

January 7, 2016

PND No. 154034.01

HMC Management
Claudia Ellsworth
P.O. Box 119
Lakebay, WA 98349
hmcmanager@herronisland.org

Subject: Herron Island Ferry Terminal Dolphin Replacement – Concept Study Report

Dear Claudia:

HMC Management (HMC) contracted with PND Engineers, Inc. (PND) to assist in developing a program for replacement of the dolphins at the terminals of the Herron Island Ferry. PND teamed with Hart Crowser (environmental consultant), APS Surveying & Mapping (surveys) and Quigg Brothers (marine contractor) to perform this initial phase of the contract. The following presents the findings of the study.

Background:

All eight existing timber pile cluster dolphins (four at each terminal) are exhibiting signs of extreme stress and severe deterioration, hastening their need for replacement. The first phase of the dolphin replacement project is to provide HMC with all the information needed to select the best concept design, considering a range of factors, in order to secure the financing needed for final design and construction. Phase one tasks included conducting research, performing site surveys, conducting a supplemental geotechnical test pile program, development of an alternatives analysis, related cost estimating and an estimate of permitting efforts. The purpose of this report is to present the results of the dolphin replacement concept study, encompassing all of the work completed to date.

Research, Surveys and Geotechnical Exploration:

Prior to the start of field work, historical documents, record drawings, reports and other background information was collected and examined. Some of the documents studied included:

- Marine Structures Condition Assessment and Repair Recommendations Report (KPFF, September 24, 2010)
- Geotechnical Engineering Report for Proposed Replacement Ferry Landings (GeoEngineers, January 26, 1994)
- As-Built Drawings – Herron Island Ferry Terminals Replacement (ABAM, May 25, 1994)
- Washington State DNR Aquatic Resources Lease
- Aquatic Right of Way Easement – Peninsula Light Co.
- Sound Telephone Co. and Peninsula Light Co. Cable Crossings
- MV Charlie Wells Certificate of Documentation (USCG)

On August 17, 2015 APS began the site surveying work at the mainland and island terminals. This work consisted of establishing project control, performing topographic and bathymetric surveys and locating and documenting the footprint location of each dolphin. From this information, base maps were created for use in project layout and design. The survey base maps are included as an attachment to this report, for reference.

On November 24, 2015 PND and marine pile driving contractor, Quigg Bros., conducted a test pile probing program to collect supplemental geotechnical information for use in the concept study and design work. The details of the test pile probing program and the result of findings are provided in the technical memorandum, dated December 4, 2015. Generally, the test pile probing program helped to identify the depth of overburden at the new proposed dolphin locations and general character of the soil strata. It was found that the soils in the vicinity of the island terminal dolphins appear to be very dense throughout driving and approximately 34 to 46.5 feet deep before reaching vibratory refusal. The soils in the vicinity of the mainland terminal dolphins appear to be loose to medium dense and encountered refusal at a depth of approximately 61 to 68 feet. The refusal depth was not reached with all probes at the mainland terminal, but it assumed that a very dense layer exists within 10 to 20 feet below the deepest probes, based on data from two of the mainland probes that did reach refusal. The full memorandum and attachments are included as an attachment to this report, for reference.

Dolphin Concepts:

Four dolphin concepts were developed as part of this concept study and are presented as part of this report. Material types and sizes were approximated using the data collected from background research, site surveys and the supplemental geotechnical exploration findings. Each concept was evaluated for its specific advantages and disadvantages with respect to its competing concepts, with a pros and cons matrix presented on the concept drawing. Rough order of magnitude cost estimates were developed for each concept using cost ranges to account for the approximate nature of estimating costs at the preliminary level of concept development. In all cases a total of eight new dolphins will replace the eight existing dolphins, with new dolphins being installed immediately adjacent to the old dolphin. All materials will be steel, unless otherwise noted, and will be hot dip galvanized and/or spray metalized to provide corrosion protection. The four concept drawings are part of this report, for reference.

The Concept 1 dolphin consists of a row of steel pipe fender piles with plastic rub sleeve connected at the top with a steel fender cap to form a fender panel. Backing up the fender panel will be a steel dolphin cap supported by steel pipe vertical and batter piles. A rubber energy absorbing unit will be attached to the dolphin cap and the fender panel will be offset from the rubber energy absorber to allow for a multiple stage berthing fender with increasing stiffness as load is added. The pipe piles will be no larger than 12-inch x-strong pipe.

The dolphin style presented as Concept 2 consists of a fender panel, exactly like that used in Concept 1. Backing up the fender panel, is a reaction pile type of dolphin, depending on lateral capacity of the steel pipe piles and supporting soils for the stiffer element of resistance. The fender panel and reaction pile cap will be offset to allow for a multiple stage berthing fender with increasing stiffness as load is applied. The reaction piles are approximately 24 to 30-inches in diameter, requiring sufficient embedment in the soils for needed lateral resistance.

