancouver, Wash., was authorized by the river and harbor act of March 3, 1925, and provides for a channel 300 feet wide and 25 feet deep at low water. The channel is maintained by dredging and by spur dikes, seven of which have been constructed between 1926 and 1930. Maintenance dredging in July and August, 1930, cost approximately $18,000. The project for this section of Columbia River had been combined with the project for improvement of the Columbia and lower Willamette Rivers below Portland by river and harbor act of July 27, 1916, and the channel to Vancouver has been maintained under the project title Columbia and lower Willamette Rivers below Portland, Oreg., and Vancouver, Wash.

PRESENT CONDITIONS

8. The channel was dredged under the existing project to full dimensions in the fiscal year 1926, at a cost of $15,580, and 7 new dikes have been constructed, at a cost of about $76,420. The cost of new dredging and dike work was borne by the port of Vancouver. Maintenance dredging is done annually by the United States.

Annual freshets cause shoaling to about 21 feet, referred to low water for a short distance below the railroad bridge. Depths throughout the remainder of the stretch after summer freshets vary from about 23 to 28 feet. The shoals are removed by the annual maintenance dredging.

EFFECT OF PRESENT IMPROVEMENT

9. The present improvement has greatly increased the size and draft of vessels which can call at Vancouver, and the freight handled by ocean-going vessels has increased from 3,295 tons in 1921 to 67,521 tons in 1925, and to 153,160 tons in 1929. Inland river traffic has remained nearly constant.

Moderate draft vessels can now reach Vancouver at any time, where formerly they had to wait for tides and, at times after the summer freshets, before dredging was done, could not reach Vancouver at all.

BRIDGES

10. Two bridges cross the Columbia at Vancouver. At the upper end of the harbor, above the municipal dock, is the Interstate Highway Bridge. This has a lift span with clear horizontal opening of 200 feet and vertical clearance of 160 feet at low water. There is at present no ocean-borne traffic through or above this bridge. About 4,500 feet below the highway bridge and below the existing port terminal facilities, a double track railroad bridge crosses. This bridge has a swing draw with two openings, each 200 feet in width. The Northern Pacific; Great Northern; Spokane, Portland & Seattle; and Oregon-Washington Railroad & Navigation Co. all use this bridge.

RAILWAYS AND HIGHWAYS

11. Vancouver is located on the main line railroads extending up the Columbia to the east; north to Puget Sound points; and south through Portland to California. A branch line, used principally for logging, extends into the country north of Vancouver. High-class paved highways parallel the main line railroads.

12. The Pacific Highway extending north and south through the United States, crosses the Columbia River on the interstate highway bridge at Vancouver, and the Evergreen Highway extends to the east through the Columbia River gorge.

There are also numerous paved highways extending into the country immediately tributary to Vancouver.

TOWNS

13. Vancouver, Wash., is the only town on the stretch of the Columbia River under consideration. It is located about 4½ miles above the mouth of the Willamette River and is the head of deep-water navigation on the Columbia River. The population of Vancouver, 1930 census, was 15,759. There are four banks, with deposits of $5,000,000.

RESOURCES AND LOCAL INDUSTRIES

14. There is a fertile and resourceful territory tributary to Vancouver. The principal industries consist in manufacture of lumber, shingles, sash and doors, brooms, furniture, woolens, patterns, butter, pulp, and paper. Farm products produced locally consist of fruit, potatoes, grain, and livestock. There are three large packing plants for putting up fruit and vegetables.

COMMERCE

15. Following is a comparative statement of tonnage handled at the port of Vancouver:

Comparative statement of traffic

Year	Handled by ocean-going vessels		Handled by inland river vessels		Total [1]		Rafted timber	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value
1921	3,295	$39,540	6,738	$254,224	10,033	$293,764	10,000	$75,000
1922	9,214	119,782	12,632	246,174	21,846	365,956	26,000	195,000
1923	30,935	658,304	9,058	73,175	39,993	731,479	46,008	445,626
1924	20,546	297,508	10,441	341,072	30,987	638,580	67,086	553,460
1925	67,521	965,070	10,975	289,035	78,496	1,254,105	96,000	744,000
1926	117,204	1,774,494	7,000	5,250	124,204	1,779,744	128,000	1,024,000
1927	145,284	2,910,106	4,800	86,895	150,084	2,997,001	315,190	1,261,453
1928	159,491	3,471,940	16,555	12,416	176,046	3,480,365	443,827	1,776,091
1929	153,160	3,658,876	5,436	5,436	158,596	3,664,312	509,799	2,036,196
1930	149,091	3,040,579						

[1] Exclusive of rafted timber.

16. There follows a table of ocean-going vessels with their net registered tonnage and drafts, which served the port of Vancouver, Wash., during the calendar year 1930.

Actual draft (feet)	Arrivals				Departures			
	Foreign		Domestic		Foreign		Domestic	
	Steam	Motor	Steam	Motor	Steam	Motor	Steam	Motor
27-28							1	
26-27					1		2	
25-26	1		2		1		5	
20-25	2	1	26		1	1	30	
15-20			113	7			125	7
10-15			70				48	
Total	3	1	211	7	3	1	211	7

Net registered tonnage

	Inbound	Outbound
Steam	569,200	569,200
Motor	24,096	24,096

TERMINAL FACILITIES

17. The city of Vancouver during 1922 constructed an open wharf 1,000 feet long by 125 feet wide with railroad trackage and connections used for shipping lumber brought in by rail. In 1925 this wharf was extended about 200 feet in length and a warehouse was constructed for handling and storage of canned goods, paper, pulp, and miscellaneous freight.

The Du Bois Lumber Co. has a wharf with about 350 feet frontage, and the Du Bois Matlack mill, below the railroad bridge, constructed a wharf with 400 feet frontage in 1930, for the shipment of lumber.

A belt-line railroad connects these facilities with the main lines and is used jointly without switching charges. Charges for handling, etc., over the city dock are the same as are in effect at Portland and other coast ports.

ADJACENT PORTS

18. Portland, Oreg., is the nearest adjacent port. It is a city of 300,000 with a system of public docks and having an annual ocean-borne commerce of about 6,000,000 tons. Portland is on the Willamette River, about 15 miles distant by water from Vancouver. On shipments from the interior the ports are on a competitive basis, but for all freight originating in Vancouver territory or destined for this territory the transportation charges through Vancouver are lower than through Portland by the amount of transfer charges necessary.

DESIRES OF LOCAL INTERESTS

19. The Vancouver Chamber of Commerce, in letter of September 2, 1930, stated: "A channel 35 feet deep, 500 feet wide, from the mouth of the Willamette to 1 mile above Vancouver is desired." The port of Vancouver at that time also requested a channel of these dimensions with turning basins.

20. In letter of February 4, 1931, however, the port requested that the present channel dimensions be increased to a width of 300 feet and depth of 30 feet at low water and that two turning basins 800 feet wide by 2,000 feet long be provided, instead of the larger channel dimensions earlier requested. The port also states:

> While it is desired to have it included in the proposed project, that part (of the channel) lying between Ryan Point and the Pacific Highway Interstate Bridge need not be dredged nor maintained until such time as actual necessity arises, which probably will not be for several years.

21. The enlarged channel dimensions and turning basins are desired in order that larger vessels may call at Vancouver and ships now calling may have no difficulty in turning around, nor through grounding if loaded to capacity. The Columbia River pilots and the Portland Steamship Operators' Association, by letters of February 3 and 4, respectively, request that the desires of the port for a 30-foot channel 300 feet wide, with two turning basins, be recommended for approval.

EFFECT OF IMPROVEMENT DESIRED

22. Enlarged channel dimensions and turning basins would facilitate navigation by such vessels as are now using the channel and would eliminate most of the delays due to grounding. Vessels could also load to deeper drafts and would be able to finish at Vancouver in many cases where they now have to go to some other port to top off.

23. The port of Vancouver, in letter of August 20, 1930, submitted a statement showing delays to vessels as follows:

> December, 1925, steamship *Hannawa* (4,826 net tons) grounded one-quarter mile below railroad bridge; first grounded on one side of channel and in backing off grounded on other side. Had to bring port of Portland dredge to dig her out. Ship on ground three days.
>
> September, 1927, steamship *Indra* (3,220 net tons) grounded while turning off port terminal. Lay on ground four days and had to be lightered to float her. One stevedore lost his life by drowning during lighterage operation. Three tow-

boats employed in releasing ship; and, when finally pulled off, ship crashed into port dock inflicting damage to extent of $3,000.

August, 1926, steamship *Hakashika Maru* (5,037 net tons) grounded off lower end port terminal while lining up for railroad bridge. Two hours lost in getting her off.

September, 1928, steamship *Robin Adair* (4,267 net tons) grounded below railroad bridge. On ground eight and one-half hours.

October, 1928, steamship *Peter Kerr* (4,156 net tons) grounded at port terminal. Shifted downstream after two hours delay, finished loading. In leaving port she grounded again below railroad bridge and lay on ground several hours when finally released.

November, 1929, steamship *Handicap* (3,028 net tons) grounded on opposite side of channel getting away from port terminal. Only short delay.

December, 1929, steamsip *Charles H. Cramp* (3,812 net tons) grounded just above mouth of Willamette, but did not suffer much delay.

December, 1929, steamship *Surico* (1,977 net tons) grounded on opposite side of channel in getting away from port terminal and suffered five hours delay.

All of these cases were due to insufficient depth and width of fairway and in the aggregate entailed losses of very substantial amounts.

Furthermore, the effect of these groundings on ship operators and masters are detrimental to the commerce of the port.

There have also been many instances where cargo has been lightered to Portland at additional expense because of ships refusing to enter the Vancouver harbor.

In the latter part of 1928 the Hamburg-American motorship *Los Angeles* arrived in the river with six hundred tons of European pulp for the Vancouver Paper mill which was discharged in Portland and transported to Vancouver by rail because the ship operators did not consider the Vancouver channel adequate for safe navigation of the vessel.

24. The port also estimates that improved channel conditions would result in an increase of 30,000 tons of cargo per annum, on which there would be a saving of $1.25 per ton.

25. The normal increase in the past five years, according to statistics, has been about 86,000 tons, or 17,200 tons per annum. In the four years 1925 to 1928, inclusive, the increase was 92,000 tons, or 23,000 tons per annum. (The tonnage for 1928 was greater than for 1929.)

26. The improvements desired, especially as to turning basins, would probably stimulate the movement of freight through the port. Some of the cargo transfers to Portland for shipment on account of vessels refusing to enter Vancouver would be eliminated if the packages to be shipped were of sufficient size to justify shifting the vessel to Vancouver. Creation of turning basins would probably eliminate most of the charges for towboats, often used under present conditions to turn vessels.

27. It is stated by the port of Vancouver that there are good prospects for the construction of grain storage elevators at Vancouver if the channel depth and width were increased to accommodate the grain ships, which are usually of deeper draft than vessels carrying other kinds of cargo. The wheat crop moves in the fall and winter when the river stage is lowest.

LOCAL COOPERATION

28. While not required by law, the port of Vancouver, under previous projects, contributed $12,500 for dredging, and constructed two pile dikes at a cost of $15,000. In 1924, in order to secure greater channel dimensions, the port also paid $14,900 for dredging the channel to a depth of 23 feet and width of 300 feet (not covered by any project).

29. Under the existing project up to December 31, 1930, the port has contributed $92,000, of which $15,580 was for new work of dredging, and $76,420 for dike construction.

30. The existing project provides that the "local interests shall pay for the original cost of dredging the new channel at an estimated cost of $30,000 and for such dike construction, to an amount not to exceed $93,000, as may be found necessary for economical maintenance the contributed funds being made available in installments of about $20,000 per year until the work is completed." On January 1, 1931, the balance remaining to be contributed for dike work, if found by the United States to be necessary for economical maintenance, was $16,580. By the end of 1931 the port district will accordingly have contributed about $151,000 for dredging and permanent works.

As to further cooperation, the following is quoted from a letter of February 4, 1931, from the port of Vancouver commission:

> The port of Vancouver commission feels that it has heretofore contributed rather more liberally to the improvement of Vancouver channel than its limited resources should bear and while the commission wishes to do all it reasonably can do, it feels that the burden of further and necessary improvement should be lightened.
>
> Of the $123,000 that the port of Vancouver obligated itself for under the present project there still remains $16,000 to be paid upon call from your department for the construction of dikes.
>
> With the understanding that the United States Government will assume all the future maintenance, the port commission hereby offers to bear one-half the initial expense of deepening the channel to 30 feet and dredging the turning basins.
>
> However, if that proposal would jeopardize the adoption of the proposed project, the port will, of course, undertake to assume the initial cost.
>
> In either event the funds of the port for the project will be available only at the rate of $10,000 per year and it is hoped therefore that arrangements can be made whereby the Government will do the initial dredging and accept reimbursement from the port at the rate of $10,000 per year.

WATER POWER OR LAND RECLAMATION

31. There are no possibilities of water power or land reclamation which could be coordinated with the work under consideration to lessen the cost to the United States.

DISCUSSION AND RECOMMENDATION

32. The ocean-borne commerce of Vancouver, Wash., increased rapidly from 3,295 tons in 1921 to 159,491 tons in 1928. In 1929 the tonnage fell off somewhat to a total of 153,160 tons and in 1930 to 149,091 tons. This falling off was probably due to the poor market for lumber and to the general depression.

33. As to future increases in tonnage, it is difficult to predict, but it appears the normal rate of increase which has been maintained for the past five years, that is, about 20,000 tons per annum, may be expected to continue, with perhaps an additional increment if the channel should be further improved so as to attract more and larger vessels.

34. In 1929, 203, and in 1930, 222 ocean-going vessels called at Vancouver. The average amount of cargo handled per trip inbound and outbound was 754 tons in 1929 and 671 tons in 1930. The statement of drafts of vessels under commercial statistics shows

about 81 per cent with drafts of 20 feet and less, 14½ per cent with drafts of 20 to 25 feet, 2⅞ per cent with drafts of 25 to 26 feet, 1⅞ per cent with drafts of 26 to 27 feet, and 1 vessel with draft between 27 and 28 feet.

35. From these figures it appears that a very much larger tonnage could be handled with a greater number of ships and some increase in the size of shipments (if cargo were available) without a very material increase in the channel depth. The groundings in 1925 and 1927 reported by the port of Vancouver, shown in paragraph 23 above, occurred when the channel was comparatively new and the side slopes had not worked down so as to allow ships the freedom of movement they have had in later years. These groundings also occurred early in the program of dike construction when the channel shoaled during the annual summer freshet to a greater extent than it has in later years. No delays nor damage due to grounding were reported in 1930.

36. There is at present no navigation by ocean-going vessels between the Interstate Bridge and Ryan Point, over which section the port has requested the project be extended. The present depths in this section range from 23 to over 30 feet, so that there appears to be no immediate need for improvement above the Interstate Bridge. This bridge is the upper limit of the present project channel and no industries or shipping facilities are located above this point.

37. In letter of February 4, 1931, the port of Vancouver states:

> One of the principal arguments of the intercoastal steamship lines for refusing to make Vancouver a regular port of call is the limited depth and the absence of sufficient turning space, particularly in the summer, fall, and winter, when the greatest tonnage of cargo is offered.
>
> The navigation hazard, real or fancied, also operates to raise the minimum tonnage requirement for which the intercoastal and foreign ships will call and thus works a hardship on our shippers. Grounding of vessels in the Vancouver area as listed in our letter of August 20, 1930, has increased the fears of shipping, naturally.
>
> Stern wheel tow-boats are called for by practically all the offshore carriers at a cost of from $75 to $125, more frequently the latter figure, and while assistance would still be necessary, particularly during times of swift current, the aggregate towing bill would be greatly reduced and many times would be eliminated entirely.
>
> During 1930, when lumber shipments were about 50 per cent of normal, 2,300,000 feet of lumber was lightered to Portland from Vancouver, not in small lots but in parcels that ships could and probably would have called for direct if the hazard of limited depth and width of channel were removed. A particular instance of this was on August 27, 1930, the *Sidney M. Hauptman*, drawing 26½ feet, refused to call at Vancouver for a lumber shipment and it had to be lightered to Portland.
>
> The tonnage available for direct handling at Vancouver to and from intercoastal and foreign ships and that now moves by truck, rail, or lighter to and from Portland, as stated by our shippers is:

	Tons
Lumber	4,100
Canned goods	16,925
Paper and pulp	3,325
Steel products	1,150
Plywood	1,125
Miscellaneous	315
Total	26,940

A low estimated cost of this is $1.25 per ton or a total of $33,675.

38. Shoaling of the Vancouver channel occurs annually as the summer freshet recedes. This shoaling is much less in recent years than it was before dikes were constructed, but the least depth referred to low water in 1929 was 21 feet and in 1930, 24 feet. The corresponding least depths available as affected by river stages were 24.7 feet for two weeks in 1929, and 26.5 feet for two weeks in 1930. Dredging in this channel is normally done to 2 or 3 feet overdepth, but on account of the length of channel which has to be dredged (about 3 miles) there is generally a short period before dredging is completed when full project depths are not available, but with the overdepth dredging there are about 11 months of the year when drafts of 26 feet can be accommodated.

39. The port of Vancouver, in letter of February 4, 1931, above quoted in part (par. 37) shows a total of 26,940 tons of freight, mostly canned goods, which are transferred to Portland for shipment at an estimated cost of $1.25 per ton ($33,675) for the reason that many of the intercoastal and foreign ships will not call at Vancouver. It is probable, however, that, even with greater channel depths and with turning basins, some of the shipments would still have to be transferred, so that the savings to shippers might not exceed half of the above figures.

40. A turning basin off the port dock would be of very material assistance to all vessels calling at Vancouver. It would reduce to a great extent the charges now made for tugs used to turn vessels around. During freshets in the Columbia, however, for a period of probably three months, tugs would still be needed for the larger vessels, as it would not be safe to try to turn above the railroad bridge in the distance available.

41. The aggregate savings which would benefit shippers of the port due to increased channel depth and provision of turning basins is accordingly estimated at $15,000 to $20,000 per annum. The depth necessary at low water to effect such savings would appear to be about 28 feet.

42. Since there is no use being made at present of the channel above the Interstate Highway bridge and no use in immediate prospect, it is thought this section should not be added to the project channel.

