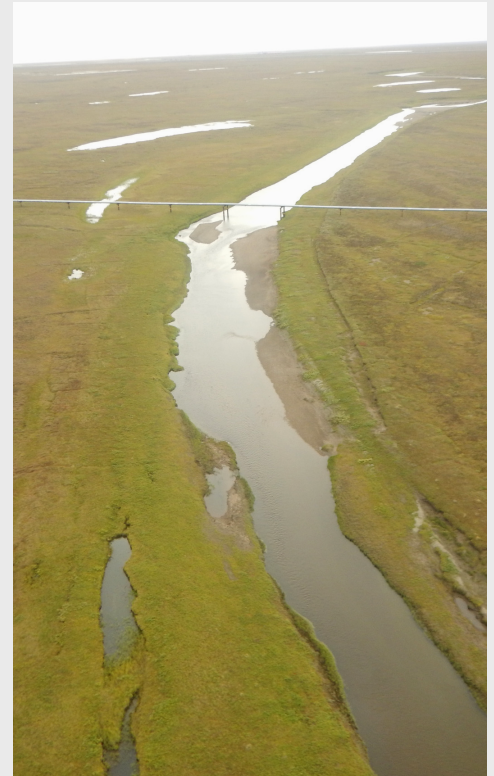


# 2018

## ALPINE PIPELINE HYDROLOGY MONITORING



PREPARED BY:

**Michael Baker**  
INTERNATIONAL

MICHAEL BAKER INTERNATIONAL  
3900 C STREET, SUITE 900  
ANCHORAGE, AK 99503

## ALPINE PIPELINE HYDROLOGY MONITORING

## TABLE OF CONTENTS

<b>1. Introduction</b>	<b>1</b>
1.1 Monitoring Criteria .....	3
<b>2. Methods</b>	<b>4</b>
2.1 Visual Observations .....	4
2.2 VSM Tilt .....	4
2.3 Bank & Pad Erosion .....	5
2.4 VSM Scour .....	5
2.5 Foundation Settlement & Jacking.....	5
2.6 Polygon Trough Subsidence .....	5
<b>3. Results</b>	<b>6</b>
3.1 HDD West .....	6
3.2 HDD East .....	8
3.3 Kachemach River .....	11
3.4 Miluveach River .....	14
<b>4. Conclusion</b>	<b>17</b>
<b>5. References</b>	<b>18</b>
<b>Appendix A Monitoring Location Photographs</b>	<b>A.1</b>
<b>Appendix B HDD West Bank Erosion and Foundation Settlement &amp; Jacking Survey</b>	<b>B.1</b>
<b>Appendix C HDD East Bank Erosion &amp; Polygon Trough Subsidence Survey</b>	<b>C.1</b>

## FIGURES

Figure 1: Alpine Pipeline Hydrology Monitoring Locations .....	2
--	---

## TABLES

Table 2.1: VSM Tilt Unit Conversion .....	5
Table 3.1: HDD West VSM Tilt Measurement Results .....	6
Table 3.2: HDD West VSM Change in Tilt, 2017-2018 .....	6
Table 3.3: HDD West Design Bank Erosion Rate vs Surveyed Bank Erosion Rates .....	8
Table 3.4: HDD East VSM Tilt Measurement Results.....	9
Table 3.5: HDD East VSM Change in Tilt, 2017-2018 .....	9
Table 3.6: HDD East Design Bank Erosion Rate vs Surveyed Bank Erosion Rates .....	11
Table 3.7: Kachemach River VSM Tilt Measurement Results .....	12
Table 3.8: Kachemach River VSM Change in Tilt, 2017-2018 .....	12
Table 3.9: Kachemach River Floodplain VSM Ground Depression Results.....	14
Table 3.10: Kachemach River Main Channel VSM Scour Results.....	14
Table 3.11: Miluveach River VSM Tilt Measurement Results.....	15
Table 3.12: Miluveach River VSM Change in Tilt, 2017-2018.....	15
Table 3.13: Miluveach River VSM Scour Results .....	16
Table 4.1: Bank Erosion Design Setback Survey Results .....	17
Table 4.2: VSM Design Scour Survey Results.....	17

## GRAPHS

Graph 3.1: HDD West VSM Historical Change in Tilt, North/South.....	7
Graph 3.2: HDD West VSM Historical Change in Tilt, East/West.....	7
Graph 3.3: HDD East VSM Historical Change in Tilt, North/South.....	9
Graph 3.4: HDD East VSM Historical Change in Tilt, East/West.....	10
Graph 3.5: Kachemach River VSM Historical Change in Tilt, North/South.....	13
Graph 3.6: Kachemach River VSM Historical Change in Tilt, East/West.....	13

## ALPINE PIPELINE HYDROLOGY MONITORING

Graph 3.7: Miluveach River VSM Historical Change in Tilt, North/South .....	15
Graph 3.8: Miluveach River VSM Historical Change in Tilt, East/West .....	16

## APPENDIX A PHOTOS

Photo A.1: HDD West pre-breakup, looking north (downstream); May 22, 2018 .....	A.1
Photo A.2: HDD West during spring breakup, looking north; June 2, 2018 .....	A.1
Photo A.3: HDD West during spring breakup, looking northeast; June 8, 2018 .....	A.1
Photo A.4: HDD West after spring breakup, looking east; August 29, 2018 .....	A.1
Photo A.5: HDD West after spring breakup, looking north; August 29, 2018.....	A.2
Photo A.6: HDD West after spring breakup, looking south; August 29, 2018 .....	A.2
Photo A.7: HDD West gravel pad and north side thermosyphons, looking east; August 29, 2018.....	A.2
Photo A.8: HDD West gravel pad thermosyphons, looking west; August 29, 2018.....	A.2
Photo A.9: HDD West bank, looking south (downstream); August 29, 2018 .....	A.3
Photo A.10: HDD West bank, looking north (downstream); August 29, 2018.....	A.3
Photo A.11: HDD East pre-breakup, looking northeast; May 30, 2018 .....	A.3
Photo A.12: HDD East pre-breakup, looking south; June 1, 2018.....	A.3
Photo A.13:HDD East during spring breakup, looking south (upstream); June 18, 2018 .....	A.4
Photo A.14: HDD East after spring breakup, looking north; August 29, 2018 .....	A.4
Photo A.15: HDD East after spring breakup, looking northeast; August 29, 2018.....	A.4
Photo A.16: HDD East after spring breakup, looking southeast; August 29, 2018.....	A.4
Photo A.17: HDD East gravel pad and north side thermosyphons, looking west; August 29, 2018.....	A.5
Photo A.18: HDD East gravel pad and south side thermosyphons, looking west; August 29, 2018 .....	A.5
Photo A.19: HDD East bank, looking south (upstream); August 29, 2018 .....	A.5
Photo A.20: HDD East bank, looking north (downstream); August 29, 2018 .....	A.5
Photo A.21: Kachemach River during spring breakup, looking northwest; June 9, 2018.....	A.6
Photo A.22: Kachemach River during spring breakup, looking southwest; June 9, 2018 .....	A.6
Photo A.23: Kachemach River after spring breakup, looking north; August 29, 2018.....	A.6
Photo A.24: Kachemach River after spring breakup, looking northeast; August 29, 2018.....	A.6
Photo A.25: Kachemach River after spring breakup, looking south; August 29, 2018 .....	A.7
Photo A.26 Kachemach River after spring breakup, looking southeast; August 29, 2018 .....	A.7
Photo A.27: Kachemach River east bank, looking north (downstream); August 29, 2018.....	A.7
Photo A.28: Kachemach River west bank, looking north (downstream); August 29, 2018.....	A.7
Photo A.29: Kachemach River VSM ground depression measurement; August 29, 2018 .....	A.8
Photo A.30: Kachemach River looking northwest; August 29, 2018 .....	A.8
Photo A.31: Miluveach River during spring breakup, looking northwest; June 9, 2018.....	A.8
Photo A.32: Miluveach River during spring breakup, looking downstream; June 15, 2018.....	A.8
Photo A.33: Miluveach River during spring breakup, looking northwest; June 15, 2018.....	A.9
Photo A.34: Miluveach River after spring breakup, looking northwest; August 29, 2018 .....	A.9
Photo A.35: Miluveach River after spring breakup, looking southeast; August 29, 2018.....	A.9
Photo A.36: Miluveach River after spring breakup, looking southwest; August 29, 2018.....	A.9
Photo A.37: Miluveach River west bank, looking south; August 29, 2018.....	A.10
Photo A.38: Miluveach River east bank, looking northwest; August 29, 2018.....	A.10

# ALPINE PIPELINE HYDROLOGY MONITORING

## ACRONYMS & ABBREVIATIONS

BPMSL	British Petroleum Mean Sea Level
CPAI	ConocoPhillips Alaska, Inc.
E	East
ft	Feet
ft/ft	Feet per vertical foot
ft/yr	Feet per year
HDD	Horizontal directionally drilled
in	Inches
in/ft	Inches per vertical foot
Michael Baker	Michael Baker International
N	North
NPS	Nominal pipe size
S	South
STA	Station
UMIAQ	Umiaq, LLC (formerly known as LCMF)
VSM	Vertical support member
W	West

# ALPINE PIPELINE HYDROLOGY MONITORING

## 1. INTRODUCTION

Originally constructed during the winter of 1998/1999, the Alpine Pipeline System crosses three rivers between the Alpine Development CD1 facility and the tie-in to the Kuparuk Pipeline. The three pipeline crossings (four monitoring locations) are the horizontal directionally drilled (HDD) crossing of the Colville River East Channel (HDD West and HDD East), and the above ground crossings of the Kachemach River and the Miluveach River.

Monitoring of these pipeline crossings is required by the Right-of-Way Lease/Grant Stipulations and the ConocoPhillips Alaska, Inc. (CPAI) Alpine Pipelines Surveillance and Monitoring Program (CPAI 2008) which identifies parameters for collecting data and evaluating the physical condition of the pipelines. Pipeline hydrology monitoring is designed to comply with the Alpine Pipelines Surveillance and Monitoring Program criteria and is conducted to document the condition of the pipeline and the pipeline's effect on channel morphology at each monitoring location. The record of monitoring allows for annual comparisons between observed conditions and design criteria.

Michael Baker International (Michael Baker) conducted initial monitoring of the HDD West and HDD East monitoring locations in 2001 and has continued annually since 2003. Umiq, LLC (UMIAQ) has conducted annual polygon trough subsidence surveys since 2001 at HDD East, bank erosion surveys since 2001 at HDD East and since 2002 at HDD West, and foundation settlement and jacking surveys since 2004 at HDD West (Michael Baker 2002, 2003a, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, and 2017).

Michael Baker conducted initial monitoring of the Kachemach River and Miluveach River monitoring locations in 2003 and continued annually through 2006. Monitoring resumed at these locations in 2008 and has continued annually (Michael Baker 2003a, 2004, 2005, 2006, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, and 2017). UMIAQ conducted annual bank erosion surveys between 2002 and 2007 and annual scour and settlement and jacking surveys between 2004 and 2008. After 2007, the surveys were scheduled to be performed every five (5) years beginning in 2012 and just recently in 2017 (Michael Baker 2004, 2005, 2006, 2008, 2012, and 2017). The next bank erosion, scour, and settlement and jacking surveys are planned for the 2022 monitoring program.

The 2018 Alpine Pipeline Hydrology Monitoring locations are included in Figure 1.



**ConocoPhillips**  
Alaska



Date:	09/11/2018	Project:	167586
Drawn:	BTG	File:	Figure 1
Checked:	SME	Scale:	1 in = 2 miles

**Michael Baker**  
INTERNATIONAL

Michael Baker International  
3900 C Street, Suite 900  
Anchorage, AK 99503  
Phone: (907) 273-1600  
Fax: (907) 273-1699

**2018 Alpine Pipeline  
Hydrology Monitoring  
Locations**

FIGURE 1

(SHEET 1 of 1)

# ALPINE PIPELINE HYDROLOGY MONITORING

## 1.1 MONITORING CRITERIA

The following data were collected by Michael Baker:

- Ground and aerial photographs at all monitoring locations;
- Vertical support member (VSM) tilt survey – evaluation of VSM tilt at all monitoring locations;
- VSM scour survey – survey of main channel and floodplain VSMs at the Kachemach River and Miluveach River monitoring locations;
- Visual observations of the following physical conditions at all monitoring locations:
  - ✧ Obstructions, ice dams, new river channels, or changes in flow in the channels; and
  - ✧ Evidence of potential pipeline leaks; and
- Visual observations of the following physical conditions at the HDD West and HDD East monitoring locations:
  - ✧ Signs of flooding threatening a facility or pipeline, or where water could not be diverted and there was:
    - Evidence of water concentrated longitudinally on or along the pipeline centerline
    - Gullying threatening the buried pipeline;
  - ✧ Soil pressure ridges parallel to the pipe axis exceeding 1 foot in height and 60 feet in length;
  - ✧ Ponding extending over the pipe axis deeper than 1 foot and more than 100 feet in length;
  - ✧ Soil disturbances (cracks) located within 10 feet of the pipeline crossing centerlines having one of the following characteristics identified:
    - At least 10 feet in length with vertical displacement exceeding 6 inches,
    - Wider than 2 inches parallel to the pipe axis and longer than 60 feet;
  - ✧ Depressions occurring longitudinally over the pipe axis deeper than 1 foot and more than 100 feet in length; and
  - ✧ Presence or absence of gravel pad erosion.

The following data were collected by UMIAQ:

- Evaluation of bank erosion and identification of locations of bank caving at least 50 feet upstream and downstream from the nominal pipe size (NPS) 14 oil pipeline at the HDD West and HDD East monitoring locations; and
- Polygon trough subsidence survey – topographic survey from the east bank of the Colville River East Channel to the HDD East pad to document bank and ground stability

# ALPINE PIPELINE HYDROLOGY MONITORING

## 2. METHODS

Field investigations by Michael Baker were performed by a two-person team on August 29, 2018. Soloy Helicopters, LLC provided helicopter access to all monitoring locations. Safety precautions were followed, as outlined in the North Slope Water Resources 2018 Health, Safety, and Environmental Plan (Michael Baker 2018a) and the 2018 Summer Hydrology Monitoring – Job Safety Analysis (Michael Baker 2018b).

### 2.1 VISUAL OBSERVATIONS

Michael Baker collected visual observations at the HDD West and HDD East monitoring locations beginning from where the pipeline casings enter the ground and extending to the bank. Visual observations at the Kachemach River and Miluveach River monitoring locations were collected along the pipeline to 15 feet outside the banks of the active channel and extended upstream and downstream several hundred feet along both banks. Aerial photographs during the 2018 spring breakup field program and ground and aerial photographs during the August 2018 field program were also collected. Spring breakup aerial photographs and summer ground and aerial photographs at all monitoring locations are provided in Appendix A.

### 2.2 VSM TILT

Michael Baker measured VSM tilt using a Stabila Type 196-2 magnetic, electronic carpenter's level with a digital read-out. Prior to field measurements, the electronic level was calibrated to manufacturer specifications. The calibration was verified by taking a reading on a surface then rotating the level 180° in the same plane to confirm the measurement. The electronic level was carefully positioned on the VSM to avoid reflective tape, welds, and fasteners that would impact the tilt measurements. A plumb bob and pocket rod tape measure were used to measure the tilt of three VSMs at HDD West where there was interference on the VSM.

Tilt was measured perpendicular to the pipeline (generally north [N]/south [S]) and parallel to the pipeline (generally east [E]/west [W]). The tilt of each VSM was documented by recording the digital level read-out in inches per vertical foot (in/ft) and converting to feet per vertical foot (ft/ft) or measuring the horizontal distance from the plumb bob in ft/ft. The accuracy of the electronic level method is  $\pm 0.0008$  ft/ft and rounded to  $\pm 0.001$  ft/ft, the accuracy of the plumb bob method is  $\pm 0.001$  ft/ft. Approximate conversions between ft/ft and inches per vertical foot, rounded to the nearest thousandth, are provided in Table 2.1.

The 2010 CPAI North Slope Foundation Design Specification states that under sustained loads, "VSM pipe supports shall be limited to  $\Delta v/l = 0.015$  and  $\Delta v = 1\text{-inch max}$ ", where  $\Delta v$  equals the horizontal deflection and  $l$  equals the vertical distance (CPAI 2010).

Taking into consideration the accuracy of the measurement method and the design specifications, the VSM axis was considered plumb and within tolerance if the tilt was measured to be less than or equal to  $0.015 \pm 0.001$  ft/ft. Any calculations that were determined to be less than the survey accuracy are reported as such ( $<0.001$  ft/ft).



# ALPINE PIPELINE HYDROLOGY MONITORING

**Table 2.1: VSM Tilt Unit Conversion**

Inches of Deflection per 10 feet	ft/ft	Slope
<b>1/8</b>	0.001 <sup>1</sup>	1:1000
<b>1/4</b>	0.002	1:500
<b>1/2</b>	0.004	1:250
<b>3/4</b>	0.006	1:160
<b>1</b>	0.008	1:125
<b>1-1/4</b>	0.010	1:100
<b>1-1/2</b>	0.013	1:77
<b>1-3/4</b>	0.015 <sup>2</sup>	1:66.6
<b>2</b>	0.017	1:58
<b>Notes:</b>		
1. <b>Survey Tolerance</b>		
2. <b>Project Tolerance</b>		

## 2.3 BANK & PAD EROSION

UMIAQ surveyed bank erosion at the HDD West and HDD East monitoring locations in August 2018, incorporated the data into figures, and provided tabulations of historical erosion. Bank erosion was surveyed relative to a permanent baseline that runs parallel to each bank. The distance from the top of the bank to the baseline was measured at regular intervals along the baseline and recorded (Michael Baker 2003b). The HDD West and HDD East bank erosion surveys are provided in Appendix B.1 and Appendix C.1, respectively.

Michael Baker collected ground and aerial photographs and visual observations to document bank erosion at all monitoring locations and to document the presence or absence of gravel pad erosion at the HDD West and HDD East monitoring locations.

## 2.4 VSM SCOUR

Michael Baker surveyed streambed scour at VSMs in the main channel and floodplain of the Kachemach River (VSMs 1714, 1714A, 1715A, 1715B, 1715C, and 1716) and main channel of the Miluveach River (2047N (A), 2047S (B), 2048N (A), 2048S (B)) in August 2018. Scour conditions were evaluated either at the VSM, or if a casing was present, inside and outside of the casing.

