PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT
A RESPEC COMPANY

SITE VISIT REPORT/ENGINEERS ESTIMATE

Observer	Elliot Wilson, PE	**Report Date**	6/18/2021
Visit Date/Time	5/10-5/11/21	**Client #**	
Temperature	-	**PDC #**	20216JN
Weather	-	**Project Name**	Skagway Waterfront Master Plan
RE	Skagway Ore Dock – Condition Review / Engineer's Estimate of Value – Rev 1		

INTRODUCTION

PDC Engineers, a RESPEC Company, was hired to conduct an inspection of the ore dock in Skagway, Alaska. The intent of the inspection was to determine the current condition of the dock to aid in the assessment of dock value. The site visit was conducted on May 10 and 11, 2021. Attending the site visit were Elliot Wilson, PE, from PDC; Matt O'Boyle, Harbormaster; and Brad Ryan, Skagway Manager for the Municipality of Skagway.

The following appendices accompany this report:

- Appendix A: Dock Areas
- Appendix B: Engineer's Estimate

BACKGROUND/NOMENCLATURE

The ore dock has undergone numerous alterations and expansions through the years. A document review done by PDC was focused on two documents provided by the municipality:

- Moffatt & Nichol - *Final Skagway Ore Dock Inspection Report*, October 27, 2012
- PND - *Skagway Ore Dock Repair Plans*, February 2013

The Moffatt & Nichol report identified areas of the ore dock that needed repair and also established an engineer's estimate of the value of the dock. The plans produced by PND addressed the damage identified in this report. The PND plans identified four phases for construction that were to be completed by 2017. PDC does not have any documentation that specifies what repair have been completed.

The Moffatt & Nichol report identified a number of specific dock areas by an assigned name. PDC's report generally retains that nomenclature. These areas are:

- Concrete Extension/Platform Dock: Concrete deck with galvanized piles
- Ship Loader Support Structure: Galvanized and ungalvanized piles used with concrete cap
- Conveyor Transport Support Structure: Galvanized and ungalvanized piles used with concrete cap
- Covered Walkway: Timber piles and deck

- Service Pier: Mix of timber and steel piles with timber deck
- Southern Infill/Timber Platform Dock: Timber piles and deck
- Middle Infill/Timber Platform Dock: Timber piles and deck
- Northern Infill/Timber Platform Dock: Timber piles and deck
- Walkway #5/Original Timber Platform Dock: Timber piles and deck
- Ore Ship Loader Dolphins: Concrete-capped, painted steel piles (paint no longer remains), designated as D1 through D5
- Ship Loader: Equipment (outside scope of work)
- AML Dolphins and Barge Dock (outside scope of work): Galvanized steel, designated as AML1-AML4

METHODS

PDC utilized the same methodology for determining dock value and condition assessment rating (CAR) presented in the 2012 Moffatt & Nichol report. Specifically, we looked at the remaining estimated useful life of dock components and subtracted the cost of repairs needed to address current areas of distress. Values of dock components were taken from Moffatt & Nichol's report and adjusted for inflation over the past 9 years at a rate of 4.5%. Further information about the CAR and the average life of steel and wood piles can be found in that report.

Repairs to address deficiencies are estimated using the values found in the Moffatt & Nichol's report, adjusted for inflation and including the proportional amount of indirect, markup, A&E design services, environmental permitting, and construction costs associated with each repair.

OBSERVATIONS

Observations of the dock pilings were done from a personal watercraft piloted by Matt O'Boyle. On both days of observations (May 10thand 11th) the morning low tide was at approximately -1 foot. The turbidity of the water was such that observations could be made only for a foot below the water. Observations were thus limited to elevations above this level.

Observations of the steel and wood was done via hand tools to record conditions of piles. Sampling was done on both a randomized and discriminatory basis. Discriminatory sampling was done on piles that showed signs of steel pitting and wood rot.

Steel thickness measurement was done with a GE Panametrics Ultrasonic Thickness Gage (37DL Plus model).

Wood condition was assessed using a punk-probe forcefully driven into the wood by hand. Both a sharp-pointed probe and a flathead screwdriver were used to conduct these tests.

The observations gathered are discussed below.