43. The principal need of the Vancouver channel at present is turning basins; one between the bridges and one below the lower bridge. The lower basin would be used during freshet stages when there would be difficulty in turning safely above the railroad bridge, and also by vessels docking below the railroad bridge. The upper turning basin would be the more valuable at the present time and would be used by nearly all vessels entering the port.

44. The cost of maintaining the present project channel is about $18,000 to $20,000 per annum. For a channel 28 feet deep and the turning basins proposed, maintenance costs would be greater, and for a 30-foot depth, as requested by the local interests, very much greater than at present. The first cost of a channel 30 feet deep would be much greater than for a 28-foot depth, as it would probably be necessary to construct additional spur dikes to rectify the river alignment for some distance above Vancouver. For a channel 35 feet deep and 500 feet wide the cost would be very high both for new work and maintenance.

The first cost of a 28-foot channel and turning basins would not be excessive and if the local interests would undertake to contribute half of this cost and $5,000 annually for maintenance, the cost to the United States over that of the present channel would be small.

45. It is the opinion of the district engineer that "The Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash.," is worthy of further improvement by the United States to the extent of providing 2 turning basins, 1 below the Interstate Highway Bridge and 1 below the railroad bridge at Vancouver, each 800 feet wide and 2,000 feet long, and to the extent of increasing the channel depth to 28 feet at low water, provided the port of Vancouver will pay one-half the first cost of such further improvement and contribute $5,000 annually for maintenance, but that the channel should not be extended upstream above the Interstate Bridge at Vancouver. An estimate of cost of such work is recommended. No field survey would be necessary as the data at hand are sufficient for the purpose of making an estimate and survey report.

OSCAR O. KUENTZ,
Major, Corps of Engineers,
District Engineer.

[First indorsement]

OFFICE DIVISION ENGINEER,
NORTH PACIFIC DIVISION,
Portland, Oreg., March 5, 1931.

THE CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The port of Vancouver, Wash., is located on Columbia River about 4½ miles above the mouth of Willamette River. Portland, Oreg., is located on the latter stream a few miles above its mouth and for several miles along that stream. By water the centers of Vancouver and Portland are about 15 miles apart; by air line the distance is much less, and, with the growth of Portland toward Vancouver (see vicinity map accompanying foregoing report) the two ports form, in effect, a single port area. No steps, so far as known, toward formation of a single port authority are contemplated, nor is consolidation likely to occur through local initiative, but the existing condition of proximity and competitive character of the ports should be recognized in planning works in this neighborhood to be paid for, wholly or in part, by the United States.

2. The port of Portland and the port of Vancouver have a resemblance to each other in this respect; each marks the upper terminus of deep water navigation on a branch waterway, the main stem being the Columbia from its mouth to the mouth of the Willamette. It is true that Vancouver is on the main Columbia, but only light draft traffic is carried on above that city, as is the case also on the Willamette above Portland.

3. Under the existing project, the cost of the improvement of the Columbia below the mouth of the Willamette is met in part by the port of Portland, through the furnishing to the United States of certain dredging plant at favorable terms and times and through acceptance of responsibility for removal of a bar in the Columbia at the mouth of the Willamette. No part of the cost of improvement of this section is met by Vancouver.

In the Willamette from its mouth up to and opposite Portland, that community is wholly responsible for creation and maintenance of a channel commensurate with that in the main Columbia to the sea.

In the Columbia between the mouth of the Willamette and Vancouver, that community was responsible for first cost of the present project, but not for maintenance.

4. The time appears to have arrived when cognizance should be taken of the conditions stated in paragraph 3 above; not to eliminate past discrimination for which there was acceptable reason, but to treat the two localities in future as part of the same port area served by the same main waterway.

5. From a local (Vancouver) point of view, the limited resources of that port are pleaded as reason for making the burden on that port light in the event its project is enlarged at its request.

From the Federal point of view further enlargement of the project should be seen as an improvement of the port facilities of the Portland-Vancouver area, and the limited resources of Vancouver and the past status of Vancouver as a pioneer port do not appear to be good reasons for Federal assumption of a larger share of the cost. The cost to the United States should be consistent with the national benefit, and that benefit should be viewed mainly as benefit derived from the improvement of the Columbia below the mouth of the Willamette.

6. The principle of assumption of all or part of the first cost of a project by the Federal Government and of maintenance by local interests should be considered whenever a project to benefit a single locality is being planned. If the project is worthy, the United States under the same conditions may properly extend aid to inaugurate the improvement; likewise, if the project proves to be worth while, those especially benefited may properly be expected to maintain it.

7. This condition obtains in the present instance. The United States is improving Columbia River below the mouth of the Willamette and maintaining that improvement. Portland and Vancouver have been benefited by the creation of the deep channel to that point. If further work is to be done in the Columbia to Vancouver, it is for Vancouver's benefit primarily. (Light-draft traffic beyond Vancouver needs no further work below Vancouver.)

8. The district engineer finds no present need of improvement of the river above the Interstate Bridge at Vancouver. The port authorities concede this, stating that their desire is that for the present an extension of about 1 mile be added to the project's geographical scope in anticipation of future needs. The division engineer concurs in the view of the district engineer that the project should continue to have its upstream end at the Interstate Bridge and no estimate of cost of an extension above the Interstate Bridge should be made.

9. The district engineer holds unnecessary even 30 feet of channel depth above the mouth of the Willamette, a depth reduced from 35 feet, the original request of local interests. He recommends 28 feet as a maximum for consideration. In this view the division engineer concurs.

10. The district engineer points out to the satisfaction of the division engineer the need of two turning basins. Such basins, if created, should have the same project depth as the ship channel.

11. The district engineer recommends that an estimate of cost of a 28-foot channel and two turning basins, 800 by 2,000 feet, be prepared, from survey data in hand. This is recommended by the division engineer also.

12. The district engineer suggests that the port of Vancouver pay one-half of the first cost and $5,000 annually thereafter for maintenance of the channel and basins. The division engineer favors total maintenance cost to be met by local interests; he reserves formulation of his view as to appropriate division of first cost until an estimate of cost of the proposed work has been made.

13. The division engineer further recommends that consideration in this instance of enlargement of the project dimensions of the channel in the Columbia above the mouth of the Willamette be based on the needs of improved waterway facilities in the Vancouver-Portland area, and not in the port of Vancouver alone; and that, in the survey report if made, this general situation be discussed and the recommendations be based on such general situation.

G. R. LUKESH,
Colonel, Corps of Engineers,
Division Engineer.

[Third indorsement]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., April 20, 1931.

The CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The board concurs with the district and division engineers in recommending a survey to determine the advisability and cost of improvement. Careful study should be given to the savings expected to result from the improvement and to the extent and nature of local cooperation to be required.

For the board:

HERBERT DEAKYNE,
Colonel, Corps of Engineers,
Senior Member.

REPORT OF THE DIVISION ENGINEER

SYLLABUS

The division engineer recommends modification of the existing project for the Columbia and lower Willamette Rivers below Portland, Oreg., and Vancouver, Wash., so as to provide for a channel 300 feet wide and 28 feet deep at low water between the mouth of the Willamette River and the Interstate Highway Bridge at Vancouver, together with two turning basins each 2,000 feet long, 800 feet wide and 28 feet deep at low water, all at an estimated additional cost of $57,000 for new work and $13,000 per annum for maintenance. In the opinion of the division engineer, no provision should be made at this time for a ship channel above the Interstate Highway Bridge at Vancouver, nor for realignment along the Washington shore of the present ship channel below the railroad bridge at Vancouver.

WAR DEPARTMENT,
OFFICE OF THE DIVISION ENGINEER,
PACIFIC DIVISION,
San Francisco, Calif., December 22, 1931.

Subject: Survey of Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash.

To: The Chief of Engineers, United States Army.

1. Preliminary examination and survey of the stretch of the Columbia River in question was authorized by the river and harbor act approved July 3, 1930. Report on the preliminary examination was made under date of February 25, 1931, and a survey was ordered by the Chief of Engineers under date of April 20, 1931. The survey has been made by the district engineer and his report thereon is herewith.

2. Vancouver, Wash., is situated at the head of deep-water navigation on the Columbia River, about 104 miles from the sea, and 4½ miles above the mouth of the Willamette River. The locality is shown on United States Coast and Geodetic Survey charts 6154 and 6155 and on the map accompanying the district engineer's report. In front of Vancouver the natural river width is about 3,000 feet, with depths varying from about 10 to 28 feet at low water. The low-water flow in this stretch of river is about 70,000 second-feet. During annual freshets, occuring ordinarily in May, June, and July, the river rises to an average crest height of about 21 feet, at which time the discharge is estimated at 680,000 second-feet. At low-water stages the tidal rise and fall varies from about 1.5 to 2.5 feet. Two bridges cross the Columbia at Vancouver. At the upper end of the harbor, above the municipal dock, is the Interstate Highway Bridge. This bridge has a lift span with horizontal clearance of 200 feet and vertical clearance of 175 feet. About 4,500 feet below the highway bridge, and downstream of the port terminal facilities, there is a double-track railroad bridge with a swing draw, each opening being 200 feet wide in the clear.

3. The existing project for the Columbia and lower Willamette Rivers below Portland, Oreg. and Vancouver, Wash., provides for a channel 300 feet wide and 25 feet deep at low water between the mouth of the Willamette River and Vancouver, subject to the provision that "local interests shall pay for the first cost of dredging the channel, estimated at $30,000, and for such dike construction, to an amount not to exceed $93,000, as may be found necessary for economical maintenance, the contributed funds to be made available at the rate of $20,000 per year until the work is completed." The channel was dredged to full project dimensions in 1926 and since that time eight new dikes have been constructed in connection therewith, all at a cost of $92,000 which was borne by the port of Vancouver. The average annual cost to the United States for maintenance dredging has been about $22,000. Prior to the adoption of the existing project, although not required to do so by law, the port of Vancouver has contributed $42,400 toward dredging and dike construction. It is further obligated to pay $16,000 for additional dikes under the existing project.

4. Local interests desire that there be provided and maintained, at Federal expense, a channel 300 feet wide and 30 feet deep at low water, from the mouth of the Willamette River to a point 1 mile above Vancouver, with two turning basins 800 feet wide, one of the latter to be located below the railroad bridge and the other between the railway and highway bridges. Local interests also desire that the channel below the railroad bridge be placed along, or near, the Washington shore.

5. Vancouver is the only town on the stretch of the Columbia River under consideration. Its population, 1930 census, was 15,766. There are four banks with deposits of about $5,000,000. The tributary area is extensive and productive. The principal industries consist of the manufacture of lumber, shingles, sash and doors, brooms, furniture, woolens, patterns, butter, pulp, and paper. Farm products produced locally consist of fruit, potatoes, grain, and livestock. There are three large packing plants for putting up fruit and vegetables.

6. The main-line railroads extending up the Columbia River Valley to the east, north to Puget Sound points, and south to California, all pass through Vancouver. A branch line used principally for logging extends north into the tributary area of the port. High-class paved highways parallel the main railroad lines. The Pacific Highway, extending north and south through the United States, crosses the Columbia River on the Interestate Highway Bridge at Vancouver and the Evergreen Highway extends to the east through the Columbia River gorge. There are numerous paved highways extending into the country immediately tributary to Vancouver.

7. In 1922 the city of Vancouver constructed just south of the highway bridge an open wharf 1,000 feet long by 125 feet wide with railroad connections for shipment of lumber brought to the port by rail. In 1925 this wharf was extended about 200 feet in length and equipped with a transit shed for handling canned goods, paper pulp, and general cargo. The Du Bois Lumber Co. has a wharf above the railroad bridge with about 350 feet of river frontage. Below the railroad bridge, the Du Bois-Matlack mill has a wharf with a river frontage of about 400 feet. A belt-line railroad connects these facilities with the main lines and is used jointly without switching charges. Handling charges for the city dock are the same as those for Portland and other coast ports.

8. Ocean shipments outbound consist principally of lumber, paper products, and canned goods; inbound, of sugar and sulphur. Local water-borne traffic consists mainly of rafted logs. The tonnage handled by ocean-going vessels through the port of Vancouver increased from 67,521 tons in 1925 to 117,204 tons in 1926, the first year under the 25-foot project. By 1929 this tonnage had increased to 153,160 tons and there were reported 12 ships with drafts of from 26 to 28 feet and 18 ships with drafts in excess of 24 feet. The average annual increase for the 7-year period 1923–1929, inclusive, was about 17,500 tons. Due to the current business depression, tonnage at Vancouver for 1930, as well as at all other Pacific coast ports, took a decided drop, but it should return to the 1929 level of over 150,000 tons, with the restoration of normal business conditions. Recently, Vancouver has been granted terminal rail rates the same as those for Portland from interior points. The Fletcher Oil Co. has just com-

pleted a 25,000-barrel gasoline tank at the port, and other oil companies are expected to follow this lead. Vancouver is well situated as to rail connections, and there is ample space for industrial growth and shipping facilities below the railroad bridge. With a deeper ship channel and adequate turning basins it is safe to assume that the water-borne commerce of the port will continue to grow at the same healthy rate that prevailed between 1923 and 1929. In other words for the next 25 years it should average well over 200,000 tons per year.

9. Records show that since 1925 eight vessels were grounded near Vancouver, the time thus lost per vessel varying from a few hours to as much as four days. Ships of deeper draft calling at the port do not ordinarily attempt to turn around but are towed downstream stern foremost at a cost of from $75 to $125 per ship. On account of these conditions certain steamship lines refuse to call at the port and about 20 per cent of the potential Vancouver tonnage is transferred to Portland for reshipment at considerable extra expense. There also results a depression in Vancouver lumber prices which causes a considerable loss to local interests. Enlarged channel dimensions and turning basins would reduce danger from grounding, eliminate most of the towing charges, and thus stimulate interstate and foreign commerce. Part of the tonnage now transferred to Portland for reshipment would be loaded direct at Vancouver, eliminating the present cost of transfer. It is estimated by local interests that the freight thus affected would total 30,000 tons, under normal conditions, and that the annual saving would be $37,500. The loss to local interests due to depression of lumber prices on account of inadequate channel depths and turning facilities can not be accurately evaluated but probably amounts to several thousand dollars per year.

10. The district engineer's report herewith contains a discussion of the engineering and economic considerations connected with the proposed improvement in the light of the information developed by the survey. The district engineer points out that since there are no industries or terminals now located above the interstate highway bridge, channel improvement in this stretch of the river is manifestly not justified at this time. Also that, while increased depths in the channel leading to Vancouver are desirable, adequate turning basins are the greatest need of the port. It is stated that the maintenance of a depth of 30 feet in the channel and turning basins will require expensive dike construction in addition to dredging, but that a depth of 28 feet can be maintained by dredging without extending the present dike system. Estimates of costs for channels 300 feet wide and 28 and 30 feet deep, respectively, each with suitable turning basins, one basin above and the other below the railroad bridge (see map), are given as follows:

Channel location	28-foot depth		30-foot depth	
	New work	Maintenance	New work	Maintenance
On present alignment	$57,000	$35,000	$160,000	$50,000
Along Washington shore below railroad bridge	183,700	50,000	251,000	60,000

From the above estimates the district engineer concludes that the cost of a channel and turning basins 30 feet deep are out of proportion to the benefits to be expected. Also that the cost of a channel and turning basin 28 feet deep, if the channel below the railroad bridge is located along the Washington shore, will be prohibitive. The district engineer believes that a channel along the present alignment, with turning basins, all 28 feet deep, would be economically justified, and probably would be sufficient to accommodate practically all vessels which might want to call at Vancouver for many years to come, but since a large part of the benefits in reduced transportation charges would accrue to local interests, the latter should bear the increased cost of maintenance. Accordingly, the district engineer recommends the provision of a channel 300 feet wide and 28 feet deep at low water from the mouth of the Willamette River to the Interstate Highway Bridge at Vancouver with two turning basins, each 800 feet wide and 2,000 feet long, all at an estimated cost for new work of $57,000, provided local interests contribute $13,000 per annum to cover the estimated increased cost of maintenance. If cooperation is not provided on this basis, the district engineer further recommends that the channel depth be left at 25 feet, but that two turning basins be provided at this depth at an estimated cost to the United States of $10,000 for original work and $4,000 per annum for maintenance.

11. I concur in the views of the district engineer except in the matter of local cooperation. It is considered unwise to make the upkeep of a Federal project dependent upon annual cash contributions by local interests. Such a procedure usually results in unending arguments and lack of project depth at the time it is most badly needed. The port of Vancouver has already contributed $134,000 toward channel improvement and is obligated to make an additional contribution of $16,000 under the provisions of the existing project. Further local cooperation at this time is not to be expected. The United States is maintaining the present inadequate channel to Vancouver at an annual cost of about $22,000 and will, it is believed, be justified in spending an additional $13,000 per year to give the deeper draft vessels plying the Columbia River free and easy access to the port. I therefore recommend modification of the existing project for the Columbia and lower Willamette Rivers below Portland, Oreg., and Vancouver, Wash., so as to provide for a channel 300 feet wide and 28 feet deep at low water from the mouth of the Willamette River to the Interstate Highway Bridge at Vancouver, together with two turning basins each 2,000 feet long, 800 feet wide and 28 feet deep at low water, all at an estimated additional cost of $57,000 for new work and $13,000 per annum for maintenance.

12. Except as discussed in the above report there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

THOMAS M. ROBINS,
Lieutenant Colonel, Corps of Engineers,
Division Engineer.

REPORT OF THE DISTRICT ENGINEER

SYLLABUS

The district engineer is of the opinion that improvement of "Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash.," is justified to the extent of increasing the present channel depth to 28 feet, and providing two turning basins, each 800 feet wide and 2,000 feet long, provided local interests will agree to contribute annually $13,000, the estimated increased cost of maintenance. The work proposed should be considered as a modification of the existing project for "Columbia and Lower Willamette Rivers below Portland, Oreg., and Vancouver, Wash." No provision should be made for a ship channel above the Interstate Highway bridge. Estimated cost of the work proposed is $57,000 for original work and $35,000 annually for maintenance.

WAR DEPARTMENT,
OFFICE OF THE DISTRICT ENGINEER,
Portland, Oreg., December 3, 1931.

Subject: Survey of Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash.

To: The Division Engineer, Pacific division, San Francisco, Calif.

