Alpine Pipeline HDD Crossing

2007 Monitoring Report

Submitted to ConocoPhillips

Submitted by Baker October 2007

111620-MBJ-RPT-001

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Submitted by

Baker

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1.0 Introduction/Objectives

The Alpine Pipeline System, constructed during the winter of 1998/1999, crosses three major rivers between the Alpine Development CD1 facility and the tie-in to the Kuparuk Pipeline. These crossings are the horizontal directionally drilled (HDD) crossing of the East Channel of the Colville River, and the aboveground crossings of the Kachemach River and the Miluveach River.

Monitoring of the HDD crossing was first conducted in the spring of 2001(Baker 2002). Since 2003 monitoring of the HDD, Kachemach River, and the Miluveach River crossings has been conducted (Baker 2003, 2004, 2005, 2006). In 2007, only monitoring to the HDD crossing was performed (Figure 1).

Monitoring was conducted to document the condition of the pipelines at the Colville River crossing and compare the observed condition to the design criteria, as required by Right-of-Way Lease/Grant Stipulations and the Alpine Surveillance and Monitoring Program. Of particular concern was the state of the pipeline itself at this crossing, as well as the pipeline's impact on the channel.

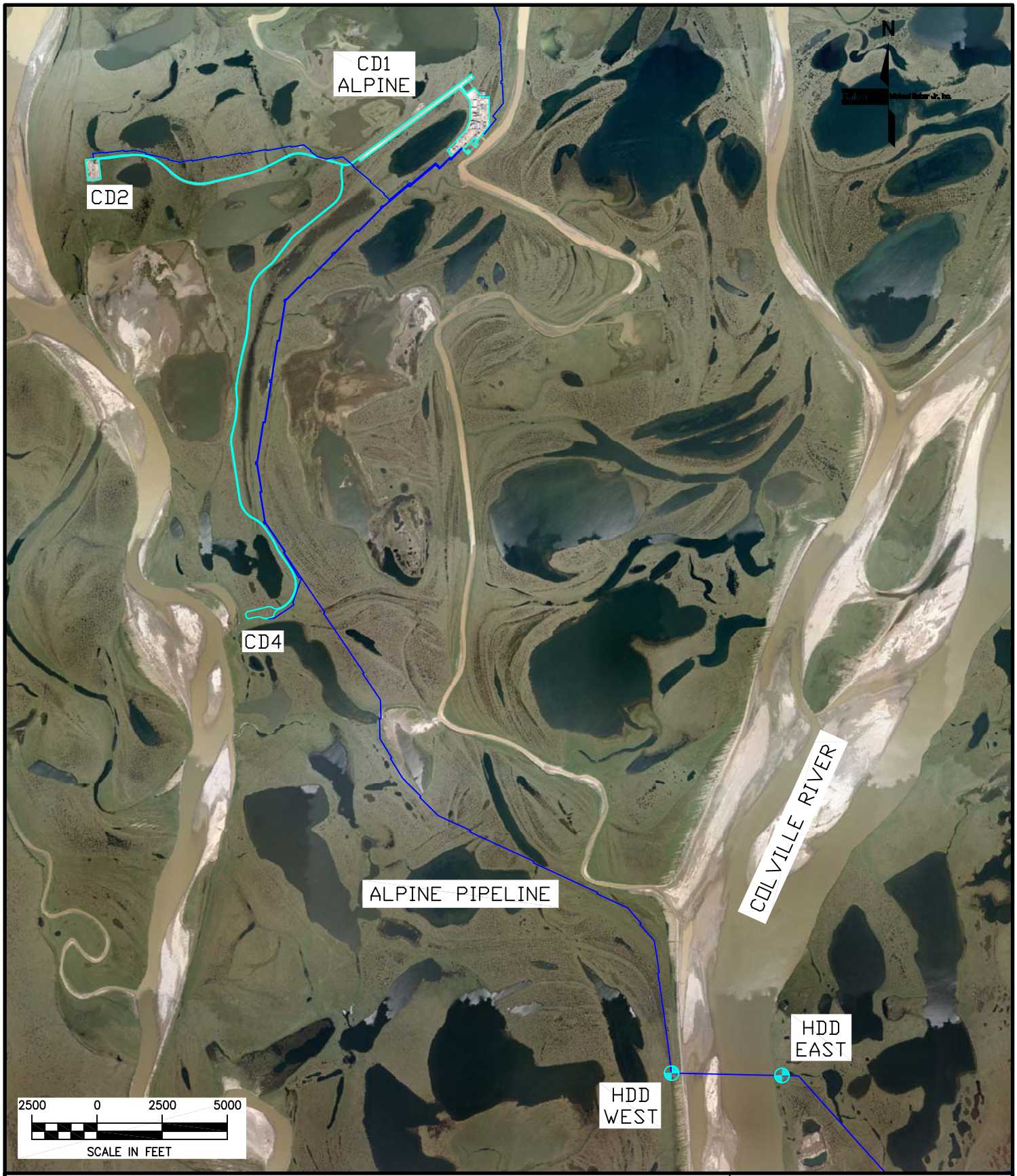
The data collected included the following:

- Photographs at east and west bank facilities: HDD East and HDD West, respectively
- Condition of Vertical Support Member(s) (VSM): tilting, settling, or jacking
- Evaluation of bank erosion, 50 feet upstream and downstream from the NPS 14 crude oil pipeline
- Topographic survey from the Colville River to the HDD East Pad to document bank and ground stability

The following physical conditions were specifically evaluated during the site inspections:

- The presence or absence of erosion at facility gravel pads
- Settlement and jacking of the HDD building foundations
- Obstructions, ice dams, or changes in flow in the channels
- Signs of flooding that threatened a facility or pipeline
- Water that could not be diverted and was concentrated longitudinally on or along the pipeline centerline, or gullying that threatened the below grade pipeline

- Soil pressure ridges that developed parallel to the pipe axis and exceeded one foot in height and 60 feet in length
- Ponding that extended over the pipe axis deeper than one foot and more than 100 feet long
- Cracks within ten feet of the pipeline centerlines at least ten feet long with vertical displacement exceeding six inches, or wider than two inches parallel to the pipe axis and longer than 60 feet
- Depressions occurring longitudinally over pipe axis deeper than one foot and more than 100 feet long
- Pipeline leaks



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DATE:	10/19/07	PROJECT:	111620
DRAWN:	MDM	FILE:	FIGURE_1.DWG
CHECKED:	JAB	SCALE:	AS SHOWN

ALPINE PIPELINE
COLVILLE RIVER HDD CROSSING
MONITORING LOCATION

FIGURE 1

2.0 Methods

Observations and photographs of the HDD crossing were collected throughout the 2007 spring breakup. Baker personnel Mark McBroom, and Ozzy Orwick inspected and took measurements at the Colville River HDD crossing on July 18, 2007. Sites were clear of ice and snow on the day of the inspection allowing full access to the channel and pipelines. Inspections extended from the points of pipeline casing entry to the riverbanks. The inspections extended upstream and downstream several hundred feet on both the east and west banks. In addition to visual observations, both aerial and ground photographs were taken at each site and are provided in **Appendix A**. The observations and measurements were then compared to established design criteria.

2.1 Bank Erosion

The survey data for the Colville River was compared to scour control points established previously to assure the pipeline system would be protected. Scour control points were located on each side of the HDD crossing, with the HDD West top of bank setback allowing for 105 feet of bank erosion and the HDD East top of bank setback allowing for 115 feet of bank erosion (Baker 1997). Setbacks were based on a 30-year design life.

Kuukpik/LCMF, LLC (LCMF) surveyed local topography at HDD East and West in August 2007. LCMF incorporated the data into figures and tabulation of historical migration since 2001 for each bank, available in **Appendices B and C**. The baseline stationing was based on arbitrary initial points, each beginning at 100 feet along each bank, and was established as a means of comparing annual measurements.

2.2 VSM Tilt, Settlement, and Jacking

Tilt of the VSM adjacent to the HDD river crossing was measured using a plumb bob (4-foot line) and tape measure. Tilt was measured perpendicular to the NPS 14 oil pipeline (north/south) and parallel to the pipeline (east/west). Tilt of each VSM was documented by measuring the horizontal distance from plumb in feet per vertical foot (feet/foot). The VSM axis was considered plumb if the tilt was measured to be less than or equal to 0.00125 feet/foot (1/64 inch/foot). If tilt was measurable, the direction of tilt was also recorded (N, S, E, or W). Conversions between feet/foot measurements presented in this report and inch/foot units are provided in Table 2-1.

Table 2-1 VSM Tilt Unit Conversion

Feet/Foot	Inch/Foot
< 0.00125	< 1/64
0.00250	1/32
0.00500	1/16
0.00750	3/32
0.01000	1/8
0.01250	5/32

The 1999 Alpine VSM installation specification states that "the plumb of each VSM shall vary no more than +/- 0.5% (1/16 inch per 12 inches) in any direction" (ARCO 1999). The 2004 CPAI North Slope VSM specification states that "the slope of any support beam in the direction parallel to the pipeline centerline shall not exceed 1/2 inch (0.042 feet) in ten feet (0.004 feet/foot or 1/16 inch per foot)" (CPAI 2004). Based on these VSM specifications and for comparison purposes, the plumb (tilt) tolerance was accepted to be 0.005 feet/foot (1/16 inch/foot).

2.3 Foundation Settlement and Jacking (HDD West)

LCMF surveyed the elevation of HDD building foundation piles (bottom of pile cap) and developed tabulations of historic elevations for each pile, available in **Appendix B**. Vertical datum was adjusted at HDD West (-0.35 feet) to reflect actual elevations based on differential levels carried from CD1 (Alpine) in August of 2007.

2.4 Polygon Trough Subsidence (HDD East)

A polygon trough located between the Colville River and HDD East gravel pad was also monitored for subsidence. Historic profiles and tabulated elevations of selected cross sections over the length of the trough are presented in **Appendix C**. Vertical datum was adjusted at HDD East (-0.50 feet) to reflect actual elevations based on differential levels carried from CD1 (Alpine) in August of 2007.

