ATTACHMENT H

COST ENGINEERING REPORT

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US Army Corps of Engineers
Alaska District

Kenai River Bluff Stabilization
Kenai, Alaska

COST ENGINEERING REPORT

May 2012

TETRA TECH

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APPENDICES

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: Kenai River Bluff Stabilization
LOCATION: Kenai, AK

DISTRICT: Alaska District
POC: CHIEF, COST ENGINEERING, xxx

PREPARED: 5/8/2012

This Estimate reflects the scope and schedule in report; Kenai Bluff Feasibility Report

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Doller Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
						Program Year (Budget EC): 2013								
						Effective Price Level Date: 1 OCT 12								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: 8-May-12 ($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*O*
04	DAMS	$651	$130	20%	$781	0.9%	$657	$131	$788			$667	$133	$801
14	RECREATION FACILITIES	$530	$106	20%	$636	0.9%	$535	$107	$642			$543	$109	$652
16	BANK STABILIZATION	$23,886	$4,777	20%	$28,663	0.9%	$24,100	$4,820	$28,920			$24,480	$4,896	$29,376
	CONSTRUCTION ESTIMATE TOTALS:	$25,067	$5,013		$30,080	0.9%	$25,292	$5,058	$30,350			$25,690	$5,138	$30,828
01	LANDS AND DAMAGES	$3,000	$600	20%	$3,600	0.9%	$3,027	$605	$3,632			$3,027	$605	$3,632
30	PLANNING, ENGINEERING & DESIGN	$3,762	$752	20%	$4,514	0.7%	$3,790	$758	$4,548			$3,792	$758	$4,550
31	CONSTRUCTION MANAGEMENT	$2,005	$401	20%	$2,879	0.7%	$2,020	$404	$2,901			$2,027	$405	$2,433
	PROJECT COST TOTALS:	$33,834	$6,767	20%	$40,600		$34,128	$6,826	**$40,954**			$34,536	$6,907	$41,443

_____ CHIEF, COST ENGINEERING, xxx

_____ PROJECT MANAGER, xxx

_____ CHIEF, REAL ESTATE, xxx

_____ CHIEF, PLANNING,xxx

_____ CHIEF, ENGINEERING, xxx

_____ CHIEF, OPERATIONS, xxx

_____ CHIEF, CONSTRUCTION, xxx

_____ CHIEF, CONTRACTING,xxx

_____ CHIEF, PM-PB, xxxx

_____ CHIEF, DPM, xxx

ESTIMATED FEDERAL COST:
ESTIMATED NON-FEDERAL COST:

ESTIMATED TOTAL PROJECT COST: **$41,443**

O&M OUTSIDE OF TOTAL PROJECT COST:

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Kenai River Bluff Stabilization
LOCATION: Kenai, AK
This Estimate reflects the scope and schedule in report; Kenai Bluff Feasibility Report

DISTRICT: Alaska District PREPARED: 5/8/2012
POC: CHIEF, COST ENGINEERING, xxx

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Doller Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 8-May-12 Effective Price Level: 8-May-12				Program Year (Budget EC): 2013 Effective Price Level Date: 1 OCT 12								
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
04	DAMS	$651	$130	20%	$781	0.9%	$657	$131	$788	2014Q1	1.6%	$667	$133	$801
14	RECREATION FACILITIES	$530	$106	20%	$636	0.9%	$535	$107	$642	2014Q1	1.6%	$543	$109	$652
16	BANK STABILIZATION	$23,886	$4,777	20%	$28,663	0.9%	$24,100	$4,820	$28,920	2014Q1	1.6%	$24,480	$4,896	$29,376
	CONSTRUCTION ESTIMATE TOTALS:	$25,067	$5,013	20%	**$30,080**		$25,292	$5,058	$30,350			$25,690	$5,138	$30,828
01	LANDS AND DAMAGES	$3,000	$600	20%	$3,600	0.9%	$3,027	$605	$3,632	2013Q1		$3,027	$605	$3,632
30	PLANNING, ENGINEERING & DESIGN													
1.5%	Project Management	$376	$75	20%	$451	0.7%	$379	$76	$455	2013Q1		$379	$76	$455
1.5%	Planning & Environmental Compliance	$376	$75	20%	$451	0.7%	$379	$76	$455	2013Q1		$379	$76	$455
7.0%	Engineering & Design	$1,755	$351	20%	$2,106	0.7%	$1,768	$354	$2,122	2013Q1		$1,768	$354	$2,122
1.0%	Engineering Tech Review ITR & VE	$251	$50	20%	$301	0.7%	$253	$51	$303	2013Q1		$253	$51	$303
1.0%	Contracting & Reprographics	$251	$50	20%	$301	0.7%	$253	$51	$303	2013Q1		$253	$51	$303
1.0%	Engineering During Construction	$251	$50	20%	$301	0.7%	$253	$51	$303	2013Q2	0.4%	$254	$51	$305
1.0%	Planning During Construction	$251	$50	20%	$301	0.7%	$253	$51	$303	2013Q2	0.4%	$254	$51	$305
1.0%	Project Operations	$251	$50	20%	$301	0.7%	$253	$51	$303	2013Q1		$253	$51	$303
31	CONSTRUCTION MANAGEMENT													
4.0%	Construction Management	$1,003	$201	20%	$1,204	0.7%	$1,010	$202	$1,212	2013Q2	0.4%	$1,014	$203	$1,217
2.0%	Project Operation:	$501	$100	20%	$601	0.7%	$505	$101	$606	2013Q2	0.4%	$507	$101	$608
2.0%	Project Management	$501	$100	20%	$601	0.7%	$505	$101	$606	2013Q2	0.4%	$507	$101	$608
	CONTRACT COST TOTALS:	$33,834	$6,767		**$40,600**		$34,128	$6,826	$40,954			$34,536	$6,907	**$41,443**

KENAI RIVER BLUFF STABILIZATION

COST ESTIMATE NARRATIVE

1. Project Description

A. General: The bluffs located where the Kenai River intersects the Cook Inlet are eroding. The design solutions for the proposed bluff stabilization have been developed to a feasibility design level

B. Purpose: The purpose of this work is to develop detailed cost estimates – consistent to the level of design – for the cost and quantities of the construction features using Micro-Computer Aided Cost Estimating System (MCACES).

C. Design Features: Features include the excavation of bluff material, placement of excavated as well as imported soil, installation of armor rock, B rock, filter rock, erosion control fabric; seeding, planting, and construction of a trail with benches, overlooks and access stairs.

2. Basis of Estimate

A Basis of Design: Available design documents of the project elements are listed below. The project site plan is presented in Appendix A.

- Kenai River Bluff Erosion, Bluff Stabilization Design Alternatives, Design Alternatives Report.

B Basis of Quantities: The cost estimate is based on project quantity take-offs that have been calculated from the documents listed above. A quantity summary along with detailed quantity take-offs are presented in Appendix B. The detailed quantities include waste/loss factors for the project materials as listed below:

Soil Swell/Shrinkage Factor	25%
Armor Rock Overplace/Loss Factor	5%
B Rock Overplace/Loss Factor	5%
Filter Rock Overplace/Loss Factor	20%

3. Construction Schedule

It is estimated that overall construction would take approximately 15 months to construct. This duration has been used in the estimate to determine costs for the contractor to maintain field facilities and construction supervision. A simplified tentative project schedule of the overall project is presented in Appendix C. The overall schedule is based on the following reasoning and assumptions:

- Typical construction, crew (1 shift) working 12hrs per day and 6 days per week.

4. Acquisition Plan

The cost estimate is based on a single contract being awarded to the Prime Contractor with subcontractors for the vegetative aspects. The prime contractor would be responsible for the preparatory work, earthwork, and rock placement, as well as overseeing the subcontractor's vegetation work.

5. Project Construction

A. Staging and Site Access: Staging would be in the open area at the top of the bluff just west of the dock. A partial ramp exists in this area. The cut and fill process would be looped by providing two access ramps, one near Cemetery Creek and one near the Pacific Seastar dock.

B. Borrow/Disposal Areas and Materials: The rock required is assumed to be blasted, stockpiled and hauled from Seward Quarry which is located approximately 102-miles from Kenai. Delivering the rock is assumed to be performed entirely by land based equipment. Fill is assumed to be locally available and imported entirely by land based equipment.

   Price quotes of the various borrow materials, taken from phone calls and emails, can be found in Appendix F.

C. Construction Methodology:

   1) Site Preparation: The construction laborers, equipment and other personnel are assumed to come from Anchorage. The site would initially be cleared and grubbed of vegetation and debris. The trees lining the top of the bluff would also be removed. All utilities located within the construction area would be excavated, and rerouted. Some small structures would be demolished and resulting debris would be hauled off-site. In addition, all abandoned foundations located within the construction area would be removed and hauled to the nearest disposal area. Temporary stormwater and groundwater diversion and dewatering systems would be installed. A temporary gravel haul road would be constructed to allow for access to the toe of the bluff, and a temporary bridge crossing would be placed across Ryan's Creek. Temporary security, and silt fencing would be installed along the bluff above the construction area.

   2) Earthwork: The bluff would be excavated and laid back at a specified slope. The excavated material would be hauled to the designated stockpile area, and later used as backfill in the construction of the new stabilized bluff. Material unsuitable for reuse would be hauled offsite for disposal. The stockpiled material, and imported fill, would be placed and compacted in lifts. Geogrid fabric would be installed at every other lift on the lower half of the bluff. The top of the bluff would be rough graded.

   3) Erosion Protection: Rock would be placed at the toe of the bluff on top of geotextile fabric. The rock would consist of a 1.5-foot thick base layer of filter rock, a 1.4-foot to 1.7-foot thick layer of B rock on top of the filter rock, and a 3.8-foot to 5.0-foot thick layer of armor rock on top of the B rock. Rock placement was assumed to be performed by land and water based equipment. Rock would be placed by land based equipment at low tide and by water based equipment at high tide. It was assumed the

land based equipment would operate for half of the shift and the water based equipment would operate the other half. Hauling was assumed to be done entirely by land in the estimate. Barging the rock over water is also an alternative, but no costs were included for this method of hauling in the estimate.

4) Recreational Features: An overland drainage system is needed also. Timber platforms are to be constructed along the top of the bluff, with stairs leading to the platforms where necessary. Three-seat benches are to be placed at each overlook along the top of the bluff.

5) Vegetation: Erosion control fabric would be used prior to the import and placement of a layer of top soil. The banks of the bluffs would be seeded with native grasses to a density of 10 lb/acre. Wouldow stakes and other shrub plantings would be set in place along the bluff. Along the top of the bluff one row of alders would be planted along with rows of spruce trees.

6) Additional Project Features: Asphalt would be placed to repair roads along the top of the bluff that were damaged during construction. Guardrails would also be installed along Mission Avenue where it parallels the bluff.

D. Unusual Conditions: (Soil, Water, Weather, Traffic). Wet saturated soils can be expected during excavation of soils along the bluff below the water table. Extreme tidal fluctuations are likely to be encountered. Extreme cold weather, turbulent waters, and ice within the river are likely to be encountered at the project site during winter construction.

E. Unique Construction Techniques: Approximately half of the rock placement would be in water work with specialty equipment.

F. Equipment/Labor Availability and Distance Traveled: All equipment and labor should be available in the Anchorage area.

6. Environmental Concerns

Construction activities would likely increase turbidity in the river. There is a potential for construction equipment to leak or spill contaminates into the river and or damage existing sensitive plant and wildlife.

7. Effective Dates for Labor, Equipment and Material Pricing

The labor, equipment, and material pricing were developed using the MCACES 2010 English Unit Cost Library, 2012 Kenai Labor Library, and the 2009 Equipment Library (Region IX) for the base cost estimates. The index pricing data has been prepared in May 2012 dollars.

The base cost estimates have been updated with current quoted fuel prices of $4.67/gal for off-road diesel, $4.95/gal for on-road diesel and $4.55/gal for gasoline in the Kenai area.

8. Productivity Index and Estimated Production Rates

The base estimate includes an overall Production Index of 70% which is based on anticipated project difficulty, method of construction, labor availability, supervision, job conditions, weather and expected delays.

The construction of this project would require many types of specialty equipment and crews due to the in-river work. See Appendix E for the Production Index calculation and notes and the Estimated Production Rates.

9. Project Markups

A. Escalation: Escalation has been calculated within the TPCS. Price levels have been escalated from index price levels of the construction cost estimate for May 2012 to the mid-point of construction, which is estimated to be November 2013.

B. Contingency: Contingencies represent allowances to cover unknowns, uncertainties and/or unanticipated conditions that are not possible to adequately evaluate from the data on hand at the time the cost estimate is prepared but must be represented by a sufficient cost to cover the identified risks. An overall contingency of 20% has been used for construction to cover design changes and uncertainties in quantities and unit prices.

10. Functional Costs

Functional costs associated with this work were provided by the Project Manager, as follows:

A. 01 Account – Lands and Damages**:** Costs for this account were estimated at $100,000 per acre for 30-acres.

B. 30 Account – Planning, Engineering, and Design: Costs for this account were estimated at 15% of the construction cost. This account covers the preparation of plans and specifications.

C. 31 Account – Construction Management: Costs for this account were estimated to be 8% of the construction cost. This account covers construction management during construction.

11. MCACES Construction Cost Estimate:

The construction cost estimate was developed using MCACES (MII) version 4.1 (Build 4) cost estimating software in accordance with guidance contained in ER 1110-2-1302, Civil Works Cost Engineering. See Appendix G for the MCACES construction cost estimate output report.

12. References

U.S. Army Corps of Engineers, 1993, *Engineering and Design Cost Engineering Policy and General Requirements, Engineering Regulation 1110-1-1300,* Department of the Army, Washington D.C., 26 March 1993.

U.S. Army Corps of Engineers, 1999, *Engineering and Design For Civil Works Projects, Engineering Regulation 1110-2-1150,* Department of the Army, Washington D.C., 31 August 1999.

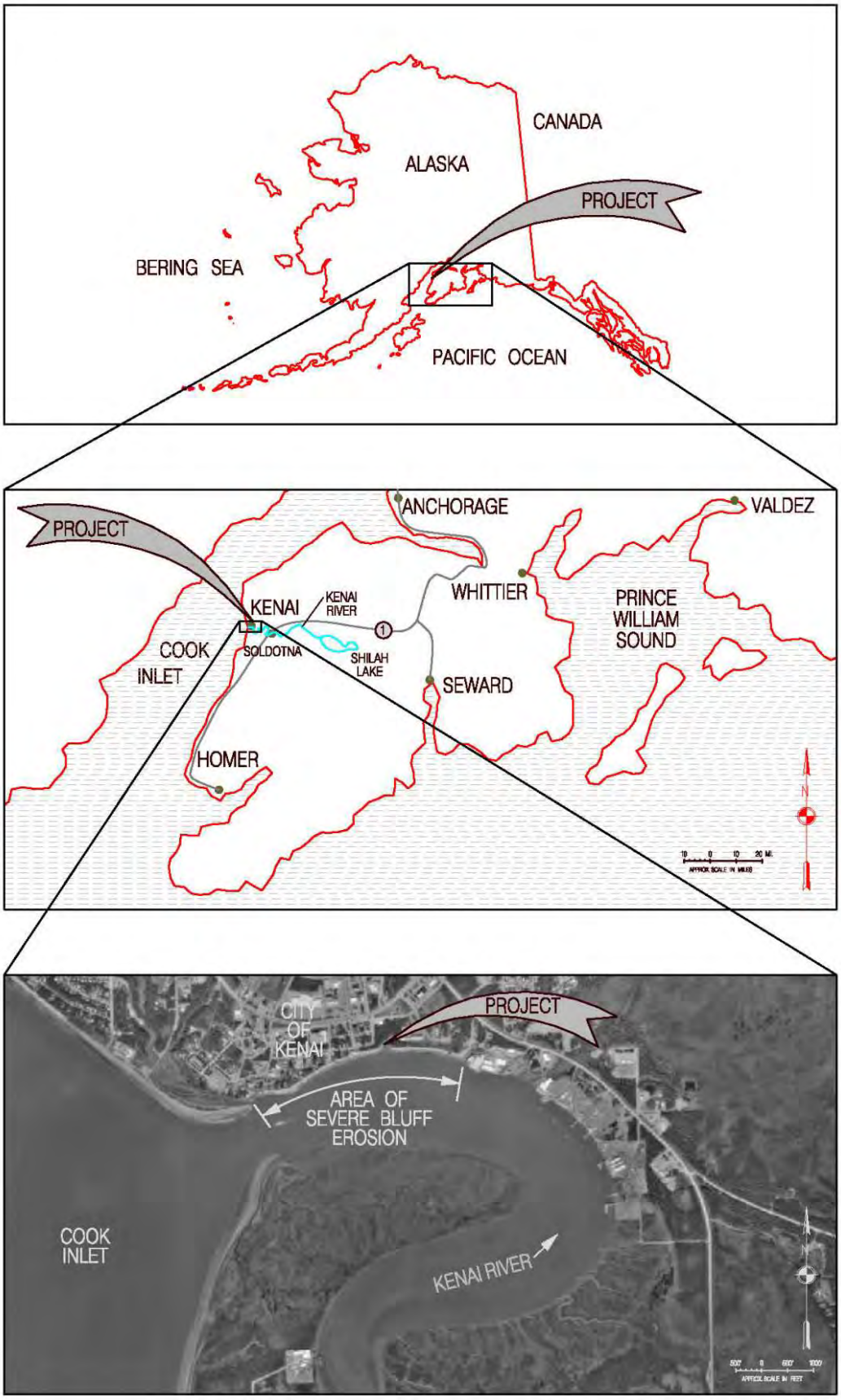
U.S. Army Corps of Engineers, 2008a, *Civil Works Cost Engineering, Engineering Regulation 1110-2-1302,* Department of the Army, Washington D.C., 15 September 2008.

U.S. Army Corps of Engineers, 2008b, *Construction Cost Estimating Guide For Civil Works, Engineering Technical Letter 1110-2-573,* Department of the Army, Washington D.C., 30 September 2008.

U.S. Army Corps of Engineers, 2010, *Civil Works Construction Cost Index System, Engineering Manual 1110-2-1304,* Department of the Army, Washington D.C., 31 March 2011.

APPENDIX A

Site Plan


CANADA
ALASKA
PROJECT
BERING SEA
PACIFIC OCEAN
PROJECT
ANCHORAGE
VALDEZ
WHITTIER
PRINCE
WILLIAM
SOUND
KENAI
KENAI
RIVER
SOLDOTNA
SHILAH
LAKE
COOK
INLET
SEWARD
HOMER
CITY
OF
KENAI
PROJECT
AREA OF
SEVERE BLUFF
EROSION
COOK
INLET
KENAI RIVER

APPENDIX B

Project Quantities and Detailed Quantity Take-Offs

Kenai River Bluff Stabilization Quantities

MCACES Source Tag	Item	Waste/Loss Factor (%)	Unit of Measure	Quantity
[02]	**RELOCATIONS**	**-**	**LS**	**1**
[02.01]	**Relcoations**	**-**	**LS**	**1**
[02.01.01]	**Pipe Demolition**	**-**	**LF**	**850**
[02.01.01.01]	**24" CMP Demolition**	**-**	**LF**	**200**
	Excavation	-	CY	178
	Demo 24" CMP	-	LF	200
	Backfill	-	CY	214
	Compaction	-	CY	214
[02.01.01.02]	**3/4" and 6" PVC Demolition**	**-**	**LF**	**650**
	Excavation	-	CY	433
	Demo 6" Pipe	-	LF	100
	Demo 3/4" to 4" Pipe	-	LF	550
	Demo 24" CMP Riser	-	EA	1
	Backfill	-	CY	520
	Compaction	-	CY	520
[02.01.02]	**Building and Pad Demolition**	**-**	**LS**	**1**
	Demo Building	-	SF	11,435
	Demo Foundation	-	SF	14,875
	Hauling	-	CY	661
	Disposal Fee	-	TON	1,227
[02.01.03]	**Overlook Demolition**	**-**	**LS**	**1**
	Demo Benches	-	EA	2
	Demo Retaining Wall	-	SF	360
	Hauling	-	CY	6.4
	Disposal Fee	-	TON	8
[02.01.04]	**Roadway Demolition**	**-**	**LS**	**1**
	Demo Pavement	-	SF	7,893
	Hauling	-	CY	117
	Tipping Fee	-	TON	195
[14]	**RECREATIONAL FACILITIES**	**-**	**LS**	**1**
[14.01]	**Recreational Facilities**	**-**	**LS**	**1**
[14.01.01]	**Overlook**	**-**	**EA**	**3**
[14.01.01.01]	**Overlook Boardwalk**	**-**	**LF**	**390**
	Lumber 2"x4"	-	LF	2,340
	Lumber 2"x6"	-	LF	2,340
	Lumber 4"x4"	-	LF	780
	Concrete Stairs	-	LF	100
	Lumber 2"x4"	-	SF	3,900
[14.01.01.02]	**Benches and Signs**	**-**	**LS**	**1**
	Benches	-	EA	15
	Signs	-	EA	40
[14.01.02]	**Roadway**	**-**	**LS**	**1**
	Asphalt Paving	-	TON	2,000
	Guide Rails	-	LF	400
[14.01.03]	**Surface Drainage**	**-**	**LS**	**1**
[14.01.03.01]	**24-inch CMP**	**-**	**LF**	**390**
	24" CMP	-	LF	205
	Excavation	-	CY	187
	Backfill	-	CY	144
	Bedding	-	CY	21
	Compaction	-	CY	165
	Hauling	-	CY	80
	Tipping Fee	-	TON	159
[14.01.03.02]	**Concrete Culverts**	**-**	**EA**	**3**
	Concrete Culverts	-	EA	3
[14.01.03.03]	**24-inch Gates**	**-**	**EA**	**3**
	24" Canal Gates	-	EA	3
[14.01.03.04]	**Riprap**	**-**	**CY**	**304**
	Riprap Placement	-	CY	304
[16]	**BANK STABILIZATION**	**-**	**LS**	**1**
[16.01]	**Bank Stabilization**	**-**	**LS**	**1**
[16.01.01]	**Site Preparation**	**-**	**LS**	**1**
[16.01.01.01]	**Silt Fence**	**-**	**LF**	**2,230**
	Silt Fence	-	LF	2,230

Kenai River Bluff Stabilization Quantities

[16.01.01.02]	**Temporary Road**	**-**	**LF**	**5,225**
	Gravel Base	-	SY	5,806
	Stone Roadway	-	CY	968
[16.01.01.03]	**Pumping**	**-**	**LS**	**1**
	Dewatering Pumping	-	DAY	1,440
[16.01.01.04]	**Clearing and Grubbing**	**-**	**ACRE**	**10.3**
	Clearing and Grubbing	-	ACRE	10.3
	Tree Removal	-	EA	35
	Hauling	-	CY	5,609
	Tipping Fee	-	TON	38
[16.01.01.05]	**Fencing**	**-**	**LF**	**5,225**
	Fence	-	LF	5,225
[16.01.01.06]	**Temporary Fencing**	**-**	**LF**	**2,000**
	Temporary Fence	-	LF	2,000
[16.01.01.07]	**Temporary Bridge Crossing**	**-**	**EA**	**1**
	Temporary Bridge Crossing	-	SF	600
[16.01.02]	**Earthwork**	**-**	**LS**	**1**
[16.01.02.01]	**Alluvial Deposits**	**-**	**BCY**	**140,944**
[16.01.02.01.01]	**Excavation**	**-**	**BCY**	**140,944**
	Excavation	-	BCY	140,944
	Hauling	10%	LCY	155,038
[16.01.02.01.02]	**Backfill**	**-**	**CY**	**144,274**
	Transport From Stockpile	10%	LCY	158,701
	Spread Fill	10%	LCY	158,701
	Compaction	-	CY	144,274
[16.01.02.01.03]	**Dispose of Unusable Material**	**-**	**CY**	**23,256**
	Excavate and Load	10%	LCY	25,581
	Hauling	10%	LCY	25,581
	Tipping Fee	-	TON	37,674
[16.01.02.02]	**Glacial Till**	**-**	**BCY**	**67,006**
[16.01.02.02.01]	**Excavation**	**-**	**BCY**	**67,006**
	Excavation	-	BCY	67,006
	Hauling	25%	LCY	83,758
[16.01.02.02.02]	**Backfill**	**-**	**CY**	**15,078**
	Transport From Stockpile	25%	LCY	18,848
	Spread Fill	25%	LCY	18,848
	Compaction	-	CY	15,078
[16.01.02.02.03]	**Dispose of Unused Material**	**-**	**CY**	**51,928**
	Excavate and Load	25%	LCY	64,910
	Hauling	25%	LCY	64,910
	Tipping Fee	-	TON	84,123
[16.01.02.03]	**Borrow Fill**	**-**	**BCY**	**8,900**
	Borrow Fill	-	LCY	8,900
	Delivery Fee	-	TON	14,418
	Compaction	-	TON	8,900
[16.01.02.04]	**Soil Stabilization**	**-**	**LS**	**1**
	Geotextile Fabric	-	SY	83,000
	Grading	-	BCY	1,275
[16.01.03]	**Erosion Protection**	**-**	**LCY**	**56,307**
[16.01.03.01]	**Land Based Placement**	**-**	**LCY**	**26,878**
	Filter Rock	20%	LCY	6,878
	B Rock	5%	LCY	6,788
	Armor Rock	5%	LCY	13,212
[16.01.03.02]	**Water Based Placement**	**-**	**LCY**	**26,878**
	Filter Rock	20%	LCY	6,878
	B Rock	5%	LCY	6,788
	Armor Rock	5%	LCY	13,212
[16.01.03.03]	**Rock Loading on Barge**	**-**	**LCY**	**26,878**
	Filter Rock	-	LCY	6,878
	B Rock	-	LCY	6,788
	Armor Rock	-	LCY	13,212
[16.01.03.04]	**Geotextile Fabric**	**-**	**SY**	**34,433**
	Geotextile Fabric	-	SY	34,433
[16.01.04]	**Vegetation**	**-**	**LS**	**1**
	Geofabric	-	SY	62,700
	Soil Preparation	-	CY	26,851
	Seeding	-	ACRE	13
	Willow Tree	-	EA	3,660
	Willow Tree Planting	-	EA	3,660
	Spruce Trees	-	EA	5,362
	Spruce Tree Planting	-	EA	5,362

[02] RELOCATIONS
[02.01] Relocations
[02.01.01] Pipe Demolition
24" CMP Demolition

Excavating

Trench Length = 200 ft
Trench Depth = 6.0 ft
Trench Width = 4.0 ft

Volume = **178 BCY**

Backfill

Bank Volume = 178 BCY
Swell/Shrinkage Factor = 20%

Loose Volume = **214 LCY**

Compaction

Volume = **214 ECY**

3/4" - 6" PVC Demolition

Excavating

Trench Length = 650 ft
Trench Depth = 6.0 ft
Trench Width = 3.0 ft

Volume = **433 BCY**

Backfill

Bank Volume = 433 BCY
Swell/Shrinkage Factor = 20%

Loose Volume = **520 LCY**

Compaction

Volume = **520 ECY**

[02.01.02] Building and Pad Demolition

Hauling and Dumping

Area =	14,875 SF
Thickness =	1.0 ft
Swell/Shrinkage Factor =	20%
Density =	165 PCF

Loose Volume =	**661 LCY**
Weight =	**1,227 Tons**

[02.01.04] Roadway Demolition

Hauling and Dumping

Area =	7893 SF
Thickness =	4 in.
Swell/Shrinkage Factor =	20%
Density =	148 PCF

Loose Volume =	**117 LCY**
Weight =	**195 Tons**

[14] RECREATION FACILITIES
[14.01] Recreation Facilities

[14.01.03] Surface Drainage

Excavating

Bank Volume = 187 BCY

Loose Volume = **187 BCY**

Backfill

Bank Volume = 120 BCY
Swell/Shrinkage Factor = 20%

Loose Volume = **144 LCY**

Bedding

Bank Volume = 18 BCY
Swell/Shrinkage Factor = 20%

Loose Volume = **21 LCY**

Compaction

Volume = **165 ECY**

Hauling and Dumping

Bank Volume = 66 BCY
Swell/Shrinkage Factor = 20%
Density = 148 PCF

Loose Volume = **80 LCY**
Weight = **159 Tons**

Rock V-Ditch

Weight = 500 TONS
Density = 140 PCF
Overplace/Loss Factor = 15%

Volume = **304 LCY**

[16] BANK STABILIZATION
[16.01] Bank Stabilization
[16.01.01] Site Preparation

Clearing and Grubbing

Hauling and Dumping

Area =	10.3 AC
Thickness =	4 in.
Density =	55 PCF

Loose Volume =	**5,539 LCY**
Weight =	**4,113 Tons**

Tree Removal

Hauling and Dumping

No. of Trees =	35 EA
Chipped Volume =	2 CY
Density =	40 PCF

Loose Volume =	**70 LCY**
Weight =	**38 Tons**

[16] BANK STABILIZATION
[16.01] Bank Stabilization
[16.01.02] Earthwork
[16.01.02.01] Alluvial Deposits

Alluvial Material to Haul & Stockpile Onsite

Bank Volume = 140,944 BCY
Swell/Shrinkage Factor = 10%

Loose Volume = **155,039 LCY**

Unsuitable Alluvial Material to Haul Offsite & Dump

Unusable Percent = 15%
Unusable Volume = 23256 BCY
Swell/Shrinkage Factor = 10%
Density = 120 PCF

Loose Volume = **25,581 LCY**
Weight = **37,674 Tons**

Place & Compact Stockpiled Alluvial Material

Bank Volume = 144,274 BCY
Swell/Shrinkage Factor = 10%

Loose Volume = **158,701 LCY**

[16.01.02.02] Glacial Till

Glacial Till to Haul & Stockpile Onsite

Bank Volume = 67,006 BCY
Swell/Shrinkage Factor = 25%

Loose Volume = **83,757 LCY**

Unsuitable Glacial Till Material to Haul Offsite & Dump

Bank Volume = 51,928 BCY
Swell/Shrinkage Factor = 25%
Density = 120 PCF

Loose Volume = **64,910 LCY**
Weight = **84,123 Tons**

Place & Compact Stockpiled Glacial Till

Bank Volume = 15,078 BCY
Swell/Shrinkage Factor = 25%

Loose Volume = **18,847 LCY**

[16.01.02.03] Borrow Material

Import, Place & Compact Borrow Material

Bank Volume = 8,900 BCY
Density = 130 PCF

Weight = **15,619 Tons**

[16] BANK STABILIZATION
[16.01] Bank Stabilization
[16.01.03] Erosion Protection
[16.01.03.01] Land Based Placement

Filter Rock Placement

Weight =	7,680 TONS
Tonnage Factor =	1.34 TONS/CY
Bank Volume =	5,731 CY
Overplace/Loss Factor =	20%

Loose Volume = **6,878 LCY**

B Rock Placement

Weight =	8,663 TONS
Tonnage Factor =	1.34 TONS/CY
Bank Volume =	6,465 CY
Overplace/Loss Factor =	5%

Loose Volume = **6,788 LCY**

Armor Rock Placement

Weight =	17,616 TONS
Tonnage Factor =	1.4 TONS/CY
Bank Volume =	12,583 CY
Overplace/Loss Factor =	5%

Loose Volume = **13,212 LCY**

[16.01.03.02] Water Based Placement

Filter Rock Placement

Weight =	7,680 TONS
Tonnage Factor =	1.34 TONS/CY
Bank Volume =	5,731 CY
Overplace/Loss Factor =	20%

Loose Volume = **6,878 LCY**

B Rock Placement

Weight =	8,663 TONS
Tonnage Factor =	1.34 TONS/CY
Bank Volume =	6,465 CY
Overplace/Loss Factor =	5%

Loose Volume = **6,788 LCY**

Armor Rock Placement

Weight =	17,616 TONS
Tonnage Factor =	1.4 TONS/CY
Bank Volume =	12,583 CY
Overplace/Loss Factor =	5%

Loose Volume = **13,212 LCY**

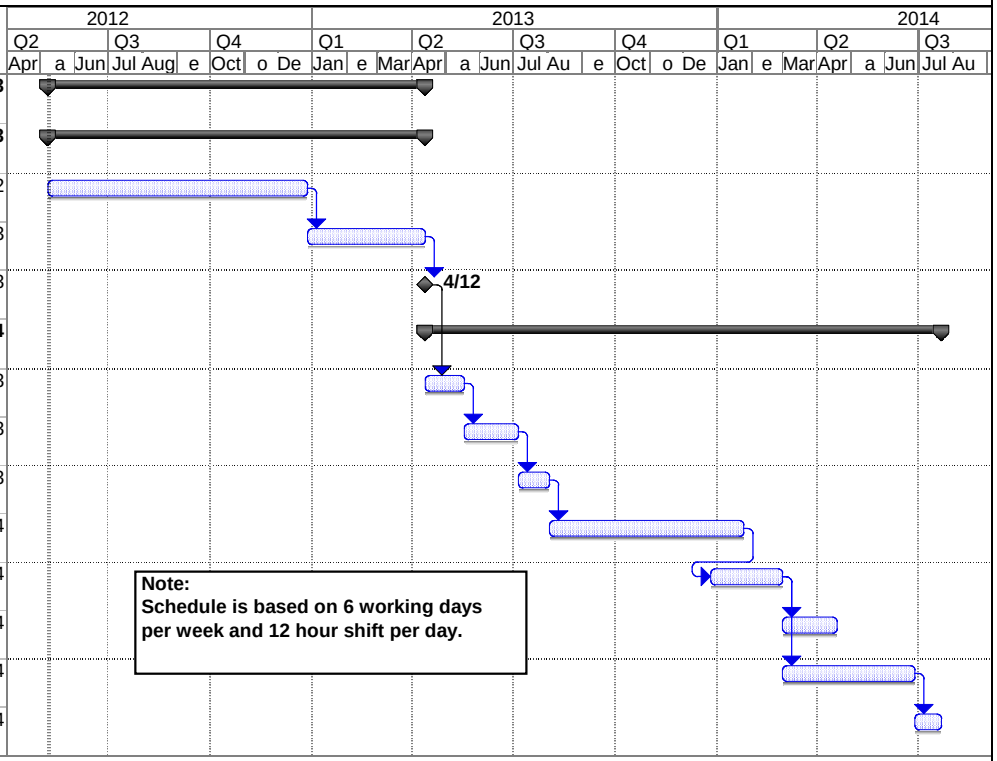
APPENDIX C

Tentative Project Schedule

Kenai River Bluff Stabilization
Tentative Project
Schedule

Tue 5/8/12

ID	Task Name	Duration	Start	Finish
1	**Pre Construction Award**	**292 days**	**Tue 5/8/12**	**Fri 4/12/13**
2	**Planning and Design**	**292 days**	**Tue 5/8/12**	**Fri 4/12/13**
3	Plans, Specifications and Estimate	201 days	Tue 5/8/12	Thu 12/27/12
4	Contract Advertising	91 days	Fri 12/28/12	Fri 4/12/13
5	Construction Contract Award	0 days	Fri 4/12/13	Fri 4/12/13
6	**Post Construction Award**	**398 days**	**Sat 4/13/13**	**Mon 7/21/14**
7	Mobilization	30 days	Sat 4/13/13	Fri 5/17/13
8	Relocations	42 days	Sat 5/18/13	Fri 7/5/13
9	Site Preparation	24 days	Sat 7/6/13	Fri 8/2/13
10	Earthwork	150 days	Sat 8/3/13	Fri 1/24/14
11	Rock Placement	56 days	Thu 12/26/13	Fri 2/28/14
12	Recreational Facilities	42 days	Sat 3/1/14	Fri 4/18/14
13	Vegetative Planting	102 days	Sat 3/1/14	Fri 6/27/14
14	Demobilization	20 days	Sat 6/28/14	Mon 7/21/14



Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External MileTask
Split

APPENDIX D

Local Market Labor Rates

General Decision Number: AK120001 04/20/2012 AK1

Superseded General Decision Number: AK20100001

State: Alaska

Construction Types: Building and Heavy

Counties: Alaska Statewide.

BUILDING AND HEAVY CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	01/06/2012
1	01/20/2012
2	02/03/2012
3	02/10/2012
4	02/17/2012
5	04/13/2012
6	04/20/2012

ASBE0097-001 01/01/2011

	Rates	Fringes
Asbestos Workers/Insulator (includes application of all insulating materials protective coverings, coatings and finishings to all types of mechanical systems)	$ 36.11	15.26

ASBE0097-002 01/01/2011

	Rates	Fringes
HAZARDOUS MATERIAL HANDLER (includes preparation, wetting, stripping, removal scrapping, vacuming, bagging, and disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems)	$ 36.11	15326

BOIL0502-002 07/01/2011

	Rates	Fringes
BOILERMAKER	$ 42.70	24.86

BRAK0001-002 07/01/2011

	Rates	Fringes
Bricklayer, Blocklayer,		

Stonemason, Marble Mason,
Tile Setter, Terrazzo Worker.....$ 37.39 17.60
Tile & Terrazzo Finisher.....$ 31.78 17.60

CARP1501-001 09/01/2011

	Rates	Fringes
MILLWRIGHT	$ 33.89	18.23

CARP2520-003 07/01/2010

	Rates	Fringes
Diver		
Stand-by	$ 39.80	18.73
Tender	$ 38.80	18.73
Working	$ 79.60	18.73
Piledriver		
Carpenter	$ 35.49	18.73
Piledriver; Skiff Operator and Rigger	$ 34.49	18.73
Sheet Stabber	$ 35.49	18.73
Welder	$ 41.05	18.73

DEPTH PAY PREMIUM FOR DIVERS BELOW WATER SURFACE:
50-100 feet $1.00 per foot
101 feet and deeper $2.00 per foot

ENCLOSURE PAY PREMIUM WITH NO VERTICAL ASCENT:
5-50 FEET $1.00 PER FOOT/DAY
51-100 FEET $2.00 PER FOOT/DAY
101 FEET AND ABOVE $3.00 PER FOOT/DAY

SATURATION DIVING:
The standby rate applies until saturation starts. The saturation diving rate applies when divers are under pressure continuously until work task and decompression are complete. the diver rate shall be paid for all saturation hours.

WORK IN COMBINATION OF CLASSIFICATIONS:
Employees working in any combination of classifications within the diving crew (except dive supervisor) in a shift are paid in the classification with the highest rate for that shift.

CARP4059-001 09/01/2011

	Rates	Fringes
CARPENTER		
Carpenter	$ 35.49	20.38
Lather/Drywall Applicator	$ 35.49	20.38

ELEC1547-004 04/01/2012

	Rates	Fringes
CABLE SPLICER	$ 39.77	3%+$21.93

Electrician;Technician.....$ 38.02 3%+$21.93

ELEC1547-005 04/01/2012

Line Construction

	Rates	Fringes
CABLE SPLICER	$ 49.92	3%+$24.08
Linemen (Including Equipment Operators, Technician)	$ 48.17	3%+24.08
Powderman	$ 46.17	3%+$24.08
TREE TRIMMER	$ 33.62	3%+$18.58

ELEV0019-002 01/01/2012

	Rates	Fringes
ELEVATOR MECHANIC	$ 49.035	23.535+a+b

FOOTNOTE: a. Employer contributes 8% of the basic hourly rate for over 5 year's service and 6% of the basic hourly rate for 6 months to 5 years' of service as vacation paid credit. b. Eight paid holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day; Friday after Thanksgiving and Christmas Day

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ENGI0302-002 01/01/2012

	Rates	Fringes
Power equipment operators:		
GROUP 1	$ 37.43	19.00
GROUP 1A	$ 39.19	19.00
GROUP 2	$ 36.66	19.00
GROUP 3	$ 35.94	19.00
GROUP 4	$ 29.73	19.00
TUNNEL WORK		
GROUP 1	$ 41.17	19.00
GROUP 1A	$ 43.11	19.00
GROUP 2	$ 40.33	19.00
GROUP 3	$ 39.53	19.00
GROUP 4	$ 32.70	19.00

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Asphalt Roller; Back Filler; Barrier Machine (Zipper); Batch Plant Operator: Batch and Mixer over 200 yds.; Beltcrete with power pack and similar conveyors; Bending Machine; Boat Coxwains; Bulldozers; Cableways, Highlines and Cablecars; Cleaning Machine; Coating Machine; Concrete Hydro Blaster; Cranes-45 tons and under or 150 foot boom and under (including jib and attachments): (a) Shovels, Backhoes, excavators with all attachments, Draglines, Clamshells; Gradalls-3 yards and under; (b) Hydralifts or Transporters, all track or truck type,(c) Derricks; Crushers; Deck Winches-Double Drum; Ditching or Trenching Machine (16 inch or over); Drilling Machines, core, cable, rotary and exploration; Finishing Machine

Operator, concrete paving, Laser Screed, sidewalk, curb and gutter machine; Helicopters; Hover Craft, Flex Craft, Loadmaster, Air Cushion, All Terrain Vehicle, Rollagon, Bargecable, Nodwell Sno Cat; Hydro Ax: Feller Buncher and similar; Loaders: Forklifts with power boom and swing attachment, Overhead and front end, 2 1/2 yards through 5 yards, Loaders with forks or pipe clamps, Loaders, elevating belt type, Euclid and similar types; Mechanics, Bodyman; Micro Tunneling Machine; Mixers: Mobile type w/hoist combination; Motor Patrol Grader; Mucking Machines: Mole, Tunnel Drill, Horizontal/Directional Drill Operator, and/or Shield; Operator on Dredges; Piledriver Engineers, L. B. Foster, Puller or similar Paving Breaker; Power Plant, Turbine Operator, 200 k.w. and over (power plants or combination of power units over 300 k.w.); Sauerman-Bagley; Scrapers-through 40 yards; Service Oiler/Service Engineer; Sidebooms-under 45 tons; Shot Blast Machine; Spreaders, Blaw Knox, Cedarapids, Barber Greene, Slurry Machine; Sub-grader (Gurries, C.M.I. and C.M.I. Roto Mills and similar types); Tack tractor; Truck mounted Concrete Pumps, Conveyor, Creter; Water Kote Machine; Unlicensed off road hauler; Welder; Electrical Mechanic, Camp Maintenance Engineer

GROUP 1A: Cranes-over 45 tons or 150 foot (including jib and attachments): (a) Shovels, backhoes,excavators with all attachments, draglines, clamshells-over 3 yards, (b) Tower cranes;Licensed Water/Waste Water Treatment Operator; Loaders over 5 yds.;Certified Welder, Electrical Mechanic, Camp Maintenance Engineer, Mechanic (over 10,000 hours); Motor Patrol Grader, Dozer, Grade Tractor (finish: when finishing to final grade and/or to hubs, or for asphalt); Power Plants: 1000 k.w. and over; Quad; Screed; Sidebooms over 45 tons; Slip Form Paver C.M.I. and similar types; Scrapers over 40 yards; Camera/Tool/Video Operator (Slipline).

GROUP 2: Batch Plant Operators: Batch and Mixer 200 yds. per hour and under; Boiler-fireman; Cement Hog and Concrete Pump Operator; Conveyors (except as listed in group 1); Hoist on steel erection; Towermobiles and Air Tuggers; Horizontal/Directional Drill Locator;Licensed Grade Technician; Loaders, Elevating Grader, Dumor and similar; Locomotives: rod and geared engines; Mixers; Screening, Washing Plant; Sideboom (cradling rock drill regardless of size); Skidder; Trencing Machine under 16 inches; Waste/ Waste Water Treatment Operator.

GROUP 3: "A" Frame Trucks, Deck Winches: single power drum; Bombardier (tack or tow rig); Boring Machine; Brooms-power; Bump Cutter; Compressor; Farm tractor; Forklift, industrial type; Gin Truck or Winch Truck with poles when used for hoisting; Grade Checker and Stake Hopper; Hoist, Air Tuggers, Elevators; Loaders: (a) Elevating-Athey, Barber Green and similar types (b) Forklifts or Lumber Carrier (on construction job site) (c) Forklifts with Tower (d) Overhead and Front-end, under 2 1/2 yds. Locomotives:Dinkey (air, steam, gas and electric) Speeders; Mechanics (light duty); Mixers: Concrete Mixers and Batch 200 yds. per hour and under; Oil, Blower Distribution; Post Hole Diggers,

mechanical; Pot Fireman (power agitated); Power Plant, Turbine Operator, under 300 k.w.; Pumps-water; Roller-other than Plantmix; Saws, concrete; Skid Steer with all attachments; Straightening Machine; Tow Tractor

GROUP 4: Rig Oiler/Assistant Engineer (if over 85 tons or 100 ft. boom);Parts and Equipment Coordinator; Swamper (on trenching machines or shovel type equipment); Spotter; Steam Cleaner; Drill Helper.

FOOTNOTE: Groups 1-4 receive 10% premium while performing tunnel or underground work. Rig Oiler/Assistant Engineer shall be required on cranes over 85 tons or over 100 feet of boom.

IRON0751-003 08/01/2011

	Rates	Fringes
Ironworkers:		
BRIDGE, STRUCTURAL, ORNAMENTAL, REINFORCING MACHINERY MOVER, RIGGER, SHEETER, STAGE RIGGER, BENDER OPERATOR	$ 33.40	23.16
FENCE, BARRIER AND GUARDRAIL INSTALLERS	$ 29.90	23.16
GUARDRAIL LAYOUT MAN	$ 30.64	23.16
HELICOPTER, TOWER	$ 34.40	23.16

LABO0341-005 07/01/2011

	Rates	Fringes
Laborers: North of the 63rd Parallel & East of Longitude 138 Degrees		
GROUP 1	$ 29.00	20.02
GROUP 2	$ 30.00	20.02
GROUP 3	$ 30.90	20.02
GROUP 3A	$ 34.18	20.02
GROUP 3B	$ 35.01	20.02
GROUP 4	$ 18.57	20.02
TUNNELS, SHAFTS, AND RAISES		
GROUP 1	$ 31.90	20.02
GROUP 2	$ 33.00	20.02
GROUP 3	$ 33.99	20.02
GROUP 3A	$ 37.60	20.02
GROUP 3B	$ 38.51	20.02
Laborers: South of the 63rd Parallel & West of Longitude 138 Degrees		
GROUP 1	$ 29.00	20.02
GROUP 2	$ 30.00	20.02
GROUP 3	$ 30.90	20.02
GROUP 3A	$ 34.18	20.02
GROUP 3B	$ 35.01	20.02
GROUP 4	$ 18.57	20.02
TUNNELS, SHAFTS, AND RAISES		
GROUP 1	$ 31.90	20.02

GROUP 2	$ 33.00	20.02
GROUP 3	$ 33.99	20.02
GROUP 3A	$ 37.60	20.02
GROUP 3B	$ 38.51	20.02

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer(curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator; Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon, airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds);Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree topper; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly employed inside a tunnel portal or shaft collar.

PAIN1959-001 07/01/2011

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
PAINTER		
BRUSH/ROLLER PAINT OR WALL COVERER	$ 29.17	18.47
TAPING, TEXTURING, STRUCTURAL PAINTING, SANDBLASTING, POT TENDER, FINISH METAL, SPRAY, BUFFER OPERATOR, RADON MITIGATION, LEAD BASED PAINT ABATEMENT, HAZARDOUS MATERIAL HANDLER	$ 29.67	18.47

PAIN1959-002 07/01/2011

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
Painters:		
Brush, Roller, Sign, Paper and Vinyl, Swing Stage, Hand Taper/Drywall, Structural Steel, and Commercial Spray	$ 26.98	18.22
Machine Taper/Drywall	$ 28.18	18.22
Spray-Sand/Blast, Epoxy and Tar Applicator	$ 29.48	16.22

PAIN1959-003 07/01/2011

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
GLAZIER	$ 34.09	17.28

PAIN1959-004 07/01/2011

	Rates	Fringes
FLOOR LAYER: Carpet	$ 30.52	12.39

PAIN1959-006 07/01/2011

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
GLAZIER	$ 34.09	17.23

PLAS0867-001 02/01/2012

	Rates	Fringes
PLASTERER		
North of the 63rd parallel	$ 33.93	19.07
South of the 63rd parallel	$ 33.68	19.07

PLAS0867-004 02/01/2012

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
North of the 63rd parallel	$ 33.68	19.07
South of the 63rd parallel	$ 33.43	19.07

PLUM0262-002 01/01/2012

East of the 141st Meridian

	Rates	Fringes
Plumber; Steamfitter	$ 36.02	23.82

PLUM0367-002 07/01/2011

South of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter	$ 36.98	18.72

PLUM0375-002 07/01/2011

North of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter	$ 39.71	18.45

* PLUM0669-002 04/01/2012

	Rates	Fringes
SPRINKLER FITTER	$ 41.23	21.52

ROOF0190-002 06/01/2011

	Rates	Fringes
ROOFER		
NORTH OF THE 63RD PARALLEL	$ 28.50	2.44 + a
SOUTH OF THE 63RD PARALLEL	$ 28.50	2.44 + a

FOOTNOTE:
a. Employers are to supply employees with comprehensive medical insurance. Employer is responsible to cover, at minimum one-half (1/2) of the individual premium. The individual will be responsible for the remaining premium.

SHEE0023-003 06/01/2010

South of the 63rd Parallel

	Rates	Fringes
Sheet Metal Worker	$ 38.84	18.35

SHEE0023-004 07/02/2010

North of the 63rd Parallel

	Rates	Fringes
Sheet Metal Worker	$ 42.98	18.56

TEAM0959-003 09/01/2011

	Rates	Fringes
TRUCK DRIVER		
GROUP 1	$ 37.77	16.43
GROUP 1A	$ 39.04	16.43
GROUP 2	$ 36.51	16.43
GROUP 3	$ 35.69	16.43
GROUP 4	$ 35.11	16.43
GROUP 5	$ 34.35	16.43

GROUP 1: Semi with Double Box Mixer; Dump Trucks (including rockbuggy and trucks with pups) over 40 yards up to and including 60 yards; Deltas, Commanders, Rollogans and similar equipment when pulling sleds, trailers or similar equipment; Boat Coxswain; Lowboys including attached trailers and jeeps, up to and including 12 axles; Ready-mix over 12 yards up to and including 15 yards); Water Wagon (250 Bbls and above); Tireman, Heavy Duty/Fueler

GROUP 1A: Dump Trucks (including Rockbuggy and Trucks with pups) over 60 yards up to and including 100 yards; Jeeps (driver under load)

GROUP 2: Turn-O-Wagon or DW-10 not self-loading; All Deltas,

Commanders, Rollogans, and similar equipment; Mechanics; Dump Trucks (including Rockbuggy and Trucks with pups) over 20 yards up to and including 40 yards; Lowboys including attached trailers and jeeps up to and including 8 axles; Super vac truck/cacasco truck/heat stress truck; Ready-mix over 7 yards up to and including 12 yards;

GROUP 3: Dump Trucks (including Rockbuggy and Trucks with pups) over 10 yards up to and including 20 yards; batch trucks 8 yards and up; Oil distributor drivers; Partsman; Oil Distributor Drivers; Trucks/Jeeps (push or pull); Traffic Control Technician

GROUP 4: Buggymobile; Semi or Truck and trailer; Dumpster; Tireman (light duty); Dump Trucks (including Rockbuggy and Truck with pups) up to and including 10 yards; Track Truck Equipment; Stringing Truck; Grease Truck; Flat Beds, dual rear axle; Hyster Operators (handling bulk aggregate); Lumber Carrier; Water Wagon, semi; Water Truck, dual axle; Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted "A" Frame manufactured rating over 5 tons; Bull Lifts and Fork Lifts with Power Boom and Swing attachments, over 5 tons; Front End Loader with Forks; Bus Operator over 30 passengers; All Terrain Vehicles; Boom Truck/Knuckle Truck over 5 tons; Foam Distributor Truck/dual axle; Hydro-seeders, dual axle; Vacuum Trucks, Truck Vacuum Sweepers; Loadmaster (air and water); Air Cushion or similar type vehicle; Fire Truck/Ambulance Driver; Combination Truck-fuel and grease; Compactor (when pulled by rubber tired equipment); Rigger (air/water/oilfield); Ready Mix, up to and including 7 yards;

GROUP 5: Gravel Spreader Box Operator on Truck; Flat Beds, single rear axle; Boom Truck/Knuckle Truck up to and including 5 tons; Pickups (Pilot Cars and all light duty vehicles); Water Wagon (Below 250 Bbls); Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted "A" Frame, manufactured rating 5 tons and under; Bull Lifts and Fork Lifts (fork lifts with power broom and swing attachments up to and including 5 tons); Buffer Truck; Tack Truck; Farm type Rubber Tired Tractor (when material handling or pulling wagons on a construction project); Foam Distributor, single axle; Hydro-Seeders, single axle; Team Drivers (horses, mules and similar equipment); Fuel Handler (station/bulk attendant); Batch Truck, up to and including 7 yards; Gear/Supply Truck; Bus Operator, Up to 30 Passengers; Rigger/Swamper

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable , i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rate.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

==========

END OF GENERAL DECISION

APPENDIX E

Productivity Index and Notes and Estimated Production Rates

PRODUCTION INDEX

NOTES. Enter percentage values in the yellow cells only. If a condition does not apply or it is already applied in the project then enter 100%.

PRODUCTION ELEMENTS	CONDITION	STATE	Production Efficiency Percent (%) Range		COMMENTS
1. Project Difficulty	**complicated**	One of a kind, hard to reach areas, overly congested, tunnel work.	*55%-85%*	80%	- Careful not to duplicate Project Difficulty. Enter 100% if Project Difficulty is already considered in the production rate of each individual cost item in the estimate.
	normal	Nature of work is common. Straightforward design. Normal site access.	*85%-100%*		
	Production efficiency resulting from project difficulty:			**80%**	
2. Method of Construction	**Low Equip - High Labor**	Unfavorable terrain, labor intensive, limited heavy equipment use	*25%-55%*		
	Medium Equip - Medium Labor	Average terrain, normal equipment and labor use	*55%-85%*		
	High Equip - Low Labor	Favorable terrain, extensive heavy equipment operation	*85%-100%*	90%	
	Production efficiency resulting from method of construction:			**90%**	
3. Labor	**shortage**	Remote area, poor training, low pay, scarce supply	*25%-55%*		- Availability of drug-free construction workers is an issue on many areas. - Shortage of labor forces in remote and specific geographic areas could be a problem.
	average	Suburban area, average training, average pay, normal supply	*55%-85%*	80%	
	surplus	Urban area, good training, good pay, surplus skilled labor supply	*85%-100%*		
	Production efficiency resulting from labor:			**80%**	
4. Supervision	**poor**	Inexperienced, low pay, 8(a) and HUB Zone Contracts	*25%-55%*		- We should not compensate contractors for having poor managers on their staff, however recognize that small contractors working on Govt projects have less experience and construction alliances.
	average	Average experience and training, average pay	*55%-85%*		
	good	Experienced, good pay, IFB Contracts	*85%-100%*	90%	
	Production efficiency resulting from supervision:			**90%**	
5. Job Conditions	**poor**	Emergency work, required first rate workmanship, short length of operations	*25%-55%*		
	average	Average site, regular workmanship required, average length of operations	*55%-85%*	55%	
	good	Favorable site, passable workmanship required, long length of operations	*85%-100%*		
	Production efficiency resulting from job conditions:			**55%**	
6. Weather	**bad**	Much precipitation, bitter cold, oppressive heat	*25%-55%*	30%	- Time extension for unusually severe weather and anticipated weather delays are covered under the Contract Clauses. This factor accounts for "normal" weather at the project site (i.e. Alaska, Las Vegas)
	fair	Some precipitation, moderate cold, moderate heat	*55%-85%*		
	good	Occasional precipitation, occasional cold, occasional heat	*85%-100%*		
	Production efficiency resulting from weather:			**30%**	
7. Expected Delays	**numerous**	Security restrictions (military bases), HTRW, Poor job flexibility, slow delivery, poor expediting	*25%-55%*		
	some	Limited number of work hours (residential proximity), normal delivery, average expediting	*55%-85%*	65%	
	minimum	Job flexibility, prompt delivery, good expediting	*85%-100%*		
	Production efficiency resulting from delays:			**65%**	

AVERAGE PRODUCTION EFFICIENCY PERCENT: **70%** ← **Enter in (MCACES) Mii**

* Each production element (8) carries equal weight.
* Apply to Direct Bare labor and equipment cost.

LABOR AND EQUIPMENT COST INCREASE: **43%** ← **For information only**

* Apply to Direct Bare labor and equipment cost.

(1 / Production Eff.) -1: MCACES (Mii) calculation method.

*** Average production efficiency percent of 70% represents 43% increase in direct labor and equipment costs.**

Production Index Notes.

For some time now, economic conditions and other factors have drastically affected the way estimates are computed in the industry. Consequently, I tabulated known economic information, applied productivity range factors based on my judgment, averaged them out and called it Production Index.

The Production Index encompass general factors affecting Government Estimates (GE) such as project difficulty, method of construction, labor availability, supervision, job conditions, weather and expected delays.

The Production Index is computed by adding the production efficiencies of each element and dividing the sum by the number of elements (i.e. arithmetic mean). Once the Production Index is calculated in EXCEL, it is applied to the labor and equipment costs at the bare cost level in the Mii estimate.

The Production Index does not account for objective construction costs, contingency and inflation. Direct construction costs such as fuel, material prices and overtime should be considered as usual. The Production Index is based on known factors and therefore it is not a contingency factor or a risk analysis tool, since it does not measure uncertainty.

In developing the Production Index care was taken to abide by our Regulations.
EI 01D010 (1 September 1997), paragraph 13-2 quotes: "Each Government estimate for procurement will reflect the fair and reasonable cost to a prudent contractor for performing the scope specified. Although contractor bids will reflect the anticipated competitiveness, the Government estimate must remain the "yardstick" against which cost reasonableness is judged. Therefore, Government estimates can contain adjustments due to quotations on direct and indirect costs, but no separate adjustment due to competitiveness or bid strategies."

Estimators are encouraged to implement the Production Index on all civil and military estimates, except projects under construction (modifications) or dredging projects. If the estimator chooses to use the Production Index then detailed comments must be included in the MCACES (Mii) notes.

Finally, particular care should be taken with on-going project estimates.

