Agency: Commerce, Community and Economic Development

Grants to Municipalities (AS 37.05.315)

Grant Recipient: Kodiak **Federal Tax ID:** 92-6000083

Project Title: **Project Type:** Remodel, Reconstruction and Upgrades

Kodiak - Pier III Replacement

State Funding Requested: $33,100,000 **House District:** 36 / R

Future Funding May Be Requested

Brief Project Description:

Replacement of the City of Kodiak's Pier III, a critical piece of harbor infrastructure. The dock, originally constructed in 1972,with improvements added in 1984 and 1986, is reaching the end if its design life and must be replaced.

Funding Plan:

Total Project Cost:	$33,812,000
Funding Already Secured:	($712,000)
FY2013 State Funding Request:	($33,100,000)
Project Deficit:	$0

Funding Details:

2010-2011 $250,000 City of Kodiak Cargo Development Fund

2012 $462,000 City of Kodiak, Cargo Development Fund

Detailed Project Description and Justification:

Pier III is one of the City of Kodiak's main cargo piers and its only facility for handling containerized cargo. Pier III is a critical piece of infrastructure to Kodiak's economy. Nearly all freight and goods coming to Kodiak are landed and transported across this dock, and the majority of seafood caught and processed in Kodiak for distribution elsewhere leaves via Pier III. This dock is absolutely essential to Kodiak's economic stability and plays a key role in any future economic expansion especially in the fisheries industry.

The current pile supported structure was built in 1972, and despite improvements added in the 1980s, the dock will reach the end of its design life within the next 4-5 years. The existing pier experiences corrosion, wear, and limited load capacity, and requires extensive maintenance to keep it operational. Replacement costs are currently estimated to be $33 million to demolish the existing pier and replace it with a 420' pile supported dock which will continue to serve as the only containerized cargo platform in Kodiak.

The City will complete geotechnical work and a wave motion study within the next six months to determine the appropriate alinment and structure of the new dock. Once complete these steps will help refine cost estimates so design and permitting work can begin. The City will complete final design in 2012. Construction would begin in 2013.

Contact Name: Erin Harrington
Contact Number: 9074654230

For use by Co-chair Staff Only:

$33,100,000 Approved

3:16 PM 5/2/2012

Project Timeline:

2011 $ 66,000 Completed Pier III Design Study Report, installed wave and current monitors at and near Pier III
2012 $ 600,000 Complete wave study and geotechnical analysis
2012-2013 $ 1,200,000 Complete design, site analyses, and permitting/mitigation
2013 $ 634,000 Construction admin, on-site work and construction oversight
2013-2014 30,500,000 Demolition of old pier and construction of 420' new dock

Entity Responsible for the Ongoing Operation and Maintenance of this Project:

City of Kodiak

Grant Recipient Contact Information:

Name:	Aimee Kniaziowski
Title:	City Manager
Address:	710 Mill Bay Road
	Kodiak, Alaska 99615
Phone Number:	(907)486-8640
Email:	akniaziowski@city.kodiak.ak.us

Has this project been through a public review process at the local level and is it a community priority? [X] Yes [ ] No

Contact Name: Erin Harrington
Contact Number: 9074654230

For use by Co-chair Staff Only:

3:16 PM 5/2/2012

Design Study Report

Pier 3 Replacement

Prepared for:

City of Kodiak

710 Mill Bay Road

Kodiak, AK 99615

Prepared by:

PND ENGINEERS, INC.

1506 W. 36th Avenue

Anchorage, AK 99503

September 2011

1.0 Introduction

This design study report, prepared for the City of Kodiak (the City), presents the results of engineering studies performed in preparation for design and construction of the replacement of Pier 3 in Kodiak, Alaska. The proposed project anticipates retrofitting or reconstructing the existing pier as it nears the end of its design life. This study looks at the existing structure, its deficiencies, and possible solutions for replacement or repair. The study evaluates the most appropriate structure type, alignment and construction phasing for Pier 3. Design factors such as constructability, feasibility, and effects on current operations are discussed as they apply to the proposed construction. Research was conducted on the best foundation for the dock at Pier 3, and the results of this study are presented in this report. Necessary utility upgrades such as electrical requirements, potable water, and a stormdrain system are also discussed as it applies to the preferred replacement solution. Ideally, the new pier design shall provide a low maintenance structure which will reduce operating costs and increase facility life.