1. In accordance with recommendation of the Board of Engineers for Rivers and Harbors, under date of April 20, 1931, and with instructions contained in department letter of April 22, 1931, the following report of survey of Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash., is submitted. A hydrographic map covering the section of the river named accompanies this report.

2. A report on preliminary examination of Columbia River between the mouth of the Willamette River and a point 1 mile above the city of Vancouver, Wash., was submitted February 25, 1931. The preliminary report contains data which pertain to original conditions of the stretch of river under consideration, previous examinations and surveys, previous projects, railways, terminal facilities, adjacent ports, and details of delays to vessels at Vancouver, which are not repeated in this report.

GENERAL DESCRIPTION

3. Vancouver, Wash., is situated on the Columbia River about 104 miles from the sea and 4½ miles above the mouth of the Willamette River. The drainage area of the Columbia is about 259,000 square miles. In front of Vancouver the natural river width is about 3,000 feet, with depths of water varying from about 10 to 28 feet at low water. The banks, about 20 feet high, are of sandy loam along Hayden Island (see map), while on the Washington shore there is a fairly stiff clay substratum under the top soil. The bottom is principally coarse sand, with an area of clay and gravel along the Washington side below the Spokane, Portland & Seattle Railway bridge. Land along the banks of the river is devoted to dairying and fruit raising, with general farming and timbering in the territory back from the river, in the State of Washington. Hayden Island, which has a heavy growth of willow and cottonwood brush, is not used to any extent, except for an area near the east end where there is a pleasure resort. The locality is shown on Coast and Geodetic Survey Charts Nos. 6154 and 6155 and map submitted herewith.

4. The low-water flow of the Columbia River past Vancouver is about 55,000 second-feet, in addition to about 15,000 second-feet which passes down Oregon Slough on the southwest side of Hayden Island. During annual freshets, occurring ordinarily in May, June, and July, the river rises to an average crest height of about 21 feet, at which time the discharge is estimated at 543,000 second-feet, in addition to about 137,000 second-feet carried by Oregon Slough. At low-water stages the tidal rise and fall at Vancouver varies from about 1.5 to 2.5 feet for neap and spring tides, respectively. The water is generally low during the fall and winter months and high in the spring and summer. The rise is due principally to melting snows in the interior. Floating ice in the winter at times obstructs the movement of river craft, but is rarely heavy enough to interfere with the movement of ocean-going vessels. The ice generally lasts for 10 days, but may occur more than once during the winter. The Interstate Highway bridge obstructs the movement of ice floes, so that, above the bridge, the ice is sometimes packed to a depth of several feet.

5. Two bridges cross the Columbia at Vancouver. At the upper end of the harbor, above the municipal dock, is the Interstate Highway bridge. This has a lift span with clear horizontal opening of 200 feet and vertical clearance of 175 feet at low water. There is at present no ocean-borne traffic through or above this bridge. About 4,500 feet below the highway bridge and below the existing port terminal facilities, a double-track railroad bridge crosses. This bridge has a swing draw with two openings, each 200 feet in width. The Northern Pacific, Great Northern, Spokane, Portland & Seattle, and Oregon-Washington Railroad & Navigation Co. all use this bridge.

6. Vancouver, Wash., is the only town on the stretch of the Columbia River under consideration. It is located about 4½ miles above the mouth of the Willamette River and is the head of deep-water navigation on the Columbia River. The population of Vancouver, 1930 census, was 15,766. There are four banks, with deposits of about $5,000,000.

7. There is a fertile and resourceful territory tributary to Vancouver. The principal industries consist in manufacture of lumber, shingles, sash and doors, brooms, furniture, woolens, patterns, butter, pulp, and paper. Farm products produced locally consist of fruit, potatoes, grain, and livestock. There are three large packing plants for putting up fruit and vegetables.

COMMERCE

8. The tabulation following shows tonnage and values of maritime shipments for the port of Vancouver for the period 1921 to 1930:

Year	Handled by ocean-going vessels		Handled by inland river vessels		Total [1]		Rafted timber	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value
1921	3,295	$30,540	6,738	$254,224	10,033	$203,764	10,000	$75,000
1922	9,214	119,782	12,632	246,174	21,846	365,956	20,000	195,000
1923	30,035	658,304	9,058	73,176	39,093	731,470	46,008	445,626
1924	20,546	297,508	10,441	341,072	30,987	638,580	67,086	553,460
1925	67,521	965,070	10,975	289,035	78,496	1,254,105	96,000	744,000
1926	117,204	1,774,494	7,000	5,250	124,204	1,779,744	128,000	1,024,000
1927	145,284	2,010,106	4,800	86,895	150,084	2,097,001	315,190	1,261,453
1928	159,491	3,473,940	16,555	12,416	176,046	3,486,365	443,827	1,776,091
1929	153,160	3,058,876	5,436	5,436	158,596	3,064,312	509,790	2,039,196
1930	95,604	3,040,479	4,920	5,760	100,524	3,046,239	320,000	1,120,000

[1] Exclusive of rafted timber.

9. Number of trips, types, and drafts of vessels calling at the port of Vancouver are shown in tabulations below, for the calendar year 1930:

Ocean-going vessels

Draft in feet	Trips inbound			Trips outbound			Cumulative total, outbound, above smaller draft shown
	Steamer	Motor vessels	Total	Steamer	Motor vessels	Total	
26 to 28	0	0	0	4	0	4	4
24 to 26	8	0	8	12	0	12	16
22 to 24	9	0	9	14	2	16	32
20 to 22	14	1	15	14	1	15	47
18 to 20	35	2	37	47	3	50	97
16 to 18	40	3	43	47	2	49	146
14 to 16	48	2	50	38	0	38	184
12 to 14	38	0	38	30	0	30	214
10 to 12	22	0	22	8	0	8	222
	214	8	222	214	8	222	
Net registered tonnage	569,200	24,096	593,296	569,200	24,096	593,296	

Internal river vessels

Draft in feet	Trips inbound				Trips outbound			
	Steamer	Motor vessels	Barges	Total	Steamer	Motor vessels	Barges	Total
2 to 8	320	12	12	344	320	12	12	344
Net registered tonnage	48,960	720	960	50,640	48,960	720	960	50,640

10. Ocean shipments outbound are principally lumber, paper products, and canned goods; inbound, sugar and sulphur. Internal traffic is principally in rafted logs, as shown in the tabulations below for the year 1930.

	By commodities	By classes	Value
FOREIGN			
Exports:	*Tons*	*Tons*	
Vegetable food products—Flour	10	10	$150
Wood and paper—Lumber and lath	4,072	4,072	52,936
Total	4,082	4,082	53,386
Imports: None.			
DOMESTIC			
Receipts, coastwise:			
Vegetable food products		1,727	153,270
Canned goods	25		
Meal	112		
Sugar	1,590		
Wood and paper		902	124,918
Paper and paper goods	305		
Roofing	229		
Wood pulp	278		
Nonmetallic minerals		3,079	117,065
Asphalt	100		
Glassware	40		
Sulphur	2,939		
Ores, metals, and manufactures of—Iron and steel, manufactured	369	369	32,240
Chemicals—All other	631	631	41,015
Unclassified—Merchandise	353	353	42,390
Total	7,061	7,061	510,868

	By commodities	By classes	Value
Shipments, coastwise:			
Vegetable food products		3,579	$710,412
Canned goods	3,547		
Fruits and vegetables	22		
Hay	10		
Wood and paper		80,746	1,745,813
Lumber and manufactures of	66,533		
Paper	4,730		
Wood pulp	9,483		
Ores, metals, and manufactures of—Iron and steel, manufactured	32	32	1,280
Unclassified—Merchandise	104	104	18,720
Total	84,461	84,461	2,476,225
Grand total, coastwise	91,522	91,522	2,987,093
Internal, combined receipts and shipments:			
Wood and paper—Logs, rafted	320,000	320,000	$1,120,000
Nonmetallic minerals—			
Sand and gravel	2,520	4,920	5,760
Stone	2,400		
Total	324,920	324,920	1,125,760

SUMMARY

Classes of commodities	Foreign exports	Coastwise		Internal	Total
		Receipts	Shipments		
	Tons	*Tons*	*Tons*	*Tons*	*Tons*
Vegetable food products	10	1,727	3,579		5,316
Wood and paper	4,072	902	80,746	320,000	405,720
Nonmetallic minerals		3,079		4,920	7,999
Ores, metals, and manufactures of		369	32		401
Chemicals		631			631
Unclassified		353	104		457
Total	4,082	7,061	84,461	324,920	420,524

EXISTING PROJECT

11. The existing project for the improvement of the section of Columbia River between the mouth of Willamette River and Vancouver, Wash., was authorized by the river and harbor act of March 3, 1925, and provided for a channel 300 feet wide and 25 feet deep at low water. The project for this section of Columbia River has been combined with the project for improvement of the Columbia and lower Willamette Rivers below Portland by the river and harbor act of July 27, 1916, and the channel to Vancouver has been maintained under the project title Columbia and Lower Willamette Rivers below Portland, Oreg., and Vancouver, Wash. The channel is maintained by dredging and by 11 spur dikes, 8 of which have been constructed since 1925. Maintenance dredging in July and August, 1930, cost approximately $18,000; and in August and September, 1931, $24,150. About 474,000 cubic yards of material were moved in 1930, and the same amount in 1931. The controlling depth between the mouth of the Willamette and Vancouver is about 26 feet.

PRESENT CONDITION

12. The channel was dredged under the existing project to full dimensions in the fiscal year 1926, at a cost of $15,580, and eight new dikes have been constructed at a cost of about $74,808. The cost of the above was borne by the port of Vancouver. Maintenance dredging is done annually by the United States from Federal funds.

13. Annual freshets cause shoaling to depths of 21 to 24 feet at several points throughout the whole length of channel. A draft of 24 feet is practicable from August to October; 25 feet from November to March; and 27 feet from April to July. Shoals resulting from annual freshets are removed by the annual maintenance dredging.

14. Under the existing project freight handled by ocean-going vessels at the port of Vancouver increased from 67,521 tons in 1925 to 153,160 tons in 1929. Freight for 1930 dropped to 95,604 tons, due mainly to a decrease in lumber movement. Inland river traffic has not increased. Moderate-draft vessels can now reach Vancouver at any time, when formerly they had to wait for tides and, at times, after the summer freshets, before dredging was done could not reach Vancouver at all.

DESIRES OF LOCAL INTERESTS

15. Former requests by the port of Vancouver, Vancouver Chamber of Commerce, and local industries were based on channel width of 500 feet and depth of 35 feet between the mouth of the Willamette and Ryan Point, the latter being located about 1.5 miles upstream from Vancouver. Two turning basins 800 feet wide were also requested, one to be located below the railway bridge and the other between the railway and highway bridges. Later requests by the above interests are for a channel 300 feet wide and 30 feet deep at low water, from the mouth of the Willamette to a point 1 mile above Vancouver, with two turning basins. The local interests are also desirous of having the channel below the Spokane, Portland & Seattle Railway bridge placed along or near the Washington shore. The following is quoted from letter of the port of Vancouver dated September 26, 1931, to show their desires in this regard:

> In your consideration of the deeper channel between Vancouver and the mouth of the Willamette River, covering which we understand you will make a report and recommendation in the near future, we ask that you would please bear in mind the fact that sometime in the near future the channel will have to be brought in much nearer to the Washington shore below the Spokane, Portland & Seattle Railway bridge.
>
> There is certain to be a development of terminals and industries along the Washington shore below the Spokane, Portland & Seattle Railway bridge, and this development will be retarded, if not completely blocked, as long as the main channel remains in its present location to the opposite side of the river.
>
> This condition is, of course, obvious, but we wish to stress it at this time as it is constantly being brought to our attention by ship operators, captains, and pilots, that future ocean terminals should by all means be located below the railway bridge.
>
> We hope that you will give this point very serious consideration in formulating your report.

EFFECT OF DESIRED IMPROVEMENT

16. Under present conditions certain steamship lines do not make Vancouver a port of call, and some vessels of deeper drafts calling have experienced difficulty in turning around. Records show that

eight vessels were grounded near Vancouver in the period from December, 1925, to December, 1929. No groundings were reported in 1930 or 1931. Time lost due to grounding varied from a few hours to as much as four days. Vessels of deeper draft do not ordinarily attempt to turn around before proceeding downstream but are towed downstream stern foremost at an expense of from $75 to $125 for each vessel. About 20 per cent of the Vancouver tonnage is transferred to Portland for reshipment on account of ships refusing to enter Vancouver Harbor.

17. Enlarged channel dimensions and turning basins would facilitate navigation by the larger vessels and probably stimulate the movement of freight through the port. Most of the delays due to grounding would be eliminated. Towing charges would be decreased, although the longer boats probably would be unable to turn around above the railroad bridge during high stages of the river and would still be subject to a towing charge during that period. Part of the tonnage now transferred to Portland for reshipment would be loaded direct at Vancouver, eliminating the present cost of transfer. It is estimated by the port of Vancouver that the tonnage thus affected would total 30,000 tons, under normal conditions, and that the annual saving would be $37,500.

18. Additional savings to lumber shippers by a deeper channel probably would result from the elimination of the possibility of depression of lumber prices by brokers, who cite the difficulty of persuading ships to enter the present channel as a justification of price depression. It is known that this evil exists. Actual annual savings from this source can not be estimated from statistics at hand but would probably amount to several thousand dollars.

WORK CONSIDERED

19. Turning basins are believed to be the greatest need of the present channel improvement. At low water vessels have difficulty in turning and many have to employ towboats, even when the current is slack. During high water (freshets) the assistance of a tug will probably be necessary to turn above the railroad bridge, even with a turning basin. Turning basins are considered essential to any further channel improvement, and are included in the estimates.

20. A channel width of 300 feet on the straight reaches of the channel is considered sufficient for the present volume of commerce, and is used in the estimates.

21. For the purpose of estimating costs, the work under consideration in this report is divided under three headings:

(A) A channel 300 feet wide along the present location, extending from mouth of Willamette River to the Interstate Bridge (about 5 miles) with two turning basins, for both 28 and 30 feet depths.

(B) A channel 300 feet wide on a location extending along the Washington side of river below the railroad bridge, from mouth of Willamette River to the Interstate Bridge (about 5 miles), with two turning basins, for both 28 and 30 feet depths (channel B, see map).

(C) A channel 300 feet wide extending 1 mile upstream from the Interstate Bridge, for depths of 28 and 30 feet.

22. Work under (A) would involve deepening of the present channel from a depth of 25 feet to 28 or 30 feet, as the case may be, and

providing two turning basins 800 feet wide, as indicated on the map herewith. This improvement would require dredging 950,000 cubic yards for a 28-foot depth and 1,500,000 cubic yards for a 30-foot depth. The cost of dredging would be $57,000 and $90,000, respectively.

23. It is thought, however, that in order satisfactorily to maintain a 30-foot depth it would be necessary to construct six or more dikes in the stretch of about 4 miles above the Interstate Bridge in order to rectify to some extent the river alignment upstream from the improved channel and throw more of the flow along the water front at Vancouver. Such works would also check part of the flow now passing down North Portland Harbor on the southwest side of Hayden Island. A check dam in this latter channel might be found to be necessary but is not included in the estimates. The regulating works (dikes) above referred to are estimated to cost $70,000, which, added to the cost of dredging for a 30-foot depth, would make the total first cost $160,000. It is thought a 28-foot depth of channel, 300 feet wide, could economically be maintained without further dike construction than that now being completed under the existing project. The annual cost of maintenance work is estimated at $35,000 for a 28-foot depth, and $50,000 for a 30-foot depth.

24. Under (B) (a channel along the Washington shore with two turning basins) excavation for a 28-foot depth of channel 300 feet wide would amount to 2,520,000 cubic yards of sand and 325,000 cubic yards of clay and gravel. Estimating sand excavation at 6 cents, and clay and gravel at 10 cents, the total first cost amounts to $183,700.

25. For a 30-foot depth, additional dikes as estimated under (A) above would also be necessary, and the total first cost would be $321,000. Annual maintenance work on this channel is estimated at $50,000 for a 28-foot depth and $60,000 for a 30-foot depth.

26. Under (C) a channel 300 feet wide and 28 feet deep, extending upstream 1 mile from the Interstate Bridge, would require 180,000 cubic yards of excavation and the construction of contraction dikes. The total first cost for this section would be $50,800. For a 30-foot depth in this same section the cost would be $89,800. This latter figure would include the construction of regulation dikes upstream for rectification of channel alignment as discussed under (A) above. Annual maintenance is estimated at $10,000 and $12,000 for 28 and 30 foot depths, respectively.

27. Local interests admit that there is no need at present for a ship channel above the Interstate Bridge. There are no industries or shipping facilities located there, and channel improvement at this time manifestly could not be justified. It may also be noted (see map) that 3,600 feet of the river frontage above Vancouver is occupied by the United States military reservation (Vancouver Barracks) and that the frontage available to the public would be very limited. Further consideration of the section 1 mile above Vancouver will accordingly not be necessary in this report.

28. Estimated costs of the work as outlined above, on the basis of 6 cents per cubic yard for sand and 10 cents for clay and gravel, are summarized below:

Summary of cost estimates

	28-foot depth			30-foot depth		
	Sand	Clay and gravel	Cost	Sand	Clay and gravel	Cost
	Cubic yards	*Cubic yards*		*Cubic yards*	*Cubic yards*	
(A) Channel 300 feet wide, mouth of Willamette to Interstate Bridge, present location, with 2 turning basins (5 miles)	950,000		$57,000	1,500,000		90,000
Dike construction						70,000
Total			57,000			160,000
(B) Channel along Washington shore, same length as (A), with turning basins	2,520,000	325,000	183,700	3,100,000	170,000	251,600
Dike construction						70,000
Total			183,700			321,000

Summary of annual costs

	28-foot depth			30-foot depth		
	Maintenance	Interest	Total	Maintenance	Interest	Total
(A) Present channel location with 2 turning basins	$35,000	$2,280	$37,280	$50,000	$6,400	$56,400
(B) Channel along Washington shore with 2 turning basins	50,000	7,348	57,348	60,000	12,840	72,840

LOCAL COOPERATION

29. While local interests are unanimously in favor of channel improvement of Columbia River between the mouth of the Willamette and Vancouver, it is not probable that financial cooperation can be secured.