TITLE: KENAI RIVER BLUFF STABILIZATION
SUBJECT: LAND BASED ROCK PLACEMENT OUTPUT RATE

MADE BY:	NSS	JOB NO.:	T17688
CHECKED BY:	IGP	DATE:	3/19/2009

FILTER ROCK PLACEMENT

CREW:

B-57 - Modified
1 Dragline Cranes on Crawler w/ Clamshell Bucket
1 Equip. Oper. (crane)
1 Equip. Oper. (oiler)
1 Labor Foreman (outside)
1 Articulated Front End Loaders
1 Equip. Oper. (light)

PRODUCTION:

5	CY bucket/ Crane
0.85	% fill
45	min/hr
0.75	cycle/min

Output:

			OVERTIME
143	CY/hr	1,721	CY/ 12 hr shift

B ROCK PLACEMENT

CREW:

B-57 - Modified
Dragline Crane on Crawler w/ Clamshell Bucket
Articulated Front End Loader
4 - Crew Members

PRODUCTION:

5	CY bucket/ Crane
0.6	% fill
45	min/hr
0.65	cycle/min

Output:

			OVERTIME
88	CY/hr	1,053	CY/ 12 hr shift

ARMOR ROCK PLACEMENT

CREW:

B-57 - Modified
Dragline Crane on Crawler w/ Clamshell Bucket
Articulated Front End Loader
4 - Crew Members

PRODUCTION:

5	CY bucket/ Crane
0.45	% fill
45	min/hr
0.6	cycle/min

Output:

			OVERTIME
61	CY/hr	729	CY/ 12 hr shift

TITLE: KENAI RIVER BLUFF STABILIZATION
SUBJECT:WATER BASED ROCK PLACEMENT OUTPUT RATE

MADE BY:	NSS	JOB NO.:	T17688
CHECKED BY:	IGP	DATE:	3/19/2009

FILTER ROCK PLACEMENT

CREW:

B-57 - Modified
1 Crane w/ Clamshell Bucket
1 Equip. Oper. (crane)
1 Equip. Oper. (light)
1 Equip. Oper. Oiler
1 Labor Foreman (outside)
2 Laborers
0.5 Tugboat
0.5 Tugboat Captain
0.5 Tugboat Hand
1 Barge

PRODUCTION:

5	CY bucket/Crane
0.85	% fill
45	min/hr
0.75	cycle/min

			OVERTIME
Output:	143	CY/hr	1,721 CY/ 12 hr shift

B ROCK PLACEMENT

CREW:

B-57 - Modified
Crane w/ Clamshell Bucket
5 - Crew Members

PRODUCTION:

5	CY bucket
0.6	% fill
45	min/hr
0.65	cycle/min

			OVERTIME
Output:	88	CY/hr	1,053 CY/ 12 hr shift

ARMOR ROCK PLACEMENT

CREW:

B-57 - Modified
Crane w/ Clamshell Bucket
5 - Crew Members

PRODUCTION:

5	CY bucket
0.45	% fill
45	min/hr
0.6	cycle/min

			OVERTIME
Output:	61	CY/hr	729 CY/ 12 hr shift

TITLE: KENAI RIVER BLUFF STABILIZATION
SUBJECT: WATER BASED ROCK LOADING OUTPUT RATE

MADE BY:	NSS	JOB NO.:	T17688
CHECKED BY:	IGP	DATE:	3/19/2009

FILTER ROCK LOADING

CREW:

B-57 - Modified
1 Barge Mounted Crane w/ Skip Box
3 Trucks with End Dump Trailers
7 - Crew Members

PRODUCTION:

15	CY skip box
0.85	% fill
45	min/hr
0.75	cycle/min

Output: 430 CY/hr — **OVERTIME** 5,164 CY/ 12 hr shift

B ROCK LOADING

CREW:

B-57 - Modified
1 Barge Mounted Crane w/ Skip Box
3 Trucks with End Dump Trailers
7 - Crew Members

PRODUCTION:

15	CY skip box
0.6	% fill
45	min/hr
0.65	cycle/min

Output: 263 CY/hr — **OVERTIME** 3,159 CY/ 12 hr shift

ARMOR ROCK LOADING

CREW:

B-57 - Modified
1 Barge Mounted Crane w/ Skip Box
3 Trucks with End Dump Trailers
7 - Crew Members

PRODUCTION:

15	CY skip box
0.45	% fill
45	min/hr
0.6	cycle/min

Output: 182 CY/hr — **OVERTIME** 2,187 CY/ 12 hr shift

TITLE: KENAI RIVER BLUFF STABILIZATION
SUBJECT: HAULING OUTPUT RATES

MADE BY:	NSS	JOB NO.:	T17688
CHECKED BY:	IGP	DATE:	3/19/2009

ROCK HAULING FROM SEWARD QUARRY

CREW:

Z - Haul Crew From Quarry
1 Truck Driver
1 Truck
1 28cy Dump Trailer

PRODUCTION:

28	Truck Size (CY)
10%	Waste Factor
210	mi/roundtrip
280	min/roundtrip

			OVERTIME
Output:	5.40	CY/hr	64.80 CY/ 12 hr shift

TITLE: KENAI RIVER BLUFF STABILIZATION
SUBJECT: HAULING OUTPUT RATES

MADE BY:	SKV	JOB NO.:	T17688
CHECKED BY:	IGP	DATE:	2/2/2012

ROCK HAULING FROM SEWARD QUARRY

CREW:	Z - Haul Crew From Quarry 1 Truck Driver 1 Truck 1 28cy Dump Trailer			
PRODUCTION:	30	cy truck		
	0.95	% fill		
	6.7	min. for loading		
	0.5	mi. to disposal location		
	20	mph haul speed		
	3.3	min. dump time		
	55	min/hr		
	28.5	cy/truck		
	0.24	hr		
				OVERTIME
Output:	120.6	cy/hr per truck	1,446.92	CY/ 12 hr shift
	2.00	Number of truck crews required to have little or no back up on route		
				OVERTIME
Total Output:	228.0	cy/hr	2,736.00	CY/ 12 hr shift

APPENDIX F

Phone Logs and Emails

NOTE: QUOTES ARE NON-BINDING ESTIMATES TO BE USED FOR INFORMATIONAL PURPOSES ONLY

Additional Notes on Earthwork:

Terry at West Construction Company estimated excavation costs, including mixing and dewatering of stockpile material, were at $20/yd. The cost of hauling excess material was estimated at $0.50 per cubic yard mile. Tel (907) 561-9811. Cost of rock for the project is estimated to be $60/ton, including transportation.

Additional Notes on Rock

Rock Alaska LLC estimated the price for 4' armor rock at $32.50/ton, not including transportation cost. Rock Alaska rents a side dump truck at $120/hr and an end dump truck at $95/hr. The quarry is located in Chugiak, Alaska, 180 miles (approximately 3hr 40 min) by land from the city of Kenai. There may be potential to ship the rock to the site on a barge. This price does not include placement cost of the rock. (907) 688-3500

Skookum Rock Quarry estimated the combined price of material and haul for 3' armor rock at $75/ton, with approximately half of that cost going to material and the other half to haul. Initially estimate based on December 2007 quote (non-binding). Fuel costs add 30% to haul costs as of June 2008 for a total delivered price of $89/ton. This estimate was based on a previous job involving shipping of 4,000 tons of 3' rock to Kenai for the State of Alaska, and the cost of the rock may be less with larger quantities. This price does not include placement cost. Skookum Rock Quarry is located in Chugiak, Alaska, 180 miles (approximately 3hr 40 min) by land from the city of Kenai. (907) 688-9700

Marcus Muler of the Seward Rock Quarry explained that the quarry, located in Seward, Alaska, (102 miles from Kenai, about 2hr 20 min by land) is not being actively quarried. Plans to reopen the quarry in the next year are underway. The quarry only has a limited amount of larger rock but would be able to produce more if reopened. The cost of 2'-3' rock is $45/ton and does not include transport or placement cost. (907) 714-2204.

According to Dick Miller at Amco Paving, current pricing for angular armor rock is approximately $35/ton for the material, and $20/ton for truck transportation from Girdwood, for a total of $55/ton. Prices are based on December 2007 quotes (non-binding). Escalation to current price level is assumed. (907) 440-1512. The price is a non-binding quote used for reference only. Due to the quantities involved, additional quotes should be obtained.

Contractor Contact info:

Rock Alaska LLC
PO Box 670249
Chugiak AK 99567

(907) 688-3500
Fax: (907) 696-2752
Cellular: 227-7448 or 229-0823

Skookum Rock Quarry
1010 Pack Horse Cir, Chugiak, AK
(907) 688-9700
State of Alaska Job: used West Construction—Bryce Ericson
Karl_High@dot.state.ak.us
May 25th to June 22nd
Rock & Haul—$75/ ton (half for haul, half for rock)
3’ rock, 4,000 tons—class III rock

Seward Rock Quarry

Kenai Peninsula Borough
Land Management Division
144 N Binkley Street
Soldotna, AK 99669
Phone 907-714-2200

Alaska Interstate Construction LLC
601 West 5th Avenue, Suite 400
Anchorage AK 99501
Tel: 907-562-2792
Fax: 907-562-4179
Email: info@aicllc.com
http://www.aicllc.com/servlet/content/7.html

Brian Forbes: brian.forbes@aicllc.com
Bristol Construction Services, LLC
111 W. 16th Avenue - Third Floor

Bristol Environmental & Engineering Services Corporation
Anchorage, AK 99501
Phone: (907) 563-0013
Steve Johnson— sjohnson@bristol-companies.com

West Construction Company
6120 A Street, Anchorage, AK 99518
Phone: 907 561 9811
Bryce Erickson—chief estimator, VP
http://bwcc.us/

Northstar Paving & ConstructionAddress:

APPENDIX G

MCACES Construction Cost Estimate

Kenai River Bluff Stabilization Cost Estimate

Estimated by	Tetra Tech
Designed by	Tetra Tech
Prepared by	Tetra Tech
Preparation Date	5/8/2012
Effective Date of Pricing	5/8/2012
Estimated Construction Time	464 Days

Description **Page**

Description **Page**

Designed by

Tetra Tech

Estimated by

Tetra Tech

Prepared by

Tetra Tech

Design Document	Kenai Bluff Stabilization Design Alternative Rpt.
Document Date	1/1/2012
District	Alaska
Contact	Pat Fitzgerald
Budget Year	2012
UOM System	Original

Direct Costs

LaborCost
EQCost
MatlCost
SubBidCost
Travel/PerDiem
Shipping
Fees

Timeline/Currency

Preparation Date	5/8/2012
Escalation Date	5/8/2012
Eff. Pricing Date	5/8/2012
Estimated Duration	464 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Costbook CB10EB: MII English Cost Book 2010

Labor 01LA2011: Labor_Kenai_AK (2011)

tes. Fringes paid to the laborers may be fully or partially taxable. In a NON-UNION job, all the fringe benefits are taxable. In a UNION job, the vacation pay fringes is taxable an

Labor Rates

LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP09R09: MII Equipment Region 9 2009

09 ALASKA

Sales Tax	3.00
Working Hours per Year	1,040
Labor Adjustment Factor	1.19
Cost of Money	4.88
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.10
Standby Depreciation Factor	0.50

Fuel

Electricity	0.132
Gas	4.550
Diesel Off-Road	4.670
Diesel On-Road	4.950

Shipping Rates

Over 0 CWT	44.02
Over 240 CWT	41.59
Over 300 CWT	38.40
Over 400 CWT	35.48
Over 500 CWT	27.35
Over 700 CWT	25.43
Over 800 CWT	22.10

Labor ID: 01LA2011 EQ ID: EP09R09 Currency in US dollars TRACES MII Version 4.1

Direct Cost Markups

Productivity
Overtime

	Days/Week	Hours/Shift	Shifts/Day
Standard	*5.00*	*8.00*	*1.00*
Actual	*6.00*	*8.00*	*1.00*

Day	*OT Factor*	*Working*
Monday	*1.50*	*Yes*
Tuesday	*1.50*	*Yes*
Wednesday	*1.50*	*Yes*
Thursday	*1.50*	*Yes*
Friday	*1.50*	*Yes*
Saturday	*1.50*	*Yes*
Sunday	*2.00*	*No*

Sales Tax
MatlCost

Category

Productivity
Overtime

	1st Shift	2nd Shift	3rd Shift
Standard	*8.00*	*0.00*	*0.00*
Actual	*12.00*	*0.00*	*0.00*

TaxAdj

Method

Productivity
Overtime

OT Percent	FCCM Percent
22.22	*(44.44)*

Running % on Selected Costs

Contractor Markups

JOOH Prime (Small Tools)
JOOH Prime
JOOH Sub
HOOH
Profit Prime

Guideline	*Value*
Risk	*0.100*
Difficulty	*0.100*
Size	*0.030*
Period	*0.075*
Invest (Contractor's)	*0.100*
Assist (Assistance by)	*0.070*
SubContracting	*0.118*
Total	

Profit Sub
Bond
Class B, Tiered, 24 months, 1.00% Surcharge

Contract Price	*Bond Rate*
500,000	*15.84*
2,000,000	*9.57*
2,500,000	*7.59*
2,500,000	*6.93*
100,000,000,000	*6.34*

Insurance
Excise Tax

Category

Allowance
JOOH
JOOH
HOOH
Profit

Profit
Bond

MiscContract
Excise

Method

% of Labor
JOOH (Calculated)
Running %
Running %
Profit Weighted Guidelines

Weight	*Percentage*
20	*2.00*
15	*1.50*
15	*0.45*
15	*1.13*
5	*0.50*
5	*0.35*
25	*2.95*
100	*8.87*

Direct %
Bond Table

Direct %
Running %

Labor ID: 01LA2011 EQ ID: EP09R09 | Currency in US dollars | TRACES MII Version 4.1

HOOH Sub

Allowance

Running %

Owner Markups

Contingency
SIOH
Escalation

Category

Contingency
SIOH
Escalation

Method

Contract %
Running %
Escalation

StartDate	*StartIndex*	*EndDate*	*EndIndex*	*Escalation*
2/18/2009	*689.38*	*11/1/2011*	*718.30*	*4.20*

Description	Quantity	UOM	ContractCost	ProjectCost	C/O
Project Cost Summary Report			**25,066,620**	**25,066,620**	
02 RELOCATIONS	**1.00**	**LS**	**650,996**	**650,996**	
02.01 Relocations	**1.00**	**LS**	**650,996**	**650,996**	
02.01.01 Pipe Demolition	**850.00**	**LF**	*30.26* **25,723**	*30.26* **25,723**	
02.01.01.01 24" CMP Demolition	**200.00**	**LF**	*54.58* **10,917**	*54.58* **10,917**	
02.01.01.02 3/4" and 6" PVC Demolition	**650.00**	**LF**	*22.78* **14,806**	*22.78* **14,806**	
02.01.02 Building and Pad Demolition	**1.00**	**LS**	**576,518**	**576,518**	
02.01.03 Overlook Demolition	**1.00**	**LS**	**3,450**	**3,450**	
02.01.04 Roadway Demolition	**1.00**	**LS**	**45,305**	**45,305**	
14 RECREATIONAL FACILITIES	**1.00**	**LS**	**529,992**	**529,992**	
14.01 Recreational Facilities	**1.00**	**LS**	**529,992**	**529,992**	
14.01.01 Overlook	**3.00**	**EA**	*37,633.12* **112,899**	*37,633.12* **112,899**	
14.01.01.01 Overlook Boardwalk	**390.00**	**LF**	*169.58* **66,136**	*169.58* **66,136**	
14.01.01.02 Benches and Signs	**1.00**	**LS**	**46,763**	**46,763**	
14.01.02 Roadway	**1.00**	**LS**	**284,494**	**284,494**	
14.01.03 Surface Drainage	**1.00**	**LS**	**132,599**	**132,599**	
14.01.03.01 24-inch CMP	**205.00**	**LF**	*128.39* **26,319**	*128.39* **26,319**	
14.01.03.02 Concrete Culverts	**3.00**	**EA**	*5,399.41* **16,198**	*5,399.41* **16,198**	
14.01.03.03 24-inch Gate	**3.00**	**EA**	*5,820.19* **17,461**	*5,820.19* **17,461**	
14.01.03.04 Riprap	**304.00**	**CY**	*238.88* **72,621**	*238.88* **72,621**	
16 BANK STABILIZATION	**1.00**	**LS**	**23,885,631**	**23,885,631**	

Labor ID: 01LA2011 EQ ID: EP09R09 Currency in US dollars TRACES MII Version 4.1

Description	Quantity	UOM	ContractCost	ProjectCost	C/O
16.01 Bank Stabilization	**1.00**	**LS**	**23,885,631**	**23,885,631**	
16.01.01 Site Preparation	**1.00**	**LS**	**1,565,263**	**1,565,263**	
16.01.01.01 Silt Fence	**2,230.00**	**LF**	*8.00* **17,846**	*8.00* **17,846**	
16.01.01.02 Temporary Road	**5,225.00**	**LF**	*41.13* **214,916**	*41.13* **214,916**	
16.01.01.03 Pumping	**1.00**	**LS**	**743,065**	**743,065**	
16.01.01.04 Clearing and Grubbing	**10.30**	**ACR**	*23,625.55* **243,343**	*23,625.55* **243,343**	
16.01.01.05 Fencing	**5,225.00**	**LF**	*44.27* **231,306**	*44.27* **231,306**	
16.01.01.06 Temporary Fencing	**2,000.00**	**LF**	*12.80* **25,594**	*12.80* **25,594**	
16.01.01.07 Temporary Bridge Crossing	**1.00**	**EA**	*89,192.51* **89,193**	*89,192.51* **89,193**	
16.01.02 Earthwork	**1.00**	**LS**	**7,990,220**	**7,990,220**	
16.01.02.01 Alluvial Deposits	**140,944.00**	**BCY**	*26.56* **3,743,400**	*26.56* **3,743,400**	
16.01.02.01.01 Excavation	**140,944.00**	**CY**	*10.77* **1,518,562**	*10.77* **1,518,562**	
16.01.02.01.02 Backfill	**144,274.00**	**CY**	*10.80* **1,558,311**	*10.80* **1,558,311**	
16.01.02.01.03 Dispose of Unusable Material	**23,256.00**	**CY**	*28.66* **666,527**	*28.66* **666,527**	
16.01.02.02 Glacial Till	**67,006.00**	**BCY**	*38.22* **2,560,949**	*38.22* **2,560,949**	
16.01.02.02.01 Excavation	**67,006.00**	**CY**	*11.65* **780,298**	*11.65* **780,298**	
16.01.02.02.02 Backfill	**15,078.00**	**CY**	*11.88* **179,198**	*11.88* **179,198**	
16.01.02.02.03 Dispose of Unused Material	**51,928.00**	**CY**	*30.84* **1,601,453**	*30.84* **1,601,453**	

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Description	Quantity	UOM	ContractCost	ProjectCost	C/O
			60.57	*60.57*	
16.01.02.03 Borrow Material	**8,900.00**	**BCY**	**539,041**	**539,041**	
16.01.02.04 Soil Stabilization	**1.00**	**LS**	**1,146,830**	**1,146,830**	
			200.16	*200.16*	
16.01.03 Erosion Protection	**56,307.00**	**LCY**	**11,270,551**	**11,270,551**	
			180.65	*180.65*	
16.01.03.01 Land Based Placement	**26,878.00**	**LCY**	**4,855,595**	**4,855,595**	
			212.52	*212.52*	
16.01.03.02 Water Based Placement	**26,878.00**	**LCY**	**5,712,200**	**5,712,200**	
			17.19	*17.19*	
16.01.03.03 Rock Loading on Barge	**26,878.00**	**LCY**	**461,949**	**461,949**	
			6.99	*6.99*	
16.01.03.04 Geotextile Fabric	**34,433.00**	**SY**	**240,807**	**240,807**	
16.01.04 Vegetation	**1.00**	**LS**	**3,059,597**	**3,059,597**	

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Description	Quantity	UOM	Contractor	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost	C/O
Contract Cost Summary Report				**15,650,986**	**507,847**	**16,158,832**	**8,907,787**	**25,066,620**	
02 RELOCATIONS	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**416,030**	**0**	**416,030**	**234,966**	**650,996**	
02.01 Relocations	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**416,030**	**0**	**416,030**	**234,966**	**650,996**	
				19.34		*19.34*		*30.26*	
02.01.01 Pipe Demolition	**850.00**	**LF**	**AA PRIME CONTRACTOR**	**16,439**	**0**	**16,439**	**9,284**	**25,723**	
02.01.02 Building and Pad Demolition	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**368,434**	**0**	**368,434**	**208,084**	**576,518**	
02.01.03 Overlook Demolition	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**2,205**	**0**	**2,205**	**1,245**	**3,450**	
02.01.04 Roadway Demolition	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**28,953**	**0**	**28,953**	**16,352**	**45,305**	
14 RECREATIONAL FACILITIES	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**338,701**	**0**	**338,701**	**191,292**	**529,992**	
14.01 Recreational Facilities	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**338,701**	**0**	**338,701**	**191,292**	**529,992**	
				24,050.09		*24,050.09*		*37,633.12*	
14.01.01 Overlook	**3.00**	**EA**	**AA PRIME CONTRACTOR**	**72,150**	**0**	**72,150**	**40,749**	**112,899**	
14.01.02 Roadway	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**181,811**	**0**	**181,811**	**102,683**	**284,494**	
14.01.03 Surface Drainage	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**84,740**	**0**	**84,740**	**47,859**	**132,599**	
16 BANK STABILIZATION	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**14,896,255**	**507,847**	**15,404,101**	**8,481,530**	**23,885,631**	
16.01 Bank Stabilization	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**14,896,255**	**507,847**	**15,404,101**	**8,481,530**	**23,885,631**	
16.01.01 Site Preparation	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**1,000,308**	**0**	**1,000,308**	**564,955**	**1,565,263**	
16.01.02 Earthwork	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**5,106,287**	**0**	**5,106,287**	**2,883,933**	**7,990,220**	

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Description	Quantity	UOM	Contractor	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost	C/O
				127.92		*127.92*		*200.16*	
16.01.03 Erosion Protection	**56,307.00**	**LCY**	**AA PRIME CONTRACTOR**	**7,202,638**	**0**	**7,202,638**	**4,067,913**	**11,270,551**	
16.01.04 Vegetation	**1.00**	**LS**	**LANDSCAPE SUBCONTRACTOR**	**1,587,021**	**507,847**	**2,094,868**	**964,729**	**3,059,597**	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
Project Direct Costs Report				**3,656,934**	**3,636,112**	**5,620,906**	**2,737,033**	**0**	**15,650,986**	
02 RELOCATIONS	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**219,827**	**29,282**	**126,670**	**40,251**	**0**	**416,030**	
02.01 Relocations	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**219,827**	**29,282**	**126,670**	**40,251**	**0**	**416,030**	
				15.37	*3.97*	*0.00*	*0.00*		*19.34*	
02.01.01 Pipe Demolition	**850.00**	**LF**	**AA PRIME CONTRACTOR**	**13,064**	**3,375**	**0**	**0**	**0**	**16,439**	
				28.24	*6.64*	*0.00*	*0.00*		*34.88*	
02.01.01.01 24" CMP Demolition	**200.00**	**LF**	**AA PRIME CONTRACTOR**	**5,648**	**1,329**	**0**	**0**	**0**	**6,976**	
				6.53	*2.15*	*0.00*	*0.00*		*8.68*	
RSM 312316130100 Excavating, trench or continuous footing, common earth, 5/8 C.Y. excavator, 4' to 6' deep, excludes sheeting or dewatering	178.00	BCY	AA PRIME CONTRACTOR	1,162	383	0	0	0	1,545	
				18.06	*2.49*	*0.00*	*0.00*		*20.54*	
RSM 024113400170 Selective demolition, metal drainage piping, CMP, steel, 24", diameter, excludes excavation	200.00	LF	AA PRIME CONTRACTOR	3,611	497	0	0	0	4,109	
(Note: 100-LF of Existing 24" CMP + 100-LF of 24" CMP storm drain = 200-LF)										
				2.07	*1.93*	*0.00*	*0.00*		*4.00*	
RSM 312323170170 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	214.00	LCY	AA PRIME CONTRACTOR	442	413	0	0	0	855	
				2.02	*0.17*	*0.00*	*0.00*		*2.19*	
RSM 023153107220 Compaction, 3 passes, 18" wide, 12" lifts, walk behind, vibrating plate	214.00	ECY	AA PRIME CONTRACTOR	432	36	0	0	0	468	
				11.41	*3.15*	*0.00*	*0.00*		*14.56*	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
02.01.01.02 3/4" and 6" PVC Demolition	**650.00**	**LF**	**AA PRIME CONTRACTOR**	**7,416**	**2,046**	**0**	**0**	**0**	**9,462**	
(Note: 100-LF of 6" pipe and 550-LF of 3/4" pipe.)										
				6.53	*2.15*	*0.00*	*0.00*		*8.68*	
RSM 312316130100 Excavating, trench or continuous footing, common earth, 5/8 C.Y. excavator, 4' to 6' deep, excludes sheeting or dewatering	433.00	BCY	AA PRIME CONTRACTOR	2,827	931	0	0	0	3,758	
				4.63	*0.00*	*0.00*	*0.00*		*4.63*	
RSM 024113381700 Selective demolition, water & sewer piping & fittings, plastic Pipe, 6"-8", diameter, excludes excavation	100.00	LF	AA PRIME CONTRACTOR	463	0	0	0	0	463	
				3.31	*0.00*	*0.00*	*0.00*		*3.31*	
RSM 024113381600 Selective demolition, water & sewer piping & fittings, plastic Pipe, 3/4" - 4", diameter, excludes excavation	550.00	LF	AA PRIME CONTRACTOR	1,821	0	0	0	0	1,821	
				180.57	*24.85*	*0.00*	*0.00*		*205.43*	
RSM 024113400220 Selective demolition, metal drainage piping, CMP end sections, steel, 24"-36", diameter, excludes excavation	1.00	EA	AA PRIME CONTRACTOR	181	25	0	0	0	205	
				2.07	*1.93*	*0.00*	*0.00*		*4.00*	
RSM 312323170170 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	520.00	LCY	AA PRIME CONTRACTOR	1,075	1,003	0	0	0	2,078	
				2.02	*0.17*	*0.00*	*0.00*		*2.19*	
RSM 023153107220 Compaction, 3 passes, 18" wide, 12" lifts, walk behind, vibrating plate	520.00	ECY	AA PRIME CONTRACTOR	1,049	87	0	0	0	1,137	
02.01.02 Building and Pad Demolition	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**195,705**	**22,048**	**110,430**	**40,251**	**0**	**368,434**	
				0.00	*0.00*	*0.00*	*3.52*		*3.52*	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
RSM 024116131020 Building demolition, single family, one story house, wood, includes 20 mile haul, excludes foundation demolition, dump fees, maximum	11,435.00	SF	AA PRIME CONTRACTOR	0	0	0	40,251	0	40,251	
(Note: Assuming single family homes are on average 1500-SF, the unit cost in SF to demolish a home is $5275-EA (per MCACES CSI Task 022201101020) /1500-SF per home = $3.52/SF.)										
				12.67	*1.11*	*0.00*	*0.00*		*13.78*	
RSM 024116170440 Bldg. footings and foundations demolition, floors, concrete slab on grade, concrete, rod reinforced, 6" thick, excludes disposal costs and dump fees	14,875.00	SF	AA PRIME CONTRACTOR	188,484	16,484	0	0	0	204,968	
				10.92	*8.42*	*0.00*	*0.00*		*19.34*	
RSM 023154901255 Hauling, excavated or borrow material, loose cubic yards, 20 mile round trip, 0.5 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	661.00	LCY	AA PRIME CONTRACTOR	7,221	5,563	0	0	0	12,785	
				0.00	*0.00*	*90.00*	*0.00*		*90.00*	
RSM 024119190100 Selective demolition, dump charges, typical urban city, building construction materials, includes tipping fees only	1,227.00	TON	AA PRIME CONTRACTOR	0	0	110,430	0	0	110,430	
02.01.03 Overlook Demolition	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**1,429**	**136**	**640**	**0**	**0**	**2,205**	
				147.84	*0.00*	*0.00*	*0.00*		*147.84*	
RSM 024113930100 Selective demolition, site furnishings, benches, all types	2.00	EA	AA PRIME CONTRACTOR	296	0	0	0	0	296	
				2.95	*0.23*	*0.00*	*0.00*		*3.18*	
RSM 024113900900 Selective demolition, retaining walls, interlocking segmental retaining wall	360.00	SF	AA PRIME CONTRACTOR	1,063	82	0	0	0	1,145	
				10.92	*8.42*	*0.00*	*0.00*		*19.34*	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
RSM 023154901255 Hauling, excavated or borrow material, loose cubic yards, 20 mile round trip, 0.5 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	6.40	LCY	AA PRIME CONTRACTOR	70	54	0	0	0	124	
				0.00	*0.00*	*80.00*	*0.00*		*80.00*	
RSM 024119190300 Selective demolition, dump charges, typical urban city, rubbish only, includes tipping fees only	8.00	TON	AA PRIME CONTRACTOR	0	0	640	0	0	640	
02.01.04 Roadway Demolition	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**9,629**	**3,724**	**15,600**	**0**	**0**	**28,953**	
				1.06	*0.35*	*0.00*	*0.00*		*1.41*	
RSM 024113175050 Demolish, remove pavement & curb, remove bituminous pavement, 4" to 6" thick, excludes hauling and disposal fees	7,893.00	SF	AA PRIME CONTRACTOR	8,351	2,739	0	0	0	11,090	
				10.92	*8.42*	*0.00*	*0.00*		*19.34*	
RSM 023154901255 Hauling, excavated or borrow material, loose cubic yards, 20 mile round trip, 0.5 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	117.00	LCY	AA PRIME CONTRACTOR	1,278	985	0	0	0	2,263	
				0.00	*0.00*	*80.00*	*0.00*		*80.00*	
RSM 024119190300 Selective demolition, dump charges, typical urban city, rubbish only, includes tipping fees only	195.00	TON	AA PRIME CONTRACTOR	0	0	15,600	0	0	15,600	
14 RECREATIONAL FACILITIES	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**89,149**	**18,505**	**218,958**	**12,089**	**0**	**338,701**	
14.01 Recreational Facilities	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**89,149**	**18,505**	**218,958**	**12,089**	**0**	**338,701**	
				11,633.27	*113.75*	*12,303.07*	*0.00*		*24,050.09*	
14.01.01 Overlook	**3.00**	**EA**	**AA PRIME CONTRACTOR**	**34,900**	**341**	**36,909**	**0**	**0**	**72,150**	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
				76.68	*0.11*	*31.59*	*0.00*		*108.37*	
14.01.01.01 Overlook Boardwalk	**390.00**	**LF**	**AA PRIME CONTRACTOR**	**29,905**	**42**	**12,319**	**0**	**0**	**42,266**	
				2.79	*0.00*	*0.35*	*0.00*		*3.14*	
RSM 061110280380 Porch or deck framing, treated lumber, railings and trim, 2" x 4"	2,340.00	LF	AA PRIME CONTRACTOR	6,539	0	819	0	0	7,358	
(Note: Per the designer, the total length of all the boardwalks is approximately 390'. Rails will be located on both sides of the boardwalk. There will be three rows of rails per designer's detail. Therefore, the total length is 390' x 2 x 3 = 2340'.)										
				1.34	*0.00*	*0.58*	*0.00*		*1.92*	
RSM 061110280320 Porch or deck framing, treated lumber, joists, 2" x 6"	2,340.00	LF	AA PRIME CONTRACTOR	3,139	0	1,357	0	0	4,496	
(Note: Per the designer, the total length of all the boardwalks is approximately 390'. 6 joists will run below the deck for the entire length per designer's detail. Therefore, the total length is 390' x 6 = 2340'.)										
				4.30	*0.00*	*6.40*	*0.00*		*10.70*	
RSM 061110280980 Porch or deck framing, redwood, posts or columns, 4" x 4"	780.00	LF	AA PRIME CONTRACTOR	3,354	0	4,992	0	0	8,346	
(Note: Per the designer, the total length of all the boardwalks is approximately 390'. Posts will be located on both sides of the boardwalk per designer's detail. Therefore, the total length is 390' x 2 = 780'.)										
				59.74	*0.42*	*5.10*	*0.00*		*65.26*	
RSM 033053406800 Structural concrete, in place, stairs (3500 psi), 3'-6" wide, free standing, includes forms(4 uses), reinforcing steel, concrete, placing and finishing, excludes safety treads	100.00	LF	AA PRIME CONTRACTOR	5,974	42	510	0	0	6,526	
				2.79	*0.00*	*1.19*	*0.00*		*3.98*	
RSM 061110280410 Porch or deck framing, treated lumber, decking, 2" x 4"	3,900.00	SF	AA PRIME CONTRACTOR	10,899	0	4,641	0	0	15,540	
(Note: The boardwalks are 10' wide per designer's detail and will have an approximate total length of 390'.)										
14.01.01.02 Benches and Signs	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**4,995**	**300**	**24,590**	**0**	**0**	**29,885**	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
				211.20	*0.00*	*1,250.00*	*0.00*		*1,461.20*	
RSM 129343130510 Site seating, park benches, steel barstock pedestals with backs, 2 x 3 wood rails, 8' long	15.00	EA	AA PRIME CONTRACTOR	3,168	0	18,750	0	0	21,918	
				45.68	*7.49*	*146.00*	*0.00*		*199.17*	
RSM 101453200300 Signs, stock, aluminum, reflectorized, .080" aluminum, 30" x 30", excludes posts	40.00	EA	AA PRIME CONTRACTOR	1,827	300	5,840	0	0	7,967	
14.01.02 Roadway	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**26,043**	**7,168**	**148,600**	**0**	**0**	**181,811**	
				11.90	*3.40*	*68.00*	*0.00*		*83.30*	
RSM 321216130854 Plant-mix asphalt paving, for highways and large paved areas, wearing course, alternate method for developing paving costs, 3" thick, no hauling included	2,000.00	TON	AA PRIME CONTRACTOR	23,799	6,800	136,000	0	0	166,599	
				5.61	*0.92*	*31.50*	*0.00*		*38.03*	
RSM 347113260100 Vehicle guide rails, corrugated steel, galvanized steel posts, install metal guide/guard rail, double face, wood posts 6'-3" O.C., 6" x 8" posts	400.00	LF	AA PRIME CONTRACTOR	2,244	368	12,600	0	0	15,212	
14.01.03 Surface Drainage	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**28,206**	**10,996**	**33,449**	**12,089**	**0**	**84,740**	
				38.70	*6.41*	*33.06*	*3.88*		*82.05*	
14.01.03.01 24-inch CMP	**205.00**	**LF**	**AA PRIME CONTRACTOR**	**7,933**	**1,314**	**6,778**	**795**	**0**	**16,820**	
				26.58	*1.76*	*30.50*	*0.00*		*58.84*	
RSM 334113402620 Public Storm Utility Drainage Piping, corrugated metal pipe, galvanized uncoated, 20' lengths, 14 ga., 24" diameter, excludes excavation and backfill	205.00	LF	AA PRIME CONTRACTOR	5,448	361	6,253	0	0	12,062	
				6.53	*2.15*	*0.00*	*0.00*		*8.68*	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
RSM 312316130100 Excavating, trench or continuous footing, common earth, 5/8 C.Y. excavator, 4' to 6' deep, excludes sheeting or dewatering	187.00	BCY	AA PRIME CONTRACTOR	1,221	402	0	0	0	1,623	
				2.07	*1.93*	*0.00*	*0.00*		*4.00*	
RSM 312323170170 Fill, from stockpile, 130 H.P., 2-1/2 C.Y., 300' haul, spread fill, with front-end loader, excludes compaction	144.00	LCY	AA PRIME CONTRACTOR	298	278	0	0	0	576	
				15.75	*2.06*	*25.00*	*0.00*		*42.81*	
RSM 312323160050 Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	21.00	LCY	AA PRIME CONTRACTOR	331	43	525	0	0	899	
				2.02	*0.17*	*0.00*	*0.00*		*2.19*	
RSM 023153107220 Compaction, 3 passes, 18" wide, 12" lifts, walk behind, vibrating plate	165.00	ECY	AA PRIME CONTRACTOR	333	28	0	0	0	361	
				3.79	*2.52*	*0.00*	*0.00*		*6.31*	
HNC 312323180470 Hauling, excavated or borrow material, loose cubic yards, 4 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	80.00	LCY	AA PRIME CONTRACTOR	303	202	0	0	0	505	
				0.00	*0.00*	*0.00*	*5.00*		*5.00*	
RSM 024119190200 Selective demolition, dump charges, typical urban city, trees, brush, lumber, includes tipping fees only	159.00	TON	AA PRIME CONTRACTOR	0	0	0	795	0	795	
				3,099.01	*21.57*	*330.00*	*0.00*		*3,450.58*	
14.01.03.02 Concrete Culverts	**3.00**	**EA**	**AA PRIME CONTRACTOR**	**9,297**	**65**	**990**	**0**	**0**	**10,352**	
				3,099.01	*21.57*	*330.00*	*0.00*		*3,450.58*	
RSM 334213130120 Concrete Culverts, headwall concrete, cast in place, 30 degree skewed wingwall, 24" diameter pipe	3.00	EA	AA PRIME CONTRACTOR	9,297	65	990	0	0	10,352	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
				990.74	*278.75*	*2,450.00*	*0.00*		*3,719.49*	
14.01.03.03 24-inch Gate	**3.00**	**EA**	**AA PRIME CONTRACTOR**	**2,972**	**836**	**7,350**	**0**	**0**	**11,158**	
				990.74	*278.75*	*2,450.00*	*0.00*		*3,719.49*	
RSM 352016630120 Canal gates, hydraulic structures, cast iron body, fabricated frame, 24" diameter	3.00	EA	AA PRIME CONTRACTOR	2,972	836	7,350	0	0	11,158	
				26.33	*28.89*	*60.30*	*37.15*		*152.66*	
14.01.03.04 Riprap	**304.00**	**CY**	**AA PRIME CONTRACTOR**	**8,003**	**8,781**	**18,331**	**11,294**	**0**	**46,410**	
				26.33	*28.89*	*60.30*	*37.15*		*152.66*	
RSM 313713100100 Rip-rap and rock lining, random, broken stone, machine placed for slope protection	304.00	LCY	AA PRIME CONTRACTOR	8,003	8,781	18,331	11,294	0	46,410	
(Note: Material: based on quote for blasting, sorting, and stockpiling rock at Seward Quarry provided by Advanced Blasting Services (Mikel Saunders, 907-243-1811); Sub Bid: based on quote for hauling the rock from Seward Quarry to Kenai provided by RL Trucking (Cal Watts, 907-351-6124);)										
16 BANK STABILIZATION	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**3,347,959**	**3,588,324**	**5,275,278**	**2,684,693**	**0**	**14,896,255**	
16.01 Bank Stabilization	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**3,347,959**	**3,588,324**	**5,275,278**	**2,684,693**	**0**	**14,896,255**	
16.01.01 Site Preparation	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**678,889**	**118,117**	**146,302**	**57,000**	**0**	**1,000,308**	
(Note: The temporary staging areas and permanent construction zones along the top of the bluff would initially be cleared and grubbed of vegetation and debris, with the materials stockpiled on site or removed for off-site disposal. The trees lining the top of the bluff within the project footprint would also be removed. Affected utilities located within the construction area would be rerouted as needed. Some small structures would be demolished and resulting debris would be hauled off-site (see 02 Account). In addition, all abandoned concrete and timber foundations located within the construction area would be removed and hauled to the selected disposal area (see 02 Account). Temporary stormwater and erosion control measures would be implemented according to the adopted SWPPP. Temporary security fencing would be installed along the bluff above the construction area according to the fencing details in the plans.)											
				4.32	*0.00*	*0.79*	*0.00*		*5.11*	
16.01.01.01 Silt Fence	**2,230.00**	**LF**	**AA PRIME CONTRACTOR**	**9,643**	**0**	**1,762**	**0**	**0**	**11,405**	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
				4.32	*0.00*	*0.79*	*0.00*		*5.11*	
HNC 023707001120 Erosion control, silt fence, polypropylene, 3' high, includes 7.5' posts	2,230.00	LF	AA PRIME CONTRACTOR	9,643	0	1,762	0	0	11,405	
				9.31	*1.60*	*15.37*	*0.00*		*26.29*	
16.01.01.02 Temporary Road	**5,225.00**	**LF**	**AA PRIME CONTRACTOR**	**48,656**	**8,361**	**80,328**	**0**	**0**	**137,346**	
				7.56	*0.50*	*8.00*	*0.00*		*16.06*	
RSM 015523500100 Temporary, roads, gravel fill, 8" gravel depth, excl surfacing	5,806.00	SY	AA PRIME CONTRACTOR	43,906	2,911	46,448	0	0	93,265	
(Note: Accounts for base of temporary road. Assumes the access road is 10' wide. The length is 5,225-LF per the designer.)										
				4.91	*5.63*	*35.00*	*0.00*		*45.54*	
RSM 310516100300 Aggregate for earthwork, crushed stone, 1.40 tons per C.Y., 1-1/2", spread with 200 H.P. dozer, includes load at pit and haul, 2 miles round trip, excludes compaction	968.00	CY	AA PRIME CONTRACTOR	4,751	5,450	33,880	0	0	44,081	
(Note: Accounts for extra stone required to support equipment on roadway. Assumes the access road is 10' wide and 6" thick. The length is 5,225-LF per the designer.)										
16.01.01.03 Pumping	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**446,538**	**28,331**	**0**	**0**	**0**	**474,869**	
				310.10	*19.67*	*0.00*	*0.00*		*329.77*	
RSM 312319200650 Dewatering, pumping, 8 hr., attended 2 hours per day, 4" discharge pump used for 8 hours, includes 20 L.F. of suction hose and 100 L.F. of discharge hose	1,440.00	DAY	AA PRIME CONTRACTOR	446,538	28,331	0	0	0	474,869	
(Note: 4-pumps are operating at 24-hrs per day for 4 months. 4-pumps * 3 8-hr shifts * 30-days * 4-months = 1440-days.)										
				8,552.76	*6,268.86*	*276.70*	*0.00*		*15,098.31*	
16.01.01.04 Clearing and Grubbing	**10.30**	**ACR**	**AA PRIME CONTRACTOR**	**88,093**	**64,569**	**2,850**	**0**	**0**	**155,513**	
				1,283.12	*1,331.11*	*0.00*	*0.00*		*2,614.22*	
RSM 311110100150 Clearing & grubbing, grub stumps	10.30	ACR	AA PRIME CONTRACTOR	13,216	13,710	0	0	0	26,927	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
				388.61	*104.27*	*0.00*	*0.00*		*492.88*	
HNC 022301007320 Tree removal, congested area, 12" to 24" diameter, tree removal, cutting and chipping	35.00	EA	AA PRIME CONTRACTOR	13,601	3,649	0	0	0	17,251	
				10.92	*8.42*	*0.00*	*0.00*		*19.34*	
RSM 023154901255 Hauling, excavated or borrow material, loose cubic yards, 20 mile round trip, 0.5 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	5,609.00	LCY	AA PRIME CONTRACTOR	61,276	47,209	0	0	0	108,485	
(Note: Clearing and Grubbing Haul Volume (5,539-LCY) + Tree Removal Haul Volume (70-LCY) = 5,609-LCY.)										
				0.00	*0.00*	*75.00*	*0.00*		*75.00*	
RSM 024119190200 Selective demolition, dump charges, typical urban city, trees, brush, lumber, includes tipping fees only	38.00	TON	AA PRIME CONTRACTOR	0	0	2,850	0	0	2,850	
(Note: Tree Removal Dumping Volume (38-Tons))										
				14.56	*3.23*	*10.50*	*0.00*		*28.29*	
16.01.01.05 Fencing	**5,225.00**	**LF**	**AA PRIME CONTRACTOR**	**76,101**	**16,857**	**54,863**	**0**	**0**	**147,820**	
				14.56	*3.23*	*10.50*	*0.00*		*28.29*	
RSM 323129101300 Wood fences & gates, no. 2 cedar, treated wood rails, 6' high, includes post and post hole	5,225.00	LF	AA PRIME CONTRACTOR	76,101	16,857	54,863	0	0	147,820	
				4.93	*0.00*	*3.25*	*0.00*		*8.18*	
16.01.01.06 Temporary Fencing	**2,000.00**	**LF**	**AA PRIME CONTRACTOR**	**9,856**	**0**	**6,500**	**0**	**0**	**16,356**	
				4.93	*0.00*	*3.25*	*0.00*		*8.18*	
RSM 015626500100 Temporary Fencing, chain link, 6' high, 11 ga	2,000.00	LF	AA PRIME CONTRACTOR	9,856	0	6,500	0	0	16,356	
				0.00	*0.00*	*0.00*	*57,000.00*		*57,000.00*	
16.01.01.07 Temporary Bridge Crossing	**1.00**	**EA**	**AA PRIME CONTRACTOR**	**0**	**0**	**0**	**57,000**	**0**	**57,000**	

(Note: A temporary bridge would need to be constructed over Ryan's Creek to connect the construction zones.)

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
				0.00	*0.00*	*0.00*	*95.00*		*95.00*	
USR Z Temporary Bridge Crossing	600.00	SF	AA PRIME CONTRACTOR	0	0	0	57,000	0	57,000	
(Note: Quantity: Assumes bridge would need to be 40' long by 15' wide; Sub Bid: Based on CalTrans estimate of temporary bridge crossings to be between $45-95 per square foot.)										
16.01.02 Earthwork	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**1,856,570**	**2,125,592**	**515,135**	**608,990**	**0**	**5,106,287**	
(Note: Several passes with a scraper would be needed to remove oranics and the upper silt layer. The excavation equipment would need to be located a sufficient distance from the edge of the bluff to avoid the risk of bank failure caused by the equipment. Material close to the edge of the bluff could be excavated with excavators. The excavated material would be transported to the stockpile locations. Much of the excavated material could be used as backfill for the new bluff.)										
				6.46	*9.18*	*0.00*	*1.34*		*16.97*	
16.01.02.01 Alluvial Deposits	**140,944.00**	**BCY**	**AA PRIME CONTRACTOR**	**910,044**	**1,293,864**	**0**	**188,375**	**0**	**2,392,284**	
				2.59	*4.29*	*0.00*	*0.00*		*6.89*	
16.01.02.01.01 Excavation	**140,944.00**	**CY**	**AA PRIME CONTRACTOR**	**365,744**	**604,719**	**0**	**0**	**0**	**970,463**	
(Note: Assumes half of excavation would be performed by scrapers and the other half by hydraulic excavators.)										
				0.85	*1.78*	*0.00*	*0.00*		*2.63*	
HNC 312316503140 Excavation, bulk, bank measure, 9 cycles/hour, 25 C.Y., push loaded self propelled scraper	70,472.00	BCY	AA PRIME CONTRACTOR	60,021	125,449	0	0	0	185,470	
				1.24	*1.73*	*0.00*	*0.00*		*2.98*	
HNC 023154260160 Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	70,472.00	BCY	AA PRIME CONTRACTOR	87,596	122,132	0	0	0	209,728	
				1.41	*2.30*	*0.00*	*0.00*		*3.71*	
USR Z15 Transport Fill to/from Stockpile Site	155,038.00	LCY	AA PRIME CONTRACTOR	218,127	357,138	0	0	0	575,265	
(Note: Quantity: Based on designer provided quantities of fill; Productivity: Based on calculations provided in the cost engineering report for fill transport.)										
				2.88	*4.02*	*0.00*	*0.00*		*6.90*	
16.01.02.01.02 Backfill	**144,274.00**	**CY**	**AA PRIME CONTRACTOR**	**415,619**	**580,246**	**0**	**0**	**0**	**995,865**	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
				1.41	*2.30*	*0.00*	*0.00*		*3.71*	
USR Z15 Transport Fill to/from Stockpile Site	158,701.00	LCY	AA PRIME CONTRACTOR	223,281	365,576	0	0	0	588,857	
(Note: Quantity: Based on designer provided quantities of fill; Productivity: Based on calculations provided in the cost engineering report for fill transport.)										
				0.34	*0.56*	*0.00*	*0.00*		*0.91*	
HNC 312323132360 Backfill, dumped gravel or fill, 6" layers, spread, dozer	158,701.00	LCY	AA PRIME CONTRACTOR	54,681	89,018	0	0	0	143,699	
				0.95	*0.87*	*0.00*	*0.00*		*1.83*	
RSM 312323235640 Compaction, 4 passes, 6" lifts, riding, sheepsfoot or wobbly wheel roller	144,274.00	ECY	AA PRIME CONTRACTOR	137,658	125,652	0	0	0	263,309	
				5.53	*4.68*	*0.00*	*8.10*		*18.32*	
16.01.02.01.03 Dispose of Unusable Material	**23,256.00**	**CY**	**AA PRIME CONTRACTOR**	**128,682**	**108,899**	**0**	**188,375**	**0**	**425,956**	
				1.24	*1.73*	*0.00*	*0.00*		*2.98*	
HNC 023154260160 Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	25,582.00	BCY	AA PRIME CONTRACTOR	31,798	44,335	0	0	0	76,133	
				3.79	*2.52*	*0.00*	*0.00*		*6.31*	
HNC 312323180470 Hauling, excavated or borrow material, loose cubic yards, 4 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	25,582.00	LCY	AA PRIME CONTRACTOR	96,884	64,564	0	0	0	161,447	
				0.00	*0.00*	*0.00*	*5.00*		*5.00*	
RSM 024119190200 Selective demolition, dump charges, typical urban city, trees, brush, lumber, includes tipping fees only	37,675.00	TON	AA PRIME CONTRACTOR	0	0	0	188,375	0	188,375	
				8.39	*9.76*	*0.00*	*6.28*		*24.42*	
16.01.02.02 Glacial Till	**67,006.00**	**BCY**	**AA PRIME CONTRACTOR**	**561,926**	**654,077**	**0**	**420,615**	**0**	**1,636,618**	
				2.81	*4.64*	*0.00*	*0.00*		*7.44*	
16.01.02.02.01 Excavation	**67,006.00**	**CY**	**AA PRIME CONTRACTOR**	**188,020**	**310,643**	**0**	**0**	**0**	**498,663**	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
(Note: Assumes half of excavation would be performed by scrapers and the other half by hydraulic excavators.)										
				0.85	*1.78*	*0.00*	*0.00*		*2.63*	
HNC 312316503140 Excavation, bulk, bank measure, 9 cycles/hour, 25 C.Y., push loaded self propelled scraper	33,503.00	BCY	AA PRIME CONTRACTOR	28,534	59,640	0	0	0	88,174	
				1.24	*1.73*	*0.00*	*0.00*		*2.98*	
HNC 023154260160 Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	33,503.00	BCY	AA PRIME CONTRACTOR	41,644	58,063	0	0	0	99,707	
				1.41	*2.30*	*0.00*	*0.00*		*3.71*	
USR Z15 Transport Fill to/from Stockpile Site	83,758.00	LCY	AA PRIME CONTRACTOR	117,841	192,941	0	0	0	310,782	
(Note: Quantity: Based on designer provided quantities of fill; Productivity: Based on calculations provided in the cost engineering report for fill transport.)										
				3.14	*4.45*	*0.00*	*0.00*		*7.60*	
16.01.02.02.02 Backfill	**15,078.00**	**CY**	**AA PRIME CONTRACTOR**	**47,398**	**67,121**	**0**	**0**	**0**	**114,520**	
				1.41	*2.30*	*0.00*	*0.00*		*3.71*	
USR Z15 Transport Fill to/from Stockpile Site	18,848.00	LCY	AA PRIME CONTRACTOR	26,518	43,417	0	0	0	69,935	
(Note: Quantity: Based on designer provided quantities of fill; Productivity: Based on calculations provided in the cost engineering report for fill transport.)										
				0.34	*0.56*	*0.00*	*0.00*		*0.91*	
HNC 312323132360 Backfill, dumped gravel or fill, 6" layers, spread, dozer	18,848.00	LCY	AA PRIME CONTRACTOR	6,494	10,572	0	0	0	17,066	
				0.95	*0.87*	*0.00*	*0.00*		*1.83*	
RSM 312323235640 Compaction, 4 passes, 6" lifts, riding, sheepsfoot or wobbly wheel roller	15,078.00	ECY	AA PRIME CONTRACTOR	14,387	13,132	0	0	0	27,518	
				6.29	*5.32*	*0.00*	*8.10*		*19.71*	
16.01.02.02.03 Dispose of Unused Material	**51,928.00**	**CY**	**AA PRIME CONTRACTOR**	**326,508**	**276,313**	**0**	**420,615**	**0**	**1,023,436**	
				1.24	*1.73*	*0.00*	*0.00*		*2.98*	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
HNC 023154260160 Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	64,910.00	BCY	AA PRIME CONTRACTOR	80,682	112,493	0	0	0	193,175	
				3.79	*2.52*	*0.00*	*0.00*		*6.31*	
HNC 312323180470 Hauling, excavated or borrow material, loose cubic yards, 4 mile round trip @ base wide rate, 12 C.Y. truck, highway haulers, excludes loading	64,910.00	LCY	AA PRIME CONTRACTOR	245,826	163,820	0	0	0	409,645	
				0.00	*0.00*	*0.00*	*5.00*		*5.00*	
RSM 024119190200 Selective demolition, dump charges, typical urban city, trees, brush, lumber, includes tipping fees only	84,123.00	TON	AA PRIME CONTRACTOR	0	0	0	420,615	0	420,615	
				12.89	*13.16*	*12.65*	*0.00*		*38.71*	
16.01.02.03 Borrow Material	**8,900.00**	**BCY**	**AA PRIME CONTRACTOR**	**114,750**	**117,148**	**112,585**	**0**	**0**	**344,483**	
				0.44	*0.52*	*12.65*	*0.00*		*13.61*	
RSM 312323155080 Borrow, select granular fill, 5 C.Y. bucket, loading and/or spreading, front end loader, wheel mounted	8,900.00	BCY	AA PRIME CONTRACTOR	3,873	4,672	112,585	0	0	121,130	
				6.55	*6.70*	*0.00*	*0.00*		*13.26*	
RSM 312323151800 Borrow, delivery charge, minimum 20 tons, 1 hour round trip, add	15,620.00	TON	AA PRIME CONTRACTOR	102,385	104,725	0	0	0	207,110	
				0.95	*0.87*	*0.00*	*0.00*		*1.83*	
RSM 312323235640 Compaction, 4 passes, 6" lifts, riding, sheepsfoot or wobbly wheel roller	8,900.00	ECY	AA PRIME CONTRACTOR	8,492	7,751	0	0	0	16,243	
16.01.02.04 Soil Stabilization	**1.00**	**LS**	**AA PRIME CONTRACTOR**	**269,849**	**60,502**	**402,550**	**0**	**0**	**732,901**	
				3.24	*0.71*	*4.85*	*0.00*		*8.81*	
RSM 312513100060 Synthetic erosion control, nylon, 3 dimensional geomatrix, 9 mil thick	83,000.00	SY	AA PRIME CONTRACTOR	269,190	59,161	402,550	0	0	730,901	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
				0.52	*1.05*	*0.00*	*0.00*		*1.57*	
HNC 023103303020 Rough grading, open site, large area, 300 H.P., dozer	1,275.00	BCY	AA PRIME CONTRACTOR	659	1,341	0	0	0	2,000	
				9.68	*22.42*	*59.97*	*35.85*		*127.92*	
16.01.03 Erosion Protection	**56,307.00**	**LCY**	**AA PRIME CONTRACTOR**	**544,995**	**1,262,408**	**3,376,533**	**2,018,703**	**0**	**7,202,638**	

(Note: The geotextile fabric, sublayers, and armor rock would need to be placed while the haul road is at a sufficient elevation to allow equipment access. Rock is therefore likely to be placed in several stages as the backfill is placed on the haul road. Rock could be imported through a combination of barging and land-based equipment with the barge placing apron material at high tide, and the land-based equipment placing the remaining armoring at low tide. Complete segments of the armor section would be completed during each low tide cycle to at least the elevation of the maximum tide lines. It is assumed the land based equipment would operate for half of the shift and the water based equipment would operate the other half. Hauling has been assumed to be done entirely by land in the current estimate; barging the rock over water is also presented as an alternative in the design report to facilitate future agency coordination that may be required to leave that option open to the contractor. Placement of the rock is assumed to be by hydraulic excavator.)

				5.15	*11.12*	*61.63*	*37.55*		*115.45*	
16.01.03.01 Land Based Placement	**26,878.00**	**LCY**	**AA PRIME CONTRACTOR**	**138,352**	**298,931**	**1,656,416**	**1,009,352**	**0**	**3,103,051**	
				2.82	*6.10*	*60.30*	*37.15*		*106.37*	
USR Z10 Land Based Rock Placement (Filter Rock)	6,878.00	LCY	AA PRIME CONTRACTOR	19,409	41,936	414,743	255,518	0	731,607	

(Note: Material: based on quote for blasting, sorting, and stockpiling rock at Seward Quarry provided by Advanced Blasting Services (Mikel Saunders, 907-243-1811); Sub Bid: based on quote for hauling the rock from Seward Quarry to Kenai provided by RL Trucking (Cal Watts, 907-351-6124); Productivity: 143.5-cy/hr is based on calculations provided in the cost engineering report for land based placement of filter rock.)

				4.60	*9.94*	*60.30*	*37.15*		*111.99*	
USR Z10 Land Based Rock Placement (B Rock)	6,788.00	LCY	AA PRIME CONTRACTOR	31,236	67,490	409,316	252,174	0	760,217	

(Note: Material: based on quote for blasting, sorting, and stockpiling rock at Seward Quarry provided by Advanced Blasting Services (Mikel Saunders, 907-243-1811); Sub Bid: based on quote for hauling the rock from Seward Quarry to Kenai provided by RL Trucking (Cal Watts, 907-351-6124); Productivity: 88-cy/hr is based on calculations provided in the cost engineering report for land based placement of B rock.)

				6.64	*14.34*	*63.00*	*37.97*		*121.95*	
USR Z10 Land Based Rock Placement (Armor Rock)	13,212.00	LCY	AA PRIME CONTRACTOR	87,707	189,505	832,356	501,660	0	1,611,228	

(Note: Material: based on quote for blasting, sorting, and stockpiling rock at Seward Quarry provided by Advanced Blasting Services (Mikel Saunders, 907-243-1811); Sub Bid: based on quote for hauling the rock from Seward Quarry to Kenai provided by RL Trucking (Cal Watts, 907-351-6124); Productivity: 61-cy/hr is based on calculations provided in the cost engineering report for land based placement of armor rock.)