Optimizing land-based freight storage and cargo movement at the pier is also an interest to the City and the operator of the facility. However, budget constraints do not to allow for the necessary uplands expansion at this time. Therefore, development of the uplands storage area and traffic flow patterns are not addressed in this report.

2.0 Purpose and Need

Pier 3 is a vital infrastructure component in the City of Kodiak and is reaching the end of its useful life. The structure provides a crucial link for cargo shipment into and out of the city. To maintain this link, the Pier 3 facility must continue supporting the container fleet serving Kodiak and elsewhere in Alaska. Therefore, with the pier reaching the end of its useful life, it must be retrofitted or replaced.

3.0 Background

As the only containerized cargo facility serving Kodiak, Pier 3 is an economic and physical lifeline for the City. Currently, the shipping company Horizon Lines (Horizon) operates Pier 3, leasing it from the City. Horizon delivers freight to the City twice a week by docking their D-7 class container vessel at Pier 3 for off-loading (pictured on cover). The containers on these vessels are off-loaded directly onto a semi-trailer truck using a 50-gage, rail-mounted container crane (Figure 1). Freight is moved inland from Pier 3 by a single lane access road and then onto the state-owned road, Rezanof Drive.

Figure 1: 50-Gage Crane at Pier 3

4.0 Limitations

The structural condition of Pier 3 is poor. Frequent and extensive maintenance has allowed the existing facility to survive beyond its initial design life. The current facility suffers from corrosion, wear, limited offloading and vessel capacity, restricted upland storage space, and difficulties in moving freight from Pier 3 to town. A copy of the most recent dock inspection can be found in Appendix D.

Rezanof Drive provides the only access to Pier 3. High speed traffic and restricted sightlines make efficient and safe cargo transport challenging, creating operational limitations and reducing the volume of containers that can be moved in and out of the area. Traffic movement was briefly examined during this study, but budget limitations and complicated coordination with the State of Alaska (who owns the right of way) will force any traffic improvements to future work efforts. The current system has worked and it is assumed that it will continue to be utilized in the same fashion. In this study, all alternatives examined will ensure that proposed improvements do not negatively affect traffic movement, but presented alternatives will not actively seek to improve traffic flow.

The existing 50-gage crane at Pier 3 is aging and parts are becoming harder to find. Diesel-operated cranes require significant maintenance, and with this crane being 40 years old, it is no longer cost effective to refurbish or repair the crane to keep it in operable condition. Furthermore, the height of the boom poses limitations on the Horizon trade lines, which has to stack cargo coming into Kodiak at lower levels on their vessels than other Alaskan ports which have taller cranes. Also, with a new generation of larger cargo vessels coming into use with the completion of the new port facility in Anchorage, the crane may cause additional limitations on the trade lines.

The existing crane is owned by the City of Kodiak and has no salvaged value. As their contribution to the project, Horizon has offered to supply the replacement crane for the new Pier 3 facility and take responsibility for disposal of the existing crane. Horizon would prefer to procure a used crane for the

new dock. The inventory of used cranes around the world is limited, and 100-gage cranes are the most common and readily available model. Therefore, the design of the structure should accommodate a 100-gage crane to provide maximum design flexibility and to minimize crane costs. Upgrading the crane would require a larger dock area than currently provided at Pier 3. This would negatively impact the already restricted traffic movement around the pier and would require a significant upgrade to the foundation and superstructure of the existing dock.