3.0 Results

3.1 HDD West Bank

The west bank of the Colville River HDD crossing was evaluated by visual inspection review of ground and aerial photography **(Photo A-1 through Photo A-5, Appendix A)**, and field surveys. The 2007 Colville River breakup floodwaters did not overtop the west bank of the channel. No significant erosion was evident along the west bank (**Photo A-1**). Deposition of sand along the toe of the bank did occur. Ice jamming did not occur within the vicinity of HDD as it had in 2006.

3.1.1 Bank Erosion (HDD West)

The greatest bank erosion observed between the 2006 and 2007 monitoring events was 1.0 feet, occurring approximately 150 feet downstream of the pipeline centerline.

A maximum erosion of 18.7 feet, between April 2002 and August 2007, has been measured along the top of bank at a single location 120 feet north of the NPS 14 oil pipeline centerline. This yields a maximum average rate of 3.5 feet/year over the monitoring period. The average rate of erosion along the 440-foot top of bank was measured to be 0.6 feet/year. A summary of the LCMF surveying results for the HDD West Bank crossing is presented in **Appendix B**. The measured average annual rate of bank erosion is less than the observed long-term historic average rate of 0.8 feet/year, and less than the estimated maximum erosion rate used for design of 2.3 feet/year (Baker 1997).

Approximately 9.0 feet of bank erosion at the NPS 14 oil pipeline centerline has occurred since 1997 (0.9 feet/year) based on a comparison of 2007 survey data and the 1997 scour control point (**Appendix B**). The observed bank erosion at the NPS14 oil centerline equals approximately 9% of the design setback as of 2007. The west bank erosion has not yet reached the 50% design setback; however, if either bank “migrates 50% of the design setback, erosion rates or possible mitigation measures will be evaluated” (Baker 1999).

3.1.2 VSM Tilt (HDD West)

The VSM directly adjacent to the HDD West pad and crossing were found to be generally plumb and adequately supporting the pipeline based on July 18, 2007 observations and measurements. Of the six VSM measured for tilt, the maximum tilt was measured to be 0.00375 feet/foot, within the project tolerances of less than or equal to 0.005 feet/foot (1/16 inch/foot). A summary of the HDD West Bank VSM tilt survey results are presented in Table 3-1.

Table 3-1 HDD West VSM Tilt Measurement Results

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
783	0.0025 N	< 0.00125
784A	0.00375 N	< 0.00125
784B	< 0.00125	< 0.00125
788	0.0025 N	< 0.00125
789A	0.00375 N	< 0.00125
789B	0.00375 N	< 0.00125

3.1.3 Foundation Pile Cap Survey (HDD West)

LCMF has conducted a pile cap elevation survey annually since 2005 and based on the result of their surveys, the pile caps have experienced less than 0.1 feet of movement vertically. A summary of the LCMF surveying results for the HDD West Bank crossing is presented in **Appendix B**.

3.1.4 Summary

The HDD West Bank crossing has eroded at an average rate that is less than both the long-term historic and design erosion rates over the 5-year study period. The observed erosion of the west bank at the NPS14 oil centerline represents approximately 9% of the 105-foot design setback, while the pipeline crossing has operated for approximately 30% of the original design life. Based on the visual inspections, measurements, and survey results, there appeared to be no tilting, settling, or jacking of the Pipeline VSM or HDD building foundations. The HDD West Bank gravel pad is free from erosion and the

pipelines appeared to be in good, stable condition with no leaks. No ponding, cracks, depressions, or pressure ridges were evident over the pipeline axis.

3.2 HDD East Bank

The east bank of the Colville River HDD crossing was evaluated by visual inspection, review of ground and aerial photography **(Photo A-6 through Photo A-10, Appendix A)**, and field surveys**.** The 2007 Colville River breakup floodwaters were not observed above the river bank and there were no signs of major erosion along the east bank of the HDD crossing**.** Shore-fast ice upstream and downstream of the alignment **(Photo A-6, Appendix A)** was intact until June 4.

3.2.1 Bank Erosion (HDD East)

The greatest bank erosion observed between the 2006 and 2007 monitoring events was 4.2 feet over the seawater pipeline, occurring approximately 110 feet downstream of the oil pipeline centerline.

A maximum erosion of 31.0 feet, between October 2001 and August 2007, has been measured along the top of bank at a single location 110 feet south of the NPS 14 oil pipeline centerline. This yields a maximum average rate of 6.2 feet/year over the monitoring period. The average rate of erosion along the 335-foot top of bank was measured to be 2.1 feet/year. A summary of the LCMF surveying results for the HDD East Bank crossing is presented in **Appendix C**. The measured average annual rate of east bank erosion is greater than the observed long-term historical average rate of 1.5 feet/year, but less than the estimated maximum erosion rate used for design of 2.5 feet/year (Baker 1997).

Approximately 8.8 feet of bank erosion at the NPS 14 oil pipeline centerline has occurred since 1997 (0.9 feet/year) based on a comparison of 2007 survey data and the 1997 scour control point (**Appendix C**). As of 2007, the observed bank erosion equals approximately 8% of the design setback which is less than was estimated in 1997. The east bank erosion has not yet reached the 50% design setback; however, if the bank “migrates 50% of the design setback, erosion rates or possible mitigation measures will be evaluated” (Baker 1999).

3.2.2 Polygon Trough Subsidence (HDD East)

In addition to bank erosion surveys, subsidence monitoring has been conducted at eight cross sections of the polygon trough since 2001. The cumulative subsidence at each of the cross sections is generally less than one foot **(Appendix C)**. Cross Section E has a cumulative subsidence of 1.7 feet at the polygon trough centerline, dropping 0.4 feet since 2006.

3.2.3 VSM Tilt

The VSM directly adjacent to the HDD East pad and crossing were found to be generally plumb and adequately supporting the pipelines based on July 18, 2007 observations and measurements. Of the five VSM measured for tilt, the maximum tilt was measured to be 0.00375 feet/foot, within the project tolerances of less than or equal to 0.005 feet/foot (1/16 inch/foot). A summary of the HDD East Bank VSM tilt survey results is presented in Table 3-2**.**

Table 3-2 HDD East VSM Tilt Measurement Results

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
883	< 0.00125	< 0.00125
884	< 0.00125	< 0.00125
885	0.00250 S	0.00250 W
889	< 0.00125	< 0.00125
890	< 0.00125	0.00375 W

During the 2006 Spring Breakup event, the southwestern most thermosyphon at the HDD East crossing was impacted by a pan of river ice. The measured tilt of the thermosyphon was approximately 0.0225 and 0.0125 feet/foot toward the northeast in 2006 and 2007, respectively. This difference in tilt is likely the result of modified methods of measurement between 2006 and 2007 monitoring events. The current orientation of this and the remaining thermosyphons are within operational tolerances and do not impact the performance of these systems (Arctic Foundations 2006).

3.2.4 Summary

Though the six year average erosion rate is greater than the long-term historic average, it is less than the design erosion rate. The observed erosion of the east bank at the NPS14 oil centerline represents approximately 8% of the 115-foot design setback, while the pipeline crossing has operated for approximately 30% of the original design life. Based on visual inspections, measurements, and survey results, there appeared to be no tilting, settling, or jacking of Pipeline VSM or foundation piles. The HDD East Bank gravel pad is free from erosion and the pipelines appeared to be in good, stable condition with no leaks. No ponding, cracks, depressions, or pressure ridges were evident over the pipeline axis. The polygon trough does pass over the seawater casing axis, however features of the trough do not meet the physical conditions listed in Section 1.0, relative to the pipeline axis.

4.0 Conclusions

No significant erosion or scour occurred at the Alpine Pipeline System HDD crossing sites during the 2007 spring breakup, based on collected data evaluation and survey results. Floodwaters did not overtop either bank during the 2007 spring breakup. The condition of the VSM and pipelines at both sites was determined to be stable. At the east and west bank HDD crossing sites, continuing natural erosion along the banks was noted to be within design estimates and is not negatively impacting the safe operation of the pipeline. No signs of pressure ridges, depressions, ponding, or cracking were evident over a length greater than 60 feet of the pipeline.

While the erosion of the banks near the HDD crossing of the Colville River does not appear to have been affected by the construction or operation of the pipeline, continued monitoring at these locations is recommended.

5.0 References

ARCO Alaska, Inc. (ARCO). 1999. Vertical Support Member and Module Pile Installation Specification. SPC-CE-AP-10001. February 1999.

Arctic Foundations. 2006. Telephone Communication between Michael Alexander, P.E. (Baker) and Edward Yarmak, P.E. July 26, 2006.

ConocoPhillips Alaska (CPAI). 2004. Vertical Support Member and Module Pile Installation Specification. SPC-CE-NS-80002. May 2004.

Michael Baker, Jr., Inc. (Baker). 2006. Alpine Pipeline River Crossings 2006 Monitoring Report. Prepared for ConocoPhillips Alaska. 108710-MBJ-RPT-001. October 2006

—— 2005. 2005 Alpine Pipeline River Crossing Monitoring. Prepared for ConocoPhillips Alaska. 105758-MBJ-001. October 2005.

—— 2004. 2004 Alpine Pipeline River Crossing Monitoring. Prepared for ConocoPhillips Alaska. 103654-MBJ-001. October 2004.

—— 2003. 2003 Alpine Pipeline River Crossing Monitoring. Prepared for ConocoPhillips Alaska. 101376-MBJ-001. July 2003.

—— 2002. HDD Transition Zones Civil Surveillance Trip Report – 2001. Prepared for Phillips Alaska Inc. 25114-217-MBJ-001. January 2002.

—— 1999. Mechanical Analysis of Aboveground Pipeline & Aboveground River Crossings. Prepared for ARCO Alaska Inc. 23100-MBJ-RP-001. May, 1999.

