ALTA GEOSCIENCES, Inc.
Environmental & Geotechnical Solutions

October 26, 2009

Mr. Paul Horwath
Alaska Department of Environmental Conservation
43335 Kalifornsky Beach Rd. - Suite 11
Soldotna, AK 99669-9792

Re: **Remediation Concept and Conceptual Investigation Plan**
Former Coastal Drilling Property, Soldotna, Alaska
ADEC File No. 2333.38.013

Dear Mr. Horwath:

This letter presents a preliminary remediation concept and a conceptual plan for a focused site investigation at the former Coastal Drilling Property (Site) in Soldotna, Alaska. A more detailed formal work plan for the investigation will be submitted once a concurrence is reached regarding the basic concepts.

BACKGROUND

Our understanding of the site is based on a review of the following site documents:

- ENSR Consulting and Engineering, 1988, *Property Transfer Assessment Phase II Hayward Hills Subdivision, Soldotna, Alaska*
- Harding Lawson Associates, 1990, *Coastal Drilling Site Investigation*, for ADEC
- Shannon & Wilson, Inc., 1992, *Environmental Site Investigation, Coastal Drilling Facility*, for ADEC
- Harding Lawson Associates, 1993, *Feasibility Study, Coastal Drilling*, for ADEC

The review focused on potential exceedence of ADEC cleanup levels for soil and groundwater as presented in 18AAC75. Table 1 presents a summary of selected sample analytical data that presents possible or likely exceedence of these cleanup levels.

The Coastal Drilling site consists of approximately 7.4 acres of land, located at Mile 0.5 of the Kenai Spur Road in Soldotna, Alaska. This property was used as an industrial site from 1957 to 1981. The property was acquired by Mr. Donald Jack in 1983 following the demise of Coastal Drilling. Following Mr. Jack's acquisition of the property, no industrial use occurred. There were several buildings (shops, etc.) on

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the site and two pits, identified as the "covered pit" which has been backfilled and the "open pit" which remains open and partially filled with water. At least one of the pits (the covered pit) was used for disposal. There are reports of disposal to the covered pit of dirt, grease and drilling mud washed from the oil field drilling rigs as well as engines, drums, scrap metal, rubber, timber, and shop wastes. The covered pit is approximately 110' x 60' and the open pit is approximately 50' x 90'. A grated sump near the former drilling shop is connected to the covered pit by a pipeline and it appears that wash water flowed from this area to the southwest corner of the covered pit. Use of the open pit for disposal has not been substantiated. It has been suggested that the soil excavated from the open pit was used to backfill the covered pit and that site operations ceased before the open pit was considered for use for disposal.

A shallow perched zone of groundwater is reported to be present beneath the site. It seems probable that the drilling mud washed into the pits has sealed the pits, creating a "bathtub" effect thereby limiting the potential migration of contaminants of concern. The regional groundwater table is at a depth of approximately 31 to 34 feet below the ground surface.

Contaminants of Concern

Identified contaminants of concern (HLA, 1993) were Benzene, Trichloroethylene, Vinyl Chloride, PCBs, Chromium, and Lead. It is clear there are high values for TPH in soil, in some cases coupled with high BTEX values. Although this suggests the potential for exceedence of cleanup levels for GRO and DRO constituents, the greater likelihood is that these TPH values reflect RRO range hydrocarbons with much higher cleanup levels. Analysis reports for "total BTEX" do not quantitate the individual constituents and the lack of gasoline usage suggests that the highest likelihood is that these reflect predominantly toluene, ethylbenzene, and xylenes since benzene is far more volatile and much more readily degraded than the other constituents.