Figures 2 and 3 show the condition of the existing dock and one of the dolphins, respectively. The most recent inspection report from 2008 (see Appendix D) concluded the dock was in poor condition and was nearing the end of its useful life.

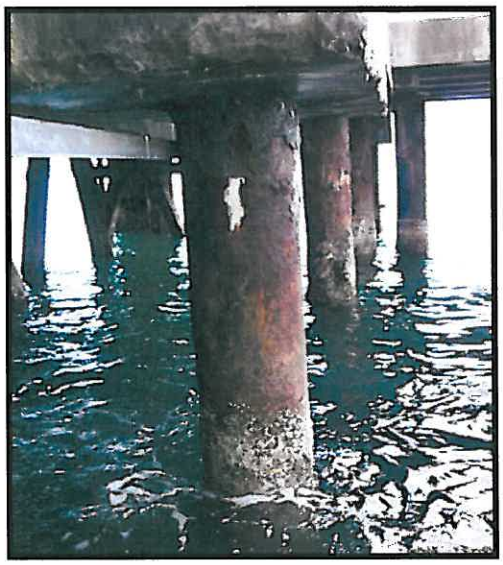

Figure 2: Condition of Existing Pile

Figure 3: Condition of Existing Dolphin

5.0 Location and Description of Pier 3

Pier 3 is located at the foot of Pillar Mountain on the southwest side of the City of Kodiak. A location and vicinity map can be found in Appendix A. Originally constructed in 1972 as a 365-foot by 60-foot wide pile supported pier, Pier 3 has been upgraded several times over the last 39 years to accommodate the ever-growing cargo vessels in the shipping industry. The original section of the pier (main pier) was constructed of a concrete haunch-panel deck supported by concrete pile caps over steel H-piles and pipe piles. The main pier is fitted with a pair of parallel rail tracks which service the container crane.

Figure 4: Aerial View of Pier 3

Several improvements have been made to the pier over the years. In 1984, improvements to the pier were made when an inspection noted the backwall was failing and observations indicated waves refracting off the existing sheet pile retaining wall may have been causing excessive movements of moored vessels during cargo unloading (PND 1982). This improvement added 32 feet of width along the full length of the pier and replaced the soldier pile wall with a riprap slope to help dissipate wave action at the pier. During this time, a new fendering system was installed at the dock and anodes were added to the piling under the deck. In 1986, two 30-foot by 60-foot wing additions were constructed to either side of the Main Pier. These wing additions are composed of concrete deck panels supported by steel pile caps and steel pipe piles. In 2004, the pier was stabilized with a tie-rod bracing system between the original H-piles and additional reinforcement was added to the pile caps. The 2004 retrofits were performed as maintenance to remedy deficient capacities found during dock inspections. The deck of Pier 3 is overlain with asphalt /concrete pavement.

Four mooring dolphins are located at the Pier 3 facility. Two dolphins are located on the east side and two on the west side of the pier. The inside dolphins on either side of the pier consist of eight battered-steel H-piles joined at the top by a deep concrete cap and were constructed in 1972. The outermost dolphins consist of four battered-steel piles and one vertical pipe pile welded to a steel dolphin cap and were constructed in 1986. Steel catwalks connect the dolphins to the main pier.

The fenders at the pier were installed along the face of the main pier and along the east and west extensions in 1986. These fenders replaced the original wood-pile fenders constructed in 1975. The fenders are steel, slip-sleeve style fenders with cylindrical, rubber energy absorbers and timber bumper panels.

Current utilities at Pier 3 include electricity, fire water and sewer. Current electrical lines running to the site bring power to the navigation and catwalk lights via lines running through a trench set into the decking of the pier. According to the City, these lines are problematic, often shorting-out.