—— 1997. Alpine Development. Colville River Crossing Design Report. Prepared for ARCO Alaska. Rev. 4 2003. Prepared for Arco Alaska Inc. 23100-MBJ-RP-003. June 1997.

Appendix A Photos

Photo A-1 HDD West, June 3, 2007. HDD West (foreground) 1 day peak stage peak stage, looking east across Colville River. A-2
Photo A-2 HDD West, July 18, 2007. Bluff, thermosyphons and pad at HDD West, looking west. A-2
Photo A-3 HDD West, July 18, 2007. Bluff, thermosyphons, pad and pipeline at HDD West, looking south. A-3
Photo A-4 HDD West, July 18, 2006. Bluff and thermosyphon at HDD West, looking west from Colville River. A-3
Photo A-5 HDD West, July 18, 2007. Thermosyphons, pads, and facilities at HDD West, looking west. A-4
Photo A-6 HDD East, June 6, 2007. Bluff, thermosyphons, pad and pipeline at HDD East 2 days after peak stage, looking east. A-4
Photo A-7 HDD East, July 18, 2007. Bluff, thermosyphons and pad at HDD East, looking southeast. A-5
Photo A-8 HDD East, July 18, 2007. Bluff, thermosyphons, pad and pipeline at HDD East, looking east. A-5
Photo A-9 HDD East, July 18, 2007. Thermosyphons, and polygon trough at HDD East, looking west. A-6
Photo A-10 HDD East, July 18, 2007. Bluff and northern thermosyphons at HDD East, looking north. A-6

Photo A-1 HDD West, June 3, 2007. HDD West (foreground) 1 day before peak stage, looking east across Colville River.

Photo A-2 HDD West, July 18, 2007. Bluff, thermosyphons, and pad at HDD West, looking west.

Photo A-3 HDD West, July 18, 2007. Bluff, thermosyphons, pad and pipeline at HDD West, looking south.

Photo A-4 HDD West, July 18, 2006. Bluff and thermosyphon at HDD West, looking west from Colville River.

Photo A-5 HDD West, July 18, 2007. Thermosyphons, pads, and facilities at HDD West, looking west.

Photo A-6 HDD East, June 6, 2007. Bluff, thermosyphons, pad, and pipeline at HDD East 2 days after peak stage, looking east.

Photo A-7 HDD East, July 18, 2007. Bluff, thermosyphons, and pad at HDD East, looking southeast.

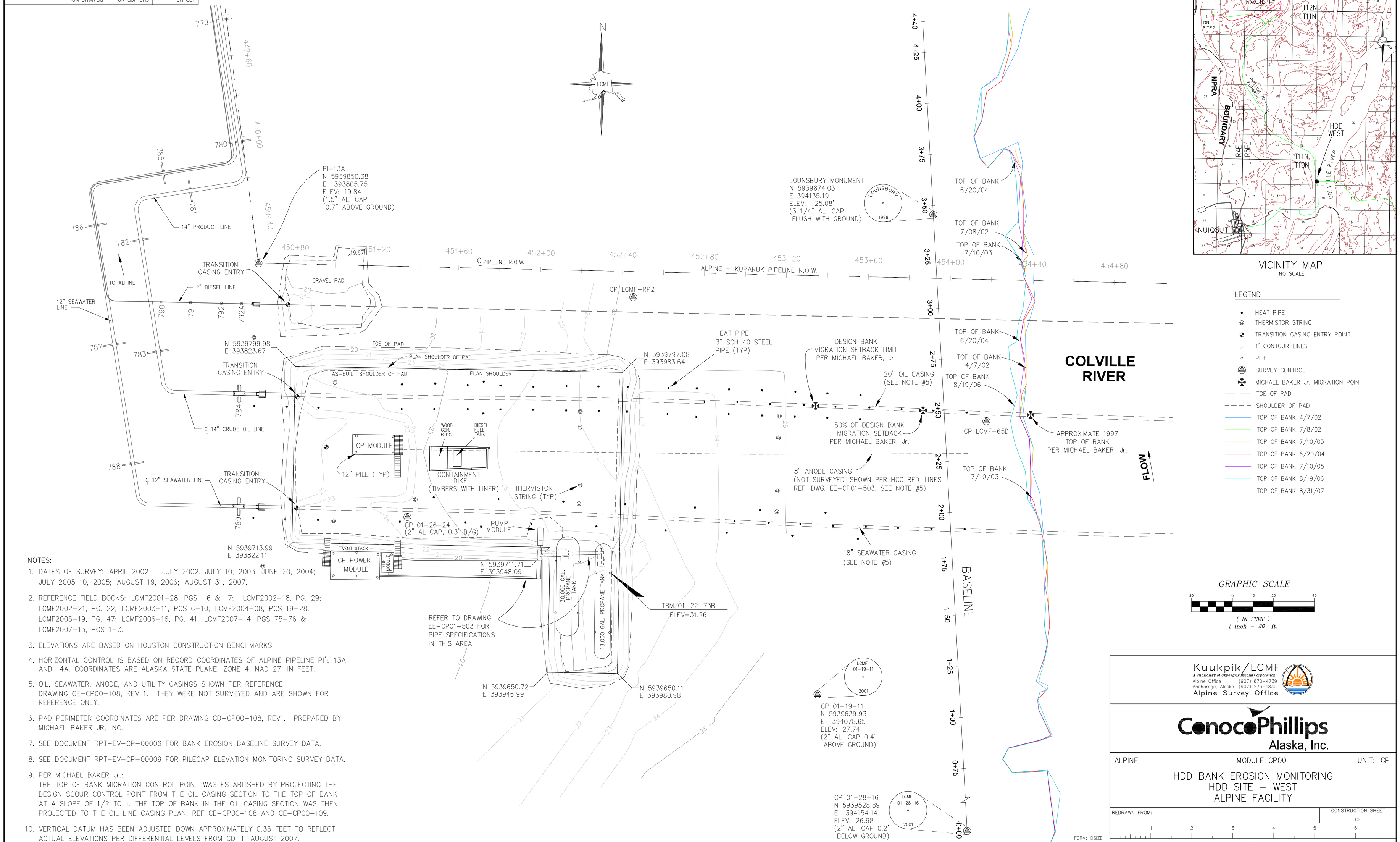
Photo A-8 HDD East, July 18, 2007. Bluff, thermosyphons, pad, and pipeline at HDD East, looking east.

Photo A-9 HDD East, July 18, 2007. Thermosyphons and polygon trough at HDD East, looking west.

Photo A-10 HDD East, July 18, 2007. Bluff and northern thermosyphons at HDD East, looking north.

Appendix B HDD West Survey Data

JOB NO: 02-205 | SUB JOB NO: | DRAWING NO: CE-CP00-143



VICINITY MAP
NO SCALE

LEGEND

- HEAT PIPE
- THERMISTOR STRING
- TRANSITION CASING ENTRY POINT
- 1' CONTOUR LINES
- PILE
- SURVEY CONTROL
- MICHAEL BAKER Jr. MIGRATION POINT
- TOE OF PAD
- SHOULDER OF PAD
- TOP OF BANK 4/7/02
- TOP OF BANK 7/8/02
- TOP OF BANK 7/10/03
- TOP OF BANK 6/20/04
- TOP OF BANK 7/10/05
- TOP OF BANK 8/19/06
- TOP OF BANK 8/31/07

GRAPHIC SCALE
20 0 10 20 40
(IN FEET)
1 inch = 20 ft.

NOTES:

1. DATES OF SURVEY: APRIL 2002 - JULY 2002. JULY 10, 2003. JUNE 20, 2004; JULY 2005 10, 2005; AUGUST 19, 2006; AUGUST 31, 2007.
2. REFERENCE FIELD BOOKS: LCMF2001-28, PGS. 16 & 17; LCMF2002-18, PG. 29; LCMF2002-21, PG. 22; LCMF2003-11, PGS 6-10; LCMF2004-08, PGS 19-28. LCMF2005-19, PG. 47; LCMF2006-16, PG. 41; LCMF2007-14, PGS 75-76 & LCMF2007-15, PGS 1-3.
3. ELEVATIONS ARE BASED ON HOUSTON CONSTRUCTION BENCHMARKS.
4. HORIZONTAL CONTROL IS BASED ON RECORD COORDINATES OF ALPINE PIPELINE PI's 13A AND 14A. COORDINATES ARE ALASKA STATE PLANE, ZONE 4, NAD 27, IN FEET.
5. OIL, SEAWATER, ANODE, AND UTILITY CASINGS SHOWN PER REFERENCE DRAWING CE-CP00-108, REV 1. THEY WERE NOT SURVEYED AND ARE SHOWN FOR REFERENCE ONLY.
6. PAD PERIMETER COORDINATES ARE PER DRAWING CD-CP00-108, REV1. PREPARED BY MICHAEL BAKER JR, INC.
7. SEE DOCUMENT RPT-EV-CP-00006 FOR BANK EROSION BASELINE SURVEY DATA.
8. SEE DOCUMENT RPT-EV-CP-00009 FOR PILECAP ELEVATION MONITORING SURVEY DATA.
9. PER MICHAEL BAKER Jr.:
   THE TOP OF BANK MIGRATION CONTROL POINT WAS ESTABLISHED BY PROJECTING THE DESIGN SCOUR CONTROL POINT FROM THE OIL CASING SECTION TO THE TOP OF BANK AT A SLOPE OF 1/2 TO 1. THE TOP OF BANK IN THE OIL CASING SECTION WAS THEN PROJECTED TO THE OIL LINE CASING PLAN. REF CE-CP00-108 AND CE-CP00-109.
10. VERTICAL DATUM HAS BEEN ADJUSTED DOWN APPROXIMATELY 0.35 FEET TO REFLECT ACTUAL ELEVATIONS PER DIFFERENTIAL LEVELS FROM CD-1, AUGUST 2007.