## 2.5 FOUNDATION SETTLEMENT & JACKING

UMIAQ surveyed the elevation of the HDD West building foundation piles (bottom of pile cap) in August 2018 and provided tabulations of historical elevations. The surveyed foundation piles (W-01 through W-20) are provided in Appendix B.2. Data presented in the 2008 Alpine Pipeline Hydrology Monitoring report reflected an adjustment to the vertical datum at HDD West of -0.35 feet, which was made to reflect actual elevations based on differential levels carried by UMIAQ from CD1 facility in August 2007 (Michael Baker 2008). According to UMIAQ, this adjustment was eliminated to avoid confusion about elevation values. Therefore, the values for each pile cap as presented in Appendix B.2 reflect the original datum.

## 2.6 POLYGON TROUGH SUBSIDENCE

UMIAQ surveyed polygon trough subsidence at cross sections of the polygon trough located between the east bank of the Colville River East Channel and west of the HDD East gravel pad in August 2018, incorporated the data into figures, and provided tabulations of elevations for each cross section (cross section A through H). The surveyed cross sections are provided in Appendix C.2.

## ALPINE PIPELINE HYDROLOGY MONITORING

## 3. RESULTS

Spring breakup observations suggest flow was confined to the active channels and did not reach the overbank regions of any of the monitoring locations. During the August field work conducted by Michael Baker, all channels were clear of ice and snow, allowing full access to the channels and pipeline. Based on visual observations at all monitoring locations, there were no obstructions, ice dams, new river channels, or changes in flow in the channels, and no evidence of potential pipeline leaks.

### 3.1 HDD WEST

#### VISUAL OBSERVATIONS

Based on visual observations of physical conditions, there were no signs of flooding threatening the facility or pipeline, no soil pressure ridges, no ponding, and no soil disturbances. Two small depressions, one measuring approximately four (4) feet in diameter and one (1) foot deep and the other measuring approximately two (2) feet in diameter and 0.5 feet deep, were observed on the gravel pad adjacent to the stairs of the southern HDD facility.

#### VSM TILT

A summary of VSM tilt survey results is presented in Table 3.1. A summary of the change in tilt measurements between 2017 and 2018 is presented in Table 3.2. A historical summary of the change in VSM tilt by orientation between 2006 and 2018 is presented in Graph 3.1 and Graph 3.2.

**Table 3.1: HDD West VSM Tilt Measurement Results**

HDD West VSM Number	Tilt Measurement Orientation (ft/ft)		Comment
	North/South	East/West	
783*	0.0025 N	0.0031 E	Plumb
784A	0.0029 N	<0.001	Plumb
784B*	0.0037 N	0.0038 W	Plumb
788	<0.001	0.0013 E	Plumb
789A	0.0042 N	<0.001	Plumb
789B*	0.0065 N	0.002 W	Plumb

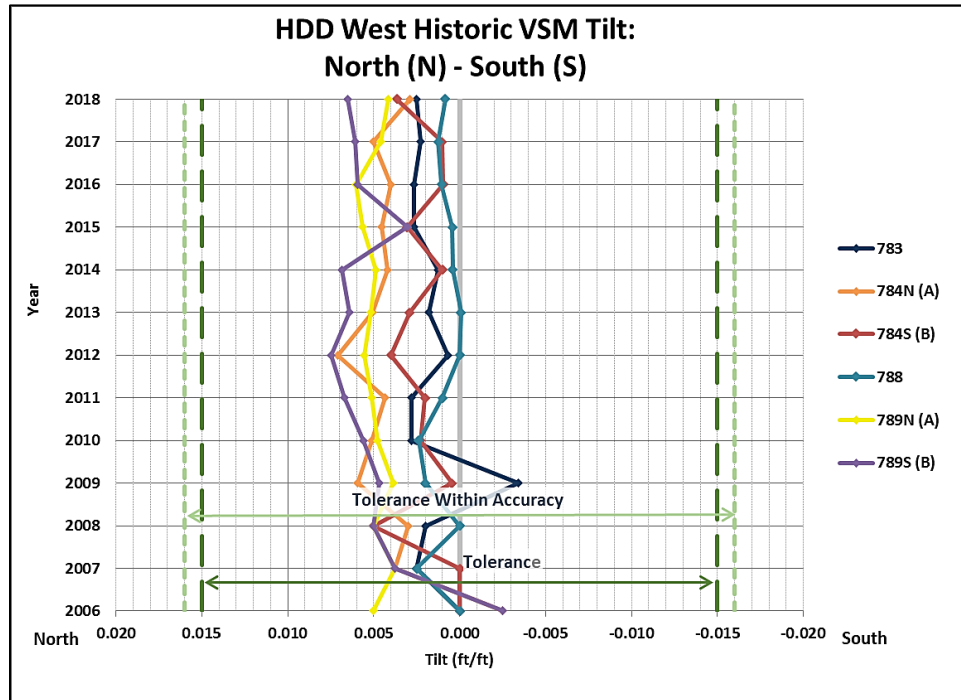
\*Measured with Plumb Bob

**Table 3.2: HDD West VSM Change in Tilt, 2017-2018**

HDD West VSM Number	Change in Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
783*	<0.001	0.0053 E
784A	0.0021 S	<0.001
784B*	0.0026 N	0.0013 E
788	<0.001	<0.001
789A	<0.001	<0.001
789B*	<0.001	<0.001

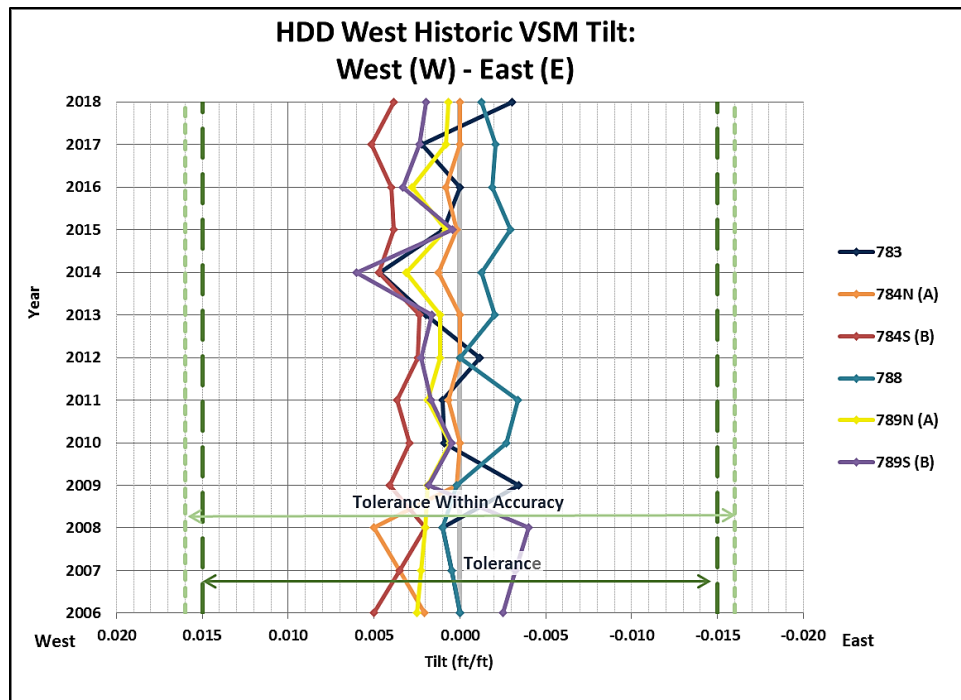
\*Measured with Plumb Bob

# ALPINE PIPELINE HYDROLOGY MONITORING



- Notes:**
1. Positive tilt indicates north (N), negative tilt indicates south (S).
  2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
  3. Survey accuracy of this project is +/-0.001 ft/ft.

**Graph 3.1: HDD West VSM Historical Change in Tilt, North/South**



- Notes:**
1. Positive tilt indicates west (W), negative tilt indicates east (E).
  2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
  3. Survey accuracy of this project is +/-0.001 ft/ft.

**Graph 3.2: HDD West VSM Historical Change in Tilt, East/West**

# ALPINE PIPELINE HYDROLOGY MONITORING

## BANK & PAD EROSION

The average rate of incremental bank erosion between 2017 and 2018 and cumulative bank erosion between 2002 and 2018 along the entire 440-foot top of bank was 0.0 ft/yr and 0.5 ft/yr, respectively. These values average both erosion and deposition. The maximum incremental bank erosion between 2017 and 2018 was 0.7 feet observed at STA 2+05, 45 feet upstream (south) of the NPS 14 oil pipeline centerline (STA 2+50).

In 1997, Michael Baker established a survey control point on the top of bank at the centerline of the NPS 14 oil pipeline, as shown on the drawing in Appendix B.1. The location of the 1997 survey control point was compared with the 2018 UMIAQ surveyed top of bank at the pipeline centerline (STA 2+50), indicating approximately 12 feet of bank erosion has occurred over the 21-year period.

The maximum cumulative bank erosion overall was 18.7 feet observed at STA 3+70 over the 16-year period, 120 feet downstream (north) of the NPS 14 oil pipeline centerline. There have been no changes in maximum cumulative bank erosion at STA 3+70 since 2006. The design bank erosion rate compared to the 21-year bank erosion rate at the pipeline centerline and the 16-year maximum cumulative bank erosion rate at STA 3+70 is presented in Table 3.3.

**Table 3.3: HDD West Design Bank Erosion Rate vs Surveyed Bank Erosion Rates**

Station	Design Bank Erosion Rate <sup>1</sup> (ft/yr)	Surveyed Bank Erosion Rate <sup>2</sup> (ft/yr)
2+50 (Pipeline Centerline)	2.3	0.6
3+70 (Maximum Cumulative Erosion)	2.3	1.2
<b>Notes:</b>		
1. Design erosion rate from Michael Baker 2003b		
2. Rate comparing UMIAQ 2002 and 2018 surveys		

Floodwater did not reach the gravel pad during 2018 spring breakup. Based on visual observations conducted by Michael Baker, there was no notable erosion of the gravel pad.

## FOUNDATION SETTLEMENT & JACKING

The average rate of incremental change between 2017 and 2018 and cumulative change between 2004 and 2018 was 0.004 ft/yr and 0.003 ft/yr, respectively. These values average both settlement and jacking. The maximum incremental settlement between 2017 and 2018 was 0.029 feet at pile W-13. The maximum incremental jacking between 2017 and 2018 was 0.043 feet at pile W-15. The maximum cumulative settlement between 2004 and 2018 was 0.004 ft at pile W-10, yielding a rate of cumulative settlement of 0.000 ft/yr. The maximum cumulative jacking between 2004 and 2018 was 0.063 feet at pile W-02, yielding a rate of cumulative jacking of 0.005 ft/yr.

## 3.2 HDD EAST

### VISUAL OBSERVATIONS

Based on visual observations of physical conditions, there were no signs of flooding threatening the facility or pipeline, no soil pressure ridges, no ponding, and no soil disturbances. A depression, identified in past years, was observed on the gravel pad near the centerline of the NPS 14 oil pipeline. The depression measured approximately 10 feet in diameter and 1.5 feet in depth. The presence of gravel fill at the same position over the adjacent 18-inch seawater pipeline was observed.

# ALPINE PIPELINE HYDROLOGY MONITORING

## VSM TILT

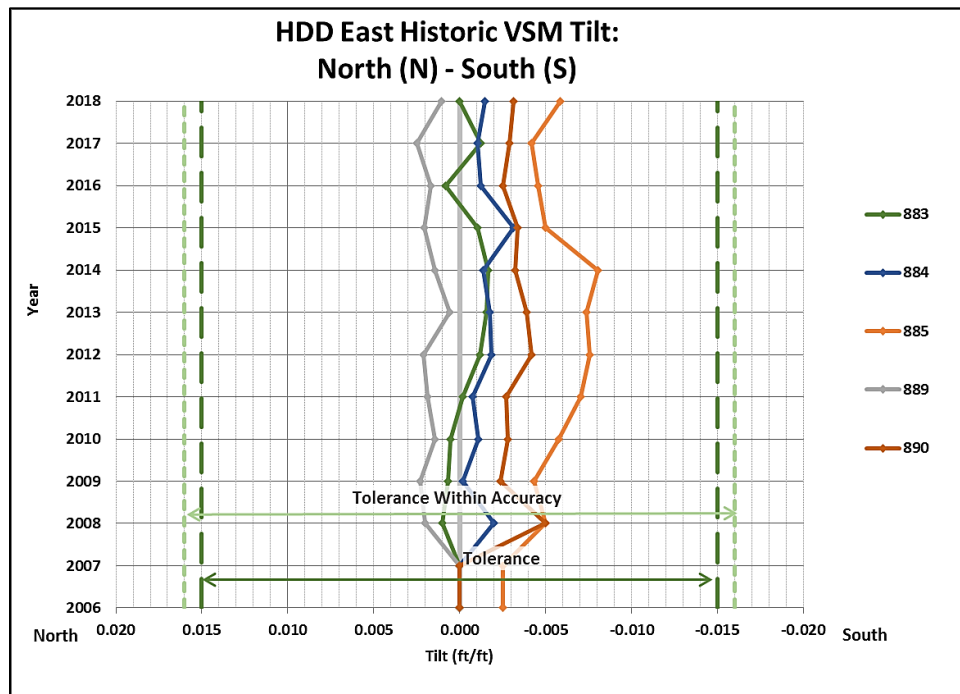
A summary of VSM tilt survey results is presented in Table 3.4. A summary of the change in tilt measurements between 2017 and 2018 is presented in Table 3.5. A historical summary of the change in VSM tilt by orientation between 2006 and 2018 is presented in Graph 3.3 and Graph 3.4.

**Table 3.4: HDD East VSM Tilt Measurement Results**

HDD East VSM Number	Tilt Measurement Orientation (ft/ft)		Comment
	North/South	East/West	
883	<0.001	<0.001	Plumb
884	0.0015 S	0.0015 W	Plumb
885	0.0058 S	0.0042 W	Plumb
889	0.001 N	<0.001	Plumb
890	0.0031 S	<0.001	Plumb

**Table 3.5: HDD East VSM Change in Tilt, 2017-2018**

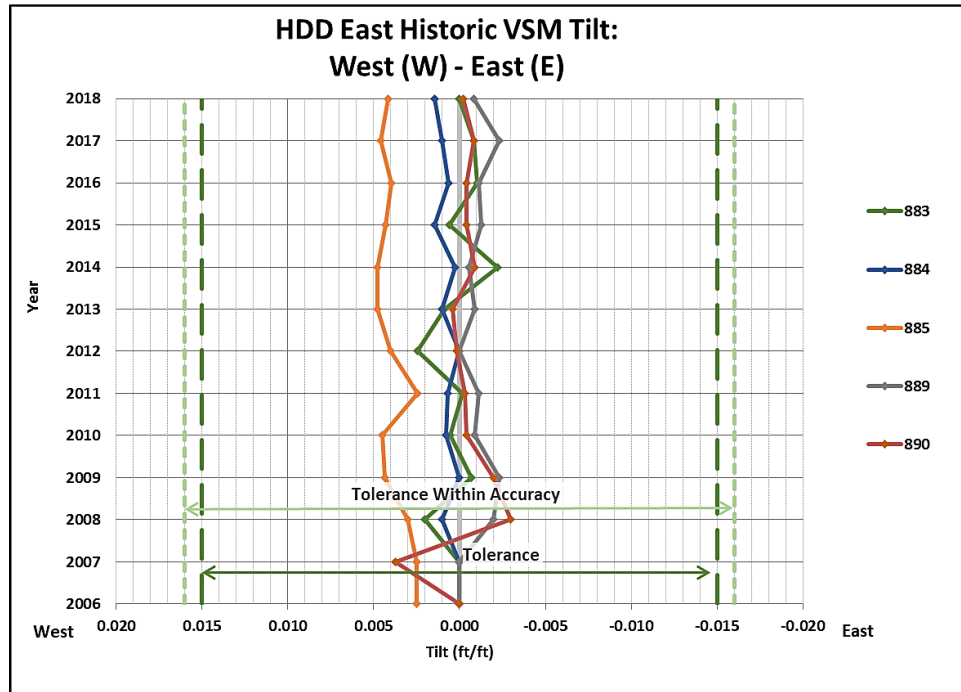
HDD East VSM Number	Change in Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
883	0.0013 N	<0.001
884	<0.001	<0.001
885	0.0017 S	<0.001
889	0.0015 S	0.0015 W
890	<0.001	<0.001



- Notes:**
1. Positive tilt indicates north (N), negative tilt indicates south (S).
  2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
  3. Survey accuracy of this project is +/-0.001 ft/ft.

**Graph 3.3: HDD East VSM Historical Change in Tilt, North/South**

## ALPINE PIPELINE HYDROLOGY MONITORING



- Notes:**
1. Positive tilt indicates west (W), negative tilt indicates east (E).
  2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
  3. Survey accuracy of this project is +/-0.001 ft/ft.

**Graph 3.4: HDD East VSM Historical Change in Tilt, East/West**

### BANK & PAD EROSION

The average rate of incremental bank erosion between 2017 and 2018 and cumulative bank erosion between 2001 and 2018 along the entire 450-foot top of bank was 0.0 ft/yr and 0.9 ft/yr, respectively. These values average both erosion and deposition. The maximum incremental bank erosion between 2017 and 2018 was 1.5 feet observed at STA 0+20, 260 feet upstream (south) of the NPS 14 oil pipeline centerline (STA 2+80).

In 1997, Michael Baker established a survey control point on the top of bank at the centerline of the NPS 14 oil pipeline, as shown on the drawing in Appendix C.1. The location of the 1997 survey control point was compared with the 2018 UMIAQ surveyed top of bank at the pipeline centerline (STA 2+80), indicating approximately 18 feet of bank erosion has occurred over the 21-year period.

The maximum cumulative bank erosion overall was 39.3 feet observed at STA 2+90 over the 17-year period, 10 feet downstream (north) of the NPS 14 oil pipeline centerline. There have been no changes in maximum cumulative bank erosion at STA 2+90 since 2014. The design bank erosion rate compared to the 21-year bank erosion rate at the pipeline centerline and the 17-year maximum cumulative bank erosion rate at STA 2+90 is presented in Table 3.6.