- Concrete Extension/Platform Dock:
  - Galvanized piles show little to no rust.
  - Horizontal connection plates between batter piles and vertical piles show significant rusting as plates do not appear to lack galvanization and were field cut. It is not anticipated that a significant section loss has occurred at this time.
  - Concrete decking panels have no signs of deterioration. Grouting between decking panels has not spalled or deteriorated.
- Ship Loader Support Structure:
  - No damage found on piers or concrete (loader outside scope of work)
- Conveyor Transport Support Structure:
  - No damage found on piers or concrete (conveyor support outside scope of work)
- Covered Walkway:
  - No damage present other than typical wearing.
- Service Pier:
  - Vertical Piles: There are (12) steel piles on the access platform connecting the shore that may need to be replaced. There was a large hole found on one, and further underwater inspection is warranted, see photos 84 & 85.
  - Timber Caps: It is likely that new steel piles will require additional steel beams to support bridge deck if steel piles are replaced.
- South Infill/Timber Platform Dock – Timber piles and deck:
  - Piles: One vertical is missing at eastern face of platform, see photo 90. Vertical and batter piles are otherwise in fair condition.
  - Decking/Beams: These are in good condition.
  - Cross Braces: Most of the cross-bracing appears to be intact. Note, only a shoreside examination was possible.
- Middle Infill/Timber Platform Dock:
  - No damage was found.
- North Infill/Timber Platform Dock:
  - Braces: There are about 25 braces that need to be repaired.
- Walkway 5/Original Timber Platform Dock – Timber piles and deck:
  - Vertical Piles: These are in critical condition, and the dock should be removed.

- Ore Ship Loader Breasting Dolphins – Concrete-capped, painted steel piles (paint no longer remains), designated as D1 thru D5:
  - Vertical Piles: Deterioration of piles varies, but all piles show significant rusting. Rusting ranges from 0-100% loss in thickness of steel. One location on Dolphin D2 had complete section loss at the -1 to -2-foot elevation; see Photo 60. Other locations showed pitting of 30-50% section loss; see Photos 86 & 87.

    In general, all piers were in critical to fair condition.

    Capacity of dolphin assemblies is in question due to the extent of damage found on D2 and the inability to inspect steel below the waterline.

    The jacketing and cathodes recommendation from the 2012 inspection could not be verified as complete during site visit.
  - Concrete Caps: Concrete on piles appeared to be in fair condition except for one location at Dolphin D4; see Photos 68 & 70.
  - Two sets of fenders need repair.
  - Numerous ladders accessing dolphins from the waterline were missing rungs.
- Ship Loader – Outside scope of work
- AML Dolphins and Barge Dock (outside scope-of-work)- Galvanized steel, designated as AML1-AML4.
  - Vertical Piles: Bent in numerous locations, and broken at AML2; see Photo 89.

DISCUSSION

PDC's inspection of the dock found that most of the deficiencies identified in Moffatt & Nichol's report had been addressed in the repairs designed by PND. The only repairs that PDC found to be grossly incomplete were to the Ore Ship Loader Dolphins. If this is not the case, the estimation of dock value of repairs may need to be revised.

It is unknown if the braces on the Northern Infill Dock still need repair, if braces have failed since the 2012 inspection, or if the braces are even necessary. Additional investigation/engineering may find the recommendation to replace these braces conservative.

Investigation of piers below the -1-foot level is advisable for the steel piles located on the Ore Ship Loader Breasting Dolphins and the piles located on the Service Platform. PDC recommends underwater investigation of all of these steel piles to verify the service life and the installation of cathodes. Without this additional information, it should be assumed that all the estimated repairs are needed within the next 5 years in order of in-service date of the platform and the dolphins.

RECOMMENDATION

The current value of dock presented in this report is based on the percentage of useful life remaining in the structure. This amount varies depending on the portion of the structure type and when the dock portion had been constructed. The current value of the dock system less the concrete extension and dolphins to the south is approximately $341K which has an expected life of 2 to 30 years (depending on area). The replacement cost of this area is estimated to be $54M.

The estimated dock value used in for this report assumes that piles in the service platform and the Ore Ship Loader Breasting Dolphins need to be replaced. This damage is located at the -2-foot level of the steel piles; see Photos 60 & 85. These may be isolated locations; however, without additional underwater inspection that cannot be assumed at this time. Further investigation of these piles would enable further refinement of this engineer's estimate, possibly allowing us to extend the assumed service life of the pier and decrease the expected repair costs assumed in the estimate.

In the engineers estimate, the line item 'mobilization & demobilization' also includes indirect costs, markup, A&E design services, environmental permitting, construction admin, and a contingency. These increase this line item by $2M. This is likely conservative. A more detailed estimate should determine what markups are applicable to mobilization & demobilization.