				8.84	*27.80*	*61.63*	*37.55*		*135.82*	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
16.01.03.02 Water Based Placement	**26,878.00**	**LCY**	**AA PRIME CONTRACTOR**	**237,557**	**747,155**	**1,656,416**	**1,009,352**	**0**	**3,650,479**	
				4.85	*15.24*	*60.30*	*37.15*		*117.53*	
USR Z03 Breakwater Placement (Filter Rock)	6,878.00	LCY	AA PRIME CONTRACTOR	33,326	104,817	414,743	255,518	0	808,404	
(Note: Material: based on quote for blasting, sorting, and stockpiling rock at Seward Quarry provided by Advanced Blasting Services (Mikel Saunders, 907-243-1811); Sub Bid: based on quote for hauling the rock from Seward Quarry to Kenai provided by RL Trucking (Cal Watts, 907-351-6124); Productivity: 143.5-cy/hr is based on calculations provided in the cost engineering report for water based placement of filter rock.)										
				7.90	*24.85*	*60.30*	*37.15*		*130.20*	
USR Z03 Breakwater Placement (B Rock)	6,788.00	LCY	AA PRIME CONTRACTOR	53,634	168,686	409,316	252,174	0	883,810	
(Note: Material: based on quote for blasting, sorting, and stockpiling rock at Seward Quarry provided by Advanced Blasting Services (Mikel Saunders, 907-243-1811); Sub Bid: based on quote for hauling the rock from Seward Quarry to Kenai provided by RL Trucking (Cal Watts, 907-351-6124); Productivity: 88-cy/hr is based on calculations provided in the cost engineering report for water based placement of B rock.)										
				11.40	*35.85*	*63.00*	*37.97*		*148.22*	
USR Z03 Breakwater Placement (Armor Rock)	13,212.00	LCY	AA PRIME CONTRACTOR	150,597	473,652	832,356	501,660	0	1,958,265	
(Note: Material: based on quote for blasting, sorting, and stockpiling rock at Seward Quarry provided by Advanced Blasting Services (Mikel Saunders, 907-243-1811); Sub Bid: based on quote for hauling the rock from Seward Quarry to Kenai provided by RL Trucking (Cal Watts, 907-351-6124); Productivity: 61-cy/hr is based on calculations provided in the cost engineering report for water based placement of armor rock.)										
				3.03	*7.95*	*0.00*	*0.00*		*10.98*	
16.01.03.03 Rock Loading on Barge	**26,878.00**	**LCY**	**AA PRIME CONTRACTOR**	**81,556**	**213,660**	**0**	**0**	**0**	**295,216**	
				1.66	*4.34*	*0.00*	*0.00*		*6.00*	
USR Z01 Breakwater Loading (Filter Rock)	6,878.00	LCY	AA PRIME CONTRACTOR	11,403	29,874	0	0	0	41,277	
(Note: The loading quantity is the same as the water based placement quantity.)										
				2.71	*7.10*	*0.00*	*0.00*		*9.81*	
USR Z01 Breakwater Loading (B Rock)	6,788.00	LCY	AA PRIME CONTRACTOR	18,400	48,205	0	0	0	66,605	
(Note: The loading quantity is the same as the water based placement quantity.)										
				3.92	*10.26*	*0.00*	*0.00*		*14.18*	
USR Z01 Breakwater Loading (Armor Rock)	13,212.00	LCY	AA PRIME CONTRACTOR	51,753	135,581	0	0	0	187,334	
(Note: The loading quantity is the same as the water based placement quantity.)										

Labor ID: 01LA2011 EQ ID: EP09R09 Currency in US dollars TRACES MII Version 4.1

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
				2.54	*0.08*	*1.85*	*0.00*		*4.47*	
16.01.03.04 Geotextile Fabric	**34,433.00**	**SY**	**AA PRIME CONTRACTOR**	**87,530**	**2,661**	**63,701**	**0**	**0**	**153,892**	
				2.54	*0.08*	*1.85*	*0.00*		*4.47*	
HTW 334626100114 Geotextile Fabric, 170 Mil Thick Non-Woven Polypropylene	34,433.00	SY	AA PRIME CONTRACTOR	87,530	2,661	63,701	0	0	153,892	
16.01.04 Vegetation	**1.00**	**LS**	**LANDSCAPE SUBCONTRACTOR**	**267,505**	**82,208**	**1,237,309**	**0**	**0**	**1,587,021**	
				1.05	*0.09*	*6.30*	*0.00*		*7.44*	
HTW 025613102415 Secure burial cell construction, liner and dike support, geogrids, uniaxial, tnsl mod. = 50KSF, 4.3' x 98' roll	62,700.00	SY	LANDSCAPE SUBCONTRACTOR	65,923	5,631	395,010	0	0	466,564	
				3.69	*2.85*	*23.00*	*0.00*		*29.55*	
RSM 329113235100 Soil preparation, structural soil mixing, spread topsoil, articulated loader and hand dress	26,851.00	CY	LANDSCAPE SUBCONTRACTOR	99,183	76,576	617,573	0	0	793,332	
				414.49	*0.00*	*3.46*	*0.00*		*417.95*	
RSM 029203207060 Seeding, mechanical spread	12.60	ACR	LANDSCAPE SUBCONTRACTOR	5,223	0	44	0	0	5,266	
				0.00	*0.00*	*6.45*	*0.00*		*6.45*	
RSM 329343407351 Conifer trees, pinus sylvestris, (Scotch Pine), container/B&B, zone 3, seedlings	3,660.00	EA	LANDSCAPE SUBCONTRACTOR	0	0	23,607	0	0	23,607	
(Note: This item covers the willow material cost.)										
				1.91	*0.00*	*0.00*	*0.00*		*1.91*	
RSM 329343100130 Planting, trees, shrubs and ground cover, light soil, bare root seedlings, 11" to 16", includes planting only	3,660.00	EA	LANDSCAPE SUBCONTRACTOR	6,988	0	0	0	0	6,988	
				0.00	*0.00*	*37.50*	*0.00*		*37.50*	
RSM 329343405651 Conifer trees, picea glauca, (White or Canadian Spruce), container/B&B, zone 3, 3' to 4'	5,362.00	EA	LANDSCAPE SUBCONTRACTOR	0	0	201,075	0	0	201,075	

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Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	C/O
(Note: 547 Alder Trees + 4,815 Spruce Trees = 5,362 Trees. This item covers the spruce tree material cost.)										
				16.82	*0.00*	*0.00*	*0.00*		*16.82*	
RSM 329343100300 Planting, trees, shrubs and ground cover, light soil, container, 1 gallon, includes planting only	5,362.00	EA	LANDSCAPE SUBCONTRACTOR	90,189	0	0	0	0	90,189	

Labor ID: 01LA2011 EQ ID: EP09R09 Currency in US dollars TRACES MII Version 4.1

Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
Crews (Bare Costs) by Contractor, Report		**28,604.77**			**55,226.80**	**2,880,276.94**	**54,532.72**	**4,792,092.59**	**7,672,369.53**
AA PRIME CONTRACTOR	**LaborCost1**	**28,604.77**		**0.00**	**55,226.80**	**2,880,276.94**	**54,532.72**	**4,792,092.59**	**7,672,369.53**
					1.00	*18.94*	*0.00*	*0.00*	*18.94*
CIV UFLDB 1 janitor	LaborCost1	900.62			900.62	17,057.76	0.00	0.00	17,057.76
FOP FB-JANTR Janitors			*Journeyman*	*18.94*	*1.00*	*18.94*			
					2.25	*122.40*	*0.00*	*0.00*	*122.40*
GOV ACARD 2 carpnters	LaborCost1	44.29			99.64	5,420.35	0.00	0.00	5,420.35
MIL B-CARPNTER Carpenters			*Foreman*	*55.82*	*0.25*	*13.96*			
MIL B-CARPNTER Carpenters			*Journeyman*	*54.22*	*2.00*	*108.44*			
					2.00	*100.04*	*0.00*	*0.00*	*100.04*
GOV ALABCLAB2 2 laborers	LaborCost1	72.82			145.63	7,284.55	0.00	0.00	7,284.55
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*2.00*	*100.04*			
					2.00	*105.16*	*1.00*	*207.92*	*313.08*
GOV CODEB12D 1 eqoprcrn + 1 hydr excavator, crawler, 3.70 CY	LaborCost1	1,709.60			3,419.20	179,781.54	1,709.60	355,463.52	535,245.05
MIL B-EQOPRCRN Equip. Operators, Heavy			*Journeyman*	*56.43*	*1.00*	*56.43*			
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			*Journeyman*	*48.73*	*1.00*	*48.73*			
GEN H25Z3210 HYDRAULIC EXCAVATOR, CRAWLER, 140,000 LB (63,503 KG), 3.50 CY (2.7 M3) BUCKET, 31.4' (9.6 M) MAX DIGGING DEPTH			*EP / Average*	*207.92*			*1.00*	*207.92*	
					6.00	*306.76*	*3.00*	*112.77*	*419.53*
GOV CODFB7 2 eqoprmed + 1 loader, F/E, crawler, 2.60 CY	LaborCost1	33.33			200.00	10,225.33	100.00	3,759.14	13,984.48
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*4.00*	*200.08*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR			*EP / Average*	*4.10*			*2.00*	*8.20*	
GEN L35Z4260 LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET			*EP / Average*	*104.57*			*1.00*	*104.57*	
					1.80	*97.37*	*1.30*	*286.15*	*383.52*
GOV CODSB33E 1 eqoprmed + 1 scraper, self propelled, 21-31 CY	LaborCost1	675.16			1,215.29	65,739.21	877.71	193,197.09	258,936.29
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.30*	*72.36*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*0.50*	*25.01*			

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
PTC S15Z5980 SCRAPER, CONVENTIONAL, STANDARD LOADING, 21-31 CY (16-24 M3), 37.5 TON (34.0 MT), 4X2 - SINGLE POWERED			*EP / Average*	*217.50*			*1.00*	*217.50*	
GEN T15Z6600 TRACTOR, CRAWLER (DOZER), 341-440 HP (254-328 KW), POWERSHIFT, W/UNIVERSAL BLADE			*EP / Average*	*228.85*			*0.30*	*68.65*	
					1.50	*80.67*	*1.00*	*182.18*	*262.85*
GOV CODTB10BS 1 eqoprmed + 1 dozer, crawler, 181-250 HP (severe)	LaborCost1	563.65			845.47	45,469.45	563.65	102,686.83	148,156.28
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*0.50*	*25.01*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE			*EP / Severe*	*182.18*			*1.00*	*182.18*	
					1.50	*80.67*	*1.00*	*228.85*	*309.52*
GOV CODTB10M 1 eqoprmed + 1 dozer, crawler, 341-440 HP	LaborCost1	6.07			9.11	489.78	6.07	1,389.42	1,879.20
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*0.50*	*25.01*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
GEN T15Z6600 TRACTOR, CRAWLER (DOZER), 341-440 HP (254-328 KW), POWERSHIFT, W/UNIVERSAL BLADE			*EP / Average*	*228.85*			*1.00*	*228.85*	
					1.00	*54.20*	*1.00*	*50.95*	*105.15*
GOV COEIB34B 1 trkdvrhv + 1 truck, dump, 16-23.5 CY	LaborCost1	4,600.48			4,600.48	249,346.15	4,600.48	234,378.58	483,724.73
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*1.00*	*54.20*			
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)			*EP / Average*	*50.95*			*1.00*	*50.95*	
					1.30	*65.33*	*0.00*	*0.00*	*65.33*
GOV ULABA 1 laborer	LaborCost1	739.80			961.73	48,327.91	0.00	0.00	48,327.91
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*0.30*	*15.31*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*1.00*	*50.02*			
					3.00	*151.06*	*0.40*	*6.19*	*157.25*
GOV ULABJ 3 laborers + 1 pickup truck, 8,8000 GVW	LaborCost1	437.24			1,311.73	66,050.15	174.90	2,707.91	68,758.05
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*2.00*	*100.04*			
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
GEN T50Z7320 TRUCK, HIGHWAY, CONVENTIONAL, 8,800 LB (3,992 KG) GVW, 4X4, 2 AXLE, 3/4 TON (0.68 MT) - PICKUP			*EP / Average*	*15.48*			*0.40*	*6.19*	
					1.00	*50.02*	*1.00*	*5.55*	*55.57*
RSM A1E A1E	LaborCost1	27.40			27.40	1,370.45	27.40	152.16	1,522.62
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*1.00*	*50.02*			
GEN C10Z1400 COMPACTOR, VIBROPLATE, 21" (534 MM) WIDE x 24" (610 MM) PLATE			*EP / Average*	*5.55*			*1.00*	*5.55*	
					1.50	*80.67*	*1.00*	*101.42*	*182.09*
RSM B10G B10G	LaborCost1	1,479.14			2,218.71	119,322.10	1,479.14	150,015.16	269,337.26
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*0.50*	*25.01*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
GEN R45Z5580 ROLLER, VIBRATORY, SELF-PROPELLED, DOUBLE DRUM, PADDED DRUM, 13 TON (11.8 MT), 84" (2.1 M) WIDE, SOIL COMPACTOR			*EP / Average*	*101.42*			*1.00*	*101.42*	
					1.50	*80.67*	*4.00*	*7.07*	*87.74*
RSM B10I B10I	LaborCost1	4,114.29			6,171.43	331,899.43	16,457.14	29,070.56	360,969.98
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*0.50*	*25.01*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
GEN P50Z5090 PUMP, WATER, CENTRIFUGAL, TRASH, HOSE, SUCTION/DISCH, 4" (102 MM) DIA x 20' (6.1 M)LENGTH, W/COUPLING/SECTION			*EP / Average*	*0.41*			*1.00*	*0.41*	
GEN P50Z5098 PUMP, WATER, CENTRIFUGAL, TRASH, HOSE, SUCTION/DISCH, 4" (100 MM) DIA X 50' (15 M) WITH COUPLING (PER SECTION)			*EP / Average*	*0.97*			*2.00*	*1.94*	
GEN P65Z5490 PUMP, WATER, DIAPHRAGM, WHEEL, ENGINE DRIVE, 4" (102 MM) DIA, 4,440 GPH (16,807 LPH) @ 25' (7.6 M) HEAD (ADD HOSES)			*EP / Average*	*4.71*			*1.00*	*4.71*	
					1.50	*80.67*	*1.00*	*104.57*	*185.24*
RSM B10P B10P	LaborCost1	16.72			25.09	1,349.11	16.72	1,748.86	3,097.97
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*0.50*	*25.01*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
GEN L35Z4260 LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET			*EP / Average*	*104.57*			*1.00*	*104.57*	

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
					1.50	*80.67*	*1.00*	*136.31*	*216.98*
RSM B10U B10U	LaborCost1	35.69			53.53	2,879.05	35.69	4,864.97	7,744.02
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*0.50*	*25.01*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
GEN L40Z4420 LOADER, FRONT END, WHEEL, ARTICULATED, 5.50 CY (4.2 M3) BUCKET, 4X4			*EP / Average*	*136.31*			*1.00*	*136.31*	
					2.00	*106.45*	*2.00*	*166.12*	*272.57*
RSM B12G B12G	LaborCost1	56.04			112.07	5,965.12	112.07	9,308.74	15,273.86
MIL B-EQOPRCRN Equip. Operators, Heavy			*Journeyman*	*56.43*	*1.00*	*56.43*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*1.00*	*50.02*			
GEN B25Z1040 BUCKET, CLAMSHELL, 0.6 CY (0.5 M3) GENERAL PURPOSE, SQUARE NOSE (ADD TEETH WEAR COST)			*EP / Average*	*5.09*			*1.00*	*5.09*	
GEN C85Z2370 CRANE, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 0.50 CY (0.4 M3), 17 TON (15 MT), 100' (30.5 M) BOOM (ADD BUCKET)			*EP / Average*	*161.03*			*1.00*	*161.03*	
					2.00	*106.45*	*1.00*	*48.76*	*155.21*
RSM B12Q B12Q	LaborCost1	36.48			72.96	3,883.30	36.48	1,778.70	5,661.99
MIL B-EQOPRCRN Equip. Operators, Heavy			*Journeyman*	*56.43*	*1.00*	*56.43*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*1.00*	*50.02*			
GEN H25Z3165 HYDRAULIC EXCAVATOR, CRAWLER, 27,000 LB (12,247 KG), 0.625 CY (0.5 M3) BUCKET, 18.1' (5.5 M) MAX DIGGING DEPTH			*EP / Average*	*48.76*			*1.00*	*48.76*	
					7.00	*356.26*	*1.00*	*68.40*	*424.66*
RSM B13 B13	LaborCost1	8.00			56.00	2,850.08	8.00	547.21	3,397.29
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
MIL B-EQOPRCRN Equip. Operators, Heavy			*Journeyman*	*56.43*	*1.00*	*56.43*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*4.00*	*200.08*			
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			*Journeyman*	*48.73*	*1.00*	*48.73*			
GEN C80Z2260 CRANE, HYDRAULIC, TRUCK MOUNTED, 25 TON (22.7 MT), 80' (24.4 M) BOOM, 6X4			*EP / Average*	*68.40*			*1.00*	*68.40*	
					6.00	*306.04*	*1.00*	*27.85*	*333.89*
RSM B14 B14	LaborCost1	121.28			727.69	37,116.81	121.28	3,377.94	40,494.74
MIL B-EQOPRLT Equip. Operators, Light			*Journeyman*	*54.94*	*1.00*	*54.94*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*4.00*	*200.08*			

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
GEN L50Z4640 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4			*EP / Average*	*27.85*			*1.00*	*27.85*	
					3.50	*189.07*	*3.00*	*304.04*	*493.11*
RSM B15 B15	LaborCost1	18.44			64.53	3,486.09	55.31	5,605.91	9,092.01
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*0.50*	*25.01*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*2.00*	*108.40*			
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE			*EP / Average*	*148.49*			*1.00*	*148.49*	
GEN T50Z7710 DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4			*EP / Average*	*77.77*			*2.00*	*155.55*	
					3.00	*149.57*	*0.00*	*0.00*	*149.57*
RSM B20 B20	LaborCost1	11.27			33.80	1,684.95	0.00	0.00	1,684.95
MIL B-SKILLWKR Skilled Workers			*Journeyman*	*48.53*	*1.00*	*48.53*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*1.00*	*50.02*			
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
					12.00	*623.80*	*4.00*	*244.72*	*868.52*
RSM B25B B25B	LaborCost1	28.57			342.86	17,822.86	114.29	6,992.06	24,814.91
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*4.00*	*222.64*			
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*7.00*	*350.14*			
GEN A30Z0640 ASPHALT PAVER, 10.0' (3.1 M) WIDE, SELF PROPELLED, W/19' (5.8 M) SCREED EXTENSION, WHEEL			*EP / Average*	*155.71*			*1.00*	*155.71*	
GEN R30Z5640 ROLLER, STATIC, SELF-PROPELLED, PNEUMATIC, 9 TIRES, 14 TON (12.7 MT), 68" (1.7 M) WIDE			*EP / Average*	*36.68*			*1.00*	*36.68*	
GEN R45Z5670 ROLLER, VIBRATORY, SELF-PROPELLED, DOUBLE DRUM, SMOOTH, 2.7 TON (2.5 MT), 47"(3.8 M) WIDE, ASPHALT COMPACTOR			*EP / Average*	*26.17*			*2.00*	*52.33*	
					3.00	*164.06*	*3.00*	*239.42*	*403.48*
RSM B30 B30	LaborCost1	58.86			176.57	9,656.10	176.57	14,091.37	23,747.48
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*2.00*	*108.40*			

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
GEN H25Z3185 HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH			*EP / Average*	*83.87*			*1.00*	*83.87*	
GEN T50Z7710 DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4			*EP / Average*	*77.77*			*2.00*	*155.55*	
					1.00	*54.20*	*1.00*	*77.77*	*131.97*
RSM B34B B34B	LaborCost1	1,373.19			1,373.19	74,426.73	1,373.19	106,797.28	181,224.01
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*1.00*	*54.20*			
GEN T50Z7710 DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4			*EP / Average*	*77.77*			*1.00*	*77.77*	
					1.00	*54.20*	*2.00*	*80.46*	*134.66*
RSM B34K B34K	LaborCost1	114.29			114.29	6,194.29	228.57	9,195.81	15,390.09
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*1.00*	*54.20*			
GEN T45Z7245 TRUCK TRAILER, LOWBOY, 120 TON (108.9 MT), 4 AXLE (ADD TOWING TRUCK)			*EP / Average*	*20.08*			*1.00*	*20.08*	
GEN T50Z7600 TRUCK, HIGHWAY, 50,000 LB (22,680 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)			*EP / Average*	*60.39*			*1.00*	*60.39*	
					1.00	*54.20*	*2.00*	*64.62*	*118.82*
RSM B34N B34N	LaborCost1	57.14			57.14	3,097.14	114.29	3,692.43	6,789.57
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*1.00*	*54.20*			
GEN T45Z7120 TRUCK TRAILER, FLATBED, 40 TON (36.3 MT), 48' (14.6 M) LENGTH, 2 AXLE (ADD TOWING TRUCK)			*EP / Average*	*7.43*			*1.00*	*7.43*	
GEN T50Z7700 DUMP TRUCK, HIGHWAY, 10 - 13 CY (7.6 - 9.9 M3) DUMP BODY, 35,000 LBS (15,900 KG) GVW, 2 AXLE, 4X2			*EP / Average*	*57.18*			*1.00*	*57.18*	
					5.00	*261.66*	*4.00*	*118.32*	*379.98*
RSM B38 B38	LaborCost1	23.86			119.32	6,244.24	95.46	2,823.64	9,067.88
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*2.00*	*100.04*			
MIL B-EQOPRLT Equip. Operators, Light			*Journeyman*	*54.94*	*1.00*	*54.94*			
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
GEN H25Z3680 HYDRAULIC EXCAVATOR, ATTACHMENT, MATERIAL HANDLING, BUCKET, 36" (914 MM) PAVEMENT REMOVAL (ADD TO 75,000 LB (34,019 KG) HYDRAULIC EXCAVATOR)			*EP / Average*	*2.76*			*1.00*	*2.76*	
GEN H25Z3685 HYDRAULIC EXCAVATOR, ATTACHMENT, CONCRETE PULVERIZER, 3,000 LB (1360 KG) W/POINT (ADD TO 26,000-36,000 LB (11,793-16,329 KG) HYDRAULIC EXCAVATOR)			*EP / Average*	*17.14*			*1.00*	*17.14*	
GEN L40Z4400 LOADER, FRONT END, WHEEL, ARTICULATED, 3.50 CY (2.7 M3) BUCKET, 4X4			*EP / Average*	*70.57*			*1.00*	*70.57*	
GEN L50Z4640 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4			*EP / Average*	*27.85*			*1.00*	*27.85*	
					3.00	*154.98*	*1.00*	*27.85*	*182.83*
RSM B6 B6	LaborCost1	1.60			4.80	247.97	1.60	44.56	292.53
MIL B-EQOPRLT Equip. Operators, Light			*Journeyman*	*54.94*	*1.00*	*54.94*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*2.00*	*100.04*			
GEN L50Z4640 LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER, 4X4			*EP / Average*	*27.85*			*1.00*	*27.85*	
					3.00	*154.98*	*1.00*	*16.27*	*171.25*
RSM B62 B62	LaborCost1	5.14			15.43	797.04	5.14	83.68	880.72
MIL B-EQOPRLT Equip. Operators, Light			*Journeyman*	*54.94*	*1.00*	*54.94*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*2.00*	*100.04*			
GEN L40Z4610 LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)			*EP / Average*	*16.27*			*1.00*	*16.27*	
					4.00	*208.52*	*3.00*	*46.37*	*254.89*
RSM B80 B80	LaborCost1	14.55			58.20	3,034.10	43.65	674.73	3,708.83
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
MIL B-EQOPRLT Equip. Operators, Light			*Journeyman*	*54.94*	*1.00*	*54.94*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*1.00*	*50.02*			
MIL B-TRKDVRLT Truck Drivers, Light			*Journeyman*	*52.54*	*1.00*	*52.54*			
GEN T40Z7010 TRUCK OPTION, FLATBED, 8' (2.4 M) x 16' (4.9 M) (ADD 25,000 LB (11,340 KG) GVW TRUCK)			*EP / Average*	*1.31*			*1.00*	*1.31*	
GEN T50Z7400 TRUCK, HIGHWAY, 25,000 LB (11,340 KG) GVW, 4X2, 2 AXLE (ADD ACCESSORIES)			*EP / Average*	*42.83*			*1.00*	*42.83*	

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
GEN XMEZ9120 POST DRIVER, 8" (203 MM) MAX DIA POST, 30,000 LB (13,608 KG) IMPACT (ADD 20,000-35,000 LB (9,072-15,876 KG) GVW TRUCK)			*Non-EP / Average*	*2.23*			*1.00*	*2.23*	
					3.00	*150.06*	*2.00*	*44.14*	*194.20*
RSM B80A B80A	LaborCost1	1,355.10			4,065.31	203,346.61	2,710.20	59,815.29	263,161.90
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*3.00*	*150.06*			
GEN T40Z7010 TRUCK OPTION, FLATBED, 8' (2.4 M) x 16' (4.9 M) (ADD 25,000 LB (11,340 KG) GVW TRUCK)			*EP / Average*	*1.31*			*1.00*	*1.31*	
GEN T50Z7400 TRUCK, HIGHWAY, 25,000 LB (11,340 KG) GVW, 4X2, 2 AXLE (ADD ACCESSORIES)			*EP / Average*	*42.83*			*1.00*	*42.83*	
					3.00	*152.58*	*3.00*	*45.66*	*198.24*
RSM B80C B80C	LaborCost1	373.21			1,119.64	56,945.04	1,119.64	17,040.48	73,985.52
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*2.00*	*100.04*			
MIL B-TRKDVRLT Truck Drivers, Light			*Journeyman*	*52.54*	*1.00*	*52.54*			
MAP L15HZ001 POST HOLE DRILL, UP TO 8" DIA, 30" DEEP, ONE MAN OPERATION			*EP / Average*	*1.52*			*1.00*	*1.52*	
GEN T40Z7010 TRUCK OPTION, FLATBED, 8' (2.4 M) x 16' (4.9 M) (ADD 25,000 LB (11,340 KG) GVW TRUCK)			*EP / Average*	*1.31*			*1.00*	*1.31*	
GEN T50Z7400 TRUCK, HIGHWAY, 25,000 LB (11,340 KG) GVW, 4X2, 2 AXLE (ADD ACCESSORIES)			*EP / Average*	*42.83*			*1.00*	*42.83*	
					5.00	*251.10*	*5.00*	*29.54*	*280.64*
RSM B9 B9	LaborCost1	566.67			2,833.33	142,290.00	2,833.33	16,741.25	159,031.25
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*4.00*	*200.08*			
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
GEN A15Z0140 AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)			*EP / Average*	*23.50*			*1.00*	*23.50*	
GEN A20Z0400 PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)			*EP / Average*	*0.66*			*2.00*	*1.32*	
GEN A20Z0480 AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)			*EP / Average*	*2.36*			*2.00*	*4.72*	
					6.00	*323.34*	*1.00*	*3.02*	*326.36*
RSM C14H C14H	LaborCost1	35.20			211.19	11,380.90	35.20	106.30	11,487.20
MIL B-RODMAN Rodmen (Reinforcing)			*Journeyman*	*56.56*	*1.00*	*56.56*			
MIL B-CARPNTER Carpenters			*Journeyman*	*54.22*	*2.00*	*108.44*			
MIL B-CARPNTER Carpenters			*Foreman*	*55.82*	*1.00*	*55.82*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*1.00*	*50.02*			
MIL B-CEMTFINR Cement Finishers			*Journeyman*	*52.50*	*1.00*	*52.50*			

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
GEN XMEZ9520 CONCRETE VIBRATOR, 2.5" (63.5 MM) DIA, W/7.5 HP (5.6 KW) GENERATOR			*Non-EP / Average*	*3.02*			*1.00*	*3.02*	
					1.00	*54.22*	*0.00*	*0.00*	*54.22*
RSM CARP CARP	LaborCost1	326.22			326.22	17,687.49	0.00	0.00	17,687.49
MIL B-CARPNTER Carpenters			*Journeyman*	*54.22*	*1.00*	*54.22*			
					1.00	*49.02*	*0.00*	*0.00*	*49.02*
RSM CLAB CLAB	LaborCost1	205.93			205.93	10,094.79	0.00	0.00	10,094.79
MIL B-LABORERG Laborers, General			*Journeyman*	*49.02*	*1.00*	*49.02*			
					1.00	*59.95*	*0.00*	*0.00*	*59.95*
RSM ELEC ELEC	LaborCost1	5.71			5.71	342.57	0.00	0.00	342.57
MIL B-ELECTRN Electricians			*Journeyman*	*59.95*	*1.00*	*59.95*			
					4.00	*228.11*	*1.00*	*88.67*	*316.78*
RSM L5A L5A	LaborCost1	9.80			39.18	2,234.55	9.80	868.59	3,103.13
MIL B-STRSTEEL Structural Steel Workers			*Journeyman*	*56.56*	*2.00*	*113.12*			
MIL B-STRSTEEL Structural Steel Workers			*Foreman*	*58.56*	*1.00*	*58.56*			
MIL B-EQOPRCRN Equip. Operators, Heavy			*Journeyman*	*56.43*	*1.00*	*56.43*			
GEN C75Z2000 CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 30 TON (27 MT), 80' (24.4 M) BOOM, 4X4			*EP / Average*	*88.67*			*1.00*	*88.67*	
					1.00	*54.20*	*2.00*	*59.07*	*113.27*
USR B34D B34D	LaborCost1	936.76			936.76	50,772.50	1,873.52	55,337.34	106,109.84
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*1.00*	*54.20*			
GEN T45Z7200 TRUCK TRAILER, END DUMP, 20 CY (15 M3), 24 TON (21.8 MT) (ADD TOWING TRUCK)			*EP / Average*	*8.13*			*1.00*	*8.13*	
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)			*EP / Average*	*50.95*			*1.00*	*50.95*	
					7.00	*368.80*	*7.00*	*1,312.30*	*1,681.10*
USR Z01 Loading Crew	LaborCost1	163.43			1,143.99	60,271.74	1,143.99	214,464.18	274,735.92
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			*Journeyman*	*48.73*	*1.00*	*48.73*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*1.00*	*50.02*			
MIL B-EQOPRCRN Equip. Operators, Heavy			*Journeyman*	*56.43*	*1.00*	*56.43*			
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*3.00*	*162.60*			
USR XX0XX430 BARGE MTD CLAMSHELL, 54CY NON DREDGE,350T,200'B,250'X75X15			*Non-EP / Average*	*1,134.10*			*1.00*	*1,134.10*	

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
GEN T45Z7080 TRUCK TRAILER, END DUMP, 17 CY (13 CM), 22 TON (20.0 MT) (ADD TOWING TRUCK)			*EP / Average*	*8.45*			*3.00*	*25.36*	
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)			*EP / Average*	*50.95*			*3.00*	*152.84*	
					4.00	*213.62*	*7.00*	*1,312.30*	*1,525.92*
USR Z01 Mob/Demob Loading Crew	LaborCost1	114.29			457.14	24,413.71	800.00	149,976.73	174,390.44
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*3.00*	*162.60*			
USR XX0XX430 BARGE MTD CLAMSHELL, 54CY NON DREDGE,350T,200'B,250'X75X15			*Non-EP / Average*	*1,134.10*			*1.00*	*1,134.10*	
GEN T45Z7080 TRUCK TRAILER, END DUMP, 17 CY (13 CM), 22 TON (20.0 MT) (ADD TOWING TRUCK)			*EP / Average*	*8.45*			*3.00*	*25.36*	
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)			*EP / Average*	*50.95*			*3.00*	*152.84*	
					0.00	*0.00*	*7.00*	*1,312.30*	*1,312.30*
USR Z01 Standby Loading Crew	LaborCost1	114.29			0.00	0.00	800.00	149,976.73	149,976.73
USR XX0XX430 BARGE MTD CLAMSHELL, 54CY NON DREDGE,350T,200'B,250'X75X15			*Non-EP / Average*	*1,134.10*			*1.00*	*1,134.10*	
GEN T45Z7080 TRUCK TRAILER, END DUMP, 17 CY (13 CM), 22 TON (20.0 MT) (ADD TOWING TRUCK)			*EP / Average*	*8.45*			*3.00*	*25.36*	
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)			*EP / Average*	*50.95*			*3.00*	*152.84*	
					2.50	*127.58*	*4.50*	*1,531.60*	*1,659.18*
USR Z03 Mob/Demob Water Based Rock Placement Crew	LaborCost1	228.57			571.43	29,161.14	1,028.57	350,081.11	379,242.25
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			*Journeyman*	*48.73*	*1.00*	*48.73*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*0.50*	*27.83*			
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
USR XX0XX800 DUMP SCOW BARGE, 1,500 CY APPROX. 200'x 50' x 15'			*Non-EP / Average*	*118.32*			*1.00*	*118.32*	
USR XX0Z9720 TUG BOAT, 150-400 HP (112-298 KW)			*Non-EP / Average*	*371.75*			*0.50*	*185.88*	
USR XX0XX430 BARGE MTD CLAMSHELL, 54CY NON DREDGE,350T,200'B,250'X75X15			*Non-EP / Average*	*1,134.10*			*1.00*	*1,134.10*	

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Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
USR XX0XX730 WORK BARGE, FLAT DECK , 3000 TON APPROX. 200'x 60'x 15',WOOD DECK			*Non-EP / Average*	*73.88*			*1.00*	*73.88*	
EP B25HB013 BUCKET, CLAMSHELL, 5.0 CY, HEAVY DUTY/DIGGING			*EP / Average*	*19.43*			*1.00*	*19.43*	
					7.00	*364.00*	*4.50*	*1,531.60*	*1,895.60*
USR Z03 Removal/Placement Crew	LaborCost1	488.08			3,416.57	177,661.56	2,196.37	747,547.54	925,209.10
MIL B-EQOPRLT Equip. Operators, Light			*Journeyman*	*54.94*	*1.00*	*54.94*			
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
MIL B-EQOPRCRN Equip. Operators, Heavy			*Journeyman*	*56.43*	*1.00*	*56.43*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*0.50*	*27.83*			
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			*Journeyman*	*48.73*	*1.00*	*48.73*			
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*2.50*	*125.05*			
USR XX0XX800 DUMP SCOW BARGE, 1,500 CY APPROX. 200'x 50' x 15'			*Non-EP / Average*	*118.32*			*1.00*	*118.32*	
USR XX0Z9720 TUG BOAT, 150-400 HP (112-298 KW)			*Non-EP / Average*	*371.75*			*0.50*	*185.88*	
USR XX0XX430 BARGE MTD CLAMSHELL, 54CY NON DREDGE,350T,200'B,250'X75X15			*Non-EP / Average*	*1,134.10*			*1.00*	*1,134.10*	
USR XX0XX730 WORK BARGE, FLAT DECK , 3000 TON APPROX. 200'x 60'x 15',WOOD DECK			*Non-EP / Average*	*73.88*			*1.00*	*73.88*	
EP B25HB013 BUCKET, CLAMSHELL, 5.0 CY, HEAVY DUTY/DIGGING			*EP / Average*	*19.43*			*1.00*	*19.43*	
					0.00	*0.00*	*4.50*	*1,531.60*	*1,531.60*
USR Z03 Standby Removal/Placement Crew	LaborCost1	114.29			0.00	0.00	514.29	175,040.56	175,040.56
USR XX0XX800 DUMP SCOW BARGE, 1,500 CY APPROX. 200'x 50' x 15'			*Non-EP / Average*	*118.32*			*1.00*	*118.32*	
USR XX0Z9720 TUG BOAT, 150-400 HP (112-298 KW)			*Non-EP / Average*	*371.75*			*0.50*	*185.88*	
USR XX0XX430 BARGE MTD CLAMSHELL, 54CY NON DREDGE,350T,200'B,250'X75X15			*Non-EP / Average*	*1,134.10*			*1.00*	*1,134.10*	
USR XX0XX730 WORK BARGE, FLAT DECK , 3000 TON APPROX. 200'x 60'x 15',WOOD DECK			*Non-EP / Average*	*73.88*			*1.00*	*73.88*	
EP B25HB013 BUCKET, CLAMSHELL, 5.0 CY, HEAVY DUTY/DIGGING			*EP / Average*	*19.43*			*1.00*	*19.43*	
					4.00	*211.12*	*2.00*	*644.75*	*855.87*
USR Z10 Land Based Rock Placement Crew	LaborCost1	488.08			1,952.32	103,043.70	976.16	314,692.43	417,736.13

Labor ID: 01LA2011 EQ ID: EP09R09 Currency in US dollars TRACES MII Version 4.1

Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
MIL B-EQOPRCRN Equip. Operators, Heavy			*Journeyman*	*56.43*	*1.00*	*56.43*			
MIL B-EQOPRLT Equip. Operators, Light			*Journeyman*	*54.94*	*1.00*	*54.94*			
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			*Journeyman*	*48.73*	*1.00*	*48.73*			
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
EP H25CA030 HYDRAULIC EXCAVATOR, CRAWLER, 175,500 LBS, 5.00 CY BUCKET, 34.75' MAX DIGGING DEPTH			*EP / Average*	*240.16*			*1.00*	*240.16*	
MAP L40CA009 LOADER, FRONT END, WHEEL, 16.00 CY BUCKET, ARTICULATED, 4X4			*EP / Average*	*404.60*			*1.00*	*404.60*	
					2.00	*105.96*	*3.00*	*585.05*	*691.01*
USR Z10 Mob/Demob Land Based Rock Placement Crew	LaborCost1	228.57			457.14	24,219.43	685.71	133,726.24	157,945.67
MIL B-LABORER Laborers Semi-Skilled			*Foreman*	*51.02*	*1.00*	*51.02*			
MIL B-EQOPRLT Equip. Operators, Light			*Journeyman*	*54.94*	*1.00*	*54.94*			
EP B25HB013 BUCKET, CLAMSHELL, 5.0 CY, HEAVY DUTY/DIGGING			*EP / Average*	*19.43*			*1.00*	*19.43*	
GEN C85Z2370 CRANE, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 0.50 CY (0.4 M3), 17 TON (15 MT), 100' (30.5 M) BOOM (ADD BUCKET)			*EP / Average*	*161.03*			*1.00*	*161.03*	
MAP L40CA009 LOADER, FRONT END, WHEEL, 16.00 CY BUCKET, ARTICULATED, 4X4			*EP / Average*	*404.60*			*1.00*	*404.60*	
					0.00	*0.00*	*2.00*	*644.75*	*644.75*
USR Z10 Standby Land Based Rock Placement Crew	LaborCost1	114.29			0.00	0.00	228.57	73,686.20	73,686.20
EP H25CA030 HYDRAULIC EXCAVATOR, CRAWLER, 175,500 LBS, 5.00 CY BUCKET, 34.75' MAX DIGGING DEPTH			*EP / Average*	*240.16*			*1.00*	*240.16*	
MAP L40CA009 LOADER, FRONT END, WHEEL, 16.00 CY BUCKET, ARTICULATED, 4X4			*EP / Average*	*404.60*			*1.00*	*404.60*	
					3.00	*164.06*	*3.00*	*384.86*	*548.92*
USR Z15 Fill Transport Crew	LaborCost1	2,608.68			7,826.03	427,979.70	7,826.03	1,003,968.17	1,431,947.87
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
MIL B-TRKDVRHV Truck Drivers, Heavy			*Journeyman*	*54.20*	*2.00*	*108.40*			
MAP L40CA007 LOADER, FRONT END, WHEEL, 6.00 CY BUCKET, ARTICULATED, 4X4			*EP / Standby*	*26.64*			*0.67*	*17.85*	

Labor ID: 01LA2011 EQ ID: EP09R09 Currency in US dollars TRACES MII Version 4.1

Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
MAP L40CA007 LOADER, FRONT END, WHEEL, 6.00 CY BUCKET, ARTICULATED, 4X4			*EP / Average*	*136.31*			*0.33*	*44.98*	
EP T55JD004 TRUCK, OFF-HIGHWAY, ARTICULATED FRAME, 29 CY, 40 TON, 6X6, REAR DUMP			*EP / Average*	*161.01*			*2.00*	*322.03*	
LANDSCAPE SUBCONTRACTOR	**LaborCost1**	**2,742.61**		**0.00**	**4,124.98**	**209,912.37**	**1,216.93**	**84,575.23**	**294,487.60**
					8.00	*398.18*	*2.00*	*44.14*	*442.32*
GOV USKCF 6 laborers + 1 truck, flatbed,20,000-25,000 GVW	LaborCost1	128.98			1,031.86	51,358.39	257.97	5,693.41	57,051.80
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*6.00*	*300.12*			
MIL B-SKILLWKR Skilled Workers			*Foreman*	*49.53*	*1.00*	*49.53*			
MIL B-SKILLWKR Skilled Workers			*Journeyman*	*48.53*	*1.00*	*48.53*			
GEN T40Z7010 TRUCK OPTION, FLATBED, 8' (2.4 M) x 16' (4.9 M) (ADD 25,000 LB (11,340 KG) GVW TRUCK)			*EP / Average*	*1.31*			*1.00*	*1.31*	
GEN T50Z7400 TRUCK, HIGHWAY, 25,000 LB (11,340 KG) GVW, 4X2, 2 AXLE (ADD ACCESSORIES)			*EP / Average*	*42.83*			*1.00*	*42.83*	
					1.00	*50.02*	*0.00*	*0.00*	*50.02*
RSM 1CLAB 1 CLAB	LaborCost1	82.57			82.57	4,130.09	0.00	0.00	4,130.09
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*1.00*	*50.02*			
					1.50	*80.67*	*1.00*	*82.26*	*162.93*
RSM B10O B10O	LaborCost1	958.96			1,438.45	77,359.65	958.96	78,881.82	156,241.47
MIL B-LABORER Laborers Semi-Skilled			*Journeyman*	*50.02*	*0.50*	*25.01*			
MIL B-EQOPRMED Equip. Operators, Medium			*Journeyman*	*55.66*	*1.00*	*55.66*			
GEN L35Z4250 LOADER, FRONT END, CRAWLER, 2.00 CY (1.5 M3) BUCKET			*EP / Average*	*82.26*			*1.00*	*82.26*	
					1.00	*49.02*	*0.00*	*0.00*	*49.02*
RSM CLAB CLAB	LaborCost1	1,572.10			1,572.10	77,064.23	0.00	0.00	77,064.23
MIL B-LABORERG Laborers, General			*Journeyman*	*49.02*	*1.00*	*49.02*			

Labor ID: 01LA2011 EQ ID: EP09R09 Currency in US dollars TRACES MII Version 4.1

ATTACHMENT I

ENGINEERING CONSIDERATIONS AND INSTRUCTIONS FOR FIELD PERSONNEL

Design Services for Kenai Bluff Stabilization

Engineering Considerations and Instructions for Field Personnel

December 2012

1.0 *Introduction.*

1.1. Purpose
This report provides specific instructions to field personnel to supplement the design details outlined in the Initial Design Documentation Report and highlight unique elements of the design. The purpose of this report is to provide field personnel with a better understanding of the project's function and to ensure that field personnel are aware of all special details of the project, including design assumptions regarding field conditions.

1.2. Scope
The report outline is generally based on Appendix G of ER 1110-2-1150. This is a draft report and shall be reviewed and updated in coordination with field personnel prior to publication in final form. This report is intended to serve as a working outline appropriate to the current level of detail of the accompanying design plans; detailed notes relevant to field personnel may be added throughout the development of final plans and specifications.

1.3. Special Field Conditions
Wet, saturated soils can be expected during excavation, particularly along the bluff below the water table. The toe of the bluff is subject to extreme tidal fluctuations. Cold weather, turbulent waters, and ice within the river are likely to be encountered at the project site, particularly during winter construction.

1.4. Special Construction Techniques
The height and steepness of the bluff and the nature of the soils along the toe of the bluff may require specialized equipment or construction techniques. A portion of the rock placement is anticipated to be in-water work using specialty equipment. The construction schedule currently assumes 12 hours per day and 6 days per week; however, this may be adjusted by the contractor and additional shifts may be incorporated to take advantage of tidal cycles or frozen ground.

1.5 Safety Plan
All field personnel shall be trained in the Safety Plan prior to entering the site. Daily safety briefings shall be held during construction. Do not conduct any construction activities without prior training in relevant elements of the safety plan. Safety concerns shall immediately be reported to supervisors and documented in adherence with the approved safety plan.

2.0 *Site Preparation*

2.1. Traffic Control
All traffic control activities, including road closures and detours, shall be in keeping with the traffic management plan prepared by the contractor and adopted by the owner. Do not engage in any traffic control activities without prior consultation of the traffic management plan; particular caution is to be exercised for truck access to the Kenai Spur Highway. All repaving of disturbed areas and the implementation of road works, including the installation of a guardrail system along Mission Avenue, are subject to the requirements of the traffic management plan.

2.2. Site Security
Prior to initiating construction activities, temporary fencing is to be installed along the bluff above the construction area according to the fencing details in the plans. The temporary fencing is intended to

prevent public access to the bluff are during construction. All access gates must be locked when construction staff are not present.

2.3. Clearing and Grubbing
The temporary staging areas and permanent construction zones along the top of the bluff are to be cleared and grubbed of vegetation and debris, with the materials stockpiled on site or removed for off-site disposal. Several passes with a scraper will likely be needed to remove organics and the upper silt layer. Organics and topsoil shall be separated and stored separately for later disposal or reuse. Clearing and grubbing of vegetation and debris shall occur only within the defined limits of construction. The project requires the removal of large trees lining the top of the bluff. For trees larger than 6" DBH, only remove trees specifically tagged for removal, even within the designated staging areas, temporary construction easements, or permanent project easements.

2.4. Site Access
The project requires the construction of a temporary gravel haul road to allow access to the toe of the bluff. The temporary haul road is to remain in place following construction for use by maintenance vehicles. Excavation equipment for access road construction will need to be located a sufficient distance from the edge of the bluff to avoid the risk of bank failure caused by the equipment. During limited time periods in extreme high tide conditions, the haul road may become submerged. All field personnel shall be briefed daily on tidal conditions.

Due to the nature of the tide flat, the preliminary grading, material placement and compaction would be done with specialized equipment from each constructed reach of the haul road itself. Haul road fill is intended for use as backing for the geotextile underlying the rock and should thus be constructed to the specified grade and slopes. A temporary bridge crossing is required across Ryan's Creek. This area is subject to special environmental restrictions as described in the environmental considerations below.

2.5. Care and Diversion of Water
Temporary stormwater and groundwater diversion and dewatering systems are to be installed in accordance with the approved water management plan. Groundwater discharge shall be monitored and documented during construction. Silt fencing is required along the bluff above the construction area according to the design plan details.

2.6. Demolition and Utilities
Affected utilities located within the construction area are to be re-routed as needed. Some small structures within the project footprint require demolition, and the resulting debris is to be hauled off-site in accordance with the disposal plan. All abandoned concrete and timber foundations located within the construction area are be removed and hauled to the selected disposal area. All utilities located within the construction area are to be rerouted during construction in coordination with the Alaska Dig Line.

3.0 *Armor Rock*

3.1. Placement
Armor rock is to be specially placed in accordance with procedures outlined in the U.S. Army Corps of Engineers Shore Protection Manual. Specifically, armor rock is to be placed with the long axis of each stone perpendicular to the structure face. Armor rock is to be placed in several stages as backfill is placed on the haul road. Rock may be imported through a combination of barging and land-based equipment with the barge placing apron material at high tide, and the land-based equipment placing the remaining armoring at low tide. Land-based equipment may operate for a portion of each shift, with water-based equipment operating in the remaining portion. Complete segments of the armor section are to be completed during each low tide cycle to at least the elevation of the maximum tide lines. Any trenching from land-based equipment would have to be completed at low tide and backfilled in sections prior to high tide, requiring construction of the entire cross section in lateral sections rather than vertical layers across the entire project site. The revetment face and foreslope toe must remain continuous and smooth to avoid

scour from incoming wave refraction; transition zones must therefore be constructed with gradual changes in revetment height, armor size, and layer thickness.

3.2. Trenching
Geotechnical analyses indicate that trenching efforts may encounter difficulties in specific areas. In these areas, the equivalent toe depth might be provided as an apron of launch material. Criteria for determining the appropriate toe configuration are to be adopted prior to construction and refined as needed, subject to the approval of the contracting officer. Preliminary bearing capacity analyses based on the results of borings at the toe of the slope indicate that no additional compaction is required at the toe once the initial overexcavation for the bedding layer is completed. Settlement is anticipated to be on the order of several inches; therefore, a slight overbuild is recommended in terms of the top of revetment elevation. This overbuild is not accounted for in the design grades and shall be incorporated by the contractor.

3.2. Filter Fabric
Filter fabric is included beneath the revetment bedding to prevent piping of material through the revetment while relieving the buildup of excessive pressure from the groundwater and/or tidal cycles. The geotextile fabric, sublayers, and armor rock would need to be placed while the haul road is at a sufficient elevation to allow equipment access.

4.0 *Excavation and Placement of Fill*

The bluff is to be excavated and laid back at the specified slope. Excavated material is to be hauled to the designated stockpile areas for later reuse as backfill in the construction of the new, stabilized bluff. Material unsuitable for reuse must be hauled offsite for disposal. All fill material is to be placed in lifts according to the project specifications. Fill material should not be allowed to become excessively wet prior to compaction. The exposed bluff face in any proposed fill areas must be notched to avoid a smooth interface between soil types. Benching into the bluff face is recommended to expose undisturbed material. No equipment is to be operated on the sloping bluff face but must rather be located on horizontal layers, with a bucket or other extension performing the final smoothing and compaction of the immediate face. The topsoil layer must be placed in several increments so as not to exceed the reach of the construction equipment.

Granular material that meets the specification for use as the filter layer must be separated and stockpiled for placement. In isolated areas, there is some risk of flow concentration surfacing. These flow concentration areas must be documented during construction and may require localized maintenance efforts involving the placement of a rock mattress or other erosion mitigation following construction.

A bench is incorporated into the typical cross section in order to prevent groundwater flows from surfacing. The bench also serves additional purposes for constructability and maintenance. Excavation activities will most likely uncover some material unsuitable for reuse onsite that will have to be hauled for offsite disposal. Some reuse of the excess till material is assumed within the toe trench backfill in order to minimize voids and reduce the potential for fish stranding. During construction, any loose and/or saturated debris should be removed from the face of the bluff prior to placing the fill material.

5.0 *Geogrid*

Placement of a geogrid, as shown in the design plans is required for operation of vehicles in lifts along the slope. Geogrid placement is required at every second compaction lift (18-inch vertical spacing) with a minimum width of five feet. For products manufactured in six-foot rolls, a six foot width would be recommended in favor of cutting the roll. Uniaxial products would need to be rolled with frequent cuts and excessive overlap requirements; a biaxial geogrid is therefore recommended. The opening size should be at least one inch square to accommodate roots from the vegetation planted along the bluff face. The geogrid should be flexible fabric rather than stiff plastic so that establishment of roots reinforces rather than destabilizes the slope.

6.0 *Drainage Features*

The design is intended to prevent overland runoff from flowing over the edge of the bluff in order to reduce the risk of head cuts and other associated drainage problems using a combination of basins and rock chutes. A small berm is required along the edge of the bluff to direct overland flows away from the bluff face. The twelve-foot wide access route adjacent to the berm is graded with a reverse cross slope and a small ditch is proposed on the landward side of the road to collect sheet flow runoff. The ditch should be vegetated in order to act as a bioswale for filtering stormwater runoff. Vegetated settling basins are to be constructed at the three designated concentration points. The swales are intended to route flow into the settling basins, which attenuate peak flows while allowing pollutants to settle, and the vegetation within the basins filters urban runoff from adjacent streets prior to being released. The bed of the ditches and basins should be lined per the design plans in order to prevent infiltration that might otherwise surcharge the groundwater table.

Connection of outlets to the City of Kenai storm drain network shall occur only in coordination with City of Kenai authorities. A rain-on-snow event occurring while culverts are blocked by ice or a design rainfall event occurring over frozen ground with highly limited infiltration may result in exceeding the system capacity. Should a greater-than-design event occur, immediate inspection is recommended to address potential erosion problems and prevent large-scale slope failure.

7.0 *Vegetation*

During the period immediately following construction, prior to the establishment of vegetation, the slope will be more susceptible to erosion, and the placement of topsoil and a high-performance erosion control mat is intended to speed the greening process. Erosion control fabric is required for the entire bluff face above the armor rock. Replacement of some plants may be required during establishment, particularly if design-level or greater-than-design rainfall events occur during the establishment period.

The planting plan for the project includes the following components:

- During Construction: Place, key in and stake erosion control fabric along entire bluff face.
- Phase I (Mandatory): Seed entire area with emergent native grasses, including beach wildrye (Elymus mollis), blue joint reed grass (Calamagrostis canadensis) at 5 lb/ac and tufted hairgrass (Deschampsia cespitosa) at 5 lb/acre.
- Phase II (Optional): Plant riparian vegetation. Plant willow stakes immediately uphill of the revetment 5 feet on center. Extend the willows 3 feet along the slope uphill from the revetment in the near mouth area and 4.5 feet in the remaining area. Plant one row of alders adjacent to willows spaced 10 feet on center.
- Phase III (Optional): Plant upland vegetation. Plant rows of spruce 15 feet on center to the top of the bluff.

A 100% biodegradable erosion control blanket meeting ASTM testing standards is required. Due to the relatively harsh environment at Kenai, several considerations should be followed during installation to extend the life and functionality of the product. Because the bluff face is south-facing, UV exposure will be intense, particularly in the summer months. A heavy-grade fabric is recommended in order to resist degradation from UV exposure. Because of the steep slope, high winds, and freeze-thaw action, the standard spacing for stakes should be doubled (quadrupling the number of required stakes) from the standard vendor recommendations. Particular care must be taken to ensure the mat lies flush against the topsoil. Key-in and overlap requirements should also be strictly adhered to.

For placement of the erosion control fabric, prepare the soil, including grading, application of lime, fertilizer, and seeds. The surface of the soil should be smooth and free of rocks, roots, and other obstructions. Starting at the top of the slope, anchor blankets in a 6” deep and 6” wide anchor trench. Place blankets, staple, backfill, and compact. Roll the blankets down the slope. Staple the open blanket edge using one row of staples at half the manufacturer recommended interval. The middle of the blankets

should be stapled ensuring a good contact between the soil and blanket. When blanket splicing is necessary, use an 8" overlap with two rows of staples. Provide an anchor trench at the toe of the slope.

Wherever the fabric is sliced for planting (including phased planting in seasons following completion of construction), the flaps should be buried into the hole for the rootball as a key-in. Plantings should be mulched as needed above the fabric. Some seeding can be completed prior to installation. In some cases, plugs can be planted through the openings in the blanket without slicing. Prevention of rilling and gullying along the bluff face relies on the infiltration. The subsurface material is likewise designed to be a pervious layer. As such, irrigation may be required during the initial phases until root depth are sufficiently established to prevent dessication.

8.0 *OMRRR requirements*

The implemented project will require ongoing monitoring of vegetation, armor rock, bluff face integrity, river thalweg location, and other aspects of the project throughout the project life. Slopes shall be monitored for creep according to instrumentation requirements in the approved OMRRR plan. Annual inspection of vegetation is required. Results of the annual inspection will drive the timing of subsequent planting phases, should they be required. The monitoring plan should also include periodic hydrographic surveys to determine whether the thalweg is migrating toward the bluff face.

OMRRR needs will be assessed, prioritized, and implemented based on the contents of the monitoring plan. Due to the slope length, the types of equipment that may be mobilized to implement maintenance activities are limited and the suitability of the equipment must be reviewed prior to implementation. Construction of rock mattresses over the slope in areas of high groundwater discharge may require manual placement.

Specifications of maintenance equipment, including width requirements for extensions, must be coordinated in further detail prior to use of equipment on the bench. Placement of additional rock at the toe in areas threatened by a thalweg shift will be guided by the results of the hydrographic survey. The top of the armor layer is not suitable as a driving surface, and maintenance of the rock may need to be provided with barge access at high tide.

9.0. *Special environmental considerations or procedures.*

As a catalogued anadromous stream supporting high value resident fish species, the Kenai River is a sensitive environmental area. The entire project site is located within the Kenai Peninsula Borough Coastal District and subject to all relevant requirements. Lands within 50 feet of Mean High Tide are covered by Kenai Pensinsula Borough's Habitat Protection Area ordinances. Areas at or below Mean High Tide are covered by the Department of Natural Resources Kenai River Special Management Area. All activities which may result in the discharge of pollutants to the Kenai River are subject to the Environmental Protection Agency. The toe of the bluff is a mapped floodplain, with lands under the jurisdiction of the KPB floodplain administrator. The Corps of Engineers has additional regulatory authority and subject to all permits.

10.0 *Demobilization*

All temporary staging areas are to be restored according to the project specifications following construction. Any damage to public roadways along haul routes is to be repaired.

ATTACHMENT J

ANNOTATED COMMENTS AND ITR CERTIFICATION

Comment Report: All Comments
Project: (102790) Kenai Bluff Technical Report Review Review: Technical documents
Displaying 93 comments for the criteria specified in this report.

1921 ms to run this page

Id	Discipline	DocType	Spec	Sheet	Detail
4227909	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Kenai River Bluff Stabilization Cost Estimate, Tetra Tech, 6/22/2011)

Labor rates look reasonable; fuel prices appear current for the area; Ctr Markups generally appear reasonable. Current labor market doesn't seem to be short of experienced workers, methodology for earthwork hard to quantify, and difficulty of task effort is better explained in individual line items production rates rather than averaging overall.

Submitted By: Al Arruda (907-753-5679). Submitted On: Oct 12 2011

1-0	Evaluation **Concurred** Added further clarification to earthwork methodology in MII in accordance with recommendations set forth in the constructibility memorandum. Explanation of production rates added in individual line items. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Al Arruda (907-753-5679) Submitted On: Aug 17 2012
	Current Comment Status: **Comment Closed**

Id	Discipline	DocType	Spec	Sheet	Detail
4227913	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Kenai River Bluff Stabilization Cost Estimate, Tetra Tech, 6/22/2011)

Estimator General Notes are fairly thorough. (ref Notes par 3. Construction Schedule) Construction duration assumed at 15 months agrees with simplified Project Schedule using same work shifts as Mii CWE. However, not certain of basis for conservative decision to road-haul quarry materials 102 miles from Seward given highway traffic, safety risks and potential delays (ref Notes par 5.B: Borrow/Disposal Areas and Materials) vs barge-haul to in-water and near-water placement at river bank toe with "specialty equipment" (ref Notes par E. Unique Construction Techniques). Do river levels or tide cycles preclude floating materials or equipment on barges? River barge hauling and floating cranes/backhoes are not unusual methodologies for well-equipped and experienced coastal and marine contractors (Alaska Marine Transport, Brice, Kiewit, Kelly-Ryan, Knik Construction, West Construction, Western Marine, etc).