REFERENCE DWG NO/SHT NO:

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
6	8/31/07	UPDATED PER 4810351ACS	CZ	DB			
5	8/21/06	UPDATED PER 4116808ACS	AG	GD			
4	7/10/05	UPDATED PER 3391755ACS	CZ	DB			
3	6/25/04	UPDATED PER 2390460ACS	CZ	BD			
2	11/15/03	ISSUED PER 2094387ACS	GD	JZ			
1	11/5/02	ISSUED PER 1870227ACS	CZ	JZ			

FORM: DSIZE

Kuukpik/LCMF
A subsidiary of Ukpeagvik Iñupiat Corporation
Alpine Office (907) 670-4739
Anchorage, Alaska (907) 273-1830
Alpine Survey Office

ConocoPhillips Alaska, Inc.

ALPINE | MODULE: CP00 | UNIT: CP

HDD BANK EROSION MONITORING
HDD SITE - WEST
ALPINE FACILITY

REDRAWN FROM: | CONSTRUCTION SHEET OF

1 2 3 4 5 6

DO NOT SCALE | ABOVE SCALE FOR REFERENCE ONLY

DATE: 11/5/02	DRAWN: CZ	DESIGN:	ECM NO: 1870227ACS
SCALE: 1"=20'	CHECKED: JZ		CC NO:
JOB NO: 02-205 / SUB JOB NO:	APPROVAL: ML		CADD FILE NO. 01-12-05-1WEST
	DRAWING NO: CE-CP00-143		PART: 1 OF 1 / REV: 6

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations See Drawing CE-CP00-143 Rev 6 for Survey Baseline Location						Description
	7/8/2002	7/10/2003	6/20/2004	7/10/2005	8/19/2006	8/31/2007	
0+00	39.5	39.5	39.5	39.3	39.3	39.3	Baseline Offset (In Feet)
0+05	39.3	39.3	39.3	37.6	37.6	37.6	Baseline Offset (In Feet)
0+10	39.4	39.4	39.4	38.5	38.5	38.5	Baseline Offset (In Feet)
0+20	45.8	45.8	45.8	41.9	41.9	41.9	Baseline Offset (In Feet)
0+25	41.5	41.5	41.5	39.1	39.1	40.7	Baseline Offset (In Feet)
0+30	37.9	37.9	37.9	37.9	37.9	40.4	Baseline Offset (In Feet)
0+40	41.9	41.9	41.9	41.9	41.9	41.9	Baseline Offset (In Feet)
0+50	42.0	42.0	42.0	42.0	42.0	44.5	Baseline Offset (In Feet)
0+60	41.4	41.4	41.4	41.4	41.4	46.4	Baseline Offset (In Feet)
0+70	40.7	40.7	40.7	40.7	40.7	41.9	Baseline Offset (In Feet)
0+75	21.4	21.4	21.4	21.4	21.4	21.4	Baseline Offset (In Feet)
0+80	20.1	20.1	20.1	20.1	20.1	20.1	Baseline Offset (In Feet)
0+85	29.0	29.0	29.0	29.0	29.0	29.7	Baseline Offset (In Feet)
0+90	42.8	42.8	42.8	42.8	42.8	43.5	Baseline Offset (In Feet)
1+00	38.7	38.7	38.7	38.7	38.7	40.1	Baseline Offset (In Feet)
1+05	37.9	37.9	37.9	37.9	37.9	38.4	Baseline Offset (In Feet)
1+10	41.4	41.4	41.4	39.2	39.2	39.2	Baseline Offset (In Feet)
1+15	38.2	38.2	38.2	38.2	38.2	39.9	Baseline Offset (In Feet)
1+20	39.4	39.4	39.4	39.4	39.4	40.4	Baseline Offset (In Feet)
1+25	41.4	41.4	41.4	41.4	41.4	41.4	Baseline Offset (In Feet)
1+30	43.0	43.0	43.0	43.0	43.0	43.0	Baseline Offset (In Feet)
1+40	45.3	45.3	45.3	43.4	43.4	43.4	Baseline Offset (In Feet)
1+45	45.7	45.7	45.7	43.4	43.4	43.4	Baseline Offset (In Feet)
1+50	45.7	45.7	45.7	43.9	43.9	43.9	Baseline Offset (In Feet)
1+60	45.8	45.8	44.9	44.2	44.3	44.3	Baseline Offset (In Feet)
1+65	45.9	45.9	45.0	44.3	44.4	44.4	Baseline Offset (In Feet)
1+75	45.9	45.9	45.9	44.4	44.4	44.4	Baseline Offset (In Feet)
1+90	45.0	44.1	44.1	44.1	44.1	44.1	Baseline Offset (In Feet)
2+00	44.7	41.8	41.8	41.1	40.4	40.4	Baseline Offset (In Feet)
2+05	44.6	40.4	40.4	39.7	38.4	38.4	Baseline Offset (In Feet)
2+10	43.7	40.4	40.2	40.2	38.3	38.3	Baseline Offset (In Feet)
2+20	41.5	41.5	40.6	40.6	37.5	37.5	Baseline Offset (In Feet)
2+25	42.0	42.0	40.7	40.7	35.9	35.9	Baseline Offset (In Feet)
2+30	42.3	42.2	40.9	40.9	34.2	34.2	Baseline Offset (In Feet)
2+35	40.4	40.4	40.4	40.4	33.1	33.1	Baseline Offset (In Feet)
2+45	36.8	36.8	36.8	36.8	32.7	32.7	Baseline Offset (In Feet)
2+50	38.1	37.8	37.5	37.1	34.3	34.3	Baseline Offset (In Feet)
2+55	39.3	38.2	38.2	37.4	35.9	35.9	Baseline Offset (In Feet)
2+60	40.7	40.7	40.7	38.3	35.1	35.1	Baseline Offset (In Feet)
2+65	40.9	40.9	40.6	39.2	34.1	34.1	Baseline Offset (In Feet)
2+70	41.1	41.1	40.3	40.3	33.3	33.3	Baseline Offset (In Feet)
2+75	41.3	41.3	39.9	39.9	33.3	33.3	Baseline Offset (In Feet)
2+80	41.5	41.5	39.4	39.4	34.6	34.6	Baseline Offset (In Feet)
2+85	41.7	41.7	39.6	39.6	37.8	37.8	Baseline Offset (In Feet)
2+90	43.5	41.5	40.8	40.8	38.5	38.5	Baseline Offset (In Feet)
3+00	47.0	46.1	46.1	44.8	41.6	41.6	Baseline Offset (In Feet)
3+10	43.6	43.6	43.6	43.6	43.2	43.2	Baseline Offset (In Feet)
3+15	42.9	42.9	42.9	42.3	42.9	42.9	Baseline Offset (In Feet)
3+25	44.6	44.6	44.4	42.3	38.9	38.9	Baseline Offset (In Feet)
3+30	44.0	44.0	43.2	42.7	36.2	36.2	Baseline Offset (In Feet)
3+35	43.4	43.4	43.4	42.0	36.4	36.4	Baseline Offset (In Feet)
3+40	44.8	44.0	44.0	41.3	41.1	41.1	Baseline Offset (In Feet)
3+45	45.2	44.2	44.2	42.8	41.5	41.5	Baseline Offset (In Feet)
3+50	44.9	44.2	44.2	42.3	41.4	41.4	Baseline Offset (In Feet)
3+60	44.1	44.1	44.1	43.4	41.4	41.4	Baseline Offset (In Feet)
3+70	44.7	42.8	41.8	41.0	26.0	26.0	Baseline Offset (In Feet)
3+75	23.6	23.6	23.6	23.6	23.6	23.6	Baseline Offset (In Feet)
3+85	23.1	23.1	23.1	23.1	23.0	22.2	Baseline Offset (In Feet)
4+00	28.4	28.4	28.4	26.5	26.5	25.5	Baseline Offset (In Feet)
4+10	37.1	37.1	37.1	33.0	33.0	33.0	Baseline Offset (In Feet)
4+25	42.2	42.2	42.2	40.4	40.3	40.2	Baseline Offset (In Feet)
4+30	43.2	43.2	42.1	41.2	41.1	41.1	Baseline Offset (In Feet)
4+35	43.1	43.1	41.9	41.9	41.8	41.8	Baseline Offset (In Feet)
4+40	42.5	42.5	42.1	42.1	42.1	42.1	Baseline Offset (In Feet)

Alpine CP 00
HDD West Site
Streambank Monitor

Pile Cap Designation	Pile Cap Monitor - Bottom of Pile Cap Locations				Description
	6/20/2004	8/4/2005	8/19/2006	8/31/2007	
W-01 NE Cor	26.389	26.389	26.391	26.040	Bottom of Pile Cap (In Feet)
W-02 NE Cor	26.391	26.390	26.390	26.042	Bottom of Pile Cap (In Feet)
W-03 NE Cor	26.391	26.391	26.394	26.042	Bottom of Pile Cap (In Feet)
W-04 NE Cor	26.389	26.388	26.390	26.036	Bottom of Pile Cap (In Feet)
W-05 NE Cor	26.383	26.378	26.386	26.032	Bottom of Pile Cap (In Feet)
W-06 NE Cor	26.395	26.391	26.394	26.042	Bottom of Pile Cap (In Feet)
W-07 NE Cor	26.397	26.393	26.402	26.048	Bottom of Pile Cap (In Feet)
W-08 NE Cor	26.403	26.401	26.404	26.050	Bottom of Pile Cap (In Feet)
W-09 NE Cor	31.291	31.294	31.292	30.932	Bottom of Pile Cap (In Feet)
W-10 NE Cor	31.266	31.261	31.261	30.906	Bottom of Pile Cap (In Feet)
W-11 NE Cor	31.299	31.300	31.288	30.936	Bottom of Pile Cap (In Feet)
W-12 NE Cor	31.301	31.301	31.298	30.936	Bottom of Pile Cap (In Feet)
W-13 NE Cor	27.377	27.373	27.383	27.035	Bottom of Pile Cap (In Feet)
W-14 NE Cor	27.428	27.423	27.433	27.081	Bottom of Pile Cap (In Feet)
W-15 NE Cor	27.413	27.407	27.407	27.067	Bottom of Pile Cap (In Feet)
W-16 NE Cor	27.389	27.385	27.392	27.058	Bottom of Pile Cap (In Feet)
W-17 NE Cor	28.940	28.947	28.944	28.582	Bottom of Pile Cap (In Feet)
W-18 NE Cor	28.965	28.972	28.968	28.607	Bottom of Pile Cap (In Feet)
W-19 NE Cor	28.959	28.962	28.960	28.598	Bottom of Pile Cap (In Feet)
W-20 NE Cor	28.964	28.965	28.965	28.607	Bottom of Pile Cap (In Feet)