30. The port of Vancouver, in letter of February 4, 1931, offered to assume the initial expense of dredging the channel to the 30-foot depth, with two turning basins, provided that the United States bear the cost of all future maintenance. In letter of April 25, 1931, the port stated that it was the view of its taxpayers that they should not be called upon for further contributions, but that the Federal Government should finance the proposed new project and maintain it at its own expense. This statement was repeated in letter of October 20, 1931. The port of Vancouver has contributed $14,900 for dredging not under a Federal project, $27,500 for dredging and dikes under previous projects but not required by law, and $92,000 for dredging and dikes under the present project, a total of $134,400. It is further obligated to pay $16,000 for additional dikes under the present project. The possibility of further cooperation from the local interests appears to be remote.

POWER, FLOOD CONTROL, AND RECLAMATION

31. There are no possibilities of water power, flood control, or reclamation development in connection with the work described in this report.

DISCUSSION

32. Reference to paragraph 9 shows that during the calendar year 1930 there were four ships outbound from Vancouver with drafts of 26 to 28 feet, and a total of 16 with drafts of 24 feet and over, out of a total of 222 outbound trips.

33. It is customary in dredging channels in this vicinity to work to an overdepth of about 2 feet on all maintenance work to allow for a certain amount of shoaling before dredging is again necessary. The dredging on this channel is done following the summer freshet and is normally completed before the river reaches a low stage in the late fall and winter. The low-water period at Vancouver normally extends from the latter part of September to February, inclusive. The river stage may approach zero at any time during this period, but the average daily mean of a period of 40 years is about 3 feet during these months. The tidal variation at low-water stage is from 1½ to 2½ feet. There are two tides every day.

34. Probably the greatest handicap of the port of Vancouver in the past has been the lack of turning basins. It is thought this, rather than lack of depth in the channel, has been the reason some ship operators have declined to send their ships to the port.

35. In 1930 there were 4 ships outbound with drafts of 26 to 28 feet, and 16 which had drafts in excess of 24 feet. During 1929, with normal movement of tonnage, there were reported 12 ships with drafts of 26 to 28 feet and 18 in excess of 24 feet.

36. It is apparent that a much greater number of the deeper-draft vessels could have used the port with existing channel depth, but all the vessels of deep draft have difficulty turning around. Two turning basins are considered to be essential to a proper handling of vessels. One should be located at the upper end of the improvement, just below the Interstate highway bridge, to facilitate the turning of vessels during low stages of the river, and the other just below the railroad bridge, to accommodate vessels unable to turn above this bridge during strong freshets when the current velocities are high. The lower basin would be adjacent to the Washington shore and would provide deep water for industries in that vicinity. These basins should be provided, even if the channel project depth were not increased.

37. It is claimed by the port of Vancouver and other interests that a 30-foot depth would encourage increased shipping and result in additional savings over the savings estimated above. The rate of such increase is problematical. A 40 per cent increase of the estimated tonnage transferred to Portland under normal conditions for reshipment would justify annual charges of $56,400 for the 30-foot channel depth. Tonnage handled by ocean-going vessels through the port of Vancouver increased from 67,521 tons in 1925 to 117,204 tons in 1926 (par. 7), the first year under the 25-foot project. The average annual increase for the 7-year period 1923–1929, inclusive, was about 17,500 tons. Tonnage for 1930 dropped to 95,604 tons, due to stagnation in the lumber industry, but may return at least to the 1928 and 1929 level (over 150,000 tons) with the restoration of favorable business conditions. It is to be noted, as an indication of increased commerce that may be expected at the port of Vancouver, that the Fletcher Oil Co. has recently completed a 25,000-barrel gasoline tank

at Vancouver. Other oil companies are expected to follow this lead. One tanker has already made delivery at Vancouver, but the draft is reported by pilots' association to have been only about 22 feet.

38. The amount of savings to the public which would result from increased channel depths is estimated by local interests at $37,500 per annum, based on the cost of transfer of 30,000 tons between Vancouver and Portland for shipment. Under the present condition of the market, and reduced tonnage, the amount probably is much less. Whether all of this saving would be effected with increased channel depths appears problematical, as doubtless there still would be many small shipments for which the larger steamers would not make the trip to Vancouver. Regular line boats on scheduled calls probably would increase in number with a deeper channel, and accordingly would pick up much of the freight which now is transferred by truck or lighter, but there would be many shipments destined to points to which there was no regular service at the time desired. A large steamer, the time of which is valued at $1,000 per day, could not afford to make a special trip to pick up, say 100 tons, which could be transferred to shipside for $125. It would be more economical for the ship to absorb the transfer charge. Many shipments no doubt are of less than 100 tons.

39. It may accordingly be assumed that with the return of normal business conditions and normal rate of increase which obtained prior to 1928, the savings estimated by local interests are all that may be expected for several years.

40. Local interests have asked for an increase in channel depth to 30 feet. The annual carrying charge for such a channel on the present location, with two turning basins, is estimated at $56,400 per annum for maintenance and interest on first cost. For the economical maintenance of such a channel, the river alignment upstream should be changed as indicated on the small chart marked "Alignment chart" on the map accompanying this report, and more of the low-water flow forced down the main channel and closer to the Vancouver water front. There is even some doubt as to the efficacy of this plan, and it might be found necessary to place a check dam in North Portland Harbor to control the flow in that channel. The estimated cost of new dike work and dredging for a 30-foot depth is $160,000. It does not appear that the expenditure of this amount for original work and $56,400 annually for interest and maintenance can be justified by the savings to be effected.

41. Estimates of cost of a channel along the Washington shore below the railroad bridge, with two turning basins, as desired by local interests, are shown (par. 28) to be $183,700 for a 28-foot depth and $321,000 for a 30-foot depth. Maintenance is estimated at $50,000 and $60,000 per annum, respectively. On the basis of present or reasonably prospective commerce, a channel in this location can not be justified, and it is believed that the proposed lower turning basin will give access to the shore sufficient for some time.

42. Increasing the present channel depth to 28 feet and providing two turning basins, as indicated on the map, is estimated to cost $57,000 for original work and $37,280 annually for interest and maintenance (par. 28). It is thought that this depth may be obtained and maintained without the construction of additional dikes.

43. A 28-foot depth with turning basins probably would be sufficient to accommodate practically all steamers which might want to call at Vancouver for many years. Reference to statistics for Portland, with a 30-foot channel, in 1929, shows 161 steamers with drafts from 26 to 28 feet, and 52 in excess of 28 feet. Portland's commerce was about 6,000,000 tons. Assuming a simple ratio, with a tonnage of 150,000, Vancouver would have had four steamers of 26 to 28 feet draft and possibly one steamer of over 28 feet draft had the channel depth been 30 feet. Records show that she had four steamers of 26 to 28 feet draft in 1930, theoretically the proper number for the tonnage handled, and this with a 25-foot project depth. This indicates that the number of deep-draft vessels probably would not have been greatly increased even with a 30-foot channel.

44. Vancouver recently has been granted terminal rail rates the same as apply to Portland from interior points, and it is likely that the commerce of the port will grow. It is well situated as to rail connections and there is ample space for industrial growth and shipping facilities below the railroad bridge.

45. Further improvement of the present channel appears desirable, especially as to the provision for turning basins, but since a large part of the benefits in reduced transportation charges would accrue to local interests, it appears that the increased cost of maintenance should be borne by local interests.

RECOMMENDATION

46. The district engineer recommends modification of the existing project for the Columbia and lower Willamette Rivers below Portland, Oreg., and Vancouver, Wash., so as to provide for a channel 300 feet wide and 28 feet deep at low water from the mouth of Willamette River to the Interstate Highway Bridge at Vancouver, a distance of 5 miles, with two turning basins, each 800 feet wide and 2,000 feet long; provided local interests at Vancouver contribute $13,000 per annum to cover the estimated increased cost of maintenance.

47. If cooperation is not provided on the above basis, it is recommended that the channel depth be left at 25 feet, but that two turning basins be provided at this depth, at an estimated cost to the United States of $10,000 for original work and $4,000 per annum for maintenance.

48. Funds to the amount of the estimated cost of any modification adopted should be provided in a single allotment.

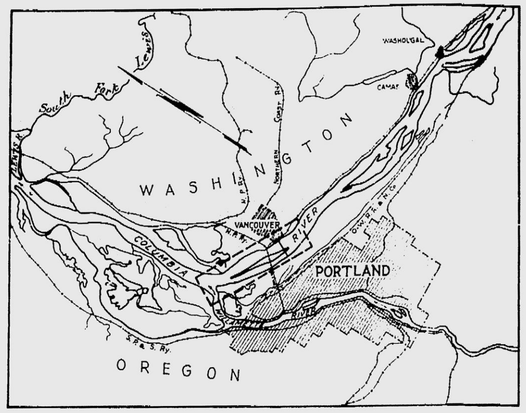
OSCAR O. KUENTZ,
Major, Corps of Engineers,
District Engineer.

○

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY

ESC. 636/1.29



VICINITY MAP
1" = 9 MILES

Dikes considered necessary for 30' depth in channel below Vancouver, Washington shown thus ------
Existing dikes shown thus ——

ALIGNMENT CHART
Scale in Feet
0 1000 2000 4000 6000

Old dike to be re-constructed and extended under existing project

Location of channel to one mile above Vancouver as requested by local interests.

- NOTES -

Soundings are in feet and show depth at low water.
Soundings of Columbia River taken from survey of September, 1931.
Soundings and low water line in vicinity of Tomahawk Island taken from survey of August, 1930.
Soundings of North Portland Harbor taken from survey of June 1929.
The Vancouver channel was dredged by U.S. Dredge "Wahkiakum" from Aug. 8th to Sept. 17th 1931, excavating 474,000 Cu. Yds.
Proposed channel indicated thus — — — —

COLUMBIA RIVER
BETWEEN THE MOUTH OF THE WILLAMETTE RIVER AND A POINT ONE MILE ABOVE THE CITY OF VANCOUVER, WASHINGTON

Scale 1:15000
1000 500 0 1000 2000 3000

U.S. ENGINEER OFFICE, PORTLAND OREGON DISTRICT, DECEMBER 3, 1931

Submitted
R. C. Dickson
Senior Engineer

Submitted
Chas. D. Hurst
Major Corps of Engineers

Surveyed by S.F.M. Drawn by J.J.D.

Transmitted with Report 12/3/31. ESC. 636/1.28

HOUSE DOC. NO 249, 72D CONG., 1ST SESSION

ATTACHMENT 5

January 9, 2013

Waterway Simulation Technology, Inc.

Columbia Office
158 Hampton Crest Trail
Columbia, SC 29209
Phone: 803-783-2118
Fax: 803-783-8236
Email: jchewlett@wst ms
Attn: J. Christopher Hewlett

Vicksburg Office
2791 Burnt House Rd
Vicksburg, MS 39180
Phone: 601-638-4226
Fax: 601-630-9017
Email: lldaggett@wst.ms
Attn: Larry L. Daggett

Telephone Call Record

To: Rob Rich, Shaver Transport (360-759-0341)

Subject: Tow Traffic on the Columbia River

1. Mr, Rich is VP in charge of operations for Shaver Transportation and also President of the Columbia River Towboat Association (CRTA), an organization representing all the towing companies working on the Columbia-Snake River System. He is also President of the Columbia River Steamship Operators Association (CRSOA). Mr. Rich discussed towing operations on the Columbia River, especially the I-5 project reach with me during this conversation.
2. Mr, Rich said that the normal tow operating in the Columbia is a 4-barge tow approximately 650'x84' with the flotilla being approximately 550'-575' in length. Grain barges are approximately 32' from top to bottom. These barges would have approximately 29.5' wind exposure with a 2' empty draft and approximately 19' with a full load draft of 13.5'. His company would have approximately 125-150 tows per year of this type resulting in 250-300 round trips/year. He stated that one could expect approximately 1000-1100 lockages/yr at Bonneville L&D.
3. Towboats or pusher boats are typically Z-drive units with regular propellers and 3500-4000 HP. There are approximately 4K-5K units operating on the river. All flotillas have the pusher unit operating in the center of the floatilla at the back. There are no tows that operate with the pusher along the side of a barge in a notch as was tested in the Bonneville L&D physical model tests.
4. Aggregate barges are approximately 300'x84' in dimension. Other barge types include Container on barge, house barges, and hopper barges.
5. The only sea-going barges are approximately 340'x80; and call on Lafarge terminal. These barges typically are 21' draft when loaded.
6. The rail road bridge below I-5 limits the size of tows operating through the project reach. This bridge is a swing type and has a 35m wide open span. The present I-5 bridge has a high span and a lift span. The industry tries not to use the lift span if possible. This limits the use of the lift span channel to times when the water level is low. This span is wider and preferred when the water level is low enough for passage under the bridge without interrupting vehicle traffic. This limits the use of this channel to water levels below 8 ft on the gage.
7. The industry typically stops operations of 4 barge tows on the Columbia River when the flow in this reach is above 400KCFS. Some companies, his included, continue operations with 2-barge tows when the flow in the river is between 400KCFS and 550KCFS in order to continue serving their customers although it is not economically profitable to do so. All operations on river are stopped above 600KCFS.. This usually occurs in the spring, i.e., early May to June. The main reason for limiting the operations at this high flow condition is the uneconomical cost of operating the tows due to high fuel consumption and low travel speeds.
8. Salt water is experienced in the river up to Skamania Island (?).
9. Further discussions with Capt. Fred Hardy, Port Captain, may be helpful.

Larry L. Daggett, Engineer

Port of Vancouver USA

March 27, 2013

Marci E. Johnson
Outreach & Planning Special Studies Specialist
U.S. Army Corps of Engineers
Planning Branch
333 SW First Avenue
Portland, OR 97204-3495

Dear Ms. Johnson:

This letter is to confirm that the Port of Vancouver is in support of the proposed modifications to the Vancouver Turning Basin, located adjacent to our former Terminal 1, now the Red Lion Inn at the Quay.

We understand approximately 18 percent of this turning basin will be impacted due to the construction of the Columbia River Crossing bridge structure. The port supports this important freight project and its benefits to surface and maritime commerce.

We greatly appreciate your consultation on this matter.

Sincerely,

Todd M. Col

Todd Coleman
Executive Director

3103 NW Lower River Road, Vancouver, WA 98660 ♦ (360) 693-3611 ♦ Fax (360) 735-1565 ♦ www.portvanusa.com

Meeting Summary

MEETING: CRC Project – Discussion of Vancouver Turning Basin and Tow Industry

MEETING DATE: April 3, 2013

ATTENDEES:
Heather Wills, CRC
Jay Lyman, CRC
Frank Green, CRC
Mike Niemi, CRC
Ron Mason, CRC
Brian Fletcher, Tidewater
Geoff Doerfler, Tidewater
Mike Walker, Foss Maritime
Fred Harding, Shaver Transportation
Lars Ludlum, Port of Vancouver
Les Bechtoldt, LaFarge Cement

FROM: Steve Morrow, CRC

Purpose of the meeting: to discuss potential impacts to navigation based on the encroachment in the turning basin by the CRC project. This was identified as a concern by the US Coast Guard (USCG) in review of the CRC General Bridge Permit application.

Action items are identified at the end of the summary. First and last names of meeting attendees are used only in the first instance in these notes.

Meeting Summary

Heather Wills began with the introductions for meeting attendees. The first item discussed was the present use of the Vancouver Turning Basin (VTB) by the tow industry.

Vancouver Turning Basin (VTB):
Fred Harding noted Shaver Transportation normally transits through the area (VTB) with grain barges. Shaver also transports downriver barges out of the Columbia Industrial Park. Mr. Harding noted Shaver does not use VTB for turning or stopping, it is simply an area to transit through.
Mike Walker noted Foss Maritime also transports downriver barges out of the Columbia Industrial Park and also does not use VTB.
Brian Fletcher also concurred that VTB is a pass-through area and Tidewater does not use it. Geoff Doerfler of Tidewater noted Salmon Bay had occasionally delivered concrete to the LaFarge terminal, but don't use the VTB to turn.
Les Bechtoldt of LaFarge Cement stated currently concrete delivery to the terminal comes by barge, no ships. The barges typically come in head first, off-load, back downriver of the BNSF Bridge, and then turn around. There is very little room between the BNSF Bridge and the terminal immediately upstream (approximately 100' distance) to allow for turning and commented that the proposed modification to the turning basin would have no impact to current operations at LaFarge. There may be some time in the future delivery may come by ship, but not in their present business plan (5 year projection)

Mr. Harding requested the location of the existing red buoy respective to the proposed bridge, if a ship were to use the VTB to turn the ship would not go upstream of the buoy. The buoy is used to align vessels through the drawbridge. The CRC project team was able to determine the red buoy in the upstream end of VTB is approximately 126' downstream of the edge of the proposed bridge.

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The discussion then moved to the origin of the VTB and design vessel it was intended for. The turning basin was original sized for a T2 Tanker (Jumbo) which has a beam width of 75 feet and an overall length of 572 feet and fully loaded has a draft of 30 feet. The Port of Vancouver developed the plan to size the turning basin. Mr. Doerfler noted VTB was established in 1934 for the Port of Vancouver Terminal #1 (now the Red Lion at the Quay). It was agreed that the T2 Tanker is obsolete and the fleet has been retired. It was discussed that tankers that presently go into Glacier NW on the lower Willamette to unload concrete could possibly go to LaFarge in the future. These vessels are much shorter than a T2. The tow captains all agreed that reduction in the length of VTB should not affect the ability of this potential future use at LaFarge to make the turn, draft depth in VTB might be more of a concern to these tankers. Additionally, they all agreed that that no deep draft vessels have used the VTB in over 15 years, with the exception possibly of the US Army Corps dredge *Yaquina*.

Ms. Wills noted the Port of Vancouver had recently sent a letter to the US Army Corps of Engineers (USACE) indicating its support of the project and asked if the tow companies would be willing to submit a similar letter to USCG and USACE. The project team was directed to contact the Columbia River Towboat Association (CRTA), as a letter from the CRTA would be the representative response from the industry.

Mike Niemi asked would new buoy locations be required? The response from the tow captains was yes, the USCG will required new configuration for buoy markings and navigation aids on the bridge, probably similar to the Longview Bridge. USCG will base the requirements on requests and recommendations from the tow industry and other users.