Submitted By: Al Arruda (907-753-5679). Submitted On: Oct 12 2011

1-0	Evaluation **For Information Only** Placement from a barge-mounted crane would be possible for several hours each day. We made assumptions on the proportion of land- vs. water-based placement. The actual proportion would likely vary with each contractor's bid. We spoke to general contractors about land- vs. water-based hauling. Some were nervous about letting barges beach during low tide vs inefficiency of moving in and out with each tide cycle and leaving offshore during low tide. We have assumed overland haul but contractors may be able to beat cost/risk with barge either in part or in full. Would depend on fuel prices and other variables at the time of bid as well as any quarries that might be identified in the future close to docks. Permitting agencies have requested that if barging and water-based placement is going to be an option for the bids that we leave it mentioned in the documentation even if it isn't used as the basis for cost estimates so that the proper permits are still pursued to leave that option open when project nears construction.

	Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Concur with leaving available options open to increase competition and encourage lower proposal prices. Submitted By: Al Arruda (907-753-5679) Submitted On: Aug 17 2012
	Current Comment Status: **Comment Closed**

4227916	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Kenai River Bluff Stabilization Cost Estimate, Tetra Tech, 6/22/2011)

Owner markups appropriate for Escalation and Contingency; but 15% for Construction Management seems high compared to Alaska District standard of 8% - please explain (ref notes par 10.C).

Submitted By: Al Arruda (907-753-5679). Submitted On: Oct 12 2011

1-0	Evaluation **Concurred** 15% had been requested by another district. Changed to 8% in accordance with AK District standards. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Construction Division should provide project specific budget cost to the estimator when the standard 8% is judged insufficient for expected tasks. Submitted By: Al Arruda (907-753-5679) Submitted On: Aug 17 2012
	Current Comment Status: **Comment Closed**

4227923	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Kenai River Bluff Stabilization COST ENGINEERING REPORT DRAFT SUBMITTAL June 2011)

Quantity takeoffs are fairly well documented with good detail calc sheets. However, App B, page 3, Detailed Quantity Take-Offs, [02] RELOCATIONS, [02.01] Relocations, [02.01.01] Pipe Demolition, 24" CMP, Demolition, Excavating, Trench Length = 200 ft, Trench Depth = 6.0 ft, Trench Width = 4.0 ft, Volume = 178 BCY, Backfill, Bank Volume = 178 BCY, Swell/Shrinkage Factor = 20%, Loose Volume = 213 LCY, Compaction, Volume = 213 ECY Doesn't appear to agree with Mii, or App B, page 1, quantities for same item (?): [02] RELOCATIONS - LS 1, [02.01] Relcoations - LS 1, [02.01.01] Pipe Demolition - LF 850, [02.01.01.01] Pipe Demo Earthwork - CY 611 Excavation - CY 6 11, Backfill - CY 7 33, Compaction - CY 6 11 Please back check quantities in design, reports, takeoff sheets and Mii CWE for agreement.

Submitted By: Al Arruda (907-753-5679). Submitted On: Oct 12 2011

1-0	Evaluation **Concurred** All quantities have been back checked for accuracy and consistency within MII and the cost report Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Al Arruda (907-753-5679) Submitted On: Aug 17 2012
	Current Comment Status: **Comment Closed**

4234951	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

The drawings are not ready for COE tech review. Missing line work, incorrect detail call outs, and missing information, ect. An in-house review should have picked up much of this.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Corrections made. Additional internal review conducted for revisions. QAQC comments and backchecks with certification will be provided. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 13 2012
	Current Comment Status: **Comment Closed**

4234952	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

The Primary Control Line (PCL) is missing on some plan sheets and has different line types when shown. Show the PCL on all plan sheets using consistent line types.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** PCL added to all plan views. Adjusted line scale to be consistent with legend. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 13 2012
	Current Comment Status: **Comment Closed**

4234954	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

The Primary Control Line (PCL) is not shown on typical section 1 on sheet C-11. Show the PCL on section 1, sheet C-11.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Added vertical line at center of bench to represent PCL location Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment.

	Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 13 2012
	Current Comment Status: **Comment Closed**

4234957	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

Underlying stationing is unreadable on the plan sheets. Show stationing on the Primary Control Line (PCL) on all plan sheets in a type size large enough to read.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Adjusted font size and corrected pen table and plot driver for improved readability Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 13 2012
	Current Comment Status: **Comment Closed**

4234959	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

The text on the PC & PT stationing, Primary Control Line (PCL), on all plan sheets is not large enough to read easily. Increase the text size on PC & PT stationing on all plan sheets.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Adjusted font size and corrected pen tables and plot drivers for improved readability. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 13 2012
	Current Comment Status: **Comment Closed**

4234960	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

Note 3 on plan sheets says "min 2% cross slope" yet typical section 1 on sht C -11 shows 2% slope. Correct discrepancy.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Deleted "min" in Note 3 for consistency with typ section Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234962	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

Note 4 on plan sheets says "min 2% cross slope" yet grading cross sections and typical section 1 on sht C-11 show 2% slope. Correct discrepancy.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Deleted "min" from Note 4 for consistency with typ section Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234963	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

Note: Construct water bars.... references Det 7/C-13. The water bar detail on sht C-13 is detail 6. Correct discrepancy.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Changed note on C-1 to "Det 6/C-13" Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234964	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

Plan sheets do not differenciate between existing and new in use of fence legend. Also the fence legend on sht G-3 shows the new fence legend as chain link fence and the proposed new fence is wood as shown of Fence and Post details, typical detail 4 on sht C-14. Correct legend and details as necessary to be consistent in intent.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Heavier/darker line type used for new fence. Legend corrected to "wood fence" for consistency with intent in cost estimate details and standard drawings. Alternative standard plans for chain link are presented in report (Attachment E) for further discussion with local sponsors. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234966	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

Plan sheets do not show the legend or starting and ending of fence in all locations where fence is intended. Add starting points and ending points for fence sections and use consistent legend.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Added stationing call-out for begin and end fence and adjusted line type. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234967	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

Trench Detail 4 on sht C-13 has note "For Restoration See". Complete the callout as needed.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Inserted text to read "For restoration see planting sheets L-1, L-2, and L-3" Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012

	Current Comment Status: **Comment Closed**

4234968	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

Flashboard Riser Plan and Section, typical detail 5 on sht C-13 has 2 incomplete callouts, "Channel (See Detail)" and "Planks (Stop Logs) See Detail". Complete the callouts as needed.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Deleted "See Detail" from callouts Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234969	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011)
Coordinating Discipline(s): Civil

Abbreviation "PROP" as used on the plan sheets is not in the abbreviations list on sht G-3. Add the abbreviation "PROP" and definition to the list.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Added PROP PROPOSED to list of abbreviations Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234970	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011/Bluff Stabilization Alternatives dtd March 2009)
Coordinating Discipline(s): Civil

The draft design report, Kenai River Bluff Erosion, Bluff Stabilization Design Alternatives dated March 2009 in several places refers to Ryan's Creek and the drawings Kenai Bluff Stabilization, Preliminary Design, dated 15Jun2011 labels it Ryans Creek. Correct discrepancy.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Correct spelling is "Ryan's Creek". Corrected throughout plans for consistency with report.

	Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234973	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011/Bluff Stabilization Alternatives dtd March 2009)
Coordinating Discipline(s): Civil

The draft design report, Kenai River Bluff Erosion, Bluff Stabilization Design Alternatives dated March 2009, page 58, second paragraph in section 5.5 Vegetation refers to phased planting with phase II taking place after several seasons followed by phase III after the establishment of phase II plantings. Sheets L-1, L-2, and L-3 do not indicate any time requirements between phased plantings. Indicate time/establishment requirements on these sheets for phased plantings.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Added "following establishment of previous phase" to references to Phase II and Phase III Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234975	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Preliminary Design dtd 15JUN2011/Bluff Stabilization Alternatives dtd March 2009/Cost Estimate dtd June 2011)
Coordinating Discipline(s): Civil

The draft design report, Kenai River Bluff Erosion, Bluff Stabilization Design Alternatives dated March 2009, page 58, second paragraph in section 5.5 Vegetation refers to phased planting with phase II taking place after several seasons followed by phase III after the establishment of phase II plantings. The cost estimate does not indicate time requirements between phased plantings. Show the cost considerations inherent in time intervals between phased plantings which may include additional mob/demob and/or follow on contracts.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Corrected schedule in cost report to reflect phasing, split in MII and added mob/demob for each phase. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234977	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Bluff Stabilization Alternatives dtd March 2009)
Coordinating Discipline(s): Civil

The draft design report, Kenai River Bluff Erosion, Bluff Stabilization Design Alternatives dated March 2009, page 20, last paragraph refers to a model of the storm drain network and says "a functioning model is anticipated in Summer 2009. Findings from the model will be incorporated during future design phases." What is the status of the model? I see no indication findings have been incorporated in the design.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** The model was not completed. Acc to last e-mail on June 7 2011 from Stephanie Kobylarz at Kenai Watershed Forum (former lead for modeling efforts) "I am leaving my position...We don't have any updates on the Kenai stormwater project...No new work on this project is anticipated" Updated design report to reflect status. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234978	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Bluff Stabilization Alternatives dtd March 2009)
Coordinating Discipline(s): Civil

The draft design report, Kenai River Bluff Erosion, Bluff Stabilization Design Alternatives dated March 2009, page 21, first paragraph refers "Dye testing is anticipated in the late spring of 2009 in order to verify flow paths,..." and last paragraph on page 56 refers to dye testing. What is the status of the dye testing and were the results incorporated into the storm drain model?

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Dye testing was completed in spring of 2009. Several directional arrows on the maps were updated and we have acquired and incorporated the new map into the report; however, no model was developed. Updated design report to reflect status. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4234979	Planning - Plan Formulation	Plans	n/a'	n/a	n/a

Comment Classification: N/A
(Document Reference: Bluff Stabilization Alternatives dtd March 2009)
Coordinating Discipline(s): Civil

The draft design report, Kenai River Bluff Erosion, Bluff Stabilization Design Alternatives dated March 2009. Update table 5 on page 33 and table 6 on page 39 to reflect the new design criteria regarding wave heights.

Submitted By: Clarke Hemphill (907-753-5602). Submitted On: Oct 17 2011

1-0	Evaluation **Concurred** Updates from 7/23/2010 revetment design memo incorporated into current draft of DDR. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Ronnie Barcak (907-753-5755) Submitted On: Sep 17 2012
	Current Comment Status: **Comment Closed**

4253263	Real Estate	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Civil

Real Estate, Access and Staging, Sheet G-5: The current temporary staging area of 2.1 acres is not adequate to stockpile materials during construction. Are there other options for increasing the temporary staging areas near the site?

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Available open space is limited from Sta 0+00 to 60+00 so need to add multiple smaller areas along the project. Added stockpile/temporary staging areas on each side of access road station 0+00 to 2+00 (approx 0.4 acres). Added approx 1 acre at 22+50 to 24+50 and 0.5 acre between 14+50 and 16+50. Some sorting will be required by antipicated construction sequence attempts to avoid excessive stockpiling by continuous placement (see constructibility memorandum). Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253264	Real Estate	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Civil

Real Estate, Access and Staging, Sheet G-5: Need to establish and show temporary construction easement crossing Ryan's Creek.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Added temporary construction easement for Ryan's Creek crossing Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253265	Real Estate	Plans	n/a'	n/a	n/a

Comment Classification: N/A

Coordinating Discipline(s): Civil

Real Estate, Access and Staging, Sheet G-5: Need to establish and show temporary construction easement along the entire length of the Kenai River. This will allow marine transportation of construction equipment and materials.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Added temporary construction easement as a 100-foot strip along outside of toe trench to allow for marine access. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253266	Environmental	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Civil

Erosion Control and Wetlands, G-6 and G-7: Do the recommend erosion control measures meet the current storm water pollution prevention plan (SWPPP) standards? Project limits or wetland limits are not provided on sheets G-6 and G-7.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Proposed erosion control measures are derived from ADOT and Corps standard drawings and generally meet highway dept standards for erosion control on roadway cuts. Detailed development of a storm water pollution prevention plan would be included as part of the plans and specs with contractor responsible for submission of their own plan subject to approval by relevant jurisdictional authorities. Special attention will be needed at Cemetery Creek and Ryan's Creek. Added notes to drawings calling out further requirements. We can check against additional applicable Corps-provided guidelines as needed. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253268	Civil	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Civil

Project Plan and Site Map, Sheet C-1 through C-7: Need to provide legible project stationing in plan view.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Adjusted font size and corrected pen table and plot driver to improve readability Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment.

	Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253269	Civil	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Project Plan and Site Map, Sheet C-1 through C-7: Need to provide all exploration test boring locations in plan view. See Geotechnical Reports for coordinate locations.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Added R&M boring/piezometer locations to plan views Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253271	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Cost Engineering Report Draft Submittal, June 2011, 16.01.02.01 Alluvial Deposits: How was the quantity of 500 BCY of unsuitable alluvial material determined? We anticipate the volume of unsuitable material excavated from the alluvial soil unit will be greater than the current estimate. For example test boring AP-608-MW shows 17.5 feet of silt and sandy silt (ML) below the ground surface before encountering the poorly graded sand. Other test borings drilled on top of the bluff show near surface silt and fine grained soils to depths of 2.5 feet. We recommend reevaluating the estimated volume of unsuitable alluvial material.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Bore logs have been reviewed and the previously estimated quantities for the unsuitable alluvial material have been updated/increased in the estimate as appropriate to account for the near surface/organic material. Additional sorting costs have also been added. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253273	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Cost Engineering Report Draft Submittal, June 2011, 16.01.02.01 Alluvial Deposits: How was the swell/shrinkage factor of 20% selected for the alluvial soil unit? We anticipate the loose poorly graded sand will not swell or shrink in volume by 20%. Provide justification for using a swell/shrinkage factor of 20% in the cost engineering report.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Factor was applied as an average from various soil types. Decreased to 10% to better account for granular material. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253274	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Cost Engineering Report Draft Submittal, June 2011, 16.01.02.02 Glacial Till: How was the swell/shrinkage factor of 20% selected for the glacial till soil unit? We anticipate the excavation of glacial till consisting of firm clay will swell in volume greater than 20%. Provide justification for using a swell/shrinkage factor of 20% in the cost engineering report.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Factor had been applied as an average from various soil types. Increased to 25% to account for presence of clays. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253276	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Cost Engineering Report Draft Submittal, June 2011, 16.01.02.02.03 Borrow Material: How was the unit weight of 120 PCF selected for imported material? Imported classified materials from the Kenai area meeting the "Filter Layer Gradation" requirements will most likely have an in-place compacted unit weight between 130 and 135 PCF. We recommend increasing the estimated unit weight of borrow material in the cost engineering report.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Increased the unity weight to 130 pcf for filter layer material. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253278	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Cost Engineering Report Draft Submittal, June 2011, Appendix E Productivity Index and Notes and Estimated Production Rates, Land Based Rock Placement Output Rate: Placement of the filter, B, and armor rock is assumed to be conducted by "Dragline Cranes on crawler w/ clamshell bucket". Recently we have seen the use of large hydraulic excavators for the placement of shore protection rock above and below water. We expect that same type of equipment used for this project. Recommend changing the cost estimate to reflect the anticipated equipment.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** The land-based rock placement crew has been changed to include the use of hydraulic excavators instead of the dragline cranes previously in the estimate Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253280	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Cost Engineering Report Draft Submittal, June 2011, Appendix G MCACES Construction Cost Estimate, Page 15, 16.01.02.01.01 and 16.01.02.02.01, Excavation of Alluvial Deposits and Glacial Till: The estimator has assumed the hauling of excavated material with 60 CY off highway haulers to a stockpile area onsite. We do not agree with this assumption. A 60 CY off highway hauler is equivalent to a Caterpillar 777. In our opinion this size of truck will not be used on the site given the relatively small volume of material that needs to be transported and the narrow and tight turning radiuses that are expected during construction. We anticipate 6-wheel drive articulated trucks such as the Volvo A40 or Caterpillar D400 or smaller to be used during construction. These trucks have a haul capacity of about 30 CY. Recommend revising the hauling production rates for the alluvial and glacial till materials.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** The hauling cost item under the excavation folders for the alluvial deposits and glacial till have been changed to use haulers that have a 30-CY capacity Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253281	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Cost Engineering Report Draft Submittal, June 2011, Appendix G MCACES Construction Cost Estimate, Page 15, 16.01.02.01.02 Backfill: The estimator has assumed a dozer and front-end loader will haul, place, and spread backfill material with an average haul distance of 300 feet. Given the location of the temporary staging area, we estimate the average haul distance will be greater than 300 feet. We also believe 6-wheel drive articulated trucks will be used to haul material to the point of placement. Provide justification for using a 300 foot haul distance and clarify the assumed method of transporting backfill material with a front end loader from temporary stockpiles to final placement.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** The crews and production rates for the backfill placement have been modified to have an increased travel distance between stockpile site and placement. Also the crews have been modified to include the equipment mentioned in the comment Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253282	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Cost Engineering Report Draft Submittal, June 2011, Appendix G MCACES Construction Cost Estimate, Page 15, 16.01.02.01.02 Backfill, Borrow Material Compaction: Generally 2 passes with a compactor will not achieve the required density of material used to construct a stable slope. Provide justification for the level of effort assumed in the cost estimate for compaction of backfill material.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** The estimate has been modified to assume 4 passes for compaction of borrow material Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253283	Civil	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Grading Cross Sections III, C-10, Construction Phasing, Phase I: Excavation of the upper alluvium soil, which accounts for approximately 169,133 loose cubic yards, is planned to be hauled and stockpiled onsite. Currently the 2.1 acre temporary staging area will not be adequate to stockpile this volume of material. Where does the designer anticipate the contractor stockpiling this material until construction phase 4 and 5 are started?

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Added temporary staging/stockpiling areas. We anticipate several continuous loops that would minimize the amount of stockpiling needed (see constructibility memorandum) Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253285	Civil	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Cost Engineering

Grading Cross Sections III, C-10, Construction Phasing, Phase I, Cost Engineering Report Draft Submittal, June 2011: Construction access to the beach to start Phase II and III will require the construction of a temporary road. A temporary road consisting of the sand and fine grained soils excavated in Phase I and II will not be adequate to support construction equipment. The construction phasing should display the need for a temporary road constructed with rock at the toe of the slope. The cost engineering report should account for this additional material requirement.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Temporary Road line item accounts for a roadway along the entire toe; however, we have increased the material quantity to reflect the nonuniform conditions. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 08 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253286	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Civil

Cost Engineering Report Draft Submittal, June 2011, Appendix G MCACES Construction Cost Estimate: A temporary construction crossing at Ryan Creek will most likely be required to efficiently construct the project. Has the cost estimate accounted for this effort?

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** The "Temporary Road" line item accounts for a haul road along the entire toe of the bluff; however, we have increased the average depth and volume of material previously listed for the roadway and added costs for construction of temporary diversion and drainage control associated with construction of temporary culverts for Ryan's Creek under the access road. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 08 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253287	Civil	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Typical Sections, C-11: The typical section has too many notes which make it difficult to understand. Remove the construction sequence notes and line hatching and provide a typical section that clearly shows construction material layer thickness, centerline stationing, and elevations.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Removed/reduced sequence-related notes and revised hatch patterns for clarity Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment.

	Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253288	Civil	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Typical Sections, C-11and C-12: The excavation and backfill material layers and definitions are not clearly defined. Provide standard construction terms and material requirements (ie gradation requirements, material classifications, PI requirements, stone weight limits, etc.) for each construction material layer (Filter Layer, Granular Material, Glacial Till Mix with Alluvium, Topsoil, Gravel Bedding, B Rock, and Armor Rock). Use standard earthwork excavation and backfill terms and define the construction material requirements using standard terms from UFGS specifications.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Added table of definitions and inclusion criteria for each material type to report and reworded layer names/types. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253291	Civil	Plans	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Typical Sections, C-11: Placement and constructability of the 1 foot topsoil layer at a 1.5H to 1V slope is a concern. What are the topsoil gradation and material requirements? Has the design evaluated the slope stability of this topsoil layer during and after construction from a geotechnical and maintenance standpoint? Has the designer considered using a thinner layer of topsoil?

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Check and Resolve** 1-foot layer was minimum recommended by Alaska Plant Materials staff. We have reviewed the fabric, pinning, and vegetation establishment criteria with geotechnical engineer and anticipate the 1-foot topsoil layer being stable on the 1.5:1 slope due to fabric/pinning during the establishment period. Localized rilling and gullying may be risks on a smaller scale; however, drainage control measures are proposed to prevent overland drainage from the upper slopes, with only direct rainfall on the topsoil itself. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4253298	Cost Engineering	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A
Coordinating Discipline(s): Geotechnical

Cost Engineering Report Draft Submittal, June 2011, 16.01.03.01 Land Base Placement: How was the over place / loss factor of 20%, 15%, and 10% for filter, B, and Armor rock selected? We would anticipate some lose during the

filter rock placement, however, after that layer is placed assuming a loss of 15% for B rock and 10% for armor rock seems high. Provide justification for using the current over place / loss factors.

Submitted By: John Rajek (907-753-5695). Submitted On: Oct 28 2011

1-0	Evaluation **Concurred** Selected based on conservative estimate. Tight controls during construction should allow a reduction of factors. The over place/loss factors for the B rock and armor rock have been lowered to 5% for both. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: John Rajek (907-753-5695) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4255908	Civil	Plans	n/a'	n/a	G-4

Comment Classification: N/A

Clean up sheet presentation e.g. Curve stationing is too small to read. Increase font size. Photo control survey notes seem to overrun each other. Look at notes and correct overlapping. Numbering font should not be shaded. Monument legend should not be in bold.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Adjusted font size and corrected pen table and plot driver to improve readability. Fixed text justification issue and font formatting Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4255920	Civil	Plans	n/a'	n/a	G-5 and cost estimate

Comment Classification: N/A

Is the cost for purchasing properties for the permanent easement included in the cost estimate?

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Placeholder costs of $100,000 per acre for 30 acres have been assumed in lieu of assessor's report as previously directed. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4255978	Civil	Plans	n/a'	n/a	G-6

Comment Classification: N/A

Add BDY to the list of abbreviations

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Added BDY BOUNDARY to abbreviations Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4255982	Civil	Plans	n/a'	n/a	C-1

Comment Classification: N/A

Fix line type for Security fencing to be consistent with line type shown in Legend

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Fixed line types for consistency and changed to "wood fence" rather than chain link. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4255990	Civil	Plans	n/a'	n/a	C-1

Comment Classification: N/A

There is a bold line on the slope at the start of the project that appears to be a cut and fill line. Clarify what this line is or remove it, if it is nothing.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** labeled cut/fill interface Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4255992	Civil	Plans	n/a'	n/a	C-1

Comment Classification: N/A

Use an unfilled triangle on the top slope line to indicate a cut section.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Changes symbol to unfilled triangle Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4255999	Civil	Plans	n/a'	n/a	C-1

Comment Classification: N/A

Does the swale start at the gate by Mission Road, or does it connect to a culvert? If the swale starts there add note to indicate it starts there, if it connects to a culvert note that.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Added start/stop stationing to notes Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256002	Civil	Plans	n/a'	n/a	C-1

Comment Classification: N/A

There is a callout for EP. Clarify what that is and add it to the list of abbreviations

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Added EP EDGE OF PAVEMENT to abbreviations list Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256009	Civil	Plans	n/a'	n/a	C-1

Comment Classification: N/A

Profile. Arrow to top of bluff does not go to a bluff. Check the arrow positioning, or clarify the callout.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Extended top of bluff line to Sta 8+00

	Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256015	Civil	Plans	n/a'	General	n/a

Comment Classification: N/A

Include PROP REG in the list of abbreviations

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Added PROP PROPOSED and REG REGULATORY to abbreviations list Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256019	Civil	Plans	n/a'	C-2	n/a

Comment Classification: N/A

Correct spelling of Concrete from concretee.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Corrected note Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256024	Civil	Plans	n/a'	C-2	n/a

Comment Classification: N/A

Clarify whether the CMP is existing or new in the call out "Constr CMP culv connect to exist storm drain network". Line type looks like it is existing, but the note sounds like it is new work.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** New feature. Changed line type/thickness to represent new feature. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment.

	Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256027	Civil	Plans	n/a'	C-2	n/a

Comment Classification: N/A

Extend line to building or pad to be demolished

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** line extended Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256061	Civil	Plans	n/a'	C-2	n/a

Comment Classification: N/A

Provide cross section of stormwater settling basin.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Added cross section Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256094	Civil	Plans	n/a'	G-6 and G-7	n/a

Comment Classification: N/A

Remove note on straw bales and silt fences. This is a detail that the contractor will need to include as part of his SWPP and the call out implies that some sort of coordination has taken place. Suggest the callout to be more general indicating that sediment management needs to be an intergral part of the construction and will need an estableished SWPP for work.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Replaced note with suggested callout Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012

	Current Comment Status: **Comment Closed**

4256100	Civil	Plans	n/a'	C-3	n/a

Comment Classification: N/A

There are grey diagonal lines across the slope face. Indicate what these lines are, or remove them if they serve no purpose.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** They are parcel/easement boundaries. Added labels for clarification Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256123	Civil	Plans	n/a'	C-4	n/a

Comment Classification: N/A

Am unclear as to what is occurring at the settling basin. Please clarify. How is the basin being regraded? What is the future primary outlet connection to city storm drain network? Does it effect this work?

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Added typical connection detail and additional grading contours. Connection to the storm drain system would need to be coordinated with City plans for future upgrades, potentially requiring some improvements to their system. Added notes regarding work to be undertaken by others. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Jan 13 2012
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256128	Civil	Plans	n/a'	C-5	n/a

Comment Classification: N/A

Move the 12' dimension from its current location. At its current location the 12' looks to be at the top of the bluff and not between the berm and swale.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Moved dimension and text Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256135	Civil	Plans	n/a'	C-5	n/a

Comment Classification: N/A

Check stationing at the end and start of the project across Ryan's Creek. Stationing is the same.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **For Information Only** Work ends at Station 38+25 on the west side of Ryan's Creek and begins at Station 50+00 on the east side. A gap was left in between to avoid any overlap and account for the access road. The access road gate is located at approximately Station 41+40. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 08 2011
1-1	Backcheck Recommendation **Open Comment** Water bar stationing on the east side of Ryan's creek needs to match stationing shown Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
1-2	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Feb 04 2013
2-0	Evaluation **Concurred** Changed callout to Sta 50+00 to 52+54 to match east side stationing. Revised pdf attached. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 19 2012 (Attachment: Kenai_C-5_C-5_(2).pdf)
	Backcheck not conducted
	Current Comment Status: **Comment Closed**

4256137	Civil	Plans	n/a'	C-6	n/a

Comment Classification: N/A

On the bottom right side of the plan view there is duplicated lines and an angled line that cuts across the contours. Clean up the line work.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Angled line is easement line. Duplicated line is water level running near a contour. Added callouts for clarification Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256139	Civil	Plans	n/a'	C-6	n/a

Comment Classification: N/A

Add an arrow noting the location of the earthen bern called out in the plan view.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Arrow added Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256142	Civil	Plans	n/a'	C-7	n/a

Comment Classification: N/A

Correct spelling of Ditch. Also clarify the routing of the swale ditch to the inlet

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Corrected spelling and adjusted contouring around inlet for drainage Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256143	Civil	Plans	n/a'	C-7	n/a

Comment Classification: N/A

Provide cross section and clarify plan view of 2' of B rock by Pacific Seastar Foods. Looks like rock work stops abruptly. Also are there any real estate issues with putting rock on this side?

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Project already encroaches on their parcel and real estate negotiations would be required. Intention of B rock is to protect against further erosion along the existing sheet pile bulkhead, particularly as the erosion might be exacerbated by energy reflection from the constructed revetment and bank slope that will protrude further from the bluff than the existing toe. Some argument for dissipation due to large rock vs existing hardened till slope - placement of rock is precautionary. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256151	Civil	Plans	n/a'	General - cross sections	n/a

Comment Classification: N/A

Provide cross sections of the project beginning and ending where there is no revetment only the dressing of the upper slope

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Sections added Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 08 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256155	Civil	Plans	n/a'	C-11	n/a

Comment Classification: N/A

Where is the filter layer being placed? May want to call out the location in the filter layer gradation title so it is easier to find it in the cross section.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Moved table and added arrow to filter layer (within 10' of surface) Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256160	Civil	Plans	n/a'	C-11	n/a

Comment Classification: N/A

What is the thickness of the fill at the bottom of the slope (the imported material or glacial till mixed with alluvium as necessary)

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** The thickness varies as the existing ground rises and falls along the project. The layer can extend upwards to an elevation that is at least 10' below the top of the revetment Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Open Comment** Need to identify the different material type at the base of the bluff - previously identified as glacial till, mixed with alluvium. That is the thickness in question. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
2-0	Evaluation **Concurred** Added callout for clay/sand backfill mix to match categories requested by John Rajek Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 19 2012 (Attachment: Kenai_C-11_rev_C-11_(2).pdf)
2-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Feb 04 2013

	Current Comment Status: **Comment Closed**

4256162	Civil	Plans	n/a'	C-11	n/a

Comment Classification: N/A

Clarify the intent of the 10' Min dimension behind the revetment.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** The 10' min dimension refers to the thickness of the filter layer (measured vertically in this location but measured perpendicular to the slope above the revetment) Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Open Comment** Clarify what is meant by ACC in the armor note Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
2-0	Evaluation **Concurred** spelled out "according to" for clarity and to avoid confusion with Asphalt Cement Concrete (not used in this project) Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 19 2012 (Attachment: Kenai_C-11_rev_C-11_(2)1.pdf)
2-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4256163	Civil	Plans	n/a'	C-11	n/a

Comment Classification: N/A

Check the stationing on the cross section title

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Corrected stationing to reflect newly adjusted transition zones Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256164	Civil	Plans	n/a'	C-11	n/a

Comment Classification: N/A

describe how far up and down the slope the geogrid is placed.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Geogrids are included on the 1.5:1 slope only. Added note to clarify

	Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256166	Civil	Plans	n/a'	C-11	n/a

Comment Classification: N/A

Remove note in parenthesis indicating that safety railing and surface treatment for birding trial by others.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Note removed Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4256189	Civil	Plans	n/a'	C-11	n/a

Comment Classification: N/A

I thought the upper slope was left undisturbed, but upper slope surface treatment detail indicates that it is being compacted. Clarify.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** It is generally undisturbed and requires only scarifying for placement of topsoil, but there are locations where it is in fill rather than cut. Fill sections would require compaction. Added note to clarify Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Open Comment** Shouldn't the detail call out circle the 2H:1V slope behind the bench? Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
2-0	Evaluation **Concurred** Moved detail callout from existing slope to the proposed slope. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 19 2012 (Attachment: Kenai_C-11_rev_C-11_(2)2.pdf)
2-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Feb 04 2013
	Current Comment Status: **Comment Closed**

4256195	Civil	Plans	n/a'	C-12	n/a

Comment Classification: N/A

Provide top of revetment elevation for each typical section

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Elevations added Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256196	Civil	Plans	n/a'	C-12	n/a

Comment Classification: N/A

Remove "Per SPM" in note.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Text removed Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256197	Civil	Plans	n/a'	C-12	n/a

Comment Classification: N/A

Check stationing. There does not appear to be a station 45+00

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Revetment ends at Sta 37+00 and begins at 51+35. Corrected titles. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256199	Civil	Plans	n/a'	C-12	n/a

Comment Classification: N/A

Check and see if call out indicating that excess till material would be toe nourishment is permissible or would it be dependent on the permits obtained?

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **For Information Only** Toe nourishment concept was presented to regulatory and others and appears to be acceptable, however subject to permit requirements. Using excess till to create smooth, consistent backfill slopes would be much preferable to an undulating surface that would cause additional scour and erosion problems. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 08 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256200	Civil	Plans	n/a'	C-13	n/a

Comment Classification: N/A

Provide slope arrow on Schematic Drain Pipe Profile

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Slope arrows added Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256201	Civil	Plans	n/a'	C-13	n/a

Comment Classification: N/A

On Riprap V Ditch detail there is a gap between the geotextile and the rip rap. Note if that is bedding material and its thickness

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** A bedding layer of 3"-6" should be used to prevent tearing the fabric during placement. Added notes. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256202	Civil	Plans	n/a'	C-13	n/a

Comment Classification: N/A

On trench detail complete call out that notes "For Restoration See...."

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Changed to "For restoration see planting plans L-1, L-2, and L-3" Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256203	Civil	Plans	n/a'	C-13	n/a

Comment Classification: N/A

Clarify hidden lines in V Ditch shown in Flared End Section Detail

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** The hidden lines represent a foundation and base for the flared end section apron. Removed for clarity. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256205	Civil	Plans	n/a'	C-13	n/a

Comment Classification: N/A

Riprap V Ditch - Would you really compact the riprap with a vibratory compactor?

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** The compactor would be used to make sure the smaller material fills the voids and settles into place, not necessarily to compact the rip rap itself. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256206	Civil	Plans	n/a'	C-13	n/a

Comment Classification: N/A

Flashboard riser - Note bar spacing for trash rack.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Estimated spacing at 6". Added note Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256207	Civil	Plans	n/a'	C-13	n/a

Comment Classification: N/A

Are wood plank stop logs to be treated wood?

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Yes. Should be treated wood or alternative materials that might also also include fiberglass, plastic, etc. Added callout for treated wood for initial estimates. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256211	Civil	Plans	n/a'	C-13	n/a

Comment Classification: N/A

Flashboard riser plan - provide details on welds. One weld indicator is missing size. Other weld indicator is missing units. Are these intended to be field welds? If they are filed welds, it looks like there could be a conflict with the all around weld and the concrete block.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Check and Resolve** Suggest removing weld details to avoid potential conflicts and unwarranted detail. These are based on standard drawings and we would likely want to allow the contractor to propose an alternative product. Suggest adding note "Contractor shall submit shop drawings of riser subject to COR representative's approval." Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 08 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256213	Civil	Plans	n/a'	C-13	n/a

Comment Classification: N/A

Flashboard riser plan - Looks like there is a size conflict on the 2nd detail. On the left it looks like the CMP is at least 48 inches and on the right it is called out as 42 inches. Also, it appears that the CMP extends down into the concrete. Is that correct?

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **For Information Only** The 42" and 48" dimensions refer to different directions. The riser is a 42" diameter pipe that is sliced and stood up on end. The height of the riser (length of pipe) once it is up on end is 48". CMP does extend into the concrete. The intention is for the concrete to be cast around the embedded part of the riser. Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 08 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256214	Civil	Plans	n/a'	C-14	n/a

Comment Classification: N/A

The legend indicates that the fence is chain link. Coordinate the the legend and the detail.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Changed legend to "wood fence" Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256215	Civil	Plans	n/a'	C-14	n/a

Comment Classification: N/A

Include the SWPP measures and the Boardwalk information in the Design Analysis Report, so as not to imply permit coordination or complete boardwalk design.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Typical details and description added to detailed design report Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 08 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

4256217	Civil	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A

Page 2 paragraph 5. C. 2) Plans indicate that the geogrid is to be placed on every other lift not every lift. Clarify.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Added clarification Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 12 2012
	Current Comment Status: **Comment Closed**

4256219	Civil	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A

Page 3 bullet 4) There isno birding trail or interpretive signage that is part of this design

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Removed reference Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 12 2012
	Current Comment Status: **Comment Closed**

4256221	Civil	Cost Estimate	n/a'	n/a	n/a

Comment Classification: N/A

page 3. Paragraph D. Note that ice can also be encountered on the river.

Submitted By: Deirdre Ginter (907-753-2805). Submitted On: Oct 31 2011

1-0	Evaluation **Concurred** Note added Submitted By: Krey Price (+610-434-087-251 (Australia)) Submitted On: Dec 05 2011
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Deirdre Ginter (907-753-2805) Submitted On: Sep 04 2012
	Current Comment Status: **Comment Closed**

KENAI BLUFF STABILIZATION
STATEMENT OF QUALITY CONTROL

Tetra Tech Inc., Surface Water Group has completed the Draft Design Report for the Kenai Bluff Stabilization Project in Kenai, Alaska. Notice is hereby given that all quality control activities appropriate to the level of risk and complexity inherent in the project, as defined in the Quality Control Plan, have been completed. Compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of assumptions; methods, procedures, and material used in analyses; alternatives evaluated; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing Corps policy. Documentation of the quality control process is attached.

March 27, 2009
Krey Price, Technical Development Team Leader

March 27, 2009
Ike Pace, Independent Technical Review Team, Costs

March 27, 2009
Bob Hall, Independent Technical Review Team, Civil

March 27, 2009
Harry Gibbons, Independent Technical Review Team, Environmental

March 27, 2009
Ridge Robinson, Independent Technical Review Team, Planning

CERTIFICATION OF QUALITY CONTROL

Significant concerns and the explanation of their resolution are included in the attached documentation. As noted above, all concerns resulting from the independent technical review of the project have been considered.

March 27, 2009
Quality Assurance Manager
Tetra Tech Inc., Surface Water Group

Technical Review Comments		Project: Kenai Bluff Stabilization		Location: Kenai, Alaska	
Date: 3/17/2009		Reviewer: Ridge Robinson	Tel: (206) 728-9655		Back Check By: (initials)
Office: Seattle		Type of Document: Design Report	Discipline: Planning		
Item No.	Page/Sheet	COMMENTS		Action Taken:	By:
1	General	Text in some locations indicates future analysis to support design refinements. Is District planning on doing any additional analysis to refine design? If so please note what types of analyses and refinements are planned upfront where appropriate.		Wind/wave analysis is expected to be initiated by the District, stormwater modeling by the City. Details/discussion added	RR
2	2	Add a statement regarding future expected erosion extent and types of damages		Statement added	RR
3	19	Do ice conditions have any effect on the erosion and if so were they factored into modeling and design criteria?		Shore ice doesn't appear to affect bluff recession significantly relative to freeze-thaw action on the bluff face, which does contribute significantly. Discussion added.	RR
4	23	Should we add a statement of relation between the referenced flow rates		Discussion added	RR
5	27	Can statement be added that notes general economic activity at top of bluff relative to rest of community? Is there any public utility infrastructure that other parts of community depend on?		Birdwatching is a common use at the top of the bluff. Public infrastructure includes public parks along the top of the bluff. Discussion added.	RR
6	27	Can statement be added noting types of commercial facilities.		Commercial facilities include fish processing and boat storage. Description added.	RR
7	29	Text references economic analysis of project benefits. Were benefits analyzed in this study? Please edit as appropriate.		Benefits were analyzed qualitatively only. Statements edited.	RR
8	30	Can we add a statement of tsunami risk to proposed structure/project?		Coordination with jurisdictional authorities required. Statement added.	RR
9	33	Should we note the risk (implications) to proposed project of thalweg shift		Thalweg shift would require additional rock placement. Hydrographic surveying to monitor thalweg shift is included in operation and maintenance activities. Reference added.	RR
10	35	Can statement be added about without project expected retreat extent?		Statement added.	RR
11	38	Should we note potential risk of rainfall events during vegetation establishment to project?		Maintenance costs assume replacement of some vegetation. Text added.	RR
12	43	Please clarify to relate discussion in 4.1-4.3. Explain "varying by zone".		Clarification/explanation added.	RR
13	43	Add table of combinations or add reference to previous report for more information		Reference to Alternatives Report added	RR
14	46	I thought I saw previously in report that public access would not be allowed (fencing). Please confirm statement.		Corps project will prevent access. Local agencies may add recreational access. Statement edited.	RR

Technical Review Comments		Project: Kenai Bluff Stabilization		Location: Kenai, Alaska	
Date: 3/17/2009		**Reviewer:** Ridge Robinson	**Tel:** (206) 728-9655		Back Check By: (initials)
Office Seattle		**Type of Document** Design Report	**Discipline** Planning		
Item No.	Page/Sheet	**COMMENTS**		Action Taken:	By:
15	46	Reference consistency with shore protection manual		Reference added.	RR
16	49	Are proposed plantings compatible with project performance (would they impact or destabilize the erosion control methods) and can the proposed plantings establish necessary roots for viability through proposed erosion control methods?		Geogrid is flexible fabric with openings large enough to allow root establishment. Contacted vendor to confirm that vegetation stabilizes rather than destabilizes slopes with the specified geogrid.	RR
17	52	Is there risk of losing project during large event prior to vegetation establishment?		Risk is localized for rilling/gullying rather than general slope stability. Discussion added.	RR
18	54	Is irrigation included in O&M costs?		O&M costs include higher vegetation maintenance costs during establishment period, accounting for irrigation and/or replacement of individual plants. Text added.	RR
19	63	Does cost estimate have a contingency for hazardous materials?		Cost estimate has high contingency (25%) to account for unforeseen conditions. Added note that cost estimate needs to be revisited following HTRW investigations	RR
20	63	Do we need to note that identification of HTRW in proposed project area would have implications on cost not currently accounted for?		Noted	RR
21	64	Documentation of existing delineation or additional wetlands delineations?		Wetlands have not been delineated. Reworded statement	RR
22	66	Note # of structures to be removed for construction under project conditions and number of structures that would be saved from continued erosion under without project conditions.		# of structures added	RR
23	68	Should add note that any proposed recreational features should be evaluated for compatibility with proposed project purposes and any potential impacts to project performance and life.		Note added	RR
24	General	See editorial changes made via track changes in electronic ITR document		Editorial changes made as suggested	RR

Technical Review Comments		Project: Kenai Bluff Stabilization		Location: Kenai, Alaska	
Date: 10 March 2009		Reviewer: IKE PACE	Tel: 949-250-6788	Irvine, CA	Back Check By: (initials)
Office		Type of Document: Cost Engineering Report	Discipline: Cost Engineering		
Item No.	Page/Sheet	COMMENTS		Action Taken:	By:
GENERAL					
1	1	Report – Use consistent terminology within the report (i.e. filter rock vs. core rock)		Consistent terminology used.	IGP
2	2	Report – Section 5.b refers to price quotes and plant locations as being listed in Appendix B, however they are not in Appendix B.		Price quotes inserted into Appendix F.	IGP
3	4	Report – Section 8.a states there are no costs for lands and damages, however there is a $3 million cost in the estimate.		Real Estate costs added.	IGP
4		Appendix B – quantities are hard to follow. What is the numbering system next to the item and how does it relate to the MCACES WBS? Suggest reorganizing quantities and listing the WBS next to the item as it is in the MCACES.		Quantities reorganized to align with MCACES WBS.	IGP
5		Appendix C – it will take much longer than 19 days to mobilize. Verify the construction schedule is consistent with the productivity calculated in the MCACES.		Mob has been revised to a more appropriate duration.	IGP
6		MCACES – cost estimate is missing the productivity index and overtime markups that are discussed in the report.		Productivity index and overtime markups added.	IGP
7		MCACES – prime contractor is shown to be from North Carolina, change to Alaska		Changed.	IGP
8		MCACES – sub contractor is shown to do concrete work, change to landscaping		Changed.	IGP
9		MCACES – the job office overhead of 4.54% is way too low. This should be much higher especially since mob/demob is included. Review assumptions.		JOOH calculation revised.	IGP
10		MCACES – the weighted profit seems low. Review assumptions.		Changed.	IGP
11		MCACES – there are no markups under the landscape sub contractor.		Markups added.	IGP
12		MCACES – mob/demob under the job office overhead calculation does not reflect mobilizing the overwater crews and equipment. These costs should be much higher. Review assumptions. Consider adding overwater insurance markup.		Cost of mob/demob was updated to reflect overwater crews and equipment. Overwater insurance also added.	IGP
13		MCACES – provide clarifying notes within the MCACES to inform where costs, quotes, quantities…..etc. are coming from as appropriate.		Clarifying notes added where appropriate.	IGP
14		MCACES – folder levels above the detail should display the appropriate unit cost for that item.		Appropriate unit cost added to the folder levels above the detail.	IGP
SPECIFIC					
1		MCACES – 01 Lands and Damages; provide clarifying notes within the MCACES		Notes added.	IGP
2		MCACES – 02 Relocations; add folders to separate each type of relocation, and show the cost items in order to match the quantity take-offs.		Folders added and quantities reorganized to align with MCACES WBS.	IGP
3		MCACES – 02 Relocations; what about disposal fees?		Dumping fees added.	IGP
4		MCACES – 14 Recreation Facilities; add folders to separate each type of facility, and show the cost items in order to match the quantity take-offs.		Folders added and quantities reorganized to align with MCACES WBS.	IGP

Technical Review Comments		Project: Kenai Bluff Stabilization		Location: Kenai, Alaska	
Date: 10 March 2009		Reviewer: IKE PACE	Tel: 949-250-6788	Irvine, CA	Back Check By: (initials)
Office		Type of Document: Cost Engineering Report	Discipline: Cost Engineering		
Item No.	Page/Sheet	COMMENTS		Action Taken:	By:
5		MCACES – 16 Bank Stabilization – 01 01 Site Preparation; how are costs for grading the path captured? What about disposal fees? May need to revisit the dewatering assumptions. Add folders to separate each type of construction, and show the cost items in order to match the quantity take-offs.		Costs for grading are captured under the rough grading item located under the 01 02 folder. Folders added and quantities reorganized to align with MCACES WBS.	IGP
6		MCACES – 16 Bank Stabilization – 01 02 Earthwork; What about disposal fees? Add folders to separate each type of construction, and show the cost items in order to match the quantity take-offs.		Folders added and quantities reorganized to align with MCACES WBS. Dumping fees added.	IGP
7		MCACES – 16 Bank Stabilization – 01 03 02 Armor (water based placement); Rename to be consistent with report. The water based placement shows 7-CY buckets, however the production rates in the report show 5-CY bucket, revise as appropriate. Why is the cost of the rock the same for armor, b-, and filter rock? They should be different. How are the costs for getting the rock loaded on the barge accounted for?		Renamed. Rock placement items revised. Multiple quotes were obtained from several different quarries. The quarry chosen to provide materials for this project gave a single quote for the three rock types. Costs for loading the rock from land onto a barge were added.	IGP
8		MCACES – 16 Bank Stabilization – 01 03 01 Armor (land based placement); Rename to be consistent with report. Why is there only one production rate for the different types of rock? Why is the cost of the rock the same for armor, b-, and filter rock? They should be different. Where did the costs for getting the rock hauled in come from? Move the filter fabric out of this folder as it applies to both types of placement.		Core rock changed to filter rock. Armor (land based placement); Renamed to be consistent with report. More production rates added for the different types of rock. Multiple quotes were obtained from several different quarries. The quarry chosen to provide materials for this project gave a single quote for the three rock types. The costs for getting the rock hauled in came from Girdwood. Filter fabric moved out of this folder.	IGP
9		MCACES – 16 Bank Stabilization – 01 04 Vegetation; Where did the quantity of trees come from? Provide calculations in Appendix B. Add folders to separate each type of construction, and show the cost items in order to match the quantity take-offs.		Tree quantities provided by designer. Quantities added to overall quantity summary.	IGP
10		MCACES – 30 PED; provide clarifying notes within the MCACES		Clarifying notes added.	IGP
11		MCACES – 31 CM; provide clarifying notes within the MCACES		Clarifying notes added.	IGP

Technical Review Comments		Project: Kenai Bluff Stabilization		Location: Kenai, Alaska	
Date: March 17, 2009		Reviewer: Bob Hall	Tel: (213) 327-0800		Back Check By: (initials)
Office Los Angeles		Type of Document Design Report	Discipline Civil/Geotech		
Item No.	Page/Sheet	COMMENTS		Action Taken:	By:
GENERAL					
1	General	The interface between the alluvium and the glacial till has a significant volume of water exiting the slope. Without providing a means to control the outflow from the slope, I would think that the water would erode the bottom surface of the alluvium and eventually undermine it, causing additional collapses in the future.		Discharge from the interface is captured under a filter layer of granular material. The gradation of the filter material and the filter fabric are designed to prevent piping. Benching/scarifying along the exposed overexcavated slope face prevents flow along the interface. Added discussion of additional testing recommendations and tighter gradation standards to Section 5.1, Appendix C, and Typical Section Plate C-11 in Attachment I.	BH
2	General	The established equilibrium slope of 1 on 1.5 for the alluvium seems steep compared with other dam, levee, and natural stream slopes I have designed.		The 1:1.5 slope is the maximum allowable side slope based on the geotechnical investigations report. The draft design slope for the alluvium is cut back to a milder slope of 2:1. A 1.5:1 slope is proposed for the till layer and the filter layer. Geogrid is included in the filter layer to provide additional slope stability, particularly during construction. Further discussion added to Section 5.3 and notes on Typical Section Plate C-11 in Attachment I.	BH

Technical Review Comments		Project: Kenai Bluff Stabilization		Location: Kenai, Alaska	
Date: March 17, 2009		Reviewer: Harry Gibbons	Tel: (206) 728-9655		Back Check By: (initials)
Office Seattle		Type of Document Design Report	Discipline Environmental		
Item No.	Page/Sheet	COMMENTS		Action Taken:	By:
GENERAL					
1	General	The existing environmental conditions and proposed environmental impacts lack sufficient detail for a typical design report.		Baseline environmental data are cited from the Corps 2006 environmental appendix. Any additional required environmental work would be determined/scoped following a decision of EA vs. EIS. Report sections are intended to be placeholders for tabulation of existing available data and insertion of future data.	HG

Technical Development Comments		**Project: Kenai Bluff Stabilization**		**Location: Kenai, Alaska**	
Date: March 17, 2009					**Team Member: David Broadfoot, John Oliver, David Bohman, Rick Waddell, Yen-Hsu Chen**
Office **Various**		**Type of Document** **Design Report**	**Discipline** **Various**		
Item No.	Page/Sheet	**COMMENTS**		Action Taken:	Comment By:
GENERAL					
1	General	The existing environmental conditions and proposed environmental impacts lack sufficient detail for a typical design report.		Baseline environmental data are cited from the Corps 2006 environmental appendix. Any additional required environmental work would be determined/scoped following a decision of EA vs. EIS. Report sections are intended to be placeholders for tabulation of existing available data and insertion of future data.	DB
2	2.11	The report says water quality data are being collected in the project area but we don't report what they are. Can we add a table or draw some conclusions as to the existing water quality.		Compilation as well as analysis of environmental data documenting the existing condition may be included in future project phases.	DB
3	2.12	Aquatic Habitat and Wetlands section also describes riparian and upland habitat. Suggest renaming the section		Section renamed.	DB
4	2.13	List invertebrate species		Species listed	DB
5	3.14	Environmental constraints listed are actually design criteria		Added project construction windows and other constraints	DB
6	G-4	Add stationing, N/E, Delta Tangent to survey control table		Details added to table	YHC
7	G-5	Temporary crossing over Ryan's Creek may require conditions/limitations by environmental agencies		Notes added	YHC
8	C-1 to C-7	Make each construction note unique and identical on all sheets. All constructed items need to be listed/associated with a construction note number.		Notes revised	YHC
9	C-1 to C-7	How does the swale drain? The flow line of the swale is controlled by the FG.		Flow line added	YHC
10	C-11	Add swale and berm details		Details added	YHC

Technical Development Comments		Project: Kenai Bluff Stabilization		Location: Kenai, Alaska	
Date: March 17, 2009					Team Member: David Broadfoot, John Oliver, David Bohman, Rick Waddell, Yen-Hsu Chen
Office Various		Type of Document Design Report	Discipline Various		
Item No.	Page/Sheet	COMMENTS		Action Taken:	Comment By:
11	C-11	Will this slope be stable? Is piping a concern?		The 1:1.5 slope is the maximum allowable side slope based on the geotechnical investigations report. The draft design slope for the alluvium is cut back to a milder slope of 2:1. A 1.5:1 slope is proposed for the till layer and the filter layer. Geogrid is included in the filter layer to provide additional slope stability, particularly during construction. The gradation of the filter material and the filter fabric are designed to prevent piping. Benching/scarifying along the exposed overexcavated slope face prevents flow along the interface. Added notes to Typical Section Plate C-11 in Attachment I.	YHC
12	C-13	Add rip rap gradation. Check hydraulics.		Gradation added. Hydraulic calculations added to Attachment E.	YHC
13	Plans	Markup changes as noted in ITR plan set		CAD changes made as suggested	YHC
14	C-1 to C-7	Infiltration basins at the top of the bluff are too close to the edge. May surcharge groundwater and cause soil piping.		Lining added to basins and swale ditches to prevent infiltration while allowing pollutant settling and filtration	JO
15	Attachment E	Hydraulic conductivity of the reworked and compacted alluvial material as the filter layer is uncertain		Physical testing recommendations added	DB/RW
16	Attachment E	The percentage of fines in the existing alluvial material may cause clogging, and the damming effect would lead to an increase in pore pressure in the bluff		Screening/sieving/sorting requirements added to specifications to remove fines from the deepest portion of the filter layer	DB/RW
17	Attachment E	The recommended grain size distribution in Table E-4 presents too large of a range, which could cause damming with a high percentage of fines or piping with a high percentage of coarse material		Sorting requirements added to provide layering of soils within the filter layer. Gravels would be precluded from use in the lowest layer.	DB/RW

Technical Review Comments		Project: Kenai Bluff Stabilization		Location: Kenai, Alaska	
Date: June 15, 2011		Reviewer: Yen-Hsu Chen	Tel: (949) 809-5000		Back Check By: (initials)
Office Irvine - CA		Type of Document Plans & Report	Discipline Civil/Geotech		
Item No.	Page/Sheet	COMMENTS		Action Taken:	By:
GENERAL					
1	Sht 1	The graph in the lower right corner is not legible		Increased image resolution	YHC
2	Sht 3	Abbreviation – Revise “Elev” to “EL.” and add “GB – Grade Break”		Changed as recommended	YHC
3	Sht 4	Most of sheet is not legible due to font and line weight.		Changed text size and weight to improve legibility	YHC
4	Sht 5	The parcel numbers are not legible. The left vertical line in the table is missing.		Changed text size and added table border line	YHC
5	Sht 6	The downstream closure is missing		Closed shape	YHC
6	Sht 7	The downstream closure of the upstream embankment is missing. The “Grading Limit” is pointed to the wrong location.		Closed shape and corrected leader line	YHC
7	Sht 8	Plan – It appears “Prop Reg High Tide” and “Prop Reg High Water” are reversed? Applicable to all sheets.		Changed as recommended	YHC
8	Sht 8	Plan – Rev Note 1 as “Construct Swale Ditch Per Det 1/C-11” Applicable to all sheets.		Changed as recommended	YHC
9	Sht 8	Plan – Rev Note 2 as “Construct Earthen Berm Per Det 1/C-11”. Applicable to all sheets.		Changed as recommended	YHC
10	Sht 8	Profile – Show STA/EL at downstream end of improvement		Changed as recommended	YHC
11	Sht 8	Profile – How to drain LP at Sta 3+00?		Additional culvert installation	YHC
12	Sht 8	Profile – Indicate “GB” at Sta 4+18.		Changed as recommended	YHC
13	Sht 8	Profile – Rev “ELEV=65’” to “EL. 65’”. Applicable to all sheets.		Changed as recommended	YHC
14	Sht 8	Profile – Provide STA/EL at all GB of the excavation and toe of armored rock.		Toe excavation will be to minimum depths below existing ground, with elevations to be confirmed by preconstruction survey.	YHC
15	Sht 9	Plan – Indicator of ‘gate’ and ‘CMP Connection’ appears to be wrong.		Changed as recommended	YHC
16	Sht 9	Plan – Show security fence along edge of swale.		Changed as recommended	YHC
17	Sht 9	Plan - Add construction note for ‘Security Fence’. Applicable to all sheets.		Changed as recommended	YHC
18	Sht 9	Profile – Correct water surface indicator of ‘Design Wave + Runup + Surge’. Applicable to all sheet.		Corrected to match design report	YHC
19	Sht 10	Plan – Zone A to Zone B shown is wrong. How is the transition taking place? Need to show dimensional changes.		Corrected stationing for the transition	YHC
20	Sht 10	Plan - Indicator of ‘Security Fence’ pointed to wrong location.		Changed as recommended	YHC
21	Sht 11	Plan – Rev ‘Rip Rap’ to “Riprap’		Changed as recommended	YHC
22	Sht 12	Plan – Indicate the end of improvement		Changed as recommended	YHC
23	Sht 12	Profile – Add ‘GB’ at Sta 34+75		Changed as recommended	YHC
24	Sht 12	Profile – Rev dashed lines to solid lines.		Changed as recommended	YHC
25	Sht 13	Plan – Portions of topo and proposed works are missing on the left side.		Changed as recommended	YHC
26	Sht 14	Plan – Missing lines for the Prop Reg High Tide and High Water.		Changed as recommended	YHC
27	Sht 14	Plan – Rev ‘Rip Rap’ to ‘Riprap’		Changed as recommended	YHC

Technical Review Comments		**Project: Kenai Bluff Stabilization**		**Location: Kenai, Alaska**	
Date: June 15, 2011		**Reviewer: Yen-Hsu Chen**	**Tel: (949) 809-5000**		Back Check By: (initials)
Office **Irvine - CA**		**Type of Document** **Plans & Report**	**Discipline** **Civil/Geotech**		
Item No.	Page/Sheet	**COMMENTS**		Action Taken:	By:
28	Sht 14	Profile – Add 'GB' at Sta 65+12		Changed as recommended	YHC
29	Sht 15	Add Note on Sht 17 to this sht.		Changed as recommended	YHC
30	Sht 16	Add Note on Sht 17 to this sht.		Changed as recommended	YHC
31	Sht 18	Swale – extend geomembrane to surface		Changed as recommended	YHC
32	Sht 18	Berm – The top of bluff is as much as 5' higher than the prop swale. Is the berm suppose to be 5' high and to the right of swale? Or is there another berm or grading in the 20'easement left of the swale? Either way, the 12' perm access or the 20' easement will be reduced.		Top of bluff will be regraded for use as haul road during construction and the haul road will likely extend well into the temporary 20' easement to the left of the swale.	YHC
33	Sht 18	Rev Sta 2+00 to Sta 2+10		Changed as recommended	YHC
34	Sht 19	Delete notes regarding 'Factor of Safety'.		Changed as recommended	YHC
35	Sht 19	Rev B rock layer thickness for 1.7' to 1.8'to make to overall dimension thickness to 15'.		Changed as recommended	YHC
36	Sht 22	The downstream terminus of embankment is not the same as civil drawing.		Adjusted terminus for consistency	YHC
1	Table 1	Rev B Layer thickness to 1.8 feet		Changed as recommended	YHC
2	Sht 19	Delete noted regarding 'Factor of Safety'		Changed as recommended	YHC
3	Sht 19	Rev B Layer thickness to 1.8 feet		Changed as recommended	YHC

ATTACHMENT K

TRIP REPORTS AND MEETING MINUTES

Meeting Minutes
Kenai Bluff Stabilization Design Alternatives

Meeting Date:	4/30/2008
Meeting Time:	10:00 am – 11:30 am
Meeting Place:	Corps Office
Meeting Purpose:	Review Project Status
Attendees:	Ken Eisses and Dee Ginter, Hydraulics, Chuck Wilson and John Rajek, Geotechnical, Dave Martinson, Project Management, and Pat Fitzgerald, Planning Bob Pintner and Pete Hardcastle, R&M, Krey Price, Tetra Tech, John Oliver, John Oliver Consulting (via teleconference)

Background:

- Purpose of meeting is to work through outstanding design issues and arrive at an agreement on a typical section to recommend in the alternatives report.
- Reviewed action items from 12/13/2007 meeting. Action items included Tetra Tech responding to questions and concerns regarding drainage, plantings, and slope stability.
- Agenda for meeting is based on the 4/4/2008 memo by Tetra Tech responding to questions and concerns.