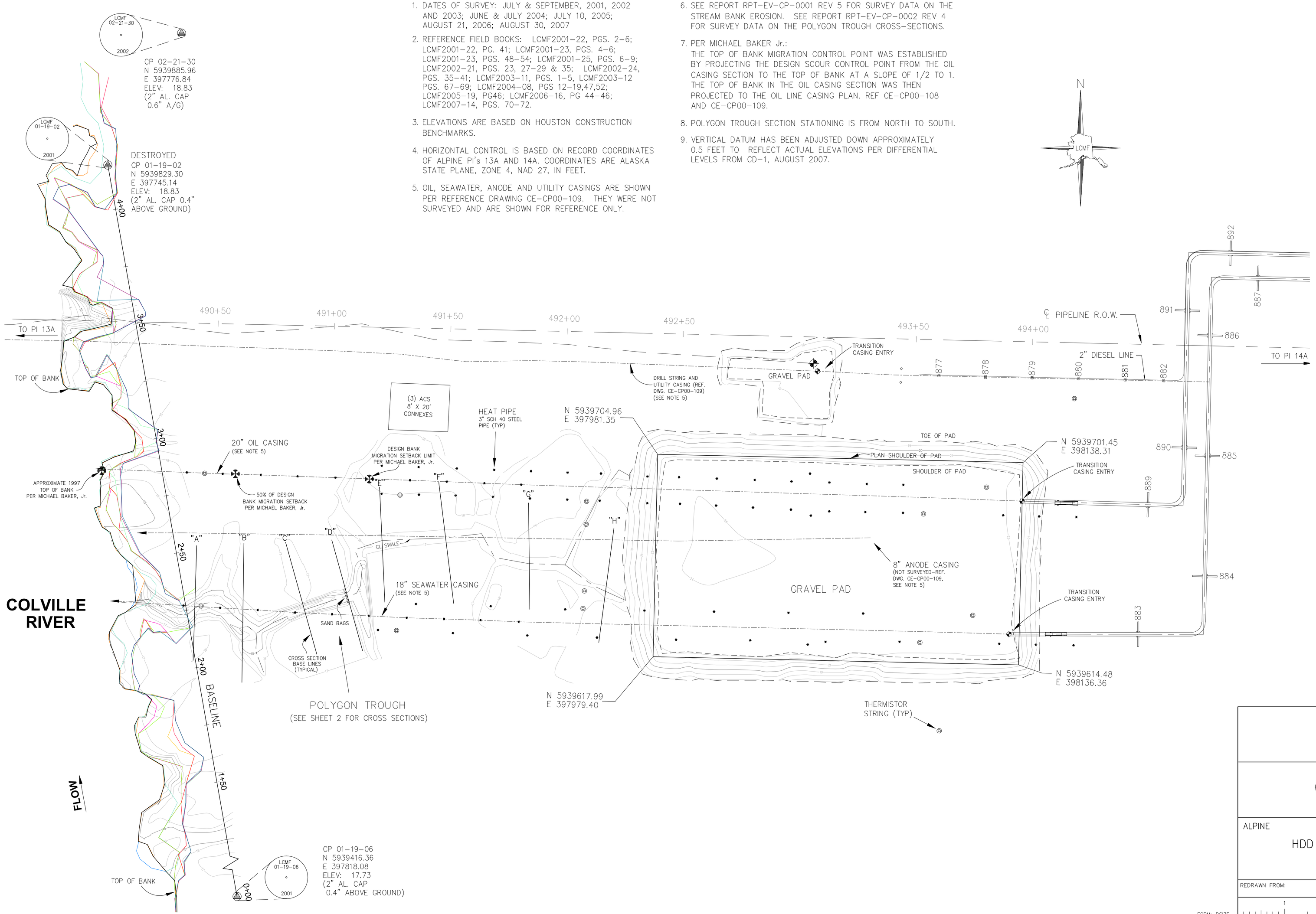
Note: Vertical datum has been adjusted down (-) approximately 0.35 feet to reflect actual elevations per differential levels from CD-1, ran August 2007.

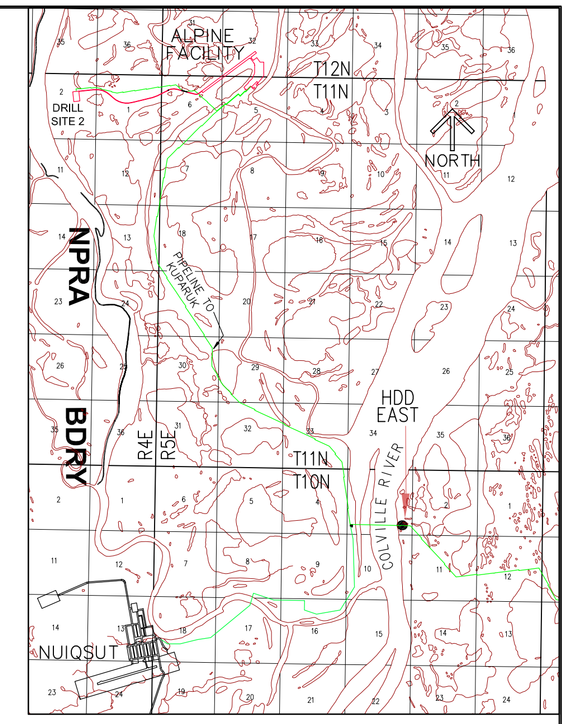
Appendix C HDD East Survey Data

JOB NO:	SUB JOB NO:	DRAWING NO:
02-205		CE-CP00-134

NOTES:

1. DATES OF SURVEY: JULY & SEPTEMBER, 2001, 2002 AND 2003; JUNE & JULY 2004; JULY 10, 2005; AUGUST 21, 2006; AUGUST 30, 2007
2. REFERENCE FIELD BOOKS: LCMF2001-22, PGS. 2-6; LCMF2001-22, PG. 41; LCMF2001-23, PGS. 4-6; LCMF2001-23, PGS. 48-54; LCMF2001-25, PGS. 6-9; LCMF2002-21, PGS. 23, 27-29 & 35; LCMF2002-24, PGS. 35-41; LCMF2003-11, PGS. 1-5, LCMF2003-12 PGS. 67-69; LCMF2004-08, PGS 12-19,47,52; LCMF2005-19, PG46; LCMF2006-16, PG 44-46; LCMF2007-14, PGS. 70-72.
3. ELEVATIONS ARE BASED ON HOUSTON CONSTRUCTION BENCHMARKS.
4. HORIZONTAL CONTROL IS BASED ON RECORD COORDINATES OF ALPINE PI's 13A AND 14A. COORDINATES ARE ALASKA STATE PLANE, ZONE 4, NAD 27, IN FEET.
5. OIL, SEAWATER, ANODE AND UTILITY CASINGS ARE SHOWN PER REFERENCE DRAWING CE-CP00-109. THEY WERE NOT SURVEYED AND ARE SHOWN FOR REFERENCE ONLY.
6. SEE REPORT RPT-EV-CP-0001 REV 5 FOR SURVEY DATA ON THE STREAM BANK EROSION. SEE REPORT RPT-EV-CP-0002 REV 4 FOR SURVEY DATA ON THE POLYGON TROUGH CROSS-SECTIONS.
7. PER MICHAEL BAKER Jr.: THE TOP OF BANK MIGRATION CONTROL POINT WAS ESTABLISHED BY PROJECTING THE DESIGN SCOUR CONTROL POINT FROM THE OIL CASING SECTION TO THE TOP OF BANK AT A SLOPE OF 1/2 TO 1. THE TOP OF BANK IN THE OIL CASING SECTION WAS THEN PROJECTED TO THE OIL LINE CASING PLAN. REF CE-CP00-108 AND CE-CP00-109.
8. POLYGON TROUGH SECTION STATIONING IS FROM NORTH TO SOUTH.
9. VERTICAL DATUM HAS BEEN ADJUSTED DOWN APPROXIMATELY 0.5 FEET TO REFLECT ACTUAL ELEVATIONS PER DIFFERENTIAL LEVELS FROM CD-1, AUGUST 2007.





VICINITY MAP
NO SCALE

LEGEND

- HEAT PIPE
- THERMISTOR STRING
- TRANSITION CASING ENTRY POINT
- 1' CONTOUR LINES
- PILE
- SURVEY CONTROL
- MICHAEL BAKER Jr. MIGRATION POINT
- TOP OF BANK 8/7/01
- TOP OF BANK 9/8/01
- TOP OF BANK 7/9/02
- TOP OF BANK 9/12/02
- TOP OF BANK 7/9/03
- TOP OF BANK 9/8/03
- TOP OF BANK 6/19/04
- TOP OF BANK 7/10/05
- TOP OF BANK 8/21/06
- TOP OF BANK 8/30/07

GRAPHIC SCALE

20 0 10 20 40

(IN FEET)
1 inch = 20 ft.

FORM: DSIZE

REFERENCE DWG NO/SHT NO:
CE-CP00-109
PD-CP00-130 SHEET 1

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
6	8/30/07	UPDATED PER 4810351ACS	CZ	DB			
5	8/25/06	UPDATED PER 4116808ACS	AG	DB			
4	7/11/05	UPDATED PER 3391755ACS	CZ	GD			
3	6/27/04	ISSUED PER 2390460ACS	CZ	BD			
2	12/31/03	ISSUED PER 2094387ACS-ADDED SHEET 2 AND 2003 DATA	GD/CZ	JZ			C/K
1	11/1/02	ISSUED PER 1870227ACS	CZ	JZ			TM
0	7/31/01	ISSUED PER A01007ACS	RLW	JZ			CD

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Anchorage, Alaska (907) 273-1830
Alpine Survey Office

ConocoPhillips Alaska, Inc.