## ALPINE PIPELINE HYDROLOGY MONITORING

Table 3.6: HDD East Design Bank Erosion Rate vs Surveyed Bank Erosion Rates

Station	Design Bank Erosion Rate <sup>1</sup> (ft/yr)	Surveyed Bank Erosion Rate <sup>2</sup> (ft/yr)
2+80 (Pipeline Centerline)	2.5	0.9
2+90 (Maximum Cumulative Erosion)	2.5	2.3
<b>Notes:</b>		
1. Design erosion rate from Michael Baker 2003b		
2. Rate comparing UMIAQ 2001 and 2018 surveys		

Several thermosyphons sustained damage from ice impacts during spring breakup in 2015. The damaged thermosyphons are not impacting the integrity of the pipeline and are not contributing to further bank erosion.

Floodwater did not reach the gravel pad during 2018 spring breakup. Based on visual observations conducted by Michael Baker, there was no notable erosion of the gravel pad.

### POLYGON TROUGH SUBSIDENCE

Maximum incremental subsidence between 2017 and 2018 was 0.8 feet observed at STA 0+27 at cross section D. Maximum cumulative subsidence between 2001 and 2018 was 4.1 feet observed at STA 0+27 at cross section A. Cross section B experienced a maximum cumulative subsidence between 2001 and 2018 of 4.0 feet at STA 0+35.

Active erosion and sloughing continue along the east bank north of the NPS 14 oil pipeline. In 2001, sandbags and Styrofoam were installed in the bank to reduce melting ice lenses and combat further erosion. Exposed sandbags and Styrofoam were evident at the toe of the polygon trough, similar to site conditions encountered during the 2017 field visit.

## 3.3 KACHEMACH RIVER

### VISUAL OBSERVATIONS

At the time of the field visit, flow was observed across the entire gravel channel at the pipeline crossing. Wetted width was approximately 85 feet with a maximum depth of approximately 3 feet. Elevated water levels during the measurement at VSM 1715B prevented safe wading to that VSM.

### VSM TILT

A summary of VSM tilt survey results is presented in Table 3.7. A summary of the change in tilt measurements between 2017 and 2018 is presented in Table 3.8. A historical summary of the change in VSM tilt by orientation between 2006 and 2018 is presented in Graph 3.5 and Graph 3.6.

## ALPINE PIPELINE HYDROLOGY MONITORING

Table 3.7: Kachemach River VSM Tilt Measurement Results

Kachemach River VSM Number	Tilt Measurement Orientation (ft/ft)		Comment
	North/South	East/West	
1714	0.0033 N	0.006 E	Plumb
1714A*	0.0088 S	0.0108 E	Plumb
1715A	0.0017 S	<0.001	Plumb
1715B <sup>1</sup>	-	-	Plumb
1715C*	0.0017 S	0.0148 E	Plumb
1716	0.0067 S	0.0052 E	Plumb

**Notes:**  
\* Abandoned VSM  
1. Elevated water levels during the measurement prevented safe wading to that VSM

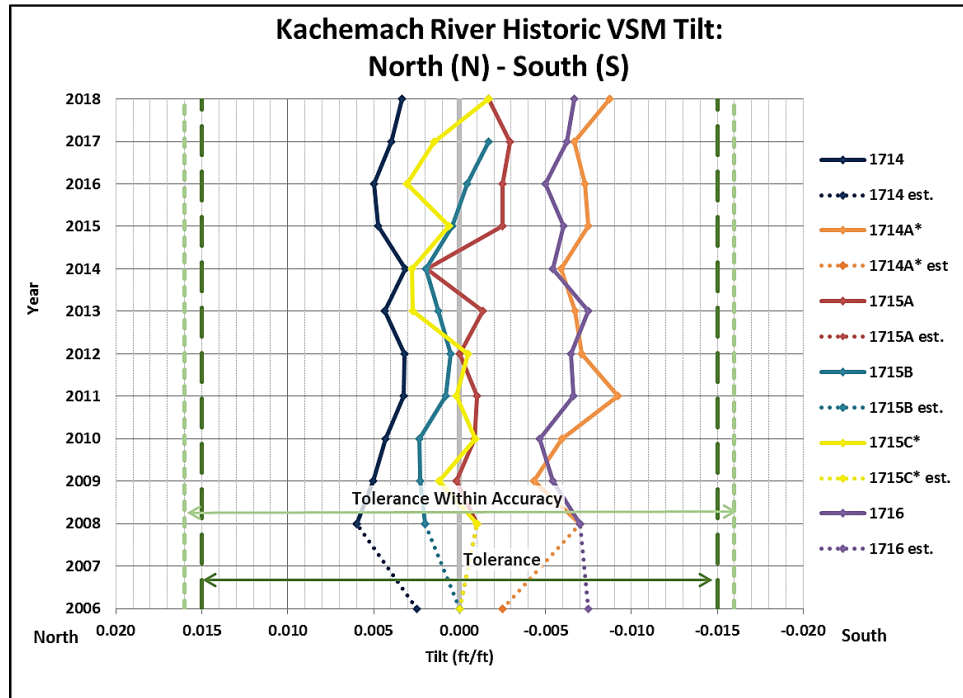
Table 3.8: Kachemach River VSM Change in Tilt, 2017-2018

Kachemach River VSM Number	Change in Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
1714	<0.001	<0.001
1714A*	0.0021 S	0.0027 W
1715A	0.0013 N	<0.001
1715B <sup>1</sup>	-	-
1715C*	0.0031 S	<0.001
1716	<0.001	0.0015 W

**Notes:**  
\* Abandoned VSM  
1. Elevated water levels during the measurement prevented safe wading to that VSM

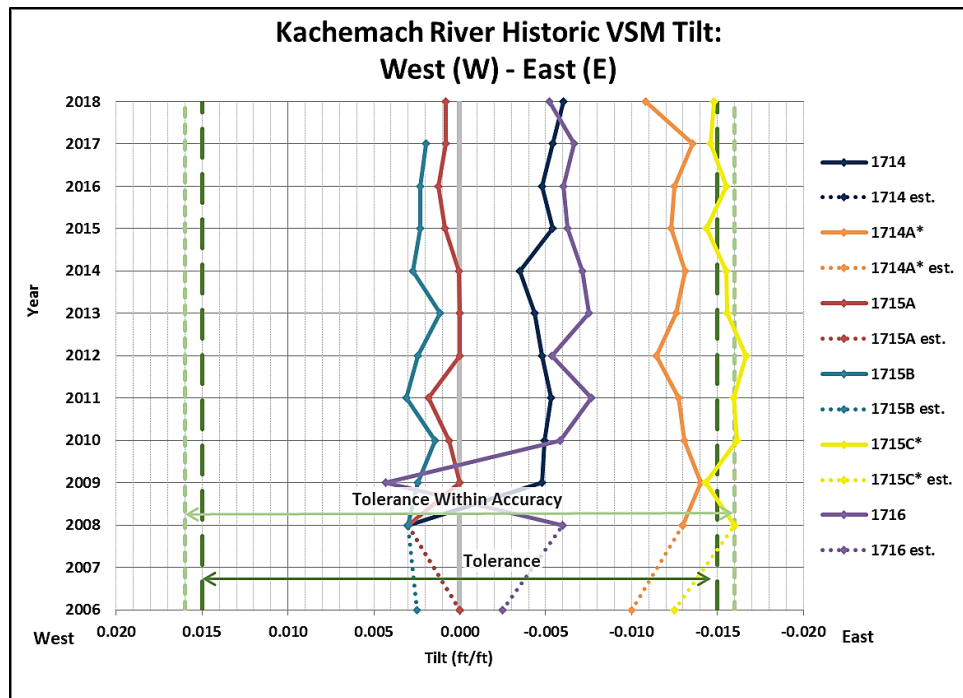


# ALPINE PIPELINE HYDROLOGY MONITORING



- Notes:**
1. Positive tilt indicates north (N), negative tilt indicates south (S).
  2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
  3. Survey accuracy of this project is +/-0.001 ft/ft.

**Graph 3.5: Kachemach River VSM Historical Change in Tilt, North/South**



- Notes:**
1. Positive tilt indicates west (W), negative tilt indicates east (E).
  2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
  3. Survey accuracy of this project is +/-0.001 ft/ft.

**Graph 3.6: Kachemach River VSM Historical Change in Tilt, East/West**

## ALPINE PIPELINE HYDROLOGY MONITORING

## VSM SCOUR

No excessive scour was observed at the base of any VSM located within the main channel or floodplain. Ground depressions observed at the base of VSM 1714, 1715C, and 1716 are likely the result of consolidated backfill material and are not attributed to hydraulic events. A summary of VSM scour results in the floodplain of the Kachemach River is presented in Table 3.9.

**Table 3.9: Kachemach River Floodplain VSM Ground Depression Results**

VSM	Location Description	Ground Depression <sup>1,2</sup> (ft)				Notes
		North	East	South	West	
1714	Grassy Floodplain	1.90	1.90	1.90	1.70	Ground depression is approximately 3.0 feet in diameter
1715C	Grassy Floodplain	-	-	0.80	1.00	Ground depression is approximately 1.5 feet in diameter
1716	Grassy Floodplain	0.80	-	-	1.00	

**Notes:**  
 1. Measurement units are feet below adjacent ground  
 2. A dash line "-" indicates no scour hole was observed

The minimum bed elevation surveyed by Michael Baker was 20.93 ft BPMSL on the south side (upstream side) of VSM 1715B on the outside of the casing. VSM 1715A and 1715B have permanent steel casings installed as a countermeasure to control local scour. The minimum bed elevation prior to construction at VSM 1715B was 27.1 ft BPMSL based on design drawings (Michael Baker 1998). Therefore, the change in bed elevation since the pipeline was constructed at 1715B was 6.2 feet. A summary of VSM scour survey results by Michael Baker in the main channel is presented in Table 3.10. No quantitative scour survey was conducted during this monitoring cycle. The last topographic scour survey was conducted by UMIAQ in 2017 (Michael Baker 2017).

**Table 3.10: Kachemach River Main Channel VSM Scour Results**

VSM	Location Description	Casing	Scour Hole Elevation <sup>1</sup> (ft BPMSL)			
			North	East	South	West
1714A	Channel	-	23.92	23.38	23.33	23.53
1715A	Channel	Inside	24.77	24.59	24.38	24.68
		Outside	22.99	22.28	21.72	22.37
1715B	Channel	Inside	23.48	23.08	23.18	23.38
		Outside	21.79	20.98	20.93	20.98

**Notes:**  
 1. Bed elevations from Michael Baker 2018 survey  
 2. The water surface elevation at the time of the survey was 26.484 ft BPMSL

### 3.4 MILUVEACH RIVER

#### VISUAL OBSERVATIONS

At the time of the field visit, flow upstream of the pipeline crossing was observed across the entire gravel channel. Flow downstream of the pipeline crossing was split by a gravel bar, with the majority of flow being conveyed on the left (west) side of the channel, as seen in previous years. Wetted width was approximately 85 feet with a maximum depth of approximately 1 foot.

# ALPINE PIPELINE HYDROLOGY MONITORING

## VSM TILT

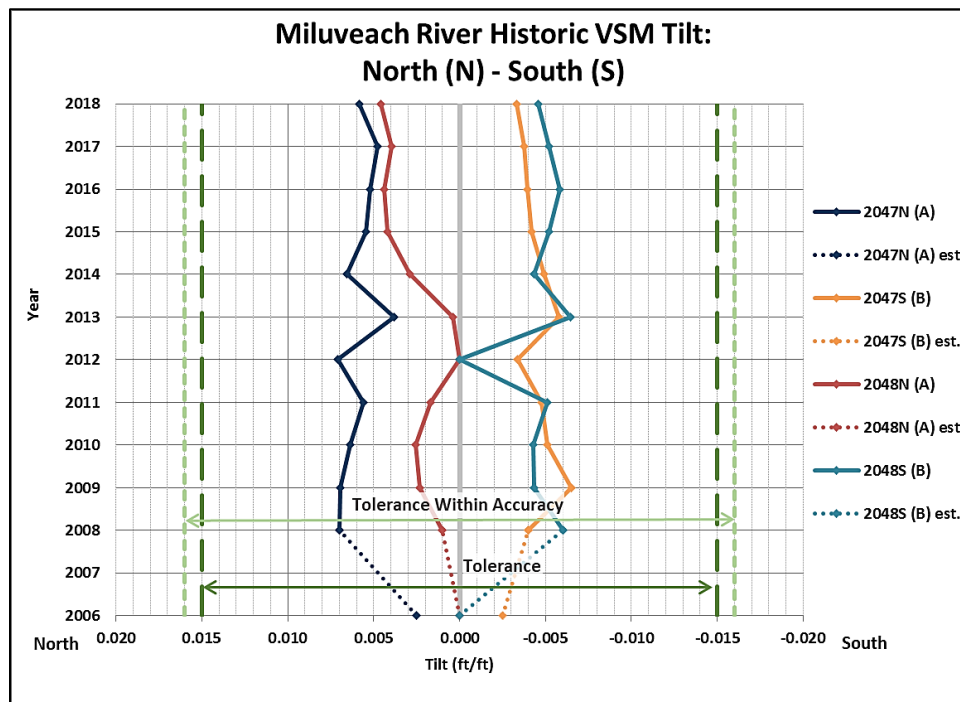
A summary of VSM tilt survey results is presented in Table 3.11. A summary of the change in tilt measurements between 2017 and 2018 is presented in Table 3.12. A historical summary of the change in VSM tilt by orientation between 2006 and 2018 is presented in Graph 3.7 and Graph 3.8.

**Table 3.11: Miluveach River VSM Tilt Measurement Results**

Miluveach River VSM Number	Tilt Measurement Orientation (ft/ft)		Comment
	North/South	East/West	
2047N (A)	0.0058 N	0.0033 E	Plumb
2047S (B)	0.0033 S	0.0021 E	Plumb
2048N (A)	0.0046 N	0.0044 W	Plumb
2048S (B)	0.0046 S	0.0083 E	Plumb

**Table 3.12: Miluveach River VSM Change in Tilt, 2017-2018**

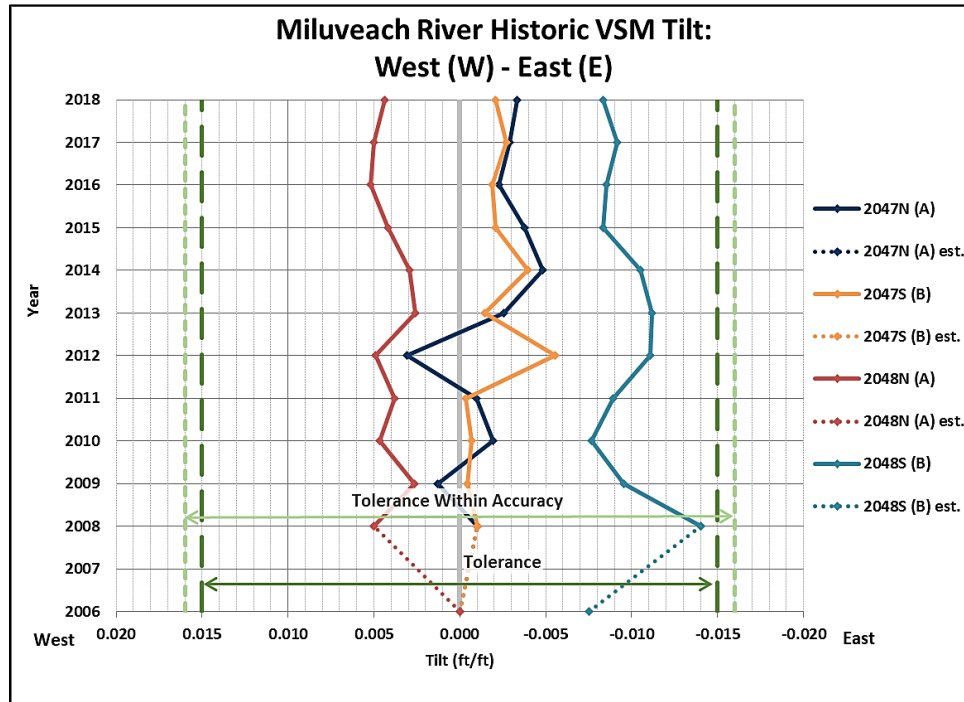
Miluveach River VSM Number	Change in Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
2047N (A)	0.001 N	<0.001
2047S (B)	<0.001	<0.001
2048N (A)	<0.001	<0.001
2048S (B)	<0.001	<0.001



- Notes:**
1. Positive tilt indicates north (N), negative tilt indicates south (S).
  2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
  3. Survey accuracy of this project is +/-0.001 ft/ft.
  4. Tilt measurements were not taken at this location in 2007; tilt is estimated between 2006 and 2008.

**Graph 3.7: Miluveach River VSM Historical Change in Tilt, North/South**

# ALPINE PIPELINE HYDROLOGY MONITORING



- Notes:**
1. Positive tilt indicates west (W), negative tilt indicates east (E).
  2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
  3. Survey accuracy of this project is +/-0.001 ft/ft.
  4. Tilt measurements were not taken at this location in 2007; tilt is estimated between 2006 and 2008.

**Graph 3.8: Miluveach River VSM Historical Change in Tilt, East/West**

## VSM SCOUR

No excessive scour was observed at the base of any VSM located within the channel. The minimum bed elevation surveyed by Michael Baker was 43.66 ft BPMSL on the south side (upstream side) of VSM 2048S (B). The minimum bed elevation prior to construction at VSM 2048S (B) was 47.3 ft BPMSL based on design drawings (Michael Baker 1998). Therefore, the change in bed elevation since the pipeline was constructed at VSM 2048S (B) is 3.6 feet. A summary of VSM scour survey results by Michael Baker is presented in Table 3.13. No quantitative scour survey was conducted during this monitoring cycle. The last topographic scour survey was conducted by UMIAQ in 2017 (Michael Baker 2017).