Agenda Items/Action Items:

- *Drainage*. All team members prefer to route any runoff currently draining over the bluff face to the City storm drain network if possible. Second choice would be infiltration. Third choice would be rock ditch. Pipe option will not be carried forward due to potential safety and maintenance concerns. Krey will send a memo with modeling results once the drainage area delineations and rainfall-runoff computations are completed.
- *Planting*. All team members agreed with a long-term, phased approach to the plantings. Krey will forward the current planting plan to Pat for distribution to interested team members. Any comments or recommendations regarding the plantings will be coordinated with Stoney Wright of the Alaska Plant Materials Center.
- *Slope Stability*. Bob and Pete mentioned that the available geotechnical data continue to support the stability of the proposed 1.5H:1V slope.
- *Reference Sites*. Pete mentioned the presence of winter aufeis on the naturally vegetated slopes in the Ryans Creek and Cemetery Creek areas. Ken expressed concern that no additional field work was completed to verify groundwater conditions. Krey mentioned that, although the presence of groundwater is indicative of a similar process, the quantity of groundwater discharge per lineal foot in these areas is likely less than along the exposed bluff face due to the overall topography of the area. Bob and Pete thought that the effort involved in quantifying discharge to any reasonable degree of certainty would be too cumbersome to be practical.
- *Dewatering Scheme*. Krey summarized the currently favored dewatering scheme, which involves preventing flows from surfacing by placing a layer of granular material over the

till where applicable. After some discussion, all team members agreed to carry this alternative forward as a preliminary recommendation to the agencies rather than revisiting a structural solution involving drainage pipes or pumps.

- *Frost depth*. John asked if anyone could estimate the frost depth. Bob and Pete estimated depths ranging from 3 to 7 feet. Krey proposed increasing the minimum thickness of the sandy layer over the till to accommodate the maximum frost depth.
- *Bench*. Krey brought up the bench concept proposed by PND in 2000. In that scenario, the bench was to be located below the lag gravel in order to collect groundwater emerging from the bluff face. In the revised concept, we would locate the bench above the lag gravel and construct the bench with granular fill material to provide additional conveyance area for groundwater.
- *Adaptive Maintenance*. Krey mentioned that one of the risks of a less structural dewatering scheme is the potential need for localized patching with a shotrock mattress following construction, most likely a year or so following construction. This approach may cause some concerns related to public perception of failures or contracting. Dave felt those issues could be worked around.
- *Maintenance*. The bench would provide an additional contingency against localized groundwater percolation and would reduce the potential need; however, the need may not be entirely eliminated and the bench would provide for future maintenance access to the slope. The top of the rock armor layer would not present a drivable surface.
- *Overland Flow*. Krey mentioned that many jurisdictions do not allow a continuous slope without intermittent terracing. The bench would interrupt surface flow that otherwise would increase down the slope. Surface drainage collected along the bench would still have to be worked out.
- *Fabric*. Bob mentioned several alternative seed-embedded matting products. Krey will take a look at the product specifications and run them by Stoney Wright as applicable.
- *Armor Sublayer*. Dee mentioned concerns about the sublayer shown in the typical section. John agreed that the sublayer ought to be extended below the armor layer throughout the section. John also recommended trenching the toe if possible from a geotechnical standpoint. Bob and Pete agreed that it should be possible, and in areas with refusal, the same quantity of rock that would otherwise be buried could be used as a weighted toe.
- *Demonstration Section*. Krey asked whether a demonstration section would be feasible if partial construction funding were received. Dave did not think that warranted inclusion in the report.
- *Rock Armoring*. Krey asked if there were any other concerns or recommendations regarding the use of rock at the toe of the slope (versus alternative materials). No concerns were raised.
- *Schedule*. Krey reviewed the potential schedule, which would involve finalizing the alternatives report with the decisions made at this meeting during May, allowing the Corps several weeks to review, and presenting the report at an agency meeting in June. By that time, the updated topography would be available, and assuming agency concerns regarding the typical section are addressed, the detailed design showing the overall project footpring would begin at that point.

Meeting Minutes
Kenai Bluff Stabilization Design Alternatives

Meeting Date:	12/13/2007
Meeting Time:	11:00 am – 12:00 pm
Meeting Place:	City Manager's Office
Meeting Purpose:	Prep for Agency/Public Meeting
Attendees:	Rick Koch, City Manager Pat Porter, Mayor Krey, Pat, Chris, Lizette, Bob

Agenda Items/Action Items:

- Discussed progress on alternative development, cost estimates, layouts and typical sections.
- Discussed revetment material (biostabilization vs. rock vs. sheetpile). Rick is ok with selection of rock over alternative materials.
- Discussed revetment location. Rick does not favor a detached breakwater.
- Discussed cut and fill balance. Rick agreed that a balanced alternative is most efficient on the whole, so long as attempts are made to preserve some areas near the toe (near Cemetery Creek, for example) that will require more cut and some areas with critical parcels/infrastructure at the top of bluff, requiring more fill.
- Discussed seismic concerns. Rick noted that recent seismic design criteria were developed for a local Wal-Mart design. Rick also mentioned that to his knowledge, there were no catastrophic failures along the bluff during the 1964 earthquake.
- Rick mentioned the existence of a tidelands survey map showing the original platting. Krey will request the tidelands survey data from Rick.
- Discussed project status, funding, and other concerns.

Meeting Date:	12/13/2007
Meeting Time:	1:00 pm – 4:00 pm
Meeting Place:	Aquaculture Center
Meeting Purpose:	Agency Meeting
Attendees:	See attendee list

Agenda Items/Action Items:

- Pat opened the meeting and described the project.
- Rick discussed the history of the project and previous community involvement.
- Krey described the features of alternatives currently under consideration

- Discussed revetment material (biostabilization vs. rock vs. sheetpile). Agencies were ok with selection of rock over alternative materials. Krey discussed geotubes and other bank stabilization alternatives that have not been tried and tested at this scale in the region.
- Discussed revetment location. Agencies agreed that the potential hazards of landslides behind a detached revetment justify dismissing the alternative.
- Discussed using excavated till material to smooth the foreslope toe of the revetment. Agencies anticipate some concerns if this is used solely as waste material. Any material disposed at the toe must have a functional, long-term purpose.
- Discussed coastal trail component. According to comments, previous objections were not to a trail in general, but to the size of the trail. A smaller trail for birdwatching was recommended. Krey mentioned that the trail could be placed on the bench previously proposed in the PND concept design. Aesthetic fencing would be required in conjunction with any trail alternative. The trail could perhaps be constructed at a lower cost on an earthen bench (higher elevation) than on the armor rock, since the armor rock contains large voids that would require filling with well-graded material and subsequent compaction.
- Bob discussed the consistency of the till material. Till material is not suitable for use behind the revetment. If the amount of excavated till material is small, mixing the till with the alluvial material in small percentages may be acceptable. If more alluvial material is required, the upper layer could be cut back to a milder slope than 1.5H:1V to generate sufficient fill material.
- Discussed revegetation plan. Agreed that all alternatives will have a revegetation component consisting of spruce, alder, and willows.
- Some agencies commented that the environmental data presented would not support an EIS. Corps agreed, since a preferred design would be required first.
- Agencies requested determination of path (EA vs EIS) up front, with coordination between Corps Planning and Regulatory occurring as early as possible.
- No comments or concerns were raised regarding the baseline data in the Corps technical report or the conclusions of the report regarding impacts.
- The project as a whole seemed to have the support of the agencies, so long as concerns continue to be addressed.

Meeting Date:	12/13/2007
Meeting Time:	6:30 pm – 8:00 pm
Meeting Place:	City Hall
Meeting Purpose:	Agency Meeting
Attendees:	City Council
	Public (landowners)
	Krey, Pat, Chris, Lizette, Bob

Agenda Items/Action Items:

- Summary of project presented by Rick Koch
- Current status, funding, and opportunities for public involvement were discussed by Pat.
- Landowners and council members wanted to know about the future schedule for the project, how much money had been spent to date, and how many more studies would be required before a project is built.
- One landowner expressed geotechnical concerns with slippage and seepage along the interface between the till and the alluvial fill material. Bob mentioned that benching would be integrated into the construction sequence and discussed the overall slope stability.
- Individual questions were raised to the team members during the work session.

Meeting Date:	12/14/2007
Meeting Time:	10:00 am – 11:00 am
Meeting Place:	Corps Office
Meeting Purpose:	Review Project Status
Attendees:	Krey Price, Tetra Tech
	Corps HH, Geotech, Planning Staff

Agenda Items/Action Items:

- Discussed current status of alternatives and results of 12/13 meetings.
- Discussed revetment material (biostabilization vs. rock vs. sheetpile). Geotech and H/H staff are ok with selection of rock.
- Ken expressed concern regarding overland drainage. Krey mentioned that a detailed drainage analysis will be conducted after receipt of updated topo. The overland drainage from a design rainfall event is likely to result in higher surface runoff than discharge from the bluff.
- Ken and Dierdre expressed concerns regarding the establishment and survivability of vegetation. Ken suggested using several planting schemes rather than putting all eggs into one basket. Tetra Tech will coordinate the proposed planting plan with Stoney Wright of the Alaska Plant Materials Center and document monitoring results for reference sites.
- Ken expressed concern over using Ryans Creek and Cemetery Creek bluff as models for the main part of the bluff. Geotech staff from R&M will finalize results and interpretations of monitoring data. Comparison of conditions between the bluff and creek areas will be expanded in the discussion. A meeting with Krey, R&M geotech staff, and Corps geotech and H/H staff will be facilitated after completion of geotech recommendations. Anticipated time for the meeting would be February or March.

Meeting Minutes
Kenai Bluff Stabilization Design Alternatives

Date of Meeting:	August 24, 2007
Location of Meeting:	Kenai City Hall, Manager's Office Conference Room
Project No.:	T19229
Project Name:	Kenai Bluff Erosion Design Alternatives
Subject:	Review of draft alternatives and proposed schedule
In Attendance:	Rick Koch, City of Kenai, rkoch@ci.kenai.ak.us
	Keith Kornelis, City of Kenai, kkornelis@ci.kena.ak.us
	Pat Fitzgerald, Corps of Engineers, Patrick.S.Fitzgerald@poa02.usace.army.mil
	Dave Martinson, Corps of Engineers, David.A.Martinson@poa02.usace.army.mil
	Krey Price, Tetra Tech, krey.price@tetratech.com
Minutes Prepared by:	Krey Price and Dave Martinson

AGENDA ITEMS	ACTION
Report distribution and review	✓
Funding issues	✓
Upcoming schedule	✓

The goal of this meeting was to present the preliminary alternatives currently under consideration to the City of Kenai, update the City on the current project status and schedule, receive input on the alternatives, and address issues related to project funding.

Krey presented a summary of the current geotechnical investigations and the draft report, which was provided to the City in hard copy at the meeting. The summary of the report focused on the design criteria and some preliminary alternatives that were being developed. Following are some items of discussion regarding the report:

Existing Condition

The existing conditions chapter of the report currently includes placeholders in some of the sections. Krey mentioned that any additional information provided to him by the City or the Corps prior to the next submittal will be incorporated.

Design Criteria

Rick suggested adding seismic design criteria. Krey will review seismic design criteria with geotechnical engineers and incorporate the recommendations into the next draft of the report. The report should include an earthquake impact analysis that addresses how an earthquake would impact the project and what the expected danger or risk would be if the project were to fail. The question of whether to design for a specific earthquake will be addressed during further discussions.

Rick asked about the design criteria regarding glaciation, i.e. what design considerations are needed to handle freezing and thawing of the seepage and are we considering ice forces from the river. Krey answered that ice design will be included with the armor calculations and that some ongoing maintenance of surface drainage ditches might be anticipated.

Alternatives

The detached breakwater alternative was presented to the City. The City prefers the original design (armored toe as a revetment) rather than the detached breakwater because the detached breakwater would require more rock and increase the shoreline impacts by extending the project footprint further toward the river.

Krey also presented options for the overall cut-fill balance. Three options are currently being considered: balancing the cuts and fills along the entire project length, cutting more from the senior center area for use as fill material in the downtown area, and cutting more in the downtown area to use as fill for the senior center area. Rick indicated a preference for the balanced approach.

Design Issues

Maintenance issues were raised, including the need to consider the maintenance requirements of the different alternatives, weighing the cost of maintenance vs. initial construction costs. Rick made several suggestions related to access. The need for a permanent maintenance easement (approximately 15’ wide) along the top of the bluff was discussed. Fencing and access control will be critical for the landowners along the top of the bluff. Set back ordinances (accounting for seismic concerns) should be enforced with any new permitted development.

Another design thought was considering if there were properties that needed to be protected in place, restricting the alternatives that were being proposed. Rick was going to provide this information during his review of the draft document. Rick indicated he would try to have comments back to us by the 31st of August.

Dave noted that the draft report that Krey provided should be sent to Lorraine Cordova for her to review and to help in her Econ evaluation. We might also consider how or if an Econ section should be incorporated into the Tetra Tech document.

Schedule

The proposed schedule for the study was also discussed. A meeting with stakeholders was suggested for the week of September 24-28. The meeting would be held in Kenai. The Challenger Learning Center was suggested by Rick as a potential venue. Pat and Rick will look into setting that up. The meeting would present the alternatives being proposed along with a preliminary recommendation. Krey will put together the presentation. The meeting would also be open to the community. Comment cards for the public may be provided in lieu of a Q&A meeting. Krey will provide a Draft Alternative Report in time for the Corps to have one week review and the agencies to have one week to review prior to the meeting.

Rick mentioned rock sources and there was some discussion on rock availability and how that would impact design costs and alternative selection. Rick provided Krey with recommendations for earthwork and coastal contractors. Rick asked about authorization language for the project. Dave agreed to provide some information on suggestions for getting the project authorized, which was completed the following week.

Following the meeting, Krey, Pat, and Dave walked the top and toe of the bluff, collecting GPS points, water measurements, and visual observations. Prior to the meeting, Krey, Pat, and Dave met in the field with Bob Scher of R&M to discuss groundwater data collection efforts and to pull the transducer data.

Meeting Minutes
Kenai Bluff Stabilization Design Alternatives

TUESDAY, MARCH 14, 2006

Project Team meeting, Alaska District offices

Attendees:

Pat Fitzgerald	Corps
Dave Martinson	Corps
Deirdre Ginter	Corps
Margan Grover	Corps
Chris Hoffman	Corps
Chuck Wilson	Corps
Krey Price	Tetra Tech
Dave Broadfoot	Tetra Tech

Meeting Summary:

The Corps summarized the project history. Results and recommendations from previous studies were presented, including initial assessment studies conducted in 1982 and subsequent analyses, conceptual designs, and environmental studies conducted since 2000. An ongoing study by the Corps has been reviewed at the draft level and is awaiting a final backcheck of responses. The Corps anticipates finalizing the "Draft Kenai Bluff Erosion Technical Report" in the next month.

The 2002 PND concept study was discussed, particularly in regard to its level of detail. The study did not have funding to address agency comments or incorporate supporting engineering studies.

Allocation of the current Corps funding was discussed. The Corps is hoping that the current $500,000 allocation will cover all of Phase I and the portions of Phase II that will be completed during the current fiscal year.

The Corps emphasized that Tetra Tech should focus on design issues. Less emphasis should be placed on determining/verifying historical bank erosion rates and estimating the relative contribution of coastal, riverine, and hydrogeological impacts on the erosion rate. The study should focus on determining a viable solution that will be designed to accommodate all erosive forces.

Hard copies and digital files of additional existing information, including maps, aerial photographs, and previous erosion studies were provided to Tetra Tech after the meeting. A bibliography of acquired materials (including reports provided to Tetra Tech by the Corps prior to the meeting) will be included in the work plan.

WEDNESDAY, MARCH 15, 2006

Meeting #1: Introductory Meeting with City of Kenai Public Works Director, City Hall

Attendees:

Keith Kornelis	City of Kenai
Pat Fitzgerald	Corps
Dave Martinson	Corps
Dierdre Ginter	Corps
Chuck Wilson	Corps
Dave Broadfoot	Tetra Tech
Rick Waddell	Tetra Tech
Krey Price	Tetra Tech

Meeting Summary:

The project team met briefly in the City of Kenai City Hall to review the project history with City of Kenai Public Works Director Keith Kornelis. Aerial photos of the bluff provided by Keith were examined and discussed. One of the aerials included a GIS layer showing property boundaries.

Keith indicated the following during the discussion with the project team:

- There are few if any septic systems in current usage. If a building is within 100 ft of a sewage line, sewage from the building must be discharged to the sanitary sewer system.
- Few water meters are used, so there is no way to perform mass-balance calculations for the water system.
- Keith does not believe that the water or sewer systems can be the main source of the water discharging from the bluff.
- Keith provided paper copies of GIS maps that show the water and sewer lines. He indicated that the sewage map was out of date. Some lines shown on the map at the western end of the bluff are no longer part of the system.
- Water and sewer lines are generally buried to a depth of 10 feet. In some areas, this is below the water table.
- Management of surface water is the responsibility of AK DOT-PF in conjunction with the Kenai Spur. There does not appear to be any management of surface water flow between the Kenai Spur and the bluff.

- The city will provide copies of photographs showing the bluff. Of particular interest are older photos of the old town area, and of another bluff that is west of town and facing the Cook Inlet. The city will also share any GIS layers they can with the project team.

- Keith believes the property boundaries extending out into the Kenai River shown on the plat overlay are indicative of the previous location of the bluff when the plats were defined, although some of the U.S. government plats may have extended beneath the river rather than the river's edge.

Project Site Visit, Kenai Bluff

The project team, accompanied by Public Works Manager Keith Kornelis, visited the Kenai Bluff project site at low tide (~+2' MLLW) in the vicinity of the Coast Guard signal station at the east end of the Kenai Dunes recreation area. The face of the bluff was exposed, and snow and ice covered the bench at the bluff base. Members of the project team (Chuck Wilson, Deirdre Ginter, Rick Waddell, and Krey Price) walked along the base of the bluff from Cemetery Creek to the mouth of Ryan's Creek near the Senior Citizens Center to make closer observations of the bluff.

The following observations were made by the group that walked along the bench at the bluff face:

- The clay layer appeared wet between the interface with the overlying sandy layer down to the bench. There was no visible discharge from the sandy layer, but the there was discharge from the clay immediately below.

- At the west end of the bluff, sandy material had apparently been dumped over the edge of the bluff, covering up the natural stratigraphy. It was presumed that the clay layer that was covered up by this sandy material was wet.

- The clay layer also contains sandy layers within it. These sandy layers will probably be important in efforts to reduce pore pressures in the clay layer.

- Erosion along the bluff face was actively occurring through several processes. The effects of slumping were observed in some areas. Direct erosion by water discharging from the clay layer was observed, as was debris flow. In one area, dry sand was observed flowing across the interface between the (upper) sandy and (lower) clay layers. Numerous areas that had experienced piping within the clay were seen; some of these were dry, but others were actively flowing. A flowing piping area in the sandy layer was also observed. Small gravel to cobble sized particles also were observed to occasionally fall from the face of the bluff.

- There was a notable absence of accumulated sediment at the base of the bluff, indicating that removal of sediment by surface water is occurring periodically.

- In some areas iron staining was observed along the interface of the sandy and clay layers. Also, in one area, where it appeared that calving from the bluff had recently occurred along a plane of weakness or fracture striking approximately parallel to the face, iron stains were present over approximately half of the fracture length.

Meeting #2: Meeting with Kenai City Manager, City Hall

Attendees:

Keith Kornelis	City of Kenai
Rick Koch	City of Kenai
Pat Fitzgerald	Corps
Dave Martinson	Corps
Dierdre Ginter	Corps
Chuck Wilson	Corps
Dave Broadfoot	Tetra Tech
Rick Waddell	Tetra Tech
Krey Price	Tetra Tech

Meeting Summary:
The project team and Keith met briefly with City Manager Rick Koch to discuss the purposes of today's visit and meetings, and the current status of Corps activities and plans regarding the Kenai Bluffs erosion.

In response to a question by Rick Koch, the Corps discussed the schedule and anticipated level of detail for further study and designs under the current $500,000 funding allocation. The Corps also described the criteria, guidelines, and limitations of the current funding authorities the Corps can make use of for this project, and the actions that could be taken by the City to help secure adequate funding for the project.

Rick Koch offered the city's assistance with providing the project team with any supporting data available from the city. Rick requested a pre-final copy of the Draft Technical Report currently being prepared by Corps, to provide to congressional representatives when they visit the City the week of March 20th.

Rick Koch mentioned that the dip-net fishing activities along the Kenai attract 20-30,000 visitors to the bluff area each summer.

Additional Field Observations

Following the meeting with the City Manager, the team members separated into subgroups to make additional field observations and gather further data.

Group 1. Chuck Wilson, Dee Ginter, and Rick Waddell drove to and walked along the beach north of the sewage treatment plant to observe the portion of the Kenai Bluffs that face Cook Inlet. Snowy and icy conditions and time constraints prevented close observation of this area, but wet areas were observed along this bluff as well. The interface between the upper sandy layer and the underlying clay layer appeared to be at a lower elevation in this area than in the area south of the City.

This group then traveled to the cannery at the eastern end of the bluff, but did not walk along the entire stretch. The easternmost 200-300 feet were much drier than the stretch further to the west. When leaving this area, a monitoring well was noticed on the north side of the parking lot. In a subsequent discussion at the City office, Keith Kornelis indicated that there had been 2 or 3 monitoring wells installed at a former FAA site, where hydrocarbon contamination had occurred. No other monitoring wells or environmental remediation projects near the Old Town area were known.

Group 2. Krey Price met with Marylin Kebschull of the City of Kenai Planning Administration to discuss geospatial data needs. Ms. Kebschull provided a DVD with GIS layers, including infrastructure, parcel data, and background aerial photography. Tetra Tech agreed to non-disclosure clauses for the aerial imagery. Under this the project team may use the data in analyses, but may not publish the photographs, and must destroy/delete the data upon completion of the project.

Group 3. Krey joined the remaining project team members to drive to tour the historical/cultural sites in the Old Town near the top of the bluff. During this tour, this group met several residents who inquired about the project. The corps described the project, the status and plans as appropriate. In general, landowners and residents talked to viewed the project favorably.

Members of this group also observed the bluff face at high tide (~+21' MLLW) from the Scout Park and Upland Street overlooks. Tide levels were observed to be approaching the toe of the bluff in some locations.

Meeting #3: Evening Kenai City Council Meeting, Council Chambers, City Hall

The project team (except for Dee Ginter and Chuck Wilson) attended the evening City Council Meeting. The Council meeting was well publicized and well attended. Articles had appeared in the *Peninsula Clarion* describing the Corps field visit and appearance on the agenda (see Attachment 2 for the excerpts of the articles).

A presentation by the Corps was the first item on the agenda. Pat Fitzgerald and Dave Martinson addressed the City Council, described the project history, the previous studies, the purpose and objectives of today's visit and the current investigation, and the upcoming work and Corps plans to help the city with the bluff erosion problems.

The following questions were raised by City Council members and discussed by the Corps during the meeting:

- Will the design attempt to incorporate "greener" solutions? Mr. Martinson answered that previous designs were conceptual only. Rather than a single cross section as shown in the concept report, the actual design may incorporate transitions to "greener" or "softer" sections.
- Will the Coastal Trail be incorporated? Mayor Pat Porter indicated she was under the impression that it is foremost an erosion control project and that any trail functions would be the City's responsibility rather than the Corps'.
- When will the project begin? Mr. Martinson suggested that if things go smoothly, alternatives to be evaluated should be ready by this coming fall. A very optimistic prediction is that construction of the most practicable and cost-effective solution could commence as early as 2008.

No public comments were voiced during the meeting. Mayor Pat Porter thanked the team for their participation, and expressed the enthusiasm of the City to have this project implemented. She pledged the support of the council and staff in helping the Corps make this a successful endeavor.

THURSDAY, MARCH 16, 2006

Debriefing Meeting, Aspen Hotel, Soldotna

Pat Fitzgerald, Dave Martinson, Dave Broadfoot, and Krey Price held a short debriefing meeting to discuss the results of the previous day's meetings, site visit, field observations, and upcoming deliverables. It was the general observation of the team that local support for the project and Corps's participation is strong. An important specific observation made by the team was that incorporation of a trail into the project design, while desirable to the city, does not appear to be a major factor in local endorsement by the city government. The foremost issue in everyone's minds appears to be stabilization of the bluff to protect the City's infrastructure and historical resources.

PROJECT SITE VISIT PHOTOS

Looking east from Coast Guard signal

HDPE pipe outfall near Upland Street

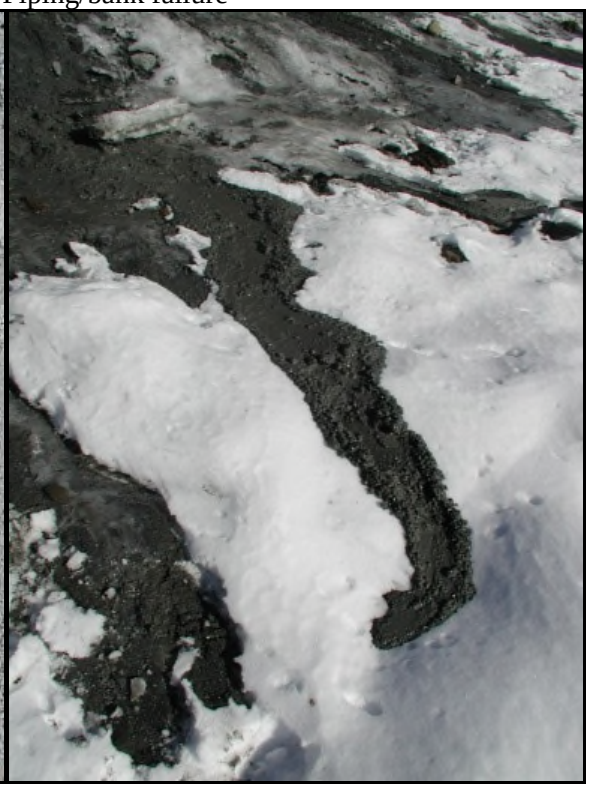
Abandoned sheet pile/tank on tide flat

Abandoned protruding PVC pipe near Bluff Street

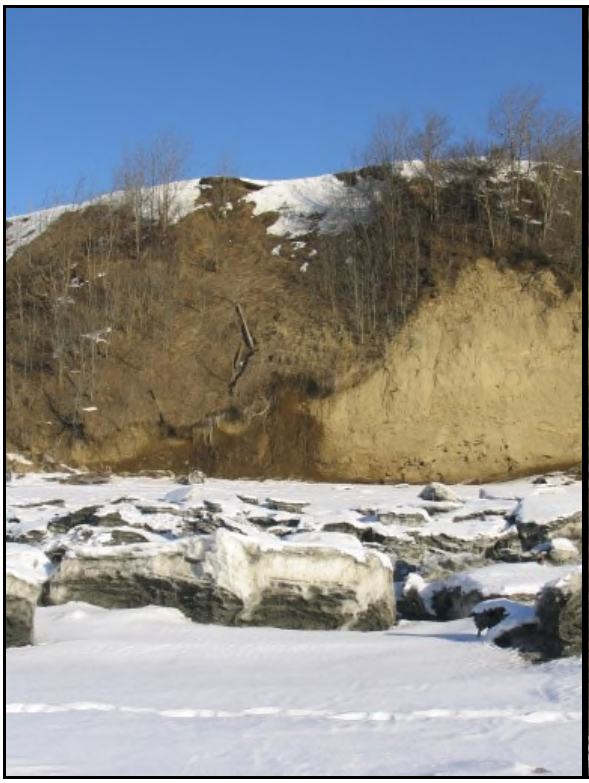
Debris and iron stains

Piping/bank failure

Piping holes near toe



Mud flow over snow



Bluff from tide flat, Cemetery Creek mouth

Near-vertical slope, no material at toe

Erosion control fabric and debris

Looking west from top of bluff at Ryan's Creek

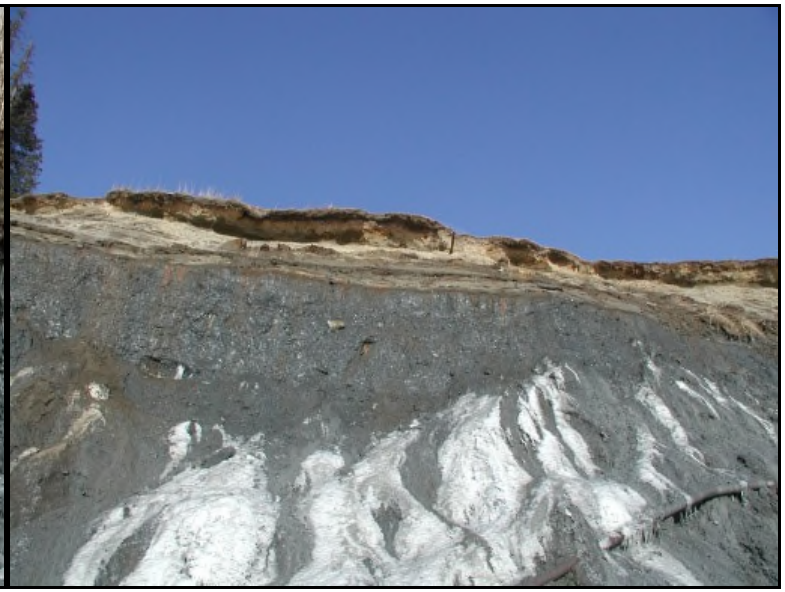
Looking west from tide flat near Cemetery Creek mouth

Looking west from tide flat near Cemetery Creek

Looking west from tide flat near Cemetery Creek mouth

Ice and seepage under topsoil

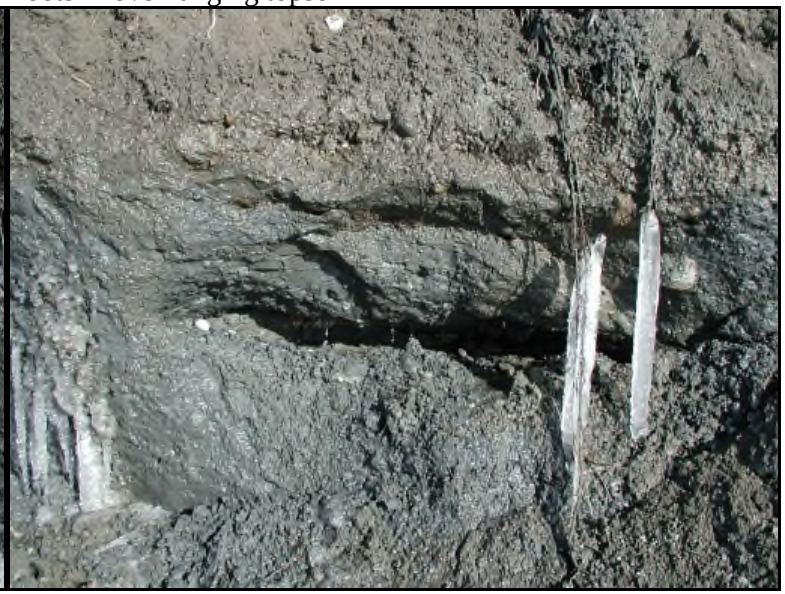
Ice on bluff face



Exposed section of buried pipe

Buried structure and debris

Roots in overhanging topsoil



Piping holes

Ice and snow on bluff face

Piping holes

Iron staining in clay layer

Asphalt debris near Willow Street

Overhanging foundation near Willow Street

Looking west from top of bluff at Willow Street

Irrigation line and sprinkler head

Looking east from top of bluff at Willow Street

Looking west from right bank of Ryan's Creek near senior center

Irrigation line and sprinkler head

Historical photo in city office - year unknown

Looking west at shoal from Coast Guard tower

Looking west at bluff from cannery

Panorama of bluff looking north from Coast Guard signal

Looking east from toe of bluff near Main Street

Overhanging topsoil and ice on bluff

PENINSULA CLARION ARTICLES

The following articles appeared in the Peninsula Clarion prior to and following the 3/15/2006 Kenai City Council meeting. An article appeared on March 15 announcing the site investigations and City Council meeting agenda, and a follow-up article appeared March 19 summarizing the proceedings of the meeting.

Peninsula Clarion, March 19, 2006.

http://peninsulaclarion.com/stories/031906/news_0319new004.shtml

Kenai boat ramp will get overhaul before dipnet season begins

By PHIL HERMANEK
Peninsula Clarion

(excerpt)

...

In other business, the council heard from Army Corps of Engineers representatives on the Kenai bluff stabilization project.

Project formulator Patrick Fitzgerald said the Corps only has funding to study environmental impacts and other issues involved with the project and the city needs to lobby for funding for the design and construction.

Project Manager Dave Martinson said preliminary scoping could begin in May or June with alternatives ready by the fall.

“If given the authority to build, the work could be done possibly in 2008,” he said.

Council member Joe Moore asked if a coastal trail is part of the Corps’ plan, and Martinson said, “We need the lead from you ... what you want.”

Mayor Pat Porter said when she was in Washington, D.C., last year, it was made clear to her that “the Corps does not do trails.”

“The main concern is bluff stabilization,” she said.

...

Peninsula Clarion, Wednesday March 15, 2006

http://peninsulaclarion.com/stories/031506/news_0315new003.shtml

Bluff work starts *Army engineers to outline studies at council tonight*

By PHIL HERMANEK
Peninsula Clarion

(excerpt) What mammals, fish and birds use the area near the Kenai bluffs?

The mouth of the Kenai River has long been important to people inhabiting the lands above. Are any archeological sites or possibly burial areas hiding below?

An Army Corps of Engineers official working on the Kenai bluff erosion project will visit the Kenai City Council meeting tonight to outline these issues and other concerns that will be studied as the city prepares to go ahead with bluff stabilization efforts.

Project formulator Patrick Fitzgerald, from the Corps' office in Anchorage, is slated to tell the council about studies that need to be completed prior to work beginning.

The studies include determining the environmental impact of the work on mammals that use the mud areas below the bluffs, fish swimming in the waters where the river meets Cook Inlet and birds that are present along the shore and the bluffs, according to Fitzgerald.

Studies also will look at potential impact on cultural resources in the area of the bluffs.

"There certainly are historic buildings on the ground above, in Kenai," Fitzgerald said.

Archeological sites also may be in the ground that have not already been determined, he said.

"Our investigation could check into issues such as burials areas," he said.

Consultants also will look into the flow of groundwater along the bluff.

"Basically the bluff is two layers," Fitzgerald said.

"The lower 30, 35 feet is real silty, like clay. The upper layer is sandy. Rainfall and snow melt percolates down through the sandy layer and then travels along the silt layer. We need to address the groundwater issue — not just wave and wind erosion," he said.

The consultants also will analyze inlet wave effects and look at designs of bluff stabilization alternatives.

The studies are expected to begin this summer.

Fitzgerald said he and the contractor were to meet with Kenai city officials this morning to walk the bluff.
…

ATTACHMENT L: HYDROGEOLOGY AND R&M GROUNDWATER MONITORING REPORT

Table L-1: 2006-2007 Groundwater Reading Summary (R&M Consultants 2008)

MW ID	TEST HOLE ID	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07
AP-608	TB-1A	21.1	22.0	22.0	21.9	22.6	22.1	22.0	21.6	21.9	22.1	22.1	21.7	22.2
AP-609	TB-1B	21.4	21.8	21.6	21.7	21.8	21.8	21.5	21.2	21.1	21.1	21.2	21.2	21.4
AP-610	TB-1C	54.4	54.5	54.4	54.3	54.3	54.3	54.3	54.2	54.2	54.2	54.2	54.2	54.3
AP-611	TB-2C	15.6	10.7	9.7	11.6	13.5	9.8	13.1	9.3	9.4	9.4	9.2	9.2	14.1
AP-612	TB-2B	53.3	39.3	39.1	39.0	38.7	38.4	38.2	38.0	38.5	38.0	37.9	37.8	37.8
AP-613	TB-2A	57.8	57.8	57.8	57.8	57.7	57.7	57.7	57.6	57.6	57.6	57.6	57.6	57.6
AP-614	TB-3A	11.0	12.9	11.8	12.8	13.8	10.4	11.7	9.4	9.4	10.4	10.1	10.2	14.1
AP-615	TB-3B	40.3	34.0	34.5	31.9	31.0	30.5	30.6	30.5	30.6	30.6	30.6	30.7	30.8
AP-616	TB-3C	56.8	56.9	56.9	56.8	56.8	56.8	56.8	56.7	56.7	56.6	56.8	56.8	56.8
AP-617	TB-4A	14.2	12.9	8.5	15.8	10.3	7.4	13.0	6.0	6.3	6.0	4.6	4.8	15.6
AP-618	TB-4B	54.9	54.8	54.6	54.3	53.9	54.1	53.8	53.8	53.6	53.5	53.4	53.6	53.1
AP-619	TB-4C	63.3	63.2	63.1	63.0	62.9	62.9	62.9	62.9	62.8	62.8	62.9	62.8	62.9
AP-620	TB-02	63.9	63.9	63.7	63.6	63.5	63.4	63.4	63.3	63.2	63.2	63.2	63.1	63.3
AP-621	TB-03	71.0	70.7	70.5	70.2	70.1	70.0	69.9	69.9	69.9	69.8	70.0	69.9	70.0
	MW-1	69.0	69.1	68.9	68.7	68.6	68.6	68.5	68.4	68.3	68.3	68.4	68.3	68.4
	MW-2	72.0	71.7	71.5	71.3	71.2	71.1	71.0	70.9	70.9	70.8	71.0	71.0	71.1
	MW-3	67.0	66.8	66.6	66.5	66.4	66.3	66.3	66.2	66.2	66.2	66.2	66.2	66.3

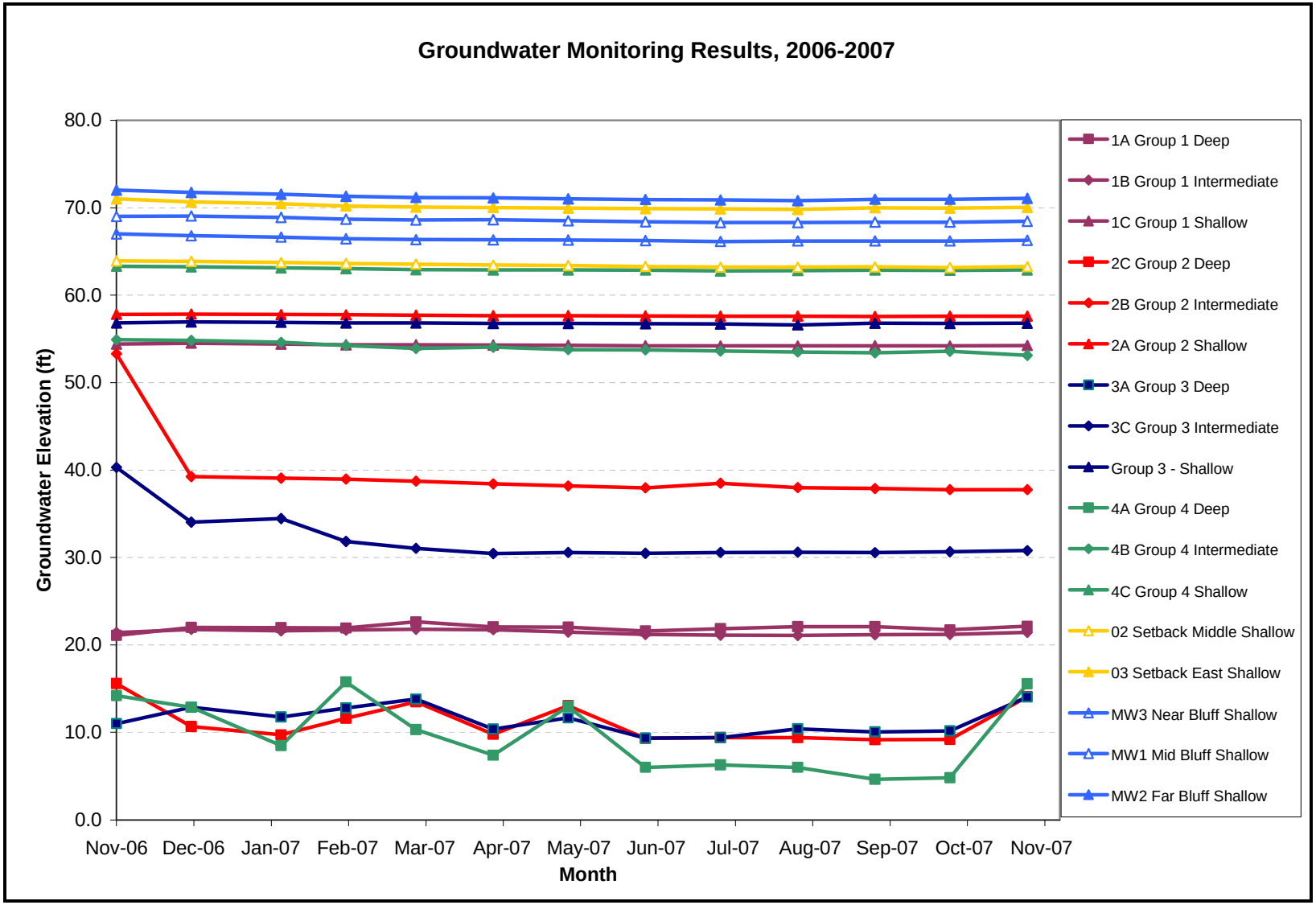


Figure L-1. Preliminary Groundwater Readings at Kenai

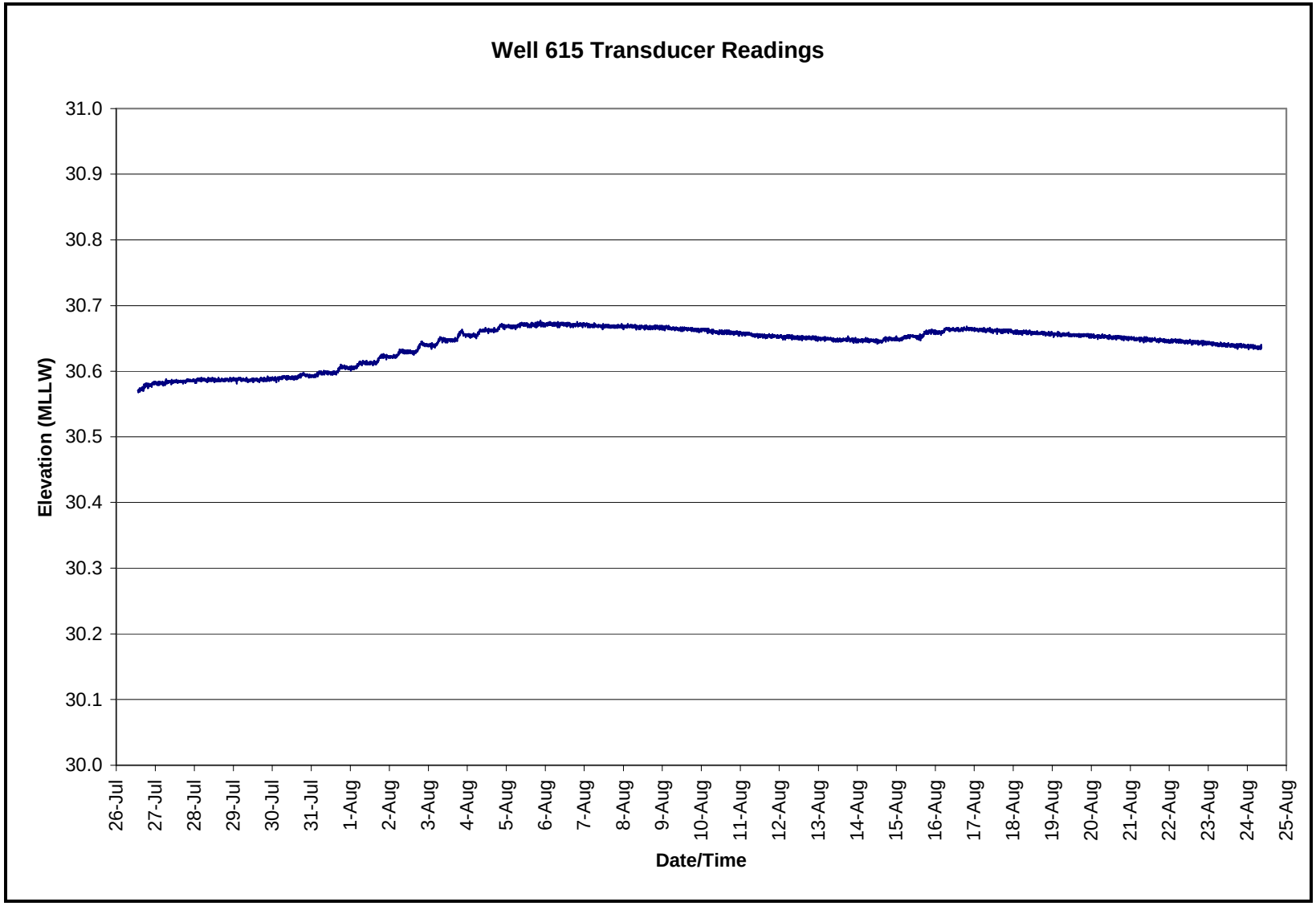


Figure L-2. August 2007 Groundwater Readings at Kenai, Intermediate Well

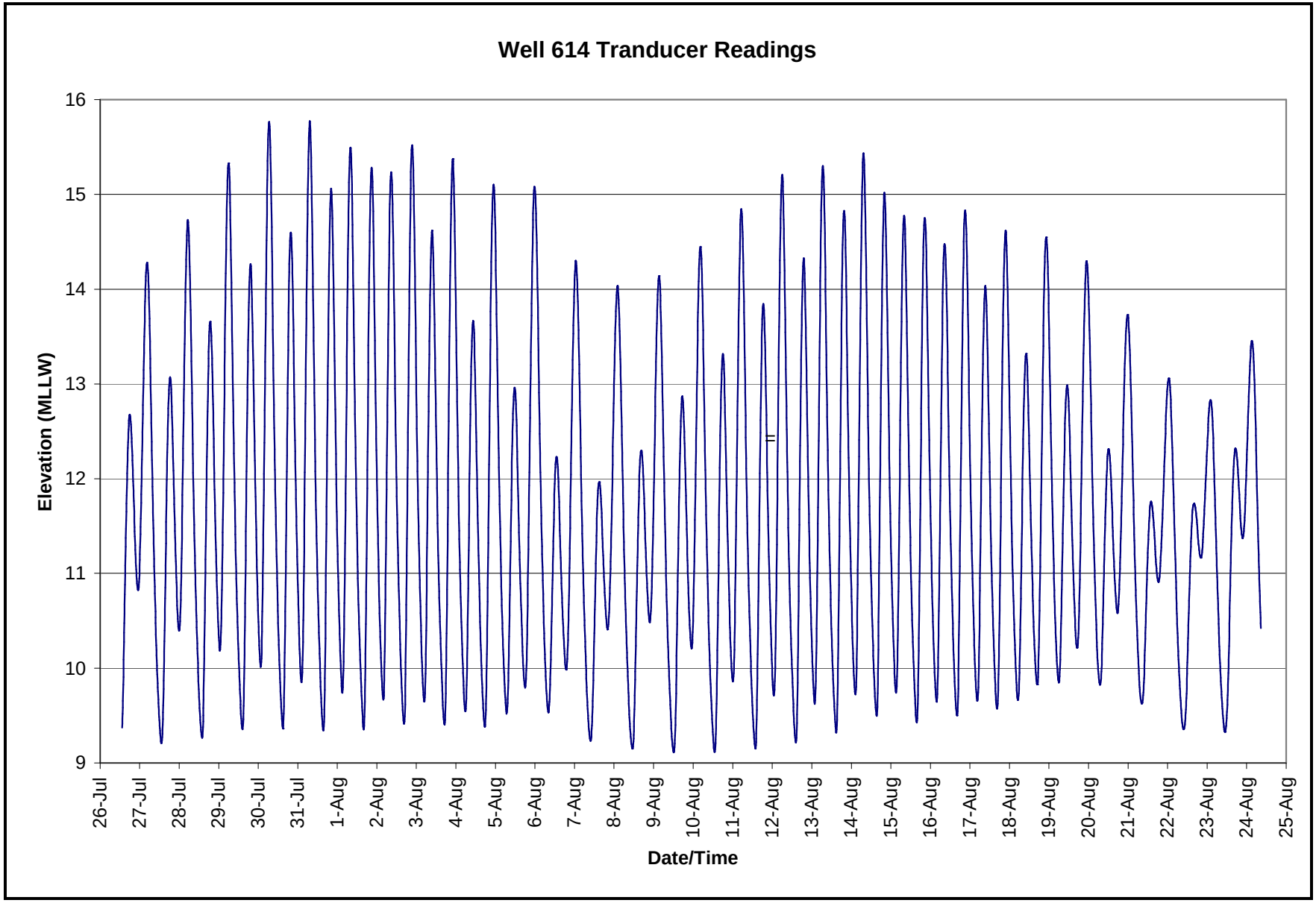


Figure L-3. August 2007 Groundwater Readings at Kenai, Deep Well

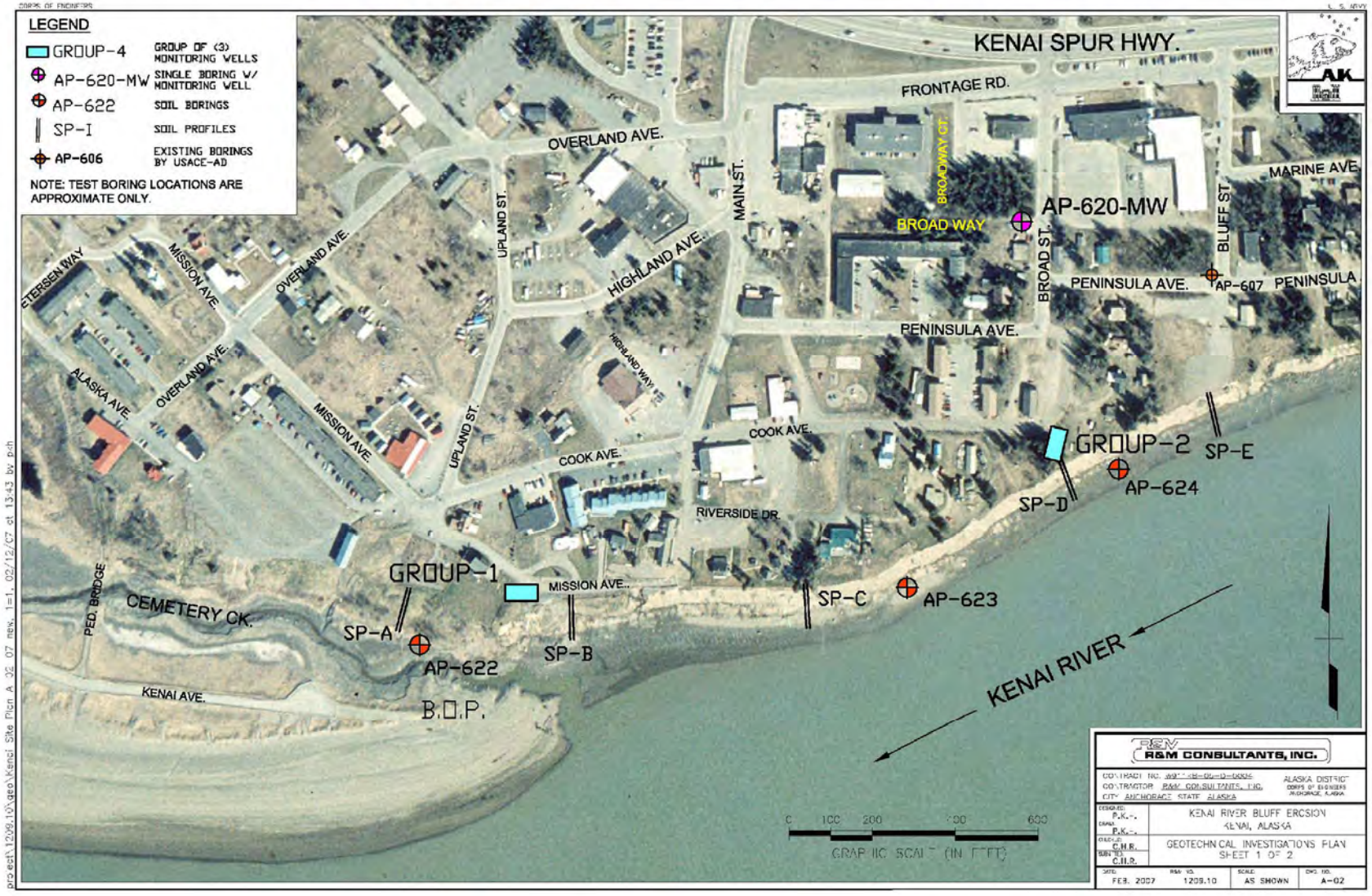


Figure L-4. West Project Area Groundwater Well Locations (R&M Consultants 2007)

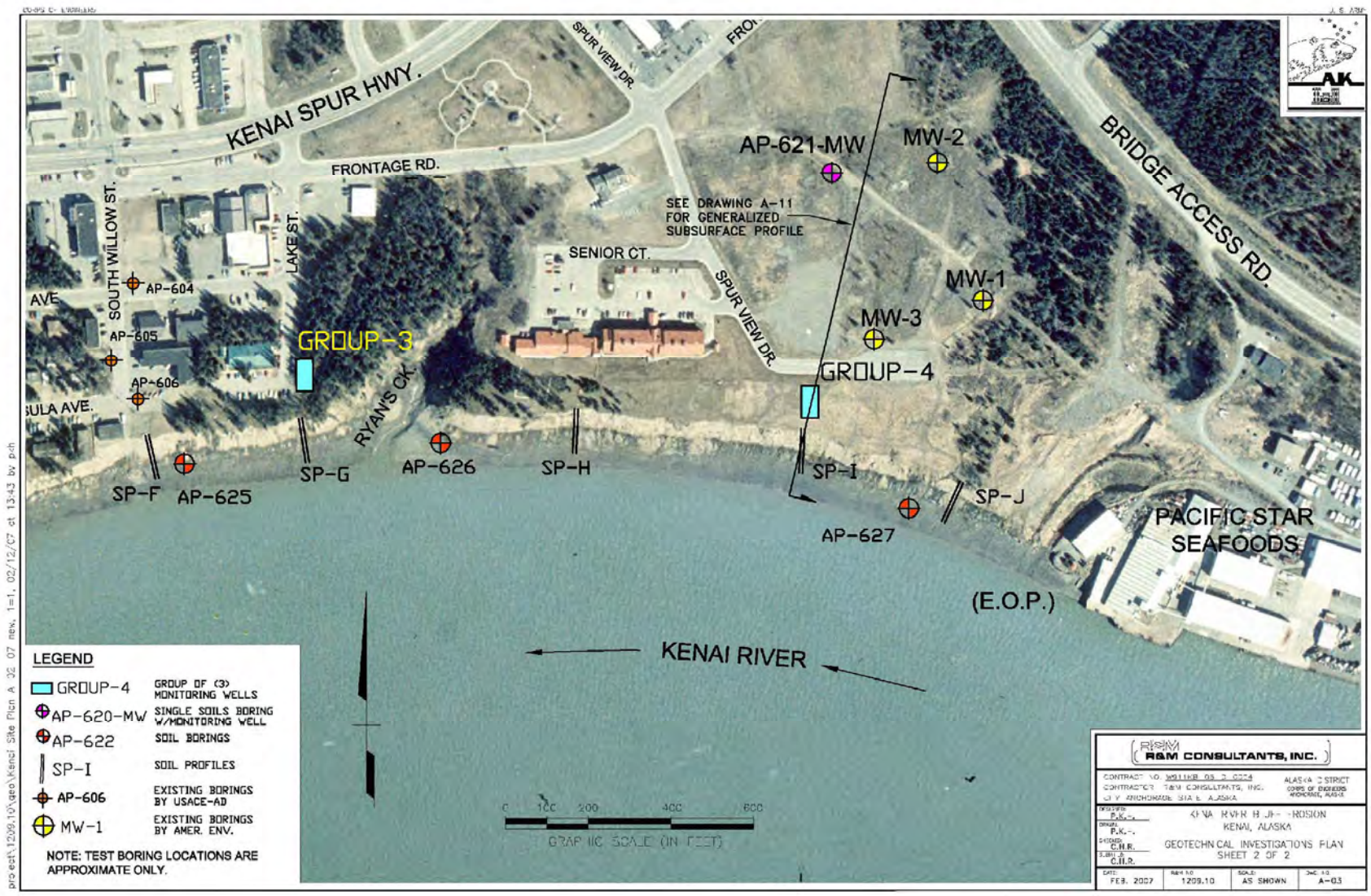


Figure L-5. East Project Area Groundwater Well Locations (R&M Consultants 2007)

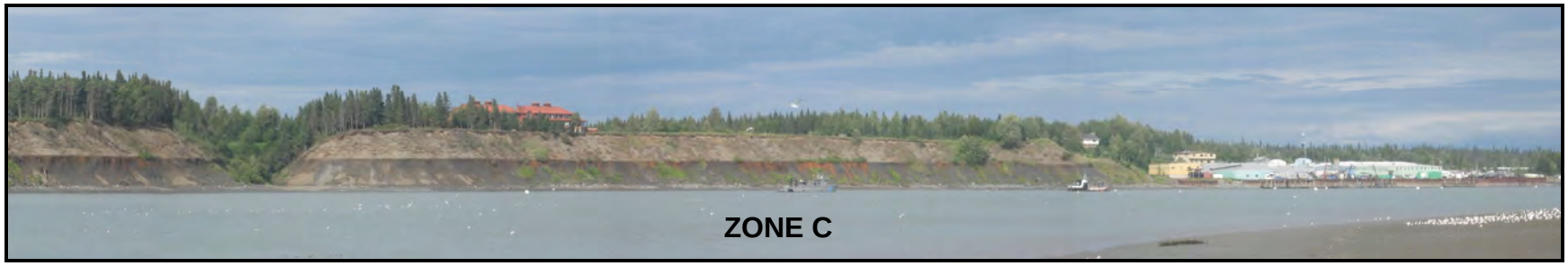


Figure L-6. Groundwater Zones

Quantification of Groundwater Seepage

In order to prevent further erosion, the project is designed to drain the maximum estimated groundwater seepage out of the bluff face during sustained, saturated conditions. Seepage was quantified with measurements and calculations. As part of the R&M Consultants study, ten soil profiles were characterized during a December 2006 field visit, including measurements of groundwater discharge rates from the bluff. Measurable flows were encountered at three of the ten soil profiles. The measured flow rate at these three profile locations ranged from 0.25 to 1.5 gallons per minute (gpm) per lineal foot. These rates apply to the immediate vicinity where significant flow was encountered and are not representative of the average discharge rate for the overall bluff face.