Soil Impacts

Covered Pit. Trench soil samples from the southwest side of the covered pit (Trench 15) from 5 to 11 feet indicate impacts from TPH, BTEX, PCBs, TCE, and PCE, and Lead. Sludge from 4 feet deep contained 260,000 ppm TPH and soil from 5 feet deep tested at 71,000 ppm TPH. Total BTEX values in this trench were likewise high, exceeding 38 ppm at 5 feet, and total PCBs in the sludge at 4 feet were 13 ppm. TCE and PCE values in this zone (4-5 feet) ranged from 0.320 ppm to 0.880 ppm. Total Lead at 11 feet was 1250 ppm. Adjacent areas (Trench 13) showed similar constituents, but at much reduced values.

Perched water samples from the trenches excavated by HLA (1990) show potential exceedence of Benzene (but again, the analysis reports only Total BTEX), exceedence for PCBs and TCE, and possible exceedence for Total Lead, although this is likely an artifact of sampling. These were likely very poor quality samples, and should not be given significant weight in evaluating potential groundwater impacts. There appears to be little if any connection between this perched zone and the principal, deeper groundwater aquifer. In general, monitoring well samples collected by HLA (1990) and S&W (1992) do not show groundwater contamination down gradient of the covered pit. A possible exception may be in the HLA data, which indicates 0.03 ppm for Lead in all samples, however the source is not clear, since even the upgradient sample also contained this amount and again this may be an artifact of sampling procedures.

Open Pit. HLA (1990) sampling mostly focused outside the pit itself, although two samples may have been collected inside the pit. Results of this sampling do not show significant exceedence of ADEC cleanup values. As a general comment, HLA (1990) does not provide sufficient data to make decisions regarding the need for remediation of this structure. S&W (1992) sampling collected two samples from the open pit. TPH values were moderate (900 to 1000 ppm) and potentially GRO or DRO constituents within the broad TPH testing range could exceed cleanup values, but this is unknown. Given that volatile organics from these samples were generally non-detect, it seems likely that the TPH constituents were from residual range hydrocarbons and that there is no exceedence for DRO/GRO. Total Lead was found to be 800 ppm in one sample from the open pit. Total Chromium was found to be 1700 ppm in this pit, which is well in excess of the ADEC cleanup value for groundwater protection (26 ppm). The ADEC cleanup value is however based on hexavalent chromium which in our experience is quite rare in site such as this, the most common state being trivalent chromium which has a much higher cleanup level. Analysis for chromium with speciation for trivalent and hexavalent chromium would resolve this issue.

Based on a northeasterly groundwater flow direction from the vicinity of the open pit (S&W 1992) there are no directly down-gradient monitoring wells that would be useful for evaluating potential groundwater impacts from this feature.

Drill Shop Sump or Grate. HLA (1990) Trench 16 was near this sump or grate, which is considered a likely source of past disposal. A 6-inch effluent pipe runs from the sump to the covered pit, and discharged near Trench 15. Surface soils were high in TPH (86,000 ppm) and Total BTEX (179 ppm), which became significantly lower in deeper samples. A soil boring sample (MW01 @1 foot)) from this area was also moderately high in these constituents, but was notably high in PCBs (21 ppm). It

appears significant BTEX impacts to soil are present to at least 6 feet deep, but the depth and extent of exceedence cannot be accurately determined based on this data.

Groundwater monitoring results from HLA and S&W do not indicate significant groundwater impacts in the regional aquifer at this location.

Machine Shop Yard. A surface soil sample from the yard at the southwest corner of the machine shop showed elevated TPH (140,000 ppm), relatively low Total BTEX (84 ppb), elevated PCBs (2.9 ppb) and Lead (4,660 ppm). Surface sampling by S&W (1992) showed similar TPH results (up to 128,000 ppm). The extent of contamination at greater depths is unknown.

Groundwater sampling by HLA and S&W in the immediate downgradient direction (according to S&W (1992) does not indicate any significant groundwater impacts to the regional aquifer that can be linked to the surface contamination at this site.