It was then suggested that CRC contact the Columbia River Pilots Association regarding potential ship use of the VTB. Captain Paul Amos and/or Captain Ann McIntyre.

Meeting discussion then shifted to the proposed modification to the navigation channels and possible impacts to safe navigation by the tows passing through. It was briefly discussed what it would take to modify the navigation through the BNSF Bridge, tow captains noted that the industry (CRTA) tried to facilitate a change several years back through the Truman-Hobbs Act but did not have success.

<u>Modification of Existing Navigation Channels:</u>
Mr. Harding noted (Mr. Walker & Fletcher concurred) that downbound tows (upstream of I-5 Bridge) must commit to a navigation channel when the BNSF Bridge is ready. Tows will not hold up/anchor in the CRC project area or VTB as there is no room/no time to stop or change direction (it takes 7 minutes or 0.5 mile for a loaded barge to stop, longer with heavy current). The CRC project area is through-way for transport and takes a maximum of 20 minutes to pass through. Tows will anchor downstream below the BNSF Bridge (~0.5 mile) or upstream at Ryan Point.

Tow captains then reviewed plans of the CRC proposed modifications to the navigation channels and concluded that the proposed channel alignments are better than present; a more direct alignment with the downstream BNSF Bridge, wider horizontal clearance for two of the channels, and would not have to coordinate drawbridge lifts during higher flows.

A question was raised about vertical clearance of the new bridge crossing. Mr. Harding noted that the tug height limit on the Columbia and Snake Rivers is 52’ (clearance height of the Camas Prairie Bridge near Lyons Ferry, WA). It was noted that within the three navigation channels the vertical clearance will be no less than 96’ and up to 116’ above 0’ CRD.

Mr. Harding asked if the pier caps on the new bridge will be exposed such that shipping can see them? Frank Green confirmed the pier caps will be exposed until the Columbia River is in flood stage. CRC project team will provide plan sets of the pier cap design (to Columbia River Towboat Association). It was also noted the ODOT bridge tender provides tow captains river gauge readings from the gauge at the I-5 Bridge each morning, will that continue after the I-5 Bridge is removed? CRC project team noted with present technology it will not be difficult to establish a web site or link that would provide real time readings of river height at the new bridge crossing. Also, when the existing bridge is removed, CRC project team will require the contractor to remove the existing piers of the I-5 bridge, and the buried wood

piles located in any of the new navigation channels to a depth of at least 5 feet below the authorized depth of associated channels to allow for safe dredging in the area if required.

Navigation during bridge construction:

Mr. Green presented a slideshow of possible bridge construction sequence, based on prior experience of DOT staff and discussions with the bridge construction industry. The tow captains were in consensus that when construction reduced the horizontal width of the navigation channel(s) down to 150' a tug assist will be necessary for upbound and downbound transport through the CRC project area.

(subsequent to the meeting, further discussion with tow captains indicated that there is not a threshold for minimum horizontal width below which would trigger a tug assist to transit through the CRC construction area. The need for tug assist during bridge construction is more of a case-by-case basis, dependent upon factors such as barge cargo, river conditions and the individual captain's level of comfort)

Other questions that came up during the presentation included:

1. would construction be 24 hours/day (tows pass through the project area at all times of the day)
2. would CRC provide a schedule when construction begins to impact navigation
3. once the existing bridge is removed who would conduct dredging around where the piers used to be located

The CRC project team noted that because the bridge construction is design/build, answers to #1 & #2 above are not absolute at this time. However, it was noted that CRC has the ability through performance measures and contract language to provide more certainty. It is for certain that during the construction and bridge removal, the contractor will be providing detailed submittals to the USCG for the weekly Local Notice to Mariners (LNM) report. Regarding question #3, if dredging in the new navigation channels after the I-5 Bridge is removed is necessary it is possible it would be conducted by the USACE, likely with the dredge *Yaquina,* the CRC project team will discuss with USACE their anticipated budget for dredging this section of river and future works.

Action Items

- CRC provide Columbia River Towboat Association scaled drawings of location of the existing red buoys respective to the proposed bridge
- CRC contact Columbia River Pilots Association regarding potential ship use of the VTB
- CRC provide Columbia River Towboat Association scaled drawing of the pier caps in the proposed bridge
- CRC (ODOT) will look into systems that provide real time readings of river height for possible future use at the new bridge crossing
- CRC provide copy of slideshow of possible bridge construction sequence to Columbia River Towboat Association after the information within the slideshow has been submitted to USCG and USACE for their respective General Bridge Permit and Section 408 reviews.

March 4, 2013

Waterway Simulation Technology, Inc.

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Fax: 803-783-8236
Email: jchewlett@wst.ms
Attn: J. Christopher Hewlett

Vicksburg Office
2791 Burnt House Rd
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Phone: 601-638-4226
Fax: 601-630-9017
Email: lldaggett@wst.ms
Attn: Larry L. Daggett

Telephone Conversation

With: Craig Nelson, Brian Flecher, Josh Nichols – Tidewater 360-759-0311;Dennis Webb- ERDC

Subject: Navigation on the Columbia River at I-5

This telephone call was in lieu of a planned meeting with Tidewater personnel and was an attempt to gain an understanding of Tidewater's operations in the I-5 Bridge reach of the Columbia River. I explained the WST/ERDC team's role in conducting a ship/tow maneuvering simulation of navigation through the existing, planned replacement, and interim situation when both bridges are in place.

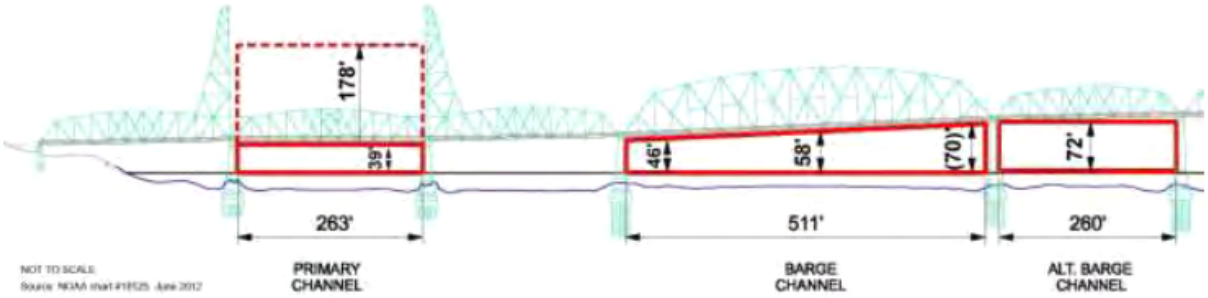
We discussed typical tow makeups in this reach of the river. It was noted that Tidewater has 16 towboats ranging from 80 to 127 ft in length and 3000-4800 HP. They have 150 barges of varying types and dimensions. A typical tow configuration is approximately 650-ft in length and 84 ft wide with a draft of up to 13.5 ft. Empty drafts are approximately 2 ft. Loads are approximately 14,000 tons. Tows are normally made up with 4 barges in a 2x2 flotilla. Approximately 25%-30% of Tidewater's tows may have an extra barge on the "hip" adjacent to the towboat at the back of the 2x2 set of barges. It was agreed that this latter arrangement should not be used as a test configuration since it is not considered a normal configuration for the majority of the traffic.

A description of the typical operations was provided to WST/ERDC. There are three spans to use in transiting the present I-5 bridge; the "high" or south span (width 260 ft), the "wide" or middle span (511 ft), and the lift span on the north side of the river (263 ft). The vertical clearances of these spans are shown in the figure below taken from the "Interstate 5 Columbia River Crossing Navigation Impact Report." This shows that the vertical clearance for the high span is 72 ft above 0 ft Columbia River Datum, between 58ft to 70ft on the south half of the wide span, and 38ft in the closed position and 178 ft in the open position for the lift span. With tows requiring between 46 ft to 52 ft for clearance for the towboats, the preference is to use the wide and high spans when possible to avoid requiring the lift span to be opened. Maintaining a 1 ft clearance in the air draft, this means that the high span can be used up to river stages of +19 ft CRD and the wide span using the south half can be used up to a river stage of +6 ft CRD.

Upbound tows tend to use the high span when possible. These tows are easier to maneuver since they are moving against the currents and can more readily move over to the south side of the river after passing through the BNSF Railroad Bridge, which is a 200-ft wide swing bridge, to align with this

span. These tows do have difficulty maneuvering with heavy winds out of the south or north as these winds are directly abeam of the tows.

Exhibit 5.2-1. Existing Columbia River Navigation Clearances



Downbound tows have difficulty maneuvering through the high span as they are hard to steer across the river after passing through the I-5 Bridge to get lined up to go through the BNSF RR Bridge. This requires a long crossing in a short distance downriver with currents pushing the tows toward the RR Bridge. Therefore, these tows tend to use the wide span. This span can be navigated as long at the river stage is below +6 ft CRD. After this stage is passed in a rising river, use of the lift span is required. Sometimes smaller tows (1-2 barges) may use the high span but they still tend to have a hard time maneuvering back across the river to align with the RR Bridge. During high flows with strong currents, usually in the spring (mid-April to June), the currents are so high that the downbound tows have to use the lift bridge as they can then have a direct line to the RR Bridge.

The lift span is used quite a bit during heavy runoff. Often with 1, 2, or 3 barge tows moving downstream.

Tidewater was asked if they ever do or would consider breaking the tows to transit a short reach of the river, for instance during construction of the new bridge when both piers are in the river. The response was no, this was not economical nor safe. There is no place to tie up the tows, especially considering the currents in the river and the cost of operating assist towboats or a second towboat to move a portion of a large tow is too costly in addition to the lost time.

It was noted that DOT has put a white light on the I-5 Bridge to mark the half width of the wide span to aid the navigation through the bridge.

The change in operations with discharge in the river was discussed. When the discharge reaches 350,000 cfs, Tidewater tends to start running 3-barge tows and at 400,000 cfs, the go to 2 loaded barges. The issue for Tidewater is the load being pushed. They will carry empties in a tow to continue pushing up to 4 barges but with loaded barges in the flotilla they can manage the currents and also the wind. This way their tows are less affected by the wind when they are pushing empties. Other companies operating on the river may not have as much opportunity to do this due to their particular operations. For example, Shaver tends to have to push empties in a flotilla upstream since much of their business requires loaded movements downbound and empties returning upbound for their grain barge movements. Whereas, Tidewater may only have 15-20 percent of their upbound tows pushing a full load of empties. With light tows, winds that are greater than 15 knots can impact control of the tow, particularly winds from the south or north. Empties tend to have drafts from 2 ft to

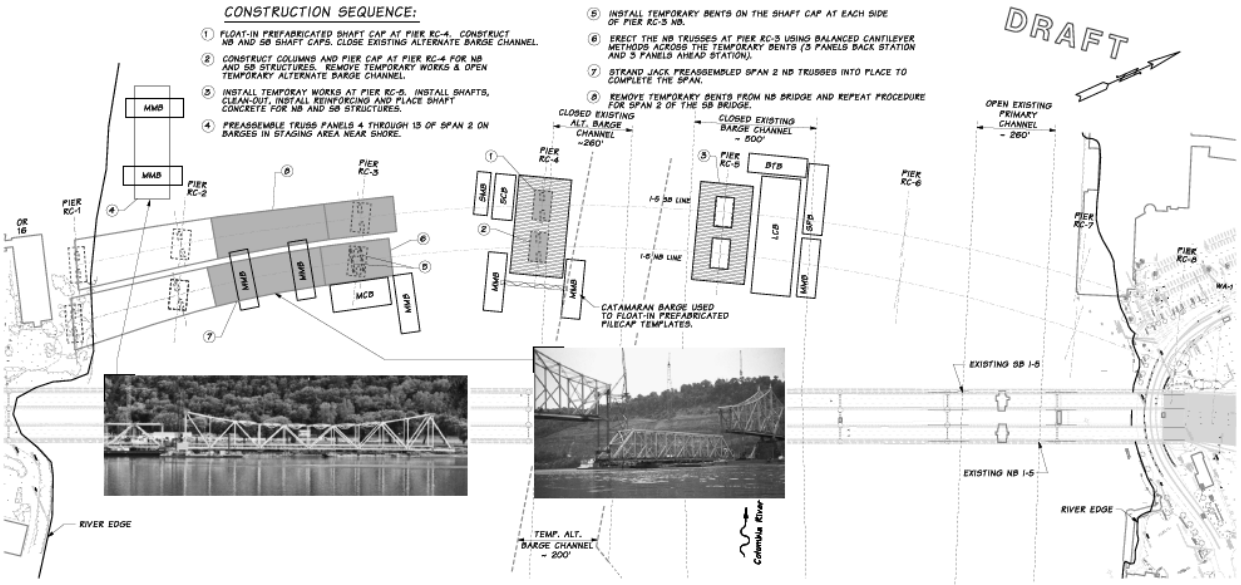
2.5 ft. Loaded petroleum barges tend to have drafts of 12.5 ft to 13.5 ft drafts, loaded solid waste barges tend to have 9ft to 10 ft drafts, and loaded fertilizer barges tend to have 12 ft drafts.

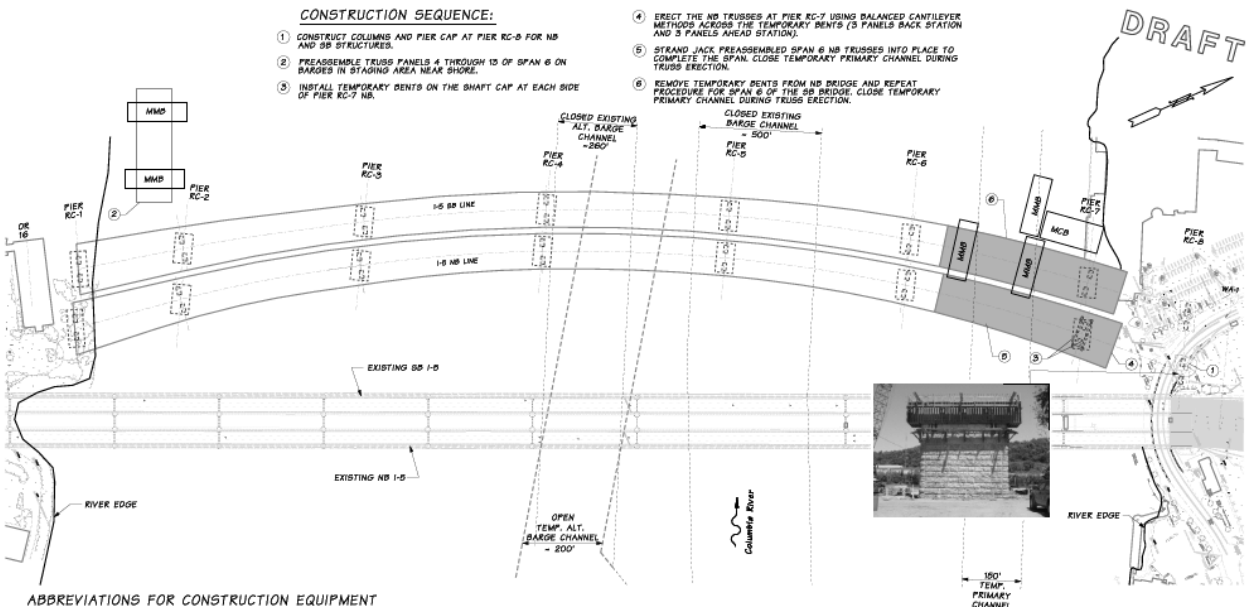
A significant point was made that beginning about a half mile upstream of the I-5 Bridge, a tow becomes committed and must make the transit through both bridges. There is no place to stop and/or change course.

It was agreed that a 4 grain barge tow would be the best test vessel for defining the effects of the bridge project on navigation. These barges have a side shell with a height of 15.6 ft and a angled top for another 16 ft. for a total height above the barge deck of about 32 ft. The superstructure is set back from the ends of the barge about 20 ft and both ends have racks that come back about as far. The sides of the superstructure are set back from the edges of the barge about 30 inches. Most of the barges have rakes on both ends; there are essentially no flat end or box barges.

When asked about handling the barges for Lafarge, the noted that these barges are about 14,000 tons with loaded drafts of about 20 ft and empty drafts of 4 ft to 6 ft. These barges are about 300 ft long and 68 ft wide. The push end of the barge is flat and, therefore towboats can push the barge. They tend to turn mid-river about 1200 to 1500 ft upstream of the berth and then drift down to tie off. They turn either loaded or empty. They stated that a Tidewater pilot could perform the test maneuvers during the simulations.

A question was raised about the interim navigation channels as it was their opinion based on what they have heard and read that this would be the most critical condition for navigating the river reach. Images of what is being proposed by CRC as some construction stages that will limit use of the wide and/or lift spans are provided below. The first shows the wide span being blocked with construction equipment and structure while the lift span is open and the high span is reoriented and narrowed with construction in the channel for some periods of time. The second presents what is proposed for the interim reach when the new and existing bridge piers are both in the river and the new bridge span directly below the lift span is under construction. It is noted that the wide span is closed with one of the piers constructed in that channel.





Based on this conversation and the conversation with Rob Rich, the following are conclusions:

- Test should be conducted at normal flows of about 200-250 kcfs, 2-yr return intervals 0f 400-450 kcfs, and the high or 10-yr return flow of 550-600 kcfs where most navigation ceases.
- The primary design vessel for the normal and 2-yr flows should be a 4 barge tow with a 2x2 configuration and for the 10-yr flow a 2 barge tow in a 2x1 configuration.
- Both loaded and light barges should be tested in order to account for strong current effects on the loaded tow and wind effects on the empty tows.
- Grain barges should be used for the design tow due to the large windage area on these barges.
- All barges should have rakes on both ends.
- Testing of mixed loaded and empty barge tows should not be considered as these will be more easily controlled than all empty and all loaded tows.
- A towboat of about 3000 HP should be used for these tows with twin fixed propellers and twin rudders..
- Upbound tows should primarily use the high span until river stages of +19 ft CRD.
- Downbound tows will not use the high span but will use the wide span until river stages of +6 ft are reached.
- For stages above those listed above, tows will use the lift span.
- Since there is an effective traffic lane separation with upbound traffic using the high span and downbound traffic using the wide span with the present bridge, should the replacement bridge have two barge channels in order to continue the traffic separation scheme?
- If there is trouble transiting through the interim 150 ft lane in the high span, consideration should be given to testing 2 barge tows even at lower discharges.
- Another option would be to use an assist towboat.
- Testing of a deep-draft barge to and from the Lafarge terminal would involve a 300 ft x68 ft x 21 ft loaded draft and 4-6 ft empty draft.