6.0 Design Criteria

The following criteria shall be considered in the design of the new or retrofit dock facility:

6.1 General

- Design Life: 50 years. In order to meet this requirement galvanizing of the steel components, and/or placement of a cathodic protection system will be necessary on the new pier.
- Daily Operations: Cargo loading and unloading operations must be continued throughout the construction process. Access to the dock is vital, therefore design, as well as construction methods, need to consider needed operations at the facility.
- Future Development: Layout of the new dock design shall consider future access between city docks 2 and 3 in relation to future development of waterfront facilities.
- Minimum Length of Pier: 420 feet. This length would provide access to approximately six hatches on the D-7 vessel specified below. Each hatch on the vessel is approximately 50 feet wide.
- Elevation of Top Deck: Current elevation of existing Pier 3 is approximately +20 feet. This will be the criteria for the new dock. This elevation should be verified prior to design of the new dock, particularly if a different structure type is chosen.
- Mooring Requirements: Mooring dolphins and breasting dolphins will be required at the new dock if the length is limited to 420 feet. The design vessel length will overhang both ends of the pier, and will require tie-off points beyond the face of the dock. Catwalks shall connect any dolphins to the main pier.

6.2 Live Loads

General Live Loads

General live load across surface of deck: 750 lb/sf. This load accounts for stored conex containers stacked three-high.

Vehicle loads:

- Structure will be designed in conformance with AASHTO HL-93 criteria which will accommodate the typical highway-legal, double-axle trailer such as the following vehicles which currently operate at the site:
  - Double-axle YT30 pulling a 45-foot chassis
  - Double-axle TJ6500 DOT vehicle pulling a 45-foot chassis
- Hyster 1050 E top-pick loader under full capacity has heavy axles which will also be accommodated

Design Vessel

The crane and dock design will consider the current D7 class vessel that frequents the port in Kodiak as well as future ship classes. The D-7 class cargo vessel from Horizon Lines uses the existing Pier 3 dock twice a week. Specifications for the vessel are listed below (see Figure 5).

D-7 Dimensions:

LOA:	710 feet (length overall)
LBP:	676 feet (length between perpendiculars)
Breadth (extreme):	78.21 feet
Depth (molded):	51 feet
Draft:	33.13 feet (Summer Load Line)
Displacement:	37,474 tons (Summer Load Line)
Deadweight:	20,966 tons (Summer Load Line)
Capacity:	1,668 TEU max (Twenty-foot equivalent units)

Figure 5: D-7 Class Container Ship

Future Vessels:

The dock design should take into account the possibility of larger ships using the facility to the greatest extent possible. Future ship classes may increase the length of the design vessel to 845-feet, the width to 106-feet, and the draft to -45-feet. These dimensions will be accounted for in the design of the fendering system and the layout of the berthing and mooring dolphins. The procurement of the crane will also consider these larger vessels. More detailed specifications for these design vessels will need to be determined during design.

Container Crane

For this design study, the replacement crane specification shall match those of a 100-gage crane with electrical power (Figure 6). Detailed specifications for the exact crane that will be purchased need to be considered during design.