REMEDIATION CONCEPT

Review of the available data summarized above does show exceedances of several ADEC Method 2 criteria. What is particularly noteworthy from the data summary shown on Table 1 however is that the great majority of samples taken thus far show little to no impacts. It is significant that these contaminants have been present at the site for over 30 years and yet have shown no migration. Potential site remediation options are complicated for several reasons:

- Excavation and offsite disposal is prohibitively expensive due to the volume of materials involved and the lack of a suitable disposal facility in Alaska. The resultant cost does not appear to represent a reasonable approach in terms of the risk to human health or the environment posed by identified contaminants.
- In-situ treatments are complicated by the low permeability of the materials related to the drill mud disposal, and the diversity of compounds present which preclude a single treatment option. That is, treatment options for hydrocarbons will not address lead and so forth.
- Ex-situ treatment options would require excavation of the materials and treatment above ground. Again, the diversity of compounds present precludes a single treatment solution. The presence of significant debris complicates any normal treatment train, and the drill mud residues promise to clog any treatment equipment.

Based on these considerations, it is our opinion that the only appropriate and cost effective remediation strategy for the covered pit is capping. It is noteworthy that capping is considered a “presumptive remedy” for many similar such sites by the U.S. Environmental Protection Agency (see for instance, *Landfill Presumptive Remedy Saves Time and Cost*, USEPA January 1997). Capping is also consistent with

Alaska guidance for monofills and drilling mud waste pits. Certain outlying areas (such as the drill shop sump/grate) would still be considered for excavation and offsite disposal based of the small volume of soils and the need to remove elevated PCB impacts.

CONCEPTUAL FOCUSSED INVESTIGATION DATA NEEDS

Work under this proposal is essentially a "fatal flaw" study to assess whether a simple and relatively small cap over is potentially viable and to establish whether the open pit would require capping at all. While site investigation work has been completed by others, issues discussed below remain unresolved and additional data are needed. It is the purpose of work under this proposal to address these data needs. As such, this scope of work does not represent a full site characterization but rather is focused on establishing specific objectives.

Review of the prior site investigation reports has identified several unresolved issues that may be pertinent to the need for future site remediation or the work required for remediation. Data from prior investigations provides an indication of the nature and location of potential issues but is not sufficient to address all concerns especially those related to the specific capping remedy.

Additional data which are needed to expedite decisions regarding the need for and nature of potential site remediation activities are discussed in the paragraphs below.

Differentiation of Petroleum Hydrocarbons

Sampling and testing have identified several areas with high concentrations of total petroleum hydrocarbons (TPH), however the differentiation of TPH into gasoline, diesel, and residual hydrocarbon ranges (GRO, DRO, and RRO respectively) should be completed. The cleanup levels are significantly different for each of these ranges, which potentially affects the need for and/or type of remediation. An associated issue is that some prior hydrocarbon samples may have been surface scraping of "oily stains". As such, they may indicate potentially high TPH values on soil, but do not represent TPH values for bulk soils, which should be sampled over a depth range. Based on the site's historical uses, the likelihood is that the reported petroleum hydrocarbons are heavy residual range organics which pose little threat to migration to groundwater.

Update Sampling Data to Current Conditions

Prior sampling occurred up to 18-20 years ago and due to natural attenuation factors, the present nature and concentration of contaminants could be significantly different. Decisions regarding site remediation should be made on present day information, not data that may be two decades old.

Covered Pit Backfill Consistency

One potential remediation alternative under consideration is the use of capping for one or both of the pits on this site. One pit is has been backfilled with soil, however, the density of this soil and potential for future settlement is unknown. These factors influence the selection of suitable capping technologies (e.g., paving versus geomembrane cover or flexible versus stiff structures). Therefore, the fill density and potential for settlement should be determined.

Depth of Water in the Open Pit

Despite the work done at the site previously, we can find nowhere that anyone has recorded the depth to water nor the depth of water in the open pit. This is significant since the volume of soil needed to backfill the open pit could be significant.

Impacts in Soils in the Open Pit

Although there has been some sampling done adjacent to the open pit and from the surface water in the open pit, there has been no sampling of the soils in the open pit. As a result, we simply don't know whether there are any impacted materials in the open pit, nor even whether the open pit was used for disposal, or whether the excavation was made simply to fill and cover the covered pit.