- Turning such a barge could take place both loaded inbound to the terminal and empty outbound from the terminal.
- Turning often happens approximately 1500 ft upstream from the terminal; the proposed replacement bridge is approximately 3200 ft from the terminal and there is deep water off the berth, so the proposed bridge is not expected to have an impact of use of the turning basin.

Larry L. Daggett, Engineer

Columbia River CROSSING

Conversation Log

☒ Telephone Call	☐ Email
☐ In Person Conversation	☐ Other Communications
Date of Communication:	4/15/2013
Subject:	Vancouver Turning Basin impacts
Contact Name:	Paul Amos, President (Contacted by Ron Mason, Contractor to CRC project, HDR Inc.)
Company:	Columbia River Pilots
Phone Number:	503-289-9924
Email:	officers@colrip.com

Conversation:

- Ron stated that Lafarge believes they may have a deep draft vessel that could make calls at their terminal sometime in the next five years. These vessels would be deep draft, 30-35 feet. Paul noted that they do not make any future fleet projections as to the vessels utilizing the navigation channels and turning basins.
- Paul noted that any ship (deep draft) transiting upstream of the swing span railroad bridge will turn before transiting back through the bridge and will not back through the span.
- Paul noted that tug assistance is possible in the turning basin and would only be limited to the users' willingness to pay for the tug assistance. He noted that the turn would likely require 2 tugs.
- Ron asked if there were any upper limit flows that inhibited navigation for deep draft vessels in the Columbia River. Paul said that they continue navigation for all high flows during spring freshets. There was a time in the floods of 1996 that navigation was limited but the system that they use now would remain operable in those conditions were they to happen again.
- Ron mentioned his approach using USACE design guidance to calculating the required length of the turning basin for low and high current conditions. Paul respectfully disagreed with the approach stating that the more extreme spring events are what they would be most concerned with; these would require that the turning basin be modeled in ship simulation.
- Paul's recollection is that no commercial deep draft vessels have made the transit upstream of the swing span railroad bridge in the 23 years that he has been a LCR Pilot.
- Paul verified that the buoy (buoy #2) located approximately 600 ft. downstream of the existing I-5 bridge represents the upstream usable limit of the turning basin.
- We are welcome to call back if we have additional questions for Paul or Anne

T I D E W A T E R

April 15, 2013

Ms. Heather Wills
Columbia River Crossing
700 Washington Street, Suite 300
Vancouver, WA 98660

Dear Ms. Wills:

This letter is in response to your inquiry as to the impacts of the reduction in the upper Vancouver turning basin by the CRC bridge construction project. This is the turning basin located upstream of the BNSF Railroad bridge and below the I -5 interstate bridge.

We can confirm that the turning basin is not in use by Tidewater vessels. Our tows have a shallow draft and do not require the additional depth offered by the turning basin. We utilize this area in a transit only operation, thus a reduction in area for the basin is not of concern to Tidewater.

Our main concern with this project relates to the reduced horizontal clearance of the channel during the construction phases that will create this issue. We would recommend that in addition to intensive and on-going communications with tow boat operators and construction project management during this time, CRC should consider the addition of a standby or assist tug in the construction area to facilitate safe navigation in the constricted water way.

Thank you for including Tidewater and the towboat industry as a whole in your planning considerations.

Sincerely,

Dennis W. McVicker
President & CEO

TIDEWATER BARGE LINES, INC.
P.O. Box 1210 • Vancouver, WA 98666-1210 • (360) 693-1491 • (503) 281-0081 • (800) 562-1607

COLUMBIA RIVER
TOWBOAT ASSOCIATION
5109 NE 239th Street, Battle Ground, WA 98604

April 16, 2013

Heather Wills
Environmental Manager
Columbia River Crossing project
700 Washington Street, Suite 300
Vancouver, WA 98660

Re: Modifications to Vancouver Turning Basin and Navigation Channels at the I-5 Bridge

Dear Ms. Wills:

Thank you for inviting several members of the Columbia River Towboat Association to your meeting on April 3 and April 12 to discuss anticipated changes in the Vancouver Turning Basin and navigation channels in the vicinity of the proposed I-5 bridge. Our members appreciated the change to review and comment on the anticipated changes.

To summarize the points discussed at the meeting, our members noted that the vast majority of tug and barge activity in the vicinity of the bridge passes through both the I-5 and BNSF bridges without using the turning basin located between the two bridges. The proposed reduction in the size of the turning basin will have no impact on our current or anticipated future tug and barge operations.

Currently, the only commercial water-dependent facility in that reach of the river is the LaFarge Cement plant, located adjacent to the BNSF Bridge on the Vancouver shoreline, which receives bulk shipments of raw materials by barge. The reduction in the turning basin will not affect tug and barge operations at the LaFarge dock. However, at the meeting it was noted that LaFarge has future plans to bring bulk materials to their site by ocean-going ship. We recommend that you confirm the size and operating characteristics of the anticipated vessels, and coordinate with the Columbia River Pilots about any concerns they may have regarding the potential change in the easterly portion of the turning basin.

You also presented graphics and a description of the proposed changes to the three navigation channels at the I-5 Bridge. It is our understanding that each of three channels will have a minimum width of 300 feet, and vertical clearance ranging from 96 to 116 feet above 0 CRD. With the proposed clearances, and the improved alignment of the channels with the downstream BNSF bridge opening, we believe that the changes represent a definite improvement in safe navigation for the towboat community.

We appreciate the opportunity for project input to ensure the safe and efficient passage of waterborne commerce. As the project moves toward construction, we look forward to continued discussions to ensure that navigation needs are addressed during construction, especially concerning channel narrowing during various phases of construction.

Sincerely,

Rob Rich, CRTA President

cc. Geoff Doerfler, Tidewater
Brian Fletcher, Tidewater
Mike Walker, Foss
Fred Harding, Shaver

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ATTACHMENT 6

Columbia River CROSSING

Memorandum

April 17, 2013

TO: Heather Wills, CRC Environmental Manager

FROM: Rich Hannan, P.E., Ron Mason, P.E., HDR

SUBJECT: Vancouver Turning Basin Evaluation Technical Memorandum

Introduction

The Columbia River Crossing (CRC) Project will construct two new bridges carrying I-5, light-rail transit, and a shared use path across the Columbia River to replace the existing interstate bridges. The proposed bridges will modify existing Federal navigation projects, thus requiring a Clean Water Act Section 404 and United States Code (USC) Section 408 authorization from the U.S. Army Corps of Engineers (USACE). The existing Federal projects impacted by the CRC Project are:

- The main Columbia River navigation channel, authorized by the Rivers and Harbors Act of August 26, 1937;
- The barge channel, authorized under Section 107 of the Rivers and Harbors Act of July 14, 1960;
- The 35-foot turning basin downstream of the existing I-5 bridge, authorized by the Rivers and Harbors Act of October 23, 1962; and
- The alternate barge channel, authorized by the Water Resources Development Act of August 17, 1999.

USC Section 408 allows non-Federal modifications to USACE projects only when the modifications will not be injurious to the public interest and will not impair the usefulness of those project (e.g. result in declines in safety, operational function, etc.). Modifications proposed by the Columbia River Crossing project meet both of these criteria. Additionally, construction of the new bridges and channel modifications will have at least one channel open to construction throughout construction and minimize impacts to USACE operations and maintenance.

This technical memorandum (TM) discusses impacts to the Vancouver Turning Basin created by the new location of the proposed Columbia River Bridges (CRB). This TM also documents the evaluation of the impacts of the proposed CRB on the Vancouver Turning Basin (VTB) by outlining the history, current use, and impacts of proposed changes to the VTB.

History

The Rivers and Harbors Act of March 3, 1905 provided for dredging of a channel 20 feet deep and 150 feet wide upriver from the confluence with the Willamette River.

Due to navigation issues in the reach of the Columbia River between its confluence with the Willamette River and the Pacific Highway Interstate Bridge (the current location of the existing I-5 Bridge), the Port of Vancouver requested USACE to modify the navigation channel. In a

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February 4, 1931 letter from the Port of Vancouver, the following modifications were recommended to USACE:

- The navigation channel be deepened to 30 feet at low water,
- The navigation channel be widened to 300 feet and,
- Construction of two turning basins each having the dimensions of 800 feet wide and 2,000 feet long.

USACE recommended to Congress that the channel be modified to 28 feet deep and 300 feet wide and complete the construction of the two turning basins. House Documents (HD) 249, dated February 16, 1932 was approved and USACE was funded to complete these recommended modifications.

Since HD 249 was approved, numerous modifications have been requested by local governments to the navigation project and many of these requests were have been subsequently approved by Congress and constructed by USACE.

Existing Conditions

Exhibit 1 shows the current configuration of the lower and upper turning basins. The upper turning basin is referred to as the Vancouver Turning Basin. The VTB is authorized to a depth of 35 feet, a width of 800 feet and a length of 2,000 feet. The upstream limit of the VTB is 50 feet downstream from the existing I-5 Bridge. This exhibit also shows the locations of the navigation channels that are immediately upstream of the VTB. The total surface area of the VTB is approximately 57 acres.

The lower turning basin is not impacted by the Columbia River Crossing Project.

Proposed Conditions

Exhibit 2 shows the proposed configuration of the VTB with the proposed CRB. The proposed CRB will encroach into the turning basin by approximately 490 feet. During construction, the temporary encroachment will be approximately 590 feet.

The width and depth of the VTB will not be impacted by the proposed CRB. The length of the VTB will be reduced from 2,000 feet to approximately 1,500 feet, resulting in a surface area reduction of approximately 10 acres.

General Discussion

Current Vessel Usage

Based on discussions with the Ports of Vancouver and Portland, terminal managers, Columbia River Pilots and the Columbia River Towboat Association, the only vessels that transit the VTB are tugs with barges for this reach of the Columbia River. They do not use the VTB for turning, but rather transit through the basin in taking approximately 20 minutes to complete the journey.

The only vessels know to utilize any portion of the VTB are ocean going barges with drafts of 20 feet which dock at the Lafarge Terminal in the Port of Vancouver on a regular basis. The terminal is just downstream of the VTB and immediately upstream of the Burlington Northern

Santa Fe (BNSF) railroad bridge. After unloading, the barges proceed upstream a couple hundred feet and then proceed to turn in the downstream direction.

In recent history, deep draft vessels do not use the VTB. According to the Port of Vancouver and local tug boat pilots, "*no one remembers seeing a deep draft vessel upstream from the BNSF Railroad Bridge*" (Cpt. Paul Amos, 2013), . Many of the pilots have been transiting this reach of the river for over 25 years.

Cpt. Paul Amos, President of Columbia River Pilots (ColRiP) also stated that it is likely that no deep draft vessel has been upstream of the BNSF railroad bridge for over 25 years or longer.

Projected Vessel Usage

Primary users of this reach of the Columbia River are tugs with barges; it is projected that they will continue to be the primary users in the foreseen future. They transit through the VTB, but do not use it for turning.

The Lafarge terminal manger has stated that if the economic conditions in the area change, they could possibly use a deep draft vessel to bring commodities (e.g. cement) to their terminal. This vessel could have a draft up to 35 feet and a length of 504 feet. A detailed written plan of the potential use of deep draft vessels is not currently available.

Due to the location of the Lafarge terminal, a deep draft vessel leaving this terminal will proceed upstream and make a downstream turn, possibly with the aide of up to two tug boats. The VTB would be used for turning in the downstream direction safely. In conversations with the Columbia River Pilots Association, Cpt. Amos also stated that the pilots could turn the vessel with tug assistance for both the existing and proposed configurations safely.

Projected Terminal/Port Usage

The original Terminal 1 was developed for oil and lumber exports and is owned by the Port of Vancouver. Terminal 1 has not been operational for many decades. The Port of Vancouver indicates there is a planned redevelopment of Terminal 1 into a condominium complex and park that this area will be converted to a park and condominiums will be constructed along the Columbia River.

The Lafarge terminal appears to be the primary active terminal along this section of the Columbia River and, as indicated previously, the Lafarge terminal is located down stream from the VTB.

Physical Constraints for Existing Conditions (Buoy 2)

The only constraint in the VTB is the Interstate 5 bridge approach Buoy 2, which is located at 45°34' 14.241"N and 122°40'33.620"W. Exhibit 2 shows this navigation beacon (Buoy 2). This buoy is about 590 feet downstream of the existing I-5 Bridge; it is a red "nun" according to the navigation charts. A review of historical navigation charts shows that this Buoy was installed in 1975. Buoy #2 is used by tug boat pilots to line up for safe passage under the draw bridge. Due to the location of this buoy, the upper portion of the VTB has not been available for turning maneuvers by deep draft vessels for over 35 years. The usable length of the turn basin has been about 1,400 feet in length.

Accident Reports

A review of safety records shows that no accidents have been reported to the USACE or the United States Coast Guard (USCG) in the VTB. This supports the concept that existing width

and effective length (as reduced by Buoy 2) of the VTB have created no navigational hazards. As such, the proposed modifications to the VTB, which will increase the effective length by nearly 100 feet, will not impact safety or create an unsafe condition for navigation.

Technical Evaluation

Background Information

The original dimensions of the VTB were proposed by the Port of Vancouver in 1931. Design guidance for turning basins was not available at that time. The dimensions of the basin were determined by the length of the terminals under development and the overall dimensions of the vessels that were calling on the Port of Vancouver. A review of documents by USACE also concluded that the dimensions of the VTB were developed by the Port of Vancouver and that no detailed design work was performed.

Methodology

To evaluate potential impacts of the VTB, the USACE current design manual, EM 1110-2-1613, Hydraulic Design of Deep Draft Navigation Projects, dated 31 May 2006 was used to assess proposed impacts to the VTB. Chapter 9 of EM 1110-2-1613, Integral Features, provides a description and guidance for the design of turning basins.

Appendix A, attached to this memorandum provides figures, hydraulic information, vessel lengths, conversion tables and supporting information used to evaluate the proposed dimension's of the VTB, given current USACE design guidance.

Results

Using EM 1110-2-1613 guidance, the dimensions of the existing turning basin were evaluated. USACE defines low current as less than 1.5 knots. Results from unsteady hydraulic modeling, relates this criterion to roughly 200,000 cubic feet per second (cfs) in the Lower Columbia River. Using summary hydrograph plots for the United States Geological Survey gage at The Dalles, Oregon, the mean flow in the Lower Columbia River is at or below 200,000 cfs, for roughly 9 months of the year. Figure 1 in Appendix A shows a typical layout of a turning basin for low currents based on USACE design criteria for existing conditions.

For a low current layout, using a design vessel length of 504 feet (length of vessel that may dock at the Lafarge terminal), the existing dimensions for the VTB meet USACE criteria requirements.

For a high current turning basin configuration, (current greater than 1.5 knots), the recommended width of the turning basin VTB would 756 feet. The current width of the VTB is 800 feet and the proposed VTB configuration would not change this dimension, therefore the width design criteria is achieved.

For the turning basin length in high current conditions, the USACE recommends ship simulations be used; however a simulation has not bee completed. The proposed CRB encroachment in to the existing VTB would result in a turning basin 1500 feet long. Tugs boats may be required to assist with a turning maneuvers during high flow conditions (e.g. spring freshets). Figure 2 in Appendix A provides a typical layout of a turning basin for high currents and the existing conditions, based on USACE design criteria. Figures 3 and 4 (Appendix A) depict the VTB with the proposed CRB for low and high current conditions.

Buoy 2 which is located about 600 feet downstream from the existing I-5 bridge effectively blocks the upper part of the turning basin for downstream turning maneuvers. As indicated earlier in the TM this buoy began operation in 1975.

The removal of Buoy 2 will need to be evaluated. Currently, the buoy is used to line the pilots up for the lift span. The lift span will be eliminated and so will the need for that buoy. Based on conversation with the river pilots and the recommendation of the USCG, proposed navigation aides might be located in the area but these aides will not be in the same location and should not reduce any of the remaining VTB area.

Conclusion

The proposed bridge will permanently reduce the VTB area by 18% but will not have an impact on current or future use. The following is a summary of the reasons that support this conclusion:

- The technical analyses in Appendix A demonstrate that with the reduced area, the VTB meets current USACE design guidance in EM 1110-2-1612.
- The existing turning basin width of 800 feet is not affected by the proposed bridge.
- During the past 35 years, Buoy #2, used for lining up for the lift span, has effectively reduced the length of the turning basin by 600 feet with no reports of accidents on this reach of the river.
- Letters from the Port of Vancouver, Columbia River Towboat Association, Port of Portland, Tidewater in support of a statement of “no impact to the turning basin”.
- Cpt. Paul Amos, President of Columbia River Pilot, stating that safe turning can be accomplished with the use of tugs.
- No commercial deep draft vessels have travelled above the BNSF railroad bridge in over 25 years according to pilots in the lower Columbia River.
- The Port of Vancouver’s Terminal #1 has not functioned for over 25 years and is currently being considered for redevelopment to be converted to a park and condominium complex. This will result in very little if any need for deep draft vessel to call on the terminal #1 location.
- There are no reports of accidents for this reach of the river,
- Based on input from the Towboat Pilots Association, they do not currently use the turning basin for turning maneuvers,
- The existing VTB has an effective length of 1400 feet and the proposed VTB effective length will be 1,500 feet.
- The existing VTB width of 800 feet will not change, and
- The existing and proposed VTB width and effective length meet the requirements of Chapter 9 of USACE design guidance, EM 1110-2-1613.

References

2006 U.S. Army Corps of Engineers. EM 110-2-1613 Engineering and Design – Hydraulic Design of Deep Draft Navigation Projects. May 31, 2006. http://publications.usace.army.mil/publications/eng-manuals/EM_1110-2-1613_sec/toc.htm

2013 Personal Communication with Cpt. Paul Amos, April 15, 2013.

Appendix A – Technical Evaluation of Proposed Vancouver Turning Basin

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Memorandum

To:	Matt Deml, PE		
From:	Ron Mason, PE	Project:	Columbia River Crossing (CRC)
Copy:			
Date:	April 17, 2013	Job No:	
Re:	Evaluation of Vancouver Turning Basin		

Computed by: Ron Mason
Checked by: Shane Cline

Problem Statement:

Using United States Army Corps of Engineers (USACE) guidelines, determine minimum dimensions of Vancouver Turning Basin (VTB). Investigate potential of proposed Columbia River Bridge (CRB) to impact minimum dimensions.