PHOTOS

Photo 1- Dolphin addition, galv. steel (1 of 2)

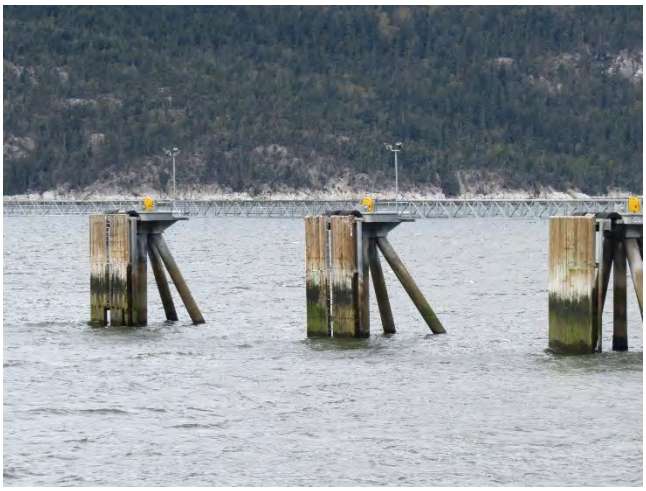


Photo 2- Dolphin addition (1 of 2)

Photo 3- Concrete platform, galv steel with concrete deck (1 of 2)

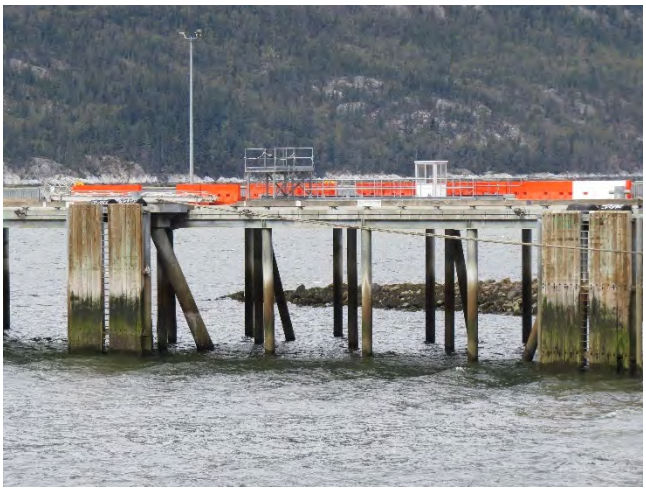


Photo 4- Concrete platform (2 of 2)

Photo 5- South timber platform (1 of 2)

Photo 6- South timber (2 of 2)

Photo 7- Ore ship loader dolphin, painted steel with concrete cap

Photo 8- Ore ship loader platform (1 of 3)

Photo 9- Ore ship loaderplatform (2 of 3)

Photo 10- Ore ship loader platform (3 of 3)

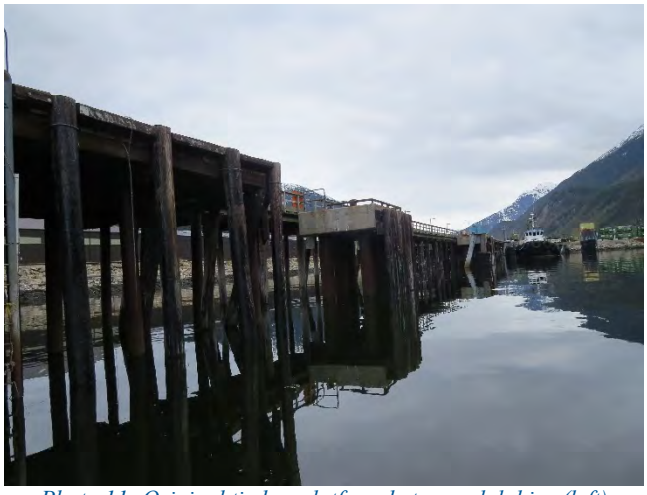


Photo 11- Original timber platform between dolphins (left)

Photo 12- - Ore ship loader dolphin, steel with concrete cap

Photo 13- North timber platform, circa 1998 (1 of 3)

Photo 14- North timber platform (2 of 3)

Photo 15- North timber platform (3 of 3)

Photo 16- AML loading dock (dolphin also on previous images)

Photo 17- North timber platform (1 of 4)

Photo 18- North timber platform, near AML3 and D1 (2 of 4)

Photo 19- North timber platform (3 of 4)

Photo 20- North timber platform (4 of 4)

Photo 21- North timber platform, west side (1 of 7)

Photo 22- North timber platform (2 of 7)

Photo 23- North timber platform (3 of 7)

Photo 24- North timber platform (4 of 7)