Polychlorinated Biphenyls (PCBs) in Soils

Because of the high cost of remediation for soils impacted by PCBs, the nature and extent of such contamination should be accurately determined. Prior investigations identified PCBs near the Drill Shop Sump or Grate, and in the covered pit. PCBs less than 10 mg/kg can generally be dealt with onsite using capping. PCBs greater than 50 mg/kg trigger requirements for disposal under the Toxic Substances Control Act (TSCA) with significantly higher remediation costs.

Chromium Speciation

Total Chromium was found to be 1700 ppm in the open pit, which is well in excess of the ADEC cleanup value for groundwater protection (26 ppm). The ADEC cleanup value is however based on hexavalent Chromium which is not likely to be a large portion of the total Chromium at this site. The most common state is trivalent chromium, which has a much higher cleanup level. Analysis for Chromium with speciation for trivalent and hexavalent Chromium would resolve this issue.

Additional Lead Evaluation

Lead was found near the machine shop and in both pits that significantly exceeds ADEC clean up criteria (400 mg/kg). However, this criteria is based on unrestricted land use (i.e., residential). Lead does not generally represent a threat from migration to groundwater due to low solubility and its strong affinity for sorbing to soils. Some

additional sampling for Lead in these areas should be considered to better define the extent of the impacts.

SITE INVESTIGATION SCOPE

Based on prior sampling and testing the following site areas have been identified as areas of concern which need to be resolved before advancing to the site remediation or more detailed site investigations. Table 2 provides a summary of the proposed test pits and lab testing for these areas of concern.

Covered Pit Area

We propose to excavate two test pits in the Covered Pit area. This will allow examination of the density of the fill materials and their suitability as a subgrade for the proposed cap. We will collect two samples from each of the test pits from the materials below the cover fill. These samples will be analyzed for GRO/DRO/RRO, BTEX (benzene, toluene, ethylbenzene and xylenes), PCBs, Halogenated Volatile Organics (TCE, PCE, etc.), Lead, and Chromium. If Chromium values exceed ADEC cleanup criteria, the sample will be speciated to determine the presence of Cr+6 in the sample. One of the two proposed test pits will be near the former discharge pipe from the outside grate.

Open Pit Area

The depth of the pit needs to be determined for future evaluations of remediation (e.g., backfill volume). Information is needed to evaluate the requirement for and type of appropriate remediation. At this time, we propose four test pits (one sample each) in the open pit area. These will be made by positioning the excavator on the bank and reaching out and down through the standing water to obtain a soil sample from the open pit soils. The samples will be analyzed for GRO, BTEX, DRO, RRO, PCBs, Halogenated Volatile Organics (TCE, PCE, etc.), Lead, and Chromium. If Chromium values exceed ADEC cleanup criteria, the sample will be speciated to determine the presence of Cr+6 in the sample.

Machine Shop

Elevated hydrocarbons, Lead, and PCBs were identified outside the NW corner of this structure (PCBs did not exceed TSCA criteria requiring regulated disposal). However, this was reported from a single surface soil sample and such samples are often not representative of overall site conditions. Since this area is not critical to the cap evaluation further investigation will be deferred to a later date.

Drill Shop Sump

The drill shop sump sludge or the soils that surround the sump may be of concern. Hydrocarbons, HVOCs, and Lead were reported at levels exceeding ADEC criteria.

However, the volume of such soils is quite small and unlikely to affect the feasibility of the capping option. Further investigation will be deferred to a later date.

Outside Grate

This structure is located between the former machine and drill shops, and connected with a pipe to the covered pit area. Hydrocarbons, HVOCs, PCBs, Lead and Chromium may be of concern here. Although this is a small area, the proximity to the pipe to the covered pit area suggests that the volume of potentially impacted soils could have significance with respect to overall site remediation costs. We propose two test pits and four samples.