Given:

- Guidance Document
  - Engineering and Design - Hydraulic Design of Deep Draft Navigation Projects **(**EM 1110-2-1613), May 31, 2006, (see Exhibit 1)
- Existing Dimensions of VTB
  - Depth = 35 feet (Columbia River Datum)
  - Width = 800 feet
  - Length = 2,000 feet
  - Effective length 1,400 feet due to location of Buoy #2.
- Dimensions of VTB after construction of proposed CRB.
  - Depth = 35feet
  - Width = 800 feet
  - Length=1,500 feet (The proposed CRB will be located downstream of existing bridge. This will impact the existing VTB by 500 feet.)
- Vessel Types:
  - T-2 Tanker – The VTB was originally sized to accommodate a T-2 Super Tanker.
    - Length = 572 feet
    - Beam width = 75 feet
    - Draft = 30 feet
  - Bulk Cement Carrier – The T-2 Super Tanker is not currently in use. Conversations with Les Bechtel at Lafarge Terminal indicate that the Bulk Cement Carrier is the largest ship anticipated for this area in the future.
    - Length = 504 feet
    - Beam width < 100 feet
    - Draft = 34 to 35 feet

- Hydraulic information from HEC-RAS unsteady flow model using 2003 spring FRESHET (May-July) Data for river mile 106.0. Model provided by USACE.

HEC-RAS Hydraulic Data for RM 106.0

Discharge (Q) (CFS)	Velocity (fps)	Knots
~100,000	~1.5	0.88
~135,000	~1.8	1.07
~150,000	~2.0	1.18
~200,000	~2.7	1.60
~250,000	~3.0	1.78
~300,000	~3.6	2.13

Case I – Low Current Condition

- Determine minimum turning diameter for Low Current Layout
  - See EM 1110-2-1613, Figure Fig 9-1, page 9-3

VTB Width Calculations

- For currents up to 1.5 knots, minimum width of turning basin = 1.5 x vessel length.
  - T-2 Tanker:
    - Minimum width of VTB = 1.5 x 572 feet = 858 feet
  - Potential Bulk Cement Carrier:
    - Minimum width of VTB= 1.5 x 504 feet = 756 feet
- Width Calculation Discussion:
  - Because VTB width = 800 feet for proposed vessel (504 feet), the criteria of width for high current is met for the Potential Bulk Cement Carrier.
  - It appears that by using a factor of 1.5 to estimate the Turning Basin width required for a T-2 Super Tanker, a basin width of 858 feet may be appropriate. This width exceeds the authorized 800 foot width of the VTB.
  - The width of the VTB is not changing between existing and proposed conditions.
  - Use of tug boats may be required for high currents

Result: Criteria of width for low currents is **met.**

VTB Length Calculations

- For currents less than 1.5 knot, the width of turning basin = 1.5 x vessel length.
  - T-2 Tanker:
    - Length of VTB = 1.5 x 572 feet = 858 feet
  - Bulk Cement Carrier:
    - Length of VTB = 1.5 x 504 feet = 756feet
- Length Calculation Discussion
    - Minimum length of VTB is approximately 700 feet.

- The existing VTB has an authorized length of 2,000 feet, but has an effective length of 1,400 feet due to the presence of Buoy #2.
- Length of VTB appears to be based on the length of terminal facilities (roughly 2,000 feet)
- Anticipated impacts from Proposed CRB are anticipated to reduce VTB length to 1,500 feet. This is nearly double the minimum turning length of 700 feet.

Result: Criteria of length is **met.**

VTB Depth Calculations

- Depth of VTB should equal depth of navigation channel.
  - Depth of VTB = 35 feet (Columbia River Datum)
  - Depth of Authorized Navigation Channel = 35 feet (Downstream of VTB)

Result: VTB depth criteria is **met.**

VTB Additional Considerations

- EM 1110-2-1613 states that "*the turning basin should use the navigations channel as part of the basin*". Both the existing and proposed conditions meet this criteria.
- EM 1110-2-1613 states that "*The ends will make angles of 45 degrees or less with the adjacent edge of channel*..". Exhibit 1 and 2 show that this criteria is also met.

Result: VTB additional considerations are **met** in the existing and proposed condition.

Case I (Low Current) Conclusions

- All criteria is met according to EM 1110-2-1613.
- It is anticipated that Deep Draft vessels can use the VTB without assistance from 100,000 to 200,000 cfs.
- Above 200,000 cfs Deep Draft vessels may require tug assistance. This is situation for both the existing conditions. At this flow, velocities exceed the 1.5 knot threshold.

Case II – High Current Configuration

Turning Basin Width Calculation

- Width of VTB = 1.5 x Vessel length
  - T-2 Super Tanker
    - Width of VTB = 1.5 x 572 feet = 858 feet
  - Potential Bulk Cement Carrier
    - Width of VTB= 1.5 x 504 feet = 756 feet
  - Width Calculation Discussion
    - Because VTB width = 800 feet for proposed vessel (504 feet), the criteria of width for high current is met for the Potential Bulk Cement Carrier.
    - It appears that by using a factor of 1.5 to estimate the Turning Basin width required for a T-2 Super Tanker, a basin width of 858 feet may be appropriate. This width exceeds the authorized 800 foot width of the VTB.

- The width of the VTB is not changing between existing and proposed conditions.
- Use of tug boats may be required for high currents

Turning Basin Length Calculation

- Final design for high flow conditions designed according to tests conducted on a ship simulator.

VTB Depth Calculations

- Depth of VTB should equal depth of navigation channel.
    - Depth of VTB = 35 feet (Columbia River Datum)
    - Depth of Authorized Navigation Channel = 35 feet (Downstream of VTB)

Result: Width and depth criteria for the Case II – High Current Configuration are met. It is anticipated that length requirements will be met with the 1,400 long proposed VTB. The length will be verified during the ship simulation study.

VTB Conclusions

- It is anticipated that Deep Draft vessels can use the VTB without assistance from 100,000 to 200,000 cfs.
- Based on an investigation of a range flows, the current and proposed VTB dimensions appear are estimated to be sufficient for safe turning of flows up to approximately 200,000 cfs. This is the flow rate that results in velocities exceeding 1.5 knots. For flows exceeding 200,000 cfs, current guidelines suggest a ship simulation.
- CRC is scheduled to perform a ship simulation in the Fall of 2013. The VTB length of 1,500 feet will be verified with this simulation.
- Turning basin criteria for length, width, and depth outlined in EM 1110-2-1613 are met.
- Use of tug boats for turning deep draft vessels may be required for periods of high currents. This is true of both existing and proposed conditions.

Attachment A

Pages 9-1 through 9-3 of EM 1110-2-1613,
Engineering and Design - Hydraulic Design of Deep Draft Navigation Projects

CHAPTER 9

Integral Project Features

9-1. Navigation Features. The following is a list of navigation features normally considered as a part of the overall improvement project:

a. Turning basins.

b. Anchorage areas.

c. Jetties and breakwaters.

d. Dikes and other channel training or control structures.

e. Salinity barriers.

f. Diversion works.

g. Aids to navigation.

h. Ice barriers.

i. Maneuvering areas.

j. Ship locks.

k. Channel wideners at turns or bends (local width increases).

These individual features when pertinent are usually integral to and necessary for the day-to-day operation of the port and allow the design ship to sail through the proposed channel improvement project in a safe and efficient manner.

9-2. Turning Basins.

a. *Ship Turning.* In normal operations, turning basins are used by the pilots in conjunction with two or more tugs to bring the ship about. Full advantage is also taken of the prevailing currents and wind conditions to help maneuver the ship. The pilot strategy may be different on flood or ebb tide current and may change with wind direction. If the ship is equipped with thrusters (bow or stern, sometimes both), then these will be used to the fullest. The ship engine and rudder are usually manipulated, which will provide additional control. Care is usually taken to keep the ship stern away from shoals, rocks, banks, and docks to minimize possible damage to propellers and rudders. Pilot strategy may change, however, depending on the location of the ship bridge on the ship. When the bridge is located at or near the stern of the ship, turning will be accomplished using the stern with another visible reference to control and monitor ship position.

b. Location. Navigation channel project improvements will provide for a turning basin to enable the ships to be turned about to reverse ship direction and allow an outbound sailing transit. The basin is usually located at the head of navigation near the upstream end of the channel project, upstream of a group of terminals and docks on a long channel, or at the entrance to a side channel with berthing facilities. The turning basin will be designed to provide sufficient area to allow the design ship to turn around using ship bow and stern thrusters (if available) and with local port tug assistance. Preference in turning basin location should be given to a site with the lowest current effects, since this has a major impact on the turning ship and therefore the size of the turning basin. Figure 9-1 gives recommended shape and size of turning basins in low and high current situations.

c. Size.

(1) The size of the turning basin should provide a minimum turning diameter of at least 1.2 times the length of the design ship where prevailing currents are 0.5 knot or less. Recent ERDC/WES simulator studies have shown that turning basins should provide minimum turning diameters of 1.5 times the length of the design setup where tidal currents are less than 1.5 knots. The turning basin should be elongated along the prevailing current direction when currents are greater than 1.5 knots and designed according to tests conducted on a ship simulator (Figure 9-1). Turning operations with tankers in ballast condition or other ships with high sail areas and design wind speeds of greater than 25 knots will require a special design study using a ship simulator.

(2) Where traffic conditions permit, the turning basin should use the navigation channel as part of the basin area. The shape of the basin is usually trapezoidal or elongated trapezoidal with the long side coincident with the prevailing current direction and the channel edge. The short side will be at least equal to the design multiple (1.2 or 1.5, depending on the current) times the ship length. The ends will make angles of 45 deg or less with the adjacent edge of the channel, depending on local shoaling tendencies. Modifications of this shape are acceptable to permit better sediment flushing characteristics or accommodate local operational considerations.

d. Depth. Normally, the depth of a turning basin should be equal to the channel depth leading or adjacent to the basin proper. This is done to prevent any possibility of confusion by the channel project users that could cause grounding accidents. The normal dredging tolerance and advance maintenance allowance are included in the depth of the turning basin. In some operational circumstances where design ships will always turn in ballast, the turning basin could be designed to a smaller ballasted ship draft, which could provide substantial cost savings.

e. Shoaling. A turning basin will tend to increase shoaling rates above normal channel rates because of the increase of the channel cross-sectional area, which modifies current patterns. Increased shoaling in the basin could cause modifications in shoaling patterns farther downstream or upstream.

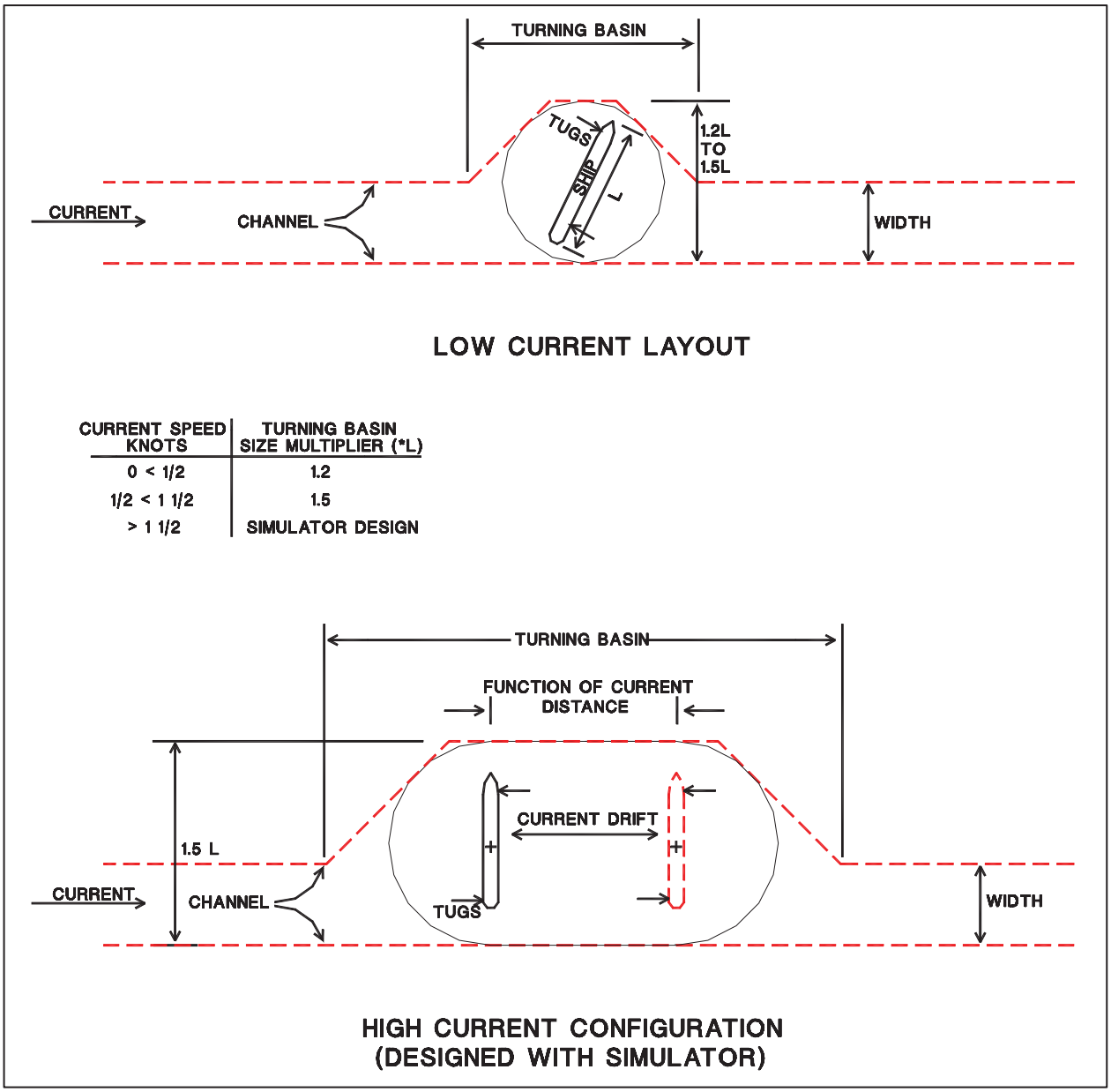


Figure 9-1. Turning basin alternative designs

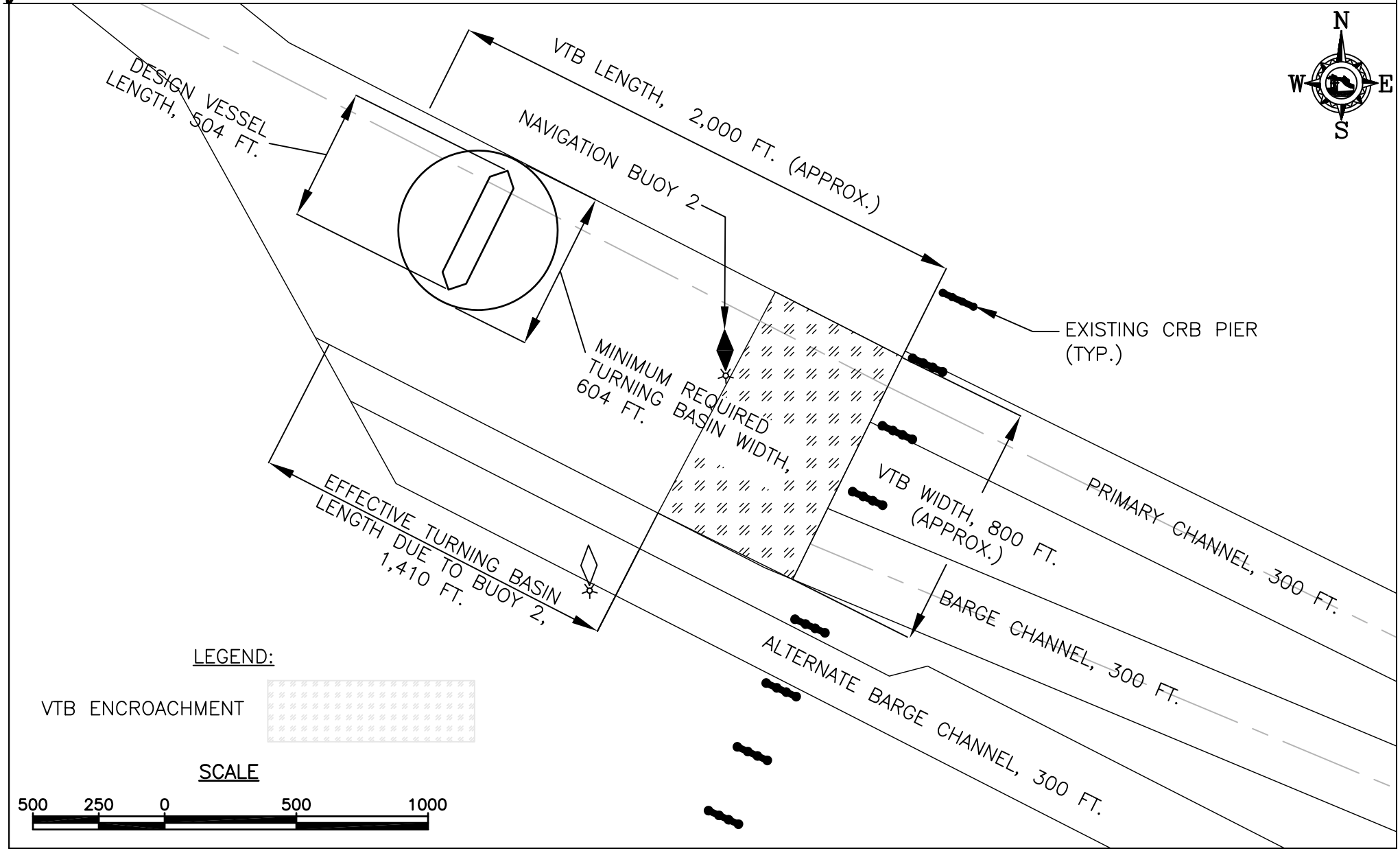
9-3. Anchorages. Anchorages are provided near the entrance to some ports for vessels awaiting berthing space, undergoing repairs, receiving supplies and crews, awaiting inspection, and lightering off cargo. In cases with long navigation channels to get to the port area and heavy traffic, additional anchorages may also be provided along the channel. As shown in Figure 9-2, design of the required anchorage area depends on the method of ship mooring, the size and number of the ships in the anchorage, and the environmental forces (wind, currents, and waves) acting on the anchored ships. Normally, anchorage areas provide space to allow for free-swinging bow anchoring, since some ships are not equipped with stern anchors. Free-swinging moorings require a circular area having a radius equal to the length of the ship plus the length of the anchor chain (scope of the anchor). The U.S. Navy (1981) has calculated a set of tables giving these required dimensions from which the following approximation can be