Supplemental measurements were taken along the entire toe of the bluff in July and August, 2007. The measurements were taken with a graduated cylinder in representative channel paths combined with a count of similar channels. The measurements indicate a total surface discharge of approximately 100 to 200 gallons per minute along the project extents. Additional subsurface flow was apparent just below the river's water surface. The measurements show some variation in discharge rate along the lateral extent of the bluff that can be divided into three groundwater seepage zones. Zone A, nearest the mouth, exhibits very little groundwater seepage along the bluff slope. Because this zone includes the area of the bluff protruding out into the inlet, the groundwater gradient may push water out to the sides of the point rather than continuing to the toe in this zone. As described in R&M Consultants (2007), cementation may also be a cause or result of the low seepage rate in this zone. Historical oblique aerial photographs show the presence of fill that may be free-draining to the toe in portions of this zone. Measured discharges in Zone A were approximately 20% of the discharge measured in Zone B, which extends from the protruding point to Ryan's Creek. Within Zone B, steady streams of surface flow are present in very small, trickling channels are present every few feet along the toe of the bluff. These streams have been observed year-round with very consistent flow rates. Flows in Zone C (the senior center reach) were approximately 50% higher than in Zone B. The design capacity of any implemented solution should account for the differences between these zones. Flows within each

zone were found to be relatively constant, although a slight concentration in discharge rate occurs in areas where the top of the bluff is slightly lower (R&M Consultants 2007).

Preliminary calculations of the discharge to be accommodated by the subsurface drainage system were performed based on the porosity and other soil parameters presented in the Geotechnical Investigations Report (R&M Consultants 2007). These results were compared to measurements taken along the lag gravel layer and along the toe of the slope. The measurements in the lag gravel layer were taken in areas representative of typical flow conditions at each given profile location, where concentrated flows emerged from the bluff. As mentioned above, these measurements are not necessarily representative of the entire bluff face from one profile location to the next. The lower, calculated value is considered appropriate for preliminary design of the subdrainage system and has been verified as conservative by supplemental measurements along the toe.

Geotechnical laboratory testing was performed on the soil samples collected by R&M Consultants in November and December 2006 to assist with characterization of subsurface conditions along the bluff. The samples were analyzed for particle size distribution and moisture content. Select samples were also analyzed for Atterberg limits and specific gravity. In order to estimate the necessary soil parameters, the particle size distribution and Atterberg limit test results were utilized to calculate estimated hydraulic conductivities of the samples. Three approaches for performing this calculation were identified: the Hazen approximation, the Shephard method, and the Krumbein and Monk method. The geotechnical sample results were grouped based on similar soil classifications and particle size distributions, and the appropriate method for calculating hydraulic conductivity was selected for each group. In general, the Hazen approximation was utilized for samples consisting primarily of sand, the Shephard method was utilized for samples consisting of a mixture of sand and fines, and the Krumbein and Monk method was used for samples consisting of primarily fines.

Following calculation of hydraulic conductivities for individual soil samples, the samples were regrouped based on the stratigraphy observed in the bluff. Three groups were selected, including surficial soil/fill, alluvial deposits, and glacial till. An average hydraulic conductivity was then

calculated for each group. These averages were converted to an average groundwater flux per linear foot along the bluff. Since groundwater seepage has not been observed from the surficial soils (within 1.5 ft bgs), this thin layer was not utilized for flux calculations.

Applying these average rates to the entire 5,000-foot length of the bluff in the study area results in an estimated total groundwater flux from the alluvial deposits and glacial till of 106 and 270 gallons per minute, respectively. Table L-2 shows a summary of the groundwater seepage calculations. Table L-3 shows the soil parameters used in the calculations.

Table L-2. Groundwater Flux Calculations

Unit Description	Depth Range	Avg K (cm/sec)	Avg K (ft/sec)	Avg Gradient	Q (ft^3/ min/ ft)	Q (gal/ min/ ft)	Approx. Bluff Length (ft)	Q (gal/ min)
Surficial Soil/Fill	0.5 - 1.5 ft bgs	3.28E-04	1.07E-05	NA	NA	NA	5,000	NA
Alluvial Deposits	2.5 - 36.5 ft bgs	7.36E-03	2.42E-04	0.013	2.83E-03	0.02	5,000	106
Glacial Till	40.0 - 101.5 ft bgs	4.21E-03	1.38E-04	0.029	7.20E-03	0.05	5,000	270

Recommendations for Test Section

The following recommendations apply to construction of a test section and additional testing performed on in-situ materials to verify design parameters. Slug testing of monitoring wells completed in the alluvial material and glacial till should be completed to provide estimates of in-situ permeability. Slug tests should be performed in at least five wells completed in each formation. Data from the tests should be collected using data logging pressure transducers. The data will provide better approximations of in-situ permeability from these units, and refine the estimated groundwater flux from the face of the bluff.

Soil samples should also be collected from the alluvial material and glacial till, and tested in a laboratory for permeability. The alluvial material samples should then be disturbed and compacted to the specifications determined for placement of the alluvial material as a filter layer on the face of the bluff. The compacted alluvium material should then be tested again for laboratory permeability. A mixture of alluvial material and glacial till, as proposed at the toe of the bluff, should also be mixed and compacted to the specifications determined for placement at the base of the bluff. The compacted mixture of alluvium material and glacial till should then be tested again for laboratory permeability.

A test section of the bluff stabilization is recommended prior to full-scale implementation. The test section would examine both the potential for quick conditions at the base of the bluff and pore pressure build up behind the bluff. Piezometers should be completed in the alluvial material and glacial till adjacent to the proposed test section prior to construction. The piezometers should be completed as close as possible to the edge of the top of the bluff. Data logging pressure transducers should be placed in each piezometer prior to construction of the test section, and data should be collected for approximately two weeks before and two months after construction. In addition to the data logging pressure transducers, manual water level measurements should be collected from the new piezometers and nearby previously existing monitoring wells/piezometers on a weekly basis for the same time frame. This data will be used to investigate potential changes in pore pressure as a result of construction.

Table L-3: Groundwater Seepage Calculations

SAMPLE IDENTIFICATION				PARTICLE SIZE ANALYSIS (% FINER)																ATTERBERG LIMITS			MOIST. CONT.	SPECIFIC GRAVITY	ASTM CLASS.	FROST CLASS.		
				STANDARD SIEVE SIZE (mm on bottom)													(mm)												
HOLE	HOLE	NO.		3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#140	#200	.02	.005	.002	LL	PL	PI	%					
			DEPTH (FT.)	76.2	50.8	38.1	25.4	19.1	12.7	9.53	4.76	2	0.84	0.42	0.25	0.11	0.07	0.0	0.005	0.002								K (cm/sec)	K (ft/sec)
Surficial Soil/Fill																												
AP-626	TB-04	1	0.5 - 1.5					100	98	96	91	82	80	77	72	64	56	35.5	22.6	14.1				25		CL-ML*	F4*	4.95E-04	1.62E-05
AP-625	TB-05	1	0.5 - 1.0					100	98	95	90	79	76	71	65	58	55	39.1	25.0	16.0				78		CL-ML*	F4*	4.80E-04	1.58E-05
AP-624	TB-06	1	0.5 - 1.0			100	95	83	70	64	55	46	43	39	31	26	25	16.9	10.9	7.1				22		GC*	F2	7.36E-06	2.41E-07
																											Average =	**3.28E-04**	**1.07E-05**
Glacial Till																												
AP-620-MW	TB-02	10	40.0 - 41.4				100	99	98	98	97	96	94	90	87	83	81				35	21	14	16	2.747	CL	F3	7.77E-05	2.55E-06
AP-608-MW	TB-1a	11	45.0 - 46.5			100	98	97	95	93	88	84	67	16	5	2	1.8							2.3		SP	NFS	4.28E-02	1.41E-03
AP-614-MW	TB-3a	11	45.0 - 46.5						100	99	98	96	94	86	72	48	42							16		SC*	F3*	1.41E-03	4.64E-05
AP-617-MW	TB-4a	11	45.0 - 46.5				100	98	97	96	93	89	86	83	75	57	54							15		CL*	F3*	7.10E-04	2.33E-05
AP-611-MW	TB-2c	12	50.0 - 51.5		100	82	82	79	79	79	78	76	75	73	70	63	60				27	16	11	11		CL	F4	1.34E-05	4.40E-07
AP-608-MW	TB-1a	13	55.0 - 56.5										100	53	6	2	1.3							2.8		SP	NFS	2.80E-02	9.18E-04
AP-614-MW	TB-3a	13	55.0 - 56.5						100	99	99	98	96	94	90	83	79				24	15	9	14	2.682	CL	F4	3.72E-05	1.22E-06
AP-617-MW	TB-4a	13	55.0 - 56.5				100	92	90	87	84	81	78	74	69	65	63				31	18	13	13		CL	F3	1.78E-04	5.84E-06
AP-611-MW	TB-2c	14	60.0 - 61.5							100	98	97	95	93	90	78	72				26	16	10	15		CL	F4	4.02E-05	1.32E-06
AP-614-MW	TB-3a	14	60.0 - 61.5					100	99	98	97	95	94	92	88	79	75				27	15	12	13		CL	F4	8.20E-05	2.69E-06
AP-617-MW	TB-4a	14	60.0 - 61.5					100	98	97	94	92	90	88	82	74	71				33	17	16	15		CL	F3	1.15E-04	3.77E-06
AP-608-MW	TB-1a	15	65.0 - 66.5					100	99	99	99	98	96	49	8	4	3.0							9.7		SP	NFS	2.67E-02	8.76E-04
AP-611-MW	TB-2c	16	70.0 - 71.5										100	99	95	82	75				22	14	8	18		CL	F4	1.19E-05	3.91E-07
AP-614-MW	TB-3a	16	70.0 - 71.5						100	99	98	97	97	95	93	83	79				31	18	13	17		CL	F3	4.28E-05	1.40E-06
AP-617-MW	TB-4a	16	70.0 - 71.5			100	98	96	95	95	93	92	91	89	86	78	74				27	16	11	13	2.724	CL*	F3*	1.46E-04	4.78E-06
AP-611-MW	TB-2c	17	75.0 - 76.5							100	99	99	99	98	96	86	78				24	16	8	15		CL	F4	1.82E-05	5.99E-07
AP-614-MW	TB-3a	17	75.0 - 76.5					100	99	98	96	94	93	90	84	61	53							15		CL*	F3*	7.10E-04	2.33E-05
AP-615-MW	TB-3b	1	75.0 - 76.5				100	99	99	99	98	98	97	96	92	61	51							19		CL*	F3*	7.10E-04	2.33E-05
AP-617-MW	TB-4a	17	75.0 - 76.5		100	97	96	95	93	89	79	66	65	63	60	54	51	36.2	23.8	15.4				15		CL*	F3*	6.58E-04	2.16E-05
AP-608-MW	TB-1a	18	80.0 - 81.5					100	98	97	94	88	79	66	24	12	11							17		SP-SM*	F2*	2.19E-03	7.19E-05
AP-614-MW	TB-3a	18	80.0 - 81.5				100	99	99	99	98	94	93	92	88	80	76	52.8	34.9	21.4				17		CL*	F3*	8.27E-05	2.71E-06
AP-617-MW	TB-4a	18	80.0 - 81.5					100	99	99	97	96	95	93	89	75	69				24	16	8	14		CL	F4	6.15E-05	2.02E-06
AP-608-MW	TB-1a	19	85.0 - 86.5			100	94	94	93	92	85	83	81	78	74	67	63				24	15	9	13		CL	F4	1.52E-04	4.98E-06
AP-614-MW	TB-3a	19	85.0 - 86.0					100	97	97	94	94	91	68	42	33	30							18		SC*	F3*	5.86E-03	1.92E-04
AP-617-MW	TB-4a	20	90.0 - 91.5				100	99	98	98	96	95	94	92	88	80	76							17		CL*	F3*	8.84E-05	2.90E-06
AP-608-MW	TB-1a	21	95.0 - 96.5					100	99	99	98	97	96	95	91	84	80				27	16	11	16		CL	F4	4.27E-05	1.40E-06
AP-611-MW	TB-2c	22	100.0 - 101.5								100	99	99	99	97	91	82							20		CL*	F3*	1.42E-05	4.64E-07
AP-614-MW	TB-3a	22	100.0 - 101.5									100	99	87	24	7	6.1							24		SP-SM*	S2*	6.82E-03	2.24E-04
																											Average =	**4.21E-03**	**1.38E-04**

SAMPLE IDENTIFICATION				PARTICLE SIZE ANALYSIS (% FINER) STANDARD SIEVE SIZE (mm on bottom)														(mm)			ATTERBERG LIMITS			MOIST. CONT.	SPECIFIC GRAVITY	ASTM CLASS.	FROST CLASS.		
HOLE	HOLE	NO.		3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#140	#200	.02	.005	.002	LL	PL	PI	%					
			DEPTH (FT.)	76.2	50.8	38.1	25.4	19.1	12.7	9.53	4.76	2	0.84	0.42	0.25	0.11	0.07	0.0	0.005	0.002								K (cm/sec)	K (ft/sec)
Alluvial Deposits																													
AP-627	TB-01	2	2.5 - 4.0					100	98	97	95	93	90	87	77	64	59							17		CL*	F3*	1.45E-04	4.76E-06
AP-620-MW	TB-02	2	2.5 - 4.0						100	99	98	98	96	88	64	27	22							10		SM*	F3*	3.04E-03	9.98E-05
AP-626	TB-04	2	2.5 - 4.0			100	90	90	89	89	88	87	86	85	77	58	51				19	13	6	28		CL-ML	F4	7.10E-04	2.33E-05
AP-625	TB-05	2	2.5 - 4.0				100	99	98	97	96	94	93	91	88	81	77				27	16	11	17		CL	F4	1.16E-04	3.80E-06
AP-622	TB-08	2	2.5 - 4.5										100	99	98	95	94				49	28	21	37		ML	F4	3.67E-06	1.20E-07
AP-611-MW	TB-2c	2	2.5 - 4.0						100	99	98	97	96	87	49	29	27							10		SM*	F3*	4.53E-03	1.49E-04
AP-624	TB-06	3	3.0 - 4.0									100	99	98	55	8	4.5							21		SP*	NFS*	4.94E-03	1.62E-04
AP-627	TB-01	3	5.0 - 6.5				100	99	97	96	92	86	85	83	80	72	68	47.3	30.5	19.1				15		CL*	F3*	1.57E-04	5.15E-06
AP-621-MW	TB-03	3	5.0 - 6.5					100	98	95	89	84	79	62	18	3	2.7							6.2		SP	NFS	1.19E-02	3.91E-04
AP-626	TB-04	3	5.0 - 6.5				100	98	97	96	94	93	92	90	85	76	72				27	16	11	15		CL	F4	1.32E-04	4.34E-06
AP-625	TB-05	3	5.0 - 6.5						100	99	98	96	95	93	90	84	81				26	16	10	17		CL	F4	4.65E-05	1.52E-06
AP-623	TB-07	3	5.0 - 6.5								100	99	99	96	26	2	1.6							3.8		SP	NFS	9.40E-03	3.09E-04
AP-608-MW	TB-1a	3	5.0 - 6.5							100	97	95	91	82	66	56	52							27		ML*	F4	7.10E-04	2.33E-05
AP-614-MW	TB-3a	3	5.0 - 6.5				100	99	99	97	89	80	67	42	14	5	4.2							5.8		SP	PFS*	1.38E-02	4.52E-04
AP-627	TB-01	4	10.0 - 11.5					100	99	99	98	97	96	94	91	74	68				29	17	12	17		CL	F4	5.33E-05	1.75E-06
AP-620-MW	TB-02	4	10.0 - 11.5			100	99	99	97	96	93	87	76	43	12	2	1.7							5.1		SP	NFS	1.95E-02	6.41E-04
AP-625	TB-05	4	10.0 - 11.5							100	98	97	93	40	10	3	2.3							14		SP	NFS	2.50E-02	8.20E-04
AP-624	TB-06	6	10.0 - 11.5			100	97	94	93	92	90	88	87	86	83	76	72				29	16	13	15		CL	F3	1.87E-04	6.13E-06
AP-623	TB-07	4	10.0 - 11.5								100	99	98	94	53	14	10							13		SP-SC*	F2*	2.19E-03	7.19E-05
AP-617-MW	TB-4a	4	10.0 - 11.5							100	99	97	94	69	22	5	3.9							6.5		SP	NFS*	8.72E-03	2.86E-04
AP-626	TB-04	5	10.5 - 11.5				100	99	99	97	94	92	89	58	24	5	3.9							16		SP	S2*	8.20E-03	2.69E-04
AP-622	TB-08	5	10.5 - 11.5			100	94	87	74	67	52	42	38	30	17	10	9.1							10		GP-GM*	F1*	4.41E-03	1.45E-04
AP-620-MW	TB-02	5	15.0 - 16.5								100	99	96	77	25	5	4.4				NV	NV	NP	4.6	2.716	SP	S2*	7.98E-03	2.62E-04
AP-621-MW	TB-03	5	15.0 - 16.5							100	99	98	94	72	25	5	4.3							7.7		SP	S2*	7.98E-03	2.62E-04
AP-626	TB-04	6	15.0 - 16.0							100	99	99	96	45	17	6	4.9							20		SP	S2*	9.95E-03	3.26E-04
AP-625	TB-05	5	15.0 - 16.5								100	99	90	37	5	1.4	1.2							20		SP	NFS	3.06E-02	1.00E-03
AP-624	TB-06	7	15.0 - 16.0										100	66	18	2	1.3							22		SP	NFS	1.26E-02	4.13E-04
AP-623	TB-07	5	15.0 - 16.5										100	95	30	3	1.9							22		SP	NFS	8.13E-03	2.67E-04
AP-622	TB-08	6	15.0 - 16.5				100	94	93	92	88	83	79	73	61	52	49				18	12	6	14		SC-SM	F4*	8.64E-04	2.83E-05
AP-611-MW	TB-2c	5	15.0 - 16.5				100	98	97	96	93	88	77	38	7	2	1.2							3.5		SP	NFS	2.84E-02	9.32E-04
AP-614-MW	TB-3a	5	15.0 - 16.5								100	99	97	78	23	4	3.1							4.8		SP	NFS*	9.09E-03	2.98E-04
AP-624	TB-06	8	16.0 - 16.5						100	99	99	98	97	94	87	77	73				26	15	11	17		CL	F4	4.03E-05	1.32E-06
AP-627	TB-01	6	20.0 - 21.5				100	99	99	98	97	95	94	91	85	62	54							17		CL*	F3*	7.10E-04	2.33E-05
AP-620-MW	TB-02	6	20.0 - 21.5							100	99	99	97	83	37	5	3.9							6.0		SP	NFS*	6.52E-03	2.14E-04
AP-621-MW	TB-03	6	20.0 - 21.5					100	97	96	92	90	89	81	37	6	3.6							12		SP	NFS*	6.12E-03	2.01E-04
AP-620-MW	TB-02	7	25.0 - 26.5			100	98	97	95	94	90	86	80	52	18	4	3.3							7.6		SP	NFS*	1.12E-02	3.67E-04
AP-622	TB-08	8	25.0 - 26.5				100	97	97	96	91	90	88	86	82	74	70				25	14	11	14		CL	F4	1.10E-04	3.62E-06
AP-608-MW	TB-1a	7	25.0 - 26.5						100	99	99	99	97	67	17	5	3.7							4.3		SP	NFS*	1.09E-02	3.59E-04
AP-614-MW	TB-3a	7	25.0 - 26.5								100	99	99	84	30	8	5.3							4.9		SP-SM*	S2*	5.59E-03	1.83E-04
AP-617-MW	TB-4a	7	25.0 - 26.5								100	99	96	67	22	6	4.3							8.4		SP	NFS*	7.98E-03	2.62E-04
AP-620-MW	TB-02	8	30.0 - 31.5			100	99	98	96	93	88	82	72	42	19	5	3.2							21		SP	NFS*	9.83E-03	3.23E-04
AP-621-MW	TB-03	8	30.0 - 31.5						100	99	98	97	92	66	29	9	6.5							19		SP-SM*	S2*	5.04E-03	1.65E-04
AP-622	TB-08	9	30.0 - 31.5								100	99	98	97	94	90	88				29	16	13	17		CL	F3	1.21E-05	3.98E-07
AP-611-MW	TB-2c	8	30.0 - 31.5				100	99	98	97	94	92	86	50	12	5	3.0							5.1		SP	NFS	1.74E-02	5.71E-04
AP-614-MW	TB-3a	9	35.0 - 36.5			100	98	96	90	85	68	53	44	27	12	6	5.5	3.3	1.3	0.6				2.4		SP-SM*	S2	1.63E-02	5.34E-04
																											Average =	**7.36E-03**	**2.42E-04**

FINAL SUBMITTAL

GROUNDWATER MONITORING REPORT

KENAI RIVER BLUFF EROSION

KENAI, ALASKA

CONTRACT NO. W911KB-05-D-0004
DELIVERY ORDER NO. 0010
MODIFICATION NO. 01

Prepared for:

U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. Box 6898
Elmendorf AFB, Alaska 99506

January, 2008

R&M CONSULTANTS, INC.

R&M CONSULTANTS, INC.
9101 Vanguard Drive, Anchorage, Alaska 99507
(907) 522-1707, FAX (907) 522-3403, www.rmconsult.com

January 15, 2008

R&M No. 1209.10

U.S. Army Engineer District, Alaska
ATTN: Mr. Chuck Wilson (CEPOA-EN-ES-SG)
P.O. Box 6898
Elmendorf AFB, Alaska 99506

RE: Groundwater Monitoring Report
Kenai River Bluff Erosion
Kenai, Alaska
Contract No. W911KB-05-D-0004, Delivery Order No. 0010, Modification No. 01

Gentlemen:

Attached find our final submittal for the above-referenced groundwater monitoring. This report was prepared under the terms of Contract No. W911KB-05-D-0004, Delivery Order No. 0010, Modification No. 01.

We trust that this final report is found to be responsive to your requirements. Should you have any questions or require further information, please contact us.

Very truly yours,

R&M CONSULTANTS, INC.

Charles H. Riddle, C.P.G.
Vice President

CHR:ATB*slv

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GROUNDWATER MONITORING REPORT

KENAI RIVER BLUFF EROSION

KENAI, ALASKA

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U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. Box 6898
Elmendorf AFB, Alaska 99506

Attention:
Mr. Chuck Wilson
CEPOA-EN-ES-SG

Prepared by:

R&M CONSULTANTS, INC.
9101 Vanguard Drive
Anchorage, Alaska 99507

January, 2008

LIST OF APPENDICES

GROUNDWATER MONITORING REPORT

KENAI RIVER BLUFF EROSION

KENAI, ALASKA

1.0 INTRODUCTION

1.1 Background

For many years, the City of Kenai has been concerned with the ongoing erosion of a one mile portion of the steep bluff along the right bank of the Kenai River within the city. This erosion has required the relocation of privately owned buildings as well as city infrastructure and utilities. Unless measures to control the erosion and protect the bluff are implemented, bluff erosion is expected to continue, further threatening existing buildings, infrastructure, and utilities within proximity to the bluff.

The U.S. Army Corps of Engineers - Alaska District (USACE-AD) has conducted a geotechnical investigation to provide design-level information for the Kenai River Bluff Erosion Project. The geotechnical investigation provides site-specific geotechnical design information necessary to establish an erosion control method that is technically feasible and satisfies resource agency needs. The work consisted of drilling and logging test borings, installing groundwater monitoring wells, laboratory testing, and the preparation of various reports. Ultimately, the geotechnical data obtained will be used, in conjunction with other considerations, in developing the specifications and design criteria for the project.

R&M Consultants, Inc. (R&M) was tasked by the USACE-AD to provide professional geotechnical services for the project. Drilling, sampling, and groundwater monitoring well installation services were performed by Discovery Drilling, Inc. of Anchorage, Alaska under direct contract to R&M. During the geotechnical field investigations, a total of 20 test borings were drilled and sampled at the project site. Fourteen (14) of these test borings were completed as groundwater monitoring wells.

The regional setting, site conditions, geotechnical conditions, bluff mapping results, and groundwater conditions are discussed in R&M's prior Geotechnical Investigation and Site Conditions Report (R&M, 2007).

1.2 Contract Authorization

This work was completed under the terms of Contract No. W911KB-05-D-0004 between the U.S. Army Corps of Engineers – Alaska District and R&M Consultants, Inc. The groundwater monitoring and this report were completed in specific fulfillment of Delivery Order No. 0010, Modification No. 01.

Measurements and weights presented in this report are generally shown as U.S. customary units. Where previous investigations and reports have utilized SI units, we have retained the units expressed in the original document. A conversion chart is included as Table 1 for use in conversion from U.S. customary units to the International System (SI) units. Actual conversion should be made with the appropriate numbers carried to three or more significant figures.

1.3 Purpose and Scope-of-Work

The intent of this groundwater monitoring program has been to provide a monthly cycle of groundwater table elevation information to evaluate the hydraulic conditions for the analysis and design of a bluff stabilization project. This report presents a summary of the results of R&M's monthly groundwater monitoring program.

This work was performed under a Statement-of-Work prepared by the USACE-AD, revised 13 September 2006.

No hydrogeologic analysis or recommendations were required under the Statement-of-Work.

1.4 Existing Information

The following document is a predecessor to the current report and provides detailed information concerning our site investigation.

R&M Consultants, Inc. (R&M), "Geotechnical Investigation and Site Conditions Report, Kenai River Bluff Erosion, Kenai, Alaska", Final Submittal, Contract No. W911KB-05-D-0004, Delivery Order 0010, prepared for U.S. Army Engineer District, Alaska, 14 February 2007.

Additionally, a number of pertinent U.S. Geological Survey documents and other technical reports are cited and listed within the References section of the February 2007 report.

2.0 GROUNDWATER MONITORING

Methods of groundwater monitoring for the Kenai River Bluff Erosion project can be divided into the following categories.

- Test Borings
- Groundwater Monitoring Well Installation
- Groundwater Monitoring
- Monitoring Well Location Surveys

2.1 Test Borings

Test borings were located and drilled to meet two primary objectives. Both of which are presented in R&M's Geotechnical Investigation and Site Conditions Report (R&M, 2007). The first objective involves delineating the subsurface soil conditions, and the second entails a study of the groundwater regime in the area.

A total of twenty (20) test borings were drilled by R&M at the project site during the period of November 9, 2006 through December 16, 2006, fourteen (14) of which were completed as groundwater monitoring wells. Each of the borings was logged in accordance with standard engineering practices, and data obtained in this manner were utilized to determine geotechnical site conditions. The depth of the test borings ranged from 30 to 101.5 feet. The total number of feet drilled during the field program was approximately 1,135. Drilling and sampling operations were performed by Discovery Drilling, Inc. of Anchorage, Alaska under direct contract to R&M. Approximate test boring locations are shown on Drawings A-02 through A-07 of Appendix A. Logs of the monitoring well test borings, including logs provided by others are illustrated in Appendix B, Drawings B-03 through B-29. A key to the test hole log general notes and an example of a typical log are illustrated on Drawings B-01 and B-02, respectively. Table 2 provides a summary of R&M monitoring well test borings performed for the project.

Soil boring, sampling, and groundwater well installation on the bluff crest were performed utilizing a truck-mounted CME-75 drill rig. Test borings were advanced using continuous flight, hollow-stem augers. Representative soil samples were generally obtained at the surface, at 2.5 feet and five feet, and then at approximately five-foot intervals or at obvious changes in soil strata. However at each grouping of three groundwater monitoring well installations (e.g. AP-608-MW through AP-610-MW), only one of the three borings was sampled and logged in detail. The other two borings were only sampled at the bottom of the boring.

The drilling program was conducted under the supervision of an experienced engineering geologist who maintained a detailed log of the materials encountered and the samples attempted and recovered. Representative soil samples generally were collected either by means of grab samples taken directly off of the augers, in the case of the surface sample, or via split-spoon samplers. In all but one boring, disturbed samples were obtained using a 2.5-inch I.D. (3.0-inch O.D.) split-spoon sampler driven by means of a 340-lb hammer with a 30-inch free-fall stroke.

Both manual (rope and cathead) and automatic (hydraulic) hammers were used on this project, as denoted for each sample on the logs of test borings in Appendix B. The penetration resistance, defined as the number of blows required to drive the sampler the last 12 inches of an 18-inch interval, gives an indication of the in-place relative density for unfrozen cohesionless soils. Blow counts reported per six-inch interval are shown on boring logs in Appendix B. Penetration resistances thus obtained can be corrected to approximate the Standard Penetration Test (SPT) "N" values by an energy to area ratio adjustment. A correction factor should be used to convert actual blow counts to the corresponding approximate SPT blow counts. Note, however, that the blow counts appearing on the logs of test borings are actual values, not converted SPT values. The Standard Penetration Test (SPT) was performed in the upper 40 feet of Test Boring AP-617-MW utilizing the 1.4-inch I.D. (2.0-inch O.D.) drive sampler and a 140-pound automatic drop hammer.

It should be noted that heaving or flowing sands interfered with sampling in the deeper test borings located on the bluff crest. The logs of test borings in Appendix B include notes on whether a sampler was overfilled with heaving sand, or whether samples were not attempted below a certain depth due to heaving sand flowing up into the augers.

All soils recovered were visually classified and logged in the field following ASTM Designation D 2488. After visual and tactile classification in the field, all soil samples were returned to the R&M laboratory. Representative samples were then selected for further examination and testing.

2.2 Groundwater Monitoring Well Installation

After completion of drilling, fourteen (14) of the test borings on the crest of the bluff were completed as groundwater monitoring wells. Groundwater monitoring wells were installed in general accordance with ASTM Designation D 5092, "Design and Installation of Groundwater Monitoring Wells in Aquifers". Each monitoring well was constructed to allow for the accurate measurement of groundwater depths relative to the top of the well riser. The well riser pipe was constructed of 2-inch I.D. polyvinyl chloride (PVC) pipe. A locking steel protective over casing was installed around the well riser pipe extending approximately three feet below and three feet above the top of ground surface. Bollards were placed around some of the installations to protect the wells from traffic and snow removal equipment.

A typical groundwater monitoring well schematic for wells installed by R&M is presented as Figure 1. Monitoring well photographs are shown in Figure 2.

2.3 Groundwater Monitoring

Groundwater monitoring occurred on a monthly basis in the 14 R&M test borings that were converted to monitoring wells and the three pre-existing American Environmental monitoring wells. Prior to the fifth reading, groundwater monitoring was expanded, at the request of the USACE, to include the four pre-existing USACE monitoring wells. This monitoring continued to occur on this basis for a period of one year from the installation date of the original 14 R&M monitoring wells.

FIGURE 1

TYPICAL GROUNDWATER MONITORING WELL GROUP

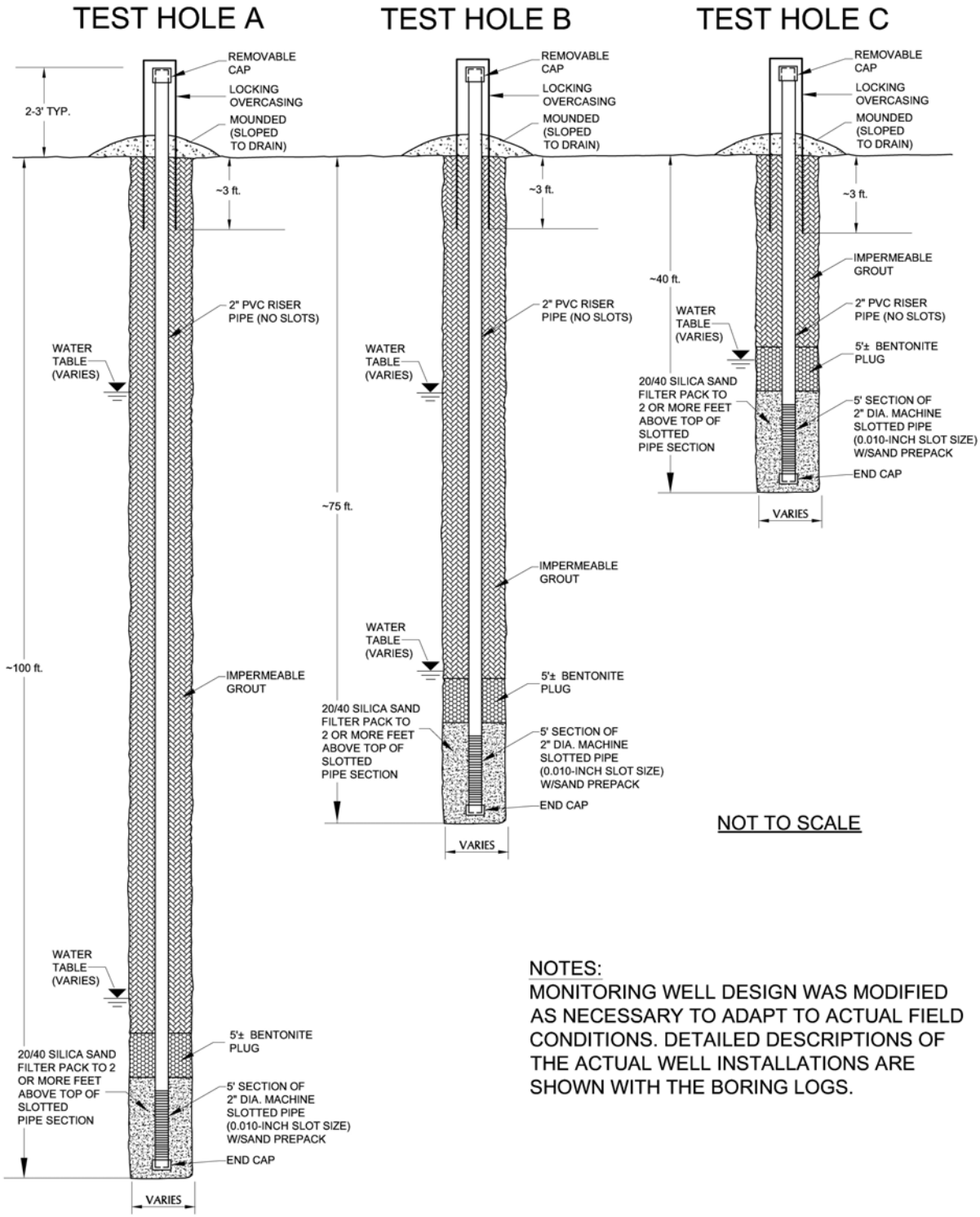


FIGURE 2

PHOTOGRAPHS SHOWING MONITORING WELLS

a. Monitoring well installation at Group 3 borings with protective bollards. December, 2006.

b. Grouting at Group 2 borings. November, 2006.

Access to the protective over casings was gained and a Solinst Model 101 water level meter was lowered down the well to measure the groundwater level. The water level meter tape is measured against a constant point on each well casing to ensure a consistent measuring point.

Two exceptions to this process were with regard to Monitoring Wells AP-606 and AP-607, which were installed by the USACE. Monitoring Well AP-606 was unable to be located in the field and no readings were obtained. Monitoring Well AP-607 was constructed with ¾-inch nominal O.D. PVC piping, and a wooden dowel float was lowered down the well until reaching equilibrium. The measuring point along the float line was then marked against a constant point on the well casing and the groundwater depth was measured with a tape after removal.

Groundwater levels were measured upon completion of the monitoring well installation and were measured monthly for one year, with a total of 13 readings for most monitoring wells. A summary presenting monitoring well identification, date, time, and groundwater elevations is provided in Appendix C as Table C-01. A summary of groundwater elevation trends for the year-long monitoring period is presented in Appendix C as Figures C-02 through C-06.

2.4 Monitoring Well Location Surveys

Survey information was based on a field survey performed by R&M Consultants, Inc. during January, 2007. The project coordinates are ACS83 Zone 4, U.S. Survey Feet. The project datum is NAD83 (CORS). The project coordinates and datum were established by ties to CP 1 and USC&GS BM NO. 3 1966 from the DOWL Engineers drawing "Kenai River Bluff Erosion Survey Topography" dated July 16, 2003. The vertical datum was established by holding USC&GS BM NO. 3 1966 with an elevation of 31.44 feet. The drawing indicates that the vertical datum is referenced to Mean Lower Low Water (2003) in U.S. Survey Feet.

Monitor wells and test borings were located horizontally using RTK GPS techniques and vertically by a combination of RTK GPS and differential leveling techniques. The RTK GPS accuracy was quality controlled by taking three-dimensional check shots on established control positions. All of the check positions fell within the tolerances defined in the scope of the project.

The elevations for the top of the pipe of the monitor wells were determined by differential levels run from TBMs with elevations established by RTK GPS. The wells were broken up into four groups based on proximity. One TBM was established for each group of wells with RTK GPS. Differential levels were then run from the TBM to the group of wells in the surrounding area. All level loops closed well within the tolerances defined in the scope of the project.

Elevations for Monitoring Wells AP-604 through AP-607 were based on information provided on the monitoring well installation logs provided by the USACE. Distances between the collar elevations and the well casing measuring points are approximate and accuracy of groundwater elevations within these wells should also be considered approximate.

3.0 CLOSURE

R&M Consultants, Inc. performed this work in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty, express or implied, beyond exercise of reasonable care and professional diligence, is made. This report is intended for use only in accordance with the purposes of study described within.

We appreciate the opportunity to perform this groundwater monitoring program. Should you require further information concerning the monitoring or this report, please contact us at your convenience.

Very truly yours,

R&M CONSULTANTS, INC.

Aaron T. Banks
Engineering Geologist

Robert M. Pintner, P.E.
Senior Geotechnical Engineer

Charles H. Riddle, C.P.G.
Vice President

CHR:ATB*slv

TABLE 1

CONVERSION FACTORS FOR SI UNITS

CONVERSION TO THE SI INTERNATIONAL SYSTEM OF UNITS		
To Convert From	**To**	**Multiply By**
Mile	Kilometer (km)	1.609344
Mile	Meter (m)	1,609.344
Foot	Meter (m)	0.3048
Foot	Centimeter (cm)	30.48
Inch	Centimeter (cm)	2.54
Square Foot	Square Meter (m^2)	0.09290304
Square Yard	Square Meter (m^2)	0.8361274
Acre	Square Meter (m^2)	4,046.825
Cubic Foot (cf)	Cubic Meter (m^3)	0.02831685
Cubic Yard (cy)	Cubic Meter (m^3)	0.7645549
Gallon (U.S. Liquid)	Cubic Meter (m^3)	0.003785412
Pound-Mass (lbf)	Kilogram (kg)	0.4535924
Ton (short)	Kilogram (kg)	907.1847
Pound-Force (lbf)	Newton (N)	4.448222
Degree Fahrenheit (°F)	Degree Celsius (°C)	T°C=(T°F-32)/1.8
Pound per Square Foot (psf)	Kilonewtons per Square Meter (kN/m^2)	0.47880
Pound per Cubic Foot (pcf)	Kilonewtons per Cubic Meter (kN/m^3)	0.157087

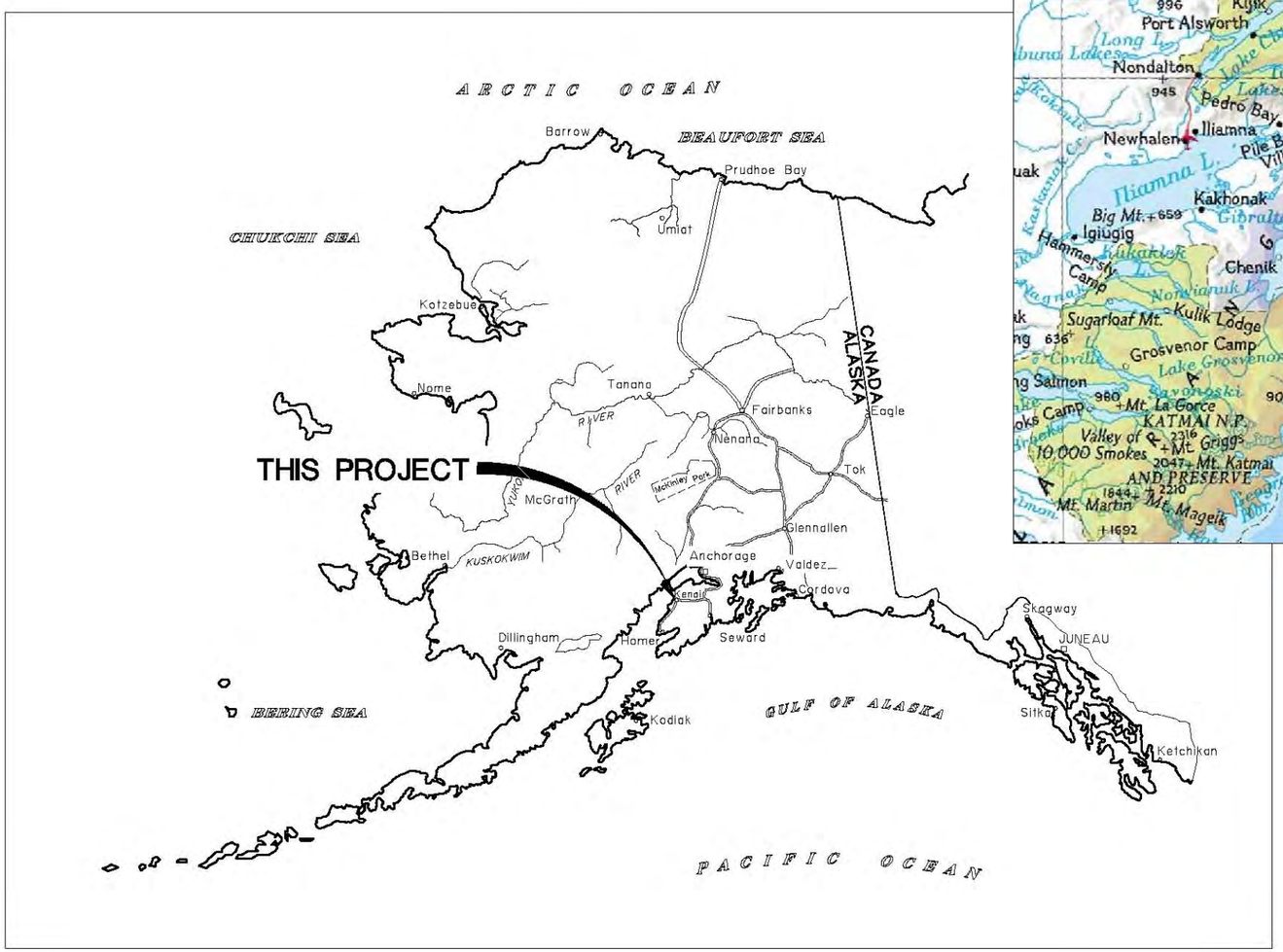
TABLE 2

SUMMARY OF MONITORING WELL TEST BORINGS
KENAI RIVER BLUFF EROSION
KENAI, ALASKA

TEST BORING NUMBER (FINAL)	TEST BORING NUMBER (FIELD)	COORDINATES (FEET)		COLLAR ELEVATION (FEET)	TOTAL DEPTH (FEET)
		NORTHING	EASTING		
AP-608-MW	TB-1A	2,395,412.81	1,413,139.72	88.4	101.2
AP-609-MW	TB-1B	2,395,415.41	1,413,150.90	88.6	76.5
AP-610-MW	TB-1C	2,395,430.86	1,413,141.62	88.9	41.3
AP-611-MW	TB-2C	2,395,775.73	1,414,431.97	91.1	101.5
AP-612-MW	TB-2B	2,395,786.22	1,414,437.68	91.3	76.5
AP-613-MW	TB-2A	2,395,795.10	1,414,440.67	91.0	41.5
AP-614-MW	TB-3A	2,396,258.31	1,415,755.43	93.9	101.5
AP-615-MW	TB-3B	2,396,268.68	1,415,756.19	93.5	76.5
AP-616-MW	TB-3C	2,396,280.50	1,415,756.60	93.7	41.5
AP-617-MW	TB-4A	2,396,189.80	1,416,979.96	92.9	101.5
AP-618-MW	TB-4B	2,396,207.48	1,416,981.72	93.1	70.0
AP-619-MW	TB-4C	2,396,224.77	1,416,982.32	93.1	40.0
AP-620-MW	TB-02	2,396,321.05	1,414,354.82	92.2	41.4
AP-621-MW	TB-03	2,396,759.77	1,417,031.71	92.7	41.0

AP = Auger Point
TB = Test Boring
MW = Monitoring Well

APPENDIX A
SITE MAPS



R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	VICINITY MAP
SUBMITTED: C.H.R.	

DATE:	R&M NO.	SCALE:	DWG. NO.
OCT. 2006	1209.10	AS SHOWN	A-01

CORPS OF ENGINEERS

U. S. ARMY

LEGEND

GROUP-4	GROUP OF (3) MONITORING WELLS
AP-620-MW	SINGLE BORING W/ MONITORING WELL
AP-606	EXISTING BORINGS BY USACE-AD

NOTE: TEST BORING LOCATIONS ARE APPROXIMATE ONLY.

KENAI SPUR HWY.

FRONTAGE RD.

OVERLAND AVE.

UPLAND ST.

MAIN ST.

BROADWAY CT.

BROAD WAY

AP-620-MW

BROAD ST.

BLUFF ST.

MARINE A

PENINSULA AVE.

AP-607

PENINSUL

ETERSEN WAY

MISSION AVE.

OVERLAND AVE.

HIGHLAND AVE.

HIGHLAND WAY

ALASKA AVE.

OVERLAND AVE.

MISSION AVE.

UPLAND ST.

COOK AVE.

COOK AVE.

GROUP-2

RIVERSIDE DR.

GROUP-1

MISSION AVE..

PED. BRIDGE

CEMETERY CK.

KENAI AVE.

B.O.P.

KENAI RIVER

0 100 200 400 600

GRAPHIC SCALE (IN FEET)

R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION KENAI, ALASKA
DRAWN: A.T.B.	
CHECKED: C.H.R.	MONITORING WELL PLAN SHEET 1 OF 2
SUBMITTED: C.H.R.	

DATE:	R&M NO.	SCALE:	DWG. NO.
DEC. 2007	1209.10	AS SHOWN	A-02

Plotted 1/15/2008 9:38 AM by PHardcastle

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CORPS OF ENGINEERS

U. S. ARMY

KENAI SPUR HWY.

FRONTAGE RD.

SOUTH WILLOW ST.

LAKE ST.

SENIOR CT.

SPUR VIEW DR.

BRIDGE ACCESS RD.

AP-621-MW

MW-2

MW-1

MW-3

AP-604

AP-605

AP-606

GROUP-3

GROUP-4

RYAN'S CK.

PACIFIC STAR SEAFOODS

(E.O.P.)

KENAI RIVER

0 100 200 400 600

GRAPHIC SCALE (IN FEET)

LEGEND

GROUP-4	GROUP OF (3) MONITORING WELLS
AP-620-MW	SINGLE SOILS BORING W/MONITORING WELL
AP-606	EXISTING BORINGS BY USACE-AD
MW-1	EXISTING BORINGS BY AMER. ENV.

NOTE: TEST BORING LOCATIONS ARE APPROXIMATE ONLY.

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CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: A.T.B.	KENAI, ALASKA
CHECKED: C.H.R.	MONITORING WELL PLAN
SUBMITTED: C.H.R.	SHEET 2 OF 2

DATE:	R&M NO.	SCALE:	DWG. NO.
DEC. 2007	1209.10	AS SHOWN	A-03

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U. S. ARMY

NOTE: TEST BORING LOCATIONS ARE APPROXIMATE ONLY.

0 50 100 200 300

GRAPHIC SCALE (IN FEET)

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CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: A.T.B.	KENAI, ALASKA
CHECKED: C.H.R.	MONITORING WELL LOCATION MAP
SUBMITTED: C.H.R.	GROUP 1 AND VICINITY

DATE:	R&M NO.	SCALE:	DWG. NO.
DEC. 2007	1209.10	AS SHOWN	A-04

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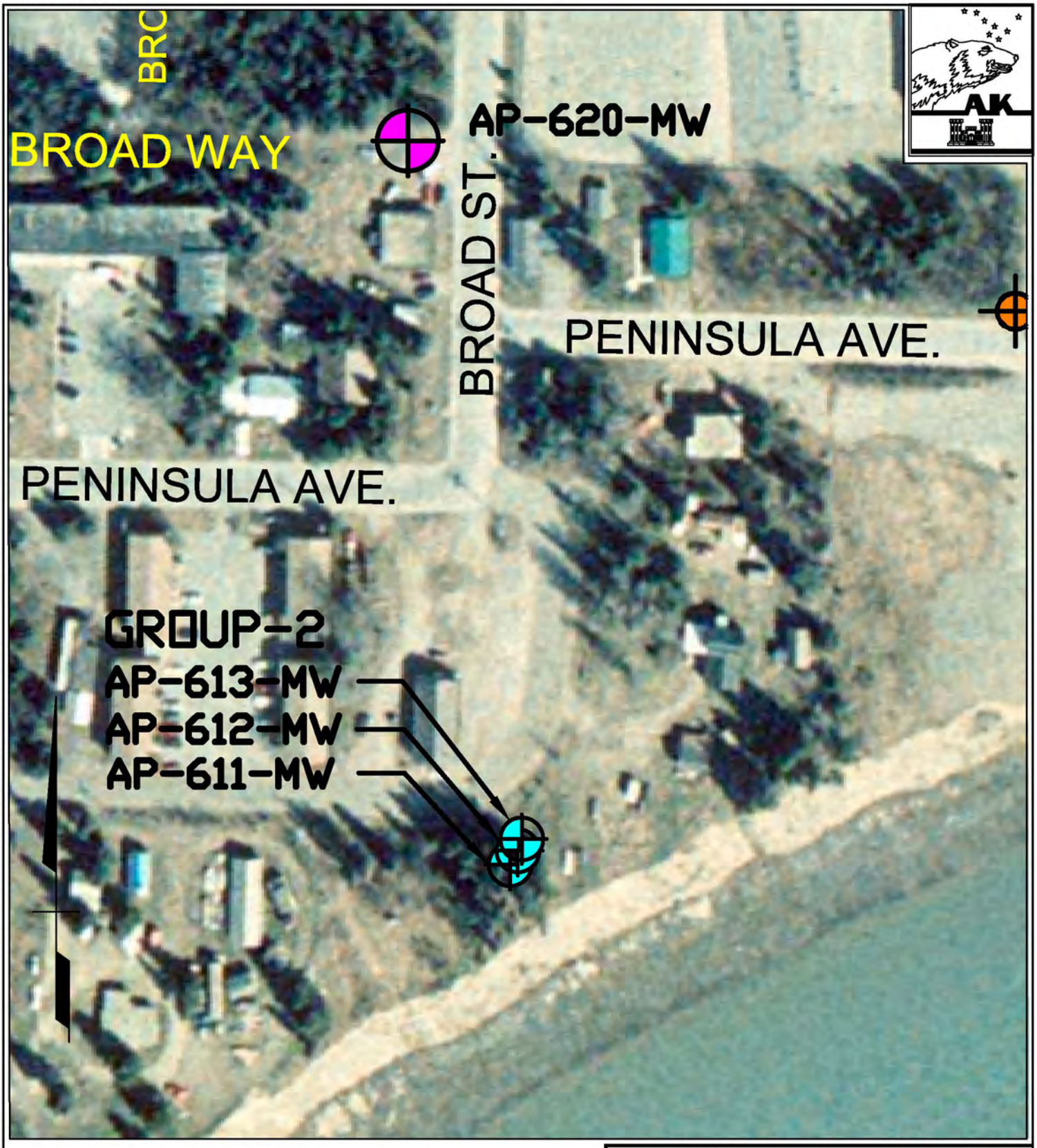

NOTE: TEST BORING LOCATIONS ARE APPROXIMATE ONLY.

0 50 100 200 300

GRAPHIC SCALE (IN FEET)

R&M CONSULTANTS, INC.

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CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: A.T.B.	KENAI, ALASKA
CHECKED: C.H.R.	MONITORING WELL LOCATION MAP
SUBMITTED: C.H.R.	GROUP 2 AND VICINITY

DATE:	R&M NO.	SCALE:	DWG. NO.
DEC. 2007	1209.10	AS SHOWN	A-05

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CORPS OF ENGINEERS

U. S. ARMY

NOTE: TEST BORING LOCATIONS ARE APPROXIMATE ONLY.

0 50 100 200 300

GRAPHIC SCALE (IN FEET)

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CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: A.T.B.	KENAI, ALASKA
CHECKED: C.H.R.	MONITORING WELL LOCATION MAP
SUBMITTED: C.H.R.	GROUP 3 AND VICINITY

DATE:	R&M NO.	SCALE:	DWG. NO.
DEC. 2007	1209.10	AS SHOWN	A-06

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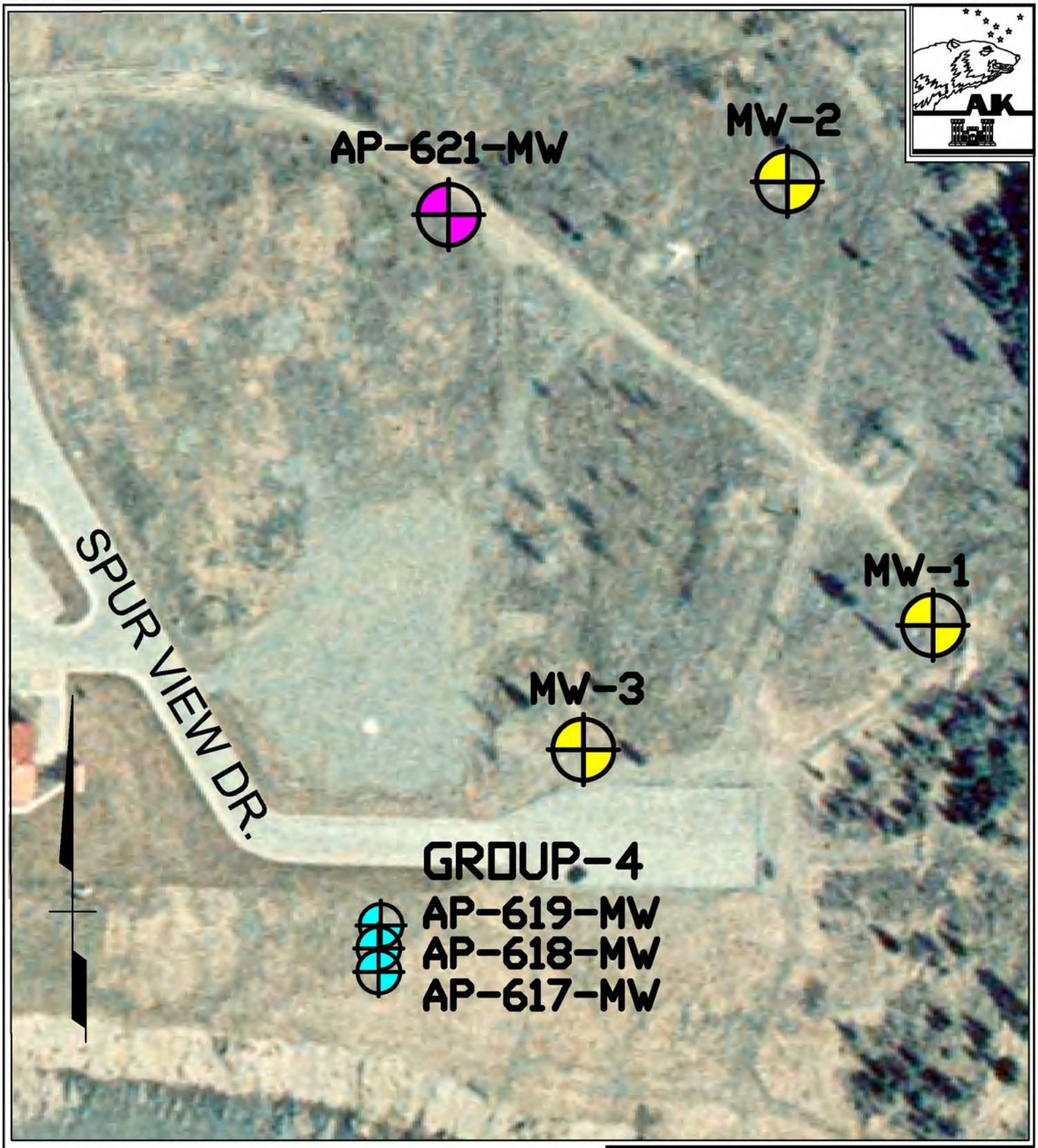
CORPS OF ENGINEERS

U. S. ARMY



NOTE: TEST BORING LOCATIONS ARE APPROXIMATE ONLY.

0 50 100 200 300

GRAPHIC SCALE (IN FEET)

R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: A.T.B.	KENAI, ALASKA
CHECKED: C.H.R.	MONITORING WELL LOCATION MAP
SUBMITTED: C.H.R.	GROUP 4 AND VICINITY

DATE:	R&M NO.	SCALE:	DWG. NO.
DEC. 2007	1209.10	AS SHOWN	A-07

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APPENDIX B
LOGS OF TEST BORINGS

SOILS
CONSISTENCY AND SYMBOLS

CLASSIFICATION: Identification and classification of the soil is accomplished in accordance with the ASTM version of the Unified Soil Classification System. When laboratory testing data on material passing the 75-mm sieve is available Standard D 2487 (Classification of Soils for Engineering Purposes) is used and when laboratory data is not available D 2488 Visual-Manual Procedure) is used. This classification system identifies three major soil divisions: coarse-grained soils, fine-grained soils, and highly organic soils. These three divisions are further subdivided into a total of 15 basic soils groups. Based on the results of visual observations and prescribed laboratory tests, a soil is catalogued according to the basic soil groups, assigned a group symbol(s) and name, and thereby classified. Flow charts contained in the two standards can be used to assign the appropriate group symbol(s) and name.