CLOSING

If you have any questions, please call at your earliest convenience.

Sincerely,

ALTA Geosciences, Inc.

Alex Tula, L.G.
Principal Consultant
Attachments: Table 1 – Coastal Drilling Site Data Summary
Table 2 – Proposed Sampling and Lab Testing Summary

Cc: Susan Reeves, Esq.; Reeves Amodio
Mr. Don Jack

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TABLE 1 - COASTAL DRILLING SITE DATA SUMMARY

SAMPLE LOCATION	DATA SOURCE	SAMPLE POSITION	DEPTH (FEET)	SAMPLE MEDIA	TPH (PPM)	BTEX (PPM)	PCBs (PPM)	TCE (PPM)	PCE (PPM)	LEAD (PPM)
HLA 1990 SI Report										
Trench 1	Lab	S. End Tr, Ctr CP	5	Soil	85	0.00	0.08	BDL	BDL	13.9
Trench 1	Field	5' from S. End Tr, Ctr CP	5	Soil	NA	0.43	NA	0.01	BDL	NA
Trench 1	Lab	N. End Tr, N. edge CP	8	Soil	16	0.26	BDL	BDL	BDL	12.6
Trench 2	Field	Outside NW OP	1 & 4	Soil	NA	BDL	NA	BDL	BDL	NA
Trench 3	Field	Between Pits	1	Soil	NA	BDL	NA	BDL	BDL	NA
Trench 4	Lab	Between Pits	9	Soil	BDL	BDL	BDL	BDL	BDL	8.2
Trench 5	Field	N. Edge OP	9	Soil	NA	0.00	NA	BDL	BDL	NA
Trench 6	Field	N. Edge OP	8	Soil	NA	0.00	NA	BDL	BDL	NA
Trench 7	Field	E. Edge OP	3 & 8	Soil	NA	BDL	NA	BDL	BDL	NA
Trench 8	Field	SE Edge of OP	9	Soil	NA	0.00	NA	BDL	BDL	NA
Trench 9	Field	S. Edge of OP	7	Soil	NA	0.00	NA	BDL	BDL	NA
Trench 10	Field	SW. Edge of OP	8	Soil	NA	0.00	NA	BDL	BDL	NA
Trench 11	Lab	NW CP	5	Soil	140	0.00	0.05	BDL	BDL	10.8
Trench 12	Lab	W CP, Inside pit	6	Soil	860	0.08	0.21	BDL	BDL	158
Trench 13	Lab	Inside SW CP	5	Soil	**8,800**	0.01	0.61	BDL	0.02	287
Trench 14	Lab	S. Edge of CP	9	Soil	190	0.05	0.03	BDL	0.01	11.4
Trench 15	Lab	Outside SW CP	4	Sludge	**260,000**	**25.17**	**13.00**	**0.88**	**0.32**	**872**
Trench 15	Lab	Outside SW CP	5	Soil	**71,000**	**38.38**	**2.50**	**0.37**	**0.66**	306
Trench 15	Lab	Outside SW CP	11	Soil	2,700	5.60	0.33	BDL	BDL	**1,250**
Trench 16	Lab	Drilling Shop Grate	0	Soil	**86,000**	**179.80**	**2.38**	BDL	BDL	**1,190**
Trench 16	Field	Drilling Shop Grate	2	Soil	NA	3.66	NA	0.00	0.00	NA
Trench 16	Field	Drilling Shop Grate	5	Soil	NA	15.72	NA	0.00	0.00	NA
Trench 16	Field	Drilling Shop Grate	7	Soil	NA	2.22		0.00	0.00	NA
Trench 16	Lab	Drilling Shop Grate	7	Soil	120	0.73	0.05	BDL	BDL	12
Machine Shop	Lab	Outside NW Corner	0	Soil	**140,000**	0.08	**2.90**	BDL	BDL	**4,660**
Drill Shop	Lab	Shop Sump	0	Sludge	**130,000**	**71.70**	BDL	BDL	BDL	**2,410**
MW01	Lab	W. of Outside Grate	1	Soil	**23,000**	3.63	**21.00**	0.08	**0.87**	227
MW02	Lab	W. of Outside Grate	5	Soil	35	BDL	BDL	BDL	BDL	7
MW03	Lab	W. of CP	5	Soil	BDL	BDL	BDL	BDL	BDL	5.8
MW03	Lab	W. of CP	15	Soil	BDL	BDL	BDL	BDL	BDL	6
MW04	Field	S. OP	2	Soil	NA	0.35	NA	BDL	BDL	NA
MW04	Lab	S. OP	15	Soil	BDL	BDL	BDL	BDL	BDL	5.8
MW04	Lab	S. OP	20	Soil	11	BDL	BDL	BDL	BDL	5.7
MW04	Lab	S. OP	35	Soil	BDL	BDL	BDL	BDL	BDL	4.8