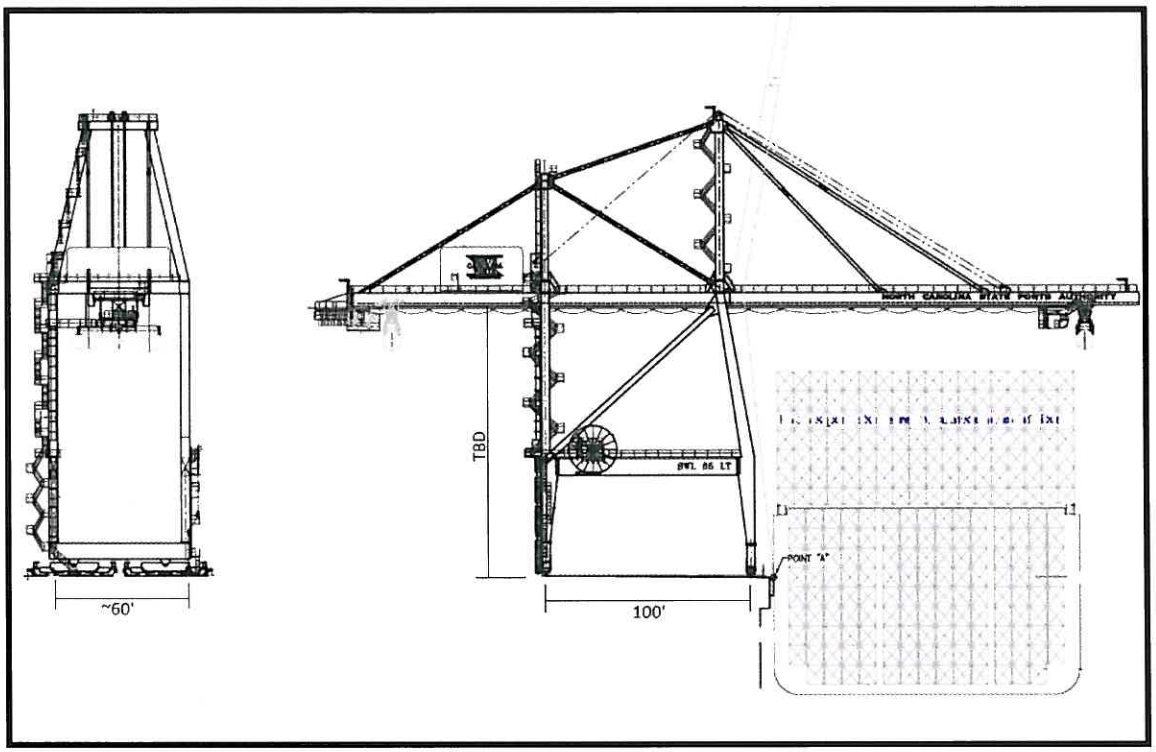

Figure 6: 100-Gage Container Crane

6.3 Seismic Loads

Contingency Level Earthquake (CLE)
(475 year recurrence, 10% exceedance in 50 years) A-horiz. (Avg. PGA) 0.43g

6.4 Wind Load

130 MPH 3- second gust, ASCE Exposure Category D

6.5 Utilities

Potable Water: Provide potable water to ships berthed near location of the existing hydrant.

Fire water: The current system appears to be adequate.

Stormwater: The new facility shall be sloped so that all storm water drains into an oil-water separator prior to discharge.

Sewage Disposal: Current sewage disposal consists of a septic system with two holding tanks. This septic system should remain in place and be utilized for the new facility.

Electrical: A study is recommended to investigate electrical versus diesel-operated cranes to determine their efficiency. In the case of this study and associated cost estimates, it is assumed that the existing facility will be modified with an electrical system that will facilitate a container crane powered by electricity. Additional study will also be necessary to determine the most efficient means of utilizing electric power regenerated during operation of the crane.

Lighting: Supply sufficient lighting in the area of any new structures to meet Occupational Health and Safety Administration (OSHA) requirements of 5 foot-candles at all ship unloading areas and 3 foot-candles in other yard areas. Lighting in the existing yard is assumed to be adequate and will need to be verified during design.

7.0 Design Standards

The design standards for this project are based on the local codes in Kodiak and the following specifications, standards, and codes:

- City of Kodiak Standard Construction Specifications and Standard Details, 2000
- American Society for Testing and Materials (ASTM) Standards, Current Edition
- American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications, 5th Edition
- American Institute of Steel Construction (AISC), "Steel Construction Manual, Thirteenth Edition"
- American Welding Society (AWS), "D1.1 Structural Welding Code – Steel, 2010 Edition"
- American Concrete Institute (ACI), Building Code Requirements for Structural Concrete – ACI 301-305, 2008
- American Institute of Steel Construction (AISC) Code of Standard Practice, 2010
- American Society of Civil Engineers (ASCE) Standard – Minimum Design Loads for Buildings and Other Structures (SEI/ASCE 7-10)
- International Building Code (IBC), 2009 Edition