SOIL DENSITY/CONSISTENCY - CRITERIA: Soil density/consistency as defined below and determined by normal field and laboratory methods applies only to non-frozen material. For these materials, the influence of such factors as soil structure, i.e. fissure systems shrinkage cracks, slickensides, etc., must be taken into consideration in making any correlation with the consistency values listed below. In permafrost zones, the consistency and strength of frozen soil may vary significantly and inexplicably with ice content, thermal regime and soil type.

COHESIONLESS

Description	N * (blows/FT.)	Relative Density
Loose	0 - 10	0 to 40%
Medium Dense	10 - 30	40 to 70%
Dense	30 - 60	70 to 90%
Very Dense	>60	90 to 100%

* Standard Penetration "N": Blows per 12 inches of a 140-pound manual hammer (lifted with rope & cathead) falling 30 inches on a 2-inch O.D. split-spoon sampler except where noted.

COHESIVE

Consistency	Shear Strength (TSF)	Unconfined Compressive Strength (TSF)
Very Soft	0.0 - 0.25	0.0 - 0.5
Soft	0.25 - 0.5	0.5 - 1.0
Firm	0.5 - 1.0	1.0 - 2.0
Stiff	1.0 - 2.0	2.0 - 4.0
Very Stiff	2.0 - 4.0	4.0 - 8.0
Hard	OVER 4.0	OVER 8.0

KEY TO TEST RESULTS

DD - Dry Density
LL - Liquid Limit
MC - Moisture Content
Org - Organic Content
PI - Plastic Index
PL - Plastic Limit
PP - Pocket Penetrometer
P200 - % Passing No. 200 Screen
P.02 - % Passing 0.02 mm
SG - Specific Gravity
TV - Torvane

DWN:	K.J.P.
CKD:	R.M.P.
DATE:	FEB 06
SCALE:	NONE

R&M CONSULTANTS, INC.
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CONSTRUCTION SERVICES
9101 Vanguard Drive, Anchorage, Alaska 99507 (907) 522-1707

GENERAL NOTES

FB:	N/A
GRID:	N/A
PROJ.NO:	GENERAL
DWG.NO:	B-01

STANDARD SYMBOLS

SYMBOL	NAME	PARTICLE SIZE	SYMBOL	NAME
	CLAY	< 0.002mm, Plastic		ORGANICS
	SILT	0.002mm, - #200		ICE
	SAND	#200, - #4		ICE W/SOIL INCLUSIONS
	GRAVEL	#4, - 3"		ICE LENSE IN SILT
	COBBLES & BOULDERS	3" - 12" & > 12"		ICE CRYSTALS IN CLAY

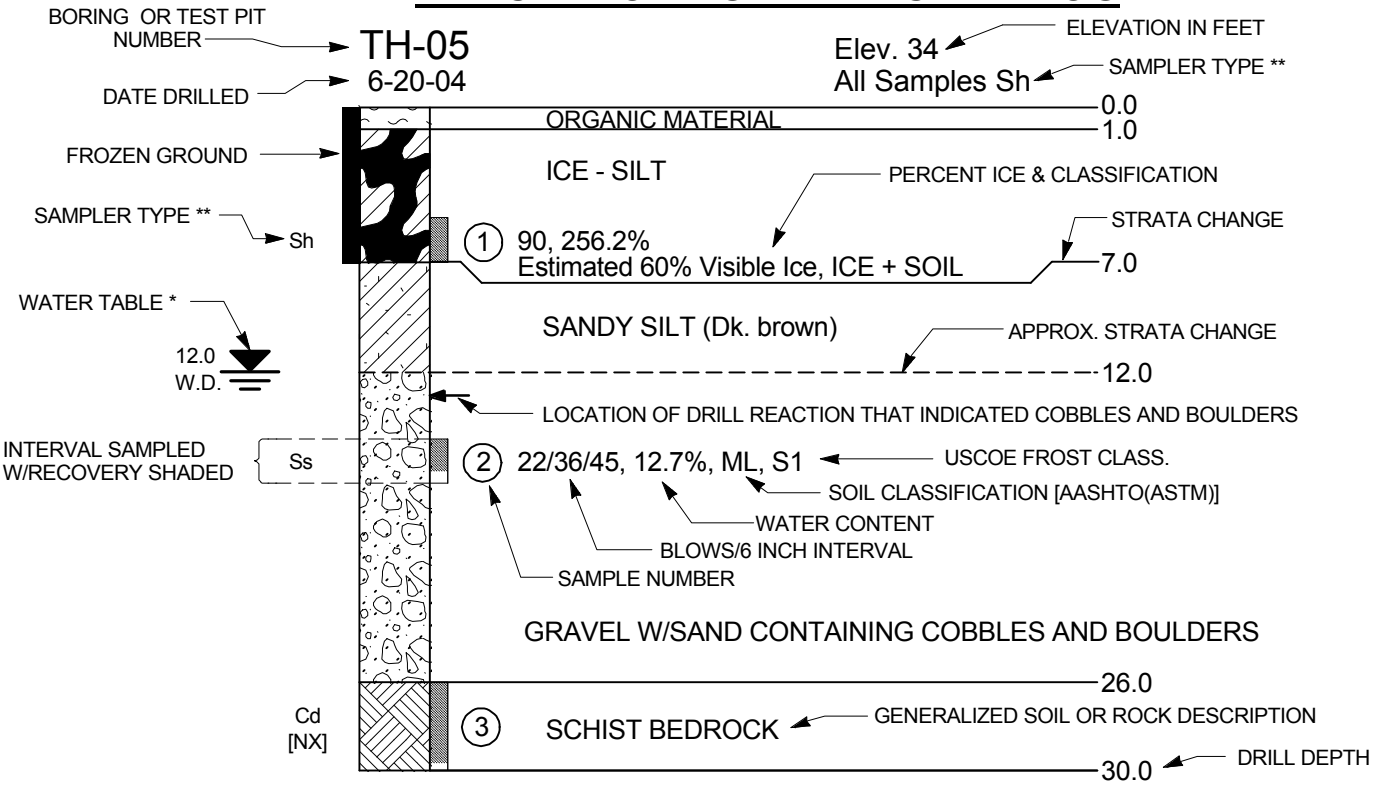
(The symbols shown above are frequently used in combinations, e. g. GRAVEL W/SILT AND SAND)

SAMPLER TYPE SYMBOLS

A	Auger Sample	Sh	2.5 In. Split Spoon w/340 lb. Manual Hammer	Sp	2.5 In. Split Spoon Pushed
C	Cuttings Sample	Sha	2.5 In. Split Spoon w/340 lb. Auto Hammer	Sz	1.4 In. Split Spoon w/340 lb. Hammer
Cd	Double Tube Core Barrel	Sl	2.5 In. Split Spoon w/140 lb. Hammer	Ts	Shelby Tube
Ct	Triple Tube Core Barrel	Ss	1.4 In. Split Spoon w/140 lb. Manual Hammer	Tm	Modified Shelby Tube
Cs	Auger Core Barrel	Ssa	1.4 In. Split Spoon w/140 lb. Auto Hammer	[x]	Sampler I. D. (Added to Symbol)
G	Grab Sample				

NOTE: Sampler types are either noted above the boring log or adjacent to it at the respective depth. An individual log may not utilize all of the items listed.

TYPICAL BORING AND TEST PIT LOG



* W.D. - WHILE DRILLING, A.B. - AFTER BORING, Ref. - SAMPLER REFUSAL
** - REFER TO SAMPLER SYMBOL (Ss, Sh, ETC.) FOR SAMPLER I.D. & HAMMER WEIGHT/TYPE
NOTE: Water levels shown on the boring logs are the levels measured in the boring at the times indicated.

DWN:	P.K.H.
CKD:	C.H.R.
DATE:	JUNE 04
SCALE:	NONE

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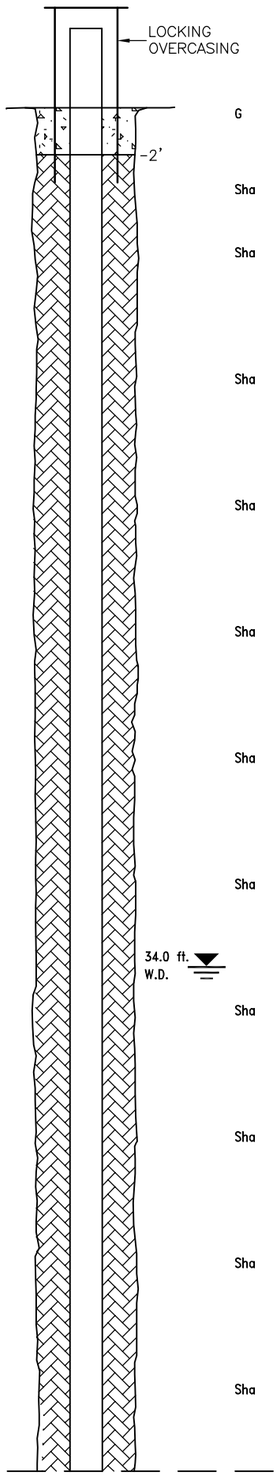
9101 Vanguard Drive, Anchorage, Alaska 99507 (907) 522-1707

EXPLANATION OF SELECTED SYMBOLS

FB:	N/A
GRID:	N/A
PROJ.NO:	GENERAL
DWG.NO:	B-02

Z:\PROJECT\1209.10\LOGS\B01&B02.GDW (DRAWING T - B-02 COE (ENG.) (CURRENT)) 2/14/07 03:39 PM

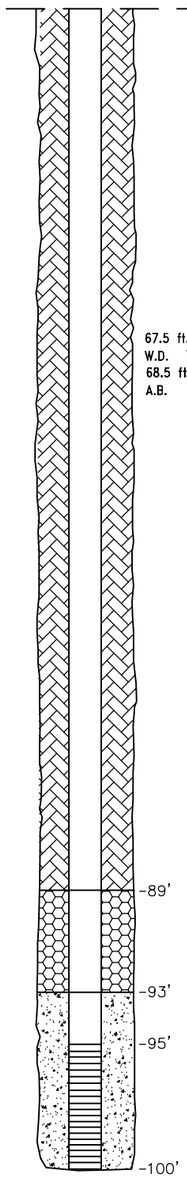


AP-608-MW (TB-1a)

N 2,395,412.81
E 1,413,139.72 Elev. 88.4
11/17/06

G	0.0	① ML*, F4* SILT CONTAINING ORGANICS
	0.5	
Sha		② 5/12/10, ML*, F4*
Sha		③ 3/3/4, 27%, ML*, F4 Gr=3, Sa=45, Fines=52 SANDY SILT (FILL) (Dk. brown, Trace gravel to 1/2" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Loose, Moist)
Sha		④ 1/2/2, ML*, F4*
Sha		⑤ 2/2/2, ML*, F4* Fragments of glass in bottom of sample
	17.5	Drilled fast and smooth to 27.5 feet
Sha		⑥ 3/8/10, SP*, NFS* POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Gravel to 1" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Medium dense, Dry)
Sha		⑦ 8/12/15, 4.3%, SP, NFS* Gr=1, Sa=95, Fines=3.7 Ferruginous cementation 27.5 to 30 feet, tougher drilling.
Sha		⑧ 7/8/6, SP*, NFS*
		Drilled fast and slightly rough 30 to 37.5 feet.
	32.5	POORLY GRADED SAND W/GRAVEL (Dk. brown, Gravel to 1" dia., rounded to subrounded, hard, Fine to coarse sand, Nonplastic, Dense, Wet)
Sha		⑨ 18/29/29, SP*, S2*
		Driller noted a gravel layer from 37.5 to 38.0 feet.
	37.5	POORLY GRADED GRAVEL W/SAND
	38.0	Driller indicated clay at 38.0 feet.
Sha		⑩ 7/11/13, CL*, F3*, PP=4.5+ tsf SANDY LEAN CLAY (Dk. gray, Gravel to 3/4" dia., rounded to subrounded, hard, Fine to coarse sand, Plastic, Very hard, Dry)
		Drilled slower, tighter, w/gravel hits 38 to 43 feet, Very slow and hard 43 to 45 feet.
	45.0	
Sha		⑪ 13/20/22, 2.3%, SP, NFS, Gr=12, Sa=86, Fines=1.8
		POORLY GRADED SAND (Dk. gray, Gravel to 1.5" dia., rounded to subrounded, hard, Fine to coarse sand, Nonplastic, Dense, Dry)
	47.0	
		SANDY LEAN CLAY (Dk. gray)
	49.5	
Sha		Drilled faster 45 to 50 feet. ⑫ 9/12/16, SP*, NFS* POORLY GRADED SAND (Dk. gray, Gravel to 1" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Dense, Dry)
	54.0	

(Continued Above)



AP-608-MW (Continued)

11/17/06

	54.0	
Sha		⑬ 6/12/18, 2.8%, SP, NFS Sa=99, Fines=1.3 Drilled slow, very tight, bit smoking 50 to 60 feet.
Sha		⑭ 6/16/19, SP*, NFS* Drilled faster and smooth 60 to 85 feet.
Sha		⑮ 3/8/15, 9.7%, SP, NFS Gr=1, Sa=96, Fines=3.0 Gravel increases with depth.
Sha		⑯ 6/18/26, SP*, NFS Sampler overfilled
	72.5	
		SANDY LEAN CLAY (Dk. gray, Trace gravel to 3/4" dia., subrounded, hard, Fine to coarse sand, Plastic, Very stiff, Dry)
Sha		⑰ 6/11/12, CL*, F3, PP=3.0 tsf
	77.5	
		POORLY GRADED SAND W/SILT (Dk. gray, Gravel to 1" dia., rounded to subrounded, hard, Fine to coarse sand, Nonplastic, Dense, Wet)
Sha		⑱ 18/35 blows for 6", 17%, SP-SM*, F2* Gr=6, Sa=83, Fines=11, Sampler overfilled
	84.0	
Sha		⑲ 6/18/23, 13%, CL, F4, PP=4.5+ tsf Gr=15, Sa=22, Fines=63, LL=24, PL=15, PI=9 SANDY LEAN CLAY (Dk. gray, Gravel to 1" dia., subrounded, hard, Fine to coarse sand, Layers of sand to 1/16" thick, irregular dip, Plastic, Very hard, Wet to dry)
Sha		⑳ 7/13/18, CL*, F3*, PP=4.5+ tsf Drilled hard, slow, and smooth 85 to 100 feet.
Sha		㉑ 6/12/18, 16%, CL, F4, PP=4.5+ tsf Gr=2, Sa=18, Fines=80, LL=27, PL=16, PI=11
	97.5	
		POORLY GRADED SAND (Dk. gray, Fine sand, Nonplastic, Dense, Wet)
Sha		㉒ 8/18/22 blows for 3", SP*, PFS* Sampler bouncing
	101.2	

* Estimated Classification
** Designates that blow counts may not be representative due to sand heaving into the augers.

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screen w/prepacked sand was installed between 95 and 100 ft.
2. Installation was uneventful.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

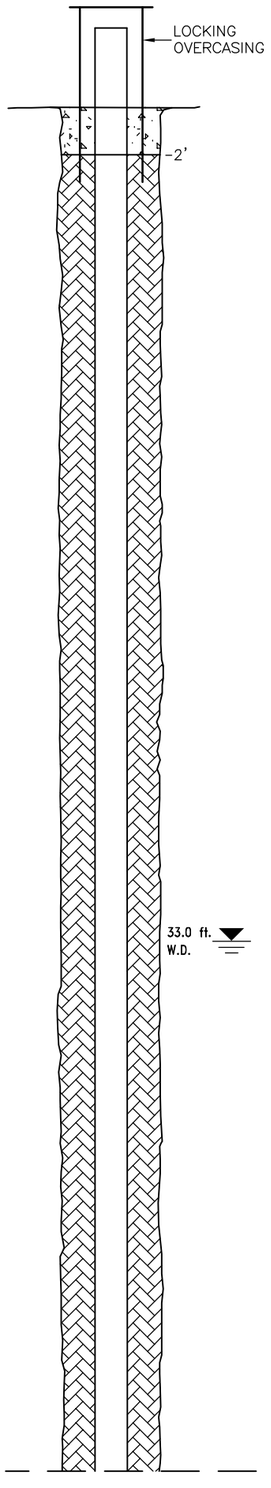
R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION KENAI, ALASKA
DRAWN: P.K.H.	
CHECKED: C.H.R.	TEST BORING LOG AP-608-MW
SUBMITTED: C.H.R.	

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-03



AP-609-MW (TB-1b)

N 2,395,415.41
E 1,413,150.90 Elev. 88.6
11/18/06

0.0 SILT CONTAINING ORGANICS 0.5

Drilled fast and smooth to 25 feet.

SANDY SILT (FILL) (Dk. brown, Gravel to 1/2" dia., Fine to medium sand, Nonplastic)

Driller indicated looser material at about 17.5 feet.

17.5

POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Gravel to 1" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Medium dense, Dry)

Ferruginous cementation 25 to 30 feet, tougher drilling.

Drilled fast and smooth to 30 to 37.5 feet.

Drilled slightly rough 37.5 to 38 feet.

37.5
38.0

Drilled tight and smooth 38 to 44 feet.

SANDY LEAN CLAY (Dk. gray)

Drilled tight and smooth 38 to 44 feet.

44.0 POORLY GRADED SAND W/GRAVEL
Drilled fast, slightly rough 44 to 45 feet. 45.0
POORLY GRADED SAND 46.0
POORLY GRADED SAND W/GRAVEL 47.0

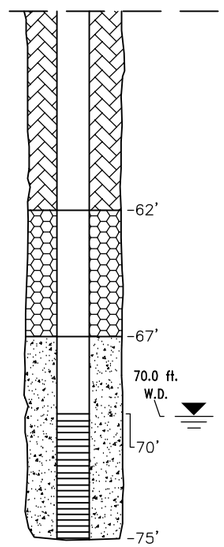
Drilled fast and smooth 45 to 46 feet, Slightly rough 46 to 47 feet.

POORLY GRADED SAND (Dk. gray, Gravel to 1.5" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Dense, Dry) 54.0

(Continued Above)

AP-609-MW (Continued)

11/17/06



54.0

Drilled fast and smooth 47 to 75 feet.

Sha ① 6/12/18**, 9" heave, sampler floated, SP-SM*, F2* 76.2

* Estimated Classification
** Designates that blow counts may not be representative due to sand heaving into the augers.

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screen w/prepacked sand was installed between 70 and 75 ft.
2. Installation was uneventful.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

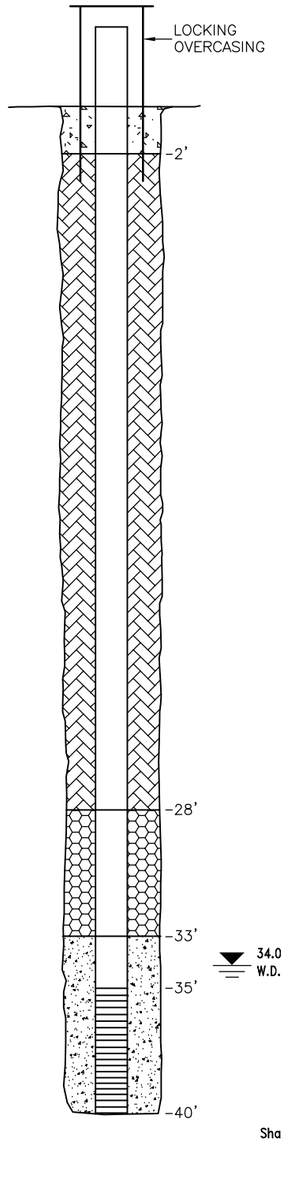
R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	TEST BORING LOG
SUBMITTED: C.H.R.	AP-609-MW

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-04



AP-610-MW (TB-1c)

N 2,395,430.86
E 1,413,141.62 Elev. 88.9
11/18/06

SILT CONTAINING ORGANICS	0.0 – 0.5
SANDY SILT (FILL) (Dk. brown, Gravel to 1/2" dia., Fine to medium sand)	
	10.0
Drilled fast and smooth to 40 feet.	
POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Gravel to 1" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Medium dense, Dry)	
Ferruginous cementation 25 to 30 feet, tougher drilling.	
Drilled fast and smooth to 30 to 37.5 feet, slightly rough to 38 feet.	
Drilled tight and smooth 38 to 40 feet.	
POORLY GRADED GRAVEL W/SAND	37.5 – 38.0
Drilled tight and smooth 38 to 40 feet.	
SANDY LEAN CLAY CONTAINING COBBLES & BOULDERS (Dk. gray)	
7/11/14 blows for 3" Sampler bouncing on cobble/boulder	41.3

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screen w/prepacked sand was installed between 35 and 40 ft.
2. Installation was uneventful.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

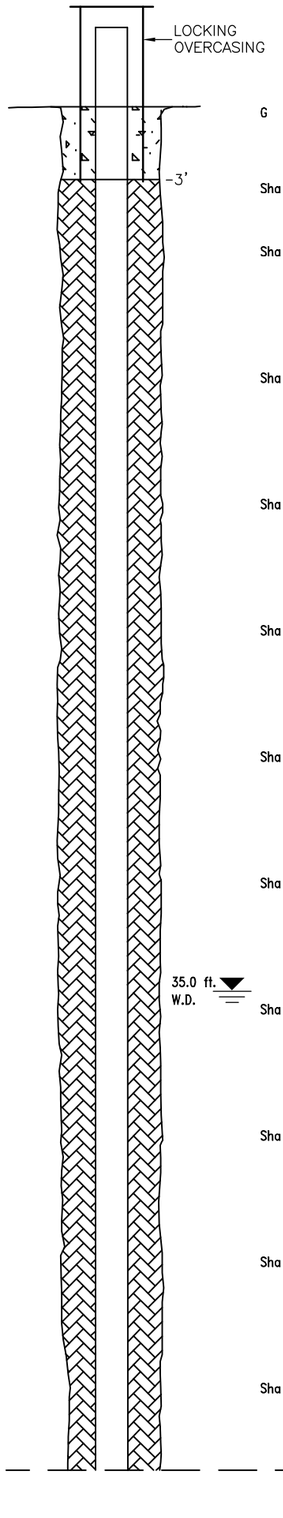
R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION KENAI, ALASKA
DRAWN: P.K.H.	
CHECKED: C.H.R.	TEST BORING LOG AP-610-MW
SUBMITTED: C.H.R.	

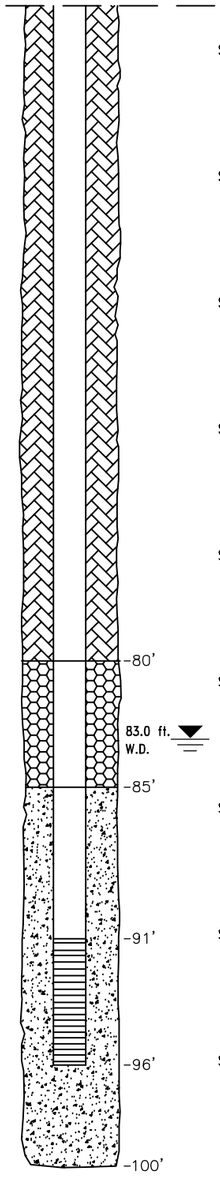
DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-05



AP-611-MW (TB-2c)

N 2,395,775.73
E 1,414,431.97
Elev. 91.1
11/14/06 - 11/15/06

G ① ML*, F4* — 0.0
SILT (Dk. brown)
2.5
Sha ② 1/2/3, 10%, SM*, F3*, Gr=2, Sa=71, Fines=27 — 4.0
SILTY SAND (Dk. brown, Fine to medium sand, Nonplastic, Loose, Dry)
Sha ③ 2/4/3, SP*, NFS*
POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Gravel to 1" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Loose to medium dense, Dry to wet)
Sha ④ 2/5/6, SP*, NFS*
Drilled fast and smooth w/fine gravel to 38 feet.
Sha ⑤ 2/4/4, 3.5%, SP, NFS, Gr=7, Sa=92, Fines=1.2
Sha ⑥ 4/6/8, SP*, NFS*
Sha ⑦ 3/5/8, SP*, NFS*
Sha ⑧ 3/7/6, 5.1%, SP, NFS, Gr=6, Sa=91, Fines=3
Sha ⑨ 2/4/6, SP*, NFS*
Driller indicated clay encountered at 38 feet. — 38.0
Sha ⑩ 6/9/14, CL*, F3*
SANDY LEAN CLAY (Dk. gray, Gravel to 1.5" dia., rounded to angular, hard, Fine to medium sand, Plastic, Very hard, Dry)
Sha ⑪ 8/12/16, CL*, F3*
Drilled moderately fast, smooth and tight 38 to 83 feet.
Sha ⑫ 6/11/14***, 11%, CL, F4
Gr=22, Sa=18, Fines=60, LL=27, PL=16, PI=11
54.0
(Continued Above)



AP-611-MW (Continued)

11/14/06 - 11/15/06

54.0
Sha ⑬ 3/7/11***, CL*, F4*
Sha ⑭ 7/12/16***, 15%, CL, F4
Gr=2, Sa=26, Fines=72, LL=26, PL=16, PI=10
Sha ⑮ 8/17/21***, CL*, F4*
Sampler overfilled
Sha ⑯ 10/12/13***, 18%, CL, F4
Sa=25, Fines=75, LL=22, PL=14, PI=8
Sha ⑰ 8/16/18***, 15%, CL, F4
Gr=1, Sa=21, Fines=78.0, LL=24, PL=16, PI=8
Sha ⑱ 8/12/19, CL*, F3*
Fine sand layers <1/4" thick
83.0
Sha ⑲ 10/21 blows for 6" **, SP*, S2*
6" heave, Sampler floated
POORLY GRADED SAND (Black, Fine angular sand, Nonplastic, Medium dense, Wet)
Sha ⑳ 2/6/10**, SP*, S2*
15 feet of heave after sample 19, pulled auger back 15 feet, and redrilled to 90 feet. 12" heave at 90 feet, sampler floated.
95.0
Sha ㉑ 3/5/7, CL*, F3*, PP=4.5+ tsf
SANDY LEAN CLAY (Dk. gray, Trace gravel to 1/2" dia., subrounded to subangular, hard, Fine to coarse sand, Plastic, Very hard, Dry)
Sha ㉒ 3/6/8, 20%, CL*, F3*, PP=4.5+ tsf
Sa=18, Fines=82
101.5

* Estimated Classification
** Designates that blow counts may not be representative due to sand heaving into the augers.
*** Sampler driven with plastic liners.
Unconsolidated-undrained triaxial compression test performed on samples #12, #14, and #16.

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screen w/prepacked sand was installed between 91 and 96 ft.
2. Installation was uneventful.

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

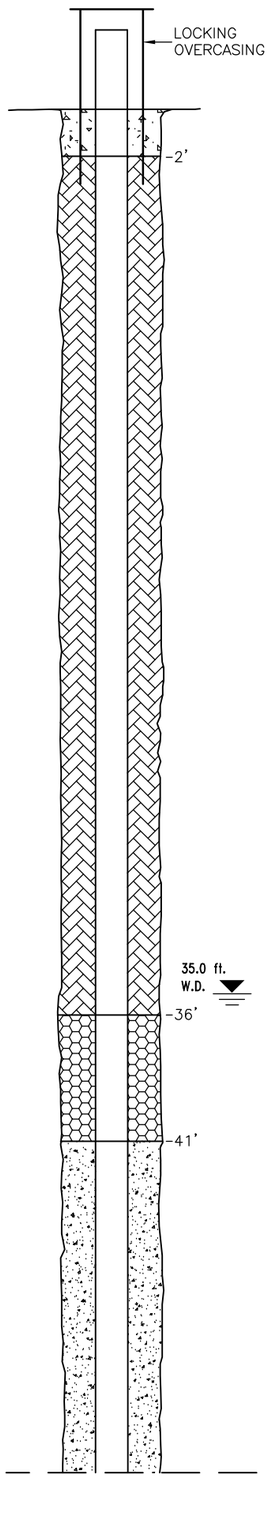
R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	TEST BORING LOG
SUBMITTED: C.H.R.	AP-611-MW

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-06



AP-612-MW (TB-2b)

N 2,395,786.22
E 1,414,437.68 Elev. TBD
11/15/06 - 11/16/06

0.0 SILT (Dk. brown)

2.5 POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Gravel to 1" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Dry to wet)

Drilled fast and smooth w/fine gravel to 38 feet.

Color change to red-brown at 30 feet, may indicate ferruginous cementation.

Driller indicated clay encountered at 38 feet.

38.0 Drill reaction indicates pieces of gravel in top 1-inch of clay.

Gravelly layer at 43 feet.

Soft sand layer between 44 and 44.5 feet.

SANDY LEAN CLAY (Dk. gray, Gravel to 1.5" dia., rounded to angular, hard, Fine to medium sand, Plastic, Very hard, Dry)

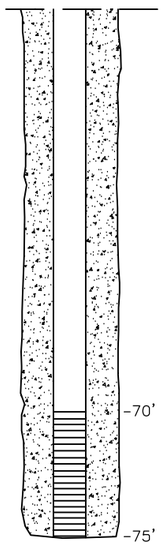
Drilled slower, tight, and smooth 38 to 75 feet.

54.0

(Continued Above)

AP-612-MW (Continued)

11/17/06



54.0 Pieces of fine gravel between 45 and 75 feet.

Sha ① 1/5/6, CL*, F3*, PP=4.5+ tsf

76.5

* Estimated Classification

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screen w/prepacked sand was installed between 70 and 75 ft.
2. Silica sand bridged in augers and bridge could not be removed until augers were pulled to 40 feet.
3. Sand from upper sand unit caved into hole to a depth of 41 feet.
4. Well appeared to be measuring water level of upper aquifer.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

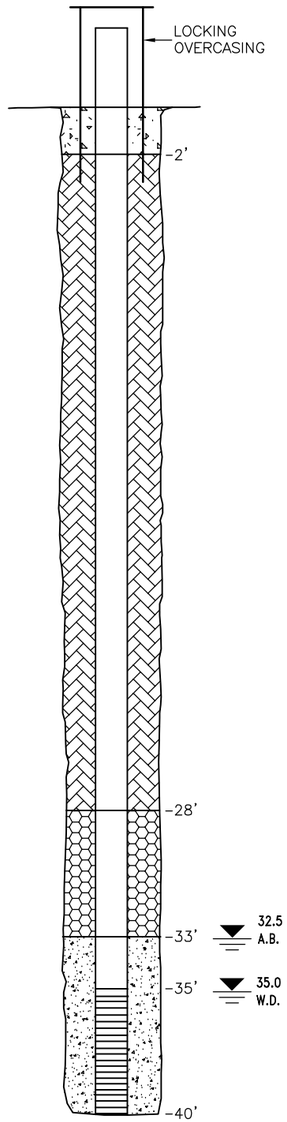
R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	TEST BORING LOG
SUBMITTED: C.H.R.	AP-612-MW

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-07



AP-613-MW (TB-2a)

N 2,395,795.10
E 1,414,440.67
11/15/06

Elev. 91.0

0.0 — SILT (Dk. brown)

2.5 — POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Fine to coarse sand, Nonplastic, Dry to wet)

Drilled fast and smooth w/fine gravel to 38 feet.

Color change to red-brown at 30 feet, may be ferruginous cementation.

Driller indicated gravel encountered on top of clay at 38 feet.

38.0 — SANDY LEAN CLAY (Dk. gray)

Sha ① 4/8/12, CL*, F3*, PP=4.5+ tsf

41.5

* Estimated Classification

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screen w/prepacked sand was installed between 35 and 40 ft.
2. Installation was uneventful.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

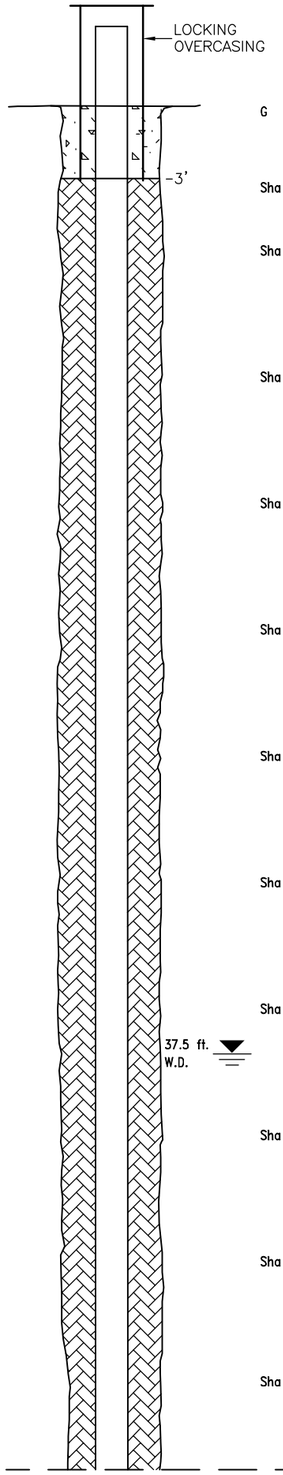
R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	TEST BORING LOG
SUBMITTED: C.H.R.	AP-613-MW

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-08

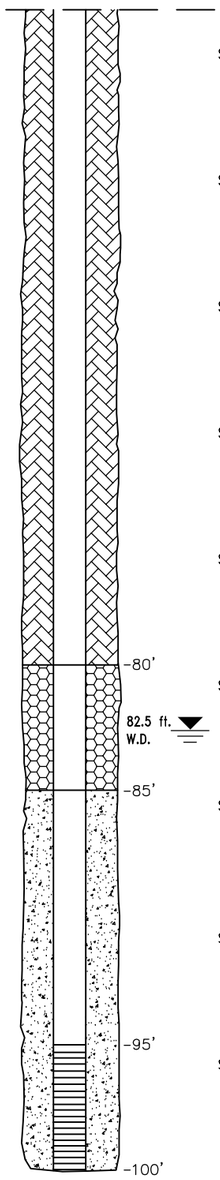


AP-614-MW (TB-3a)

N 2,396,258.31
E 1,415,755.43 Elev. 93.9
11/11/06

G	0.0	ML* to SM*, F4* SILT GRADING TO SILTY SAND (Dk. brown, Fine to coarse sand, Nonplastic)
	1.0	
Sha		1/4/6, SM*, F3* SILTY SAND GRADING TO POORLY GRADED SAND (Dk. brown, Fine sand, Nonplastic, Medium dense, Dry)
Sha	4.0	3/4/4, 5.8%, SP, PFS* Gr=11, Sa=85, Fines=4.2
Sha		3/6/8, SP*, NFS* POORLY GRADED SAND TO SAND W/SILT CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Gravel to 1" dia., subrounded to rounded, hard, Fine to coarse sand, Nonplastic, Medium dense, Dry)
Sha		2/5/6, 4.8%, SP, NFS* Sa=97, Fines=3.1 Drilled fast and smooth to 32.5 feet.
Sha	24.0	2/4/6, SP*, NFS* Ferruginous cementation 22.5 to 32.5 feet.
Sha		7/10/15, 4.9%, SP-SM*, S2* Sa=95, Fines=5.3
Sha		6/10/11, SP*, NFS* Driller indicated change at 32.5 feet.
	32.5	
		Drilled fast and slightly rough 32.5 to 42.5 feet.
Sha		8/18/22, 2.4%, SP-SM*, S2 Gr=32, Sa=63, Fines=5.5, P.02=3.3 POORLY GRADED SAND W/SILT AND GRAVEL (Dk. brown, Gravel to 1.5" dia., subrounded to rounded, hard, Fine to coarse sand, Nonplastic, Medium dense to dense, Dry to wet)
Sha		10/12/10, SP-SM*, S2*
	42.5	
		Driller indicated gravel layer at 42.5 feet. Drilled slightly rough and tight 42.5 to 52.5 feet.
Sha		10/15/16, 16%, SC*, F3*, Gr=2, Sa=56, Fines=42 Gravel layer to 6" thick at 47.5 feet. CLAYEY SAND W/GRAVEL LAYERS CONTAINING COBBLES & BOULDERS (Dk. gray, Gravel subrounded to angular, hard, Fine to coarse sand, Sand layers to 1/4" thick, Plastic, Very hard, Dry)
Sha		12/32 blows for 6", CL*, F3*, Sampler bouncing on cobble/boulder
	52.5	

(Continued Above)



AP-614-MW (Continued)

11/17/06

Sha		10/20/18***, 14%, CL, F4, Gr=1, Sa=20, Fines=79, LL=24, PL=15, PI=9, SG=2.682 SANDY LEAN CLAY TO LEAN CLAY W/SAND (Dk. gray, Gravel to 1" dia., subrounded, hard, Fine to coarse sand, Plastic, Very hard, Dry)
Sha		5/12/16***, 13%, CL, F4 Gr=3, Sa=22, Fines=75, LL=27, PL=15, PI=12 Drilled moderately fast, smooth and tight 52.5 to 82.5 feet.
Sha		7/12/19***, 16%, CL*, F4*
Sha		7/9/14***, 17%, CL, F3 Gr=2, Sa=19, Fines=79, LL=31, PL=18, PI=13
Sha		8/14/15, 15%, CL*, F3* Gr=4, Sa=43, Fines=53, Thin layers of sand
Sha		6/10/10, 17%, CL*, F3* Gr=2, Sa=22, Fines=76, P.02=52.8
	82.5	
		Drilled fast, easy and smooth 82.5 to 100 feet.
Sha		7/17 blows for 6"**, 18%, SC*, F3*, Gr=6, Sa=64, Fines=30, 6" heave, sampler floated, sampler overfilled
	87.5	POORLY GRADED SAND CONTAINING LAYERS OF LEAN CLAY (Dk. gray, Gravel to 1" dia., subrounded, hard, Fine to medium sand, Nonplastic, Medium dense, Wet)
Sha		6/12/11**, SP-SM*, S2* 18" heave, sampler floated POORLY GRADED SAND TO SAND W/SILT (Dk. gray, Fine to medium sand, Nonplastic, Medium dense to dense, Wet)
Sha		7/15/17**, 24" heave sampler floated
Sha		6/10/17**, 24%, SP-SM*, S2* Sa=94, Fines=6.1, 24" heave, sampler floated
	101.5	

* Estimated Classification
** Designates that blow counts may not be representative due to sand heaving into the augers.
*** Sampler driven with plastic liners.
Consolidated undrained triaxial compression test performed on samples #13, #14, and #15.

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screen w/prepacked sand was installed between 95 and 100 ft.
2. Due to heaving conditions the screen could not be placed down the hole and the augers were reinstalled with a wooden plug. Otherwise installation was uneventful.

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

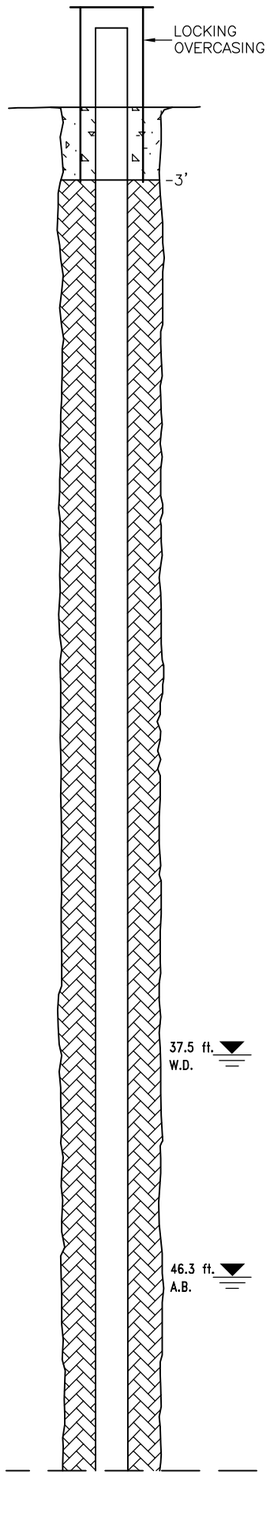
R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	TEST BORING LOG
SUBMITTED: C.H.R.	AP-614-MW

DATE:	R&M NO.	SCALE:	DWG. NO.
FEB. 2007	1209.10	AS SHOWN	B-09



AP-615-MW (TB-3b)

N 2,396,268.68
E 1,415,756.19 Elev. 93.5
11/12/06

0.0 SILT (Dk. brown)

1.0 SILTY SAND (Dk. brown)

4.0 POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Fine to medium sand, Nonplastic, Dry)

Drilled fast and smooth to 32.5 feet.

32.5 POORLY GRADED SAND W/GRAVEL (Dk. brown)

Drilled fast and slightly rough 32.5 to 41.5.

41.5 Drilled rougher 41.5 to 47.5 feet.

Gravel layer 43 to 43.5 feet.

SANDY LEAN CLAY W/GRAVEL LAYERS CONTAINING COBBLES & BOULDERS (Dk. gray)

Coarse gravel/cobble layer 46.5 to 47.5 feet.

47.5

54.0 (Continued Above)

AP-615-MW (Continued)

11/12/06

54.0 SANDY LEAN CLAY (Dk. gray, Plastic, Dry)

Sha ① 8/12/15, 19%, CL*, F3* Gr=2, Sa=47, Fines=51

76.5

* Estimated Classification

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screen w/prepacked sand was installed between 70 and 75 ft.
2. Installation was uneventful.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

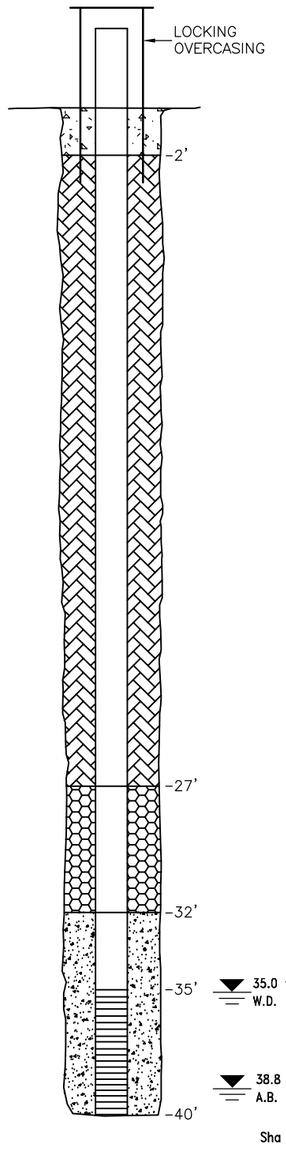
R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION KENAI, ALASKA
DRAWN: P.K.H.	
CHECKED: C.H.R.	TEST BORING LOG AP-615-MW
SUBMITTED: C.H.R.	

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-10



AP-616-MW (TB-3c)

N 2,396,280.50
E 1,415,756.60
11/13/06

Elev. 93.7

0.0 — SILT (Dk. brown) — 1.0

SILTY SAND GRADING TO POORLY GRADED SAND (Dk. brown, Nonplastic)

4.0

POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Fine to medium sand, Nonplastic, Dry)

Drilled fast and smooth to 32.5 feet.

32.5

POORLY GRADED SAND W/GRAVEL (Dk. brown)

Drilled fast and slightly rough 32.5 to 40 feet.

① 10/9/11***, SP*, S2*

41.5

* Estimated Classification
*** Sampler driven with plastic liners.

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger Drill
Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screen w/prepacked sand was installed between 35 and 40 ft.
2. Installation was uneventful.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

R&M CONSULTANTS, INC.

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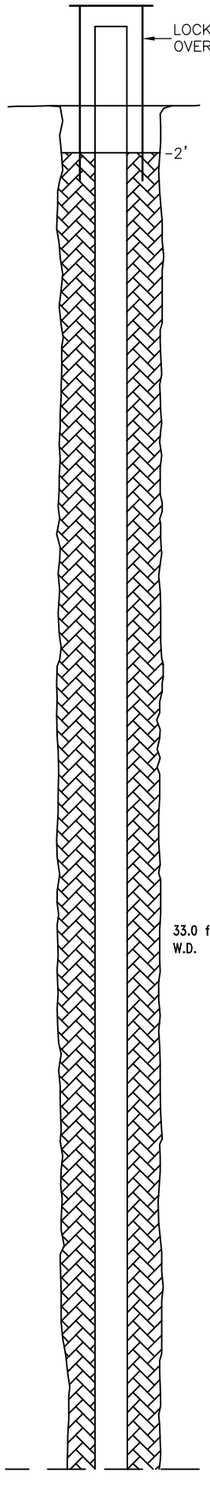
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	TEST BORING LOG
SUBMITTED: C.H.R.	AP-616-MW

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-11

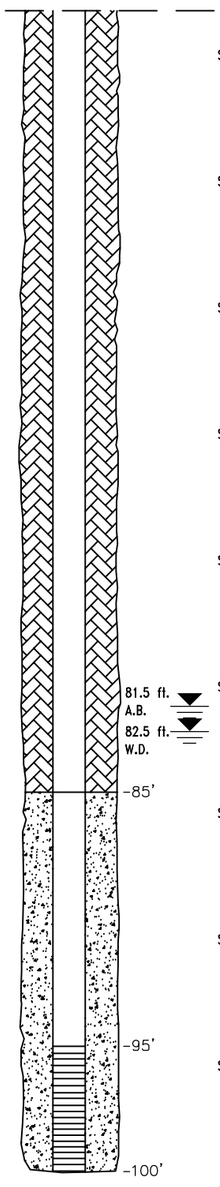


AP-617-MW (TB-4a)

N 2,396,189.80
E 1,416,979.96 Elev. 92.9
11/19/06

G	0.0	ORGANIC MAT
	0.2	(1) SM*, F3*
		SILTY SAND GRADING TO SAND (Dk. brown, Gravel to 1/4" dia., rounded to subrounded, hard, Fine to coarse sand, Nonplastic, Dry)
Ssa		(2) 5/8/9, SM*, F3*
	4.0	
Ssa		(3) 3/5/5, SP*, NFS*
		POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Gravel to 3/8" dia., subrounded, hard, Fine to medium sand, Nonplastic, Medium dense, Dry)
Ssa		(4) 3/7/10, 6.5%, SP, PFS* Gr=1, Sa=95, Fines=3.9
Ssa		(5) 3/12/15, SP*, NFS*
Ssa		(6) 4/12/11, SP*, NFS*
		Drilled fast and smooth to 39.5 feet.
Ssa		(7) 3/5/10, 8.4%, SP, NFS*, Sa=96, Fines=4.3, Ferruginous cementation in portions of sample, Fragments of carbonized wood in sample
Ssa		(8) 3/11/16, SP*, NFS* Ferruginous cementation in portions of sample
Ssa		(9) 7/18/27, SP*, NFS*
		Driller indicated clay at 39.5 feet.
	39.5	
Sha		(10) 5/7/12, CL*, F3*, PP=4.5+ tsf, Pocket penetrometer leaves little impression
		Drilled moderately fast, tight, and smooth 39.5 to 55 feet.
Sha		(11) 5/11/12, 15%, CL*, F3* Gr=7, Sa=39, Fines=54, PP=4.5+ tsf, Pocket penetrometer doesn't leave impression, Fine sand layer to 1/8" thick, dipping at ~50°
Sha		(12) 15/35 blows for 6"**, CL*, F3* 12" heave in augers, sampler floated
		Drilled faster and smooth 55 to 60 feet.
	54.0	

(Continued Above)



AP-617-MW (Continued)

11/19/06

	54.0	
Sha		(13) 9/11/12***, 13%, CL, F3 Gr=16, Sa=21, Fines=63, LL=31, PL=18, PI=13
		SANDY LEAN CLAY W/GRAVEL TO LEAN CLAY W/SAND (Dk. gray, Gravel to 1.5" dia., subrounded, hard, Fine to coarse sand, Plastic, Very hard, Dry)
Sha		(14) 4/10/19, 15%, CL, F3, PP=4.5+ tsf Gr=6, Sa=23, Fines=71, LL=33, PL=17, PI=16
		Drilled slow and tight 60 to 75 feet.
Sha		(15) 8/16/22, CL*, F3*, PP=4.5+ tsf Sand layer to 6" thick
		Drilled slow and tight 70 to 75 feet.
Sha		(16) 5/10/13, 13%, CL*, F3*, PP=4.5+ tsf Gr=7, Sa=19, Fines=74, LL=27, PL=16, PI=11, SG=2.724
Sha		(17) 3/7/10, 15%, CL*, F3*, PP=4.5+ tsf Gr=21, Sa=28, Fines=51, P.02=36.2
		Drilled fast and smooth 75 to 85 feet.
Sha		(18) 6/9/14, 14%, CL, F4 Gr=3, Sa=28, Fines=69, LL=24, PL=16, PI=8
		Drilled easy and smooth 85 to 90 feet.
	85.0	
Sha		(19) 4/7/11, SP & CL*, PFS & F3*
		POORLY GRADED SAND CONTAINING LAYERS OF LEAN CLAY (Dk. gray, Fine sand, Nonplastic sand and plastic clay, Medium dense, Wet)
		Drilled slower and smooth 90 to 92.5 feet
	90.0	
Sha		(20) 3/7/12, 17%, CL*, F3*, PP=3.5 tsf, Gr=4, Sa=20, Fines=76
		LEAN CLAY W/SAND (Dk. gray, Gravel to 1/4" dia., subrounded, hard, Plastic, Very stiff, Moist)
	92.5	
		POORLY GRADED SAND (Dk. gray, Fine to medium sand, Nonplastic, Medium dense, Wet)
Sha		(21) 3/5/7**, 6 ft. of heave after sampling
		Drilled fast and smooth 92.5 to 100 feet.
Sha		(22) 18/28/11**, SP*, PFS* 5 ft. of heave, Sampler floated down and sanded in
	101.5	

* Estimated Classification
** Designates that blow counts may not be representative due to sand heaving into the augers.
*** Sampler driven with brass liners.
One-dimensional consolidation test performed on sample #16.
Unconsolidated-undrained triaxial compression test performed on sample #13.

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Due to heaving conditions the screen could not be placed down the hole and the augers were reinstalled with a wooden plug.
2. Screen w/prepacked sand was installed between 95 and 100 ft.
3. Unable to get bentonite down hole due to slurry in hole.
4. Pulled augers to 40 feet and backfilled with grout to surface. Grout sank to 35 by the next morning.
5. Additional grout was placed in hole until it came to within 2 feet of surface.
6. Water measurement indicated that the grout had sealed off the upper aquifer.
7. Water levels were observed to changed over time, apparently relative to the tides.

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

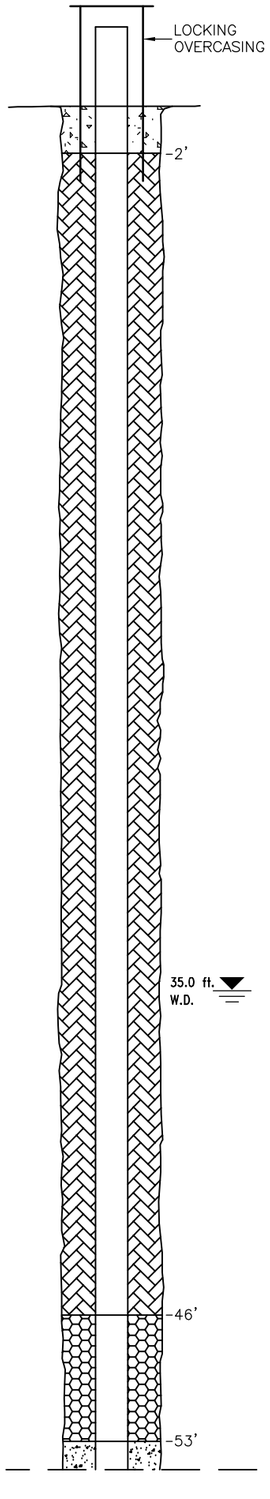
See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004 ALASKA DISTRICT
CORPS OF ENGINEERS
CONTRACTOR R&M CONSULTANTS, INC. ANCHORAGE, ALASKA
CITY ANCHORAGE STATE ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	TEST BORING LOG
SUBMITTED: C.H.R.	AP-617-MW

DATE:	R&M NO.	SCALE:	DWG. NO.
FEB. 2007	1209.10	AS SHOWN	B-12



AP-618-MW (TB-4b)

N 2,396,207.48
E 1,416,981.72 Elev. 93.1
11/20/06

0.0 SILT CONTAINING ORGANICS (Dk. brown)

0.5 SILTY SAND (Dk. brown, Gravel to 1/4" dia., rounded to subrounded, hard, Fine to coarse sand, Nonplastic, Dry)

4.0 POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown)

Drilled fast and smooth to 35.0 feet.
Faster to 40 feet.

Driller indicated clay at 39.5 feet. — 39.5

Smooth drilling alternated between slow and fast 40 to 45 feet. Tight hard drilling from 45 to 48 feet, faster 48 to 50 feet.

SANDY LEAN CLAY CONTAINING LAYERS OF POORLY GRADED SAND (Dk. gray, Gravel to 1.5" dia., subrounded, hard, Fine to coarse sand, Plastic, Very hard, Dry)

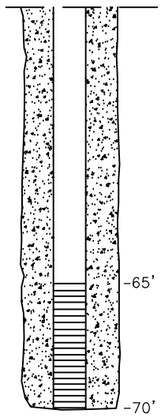
Drilled fast and smooth 50 to 50.5 feet, slower 50.5 to 51 feet. Rough from 51 to 53 feet, and faster and smooth 53 to 55 feet.

51.0 SANDY LEAN CLAY CONTAINING COBBLES & BOULDERS (Dk. gray, Plastic, Very hard, Dry)

53.0

54.0

(Continued Above)



AP-618-MW (Continued)

11/20/06

54.0

Drilled slow and tight 55 to 56.5 feet. Faster and smooth w/ occasional small cobbles 56.5 to 60 feet.

POORLY GRADED SAND CONTAINING LAYERS OF LEAN CLAY (Dk. gray)

Drilled fast 60 to 63 feet, slower and tighter 63 to 65 feet.
Drilled fast and smooth 65 to 68 feet, tighter 68 to 70 feet.

68.0

SANDY LEAN CLAY (Dk. gray, Plastic)

70.0

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Hole was drilled with wooden plug in end of augers.
2. Screen w/prepacked sand was installed between 65 and 70 ft.
3. Installation was uneventful.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

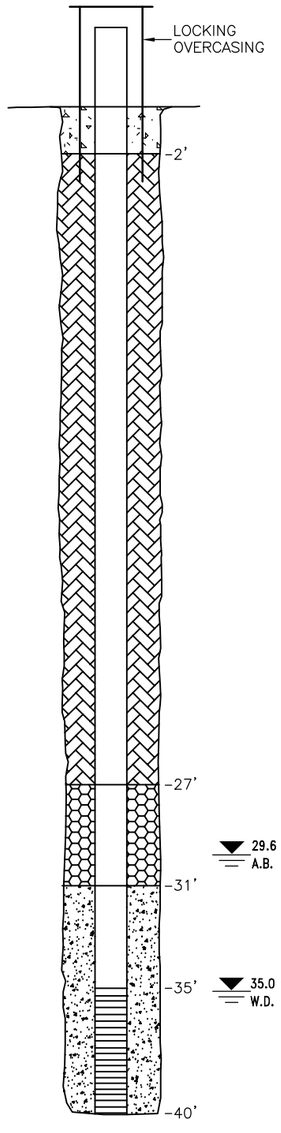
R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION KENAI, ALASKA
DRAWN: P.K.H.	
CHECKED: C.H.R.	TEST BORING LOG AP-618-MW
SUBMITTED: C.H.R.	

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-13



AP-619-MW (TB-4c)

N 2,396,224.77
E 1,416,982.32 Elev. 93.1
11/21/06

SILT CONTAINING ORGANICS (Dk. brown)	0.0 – 0.5
SILTY SAND CONTAINING COBBLES & BOULDERS (FILL) (Dk. brown, Nonplastic, Dry)	0.5 – 2.0
Drilled rough to 2.0 feet.	
POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown)	
Drilled fast and smooth 2.0 to 39.5 feet.	
Driller indicated clay at 39.5 feet.	
SANDY LEAN CLAY	39.5 – 40.0

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Hole was drilled with wooden plug in end of augers.
2. Screen w/prepacked sand was installed between 35 and 40 ft.
3. Hole walls caved to 31 feet when augers were withdrawn. Sand backfill is mixture of silica sand and natural sand.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

R&M CONSULTANTS, INC.