Attachment B

Figures

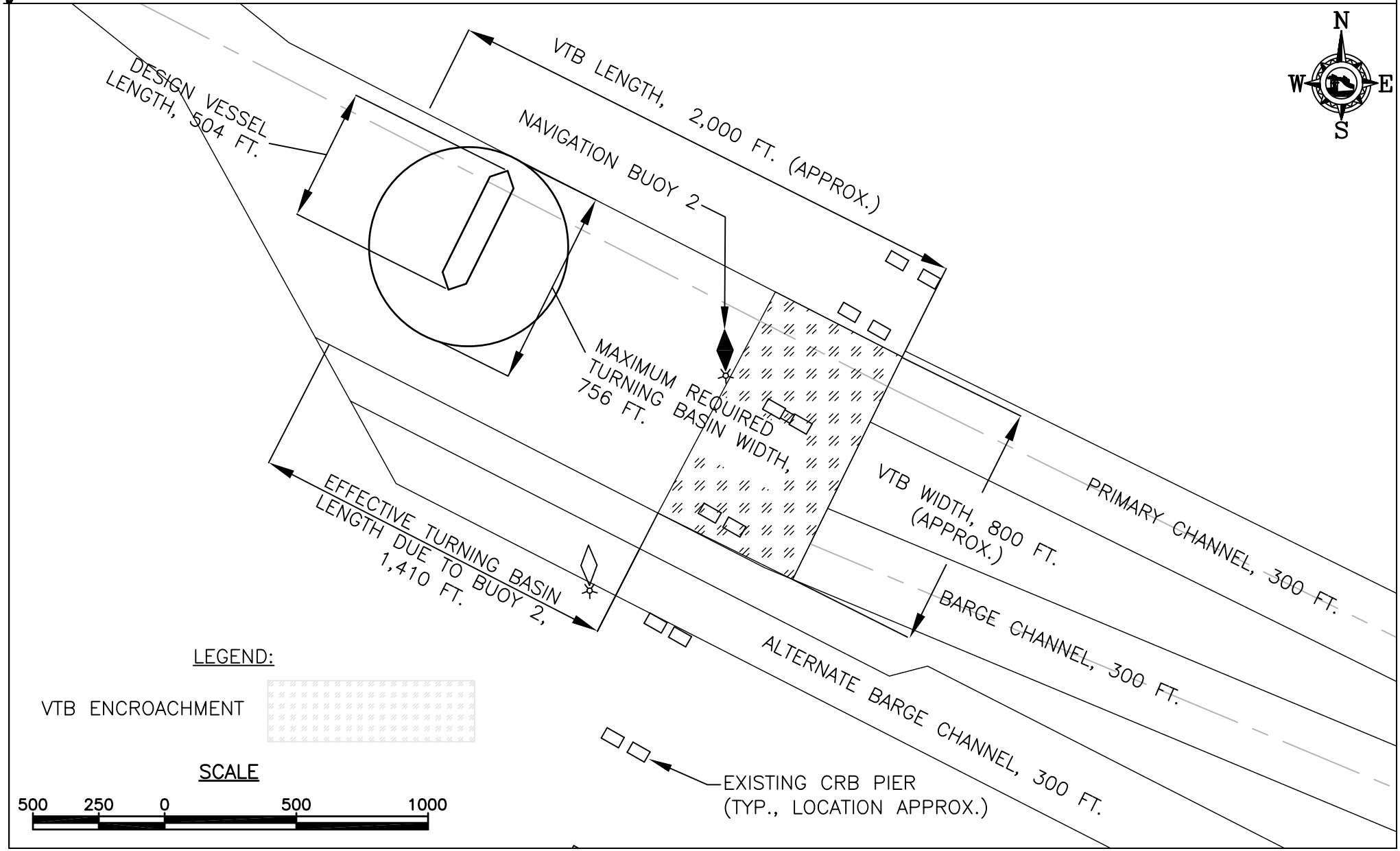
Columbia River CROSSING

FIGURE 1 - LOW CURRENT LAYOUT BASED UPON USACE DESIGN CRITERIA (EXISTING I-5 BRIDGE)



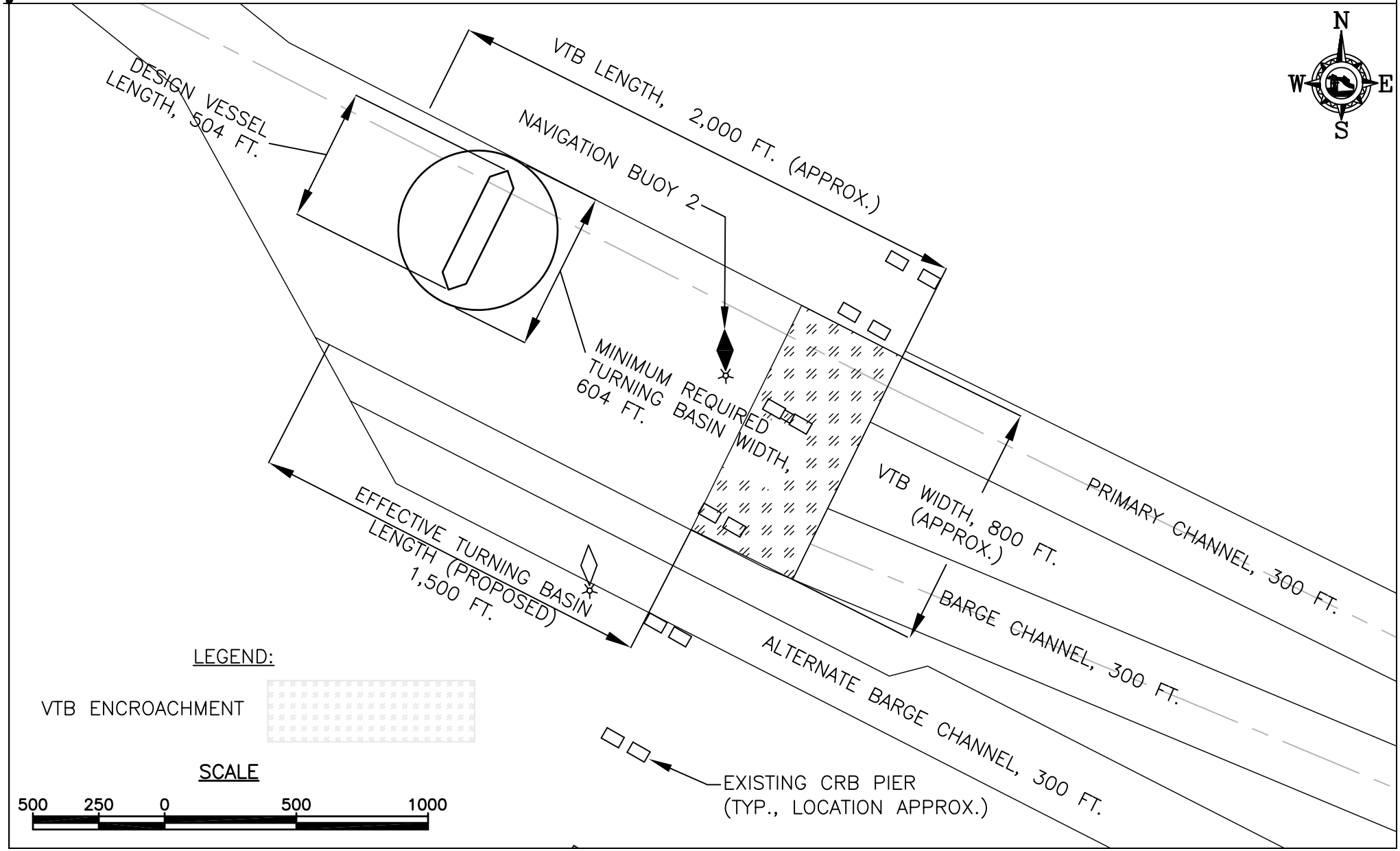
Columbia River CROSSING

FIGURE 2 - HIGH CURRENT LAYOUT BASED UPON USACE DESIGN CRITERIA (EXISTING I-5 BRIDGE)



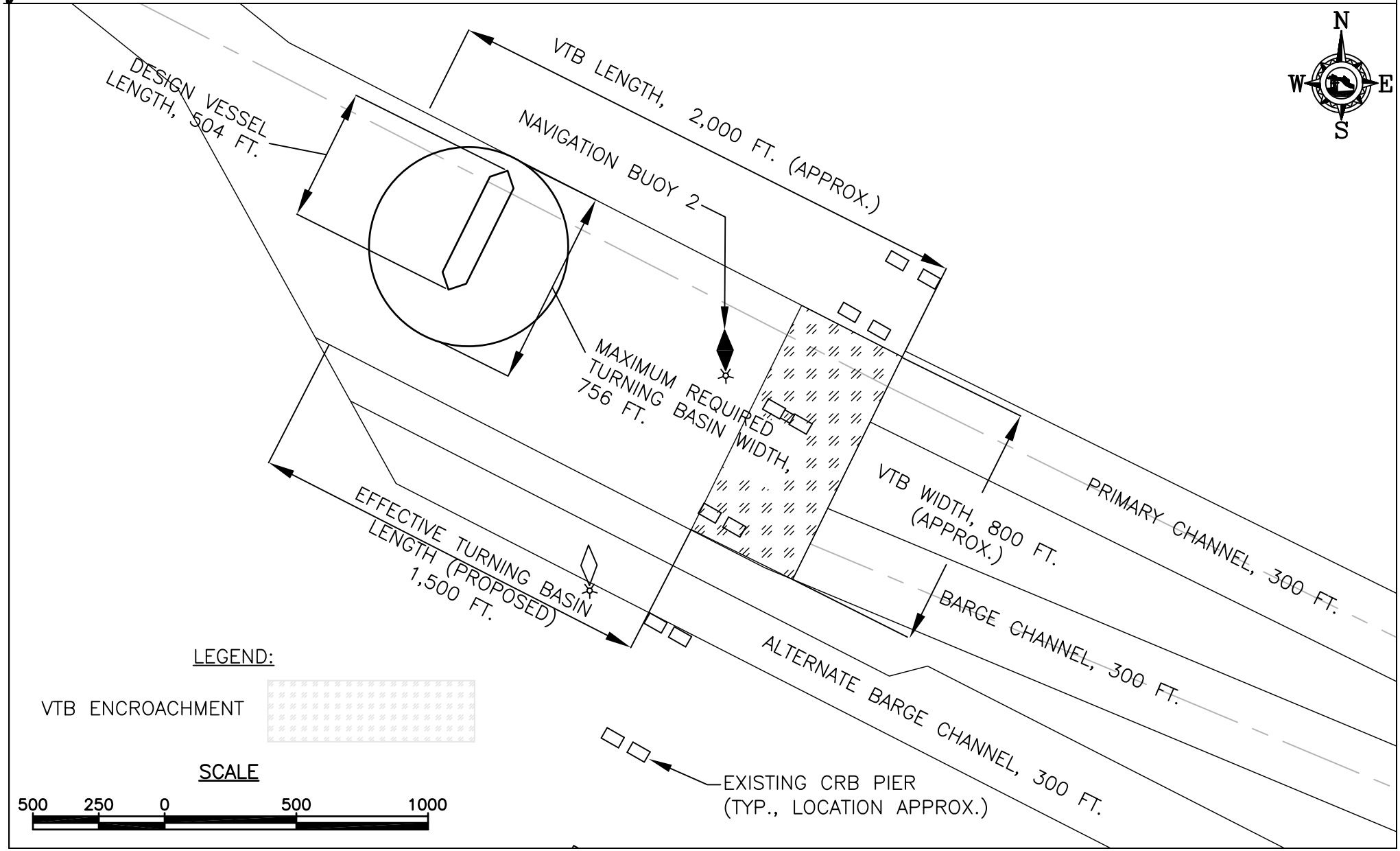
Columbia River CROSSING

FIGURE 3 - LOW CURRENT LAYOUT BASED UPON USACE DESIGN CRITERIA (PROPOSED I-5 BRIDGE)



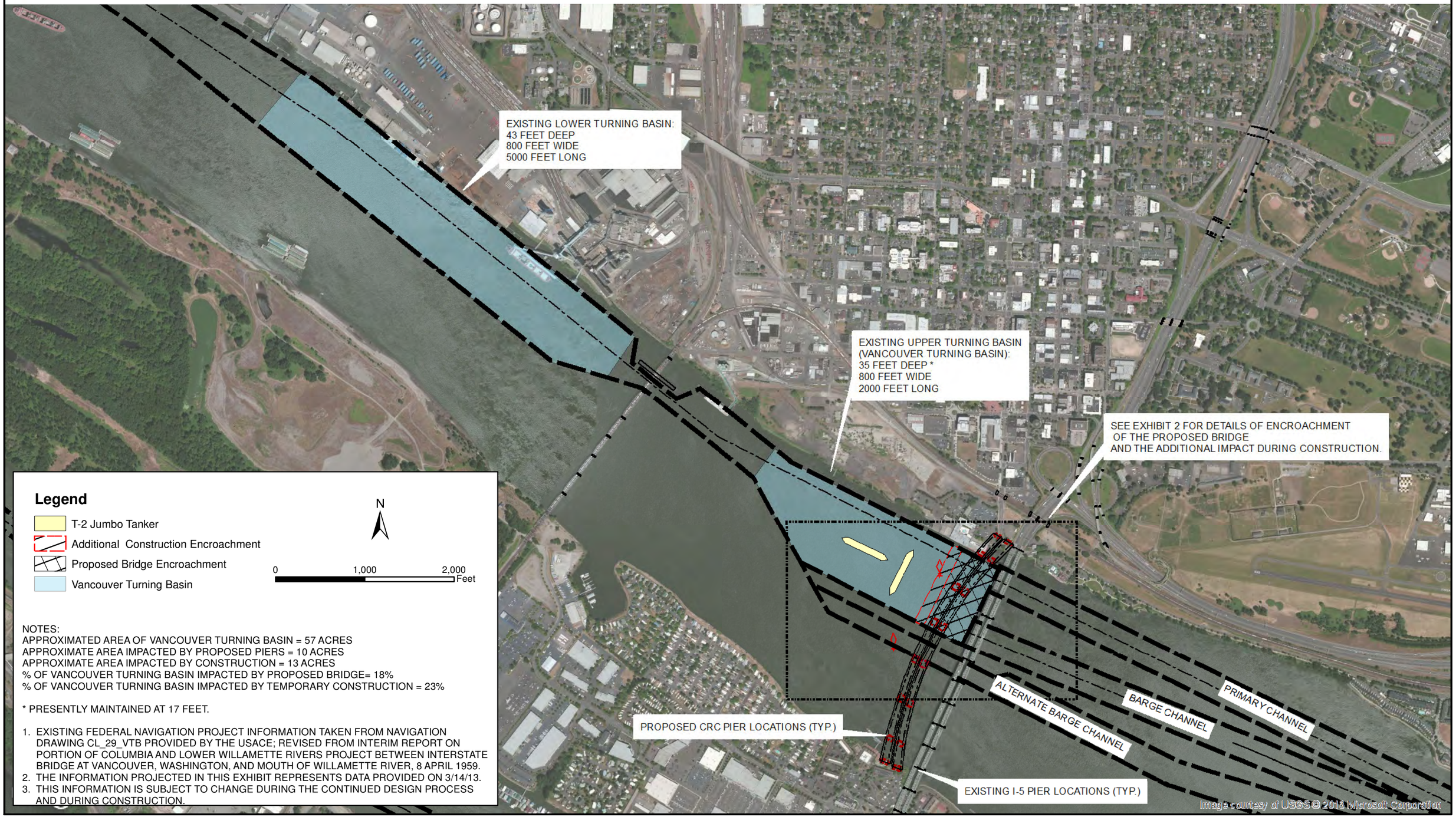
Columbia River CROSSING

FIGURE 4 - HIGH CURRENT LAYOUT BASED UPON USACE DESIGN CRITERIA (PROPOSED I-5 BRIDGE)



Exhibits 1 and 2

Exhibit 1 - Vancouver Turning Basin Encroachment



NOTES:
APPROXIMATED AREA OF VANCOUVER TURNING BASIN = 57 ACRES
APPROXIMATE AREA IMPACTED BY PROPOSED PIERS = 10 ACRES
APPROXIMATE AREA IMPACTED BY CONSTRUCTION = 13 ACRES
% OF VANCOUVER TURNING BASIN IMPACTED BY PROPOSED BRIDGE= 18%
% OF VANCOUVER TURNING BASIN IMPACTED BY TEMPORARY CONSTRUCTION = 23%

* PRESENTLY MAINTAINED AT 17 FEET.

1. EXISTING FEDERAL NAVIGATION PROJECT INFORMATION TAKEN FROM NAVIGATION DRAWING CL_29_VTB PROVIDED BY THE USACE; REVISED FROM INTERIM REPORT ON PORTION OF COLUMBIA AND LOWER WILLAMETTE RIVERS PROJECT BETWEEN INTERSTATE BRIDGE AT VANCOUVER, WASHINGTON, AND MOUTH OF WILLAMETTE RIVER, 8 APRIL 1959.
2. THE INFORMATION PROJECTED IN THIS EXHIBIT REPRESENTS DATA PROVIDED ON 3/14/13.
3. THIS INFORMATION IS SUBJECT TO CHANGE DURING THE CONTINUED DESIGN PROCESS AND DURING CONSTRUCTION.

Columbia River CROSSING

Exhibit 2 - Vancouver Turning Basin Encroachment (Enlarged)