**Table 3.13: Miluveach River VSM Scour Results**

VSM	Location Description	Bed Elevation <sup>1,2</sup> (ft BPMSL)			
		North	East	South	West
2047N (A)	Grassy Mud – Bank/Channel Interface	-	45.04	45.27	45.28
2047S (B)	Grassy Mud – Bank/Channel Interface	-	-	45.23	-
2048N (A)	Channel	44.74	44.42	44.19	44.42
2048S (B)	Channel	44.04	43.93	43.66	43.80

**Notes:**

1. Bed elevations from Michael Baker 2018 survey
2. A dash line "-" indicates no scour hole was observed
3. The water surface elevation at the time of the survey was 45.42 ft BPMSL

## ALPINE PIPELINE HYDROLOGY MONITORING

## 4. CONCLUSION

Channel morphology and flow direction within the channels remain largely unchanged. The pipeline at each monitoring location appeared to be in stable condition with no visual indication of leaks. No ponding, cracks, or pressure ridges were evident over the buried pipe axis at HDD West and HDD East. The HDD West, HDD East, Kachemach River, and Miluveach River VSMs monitored were all plumb and within project tolerance based on tilt measurements and project method accuracy. The tilt of VSM 1715C (abandoned) at the Kachemach River crossing is within but near the project tolerance in the east/west orientation.

Gravel pad erosion was not observed at the HDD West and HDD East gravel pads. Bank erosion at all four monitoring locations was less than 50% of the respective design setback. If in the future, the banks “migrate 50% of the design setback, erosion rates or possible mitigation measures will be evaluated” (Michael Baker 2003c). The design setback, cumulative bank erosion at the pipeline centerline, and percent of design setback at each monitoring location is presented in Table 4.1.

**Table 4.1: Bank Erosion Design Setback Survey Results**

Monitoring Location	Design Setback <sup>1</sup> (ft)	Cumulative Bank Erosion at Pipeline Centerline <sup>2</sup> (ft)	Percent of Design Setback (%)
HDD West	105	12	11.4
HDD East	115	18	15.7

**Notes:**  
 1. Design setbacks from Michael Baker 2003c  
 2. Bank erosion provided by UMIAQ 2018 survey drawings "HDD Bank Erosion Monitoring HDD Site - West Alpine Facility" and "HDD Bank Erosion Monitoring HDD Site - East Alpine Facility"; erosion cumulative comparing 1997 and 2018 surveys

Observed scour of each measured VSM at the Kachemach River and Miluveach River were found to be within project design criteria. Scour at the VSMs in the main channel of the Kachemach River and Miluveach River monitoring locations was greater than the design minimum scour hole elevations, as presented in Table 4.2.

**Table 4.2: VSM Design Scour Survey Results**

Monitoring Location	Design Minimum Scour Hole Elevation <sup>1</sup> (ft BPMSL)	Surveyed Minimum Scour Hole Elevation <sup>2</sup> (ft BPMSL)
	Main Channel	Main Channel
Kachemach River	6.9	20.9
Miluveach River	35.1	43.7

**Notes:**  
 1. Design scour hole elevations from Michael Baker 2003c  
 2. Bed elevations from Michael Baker 2018 survey

Since 2004, the maximum vertical change of any one pile cap at HDD West was 0.063 feet. Since 2001, the maximum cumulative polygon trough subsidence at HDD East was 4.1 feet.

## ALPINE PIPELINE HYDROLOGY MONITORING

## 5. REFERENCES

- ConocoPhillips Alaska, Inc. (CPAI). 2010. Foundation Design Specification. SPC-SS-NS-80502. December 2010.
- 2008. Alpine Pipelines Surveillance and Monitoring Program. Alpine Oil Pipeline ADL 415701, Alpine Utility Pipeline ADL415857, Alpine Diesel Pipeline ADL 415932. Edition 1, Revision 0. February 2008.
- Michael Baker International (Michael Baker). 2018a. North Slope Water Resources 2018 Health, Safety, and Environment Plan. Prepared for ConocoPhillips Alaska, Inc.
- 2018b. 2018 Summer Hydrology Programs – Job Safety Analysis. Prepared for ConocoPhillips Alaska, Inc.
- 2017. 2017 Alpine Pipeline Hydrology Monitoring Report. Prepared for ConocoPhillips Alaska. 161687-MBI-RPT-001. September 2017.
- 2016. 2016 Alpine Pipeline Hydrology Monitoring Report. Prepared for ConocoPhillips Alaska. 154991-MBI-RPT-001. September 2016.
- 2015. 2015 Alpine Pipeline River Crossing Monitoring Report. Prepared for ConocoPhillips Alaska. 148249-MBI-RPT-001. November 2015.
- 2014. 2014 Alpine Pipeline River Crossing Monitoring Report. Prepared for ConocoPhillips Alaska. 141674-MBJ-RPT-001. September 2014.
- 2013. 2013 Alpine Pipeline River Crossing Monitoring Report. Prepared for ConocoPhillips Alaska. 135894-MBJ-RPT-001. September 2013.
- 2012. 2012 Alpine Pipeline River Crossing Monitoring Report. Prepared for ConocoPhillips Alaska. 128228-MBJ-RPT-001. December 2012.
- 2011. Alpine Pipeline River Crossings 2011 Monitoring Report. Prepared for ConocoPhillips Alaska. 123744-MBJ-RPT-001. September 2011.
- 2010. Alpine Pipeline River Crossings 2010 Monitoring Report. Prepared for ConocoPhillips Alaska. 120259-MBJ-RPT-001. September 2010.
- 2009. Alpine Pipeline River Crossings 2009 Monitoring Report. Prepared for ConocoPhillips Alaska. 117009-MBJ-RPT-001. September 2009.
- 2008. Alpine Pipeline HDD Crossing 2008 Monitoring Report. Prepared for ConocoPhillips Alaska. 114133-MBJ-RPT-001. October 2008.
- 2007. Alpine Pipeline HDD Crossing 2007 Monitoring Report. Prepared for ConocoPhillips Alaska. 111620-MBJ-RPT-001. October 2007.
- 2006. Alpine Pipeline River Crossings 2006 Monitoring Report. Prepared for ConocoPhillips Alaska. 108710-MBJ-RPT-001. October 2006.
- 2005. Alpine Pipeline River Crossing Monitoring. Prepared for ConocoPhillips Alaska. 105758-MBJ-001. October 2005.

## ALPINE PIPELINE HYDROLOGY MONITORING

- 2004. Alpine Pipeline River Crossing Monitoring. Prepared for ConocoPhillips Alaska. 103654-MBJ-001. October 2004.
- 2003a. 2003 Alpine Pipeline River Crossing Monitoring. Prepared for ConocoPhillips Alaska. 101376-MBJ-001. July 2003.
- 2003b. Alpine Development. Colville River Crossing Design Report. Prepared for Arco Alaska Inc. 23100-MBJ-RP-003. June 1997. Rev 5. 2003.
- 2003c. Mechanical Analysis of Aboveground Pipeline & Aboveground River Crossings. Prepared for ARCO Alaska Inc. 23100-MBJ-RP-001. October 1997. Rev 7. 2003.
- 2002. HDD Transition Zones Civil Surveillance Trip Report – 2001. Prepared for Phillips Alaska Inc. 25114-217-MBJ-001. January 2002.
- 1998. Alpine Development Overland Pipeline PI-03 to PI-40 Plan and Profile Drawings. November 1998.

## ALPINE PIPELINE HYDROLOGY MONITORING

## Appendix A MONITORING LOCATION PHOTOGRAPHS

## A.1 HDD WEST



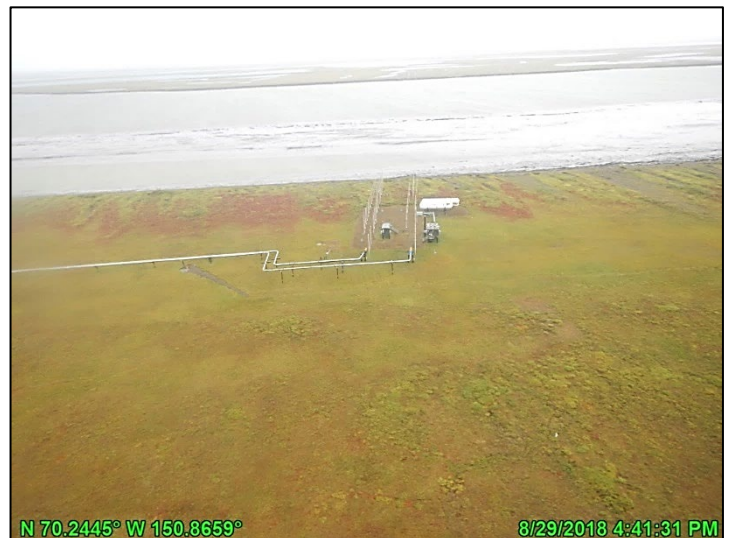
**Photo A.1: HDD West pre-breakup, looking north (downstream); May 22, 2018**



**Photo A.2: HDD West during spring breakup, looking north; June 2, 2018**



**Photo A.3: HDD West during spring breakup, looking northeast; June 8, 2018**



**Photo A.4: HDD West after spring breakup, looking east; August 29, 2018**



# ALPINE PIPELINE HYDROLOGY MONITORING



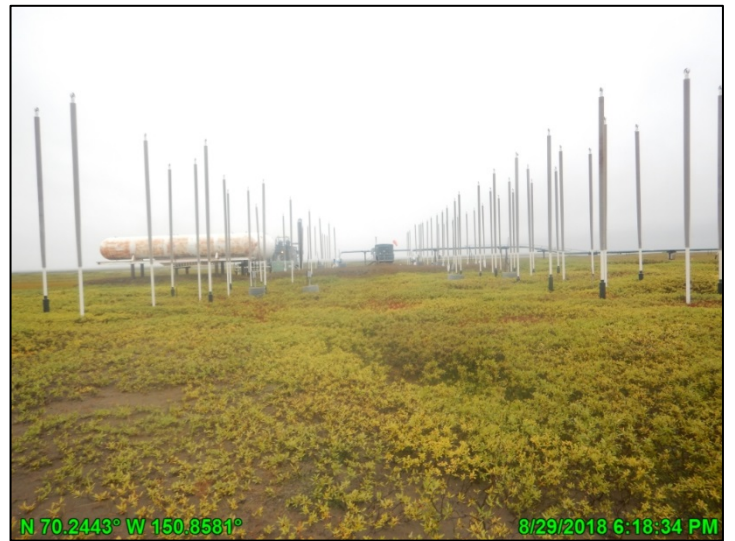
**Photo A.5: HDD West after spring breakup, looking north; August 29, 2018**