Photo 25- North timber platform (5 of 7)
Photo 26- Timber dock (4 of 7)

Photo 27- North timber platform (6 of 7)

Photo 28- North timber platform (7 of 7)

Photo 29- Ore ship loader and timber approach, (1 of 6)

Photo 30- Ore ship loader and timber approach (2 of 6)

Photo 31- Ore ship loader and timber approach (3 of 6)

Photo 32- Ore ship loader and timber approach (4 of 6)

Photo 33- Ore ship loader and timber approach (5 of 6)

Photo 34- Ore ship loader and timber approach (6 of 6)

Photo 35- South timber platform (1 of 3)

Photo 36- South timber platform, (2 of 3)

Photo 37- South timber platform, (3 of 3)

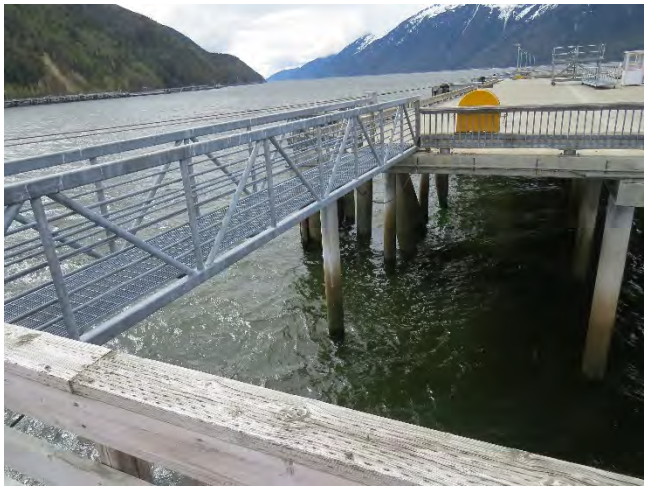


Photo 38- Concrete platform, north elevation (1 of 4)

Photo 39- Concrete platform (2 of 4)

Photo 40- Concrete platform (3 of 4)

Photo 41- Concrete platform (4 of 4)

Photo 42- Concrete approach to concrete platform

Intentionally left blank

Photo 43- Concrete platform deck (1 of 4)

Photo 44- Concrete platform deck (2 of 4)

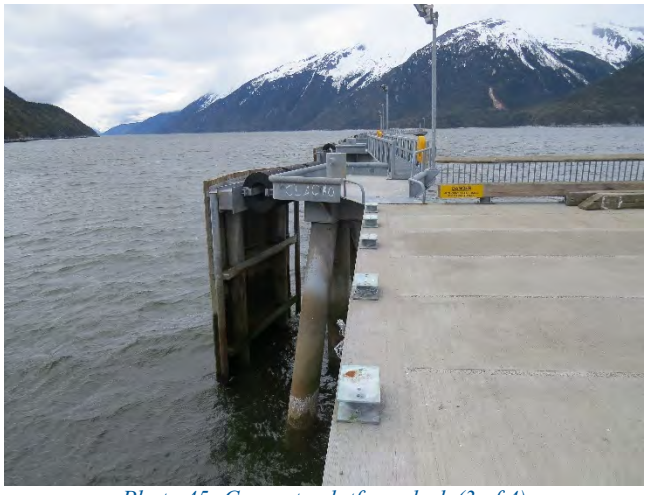


Photo 45- Concrete platform deck (3 of 4)

Photo 46- Concrete platform deck (4 of 4)

Photo 47- Dolphin addition (1 of 6)

Photo 48- Dolphin addition (2 of 6)

Photo 49- Dolphin addition (3 of 6)

Photo 50- Dolphin addition (4 of 6)

Photo 51- Dolphin addition (5 of 6)

Photo 52- Dolphin addition (6 of 6)

Photo 53 -Dophin AML1

Photo 54 – Dolphin AML2

Photo 55 -Dolphin D1

Photo 56 – Dolphin D1

Photo 57 – Dolphin AML3 (1 of 2)

Photo 58 – Dolphin AML3 (2 of 2)

Photo 59 – Dolphin D2 (1 of 2)

Photo 60 – Dolphin D2 (2 of 2)

Photo 61 – Dolphin AML4 (1 of 2)

Photo 62 – Dolphin AML4 (2 of 2)

Photo 63 – Dolphin D3 (1 of 4)