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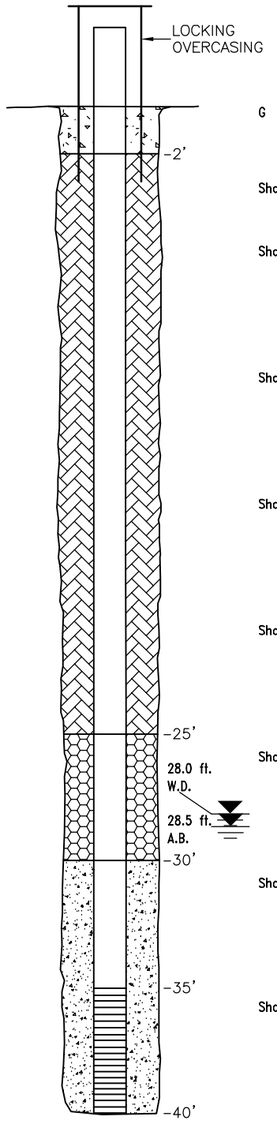
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	TEST BORING LOG
SUBMITTED: C.H.R.	AP-619-MW

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-14



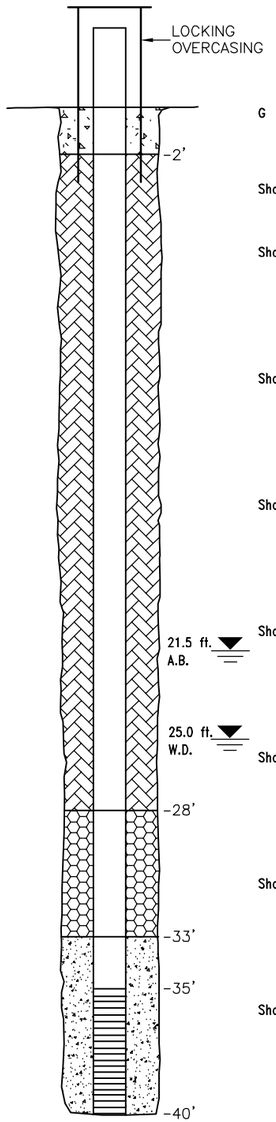
AP-620-MW (TB-02)

N 2,396,321.05
E 1,414,354.82 Elev. 92.2
11/13/06

G			0.0
	1	ML*, F4* SILT CONTAINING ORGANICS (Dk. brown)	
			2.5
Sha	2	3/3/5, 10%, SM*, F3*, Gr=2, Sa=76, Fines=22 SILTY SAND (Dk. brown, Fine to medium sand)	4.0
Sha	3	3/4/4, SP*, NFS* Drilled fast and smooth to 39 feet.	
Sha	4	1/3/4, 5.1%, SP, NFS, Gr=7, Sa=92, Fines=1.7 POORLY GRADED SAND CONTAINING LAYERS OF SAND W/GRAVEL, Gravel to 2" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Medium dense, Dry becoming wet below 28 ft.	
Sha	5	3/5/8***, 4.6%, SP, S2*, Sa=96, Fines=4.4, LL=NV, PL=NP, PI=NP, SG=2.716	
Sha	6	5/8/8, 6.0%, SP, NFS*, Gr=1, Sa=95, Fines=3.9	
Sha	7	3/6/12***, 7.6%, SP, NFS*, Gr=10, Sa=87, Fines=3.3	
Sha	8	5/8/6, 21%, SP, NFS*, Gr=12, Sa=85, Fines=3.2	
Sha	9	7/13/15 blows for 4"***, SP*, NFS* Sampler had a piece of wood blocking shoe. Driller indicated clay at 39 feet.	
			39.0
Sha	10	LEAN CLAY W/SAND CONTAINING COBBLES & BOULDERS (Dk. gray, Plastic, Very hard, Dry) 4/10/16 blows for 5"**, 16%, CL, F3, Gr=3, Sa=16, Fines=81, LL=35, PL=21, PI=14, SG=2.747, 1 foot of heave in augers, sampler floated. Sampler bouncing on cobble/boulder	
			41.4

* Estimated Classification
** Designates that blow counts may not be representative due to sand heaving into the augers.
*** Sampler driven with brass liners.
One-dimensional consolidation performed on sample #10.
Constant head permeability test performed on sample #5.

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey



AP-621-MW (TB-03)

N 2,396,759.77
E 1,417,031.71 Elev. 92.7
11/14/06

G			0.0
	1	SM*, F3* SILT W/ORGANICS (Dk. brown)	
			2.0
Sha	2	4/10/11, SP*, NFS*	
Sha	3	3/9/8, 6.2%, SP, NFS, Gr=11, Sa=86, Fines=2.7 Drilled fast and smooth to 40 feet.	
Sha	4	2/4/3***, SP*, NFS* POORLY GRADED SAND TO SAND W/SILT CONTAINING LAYERS OF SAND W/GRAVEL (Dk. brown, Gravel to 3/4" dia., subrounded, hard, Fine to coarse sand, Nonplastic, Medium dense, Dry becoming wet below 28 ft.)	
Sha	5	3/3/7, 7.7%, SP, S2*, Gr=1, Sa=95, Fines=4.3	
Sha	6	4/6/7***, 12%, SP, NFS*, Gr=8, Sa=88, Fines=3.6	
Sha	7	5/8/12, SP*, NFS*	
Sha	8	3/6/12**, 19%, SP-SM*, S2*, Gr=2, Sa=92, Fines=6.5, 6" heave, sampler floated	
Sha	9	3/7/10**, SP*, NFS*, 6" heave, sampler floated	
			40.0
Sha	10	6/11 blows for 1", Sampler bouncing on cobble/boulder GRAVEL W/SAND CONTAINING COBBLES & BOULDERS	
			41.0

* Estimated Classification
** Designates that blow counts may not be representative due to sand heaving into the augers.
*** Sampler driven with brass liners.
Constant head permeability test performed on samples #4 and #6.

Geologist: Peter Hardcastle
Drill Company/Rig: Discovery Drilling/CME 75
Drilling Method: 8-inch Hollow Stem Auger
Drill Crew: Gary Cormier and Darin Vandehey

MONITORING WELL LEGEND

- SCREEN - 0.010" SLOT
- 20/40 SILICA SAND
- BENTONITE (CHIPS)
- VOLCLAY GROUT
- CONCRETE

MONITORING WELL NOTES :

1. Screens w/prepacked sand were installed between 35 and 40 ft.
2. Caving sand prevented placement of silica sand through the augers until they had been pulled back 10 feet in AP-620-MW. Sand backfill was a mixture of silica sand and sand cave in.
2. Installation of AP-621-MW was uneventful.

See Drawings B-01 and B-02 for Explanation of Boring Log Symbols.

R&M CONSULTANTS, INC.

CONTRACT NO. W911KB-05-D-0004
CONTRACTOR R&M CONSULTANTS, INC.
CITY ANCHORAGE STATE ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: P.K.H.	KENAI RIVER BLUFF EROSION
DRAWN: P.K.H.	KENAI, ALASKA
CHECKED: C.H.R.	TEST BORING LOG
SUBMITTED: C.H.R.	AP-620-MW & AP-621-MW

DATE:	R&M NO.	SCALE:	DWG. NO.
JAN. 2007	1209.10	AS SHOWN	B-15

WELL LOG DATA

American Environmental

PROJECT: Daubenspeck Property	WELL NO. MW-1
LOCATION: Grid 337.7, 315.1	DATE DRILLED: 6/14/2000
DRILLING METHOD: Hollow Stem Auger \ Split Spoon Sample	CASING TYPE/DIA. PVC 2"
DEPTH DRILLED: 28 feet	TOTAL CASING: 20 feet
GROUND ELEVATION:	T.O.C. ELEVATION:
GROUT TYPE/QUANTITY: Bentonite Chips ½ bag \ Bentonite slurry 20 gallons	SCREEN TYPE/ LENGTH: 0.20 slot PVC \ 10 feet
GROUT INTERVAL: Chips 12 to 14.11' Slurry 1 to 12'	SCREENED INTERVAL:
SAND PACK TYPE/INTERVAL: 14.11 to 28 feet	STATIC WATER LEVEL/DATE:
DEPTH TO WATER WHILE DRILLING: 21.5' bgl	LOGGED BY: PETE CAMPBELL
WATER LEVEL ELEVATION:	DRILLER: Hughes Drilling

DEPTH	H20\SOIL SAMPLE	FORMATION DESCRIPTION
0-5'		Sand, brown, clean
5-7	SSS #1 BC:3-5-5-5	5-6' Sand, medium, brown with minor gravel, moist 6-7' Sand, fine brown, moist PID 8.1
7-9'	SSS#2 BC: 3-3-4-5	7-8' Sand, fine brown, moist 8-9' Sand, fine, gray PID 0.0
9-11	SSS#3 BC: 3-4-6-8	Sand, fine, gray PID 0.0
11-13	SSS#4 BC: 4-8-8-4	Sand, fine, gray PID 0.0
13-15	SSS#5 BC: 6-7-8-9	Sand, fine, gray to 13.8 13.8-15 Sand, very fine, gray, moist PID 0.0
15-17	SSS#6 BC: 4-7-9-8	Sand, medium, brown salt & pepper. PID 0.0 Drill to 20
20-28	SSS#7 BC: 5-10-13-15	20-21' Sand fine, brown, wet 21-22' Sand with minor silt, wet, approximately 6" of water in augers PID 5.1 Sample Collected: MW-1-20-22 @09:34 Drill to 24', water at 21.5 Drill to 28' EOB

DWG. NO. B-16

WELL LOG DATA

American Environmental

PROJECT: Daubenspeck Property	WELL NO. MW-2
LOCATION: Grid 669.3, 198.9	DATE DRILLED: 6/14/2000
DRILLING METHOD: Hollow Stem Auger \ Split Spoon Sample	CASING TYPE/DIA: PVC 2"
DEPTH DRILLED: 25 feet	TOTAL CASING: 13'
GROUND ELEVATION:	T.O.C. ELEVATION:
GROUT TYPE/QUANTITY: Bentonite Chips ½ bag \ Bentonite slurry 20 gallons	SCREEN TYPE/ LENGTH: 0.20 slot PVC \ 10 feet
GROUT INTERVAL: Chips 8 to 10' Slurry 1 to 8'	SCREENED INTERVAL: 15 to 25'
SAND PACK TYPE/INTERVAL: 10 to 25 feet	STATIC WATER LEVEL/DATE:
DEPTH TO WATER WHILE DRILLING: 18.8' bgl	LOGGED BY: PETE CAMPBELL
WATER LEVEL ELEVATION:	DRILLER: Hughes Drilling

DEPTH	H20\SOIL SAMPLE	FORMATION DESCRIPTION
0-4'		Drill, no cuttings
4-6	SSS #1 BC: 1-1	Sand, brown with some surface litter, (wood) 50% recovery PID 4.5
6-8'	SSS#2 BC: 1-1-1-0	Sand, brown, dry 30% recovery PID 6.6
8-10	SSS#3 BC: 3-3-2-2	0% recovery, Spoon bounced as if on a log. Balling wire on tip of bit
10-12	SSS#4 BC: 2-1-1-1	Sand, brown with some organics PID 7.5 20% recovery
12-14	SSS#5 BC: 3-5-5-6	Sand, brown dry to moist PID 4.5
14-16	SSS#6 BC: 4-7-7-8	Sand, brown dry to moist PID 1.3 Drill to 20
20-22	SSS#7 BC: 4-4-4-7	Sand, brown wet PID 2.5 Water at 18.8 Sample Collected: MW-2-20-22 @ 12:14 Drill to 25', water at 18.8 EOB As the augers were removed from the hole a large chunk of metal came up the augers with several pieces of copper wire.

DWG. NO. B-17

WELL LOG DATA

American Environmental

PROJECT: Daubenspeck Property	WELL NO. MW-3
LOCATION: Grid 238.7, 54.1	DATE DRILLED: 6/14/2000
DRILLING METHOD: Hollow Stem Auger \ Split Spoon Sample	CASING TYPE/DIA: PVC 2"
DEPTH DRILLED: 30 feet	TOTAL CASING: 22.9'
GROUND ELEVATION: 100.3	T.O.C. ELEVATION: 103.41
GROUT TYPE/QUANTITY: Bentonite Chips 1 bag \ Bentonite slurry 20 gallons	SCREEN TYPE/ LENGTH: 0.20 slot PVC \ 10 feet
GROUT INTERVAL: Chips 12.5 to 17' Slurry 4.5 to 12.5'	SCREENED INTERVAL: 20 to 30'
SAND PACK TYPE/INTERVAL: 17 to 30 feet	STATIC WATER LEVEL/DATE:
DEPTH TO WATER WHILE DRILLING: 24' bgl	LOGGED BY: PETE CAMPBELL
WATER LEVEL ELEVATION:	DRILLER: Hughes Drilling

DEPTH	H20\SOIL SAMPLE	FORMATION DESCRIPTION
0-5'		Sand, brown
5-7	SSS #1 BC: 1-1-1-1	Sand, brown, moist, fine PID 0.0
7-9'	SSS#2 BC: 1-1-1-1	7-8 Sand, medium, brown, moist 8-8.3 Sand, fine, brown 8.3-9 Sand, medium, brown, some organics PID 0.0
9-11	SSS#3 BC: 1-1-1-1	Sand, medium, brown, with minor gravel. PID 0.0
11-13	SSS#4 BC: 1-1-1-1	Sand, medium, brown. PID 0.0
13-15	SSS#5 BC: 1-1-1-1	Sand, medium, brown. PID 0.0
15-17	SSS#6 BC: 1-1-1-1	Sand, medium, brown. PID 0.0
17-19	SSS#7 BC: 1-1-1-1	Sand, medium, brown, with minor gravel. PID 5.0
19-21	SSS#8 BC: 1-1-1-1	Sand, medium, brown, with minor gravel. PID 8.5
21-23	SSS#9 BC: 2-7-23	21-22 Sand, fine, brown. 22-23 Pea Gravel with concrete in tip, refusal. PID 8.6
		The augers apparently hit the suspected tip of the cistern that was rumored to be in the area. The rig was moved east 10 feet and re-drilled to 23'
23-25	SSS#10 BC: 3-7-7-10	Sand, brown with minor gravel, wet. PID 8.2 Sample Collected MW-3-23-25 @17:57

DWG. NO. B-18

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section
EXPLORATION LOG

Project: Kenai River Bluff Erosion Study, Kenai, Alaska

Date: 15 Sep 2003

Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling

Elevation Datum: MLLW ☐ MSL ☒ other

Location: Northing: 2,396,502 ft. Easting: 1,415,363 ft.

Top of Hole Elevation: 90.0 ft.

Hole Number, Field: TB-1

Permanent: AP-604-P

Operator: Pat Kelley

Inspector: Steven Henslee

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☒ Piezometer

Depth to Groundwater: 27.0 ft. WD

Depth Drilled: 100.0 ft.

Total Depth: 101.5 ft.

Hammer Weight: .340 lbs

Split Spoon I.D: 2.5 in.

Size and Type of Bit: 8 in. HSA

Type of Equipment: CME-75 with Autohammer

Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	Grain Size %Sand	Grain Size %Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
														Surface: Second growth willows
0		1		NFS	Grab	SP	Poorly graded SAND					-/ 0.0		Brown, moist, fine to medium sand
2														
4		2		NFS	1 1 2 1	SP	Poorly graded SAND	8	87	5		-/ 0.0	3	Brown, moist, fine to medium sand
6		3		NFS	1 1 1 1	SP	Poorly graded SAND					-/ 0.0		Brown, moist, fine to medium sand
8														
10		4		NFS	2 3 3 5	SP	Poorly graded SAND	4	93	3		-/ 0.0	5	Gray, moist, fine to medium sand
12														
14														
16		5		NFS	2 5 7 9	SP	Poorly graded SAND					-/ 0.0		Gray, moist, fine to medium sand
18														
20		6			3 4 3 5	SP	Poorly graded SAND					-/ 0.0		Gray, moist, fine to medium sand
22														
24														
26		7a			3 5	SP	Poorly graded SAND							
		7b			5	SM	Silty SAND	1	75	24			22	Dark gray, moist, fine sand, nonplastic (NP) fines
		7c			9	SP	Poorly graded SAND							
28														
30		8			7 11 15	SP	Poorly graded SAND							Gray, wet, medium sand
32														
34														
36		9			5 8	SP	Poorly graded SAND							Gray, wet, fine to medium sand

EXPLORATION LOG KENAI_BLUFFS.GPJ ACE_ANC.GDT 9/3/04

NPA Form 19-E
May 94 Prev. Ed. Obsolete

Project: Kenai River Bluff Erosion Study

Hole Number: AP-604-P

DWG. NO. B-19

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section

EXPLORATION LOG

Project: Kenai River Bluff Erosion Study
Kenai, Alaska

Date: 15 Sep 2003

Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling

Elevation Datum: ☐ MSL ☒ other MLLW

Location: Northing: 2,396,502 ft. Easting: 1,415,363 ft.

Top of Hole Elevation: 90.0 ft.

Hole Number, Field: TB-1

Permanent: AP-604-P

Operator: Pat Kelley

Inspector: Steven Henslee

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☒ Piezometer

Depth to Groundwater: 27.0 ft. WD

Depth Drilled: 100.0 ft.

Total Depth: 101.5 ft.

Hammer Weight: 340 lbs

Split Spoon I.D.: 2.5 in.

Size and Type of Bit: 8 in. HSA

Type of Equipment: CME-75 with Autohammer

Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	%Sand	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
					13									Surface: Second growth willows
38														
40		10			6 11 14	CL	Lean CLAY with Sand	0	22	78				Dark gray, moist, fine sand, plastic fines. LL=30.8, PI=15.5
42														
44														
46		11			7 7 10	CL	Lean CLAY with Sand							Dark gray, moist, rounded gravel, fine sand, plastic fines, very stiff
48														
50		12			6 8 13	CL	Lean CLAY with Sand							Dark gray, moist, plastic fines, very stiff
52														
54														
56		13			8 20 12	CL	Lean CLAY with Sand							Dark gray, moist, fine sand, plastic fines, very stiff
58														
60		14			5 9 8	CL	Lean CLAY with Sand							Dark gray, moist, fine sand, plastic fines, very stiff
62														
64														
66		15			4 9 12	CL	Lean CLAY with Sand	7	18	75	0.25		15	Dark gray, moist, fine sand, plastic fines, very stiff
68														
70		16			4 6 9	CL	Lean CLAY with Sand							Dark gray, moist, fine sand, plastic fines, very stiff
72														

EXPLORATION LOG KENAI_BLUFFS.GPJ ACE_ANC.GDT 9/3/04

DWG. NO. B-20

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section

EXPLORATION LOG

Project: Kenai River Bluff Erosion Study
Kenai, Alaska

Date: 15 Sep 2003

Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling

Elevation Datum: MLLW ☐ MSL ☒ other

Location: Northing: 2,396,502 ft. Easting: 1,415,363 ft.

Top of Hole Elevation: 90.0 ft.

Hole Number, Field:	Permanent:	Operator:	Inspector:
TB-1	AP-604-P	Pat Kelley	Steven Henslee

Type of Hole: ☐ other _____
☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☒ Piezometer

Depth to Groundwater:	Depth Drilled:	Total Depth:
27.0 ft. WD	100.0 ft.	101.5 ft.

Hammer Weight:	Split Spoon I.D.:	Size and Type of Bit:	Type of Equipment:	Type of Samples:
340 lbs	2.5 in.	8 in. HSA	CME-75 with Autohammer	Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	Grain Size %Sand	Grain Size %Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
74						CL	Lean CLAY with Sand							Surface: Second growth willows
76		17			6 14 21	SP- SM	Poorly graded SAND with Silt							Dark gray, moist, fine sand, plastic fines, very stiff Gray, wet, fine to medium sand
78														
80		18			10 14 18	SP- SM	Poorly graded SAND with Silt	1	92	7				Gray, wet, medium sand
82														
84														
86														
88														
90		19a			4 12 11	SP- SM CL	Poorly graded SAND with Silt Lean CLAY with Sand							Gray, wet, medium sand Dark gray, moist, fine sand, plastic fines
92		19b												
94														
96														
98														
100					7 15 18	SP	Poorly graded SAND							Gray, wet, fine to medium sand
102														Bottom of Hole 101.5 ft. Groundwater Encountered While Drilling: at an elevation of 63.0 ft. PID = (Cold/Hot) Photo Ionization Detector
104														
106														Survey datum is Alaska State Plane, Zone 4, NAD83. Elevation datum MLLW.
108														

EXPLORATION LOG KENAI BLUFFS.GPJ ACE_ANC.GDT 9/3/04

DWG. NO. B-21

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section

EXPLORATION LOG

Project: Kenai River Bluff Erosion Study, Kenai, Alaska

Date: 16 Sep 2003

Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling

Elevation Datum: ☐ MSL ☒ other MLLW

Location: Northing: 2,396,309 ft. Easting: 1,415,302 ft.

Top of Hole Elevation: 89.8 ft.

Hole Number, Field: TB-2

Permanent: AP-605-MW

Operator: Pat Kelley

Inspector: Steven Henslee

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☒ Monitoring Well ☐ Piezometer

Depth to Groundwater: 29.9 ft. WD

Depth Drilled: 37.5 ft.

Total Depth: 38.5 ft.

Hammer Weight: 340 lbs

Split Spoon I.D: 2.5 in.

Size and Type of Bit: 8 in. HSA

Type of Equipment: CME-75 with Autohammer

Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	%Sand	%Fines	Max Size (in.)	PID (ppm)	% Water.	Description and Remarks
														Surface: Lawn
		1a			Grab	ML	SILT					-/		Brown, moist, nonplastic (NP) fines, organics (sixty percent by volume)
		1b				SP	Poorly graded SAND				1	1.0		Brown, moist, rounded gravel, fine to medium sand
2														
		2			2 2 4 6	SP	Poorly graded SAND				0.5	-/ 1.0		Brown, moist, fine to medium sand
4														
		3			2 3 4 5	SP	Poorly graded SAND					-/ 1.0		Brown, moist, fine to medium sand
6														
8														
10		4			5 4 6	SP	Poorly graded SAND				0.75	-/ 0.0		Gray, moist, fine to medium sand
12														
14														
16		5			2 6 7	SP	Poorly graded SAND	4	92	4	0.75	-/ 1.0	5	Gray, moist, fine to medium sand
18														
20		6			3 3 5	SP	Poorly graded SAND					-/ 1.0		Brown, moist, fine to medium sand
22														
24														
26		7			3 4 8	SP	Poorly graded SAND					-/ 1.0		Brown, moist, fine to medium sand, localized evidence of mottling, one small area (one inch thick) of 30% silt
28														
30		8			2 6 10	SP	Poorly graded SAND with Gravel	24	74	2	1			Brown, wet, rounded gravel, fine to coarse sand
32														
34														
36		9			2 3	SP	Poorly graded SAND							Twelve inches of heaving sand Gray, wet, fine to medium sand

EXPLORATION LOG KENAI_BLUFFS.GPJ ACE_ANC.GDT 9/3/04

DWG. NO. B-22

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section

EXPLORATION LOG

Project: Kenai River Bluff Erosion Study
Kenai, Alaska

Date: 16 Sep 2003

Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling

Elevation Datum: MLLW ☐ MSL ☒ other

Location: Northing: 2,396,309 ft. Easting: 1,415,302 ft.

Top of Hole Elevation: 89.8 ft.

Hole Number, Field: TB-2

Permanent: AP-605-MW

Operator: Pat Kelley

Inspector: Steven Henslee

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☒ Monitoring Well ☐ Piezometer

Depth to Groundwater: 29.9 ft. WD

Depth Drilled: 37.5 ft.

Total Depth: 38.5 ft.

Hammer Weight: 340 lbs

Split Spoon I.D: 2.5 in.

Size and Type of Bit: 8 in. HSA

Type of Equipment: CME-75 with Autohammer

Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	%Sand	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
					4									Surface: Lawn
38		10			3 7	CL	Lean CLAY with Sand	4	14	82			17	Dark gray, moist, fine sand, plastic fines, very stiff
40														Bottom of Hole 38.5 ft.
42														Groundwater Encountered While Drilling: at an elevation of 59.9 ft.
44														PID = (Cold/Hot) Photo Ionization Detector
46														Survey datum is Alaska State Plane, Zone 4, NAD83. Elevation datum MLLW.
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														
68														
70														
72														

EXPLORATION LOG KENAI BLUFFS.GPJ ACE_ANC.GDT 9/3/04

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section

EXPLORATION LOG

Project: Kenal River Bluff Erosion Study, Kenal, Alaska		Page 1 of 3; Date: 17 Sep 2003
Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling		Elevation Datum: MLLW ☐ MSL ☒ other
Location: Northing: 2,396,225 ft. Easting: 1,415,366 ft.		Top of Hole Elevation: 88.7 ft.
Hole Number, Field: TB-3	Permanent: AP-606-P	
Operator: Pat Kelley		Inspector: Steven Henslee
Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☒ Piezometer	Depth to Groundwater: 27.9 ft. WD	Depth Drilled: 99.5 ft. / Total Depth: 101.0 ft.
Hammer Weight: 340 lbs	Split Spoon I.D.: 2.5 in.	Size and Type of Bit: 8 in. HSA
Type of Equipment: CME-75 with Autohammer		Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	%Gravel	%Sand	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
		1			Grab	SP	Poorly graded SAND with Gravel				0.75			Surface: Dirt parking lot Brown, moist, rounded gravel, fine to medium sand, FILL
2		2			2 3 4 4	SP	Poorly graded SAND							Brown, moist, fine sand
6		3			2 3 1 4	SP	Poorly graded SAND				0.25	-/ 0.0		Brown, moist, fine sand
10		4			2 1 3	SP	Poorly graded SAND				0.25	-/ 0.0		Brown, moist, fine sand
14		5			2 2 3 4	SP	Poorly graded SAND					-/ 1.0		Brown, moist, fine sand
20		6			2 4 6	SP	Poorly graded SAND					-/ 1.0		Brown, moist, fine sand
24		7			4 7 9	SM	Silty SAND	0	79	21		-/ 0.0	15	Brown, moist, fine sand
30		8			7 9 15	SP	Poorly graded SAND with Gravel	17	81	2				Brown, moist, medium to coarse sand
36		9			1 6 9	SP	Poorly graded SAND with Gravel	32	66	2				Brown, wet, rounded gravel, fine to coarse sand

EXPLORATION LOG KENAI BLUFFS.GPJ ACE_ANC.GDT 9/3/04

NPA Form 19-E
May 94 Prev. Ed. Obsolete

Project: Kenal River Bluff Erosion Study

Hole Number: AP-606-P

DWG. NO. B-24

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section

EXPLORATION LOG

Project: Kenal River Bluff Erosion Study
Kenal, Alaska

Date: 17 Sep 2003

Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling

Elevation Datum: MLLW ☐ MSL ☒ other

Location: Northing: 2,396,225 ft. Easting: 1,415,366 ft.

Top of Hole Elevation: 88.7 ft.

Hole Number, Field: TB-3

Permanent: AP-606-P

Operator: Pat Kelley

Inspector: Steven Henslee

Type of Hole: ☐ other
☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☒ Piezometer

Depth to Groundwater: 27.9 ft. WD

Depth Drilled: 99.5 ft.

Total Depth: 101.0 ft.

Hammer Weight: 340 lbs

Split Spoon I.D.: 2.5 in.

Size and Type of Bit: 8 in. HSA

Type of Equipment: CME-75 with Autohammer

Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	Grain Size %Sand	Grain Size %Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
														Surface: Dirt parking lot
38														
40		10a			4 8 15	CL	Lean CLAY with Sand					-/ 1.0		Gray, moist, plastic fines, very stiff
		10b				GP	Poorly graded GRAVEL							Gray, moist, rounded gravel, coarse sand, 1.5 inches thick
42		10c				CL	Lean CLAY with Sand							
44														
		11a			7 17 24	CL	Lean CLAY with Sand							Dark gray, moist, fine sand, plastic fines, very stiff
46		11b				SP	Poorly graded SAND							Dark gray, moist, medium sand
		11c				CL	Lean CLAY with Sand							Dark, gray, moist, fine sand, plastic fines, very stiff
48														
50		12			7 13 16	CL	Lean CLAY with Sand					-/ 1.0		Dark gray, moist, fine sand, plastic fines, very stiff
52						SP	Poorly graded SAND							Estimated by drill action
54														
		13			6 13 16	CL	Lean CLAY with Sand					-/ 0.0		Dark gray, moist, fine sand, plastic fines, very stiff, marbled with clean gray medium sand to one and one sixteen inches thick
56														
58														
60		14			9 13 38	CL	Lean CLAY with Sand	0	23	77		-/ 0.0	17	Dark gray, moist, fine sand, plastic fines. LL=29, PI=15
62														
64														
		15			7 11 15	CL	Lean CLAY with Sand					-/ 0.0		Dark gray, moist, fine sand, plastic fines
66														
68														
70		16			4 8 12	CL	Lean CLAY with Sand					-/ 0.0		Dark gray, moist, fine sand, plastic fines
72														

EXPLORATION LOG KENAI_BLUFFS.GPJ ACE_ANC.GDT 9/3/04

DWG. NO. B-25

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section

EXPLORATION LOG

Project: Kenai River Bluff Erosion Study
Kenai, Alaska

Date: 17 Sep 2003

Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling

Elevation Datum: MLLW ☐ MSL ☒ other

Location: Northing: 2,396,225 ft. Easting: 1,415,366 ft.

Top of Hole Elevation: 88.7 ft.

Hole Number, Field: TB-3

Permanent: AP-606-P

Operator: Pat Kelley

Inspector: Steven Henslee

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☒ Piezometer

Depth to Groundwater: 27.9 ft. WD

Depth Drilled: 99.5 ft.

Total Depth: 101.0 ft.

Hammer Weight: 340 lbs

Split Spoon I.D.: 2.5 in.

Size and Type of Bit: 8 in. HSA

Type of Equipment: CME-75 with Autohammer

Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	%Gravel	%Sand	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
														Surface: Dirt parking lot
74		17			4 9 11	CL	Lean CLAY with Sand	1	26	73		-/ 0.0	17	Dark gray, moist, fine sand, plastic fines, very stiff
76														
78														
80		18			5 9 12	CL	Lean CLAY with Sand					-/ 0.0		Dark gray, fine sand, plastic fines, 1.25-inch thick seam of fine gray sand in sample
82														
84		19			5 13 21	SP-SM	Poorly graded SAND with Silt					-/ 0.0		Dark gray, moist, fine to medium sand, NP fines
86														
88														
90		20			3 7 17	SP-SM	Poorly graded SAND with Silt	0	89	11		-/ 0.0	20	Dark gray, moist, fine to medium sand, NP fines
92														
94		21			7 12 12	SP-SM	Poorly graded SAND with Silt					-/ 1.0		Dark gray, moist, medium sand, NP fines
96														
98														
100		22			6 17	SP-SM	Poorly graded SAND with Silt					-/ 0.0		Dark gray, moist, fine to medium sand, NP fines
102														Bottom of Hole 101.0 ft. Groundwater Encountered While Drilling: at an elevation of 60.8 ft. PID = (Cold/Hot) Photo Ionization Detector
104														
106														Survey datum is Alaska State Plane, Zone 4, NAD83. Elevation datum MLLW.
108														

EXPLORATION LOG KENAI BLUFFS.GPJ ACE ANC.GDT 9/3/04

DWG. NO. B-26

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section
EXPLORATION LOG

Project: Kenai River Bluff Erosion Study
Kenai, Alaska

Page 1 of 3
Date: 18 Sep 2003

Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling

Elevation Datum: ☐ MSL ☒ other MLLW

Location: Northing: 2,396,206 ft. Easting: 1,414,825 ft.

Top of Hole Elevation: 89.6 ft.

Hole Number, Field: TB-4

Permanent: AP-607-P

Operator: Pat Kelley

Inspector: Steven Henslee

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☒ Piezometer

Depth to Groundwater: 27.9 ft. WD

Depth Drilled: 100.0 ft.

Total Depth: 101.5 ft.

Hammer Weight: 340 lbs

Split Spoon I.D.: 2.5 in.

Size and Type of Bit: 8 in. HSA

Type of Equipment: CME-75 with Autohammer

Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	%Sand	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
														Surface: Second growth willows and spruce
0		1		F2	Grab	SM	Silty SAND with Gravel				2	-/ 0.0		Brown, moist, rounded gravel, fine to medium sand, nonplastic (NP) fines
2														
4														
6		2		NFS	4 3 3 5	SP	Poorly graded SAND				0.25	-/ 1.0		Brown, moist, fine sand
8														
10														
12														
14														
16		3		NFS	3 3 4 5	SP	Poorly graded SAND				1.25	-/ 0.0		Brown, moist, rounded gravel, fine sand
18														
20														
22														
24														
25		4a			5	SP	Poorly graded SAND					-/		Brown, moist, fine sand
26		4b			4	SM	Silty SAND	0	65	35		0.0	23	Brown, moist, fine sand, NP fines
		4c			4	SP	Poorly graded SAND							Brown, moist, fine sand
28														
30		5			4 7 6	SP	Poorly graded SAND	7	92	1				Brown, wet, medium to coarse sand
32														
34														Twelve inches of heaving sand
36		6			2 9	GP	Poorly graded GRAVEL with Sand	50	48	2				Dark gray, wet, rounded gravel, fine to coarse sand

EXPLORATION LOG KENAI_BLUFFS.GPJ ACE_ANC.GDT 9/3/04

NPA Form 19-E
May 94 Prev. Ed. Obsolete

Project: Kenai River Bluff Erosion Study

Hole Number: AP-607-P

DWG. NO. B-27

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section

EXPLORATION LOG

Project: Kenai River Bluff Erosion Study, Kenai, Alaska		Page 2 of 3 Date: 18 Sep 2003
Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling		Elevation Datum: MLLW ☐ MSL ☒ other
Location: Northing: 2,396,206 ft. Easting: 1,414,825 ft.		Top of Hole Elevation: 89.6 ft.
Hole Number, Field: TB-4	Permanent: AP-607-P	
Operator: Pat Kelley		Inspector: Steven Henslee
Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☒ Piezometer	Depth to Groundwater: 27.9 ft. WD	Depth Drilled: 100.0 ft. / Total Depth: 101.5 ft.
Hammer Weight: 340 lbs	Split Spoon I.D.: 2.5 in.	Size and Type of Bit: 8 in. HSA
Type of Equipment: CME-75 with Autohammer		Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	%Sand	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
					13									Surface: Second growth willows and spruce
38														
40														
42														
44														
46		7			5 15 18	CL	Lean CLAY with Sand					-/ 0.0		Dark gray, moist, find sand, plastic fines, very stiff
48														
50														
52														
54														
56		8			3 6 10	CL	Lean CLAY with Sand					-/ 1.0		Dark gray, moist, rounded gravel, fine sand, plastic fines, very stiff
58														
60														
62														
64														
66		9a 9b			2 6 8	CL SP	Lean CLAY with Sand Poorly graded SAND					-/ 1.0		Dark gray, moist, fine sand, plastic fines, very stiff Dark gray, moist, fine to medium sand
68														
70		10			6 11 14	CL	Lean CLAY with Sand							Dark gray, moist, fine sand, plastic fines, very stiff, 1.25-inch layer of gray fine sand
72														

EXPLORATION LOG KENAI BLUFFS.GPJ ACE_ANC.GDT 9/3/04

NPA Form 19-E
May 94 Prev. Ed. Obsolete

Project: Kenai River Bluff Erosion Study

Hole Number: AP-607-P

DWG. NO. B-28

ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES

Soils and Geology Section

EXPLORATION LOG

Project: Kenal River Bluff Erosion Study
Kenal, Alaska

Date: 18 Sep 2003

Drilling Agency: ☐ Alaska District ☒ Other Hughes Drilling

Elevation Datum: MLLW ☐ MSL ☒ other

Location: Northing: 2,396,206 ft. Easting: 1,414,825 ft.

Top of Hole Elevation: 89.6 ft.

Hole Number, Field: TB-4

Permanent: AP-607-P

Operator: Pat Kelley

Inspector: Steven Henslee

Type of Hole: ☐ other
☐ Test Pit ☐ Auger Hole ☐ Monitoring Well ☒ Piezometer

Depth to Groundwater: 27.9 ft. WD

Depth Drilled: 100.0 ft.

Total Depth: 101.5 ft.

Hammer Weight: 340 lbs

Split Spoon I.D.: 2.5 in.

Size and Type of Bit: 8 In. HSA

Type of Equipment: CME-75 with Autohammer

Type of Samples: Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	Grain Size %Sand	Grain Size %Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
														Surface: Second growth willows and spruce
74														
76														
78														
80		11			5 6 9	CL	Lean CLAY with Sand					-/ 1.0		Dark gray, moist, fine sand, plastic fines
82														
84														
86		12a			5 12	CL	Lean CLAY with Sand							Dark gray, moist, fine sand, plastic fines
		12b			25	SP	Poorly graded SAND							Dark gray, moist, fine to medium sand
88						CL	Lean CLAY with Sand							
90		13			3 9 12	SP	Poorly graded SAND					-/ 1.0		Dark gray, moist, fine to medium sand
92														
94														
96		14			3 4 16	SP	Poorly graded SAND	0	98	2		-/ 1.0	20	Dark gray, moist, fine to medium sand
98														
100		15			.33	CL	Lean CLAY	0	8	92		-/ 0.0	27	Dark gray, moist, fine sand, plastic fines, very soft
102														Bottom of Hole 101.5 ft. Groundwater Encountered While Drilling: at an elevation of 61.6 ft. PID = (Cold/Hot) Photo Ionization Detector
104														
106														Survey datum is Alaska State Plane, Zone 4, NAD83. Elevation datum MLLW.
108														

EXPLORATION LOG KENAI BLUFFS.GPJ ACE_ANC.GDT 9/3/04

DWG. NO. B-29

APPENDIX C
GROUNDWATER MONITORING DATA

TABLE C-01
KENAI RIVER BLUFF EROSION STUDY
GROUNDWATER MONITORING PROGRAM
GROUNDWATER ELEVATION SUMMARY

Group ID	Monitoring Well ID	Test Hole ID	Total Depth (ft.)	Aquifer	Groundwater Elevations[a]																					
					Reading No. 1 20/21-Nov-2006		Reading No. 2 27-Dec-2006		Reading No. 3 24-Jan-2007		Reading No. 4 28-Feb-2007		Reading No. 5 23-Mar-2007		Reading No. 6 28-Apr-2007		Reading No. 7 24-May-2007		Reading No. 8 26-Jun-2007		Reading No. 9 26-Jul-2007		Reading No. 10 24-Aug-2007		Reading No. 11 25-Sep-2007		Reading No. 12 24-Oct-2007		Reading No. 13 3-Dec-2007	
					Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.	Time	Elev.
GROUP-1	AP-608-MW	TB-1A	100	LOWER	NA	21.1	14:45	22.0	14:15	22.0	12:13	21.9	10:55	22.6	9:00	22.1	12:15	22.0	12:10	21.6	12:25	21.9	9:33	22.1	12:25	22.1	11:35	21.7	14:35	22.2
	AP-609-MW	TB-1B	75	LOWER	NA	21.4	14:45	21.8	14:12	21.6	12:08	21.7	10:59	21.8	9:05	21.8	12:12	21.5	12:07	21.2	12:23	21.1	9:30	21.1	12:22	21.2	11:32	21.2	14:34	21.4
	AP-610-MW	TB-1C	40	UPPER	NA	54.4	14:40	54.5	14:10	54.4	12:16	54.3	11:02	54.3	8:55	54.3	12:10	54.3	12:05	54.2	12:20	54.2	9:26	54.2	12:20	54.2	11:30	54.2	14:33	54.3
GROUP-2	AP-611-MW	TB-2C	100	LOWER	NA	15.6	14:15	10.7	14:00	9.7	12:32	11.6	11:10	13.5	9:10	9.8	12:00	13.1	12:00	9.3	12:15	9.4	9:45	9.4	12:15	9.2	11:25	9.2	14:30	14.1
	AP-612-MW	TB-2B	75	UPPER	NA	53.3	14:10	39.3	13:57	39.1	12:28	39.0	11:13	38.7	9:13	38.4	11:57	38.2	11:58	38.0	12:12	38.5	9:40	38.0	12:12	37.9	11:22	37.8	14:27	37.8
	AP-613-MW	TB-2A	40	UPPER	NA	57.8	14:10	57.8	13:55	57.8	12:27	57.8	11:15	57.7	9:15	57.7	11:55	57.7	11:57	57.6	12:10	57.6	9:48	57.6	12:10	57.6	11:20	57.6	14:25	57.6
GROUP-3	AP-614-MW	TB-3A	100	LOWER	NA	11.0	14:00	12.9	13:40	11.8	14:56	12.8	12:20	13.8	10:30	10.4	11:50	11.7	11:25	9.4	12:30	9.4	8:58	10.4	11:45	10.1	10:45	10.2	14:00	14.1
	AP-615-MW	TB-3B	75	UPPER	NA	40.3	13:55	34.0	13:37	34.5	14:54	31.9	12:22	31.0	10:32	30.5	11:45	30.6	11:20	30.5	12:32	30.6	9:06	30.6	11:42	30.6	10:42	30.7	13:57	30.8
	AP-616-MW	TB-3C	40	UPPER	NA	56.8	13:50	56.9	13:35	56.9	14:51	56.8	12:25	56.8	10:35	56.8	11:40	56.8	11:18	56.7	12:35	56.7	8:50	56.6	11:40	56.8	10:40	56.8	13:55	56.8
GROUP-4	AP-617-MW	TB-4A	100	LOWER	NA	14.2	13:15	12.9	13:28	8.5	15:27	15.8	12:50	10.3	11:33	7.4	11:00	13.0	11:15	6.0	11:40	6.3	9:56	6.0	11:35	4.6	10:30	4.8	13:50	15.6
	AP-618-MW	TB-4B	70	UPPER	NA	54.9	13:10	54.8	13:25	54.6	15:25	54.3	12:55	53.9	11:35	54.1	10:55	53.8	11:10	53.8	11:38	53.6	9:58	53.5	11:32	53.4	10:27	53.6	13:47	53.1
	AP-619-MW	TB-4C	40	UPPER	NA	63.3	13:05	63.2	13:20	63.1	15:24	63.0	13:00	62.9	11:40	62.9	10:50	62.9	11:05	62.9	11:35	62.8	10:01	62.8	11:30	62.9	10:25	62.8	13:45	62.9
SINGLE WELLS	AP-620-MW	TB-02	40	UPPER	NA	63.9	14:25	63.9	13:50	63.7	14:37	63.6	12:09	63.5	9:20	63.4	12:05	63.4	11:55	63.3	12:05	63.2	9:18	63.2	12:05	63.2	11:15	63.1	14:20	63.3
	AP-621-MW	TB-03	40	UPPER	NA	71.0	12:10	70.7	13:00	70.5	15:06	70.2	12:34	70.1	10:40	70.0	10:35	69.9	10:50	69.9	11:15	69.9	10:10	69.8	11:05	70.0	10:05	69.9	13:25	70.0
	MW-1[b]	NA	25	UPPER	NA	69.0	12:25	69.1	13:10	68.9	15:17	68.7	12:38	68.6	10:55	68.6	10:45	68.5	10:58	68.4	11:25	68.3	10:22	68.3	11:20	68.4	10:15	68.3	13:35	68.4
	MW-2[b]	NA	25	UPPER	NA	72.0	12:20	71.7	13:05	71.5	15:11	71.3	12:40	71.2	10:51	71.1	10:40	71.0	10:55	70.9	11:20	70.9	10:15	70.8	11:15	71.0	10:10	71.0	13:30	71.1
	MW-3[b]	NA	30	UPPER	NA	67.0	12:00	66.8	12:50	66.6	15:20	66.5	12:45	66.4	11:30	66.3	10:30	66.3	11:00	66.2	11:30	66.2	10:06	66.2	11:25	66.2	10:20	66.2	13:40	66.3
	AP-604[c]	TB-1	101.5	UPPER	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10:25	29.5	13:00	27.5	1145	27.4	11:45	27.4	11:25	27.5	11:55	27.3	11:00	27.6	14:10	27.3
	AP-605[c]	TB-2	38.5	UPPER	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10:15	29.8	13:05	29.8	1140	29.9	11:50	29.9	11:16	29.9	12:00	29.8	11:10	29.8	14:15	29.8
	AP-606[c,d]	TB-3	101	UPPER	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	AP-607[c,e]	TB-4	101.5	UPPER	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10:00	30.0	12:51	27.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Key:

a - The groundwater elevations shown are in feet above mean sea level.
b - MW-1 through MW-3 were installed by American Environmental, and have not been assigned an AP number.
c - AP-604 through AP-607 were installed by the USACE and were not scheduled for a complete 12 month reading cycle.
d - AP-606 was unable to be located.
e - Tooling became jammed in AP-607 and was not operable after Reading No. 6.

FIGURE C-02
GROUP ONE-GROUNDWATER ELEVATION TRENDS
KENAI RIVER BLUFF EROSION

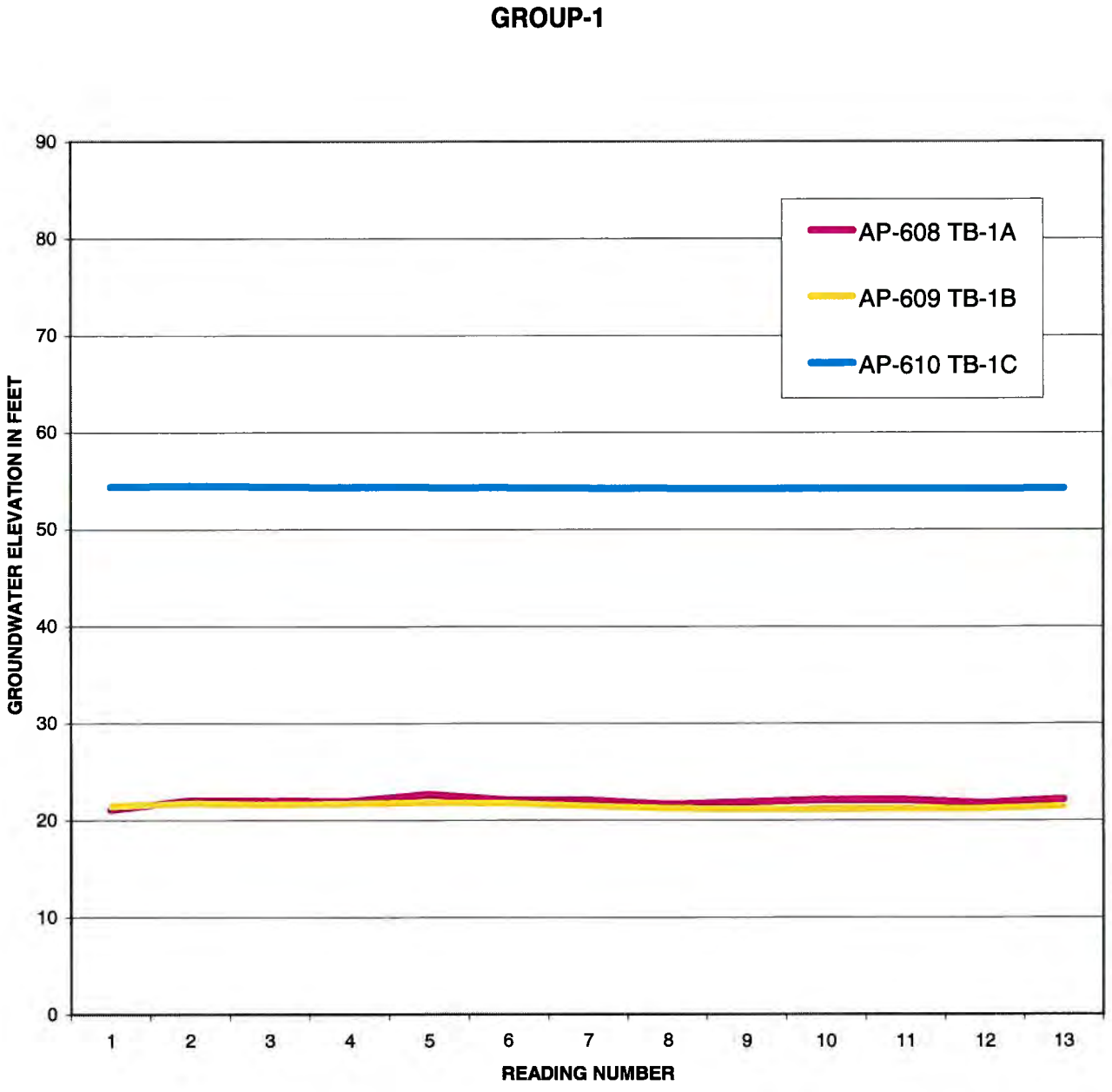


FIGURE C-03
GROUP TWO-GROUNDWATER ELEVATION TRENDS
KENAI RIVER BLUFF EROSION

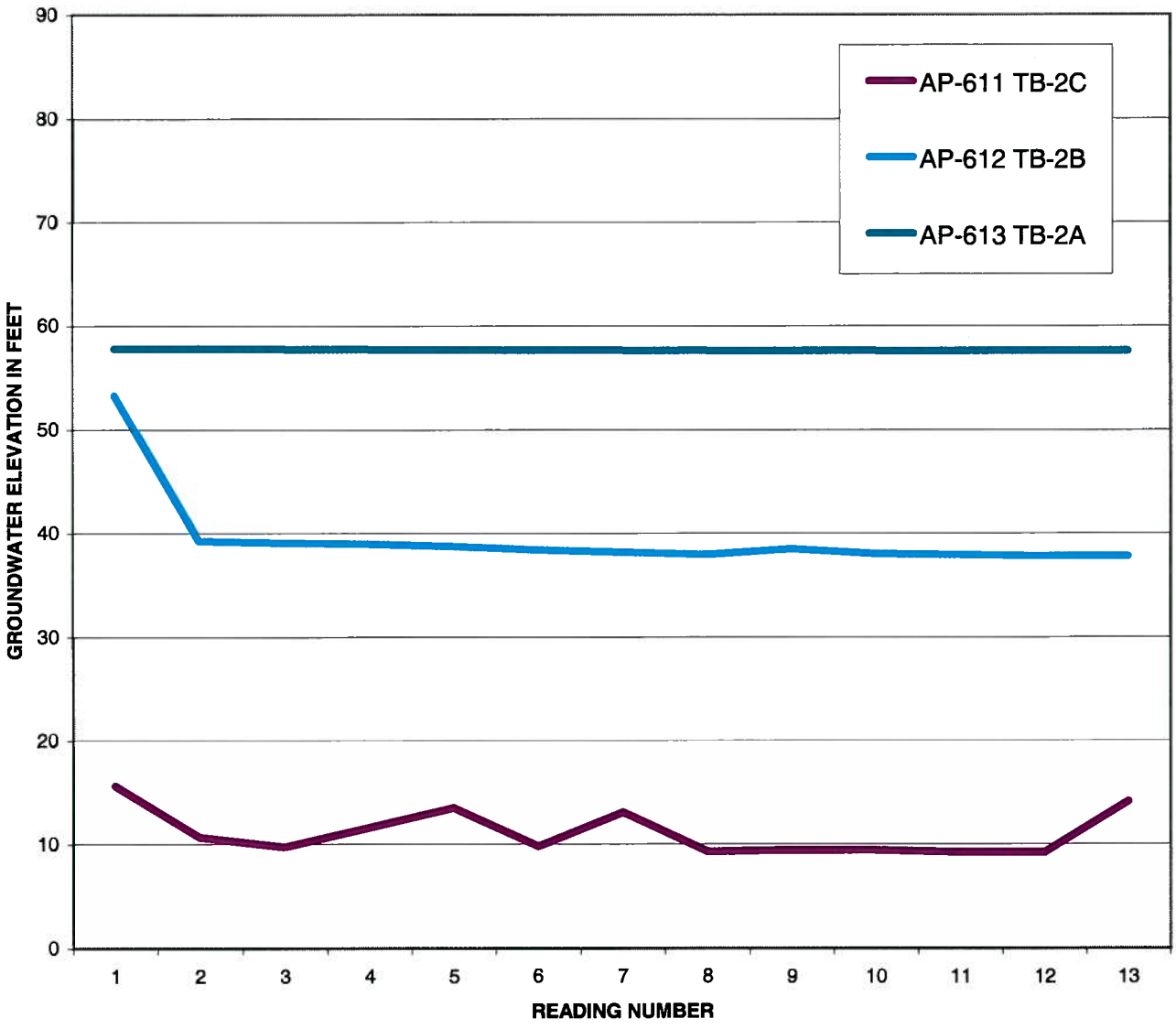


FIGURE C-04
GROUP THREE-GROUNDWATER ELEVATION TRENDS
KENAI RIVER BLUFF EROSION

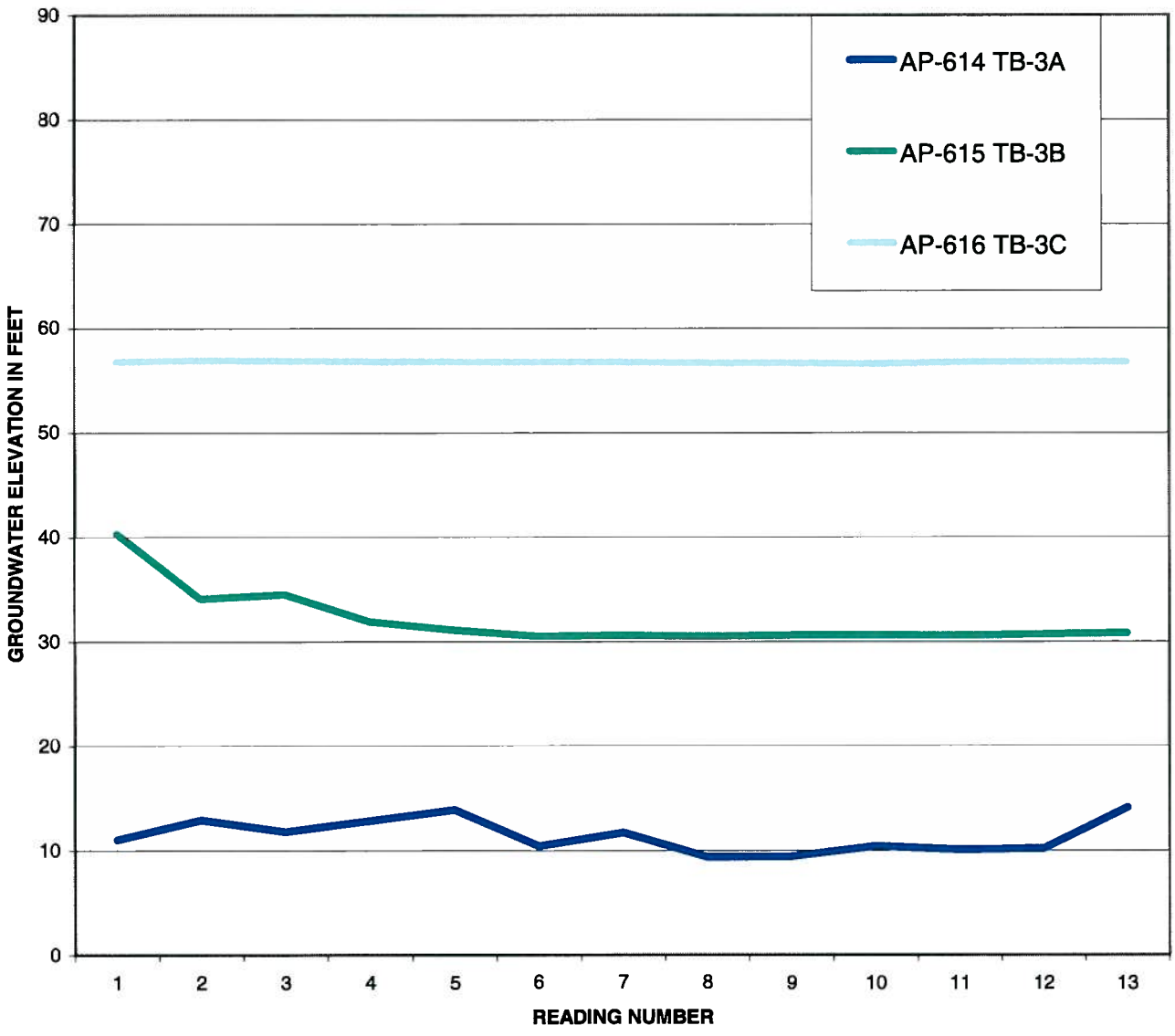


FIGURE C-05
GROUP FOUR-GROUNDWATER ELEVATIONS TRENDS
KENAI RIVER BLUFF EROSION

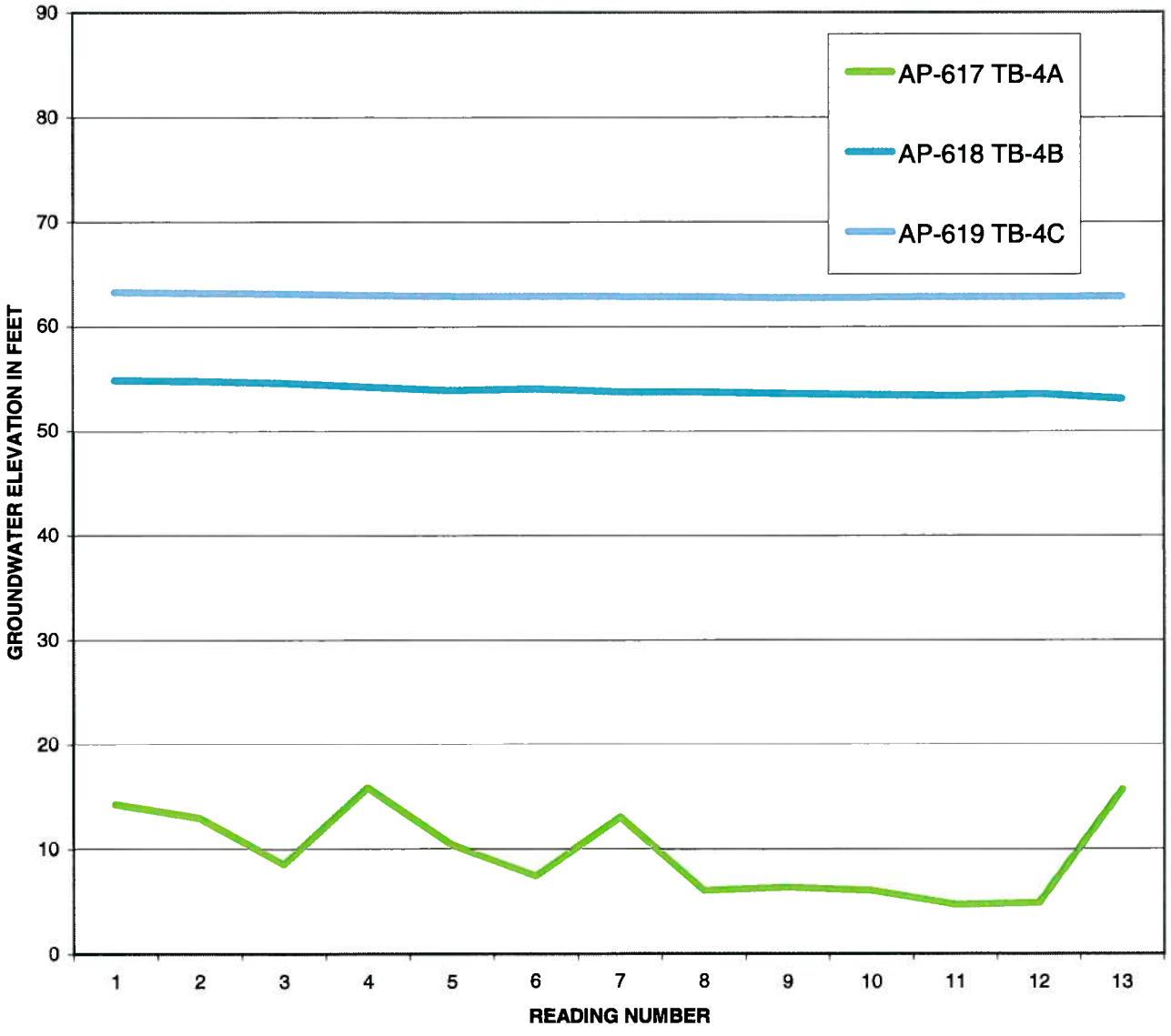


FIGURE C-06
SINGLE WELLS-GROUNDWATER ELEVATION TRENDS
KENAI RIVER BLUFF EROSION