ALPINE | MODULE: CP00 | UNIT: CP

HDD BANK EROSION TOPO/MONITORING
HDD SITE - EAST
ALPINE FACILITY

REDRAWN FROM: | CONSTRUCTION SHEET OF

1 2 3 4 5 6
DO NOT SCALE — ABOVE SCALE FOR REFERENCE ONLY

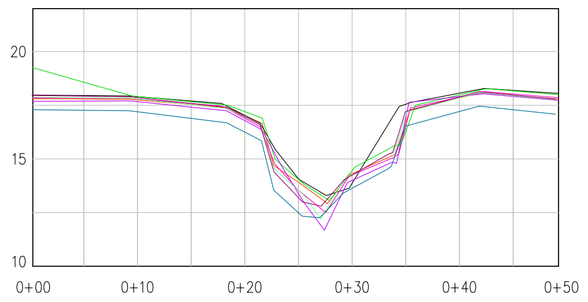
DATE:	DRAWN: GD/CZ	DESIGN:	ECM NO: A01007ACS
7/31/01	CHECKED: JZ		CC NO:
SCALE: 1"=20'	APPROVAL: CD		CADD FILE NO. 01-12-05-1EAST
JOB NO: 02-205 / SUB JOB NO:	DRAWING NO: CE-CP00-134		PART: 1 OF 2 / REV: 6

JOB NO:	SUB JOB NO:	DRAWING NO:
02-205		CE-CP00-134

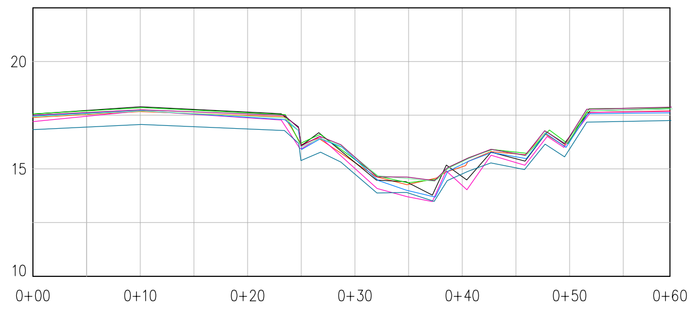
CROSS SECTIONS, POLYGON TROUGH

HORIZONTAL SCALE = 1"=10' VERTICAL SCALE = 1"=5'

"A"



"B"



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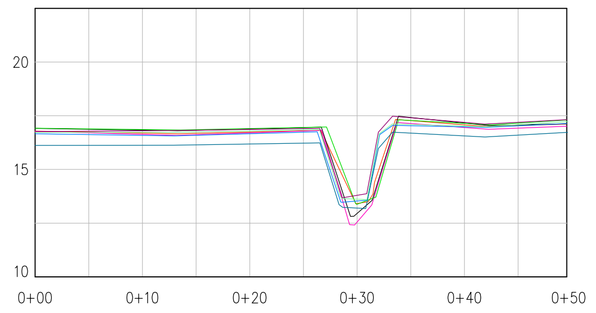

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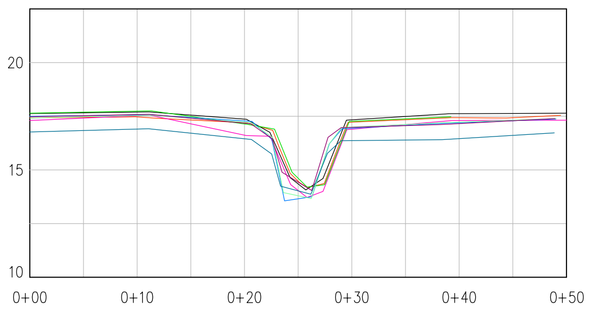
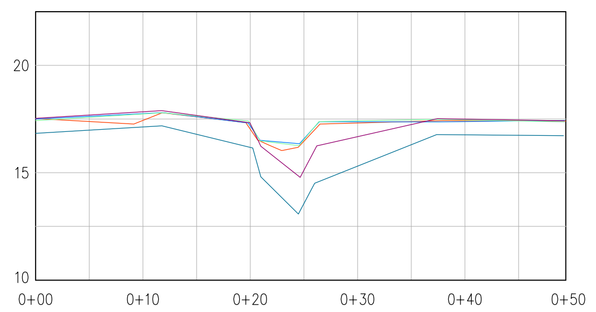
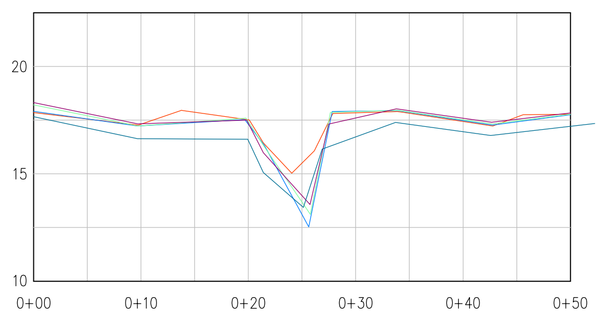


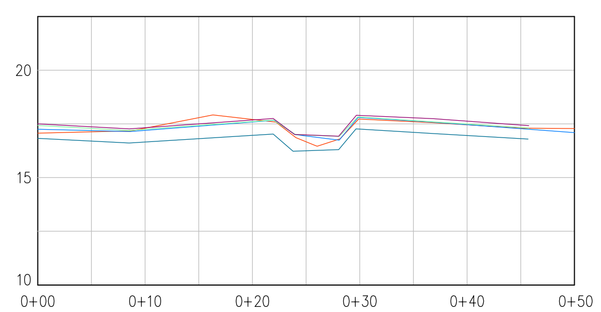
"E"



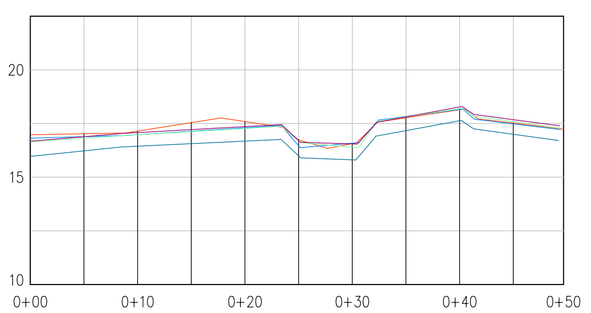
"F"



"G"



"H"

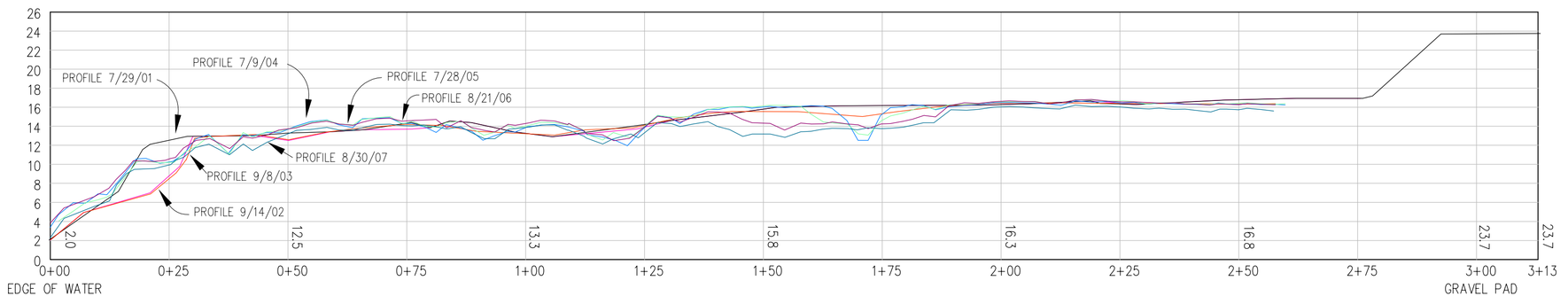


LEGEND

- CROSS SECTION 8/23/01
- CROSS SECTION 9/14/02
- CROSS SECTION 7/9/03
- CROSS SECTION 9/8/03
- CROSS SECTION 7/9/04
- CROSS SECTION 7/28/05
- CROSS SECTION 8/21/06
- CROSS SECTION 8/30/07

CENTERLINE PROFILE, POLYGON TROUGH

HORIZONTAL SCALE = 1"=20' VERTICAL SCALE = 1"=10'



FORM: DSIZE

REFERENCE DWG NO/SHT NO:
CE-CP00-109
PD-CP00-130 SHEET 1

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
5	8/30/07	UPDATED PER 4810351ACS	CZ	DB			
4	8/25/06	UPDATED PER 4116808ACS	AG	DB			
3	7/28/05	UPDATED PER 3391755ACS	CZ	GD			
2	7/9/04	ISSUED PER 2390460ACS	AG	GD			
1	12/31/03	ISSUED PER 2094387ACS	GD	JZ			C/K

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Anchorage, Alaska (907) 273-1830
Alpine Survey Office

ConocoPhillips Alaska, Inc.