**Photo A.6: HDD West after spring breakup, looking south; August 29, 2018**



**Photo A.7: HDD West gravel pad and north side thermosyphons, looking east; August 29, 2018**



**Photo A.8: HDD West gravel pad and north side thermosyphons, looking west; August 29, 2018**

# ALPINE PIPELINE HYDROLOGY MONITORING

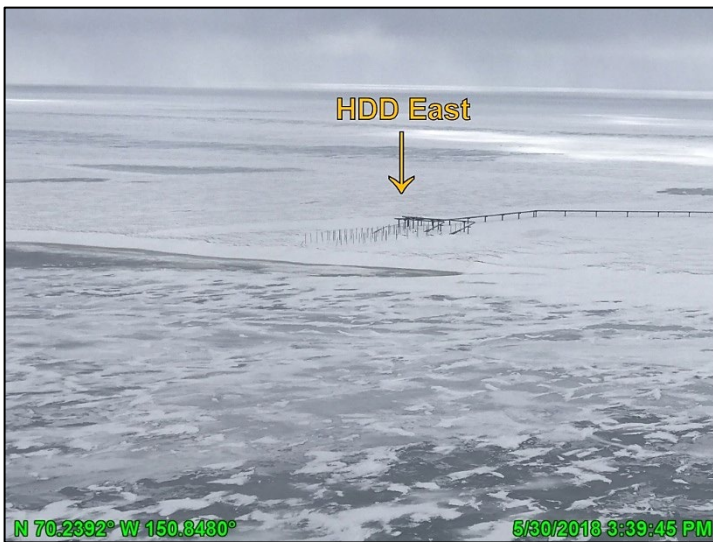


**Photo A.9: HDD West bank, looking south (downstream); August 29, 2018**



**Photo A.10: HDD West bank, looking north (downstream); August 29, 2018**

## A.2 HDD EAST

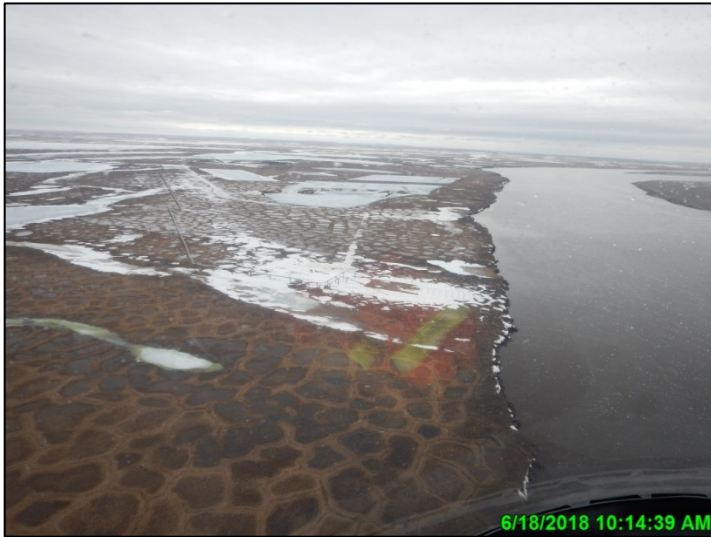


**Photo A.11: HDD East pre-breakup, looking northeast; May 30, 2018**



**Photo A.12: HDD East pre-breakup, looking south; June 1, 2018**

## ALPINE PIPELINE HYDROLOGY MONITORING



**Photo A.13: HDD East during spring breakup, looking south (upstream); June 18, 2018**



**Photo A.14: HDD East after spring breakup, looking north; August 29, 2018**



**Photo A.15: HDD East after spring breakup, looking northeast; August 29, 2018**



**Photo A.16: HDD East after spring breakup, looking southeast; August 29, 2018**

## ALPINE PIPELINE HYDROLOGY MONITORING



**Photo A.17: HDD East gravel pad and north side thermosyphons, looking west; August 29, 2018**



**Photo A.18: HDD East gravel pad and south side thermosyphons, looking west; August 29, 2018**



**Photo A.19: HDD East bank, looking south (upstream); August 29, 2018**



**Photo A.20: HDD East bank, looking north (downstream); August 29, 2018**

# ALPINE PIPELINE HYDROLOGY MONITORING

## A.3 KACHEMACH RIVER



**Photo A.21: Kachemach River during spring breakup, looking northwest; June 9, 2018**



**Photo A.22: Kachemach River during spring breakup, looking southwest; June 9, 2018**



**Photo A.23: Kachemach River after spring breakup, looking north; August 29, 2018**



**Photo A.24: Kachemach River after spring breakup, looking northeast; August 29, 2018**

## ALPINE PIPELINE HYDROLOGY MONITORING



**Photo A.25: Kachemach River after spring breakup, looking south; August 29, 2018**



**Photo A.26 Kachemach River after spring breakup, looking southeast; August 29, 2018**



**Photo A.27: Kachemach River east bank, looking north (downstream); August 29, 2018**

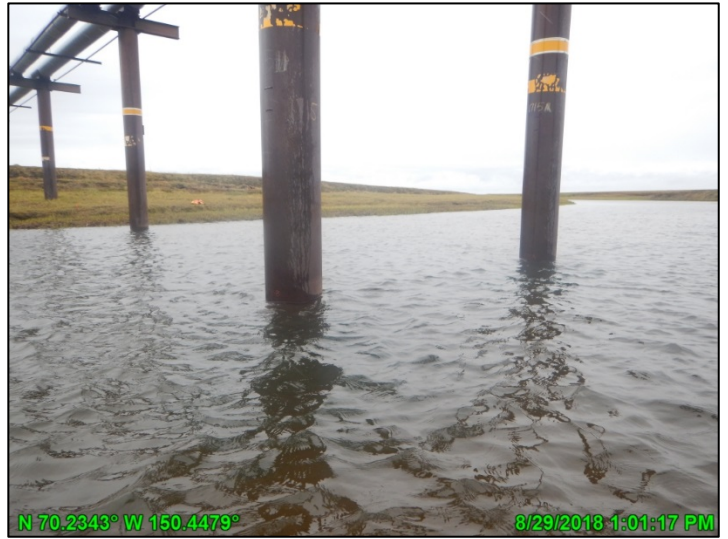


**Photo A.28: Kachemach River west bank, looking north (downstream); August 29, 2018**

# ALPINE PIPELINE HYDROLOGY MONITORING



**Photo A.29: Kachemach River VSM ground depression measurement; August 29, 2018**



**Photo A.30: Kachemach River looking northwest; August 29, 2018**

## A.4 MILUVEACH RIVER



**Photo A.31: Miluveach River during spring breakup, looking northwest; June 9, 2018**

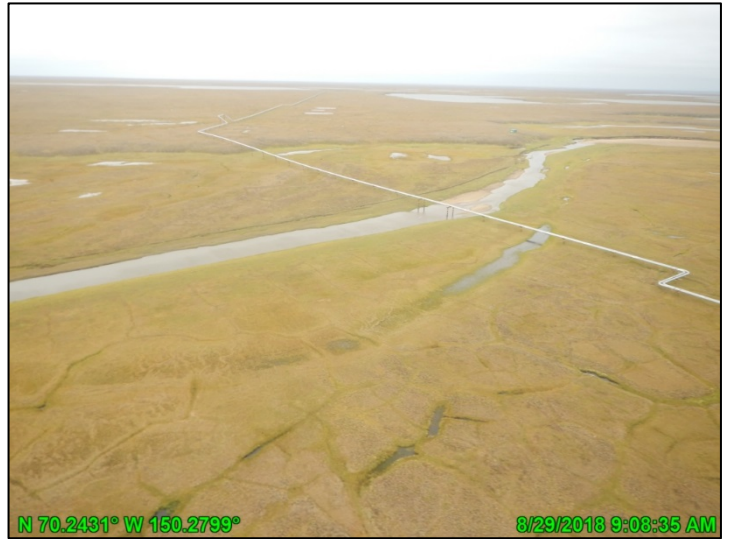


**Photo A.32: Miluveach River during spring breakup, looking downstream; June 15, 2018**

# ALPINE PIPELINE HYDROLOGY MONITORING



**Photo A.33: Miluveach River during spring breakup, looking northwest; June 15, 2018**



**Photo A.34: Miluveach River after spring breakup, looking northwest; August 29, 2018**



**Photo A.35: Miluveach River after spring breakup, looking southeast; August 29, 2018**



**Photo A.36: Miluveach River after spring breakup, looking southwest; August 29, 2018**



# ALPINE PIPELINE HYDROLOGY MONITORING



**Photo A.37: Miluveach River west bank, looking south; August 29, 2018**



**Photo A.38: Miluveach River east bank, looking northwest; August 29, 2018**

# ALPINE PIPELINE HYDROLOGY MONITORING

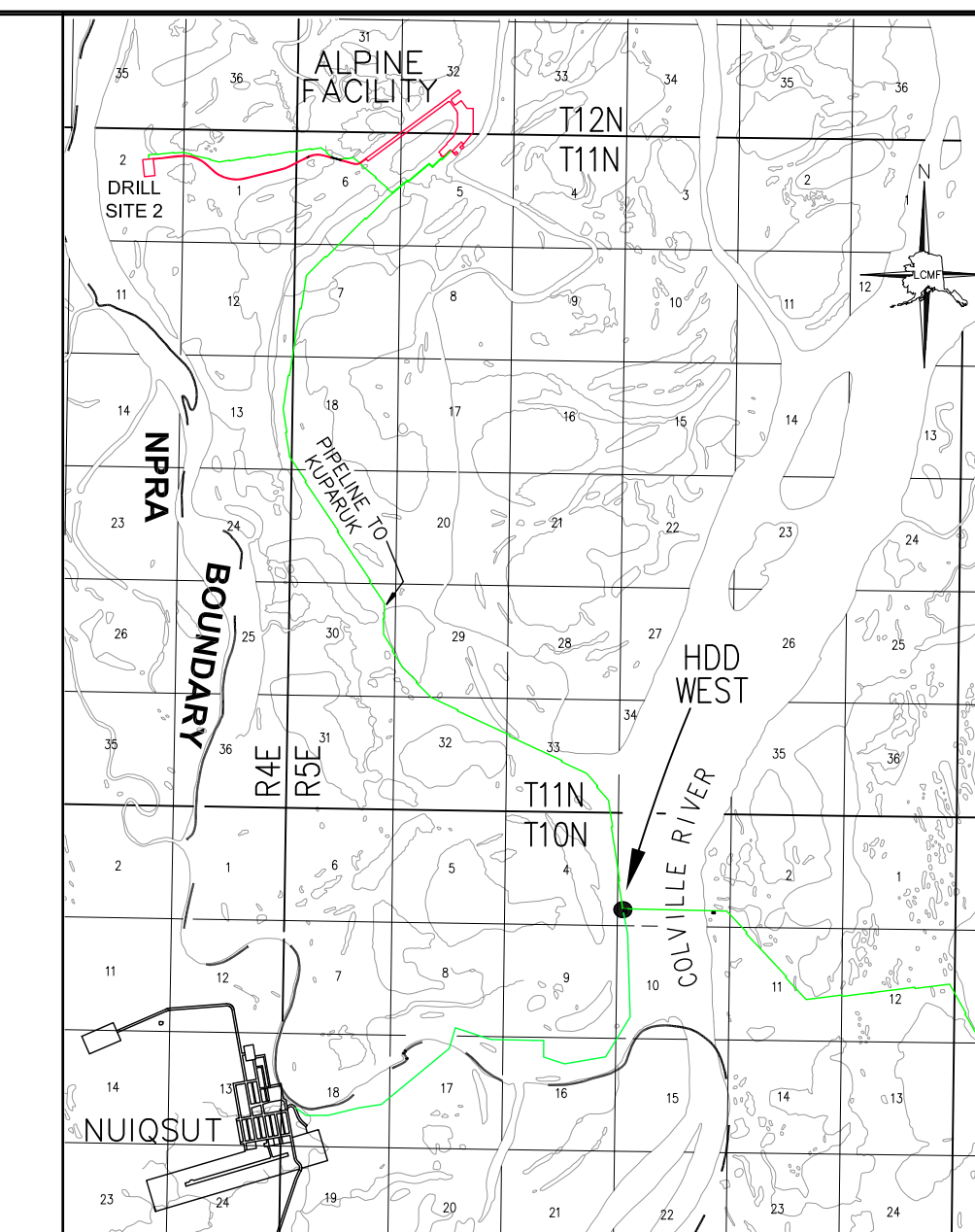
## Appendix B HDD WEST BANK EROSION AND FOUNDATION SETTLEMENT & JACKING SURVEY

### B.1 BANK EROSION

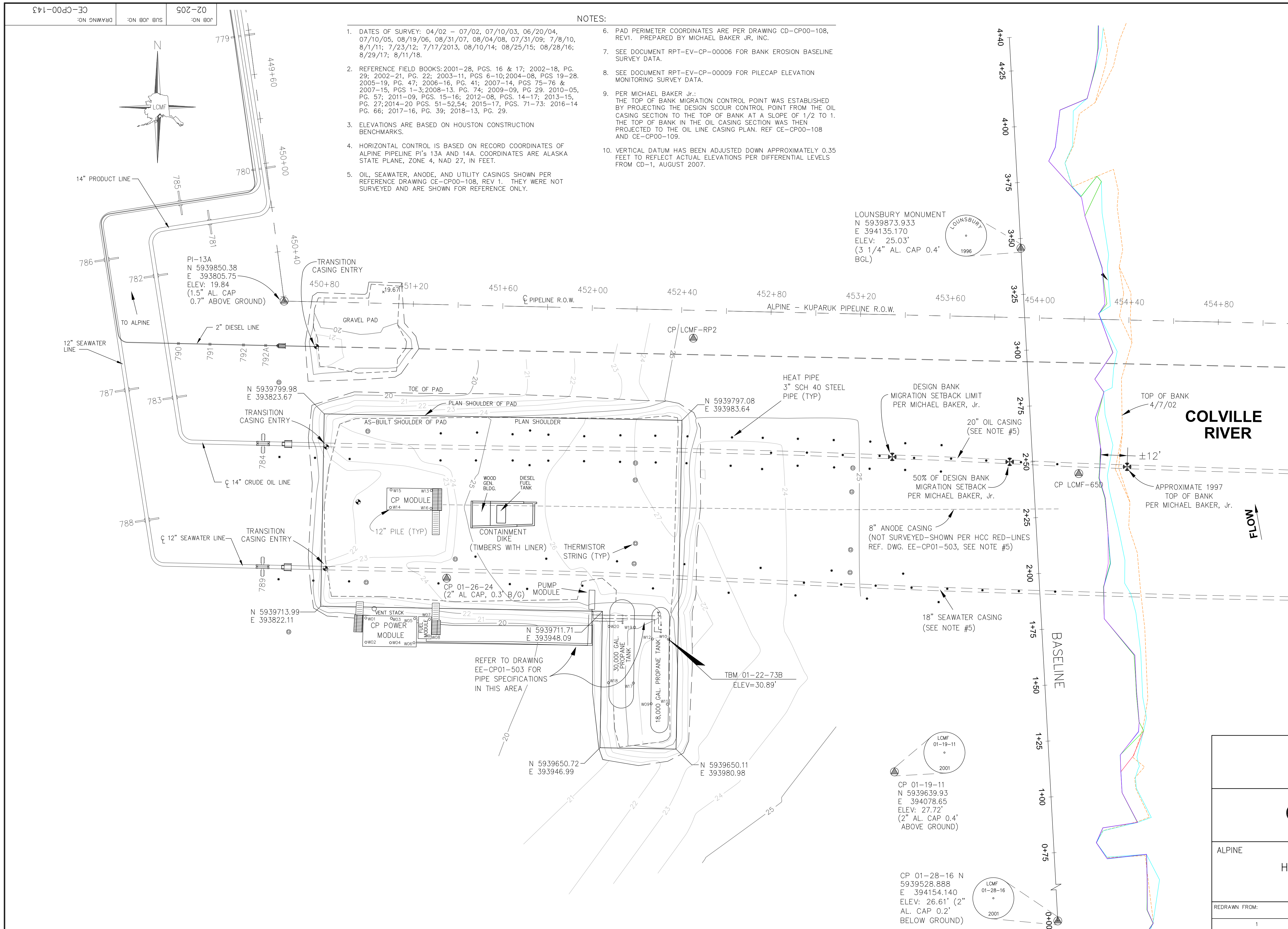
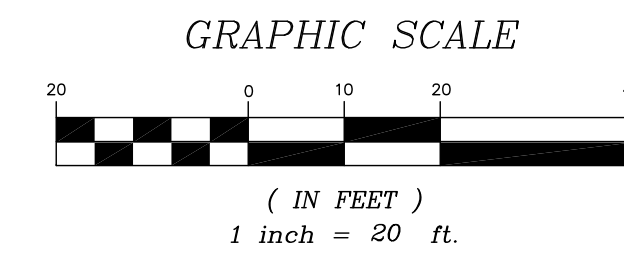
NOTES:

- DATES OF SURVEY: 04/02 - 07/02, 07/10/03, 06/20/04, 07/10/05, 08/19/06, 08/31/07, 08/04/08, 07/31/09, 7/8/10, 8/1/11, 7/23/12, 7/17/2013, 08/10/14, 08/25/15, 08/28/16, 8/29/17, 8/11/18.
- REFERENCE FIELD BOOKS: 2001-28, PGS. 16 & 17; 2002-18, PG. 29; 2002-21, PG. 22; 2003-11, PGS 6-10; 2004-08, PGS 19-28, 2005-19, PG. 47; 2006-16, PG. 41; 2007-14, PGS 75-76 & 2007-15, PGS 1-3, 2008-13, PG. 74; 2009-09, PG. 29; 2010-05, PG. 57; 2011-09, PGS. 15-16; 2012-08, PGS. 14-17; 2013-15, PG. 27; 2014-20 PGS. 51-52, 54; 2015-17, PGS. 71-73; 2016-14 PG. 66; 2017-16, PG. 39; 2018-13, PG. 29.
- ELEVATIONS ARE BASED ON HOUSTON CONSTRUCTION BENCHMARKS.
- 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.
- 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.
- PAD PERIMETER COORDINATES ARE PER DRAWING CD-CP00-108, REV1. PREPARED BY MICHAEL BAKER JR, INC.
- SEE DOCUMENT RPT-EV-CP-00006 FOR BANK EROSION BASELINE SURVEY DATA.
- SEE DOCUMENT RPT-EV-CP-00009 FOR PILECAP ELEVATION MONITORING SURVEY DATA.
- 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.
- VERTICAL DATUM HAS BEEN ADJUSTED DOWN APPROXIMATELY 0.35 FEET TO REFLECT ACTUAL ELEVATIONS PER DIFFERENTIAL LEVELS FROM CD-1, AUGUST 2007.

LOUNSBURY MONUMENT  
 N 5939873.933  
 E 394135.170  
 ELEV: 25.03'  
 (3 1/4" AL. CAP 0.4' BGL)



- 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 7/8/02
  - TOP OF BANK 8/10/14
  - TOP OF BANK 8/25/15
  - TOP OF BANK 8/28/16
  - TOP OF BANK 8/29/17
  - TOP OF BANK 8/11/18



**KUUKPIK LCMF LLC**  
 615 E. 52nd Ave., Anchorage, Alaska 99518 (907) 775-1500  
 Alpine Survey Office

**ConocoPhillips**  
 Alaska, Inc.

ALPINE MODULE: CP00 UNIT: CP  
 HDD BANK EROSION MONITORING  
 HDD SITE - WEST  
 ALPINE FACILITY

DATE: 11/5/02	DRAWN: CZ	DESIGN: JZ	ECM NO: 1870227ACS
SCALE: 1"=20'	CHECKED: ML	APPROVAL: ML	CC NO:
JOB NO: 02-205	SUB JOB NO:	DRAWING NO: CE-CP00-143	CADD FILE NO: 01-12-05-1WEST
REV: 17	CONSTRUCTION SHEET OF 6	PART: 1 of 1	REV: 17

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP	REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
12	7/17/13	UPDATED PER 9670829ACS	CZ	DB				6	8/31/07	UPDATED PER 4810351ACS	CZ	DB			
11	7/23/12	UPDATED PER 9101901ACS	AG	DB				17	8/12/18	UPDATED PER 22572487ACS	RR	CZ			
10	8/3/11	UPDATED PER 8292382ACS	AG	DB				16	8/31/17	UPDATED PER 22259977ACS	CZ	GD			
9	7/10/10	UPDATED PER 7224503ACS	CZ	GD				15	9/05/16	UPDATED PER 21654942ACS	CZ	DB			
8	7/31/09	UPDATED PER 6370813ACS	AG	DB				14	9/01/15	UPDATED PER 20967693ACS	CZ	DB			
7	8/7/08	UPDATED PER 5538034ACS	CZ	GD				13	08/11/14	ISSUED PER 20306694ACS	TB	DB			

**Alpine CP 00**  
**HDD West Site**  
**Streambank Monitor**

Baseline Station	Streambank Monitor - Top of Bank Locations																		Description	
	See Drawing CE-CP00-143 Rev 17 for Survey Baseline Location																			
	4/7/2002	7/8/2002	7/10/2003	6/20/2004	7/10/2005	8/19/2006	8/31/2007	8/5/2008	7/31/2009	7/8/2010	8/1/2011	7/23/2012	7/17/2013	8/10/2014	8/26/2015	8/28/2016	8/29/2017	8/21/2018	Date	
<b>0+00</b>	39.5	39.5	39.5	39.5	39.3	39.3	39.3	39.3	39.4	39.3	39.4	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	Baseline Offset (In Feet)
		0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.1	-0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-0.3	-0.2	-0.2	-0.2	-0.1	-0.2	-0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Cumulative Change
<b>0+05</b>	39.3	39.3	39.3	39.3	37.6	37.6	37.6	37.6	37.7	37.6	37.7	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8	Baseline Offset (In Feet)
		0.0	0.0	0.0	-1.7	0.0	0.0	0.0	0.1	-0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-1.7	-1.7	-1.7	-1.7	-1.6	-1.7	-1.6	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	Cumulative Change
<b>0+10</b>	39.4	39.4	39.4	39.4	38.5	38.5	38.5	38.5	38.7	38.5	38.7	38.8	38.8	38.8	36.5	36.5	36.5	36.5	36.5	Baseline Offset (In Feet)
		0.0	0.0	0.0	-0.9	0.0	0.0	0.0	0.2	-0.2	0.2	0.1	0.0	0.0	-2.3	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-0.9	-0.9	-0.9	-0.9	-0.7	-0.9	-0.6	-0.5	-0.5	-0.5	-2.9	-2.9	-2.9	-2.9	-2.9	Cumulative Change
<b>0+20</b>	45.8	45.8	45.8	45.8	41.9	41.9	41.9	41.9	39.9	39.9	39.8	40.1	40.1	40.1	34.9	34.9	34.9	34.9	34.9	Baseline Offset (In Feet)
		0.0	0.0	0.0	-3.8	0.0	0.0	0.0	-2.0	0.0	-0.1	0.4	0.0	0.0	-5.2	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-3.8	-3.9	-3.9	-3.9	-5.9	-5.9	-6.0	-5.6	-5.6	-5.6	-10.9	-10.9	-10.9	-10.9	-10.9	Cumulative Change
<b>0+25</b>	41.5	41.5	41.5	41.5	39.1	39.1	39.1	39.1	37.6	37.6	37.6	37.9	37.9	37.9	33.8	33.8	33.8	33.8	33.8	Baseline Offset (In Feet)
		0.0	0.0	0.0	-2.4	0.0	0.0	0.0	-1.5	0.0	0.0	0.3	0.0	0.0	-4.1	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-2.4	-2.4	-2.4	-2.4	-3.9	-3.9	-3.9	-3.7	-3.7	-3.7	-7.7	-7.7	-7.7	-7.7	-7.7	Cumulative Change
<b>0+30</b>	37.7	37.9	37.9	37.9	37.9	37.9	37.9	37.9	37.8	37.9	37.9	38.1	38.1	38.1	34.0	34.0	34.0	34.0	34.0	Baseline Offset (In Feet)
		0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.2	0.0	0.0	-4.1	0.0	0.0	0.0	0.0	Incremental Change
		0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.4	0.4	0.4	-3.7	-3.7	-3.7	-3.7	-3.7	Cumulative Change
<b>0+40</b>	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	42.2	41.9	41.6	41.8	41.8	41.8	41.6	41.6	41.6	41.6	41.6	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	-0.3	-0.3	0.2	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	-0.3	-0.1	-0.1	-0.1	-0.3	-0.3	-0.3	-0.3	-0.3	Cumulative Change
<b>0+50</b>	42.0	42.0	42.0	42.0	42.0	42.0	44.5	44.5	44.5	44.0	44.0	44.3	44.3	44.3	40.2	40.2	40.2	40.2	40.2	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	-0.5	0.0	0.3	0.0	0.0	-4.1	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	2.5	2.5	2.5	2.0	1.9	2.3	2.3	2.3	-1.8	-1.8	-1.8	-1.8	-1.8	Cumulative Change
<b>0+60</b>	41.4	41.4	41.4	41.4	41.4	41.4	46.4	46.4	46.3	46.4	46.3	46.3	46.3	46.3	40.8	40.8	40.8	40.8	40.8	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	5.0	0.0	-0.1	0.1	-0.1	0.0	0.0	0.0	-5.5	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	5.0	5.0	4.9	5.0	4.9	4.9	4.9	4.9	-0.6	-0.6	-0.6	-0.6	-0.6	Cumulative Change
<b>0+70</b>	40.7	40.7	40.7	40.7	40.7	40.7	41.9	41.9	41.9	41.9	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	Cumulative Change