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TABLE 1 - COASTAL DRILLING SITE DATA SUMMARY

SAMPLE LOCATION	DATA SOURCE	SAMPLE POSITION	DEPTH (FEET)	SAMPLE MEDIA	TPH (PPM)	TOTAL BTEX (PPM)	PCBs (PPM)	TCE (PPM)	PCE (PPM)	CHROMIUM (PPM)	TOTAL LEAD (PPM)
S&W 1992 ESI Report											
SS-1	Lab	W. of Outside Grate	0	Soil	**64,300**	>0.332	**2.15**	NE	0.04	**74**	**820**
SS-2	Lab	W. Side of CP	0	Soil	2,280	NE	**2.01**	NE	NE	**2,700**	160
SS-3	Lab	S.E. of Outside Grate	0	Soil	**128,000**	NE	NE	NE	NE	**130**	**1276**
B1-S6	Lab	SE of CP	25	Soil	9.37	BDL	BDL	BDL	BDL	17	4.3
B5-S4	Lab	N. CP outside fence	6	Soil	16.80	BDL	BDL	BDL	BDL	**30**	6.4
B6-S1	Lab	NE Side of Site	1	Soil	10,800	NE	NA	BDL	BDL	**30**	79
B7-S3	Lab	S. of Outside Grate	3	Soil	200	BDL	NA	BDL	BDL	**27**	24
B9-S2	Lab	NW Cor Fenced Area	1.5	Soil	865	BDL	NA	BDL	BDL	**40**	50
B12-S3	Lab	W. of Outside Grate	7	Soil	7.23	BDL	NA	BDL	BDL	22	7
PS1	Lab	E. Side of OP	?	Soil	967	BDL	0.86	BDL	BDL	**30**	37
PS2	Lab	W. Side of OP	?	Soil	903	BDL	0.28	BDL	BDL	**1,700**	**800**

NOTES: CP = Covered Pit; OP = Open Pit
BDL = Below Detection Level
NA = Not Analyzed
NE = Not Exceeding Cleanup Values
BOLD values represent probable exceedance of ADEC Method 2 cleanup levels

Note 1: ADEC Method 2 cleanup levelsin soil migration to groundwater: GRO 300 mg/kg, DRO 2530 mg/kg, RRO 12,500 mg/kg
TPH values likely represent predominantly RRO

Note 2: Method 2 cleanup levels for total chromium is 26 mg/kg. For trivalent chromium, cleanup level is >10e6.
Likelihood is that Cr present at the site is trivalent, based on manner of disposal

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TABLE 2
PROPOSED SAMPLING AND LAB TESTING SUMMARY

AREA OF INVESTIGATION	AK101 (GRO, BTEX)	AK102 (DRO, RRO)	HVOCs	TOTAL LEAD	TOTAL CHROME	HEX CHROME	PCBS
Covered Pit Area	4	4	4	4	4	2	4
Open Pit Area	4	4	4	4	4	2	4
Grate Area	4	4	4	4	4	2	4
NUMBER TESTS:	12	12	12	12	12	6	12