ALPINE MODULE: CP00 UNIT: CP

HDD BANK EROSION TOPO/MONITORING
HDD SITE – EAST
ALPINE FACILITY

REDRAWN FROM: CONSTRUCTION SHEET OF

1 2 3 4 5 6

DO NOT SCALE ABOVE SCALE FOR REFERENCE ONLY

DATE: 12/31/03	DRAWN: GD/CZ; DESIGN:	ECM NO: 2094387ACS
SCALE: 1"=20'	CHECKED: JZ	CC NO:
	APPROVAL: COLEGROVE/KANADY	CADD FILE NO. 01-12-05-1EAST
JOB NO: 02-205; SUB JOB NO:	DRAWING NO: CE-CP00-134	PART: 2 OF 2; REV: 5

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations See Drawing CE-CP00-134 Rev 6 for Survey Baseline Stations							Description
	9/8/2001	9/12/2002	9/8/2003	6/19/2004	7/10/2005	8/21/2006	8/30/2007	
0+10	N/A	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	Baseline Offset (In Feet)
0+20	N/A	-32.1	-30.9	-30.9	-30.9	-30.9	-30.9	Baseline Offset (In Feet)
0+25	N/A	-38.2	-38.2	-38.2	-37.0	-37.0	-37.0	Baseline Offset (In Feet)
0+30	N/A	-41.1	-41.1	-41.1	-36.9	-36.9	-36.9	Baseline Offset (In Feet)
0+40	N/A	-37.7	-37.7	-37.7	-36.5	-35.1	-35.1	Baseline Offset (In Feet)
0+50	N/A	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	Baseline Offset (In Feet)
0+60	N/A	-28.0	-27.5	-27.5	-27.5	-27.5	-27.5	Baseline Offset (In Feet)
0+65	N/A	-39.8	-23.9	-23.9	-23.4	-23.4	-23.4	Baseline Offset (In Feet)
0+70	-31.2	-27.7	-20.0	-20.0	-16.2	-16.2	-16.2	Baseline Offset (In Feet)
0+75	-27.1	-27.2	-21.1	-21.0	-18.0	-18.0	-18.0	Baseline Offset (In Feet)
0+80	-26.5	-27.5	-22.4	-22.4	-22.4	-22.4	-22.4	Baseline Offset (In Feet)
0+90	-29.2	-29.2	-29.2	-27.8	-27.8	-27.2	-27.2	Baseline Offset (In Feet)
1+00	-26.8	-26.7	-26.7	-26.7	-26.7	-26.7	-26.7	Baseline Offset (In Feet)
1+10	-25.4	-25.6	-23.9	-23.9	-23.9	-23.9	-23.9	Baseline Offset (In Feet)
1+15	-27.6	-24.5	-20.8	-20.8	-20.2	-20.2	-20.2	Baseline Offset (In Feet)
1+20	-30.5	-22.6	-21.4	-21.4	-18.2	-18.2	-18.2	Baseline Offset (In Feet)
1+25	-32.8	-23.0	-18.1	-18.1	-16.4	-16.4	-16.4	Baseline Offset (In Feet)
1+30	-36.1	-28.0	-17.3	-17.3	-17.0	-17.0	-17.0	Baseline Offset (In Feet)
1+40	-34.9	-20.6	-17.1	-17.1	-15.8	-15.8	-15.8	Baseline Offset (In Feet)
1+45	-28.8	-16.5	-16.1	-16.1	-14.3	-14.3	-14.3	Baseline Offset (In Feet)
1+50	-23.8	-15.6	-13.8	-13.8	-13.4	-13.4	-13.4	Baseline Offset (In Feet)
1+55	-22.2	-14.5	-11.5	-11.5	-7.1	-7.1	-7.1	Baseline Offset (In Feet)
1+60	-21.6	-15.1	-9.0	-9.0	-4.2	-4.2	-4.2	Baseline Offset (In Feet)
1+65	-26.5	-24.9	-11.4	-9.7	-6.9	-6.9	-6.9	Baseline Offset (In Feet)
1+70	-30.1	-29.7	-15.7	-13.0	-10.8	-10.8	-10.8	Baseline Offset (In Feet)
1+75	-30.5	-29.6	-16.1	-14.4	-12.0	-12.0	-12.0	Baseline Offset (In Feet)
1+80	-29.4	-24.6	-13.9	-13.9	-12.8	-12.8	-12.8	Baseline Offset (In Feet)
1+85	-24.5	-20.5	-12.7	-12.7	-12.3	-12.3	-12.3	Baseline Offset (In Feet)
1+90	-21.5	-21.9	-16.9	-16.9	-16.9	-16.9	-16.9	Baseline Offset (In Feet)
1+95	-28.5	-27.7	-27.7	-27.7	-27.7	-26.3	-26.3	Baseline Offset (In Feet)
2+00	-33.4	-27.8	-27.8	-27.8	-27.8	-26.4	-26.4	Baseline Offset (In Feet)
2+05	-32.6	-27.3	-27.3	-27.3	-27.3	-26.8	-26.8	Baseline Offset (In Feet)
2+10	-33.5	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0	Baseline Offset (In Feet)
2+15	-34.5	-23.2	-23.2	-23.2	-23.2	-23.2	-23.2	Baseline Offset (In Feet)
2+20	-34.9	-21.0	-21.0	-20.4	-17.4	-17.3	-17.3	Baseline Offset (In Feet)
2+25	-31.2	-18.4	-8.0	-5.2	-5.2	-5.2	-1.0	Baseline Offset (In Feet)
2+30	-23.2	-13.7	-2.4	-2.4	-2.4	-2.4	-2.4	Baseline Offset (In Feet)
2+35	-18.8	-8.9	-7.0	-7.1	-7.1	-7.1	-7.1	Baseline Offset (In Feet)
2+40	-15.9	-8.3	-8.3	-8.3	-8.3	-8.3	-8.3	Baseline Offset (In Feet)
2+50	-21.0	-14.7	-14.6	-14.6	-14.6	-13.6	-13.3	Baseline Offset (In Feet)
2+60	-26.0	-20.5	-20.6	-20.5	-19.8	-17.7	-17.7	Baseline Offset (In Feet)
2+70	-30.0	-25.5	-20.8	-20.8	-20.8	-20.6	-20.0	Baseline Offset (In Feet)
2+75	-30.7	-26.1	-20.9	-20.9	-20.8	-19.7	-19.7	Baseline Offset (In Feet)
2+85	-26.8	-22.8	-22.8	-22.8	-20.4	-17.9	-17.9	Baseline Offset (In Feet)
2+90	-24.5	-21.4	-21.4	-21.3	-21.3	-17.3	-16.5	Baseline Offset (In Feet)
3+00	-8.7	-9.0	-6.0	-6.0	0.3	0.3	0.3	Baseline Offset (In Feet)
3+10	-11.0	-11.4	-11.4	-11.4	-6.9	-5.2	-5.2	Baseline Offset (In Feet)
3+15	-16.2	-16.0	-15.9	-15.9	-10.5	-9.6	-9.6	Baseline Offset (In Feet)
3+20	-15.8	-11.9	-11.9	-11.8	-11.8	-8.9	-8.9	Baseline Offset (In Feet)
3+25	-17.3	-11.4	-11.1	-11.1	-10.3	-9.5	-9.5	Baseline Offset (In Feet)
3+30	-35.0	-23.4	-11.5	-11.5	-11.2	-11.2	-11.2	Baseline Offset (In Feet)
3+35	-35.0	-23.8	-23.5	-23.5	-23.5	-23.5	-23.5	Baseline Offset (In Feet)
3+40	-33.9	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	Baseline Offset (In Feet)
3+45	-32.4	-27.3	-27.4	-26.4	-24.1	-24.1	-24.1	Baseline Offset (In Feet)
3+52	-10.4	-9.9	-8.4	-8.4	-8.4	2.4	2.4	Baseline Offset (In Feet)
3+60	-12.4	-11.3	-11.2	-10.8	-10.8	3.0	3.0	Baseline Offset (In Feet)
3+65	-18.9	-18.7	-18.7	-18.4	-18.4	-3.3	-13.8	Baseline Offset (In Feet)
3+70	-23.8	-24.0	-24.0	-24.1	-21.2	-9.6	-11.9	Baseline Offset (In Feet)
3+75	-23.3	-20.2	-20.2	-20.2	-19.3	-11.3	-10.1	Baseline Offset (In Feet)
3+80	-19.3	-12.9	-12.9	-11.6	-11.6	-9.0	-9.0	Baseline Offset (In Feet)
3+85	-19.5	-13.2	-12.3	-12.0	-12.0	-11.1	-11.1	Baseline Offset (In Feet)
3+95	-25.9	-22.4	-22.4	-21.9	-21.9	-16.1	-16.1	Baseline Offset (In Feet)
4+00	-29.7	-21.2	-21.2	-21.9	-21.9	-18.6	-18.6	Baseline Offset (In Feet)
4+05	-29.4	-19.5	-19.5	-19.5	-19.5	-21.7	-21.7	Baseline Offset (In Feet)
4+15	-30.6	2.7	2.6	2.6	2.6	2.7	2.7	Baseline Offset (In Feet)
4+25	-5.4	5.1	5.1	5.1	5.1	5.1	5.1	Baseline Offset (In Feet)
4+35	-5.4	4.4	4.5	4.5	4.5	4.5	4.5	Baseline Offset (In Feet)
4+45	N/A	1.3	1.2	1.9	1.9	1.9	1.9	Baseline Offset (In Feet)
4+50	N/A	1.9	4.1	4.1	4.1	4.1	4.1	Baseline Offset (In Feet)