**Alpine CP 00**  
**HDD West Site**  
**Streambank Monitor**

Baseline Station	Streambank Monitor - Top of Bank Locations																		Description
	See Drawing CE-CP00-143 Rev 17 for Survey Baseline Location																		
	4/7/2002	7/8/2002	7/10/2003	6/20/2004	7/10/2005	8/19/2006	8/31/2007	8/5/2008	7/31/2009	7/8/2010	8/1/2011	7/23/2012	7/17/2013	8/10/2014	8/26/2015	8/28/2016	8/29/2017	8/21/2018	Date
<b>0+75</b>	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.3	21.4	21.3	21.4	21.4	21.4	21.4	21.4	21.4	21.4	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Cumulative Change
<b>0+80</b>	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.2	20.3	20.3	20.3	20.3	20.3	20.3	20.3	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Cumulative Change
<b>0+85</b>	29.0	29.0	29.0	29.0	29.0	29.0	29.7	29.7	30.3	29.7	30.3	30.7	30.7	30.1	30.1	30.1	30.1	30.1	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.6	-0.6	0.6	0.4	0.0	-0.6	0.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.7	0.7	1.3	0.7	1.3	1.7	1.7	1.1	1.1	1.1	1.1	1.1	Cumulative Change
<b>0+90</b>	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8	43.3	42.8	43.4	43.6	43.6	43.6	36.4	36.4	36.4	36.4	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	-0.5	0.6	0.2	0.0	0.0	-7.2	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.8	0.8	0.8	-6.4	-6.4	-6.4	-6.4	Cumulative Change
<b>1+00</b>	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.9	38.7	39.0	39.1	39.1	39.1	31.9	31.9	31.9	31.9	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-0.2	0.3	0.1	0.0	0.0	-7.2	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.4	0.4	0.4	-6.8	-6.8	-6.8	-6.8	Cumulative Change
<b>1+05</b>	37.9	37.9	37.9	37.9	37.9	37.9	37.9	37.9	37.8	37.9	38.0	38.2	38.2	38.2	31.8	31.8	31.8	31.8	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.2	0.0	0.0	-6.4	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.3	0.3	0.3	-6.1	-6.1	-6.1	-6.1	Cumulative Change
<b>1+10</b>	41.4	41.4	41.4	41.4	39.2	39.2	39.2	39.2	39.2	39.2	39.2	39.4	39.4	39.4	32.2	31.8	31.8	31.8	Baseline Offset (In Feet)
		0.0	0.0	0.0	-2.2	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	-7.2	-0.4	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.0	-2.0	-2.0	-9.2	-9.6	-9.6	-9.6	Cumulative Change
<b>1+15</b>	38.2	38.2	38.2	38.2	38.2	38.2	39.9	39.9	39.9	39.1	39.3	39.5	39.5	39.5	36.6	31.9	31.9	31.9	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	-0.8	0.1	0.2	0.0	0.0	-2.9	-4.7	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	1.7	1.7	1.7	0.9	1.0	1.3	1.3	1.3	-1.6	-6.3	-6.3	-6.3	Cumulative Change
<b>1+20</b>	39.4	39.4	39.4	39.4	39.4	39.4	40.4	40.4	40.4	40.4	40.5	40.7	40.7	40.7	40.7	35.2	34.5	34.5	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	-5.5	-0.7	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.1	1.3	1.3	1.3	1.3	-4.2	-4.9	-4.9	Cumulative Change
<b>1+25</b>	41.4	41.4	41.4	41.4	41.4	41.4	41.4	41.4	42.1	41.4	42.1	42.3	42.3	42.3	42.3	40.6	39.0	39.0	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	-0.7	0.7	0.2	0.0	0.0	0.0	-1.7	-1.6	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7	0.9	0.9	0.9	0.9	-0.8	-2.4	-2.4	Cumulative Change

**Alpine CP 00**  
**HDD West Site**  
**Streambank Monitor**

Baseline Station	Streambank Monitor - Top of Bank Locations																	Description	
	See Drawing CE-CP00-143 Rev 17 for Survey Baseline Location																		
	4/7/2002	7/8/2002	7/10/2003	6/20/2004	7/10/2005	8/19/2006	8/31/2007	8/5/2008	7/31/2009	7/8/2010	8/1/2011	7/23/2012	7/17/2013	8/10/2014	8/26/2015	8/28/2016	8/29/2017	8/21/2018	Date
<b>1+30</b>	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.5	43.0	43.6	43.8	43.8	43.8	41.7	41.7	41.0	41.0	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	-0.5	0.6	0.2	0.0	0.0	-2.1	0.0	-0.7	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.8	0.8	0.8	-1.3	-1.3	-2.0	-2.0	Cumulative Change
<b>1+35</b>	44.2	44.2	44.2	44.2	43.8	43.8	43.8	43.8	44.1	43.8	44.1	44.3	44.3	44.3	40.7	40.7	41.1	41.1	Baseline Offset (In Feet)
		0.0	0.0	0.0	-0.4	0.0	0.0	0.0	0.3	-0.3	0.3	0.2	0.0	0.0	-3.6	0.0	0.4	0.0	Incremental Change
		0.0	0.0	0.0	-0.4	-0.4	-0.4	-0.4	-0.1	-0.4	-0.1	0.1	0.1	0.1	-3.5	-3.5	-3.1	-3.1	Cumulative Change
<b>1+40</b>	45.3	45.3	45.3	45.3	43.4	43.4	43.4	43.4	43.4	43.4	43.5	43.7	43.7	43.7	40.7	40.7	41.0	41.0	Baseline Offset (In Feet)
		0.0	0.0	0.0	-1.9	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	-3.0	0.0	0.3	0.0	Incremental Change
		0.0	0.0	0.0	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.8	-1.6	-1.6	-1.6	-4.6	-4.6	-4.3	-4.3	Cumulative Change
<b>1+45</b>	45.7	45.7	45.7	45.7	43.4	43.4	43.4	43.4	43.4	43.4	43.3	43.4	43.4	43.4	40.7	40.7	40.8	40.8	Baseline Offset (In Feet)
		0.0	0.0	0.0	-2.3	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	-2.7	0.0	0.1	0.0	Incremental Change
		0.0	0.0	0.0	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.4	-2.3	-2.3	-2.3	-5.0	-5.0	-4.9	-4.9	Cumulative Change
<b>1+50</b>	45.7	45.7	45.7	45.7	43.9	43.9	43.9	43.9	44.1	43.9	43.4	43.5	43.5	43.5	40.7	40.7	40.7	40.7	Baseline Offset (In Feet)
		0.0	0.0	0.0	-1.8	0.0	0.0	0.0	0.2	-0.2	-0.5	0.1	0.0	0.0	-2.8	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-1.8	-1.8	-1.8	-1.8	-1.6	-1.8	-2.3	-2.2	-2.2	-2.2	-5.0	-5.0	-5.0	-5.0	Cumulative Change
<b>1+60</b>	45.8	45.8	45.8	44.9	44.2	44.3	44.3	44.3	44.2	43.7	43.8	43.6	43.6	43.6	40.6	40.6	40.6	40.6	Baseline Offset (In Feet)
		0.0	0.0	-1.0	-0.6	0.0	0.0	0.0	-0.1	-0.5	0.0	-0.1	0.0	0.0	-3.0	0.0	0.0	0.0	Incremental Change
		0.0	0.0	-1.0	-1.6	-1.6	-1.5	-1.5	-1.6	-2.1	-2.1	-2.2	-2.2	-2.2	-5.2	-5.2	-5.2	-5.2	Cumulative Change
<b>1+65</b>	45.9	45.9	45.9	45.0	44.3	44.4	44.4	44.4	44.2	43.8	43.6	43.5	43.5	43.5	37.8	37.8	37.8	37.8	Baseline Offset (In Feet)
		0.0	0.0	-0.9	-0.7	0.1	0.0	0.0	-0.2	-0.4	-0.2	-0.1	0.0	0.0	-5.7	0.0	0.0	0.0	Incremental Change
		0.0	0.0	-0.9	-1.6	-1.5	-1.5	-1.5	-1.7	-2.1	-2.3	-2.4	-2.4	-2.4	-8.1	-8.1	-8.1	-8.1	Cumulative Change
<b>1+75</b>	45.9	45.9	45.9	45.9	44.4	44.4	44.4	44.4	44.4	44.3	42.7	42.8	42.8	42.8	30.5	30.5	30.5	30.5	Baseline Offset (In Feet)
		0.0	0.0	0.0	-1.5	0.0	0.0	0.0	0.0	-0.1	-1.6	0.1	0.0	0.0	-12.3	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-1.5	-1.5	-1.5	-1.5	-1.5	-1.6	-3.2	-3.1	-3.1	-3.1	-15.4	-15.4	-15.4	-15.4	Cumulative Change
<b>1+90</b>	45.0	45.0	44.1	44.1	44.1	44.1	44.1	44.1	44.2	40.9	40.1	40.0	40.0	40.0	28.5	28.5	28.5	28.5	Baseline Offset (In Feet)
		0.0	-0.9	0.0	0.0	0.0	0.0	0.0	0.1	-3.3	-0.8	-0.1	0.0	0.0	-11.5	0.0	0.0	0.0	Incremental Change
		0.0	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9	-0.8	-4.1	-4.9	-5.1	-5.1	-5.1	-16.5	-16.5	-16.5	-16.5	Cumulative Change
<b>1+95</b>	44.9	44.9	42.8	42.8	42.8	42.8	42.8	42.8	42.8	37.8	38.0	38.2	38.2	38.2	29.5	29.5	29.5	29.4	Baseline Offset (In Feet)
		0.0	-2.1	0.0	0.0	0.0	0.0	0.0	0.0	-5.0	0.2	0.3	0.0	0.0	-8.7	0.0	0.0	-0.1	Incremental Change
		0.0	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-7.1	-6.9	-6.7	-6.7	-6.7	-15.4	-15.4	-15.4	-15.5	Cumulative Change

**Alpine CP 00**  
**HDD West Site**  
**Streambank Monitor**

Baseline Station	Streambank Monitor - Top of Bank Locations																	Description	
	See Drawing CE-CP00-143 Rev 17 for Survey Baseline Location																		
	4/7/2002	7/8/2002	7/10/2003	6/20/2004	7/10/2005	8/19/2006	8/31/2007	8/5/2008	7/31/2009	7/8/2010	8/1/2011	7/23/2012	7/17/2013	8/10/2014	8/26/2015	8/28/2016	8/29/2017	8/21/2018	Date
<b>2+00</b>	44.7	44.7	41.8	41.8	41.1	40.4	40.4	40.4	40.6	38.1	38.3	38.6	38.6	38.6	31.2	31.2	31.2	30.6	Baseline Offset (In Feet)
		0.0	-2.9	0.0	-0.8	-0.6	0.0	0.0	0.2	-2.5	0.2	0.3	0.0	0.0	-7.4	0.0	0.0	-0.6	Incremental Change
		0.0	-2.9	-2.9	-3.6	-4.3	-4.3	-4.3	-4.1	-6.6	-6.5	-6.1	-6.1	-6.1	-13.5	-13.5	-13.5	-14.1	Cumulative Change
<b>2+05</b>	44.6	44.6	40.4	40.4	39.7	38.4	38.4	38.4	38.3	38.4	38.3	38.6	38.6	38.6	32.1	32.1	32.1	31.4	Baseline Offset (In Feet)
		0.0	-4.2	0.0	-0.7	-1.4	0.0	0.0	-0.1	0.1	-0.1	0.3	0.0	0.0	-6.5	0.0	0.0	-0.7	Incremental Change
		0.0	-4.2	-4.2	-4.8	-6.2	-6.2	-6.2	-6.3	-6.2	-6.2	-5.9	-5.9	-5.9	-12.5	-12.5	-12.5	-13.2	Cumulative Change
<b>2+10</b>	43.7	43.7	40.4	40.2	40.2	38.3	38.3	38.3	38.1	38.3	37.6	37.9	37.9	37.9	32.0	32.0	32.0	31.6	Baseline Offset (In Feet)
		0.0	-3.2	-0.3	0.0	-1.9	0.0	0.0	-0.2	0.2	-0.7	0.3	0.0	0.0	-5.9	0.0	0.0	-0.4	Incremental Change
		0.0	-3.2	-3.5	-3.5	-5.4	-5.4	-5.4	-5.6	-5.4	-6.0	-5.8	-5.8	-5.8	-11.7	-11.7	-11.7	-12.1	Cumulative Change
<b>2+20</b>	41.5	41.5	41.5	40.6	40.6	37.5	37.5	37.5	37.2	37.5	36.1	36.3	36.3	36.3	31.8	31.8	31.8	31.8	Baseline Offset (In Feet)
		0.0	0.0	-0.9	0.0	-3.1	0.0	0.0	-0.3	0.3	-1.4	0.2	0.0	0.0	-4.5	0.0	0.0	0.0	Incremental Change
		0.0	0.0	-0.9	-0.9	-3.9	-4.0	-4.0	-4.3	-4.0	-5.4	-5.2	-5.2	-5.2	-9.7	-9.7	-9.7	-9.7	Cumulative Change
<b>2+25</b>	42.0	42.0	42.0	40.7	40.7	35.9	35.9	35.9	35.7	35.9	35.1	35.2	35.2	35.2	31.6	31.6	31.6	31.6	Baseline Offset (In Feet)
		0.0	0.0	-1.3	0.0	-4.8	0.0	0.0	-0.2	0.2	-0.8	0.1	0.0	0.0	-3.6	0.0	0.0	0.0	Incremental Change
		0.0	0.0	-1.3	-1.3	-6.1	-6.1	-6.1	-6.3	-6.1	-6.9	-6.8	-6.8	-6.8	-10.4	-10.4	-10.4	-10.4	Cumulative Change
<b>2+30</b>	42.4	42.3	42.2	40.9	40.9	34.2	34.2	34.2	34.2	34.2	34.1	34.2	34.2	34.2	31.5	31.5	31.5	31.5	Baseline Offset (In Feet)
		0.0	-0.1	-1.4	0.0	-6.6	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-2.7	0.0	0.0	0.0	Incremental Change
		0.0	-0.1	-1.5	-1.5	-8.1	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-10.9	-10.9	-10.9	-10.9	Cumulative Change
<b>2+35</b>	41.0	40.4	40.4	40.4	40.4	33.1	33.1	33.1	33.1	33.1	33.1	33.3	33.3	33.3	30.7	30.7	30.7	30.7	Baseline Offset (In Feet)
		-0.6	0.0	0.0	0.0	-7.3	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	-2.6	0.0	0.0	0.0	Incremental Change
		-0.6	-0.6	-0.6	-0.6	-7.9	-7.9	-7.9	-7.9	-7.9	-7.9	-7.7	-7.7	-7.7	-10.3	-10.3	-10.3	-10.3	Cumulative Change
<b>2+45</b>	38.3	36.8	36.8	36.8	36.8	32.7	32.7	32.7	32.7	32.7	33.3	33.5	33.5	33.5	29.7	29.7	29.7	29.7	Baseline Offset (In Feet)
		-1.5	0.0	0.0	0.0	-4.1	0.0	0.0	0.0	0.0	0.6	0.2	0.0	0.0	-3.8	0.0	0.0	0.0	Incremental Change
		-1.5	-1.5	-1.5	-1.5	-5.6	-5.6	-5.6	-5.6	-5.6	-5.0	-4.8	-4.8	-4.8	-8.6	-8.6	-8.6	-8.6	Cumulative Change
<b>2+50</b>	39.0	38.1	37.8	37.5	37.1	34.3	34.3	34.3	34.3	34.3	34.7	34.8	34.8	34.8	30.3	30.3	30.3	30.3	Baseline Offset (In Feet)
		-1.0	-0.3	-0.3	-0.4	-2.8	0.0	0.0	0.0	0.0	0.4	0.1	0.0	0.0	-4.5	0.0	0.0	0.0	Incremental Change
		-1.0	-1.2	-1.5	-1.9	-4.7	-4.7	-4.7	-4.7	-4.7	-4.4	-4.2	-4.2	-4.2	-8.7	-8.7	-8.7	-8.7	Cumulative Change
<b>2+55</b>	39.9	39.3	38.2	38.2	37.4	35.9	35.9	35.9	35.9	35.9	36.0	36.0	36.0	36.0	30.7	30.7	30.6	30.6	Baseline Offset (In Feet)
		-0.5	-1.1	0.0	-0.8	-1.5	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-5.3	0.0	-0.1	0.0	Incremental Change
		-0.5	-1.6	-1.6	-2.4	-4.0	-4.0	-4.0	-4.0	-4.0	-3.8	-3.9	-3.9	-3.9	-9.2	-9.2	-9.3	-9.3	Cumulative Change