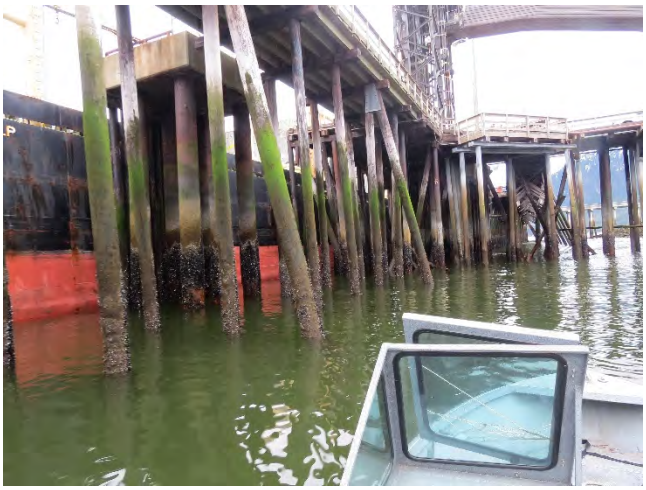


Photo 64 – Dolphin D3 (2 of 4)

Photo 65 – Dolphin D3 (3 of 4)

Photo 66 – Dolphin D3 (4 of 4)

Photo 67 - Dolphin D4 (1 of 4)

Photo 68 – Dolphin D4 (2 of 4)

Photo 69 – Dolphin D4 (3 of 4)

Photo 70 – Dolphin D4 (4 of 4)

Photo 71 – Dolphin D5 (1 of 2)

Photo 72 – Dolphin D5 (2 of 2)

Photo 73 – Dolphin G1 (1 of 2)

Photo 74 – Dolphin G1 (2 of 2)

Photo 75 -Dolphin G2 (1 of 2)

Photo 76 – Dolphin G2 (2 of 2)

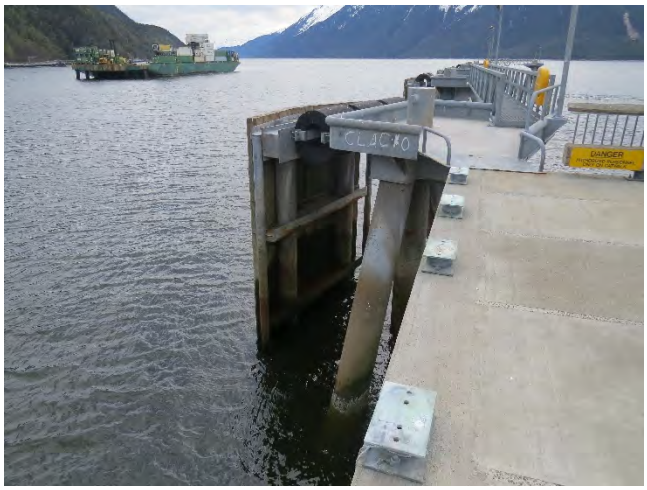


Photo 77 – Dolphin G3

Photo 78 – Dolphins G4 thru G8

Photo 79 - Old piles left- in-place (1 of 2)

Photo 80 -

Photo 81- Old pile left-in-place (2 of 2)

Photo 82- Broken cross-bracing (1 of 2)

Photo 83- Broken cross-bracing (2 of 2)

Photo 84 - Alternating steel and wood columns

Photo 85 - Enlargement of steel pile (previous image)

Photo 86- Large pitting at ore dolphin piles (1 of 2)

Photo 87- Large pitting at ore dolphin piles (2 of 2)