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section A See Drawing CE-CP00-134 for Survey Cross-Section Locations							Description
		9/8/2001	9/14/2002	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	
0+00	Tundra	18.0	17.8	17.8	17.7	17.9	18.0	17.3	Elevation (In Feet)
0+09	Tundra	18.0	17.8	17.8	17.7	17.8	17.9	17.2	Elevation (In Feet)
0+18	Tundra	17.5	17.5	17.4	17.2	17.4	17.4	16.7	Elevation (In Feet)
0+21	Top Bank	16.7	16.5	16.8	16.4	16.6	16.6	15.8	Elevation (In Feet)
0+22.5	Gradebreak	15.4	14.8	14.8	14.8	14.6	14.4	13.5	Elevation (In Feet)
0+25	Toe Bank	13.9	13.6	13.7	13.0	13.3	13.0	12.3	Elevation (In Feet)
0+27	CL Swale	13.5	12.5	13.1	11.7	12.2	12.8	12.3	Elevation (In Feet)
0+29	Toe Bank	13.5	14.2	14.5	13.9	14.1	14.0	13.4	Elevation (In Feet)
0+34	Gradebreak	15.6	15.2	15.5	14.8	15.3	15.3	14.6	Elevation (In Feet)
0+35	Top Bank	17.6	17.4	17.4	17.6	17.2	17.2	16.5	Elevation (In Feet)
0+42	Tundra	18.4	18.1	18.1	18.0	18.1	18.1	17.5	Elevation (In Feet)
0+50	Tundra	18.1	17.8	17.8	17.7	17.8	17.8	17.1	Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section B See Drawing CE-CP00-134 for Survey Cross-Section Locations							Description
		9/8/2001	9/14/2002	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	
0+00	Tundra	17.6	17.2	17.4	17.5	17.4	17.5	16.8	Elevation (In Feet)
0+10	Tundra	18.0	17.7	17.7	17.7	17.7	17.8	17.1	Elevation (In Feet)
0+23	Tundra	17.6	17.3	17.4	17.3	17.4	17.5	16.8	Elevation (In Feet)
0+25	Top of Bank	17.2	16.0	16.0	15.9	16.0	16.1	15.4	Elevation (In Feet)
0+27	Gradebreak	16.6	16.5	16.5	16.4	16.4	16.5	15.8	Elevation (In Feet)
0+32	Toe Bank	14.4	14.1	14.5	14.5	14.7	14.6	13.9	Elevation (In Feet)
0+35	CL Swale	14.3	13.7	14.2	14.2	14.6	14.6	13.9	Elevation (In Feet)
0+37	Toe Bank	14.2	13.5	14.4	13.7	14.4	14.5	13.5	Elevation (In Feet)
0+38	Gradebreak		14.9	14.9	14.9	15.0	15.1	14.4	Elevation (In Feet)
0+40	Gradebreak		14.0	15.4	15.4	15.5	15.5	14.9	Elevation (In Feet)
0+42	Gradebreak	16.1	15.6	15.8	15.8	15.9	15.9	15.3	Elevation (In Feet)
0+49	Gradebreak	16.2	16.0	16.0	16.0	16.2	16.2	15.6	Elevation (In Feet)
0+52	Top Bank	17.6	17.6	17.7	17.6	17.7	17.8	17.2	Elevation (In Feet)
0+60	Tundra	17.8	17.7	17.7	17.6	17.8	17.9	17.2	Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section C See Drawing CE-CP00-134 for Survey Cross-Section Locations							Description
		9/8/2001	9/14/2002	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	
0+00	Tundra	16.9	16.8	16.8	16.7	16.7	16.8	16.1	Elevation (In Feet)
0+13	Tundra	16.7	16.6	16.7	16.6	16.7	16.8	16.1	Elevation (In Feet)
0+27	Top Bank	16.8	16.8	16.8	16.8	16.8	16.9	16.2	Elevation (In Feet)
0+29	Toe Bank	12.9	12.4	13.2	13.5	13.7	13.8	13.2	Elevation (In Feet)
0+31	Toe Bank	13.9	13.4	13.6	13.5	13.6	13.9	13.2	Elevation (In Feet)
0+32	Gradebreak	16.7	N/A	16.7	16.6	16.7	16.7	16.0	Elevation (In Feet)
0+33	Top Bank	17.5	17.2	17.2	17.1	17.1	17.5	16.7	Elevation (In Feet)
0+42	Tundra	17.1	16.9	16.9	17.0	17.0	17.1	16.5	Elevation (In Feet)
0+50	Tundra	17.2	17.0	17.2	17.1	17.2	17.3	16.7	Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section D See Drawing CE-CP00-134 for Survey Cross-Section Locations							Description
		9/8/2001	9/14/2002	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	
0+00	Tundra	17.6	17.3	17.5	17.5	17.4	17.5	16.8	Elevation (In Feet)
0+10	Tundra	17.9	17.6	17.6	17.6	17.6	17.6	16.9	Elevation (In Feet)
0+20	Gradebreak	17.6	16.6	NA	NA	17.2	17.2	16.4	Elevation (In Feet)
0+22	Top Bank	16.7	16.6	16.8	16.8	16.5	16.5	15.7	Elevation (In Feet)
0+24	Toe Bank	14.7	14.3	14.8	14.8	13.9	14.9	14.2	Elevation (In Feet)
0+25	CL Swale	14.2	13.7	14.1	14.1	13.7	14.0	13.4	Elevation (In Feet)
0+27	Toe Bank	14.6	14.0	14.2	14.2	16.2	16.5	15.8	Elevation (In Feet)
0+29	Top Bank	17.4	16.9	17.1	17.0	17.0	17.0	16.4	Elevation (In Feet)
0+38	Tundra	17.7	17.3	17.3	17.2	17.2	17.1	16.4	Elevation (In Feet)
0+50	Tundra	17.6	17.3	16.8	17.4	17.4	17.4	16.7	Elevation (In Feet)

Note: Vertical datum has been adjusted down (-) approximately 0.50 feet to reflect actual elevations per differential levels from CD-1, ran August 2007.

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section E See Drawing CE-CP00-134 for Survey Cross-Section Locations							Description
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	Future	Future	
0+00	Tundra	17.5	17.5	17.4	17.5	16.8			Elevation (In Feet)
0+9	Tundra	17.3	17.3	17.3	17.8	17.1			Elevation (In Feet)
0+12	Gradebreak	17.8	17.8	17.4	17.9	17.2			Elevation (In Feet)
0+20	Top Bank	17.3	17.3	17.3	17.3	16.2			Elevation (In Feet)
0+21	Toe Bank	16.5	16.5	16.5	16.2	14.8			Elevation (In Feet)
0+23	CL Swale	16.0	16.0	16.0	14.7	13.8			Elevation (In Feet)
0+24	Toe Bank	16.2	16.4	16.3	14.8	13.1			Elevation (In Feet)
0+27	Top Bank	17.3	17.4	17.4	16.3	14.5			Elevation (In Feet)
0+38	Tundra	17.4	17.4	17.5	17.5	16.8			Elevation (In Feet)
0+49	Tundra	17.4	17.4	17.4	17.4	16.7			Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section F See Drawing CE-CP00-134 for Survey Cross-Section Locations							Description
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	Future	Future	
0+00	Tundra	17.9	17.9	18.2	18.3	17.7			Elevation (In Feet)
0+10	Tundra	17.3	17.2	17.2	17.3	16.6			Elevation (In Feet)
0+14	Gradebreak	18.0	18.0	18.0	18.0	16.6			Elevation (In Feet)
0+20	Top Bank	17.5	17.5	17.6	17.6	16.6			Elevation (In Feet)
0+21	Toe Bank	16.5	16.3	16.3	16.0	15.1			Elevation (In Feet)
0+24	CL Swale	15.0	12.5	15.0	13.8	13.4			Elevation (In Feet)
0+26	Toe Bank	16.1	12.5	13.1	13.6	15.2			Elevation (In Feet)
0+28	Top Bank	17.8	17.9	17.9	17.3	16.4			Elevation (In Feet)
0+34	Gradebreak	17.9	17.9	18.0	18.0	17.4			Elevation (In Feet)
0+43	Gradebreak	17.2	17.3	17.2	17.4	16.8			Elevation (In Feet)
0+46	Gradebreak	17.8	17.8	17.8	17.6	17.0			Elevation (In Feet)
0+52	Tundra	17.8	17.9	17.9	18.0	17.3			Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section G See Drawing CE-CP00-134 for Survey Cross-Section Locations							Description
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	Future	Future	
0+00	Tundra	17.1	17.3	17.4	17.5	16.8			Elevation (In Feet)
0+09	Tundra	17.2	17.1	17.2	17.3	16.6			Elevation (In Feet)
0+16	Gradebreak	17.9	17.9	17.9	17.5	16.8			Elevation (In Feet)
0+22	Top Bank	17.6	17.7	17.7	17.8	17.0			Elevation (In Feet)
0+24	Toe Bank	16.9	17.0	17.0	17.0	16.2			Elevation (In Feet)
0+26	CL Swale	16.5	16.5	16.5	16.5	16.3			Elevation (In Feet)
0+28	Toe Bank	16.8	16.7	16.9	16.9	16.3			Elevation (In Feet)
0+30	Top Bank	17.7	17.8	17.8	17.9	17.3			Elevation (In Feet)
0+37	Tundra	17.6	17.6	17.6	17.7	17.0			Elevation (In Feet)
0+46	Tundra	17.3	17.3	17.3	17.4	16.8			Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section H See Drawing CE-CP00-134 for Survey Cross-Section Locations							Description
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	Future	Future	
0+00	Tundra	17.0	16.8	16.6	16.7	16.0			Elevation (In Feet)
0+09	Tundra	17.1	16.9	16.9	17.0	16.4			Elevation (In Feet)
0+18	Gradebreak	17.8	17.8	17.8	17.3	16.6			Elevation (In Feet)
0+24	Top Bank	17.3	17.4	17.4	17.5	16.8			Elevation (In Feet)
0+25	Toe Bank	16.8	16.4	16.6	16.6	15.9			Elevation (In Feet)
0+28	CL Swale	16.3	16.3	16.3	16.3	15.8			Elevation (In Feet)
0+30	Toe Bank	16.6	16.6	16.4	16.5	15.8			Elevation (In Feet)
0+32	Top Bank	17.6	17.7	17.6	17.6	16.9			Elevation (In Feet)
0+40	Gradebreak	18.2	18.2	18.2	18.3	17.6			Elevation (In Feet)
0+42	Gradebreak	17.7	17.7	17.8	17.9	17.2			Elevation (In Feet)
0+50	Tundra	17.2	17.2	17.3	17.4	16.7			Elevation (In Feet)

Note: Vertical datum has been adjusted down (-) approximately 0.50 feet to reflect actual elevations per differential levels from CD-1, ran August 2007.