**Alpine CP 00**  
**HDD West Site**  
**Streambank Monitor**

Baseline Station	Streambank Monitor - Top of Bank Locations																	Description	
	See Drawing CE-CP00-143 Rev 17 for Survey Baseline Location																		
	4/7/2002	7/8/2002	7/10/2003	6/20/2004	7/10/2005	8/19/2006	8/31/2007	8/5/2008	7/31/2009	7/8/2010	8/1/2011	7/23/2012	7/17/2013	8/10/2014	8/26/2015	8/28/2016	8/29/2017	8/21/2018	Date
<b>2+60</b>	40.7	40.7	40.7	40.7	38.3	35.1	35.1	35.1	35.2	35.1	35.2	35.3	35.3	35.3	30.4	30.4	30.1	30.1	Baseline Offset (In Feet)
		0.0	0.0	0.0	-2.4	-3.1	0.0	0.0	0.1	-0.1	0.1	0.1	0.0	0.0	-4.9	0.0	-0.3	0.0	Incremental Change
		0.0	0.0	0.0	-2.4	-5.5	-5.6	-5.6	-5.5	-5.6	-5.5	-5.4	-5.4	-5.4	-10.3	-10.3	-10.6	-10.6	Cumulative Change
<b>2+65</b>	40.9	40.9	40.9	40.6	39.2	34.1	34.1	34.1	34.2	34.1	34.2	34.2	34.2	34.2	30.2	30.2	29.5	29.5	Baseline Offset (In Feet)
		0.0	0.0	-0.4	-1.3	-5.1	0.0	0.0	0.1	-0.1	0.1	0.1	0.0	0.0	-4.0	0.0	-0.7	0.0	Incremental Change
		0.0	0.0	-0.4	-1.7	-6.8	-6.8	-6.8	-6.7	-6.8	-6.8	-6.7	-6.7	-6.7	-10.7	-10.7	-11.4	-11.4	Cumulative Change
<b>2+70</b>	41.1	41.1	41.1	40.3	40.3	33.3	33.3	33.3	33.4	33.3	33.3	33.4	33.4	33.4	30.6	30.6	29.9	29.9	Baseline Offset (In Feet)
		0.0	0.0	-0.8	0.0	-7.0	0.0	0.0	0.1	-0.1	0.0	0.1	0.0	0.0	-2.8	0.0	-0.7	0.0	Incremental Change
		0.0	0.0	-0.8	-0.8	-7.8	-7.8	-7.8	-7.7	-7.8	-7.8	-7.7	-7.7	-7.7	-10.5	-10.5	-11.2	-11.2	Cumulative Change
<b>2+75</b>	41.3	41.3	41.3	39.9	39.9	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	32.1	32.1	31.9	31.9	Baseline Offset (In Feet)
		0.0	0.0	-1.4	0.0	-6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	0.0	-0.2	0.0	Incremental Change
		0.0	0.0	-1.4	-1.4	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-9.2	-9.2	-9.4	-9.4	Cumulative Change
<b>2+80</b>	41.5	41.5	41.5	39.4	39.4	34.6	34.6	34.6	34.2	34.6	33.5	34.5	34.5	34.5	33.1	33.1	33.1	33.1	Baseline Offset (In Feet)
		0.0	0.0	-2.2	0.0	-4.8	0.0	0.0	-0.4	0.4	-1.1	0.9	0.0	0.0	-1.4	0.0	0.0	0.0	Incremental Change
		0.0	0.0	-2.2	-2.2	-6.9	-6.9	-6.9	-7.3	-6.9	-8.0	-7.1	-7.1	-7.1	-8.4	-8.4	-8.4	-8.4	Cumulative Change
<b>2+85</b>	41.7	41.7	41.7	39.6	39.6	37.8	37.8	37.8	37.6	37.8	36.1	37.7	37.7	37.7	30.0	30.0	30.0	30.0	Baseline Offset (In Feet)
		0.0	0.0	-2.1	0.0	-1.8	0.0	0.0	-0.2	0.2	-1.7	1.6	0.0	0.0	-7.7	0.0	0.0	0.0	Incremental Change
		0.0	0.0	-2.1	-2.1	-3.9	-3.9	-3.9	-4.1	-3.9	-5.6	-4.0	-4.0	-4.0	-11.7	-11.7	-11.7	-11.7	Cumulative Change
<b>2+90</b>	43.5	43.5	41.5	40.8	40.8	38.5	38.5	38.5	38.5	38.5	38.6	38.5	38.5	38.5	33.3	33.3	33.3	33.3	Baseline Offset (In Feet)
		0.0	-1.9	-0.7	0.0	-2.3	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	-5.2	0.0	0.0	0.0	Incremental Change
		0.0	-1.9	-2.6	-2.6	-5.0	-5.0	-5.0	-5.0	-5.0	-4.9	-5.0	-5.0	-5.0	-10.2	-10.2	-10.2	-10.2	Cumulative Change
<b>3+00</b>	47.0	47.0	46.1	46.1	44.8	41.6	41.6	41.6	41.6	40.5	40.3	39.3	39.3	39.3	37.5	37.5	37.5	37.5	Baseline Offset (In Feet)
		0.0	-0.9	0.0	-1.3	-3.2	0.0	0.0	0.0	-1.1	-0.3	-1.0	0.0	0.0	-1.8	0.0	0.0	0.0	Incremental Change
		0.0	-0.9	-0.9	-2.2	-5.4	-5.4	-5.4	-5.4	-6.5	-6.7	-7.7	-7.7	-7.7	-9.5	-9.5	-9.5	-9.5	Cumulative Change
<b>3+10</b>	47.1	43.6	43.6	43.6	43.6	43.2	43.2	43.2	43.2	39.8	39.2	35.0	35.0	35.0	34.5	34.5	34.5	34.5	Baseline Offset (In Feet)
		-3.5	0.0	0.0	0.0	-0.4	0.0	0.0	0.0	-3.4	-0.6	-4.2	0.0	0.0	-0.5	0.0	0.0	0.0	Incremental Change
		-3.5	-3.5	-3.5	-3.5	-3.8	-3.8	-3.8	-3.8	-7.3	-7.9	-12.1	-12.1	-12.1	-12.6	-12.6	-12.6	-12.6	Cumulative Change
<b>3+15</b>	47.4	42.9	42.9	42.9	42.3	42.9	42.9	42.0	42.0	39.4	38.9	33.5	33.5	33.5	33.5	33.5	33.7	33.7	Baseline Offset (In Feet)
		-4.5	0.0	0.0	-0.6	0.6	0.0	-0.9	0.0	-2.6	-0.5	-5.4	0.0	0.0	0.0	0.0	0.2	0.0	Incremental Change
		-4.5	-4.5	-4.5	-5.2	-4.6	-4.5	-5.4	-5.4	-8.0	-8.5	-13.9	-13.9	-13.9	-13.9	-13.9	-13.7	-13.7	Cumulative Change



**Alpine CP 00**  
**HDD West Site**  
**Streambank Monitor**

Baseline Station	Streambank Monitor - Top of Bank Locations																	Description	
	See Drawing CE-CP00-143 Rev 17 for Survey Baseline Location																		
	4/7/2002	7/8/2002	7/10/2003	6/20/2004	7/10/2005	8/19/2006	8/31/2007	8/5/2008	7/31/2009	7/8/2010	8/1/2011	7/23/2012	7/17/2013	8/10/2014	8/26/2015	8/28/2016	8/29/2017	8/21/2018	Date
<b>3+25</b>	47.3	44.6	44.6	44.4	42.3	38.9	38.9	37.4	37.4	36.9	36.7	38.3	38.3	38.3	36.5	36.5	36.0	36.0	Baseline Offset (In Feet)
		-2.7	0.0	-0.2	-2.1	-3.4	0.0	-1.5	0.0	-0.5	-0.2	1.6	0.0	0.0	-1.8	0.0	-0.5	0.0	Incremental Change
		-2.7	-2.7	-2.9	-5.0	-8.4	-8.4	-9.9	-9.9	-10.4	-10.6	-9.0	-9.0	-9.0	-10.8	-10.8	-11.3	-11.3	Cumulative Change
<b>3+30</b>	45.4	44.0	44.0	43.2	42.7	36.2	36.2	35.4	35.4	35.2	35.1	38.2	38.2	38.2	36.1	36.1	35.9	35.9	Baseline Offset (In Feet)
		-1.4	0.0	-0.9	-0.5	-6.5	0.0	-0.8	0.0	-0.2	-0.1	3.1	0.0	0.0	-2.1	0.0	-0.2	0.0	Incremental Change
		-1.4	-1.4	-2.3	-2.7	-9.2	-9.2	-10.0	-10.0	-10.2	-10.3	-7.2	-7.2	-7.2	-9.3	-9.3	-9.5	-9.5	Cumulative Change
<b>3+35</b>	43.4	43.4	43.4	43.4	42.0	36.4	36.4	35.8	35.8	35.8	35.5	38.2	38.2	38.2	35.7	35.7	35.7	35.7	Baseline Offset (In Feet)
		0.0	0.0	0.0	-1.4	-5.6	0.0	-0.6	0.0	0.0	-0.3	2.6	0.0	0.0	-2.5	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-1.4	-7.0	-7.0	-7.6	-7.6	-7.6	-7.9	-5.3	-5.3	-5.3	-7.7	-7.7	-7.7	-7.7	Cumulative Change
<b>3+40</b>	44.8	44.8	44.0	44.0	41.3	41.1	41.1	40.1	40.1	40.1	38.7	38.9	38.9	38.9	34.3	34.3	34.3	34.3	Baseline Offset (In Feet)
		0.0	-0.8	0.0	-2.6	-0.3	0.0	-1.0	0.0	0.0	-1.4	0.1	0.0	0.0	-4.6	0.0	0.0	0.0	Incremental Change
		0.0	-0.8	-0.8	-3.5	-3.7	-3.7	-4.7	-4.7	-4.7	-6.1	-6.0	-6.0	-6.0	-10.5	-10.5	-10.5	-10.5	Cumulative Change
<b>3+45</b>	45.2	45.2	44.2	44.2	42.8	41.5	41.5	40.7	40.7	40.7	38.8	38.8	38.7	38.7	33.0	33.0	33.0	33.0	Baseline Offset (In Feet)
		0.0	-1.0	0.0	-1.5	-1.3	0.0	-0.8	0.0	0.0	-1.9	0.0	-0.1	0.0	-5.7	0.0	0.0	0.0	Incremental Change
		0.0	-1.0	-1.0	-2.5	-3.7	-3.7	-4.5	-4.5	-4.5	-6.4	-6.4	-6.5	-6.5	-12.2	-12.2	-12.2	-12.2	Cumulative Change
<b>3+50</b>	44.9	44.9	44.2	44.2	42.3	41.4	41.4	40.8	40.8	40.8	38.7	38.7	38.2	38.2	31.7	31.7	31.7	31.7	Baseline Offset (In Feet)
		0.0	-0.6	0.0	-1.9	-0.9	0.0	-0.6	0.0	0.0	-2.1	0.0	-0.5	0.0	-6.5	0.0	0.0	0.0	Incremental Change
		0.0	-0.7	-0.7	-2.6	-3.5	-3.5	-4.1	-4.1	-4.1	-6.2	-6.2	-6.7	-6.7	-13.2	-13.2	-13.2	-13.2	Cumulative Change
<b>3+60</b>	44.1	44.1	44.1	44.1	43.4	41.4	41.4	41.4	41.0	41.4	38.4	38.4	37.3	37.3	30.2	30.2	30.2	30.2	Baseline Offset (In Feet)
		0.0	0.0	0.0	-0.7	-2.0	0.0	0.0	-0.4	0.4	-3.0	0.0	-1.1	0.0	-7.1	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-0.7	-2.7	-2.7	-2.7	-3.1	-2.7	-5.7	-5.7	-6.8	-6.8	-13.9	-13.9	-13.9	-13.9	Cumulative Change
<b>3+70</b>	44.7	44.7	42.8	41.8	41.0	26.0	26.0	26.0	26.0	26.0	26.2	26.0	26.0	26.0	26.0	26.0	26.0	26.0	Baseline Offset (In Feet)
		0.0	-1.9	-1.1	-0.8	-15.0	0.0	0.0	0.0	0.0	0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
		0.0	-1.9	-2.9	-3.7	-18.7	-18.7	-18.7	-18.7	-18.7	-18.6	-18.7	-18.7	-18.7	-18.7	-18.7	-18.7	-18.7	Cumulative Change
<b>3+75</b>	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.8	23.6	23.6	23.6	21.7	21.7	21.7	21.7	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-0.2	0.0	0.0	-1.9	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	-1.9	-1.9	-1.9	-1.9	Cumulative Change
<b>3+85</b>	23.1	23.1	23.1	23.1	23.1	23.0	23.0	23.0	23.1	23.0	23.0	23.0	23.0	23.0	15.2	15.2	15.2	15.2	Baseline Offset (In Feet)
		0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	-7.8	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-7.9	-7.9	-7.9	-7.9	Cumulative Change

**Alpine CP 00**  
**HDD West Site**  
**Streambank Monitor**

Baseline Station	Streambank Monitor - Top of Bank Locations																		Description
	See Drawing CE-CP00-143 Rev 17 for Survey Baseline Location																		
	4/7/2002	7/8/2002	7/10/2003	6/20/2004	7/10/2005	8/19/2006	8/31/2007	8/5/2008	7/31/2009	7/8/2010	8/1/2011	7/23/2012	7/17/2013	8/10/2014	8/26/2015	8/28/2016	8/29/2017	8/21/2018	Date
<b>4+00</b>	28.4	28.4	28.4	28.4	26.5	26.5	26.5	26.5	26.4	26.5	26.3	26.4	26.4	26.4	19.7	19.7	19.7	19.7	Baseline Offset (In Feet)
		0.0	0.0	0.0	-1.8	0.0	0.0	0.0	-0.1	0.1	-0.2	0.1	0.0	0.0	-6.7	0.0	0.0	0.0	Incremental Change
		0.0	0.0	0.0	-1.9	-1.9	-1.9	-1.9	-2.0	-1.9	-2.1	-2.0	-2.0	-2.0	-8.7	-8.7	-8.7	-8.7	Cumulative Change
<b>4+10</b>	37.4	37.1	37.1	37.1	33.0	33.0	33.0	33.0	34.0	34.0	32.2	32.1	32.1	32.1	30.8	30.8	30.8	30.8	Baseline Offset (In Feet)
		-0.3	0.0	0.0	-4.1	0.0	0.0	0.0	1.0	0.0	-1.8	-0.1	0.0	0.0	-1.3	0.0	0.0	0.0	Incremental Change
		-0.3	-0.3	-0.3	-4.4	-4.4	-4.4	-4.4	-3.4	-3.4	-5.2	-5.3	-5.3	-5.3	-6.6	-6.6	-6.6	-6.6	Cumulative Change
<b>4+25</b>	45.9	42.2	42.2	42.2	40.4	40.3	40.2	40.0	40.0	40.0	38.1	38.0	38.0	38.0	37.8	37.8	37.6	37.6	Baseline Offset (In Feet)
		-3.7	0.0	0.0	-1.9	0.0	-0.1	-0.2	0.0	0.0	-1.9	-0.1	0.0	0.0	-0.2	0.0	-0.2	0.0	Incremental Change
		-3.7	-3.7	-3.7	-5.6	-5.6	-5.7	-5.9	-5.9	-5.9	-7.8	-8.0	-8.0	-8.0	-8.1	-8.1	-8.3	-8.3	Cumulative Change
<b>4+30</b>	47.3	43.2	43.2	42.1	41.2	41.1	41.1	40.5	40.5	40.5	39.7	39.5	39.5	39.5	38.7	38.7	38.7	38.7	Baseline Offset (In Feet)
		-4.1	0.0	-1.1	-0.9	-0.1	0.0	-0.6	0.0	0.0	-0.8	-0.1	0.0	0.0	-0.8	0.0	0.0	0.0	Incremental Change
		-4.1	-4.1	-5.2	-6.1	-6.2	-6.2	-6.8	-6.8	-6.8	-7.6	-7.8	-7.8	-7.8	-8.6	-8.6	-8.6	-8.6	Cumulative Change
<b>4+35</b>	48.8	43.1	43.1	41.9	41.9	41.8	41.8	41.1	41.1	41.1	41.0	40.9	40.9	40.9	39.4	39.4	39.4	39.4	Baseline Offset (In Feet)
		-5.7	0.0	-1.3	0.0	-0.1	0.0	-0.7	0.0	0.0	-0.1	-0.1	0.0	0.0	-1.5	0.0	0.0	0.0	Incremental Change
		-5.7	-5.7	-6.9	-6.9	-7.1	-7.0	-7.7	-7.7	-7.7	-7.8	-7.9	-7.9	-7.9	-9.4	-9.4	-9.4	-9.4	Cumulative Change
<b>4+40</b>	50.9	42.5	42.5	42.1	42.1	42.1	42.1	41.9	41.9	41.9	41.7	41.6	41.6	41.6	39.7	39.7	39.7	39.7	Baseline Offset (In Feet)
		-8.4	0.0	-0.4	0.0	0.0	0.1	-0.2	0.0	0.0	-0.2	0.0	0.0	0.0	-1.9	0.0	0.0	0.0	Incremental Change
		-8.4	-8.4	-8.8	-8.8	-8.9	-8.8	-9.0	-9.0	-9.0	-9.2	-9.3	-9.3	-9.3	-11.2	-11.2	-11.2	-11.2	Cumulative Change

\*\*\*Note: Survey completed on 4/7/02 was used for baseline data to compute Incremental/Cumulative Change. Negative numbers indicate erosion.