Photo 88- Decking surface condition

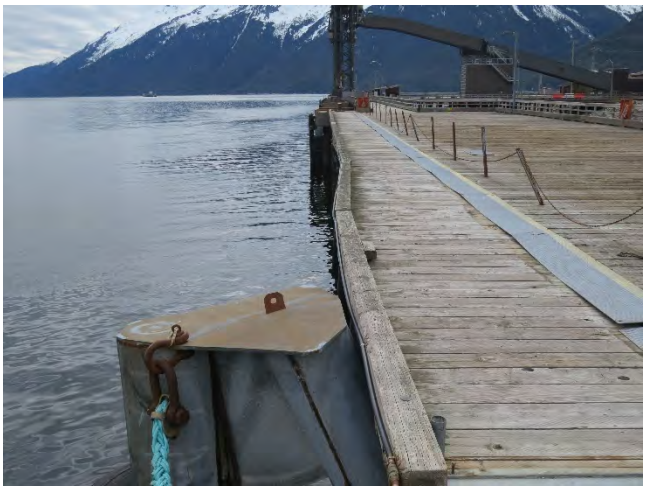


Photo 89- Old portion of dock

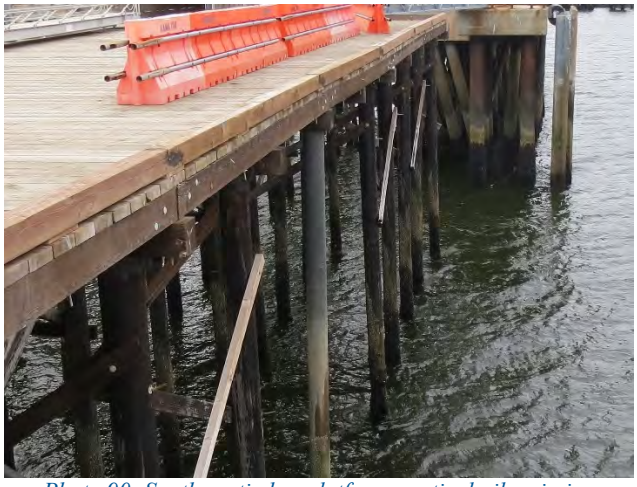
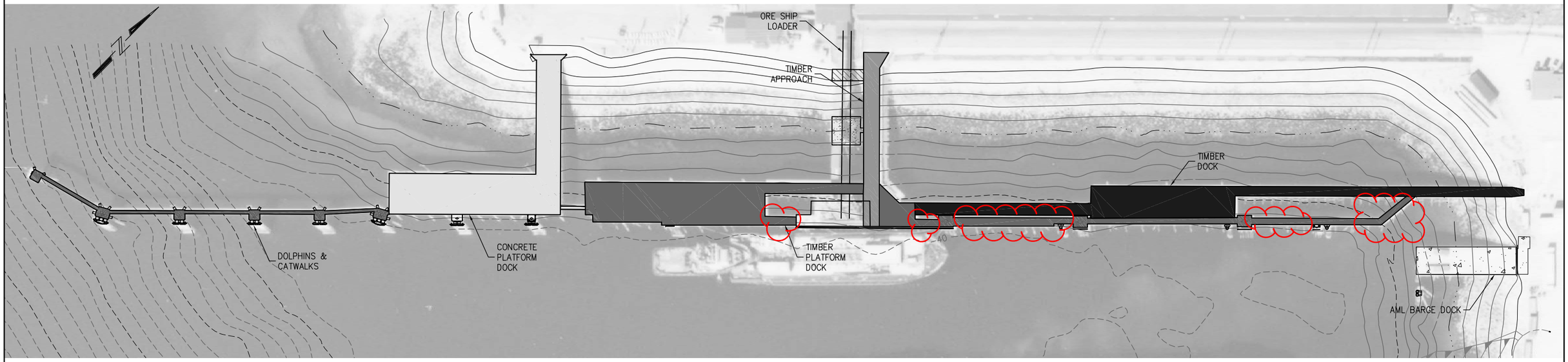


Photo 90- Southern timber platform, vertical pile missing

END OF REPORT

Appendix A- Dock Areas



SITE PLAN

0 20 40 60 120 180 FT.

LOAD RATING LEGEND

- PEDESTRIAN ONLY
- HEAVY VEHICLE ACCESS (120 KIP AXLE LOAD FROM FORKLIFT)
- LIGHT VEHICLE ACCESS (6,000 LBS MAX. VEHICLE WEIGHT)
- TRUCK ACCESS (26,000 LBS MAX. VEHICLE WEIGHT)

DOES NOT EXIST AS OF MAY 2021

PND ENGINEERS, INC.
811 First Avenue, Suite 570
Seattle, Washington 98104
Phone: 206-624-1387
Fax: 206-624-1388
mail@pndengineers.com