Concept 3 shows a dolphin style that the HMC is probably familiar with from previous studies. This dolphin consists of a specialized compressible floating DONUT fender, consisting of a flexible foam core wrapped in a urethane skin, sleeved over a single, large diameter steel pipe pile. The impact energy of a berthing vessel is absorbed partially through the compression of the DONUT and partially by the lateral deflection of the pile. It is estimated that the pipe pile will be approximately 36-inches in diameter, requiring significant embedment in the soils for needed lateral resistance.

The dolphin style presented as Concept 4 is very similar to the original construction, except that the creosote timber piles are replaced with fiber reinforced plastic timbers. The function and appearance will be very similar to the existing dolphins, but require many more piles than the other concepts to construct.

Recommendations:

Based on our evaluation and analysis of project constructability, design complexity, scheduling of work, construction phasing, permitting complexity, preliminary cost estimates and control of project risk, Dolphin Concept 1 is recommended. Following is a summary of the rationale for this recommendation.

This design concept can be implemented at all dolphin locations at both terminals, with very little variation in design or construction method. Other design concepts would only work at one location or another, without employing entirely different construction methods. This 'single repetitive design' benefits the project in a number of ways, including:

- Improved pricing and quality control on fabricated materials built in a repetitive manner,
- Same construction equipment and methods used for all construction, also improves quality and efficiency,
- All dolphins will have a consistent feel to ferry operators, regardless of the terminal

This type of dolphin depends on tension and compression (bearing) piles in the backing dolphin cap, rather than large diameter lateral bending piles. For that reason, smaller diameter piles can be used. From review of the geotechnical information, we are confident that the required bearing capacity and tension capacity can be achieved in these soils. The 12-inch extra-strong pipe piles proposed to be used to construct these dolphins match the section of pipe used for the test pile probe, eliminating many of the unknowns and risks that are often a concern with pile driving. Pile lengths and required installation energy can be estimated with a certain degree of confidence due to the close correlation with the test probing plan.

This dolphin concept also has the least amount of permitting effort associated with it. First off, it will be considered self-mitigating since we will be replacing creosote treated timbers with a steel structure that is roughly equivalent in size. It will only require a programmatic Nationwide 3 (Biological Evaluation not required) from USACE. Both NMFS and USFW consultations should be minor. The estimated permit review and approval timeline is only two to three months. There will be no requirement for marine mammal monitoring or Marbled Murrelet monitoring, during construction. A preliminary matrix of anticipated permitting efforts is below, comparing the four individual concepts.

Concept	USACE Permit	SPIF Application	BE Required	NMFS Consultation	USFW Consultation	Marine Mammal Monitoring	Marbled Murrelet Monitoring	Permit Timeline
1	Nationwide 3	Yes	No	Minor	Minor	No	No	2-3 Months
2	Nationwide 3	No	Yes, Partial	Moderate	Moderate	Yes	Yes	5-6 Months
3	Nationwide 3	No	Yes, Partial	Major	Major	Yes	Yes	8 Months
4	Individual	No	Yes, Full	Major	Moderate	Yes	No	8-10 Months

Key to abbreviations in table:

USACE: U.S. Army Corps of Engineers

SPIF: Specific Project Information Form

BE: Biological Evaluation

NMFS: National Marine Fisheries Service

USFW: U.S. Department of Fish and Wildlife

Schedule:

Below is the anticipated schedule from notice to proceed with design, through completion of on-site construction. This schedule shows project completion by January of 2017, assuming several critical milestones are reached. It is understood that funding decisions may push the schedule into a later completion date. However, based on the condition of the existing dolphins and potential loss of service due to failure, it is recommended that this work be started at the earliest possible.

Anticipated Notice to Proceed (NTP)	February 1, 2016	(3 weeks from now)
30% Design	March 1, 2016	(4 weeks from NTP)
Submit JARPA Application	March 15, 2016	(2 weeks after 30%)
60%, 90% and Final Design	April 30, 2016	(8 weeks after 30%)
Anticipated Permit Approvals	July 15, 2016	(12 weeks after application)
Advertise for Bids	July 15, 2016	
Bid Opening	August 30, 2016	(6 weeks bidding period)
Contracts	September 10, 2016	(September Board meeting)
Submittals & Material Procurement	September - October, 2016	(6 weeks duration)
Fabrication	October - November, 2016	(6 weeks duration)
Site Construction	December, 2016 - January, 2017	(8 weeks duration)

Typical allowable work window July 15 through February 14

As stated in our proposal for engineering services, we are confident that any disruptions to service will be minimal, if at all, during the approximate eight weeks of site demolition and construction. This will be achieved through effective design, specification, construction sequencing and management.

It has been a pleasure working with HMC on this phase of the project and we look forward to starting on phase 2. Please feel free to contact us if you have any questions or need anything further.

Sincerely,

PND Incorporated | Seattle Office

Todd Belsick, P.E.
Principal

John Olson, P.E.
Senior Engineer

Attachments:

Survey Basemaps
Test Pile Probing Technical Memorandum
Concept Drawings