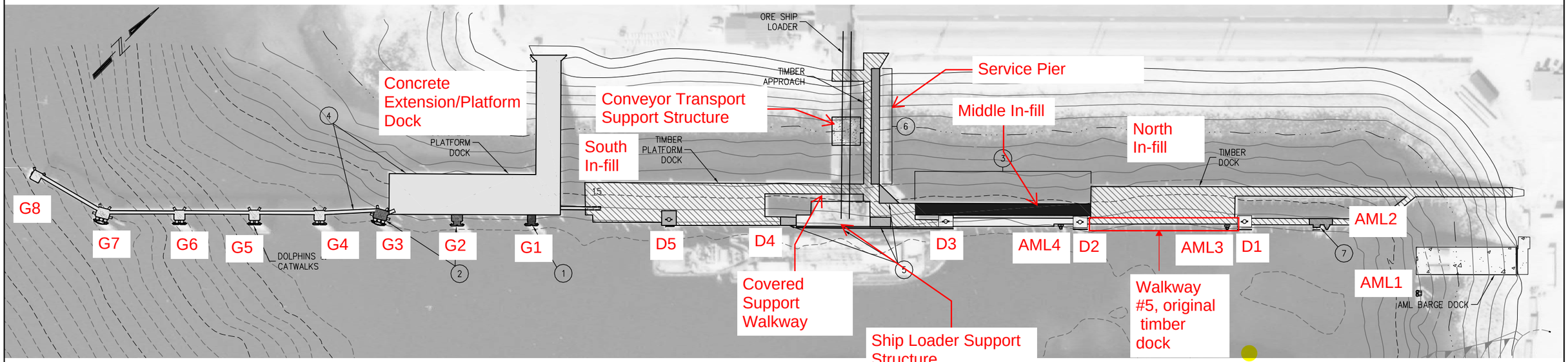
REVISIONS		
REV	DATE	DESCRIPTION

PROJECT: **WPYR ORE DOCK SKAGWAY, ALASKA**

TITLE: **LOAD CAPACITY ZONES**

DESIGNED BY:	LG	PROJECT NO:	104069.01	SHEET NO:	
DRAWN BY:	GRD	DATE:	NOVEMBER 2010	1 OF 2	
CHECKED BY:		SCALE:	NOTED		

11/9/10 Drawings\2010\104069.01 - Skagway Navigation Lights\WPYR Ore Dock\104069.01-01.dwg



SITE PLAN

0 20 40 60 120 180 FT.

SKAGWAY ORE DOCK-WPYR MAINTENANCE HISTORY LEGEND

1. (1989) DOLPHIN REPAIR FROM SANKO CORAL ACCIDENT.
2. (1990) DOLPHIN REPAIRS FROM STAR PRINCESS ALLISION.
3. (1997) INSTALL ORE TERMINAL PEDESTRIAN DOCK (FIXED DOCK).
4. (1998) INSTALL NEW MAIN DOCK, APPROACH DOCK AND FOUR DOLPHINS.
5. (2006)
   1. INSTALL BOLLARD NEAR APPROACH DOCK.
   2. INSTALL LINE GUARDS ALONG EDGE OF BULKHEAD DOCK.
   3. INSTALL TWO SLIP ON FENDERS TO EXISTING DOLPHINS.
   4. INSTALL PIPE LINE GUARD ONTO BULLRAIL.
   5. REPLACE AND REPAIR DAMAGED FENDER PILES AS NEEDED.
   6. REPLACE STEEL PLATES.
   7. INSTALL 4 STEEL OR TIMBER PILES TO SUPPORT HEADER PLATFORM.
6. (2007) REPLACE DAMAGED AND CORRODED PILES.
7. (2010) REPLACE DOLPHIN ON ORE DOCK 2 (M/V PAC STAR).

PND ENGINEERS, INC.
811 First Avenue, Suite 570
Seattle, Washington 98104
Phone: 206-624-1387
Fax: 206-624-1388
mail@pndengineers.com

REVISIONS

REV	DATE	DESCRIPTION

PROJECT:

WPYR ORE DOCK SKAGWAY, ALASKA

TITLE:

MAINTENANCE AND IMPROVEMENTS HISTORY

DESIGNED BY:	LG	PROJECT NO:	104069.01
DRAWN BY:	GRD	DATE:	NOVEMBER 2010
CHECKED BY:		SCALE:	NOTED

SHEET NO: 2 OF 2

APPENDIX B: Engineer's Estimate												
Structure	2012 CAR	2021 CAR	2012 % of Normal Service Life Remaining	2021 % of Normal Service Life Remaining	Replacement Cost ($2012)	Replacement Cost ($2021)	Present Value	Repair Cost ($2012) Excludes **	2012 Repairs % not complete	New Repairs Includes**	Repair costs ($2021) *Includes* **	Net Present Value ($2021)
Concrete Extension	Good	Good	83%	70%	10,253,000	15,236,933	10,665,853	$0	0%	$ -	-	10,665,853
Ship Loader Support Structure	Good	Good	67%	50%	2,371,000	3,523,532	1,761,766	$0	0%	$ -	-	1,761,766
Conveyor Transfer Support Structure	Good	Good	67%	50%	1,593,000	2,367,350	1,183,675	$0	0%	$ -	-	1,183,675
Covered Walkway	Good	Fair	25%	20%	571,000	848,560	169,712	$0	0%	$ -	-	169,712
Service Pier	Critical	Poor	25%	15%	4,332,000	6,437,764	965,665	$883,000	0%	$ 644,619	644,619	321,046
South In-Fill	Fair	Fair	25%	20%	2,801,000	4,162,552	832,510	$163,000	0%	$ 38,049	38,049	794,462
Middle In-Fill	Fair	Fair	25%	20%	1,063,000	1,579,719	315,944	$111,000	0%	$ -	-	315,944
North In-Fill	Fair	Fair	25%	20%	3,943,000	5,859,673	1,171,935	$338,000	0%	$ 128,103	128,103	1,043,832
Walkways	Serious	Critical	13%	5%	2,345,000	3,484,893	174,245	$562,000	0%	$ -	-	174,245
Dolphins & Fenders	Poor	Poor	50%	20%	4,192,000	6,229,711	1,245,942	$773,000	100%	$ 55,771	2,013,780	(767,838)
Ship Loader	Fair	-	7%	5%	10,000,000	14,860,951	7,430	$0	0%	$ -	-	7,430
Miscellaneous	N/A	-	50%	50%	159,000	236,289	1,181	$0	0%	$ 417,856	417,856	(416,674)
Mobilization & Demobilization	N/A	-			2,800,000	4,161,066	-	$1,500,000	0%	$ 4,246,500	4,246,500	(4,246,500)
Overall Ore Dock	N/A	N/A	N/A	N/A	46,423,000	68,988,995	18,487,246	$4,330,000	N/A	$ 5,530,896	7,488,905	11,006,953

Condition Assessment Rating (CAR)

** Inflation from 2012 @ 4.5% APR
Indirect Costs @10%
Markup @ 15%
A&E Design Services @7%
Environmental Permitting @3%
Construction Administration @5%
Contingency @30%

APPENDIX B: Engineer's Estimate of Repairs						
Item No.	Description	Approx. Quantity	Unit	Order of Magnitude		
				Unit Cost ($)	Extended Cost	Extended Cost, Subtotal
1	**Mobilization / Demobilization**					**$ 2,235,000**
	Mob / Demob	1	LS	$ 2,235,000	$ 2,235,000	
2	**Demolition (MISC)**					**$ 220,800**
	Timber Bracing	30	EA	$ 2,578	$ 77,340	
	Timber Fender Piling	8	EA	$ 3,442	$ 27,536	
	Misc. Demo & Cleanup	1	LS	$ 29,800	$ 29,800	
	Timber Piling Demo	25	EA	$ 3,442	$ 86,050	
3	**Service Pier - Repairs**					**$ 339,300**
	Replace 14" Steel Piling	12	EA	$ 26,075	$ 312,900	
	Steel Pile Cap Beam	8	LS	$ 3,292	$ 26,336	
4	**Walkways - Repairs**					**--**
5	**Covered Walkway - Repairs**					**--**
6	**South In-Fill - Repairs**					**$ 20,100**
	Replace Timber Pile	1	EA	$ 6,541	$ 6,541	
	Replace Timber Bracing	5	EA	$ 2,697	$ 13,485	
7	**Middle In-Fill - Repairs**					**--**
8	**North In-Fill - Repairs**					**$ 67,500**
	Replace Timber Bracing	25	EA	$ 2,697	$ 67,425	
9	**Dolphins - Repairs**					**$ 1,151,770**
	No new repairs, see 2012 Documents for repairs not completed					
10	**Conveyor Support Structure - Repairs**					**--**
11	**Ship Loader Foundation - Repairs**					**--**
12	**Fenders - Repairs**					**$ 29,300**
	Replace Timber Fender Pile	2	EA	$ 6,541	$ 13,082	
	Fender Additional	2	EA	$ 8,075	$ 16,150	
13	**Ship Loader - Repairs**					**$ 0**
14	**Indirects @ 10%**					**$ 407,000**
	Overhead			10%	$ 407,000	

Item No.	Description	Approx. Quantity	Unit	Order of Magnitude		
				Unit Cost ($)	Extended Cost	Extended Cost, Subtotal
15	**Markup @ 15%**					**$ 609,600**
	Profit & Risk			15%	$ 609,600	
				Subtotal		**$ 5,080,400**
				Contingency	30%	1,525,000
			Construction Subtotal			**$ 6,605,400**
			Construction Total			**$ 6,605,400**
			A&E Design Services		7%	462,400
		Environmental Permitting			3%	198,200
		Construction Administration			5%	330,300
		Total Repair Cost (Rounded)				**$ 7,597,000**