# ALPINE PIPELINE HYDROLOGY MONITORING

## B.2 FOUNDATION SETTLEMENT & JACKING SURVEY

**Alpine CP 00**  
**HDD West Site**  
 Pilecap 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	8/7/2008	8/3/2009	7/8/2010	8/3/2011	7/23/2012	7/17/2013	8/9/2014	8/25/2015	8/28/2016	8/29/2017	8/11/2018	
<b>W-01</b> NE Cor	26.389	26.389	26.391	26.398	26.397	26.401	26.401	26.413	26.420	26.420	26.427	26.431	26.437	26.440	26.451	Bottom of Pile Cap (In Feet)
		0.000	0.002	0.007	-0.001	0.004	0.000	0.012	0.007	0.000	0.007	0.004	0.006	0.003	0.011	Incremental Change
		0.000	0.002	0.009	0.008	0.012	0.012	0.024	0.031	0.031	0.038	0.042	0.048	0.051	0.062	Cumulative Change
<b>W-02</b> NE Cor	26.391	26.390	26.390	26.400	26.397	26.403	26.401	26.416	26.420	26.422	26.427	26.436	26.440	26.445	26.454	Bottom of Pile Cap (In Feet)
		-0.001	0.000	0.010	-0.003	0.006	-0.002	0.015	0.004	0.002	0.005	0.009	0.004	0.005	0.009	Incremental Change
		-0.001	-0.001	0.009	0.006	0.012	0.010	0.025	0.029	0.031	0.036	0.045	0.049	0.054	0.063	Cumulative Change
<b>W-03</b> NE Cor	26.391	26.391	26.394	26.400	26.398	26.403	26.401	26.414	26.420	26.422	26.428	26.435	26.438	26.443	26.452	Bottom of Pile Cap (In Feet)
		0.000	0.003	0.006	-0.002	0.005	-0.002	0.013	0.006	0.002	0.006	0.007	0.003	0.005	0.009	Incremental Change
		0.000	0.003	0.009	0.007	0.012	0.010	0.023	0.029	0.031	0.037	0.044	0.047	0.052	0.061	Cumulative Change
<b>W-04</b> NE Cor	26.389	26.388	26.390	26.394	26.394	26.396	26.397	26.407	26.415	26.419	26.424	26.429	26.432	26.436	26.446	Bottom of Pile Cap (In Feet)
		-0.001	0.002	0.004	0.000	0.002	0.001	0.010	0.008	0.004	0.005	0.005	0.003	0.004	0.010	Incremental Change
		-0.001	0.001	0.005	0.005	0.007	0.008	0.018	0.026	0.030	0.035	0.040	0.043	0.047	0.057	Cumulative Change
<b>W-05</b> NE Cor	26.383	26.378	26.386	26.390	26.389	26.393	26.393	26.404	26.410	26.413	26.418	26.426	26.428	26.432	26.442	Bottom of Pile Cap (In Feet)
		-0.005	0.008	0.004	-0.001	0.004	0.000	0.011	0.006	0.003	0.005	0.008	0.002	0.004	0.010	Incremental Change
		-0.005	0.003	0.007	0.006	0.010	0.010	0.021	0.027	0.030	0.035	0.043	0.045	0.049	0.059	Cumulative Change
<b>W-06</b> NE Cor	26.395	26.391	26.394	26.400	26.397	26.401	26.401	26.412	26.416	26.422	26.425	26.432	26.438	26.440	26.442	Bottom of Pile Cap (In Feet)
		-0.004	0.003	0.006	-0.003	0.004	0.000	0.011	0.004	0.006	0.003	0.007	0.006	0.002	0.002	Incremental Change
		-0.004	-0.001	0.005	0.002	0.006	0.006	0.017	0.021	0.027	0.030	0.037	0.043	0.045	0.047	Cumulative Change
<b>W-07</b> NE Cor	26.397	26.393	26.402	26.406	26.404	26.408	26.405	26.419	26.423	26.426	26.432	26.439	26.442	26.446	26.456	Bottom of Pile Cap (In Feet)
		-0.004	0.009	0.004	-0.002	0.004	-0.003	0.014	0.004	0.003	0.006	0.007	0.003	0.004	0.010	Incremental Change
		-0.004	0.005	0.009	0.007	0.011	0.008	0.022	0.026	0.029	0.035	0.042	0.045	0.049	0.059	Cumulative Change

**Alpine CP 00**  
**HDD West Site**  
 Pilecap 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	8/7/2008	8/3/2009	7/8/2010	8/3/2011	7/23/2012	7/17/2013	8/9/2014	8/25/2015	8/28/2016	8/29/2017	8/11/2018	
<b>W-08</b> NE Cor	26.403	26.401	26.404	26.408	26.406	26.412	26.410	26.423	26.422	26.430	26.435	26.443	26.441	26.451	26.461	Bottom of Pile Cap (In Feet)
		-0.002	0.003	0.004	-0.002	0.006	-0.002	0.013	-0.001	0.008	0.005	0.008	-0.002	0.010	0.010	Incremental Change
		-0.002	0.001	0.005	0.003	0.009	0.007	0.020	0.019	0.027	0.032	0.040	0.038	0.048	0.058	Cumulative Change
<b>W-09</b> NE Cor	31.291	31.294	31.292	31.290	31.292	31.294	31.296	31.301	31.297	31.303	31.305	31.307	31.307	31.309	31.310	Bottom of Pile Cap (In Feet)
		0.003	-0.002	-0.002	0.002	0.002	0.002	0.005	-0.004	0.006	0.002	0.002	0.000	0.002	0.001	Incremental Change
		0.003	0.001	-0.001	0.001	0.003	0.005	0.010	0.006	0.012	0.014	0.016	0.016	0.018	0.019	Cumulative Change
<b>W-10</b> NE Cor	31.266	31.261	31.261	31.264	31.263	31.263	31.262	31.264	31.263	31.266	31.266	31.265	31.263	31.267	31.262	Bottom of Pile Cap (In Feet)
		-0.005	0.000	0.003	-0.001	0.000	-0.001	0.002	-0.001	0.003	0.000	-0.001	-0.002	0.004	-0.005	Incremental Change
		-0.005	-0.005	-0.002	-0.003	-0.003	-0.004	-0.002	-0.003	0.000	0.000	-0.001	-0.003	0.001	-0.004	Cumulative Change
<b>W-11</b> NE Cor	31.299	31.300	31.288	31.294	31.299	31.304	31.299	31.304	31.302	31.310	31.310	31.309	31.313	31.316	31.315	Bottom of Pile Cap (In Feet)
		0.001	-0.012	0.006	0.005	0.005	-0.005	0.005	-0.002	0.008	0.000	-0.001	0.004	0.003	-0.001	Incremental Change
		0.001	-0.011	-0.005	0.000	0.005	0.000	0.005	0.003	0.011	0.011	0.010	0.014	0.017	0.016	Cumulative Change
<b>W-12</b> NE Cor	31.301	31.301	31.298	31.294	31.297	31.298	31.296	31.301	31.298	31.302	31.303	31.302	31.301	31.303	31.301	Bottom of Pile Cap (In Feet)
		0.000	-0.003	-0.004	0.003	0.001	-0.002	0.005	-0.003	0.004	0.001	-0.001	-0.001	0.002	-0.002	Incremental Change
		0.000	-0.003	-0.007	-0.004	-0.003	-0.005	0.000	-0.003	0.001	0.002	0.001	0.000	0.002	0.000	Cumulative Change
<b>W-13</b> NE Cor	27.377	27.373	27.383	27.393	27.389	27.391	27.394	27.401	27.408	27.409	27.413	27.420	27.424	27.463	27.434	Bottom of Pile Cap (In Feet)
		-0.004	0.010	0.010	-0.004	0.002	0.003	0.007	0.007	0.001	0.004	0.007	0.004	0.039	-0.029	Incremental Change
		-0.004	0.006	0.016	0.012	0.014	0.017	0.024	0.031	0.032	0.036	0.043	0.047	0.086	0.057	Cumulative Change
<b>W-14</b> NE Cor	27.428	27.423	27.433	27.439	27.442	27.442	27.454	27.455	27.462	27.463	27.468	27.474	27.478	27.481	27.488	Bottom of Pile Cap (In Feet)
		-0.005	0.010	0.006	0.003	0.000	0.012	0.001	0.007	0.001	0.005	0.006	0.004	0.003	0.007	Incremental Change
		-0.005	0.005	0.011	0.014	0.014	0.026	0.027	0.034	0.035	0.040	0.046	0.050	0.053	0.060	Cumulative Change

**Alpine CP 00**  
**HDD West Site**  
 Pilecap 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	8/7/2008	8/3/2009	7/8/2010	8/3/2011	7/23/2012	7/17/2013	8/9/2014	8/25/2015	8/28/2016	8/29/2017	8/11/2018	
<b>W-15 NE Cor</b>	27.413	27.407	27.407	27.425	27.428	27.425	27.434	27.436	27.442	27.448	27.451	27.458	27.460	27.427	37.470	Bottom of Pile Cap (In Feet)
		-0.006	0.000	0.018	0.003	-0.003	0.009	0.002	0.006	0.006	0.003	0.007	0.002	-0.033	10.043	Incremental Change
		-0.006	-0.006	0.012	0.015	0.012	0.021	0.023	0.029	0.035	0.038	0.045	0.047	0.014	10.057	Cumulative Change
<b>W-16 NE Cor</b>	27.389	27.385	27.392	27.416	27.400	27.404	27.410	27.414	27.421	27.421	27.428	27.432	27.437	27.439	27.446	Bottom of Pile Cap (In Feet)
		-0.004	0.007	0.024	-0.016	0.004	0.006	0.004	0.007	0.000	0.007	0.004	0.005	0.002	0.007	Incremental Change
		-0.004	0.003	0.027	0.011	0.015	0.021	0.025	0.032	0.032	0.039	0.043	0.048	0.050	0.057	Cumulative Change
<b>W-17 NE Cor</b>	28.940	28.947	28.944	28.940	28.945	28.946	28.942	28.948	28.943	28.957	28.952	28.953	28.954	28.961	28.957	Bottom of Pile Cap (In Feet)
		0.007	-0.003	-0.004	0.005	0.001	-0.004	0.006	-0.005	0.014	-0.005	0.001	0.001	0.007	-0.004	Incremental Change
		0.007	0.004	0.000	0.005	0.006	0.002	0.008	0.003	0.017	0.012	0.013	0.014	0.021	0.017	Cumulative Change
<b>W-18 NE Cor</b>	28.965	28.972	28.968	28.965	28.970	28.969	28.968	28.968	28.972	28.982	28.982	28.984	28.984	28.988	28.988	Bottom of Pile Cap (In Feet)
		0.007	-0.004	-0.003	0.005	-0.001	-0.001	0.000	0.004	0.010	0.000	0.002	0.000	0.004	0.000	Incremental Change
		0.007	0.003	0.000	0.005	0.004	0.003	0.003	0.007	0.017	0.017	0.019	0.019	0.023	0.023	Cumulative Change
<b>W-19 NE Cor</b>	28.959	28.962	28.960	28.956	28.958	28.958	28.955	28.955	28.952	28.970	28.963	28.963	28.963	28.966	28.962	Bottom of Pile Cap (In Feet)
		0.003	-0.002	-0.004	0.002	0.000	-0.003	0.000	-0.003	0.018	-0.007	0.000	0.000	0.003	-0.004	Incremental Change
		0.003	0.001	-0.003	-0.001	-0.001	-0.004	-0.004	-0.007	0.011	0.004	0.004	0.004	0.007	0.003	Cumulative Change
<b>W-20 NE Cor</b>	28.964	28.965	28.965	28.965	28.966	28.964	28.964	28.963	28.964	28.973	28.973	28.973	28.974	28.977	28.975	Bottom of Pile Cap (In Feet)
		0.001	0.000	0.000	0.001	-0.002	0.000	-0.001	0.001	0.009	0.000	0.000	0.001	0.003	-0.002	Incremental Change
		0.001	0.001	0.001	0.002	0.000	0.000	-0.001	0.000	0.009	0.009	0.009	0.010	0.013	0.011	Cumulative Change
<b>Note:</b> Survey completed on 6/20/2004 was used to compute Incremental/Cumulative Change. Negative numbers indicate subsidence.																
All Pile Caps are 0.083' Thick. Add Cap thickness to shown elevations for Top of Pile Cap Elevations																

# ALPINE PIPELINE HYDROLOGY MONITORING

## Appendix C HDD EAST BANK EROSION & POLYGON TROUGH SUBSIDENCE SURVEY

### C.1 BANK EROSION





**Alpine CP 00  
 HDD East Site  
 Streambank Monitor**

Baseline Station	Streambank Monitor - Top of Bank Locations																							Description	
	See Drawing CE-CP00-134 Rev 16 for Survey Baseline Stations																								
	7/29/2001	8/7/2001	8/15/2001	8/23/2001	9/8/2001	7/8/2002	9/12/2002	7/9/2003	9/8/2003	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	8/12/2014	8/23/2015	9/6/2016	8/31/2017		8/10/2018
<b>0+10</b>	N/A	N/A	N/A	N/A	N/A	N/A	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	-25.6	-25.6	-23.9	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0	Baseline Offset (In Feet)
							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	-1.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
								0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	-1.4	-1.4	-1.4	-1.3	-1.3	-1.3	-1.3	-1.3
<b>0+20</b>	N/A	N/A	N/A	N/A	N/A	N/A	-32.1	-30.9	-30.9	-30.9	-30.9	-30.9	-30.9	-30.9	-31.0	-29.1	-29.2	-29.2	-29.2	-29.2	-28.7	-28.7	-28.7	-27.2	Baseline Offset (In Feet)
							-1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-1.9	0.1	0.0	0.0	0.0	-0.5	0.0	0.0	-1.5	Incremental Change
							-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.1	-3.0	-2.9	-2.9	-2.9	-2.9	-3.4	-3.4	-3.4	-4.9	Cumulative Change
<b>0+25</b>	N/A	N/A	N/A	N/A	N/A	N/A	-38.2	-38.2	-38.2	-38.2	-37.0	-37.0	-37.0	-37.0	-34.1	-29.9	-29.2	-29.2	-29.2	-29.2	-29.2	-29.2	-29.2	-29.2	Baseline Offset (In Feet)
							0.0	0.0	0.0	-1.2	0.0	0.0	0.0	0.0	-2.9	-4.2	-0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
							0.0	0.0	0.0	-1.2	-1.2	-1.2	-1.2	-1.2	-4.1	-8.3	-9.0	-9.1	-9.1	-9.1	-9.1	-9.1	-9.1	-9.1	Cumulative Change
<b>0+30</b>	N/A	N/A	N/A	N/A	N/A	N/A	-41.1	-41.1	-41.1	-41.1	-36.9	-36.9	-36.9	-36.9	-34.3	-31.4	-29.3	-29.3	-29.3	-29.3	-29.3	-29.3	-29.3	-29.3	Baseline Offset (In Feet)
							0.0	0.0	0.0	-4.2	0.0	0.0	0.0	0.0	-2.6	-2.9	-2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
							0.0	0.0	0.0	-4.2	-4.2	-4.2	-4.2	-4.2	-6.8	-9.7	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	Cumulative Change
<b>0+40</b>	N/A	N/A	N/A	N/A	N/A	N/A	-37.7	-37.7	-37.7	-37.7	-36.5	-35.1	-35.1	-35.1	-34.8	-34.3	-29.4	-29.4	-29.4	-29.4	-29.4	-29.4	-29.4	-29.4	Baseline Offset (In Feet)
							0.0	0.0	0.0	-1.2	-1.4	0.0	0.0	0.0	-0.3	-0.5	-4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
							0.0	0.0	0.0	-1.2	-2.6	-2.6	-2.6	-2.6	-2.9	-3.4	-8.3	-8.2	-8.2	-8.3	-8.3	-8.3	-8.3	-8.3	Cumulative Change
<b>0+50</b>	N/A	N/A	N/A	N/A	N/A	N/A	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.1	-30.1	-30.1	-30.1	-30.1	-30.1	-30.1	-30.1	Baseline Offset (In Feet)
							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	Cumulative Change
<b>0+60</b>	N/A	N/A	N/A	N/A	N/A	N/A	-28.0	-27.9	-27.5	-27.5	-27.5	-27.5	-27.5	-27.5	-27.5	-27.5	-25.3	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	Baseline Offset (In Feet)
							-0.1	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
							-0.1	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.4	-0.5	-2.7	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	Cumulative Change
<b>0+65</b>	N/A	N/A	N/A	N/A	N/A	N/A	-39.8	-39.8	-23.9	-23.9	-23.4	-23.4	-23.4	-23.4	-23.4	-23.4	-19.9	-19.9	-19.9	-19.9	-19.9	-19.9	-19.9	-19.9	Baseline Offset (In Feet)
							0.0	-16.0	0.0	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	-3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
							0.0	-16.0	-16.0	-16.4	-16.4	-16.4	-16.4	-16.4	-16.4	-16.4	-19.9	-19.9	-19.9	-19.9	-19.9	-19.9	-19.9	-19.9	Cumulative Change
<b>0+70</b>	N/A	-32.4	N/A	-31.2	-31.2	-31.5	-27.7	-27.7	-20.0	-20.0	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	Baseline Offset (In Feet)
				-1.2	0.0	0.3	-3.8	0.0	-7.7	0.0	-3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
				-1.2	-1.2	-0.9	-4.7	-4.7	-12.4	-12.4	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	Cumulative Change
<b>0+75</b>	N/A	-27.1	-27.0	-27.0	-27.1	-27.0	-27.2	-27.6	-21.1	-21.0	-18.0	-18.0	-18.0	-18.0	-18.0	-18.0	-17.8	-17.8	-17.8	-17.8	-17.8	-17.8	-17.0	-17.0	Baseline Offset (In Feet)
			-0.1	0.0	0.1	-0.1	0.2	0.4	-6.5	-0.1	-3.0	0.1	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	-0.8	0.0	Incremental Change
			-0.1	-0.1	0.0	-0.1	0.1	0.5	-6.0	-6.1	-9.1	-9.1	-9.1	-9.1	-9.1	-9.1	-9.3	-9.3	-9.3	-9.3	-9.3	-9.3	-10.0	-10.0	Cumulative Change
<b>0+80</b>	N/A	-26.4	N/A	-26.6	-26.5	-26.5	-27.5	-27.5	-22.4	-22.4	-22.4	-22.4	-22.4	-22.4	-22.4	-22.1	-21.7	-21.6	-21.6	-21.6	-20.6	-18.0	-18.0	-18.0	Baseline Offset (In Feet)
				0.2	-0.1	0.0	1.0	0.0	-5.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.4	-0.1	0.0	0.0	-1.0	-2.6	0.0	0.0	Incremental Change
				0.2	0.1	0.0	1.1	1.1	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.3	-4.8	-4.8	-4.8	-4.8	-5.8	-8.4	-8.4	-8.4
<b>0+90</b>	N/A	-29.2	N/A	-28.9	-29.2	-29.2	-29.2	-29.2	-29.2	-27.8	-27.8	-27.2	-27.2	-27.2	-27.2	-26.5	-23.1	-23.1	-23.1	-23.1	-22.3	-22.3	-20.2	-20.2	Baseline Offset (In Feet)
				-0.3	0.3	0.0	0.0	0.0	0.0	0.0	-1.5	0.0	-0.6	0.0	0.0	-0.7	-3.4	0.0	0.0	0.0	-0.8	0.0	-2.1	0.0	Incremental Change
				-0.3	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-1.5	-2.0	-2.0	-2.0	-2.0	-2.7	-6.1	-6.1	-6.1	-6.1	-6.9	-6.9	-9.0	-9.0









**Alpine CP 00  
 HDD East Site  
 Streambank Monitor**

Baseline Station	Streambank Monitor - Top of Bank Locations																							Description		
	See Drawing CE-CP00-134 Rev 16 for Survey Baseline Stations																									
	7/29/2001	8/7/2001	8/15/2001	8/23/2001	9/8/2001	7/8/2002	9/12/2002	7/9/2003	9/8/2003	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	8/12/2014	8/23/2015	9/6/2016	8/31/2017	8/10/2018	Date	
<b>3+85</b>	N/A	-19.9	N/A	-19.9	-19.5	-19.3	-13.2	-12.3	-12.3	-12.0	-12.0	-11.1	-11.1	-11.1	-11.1	-11.1	-10.6	-10.6	-10.6	-10.6	-8.8	-8.8	-8.8	-8.8	Baseline Offset (In Feet)	
				0.0	-0.5	-0.1	-6.1	-1.0	0.0	-0.3	0.0	-0.9	0.0	0.0	0.0	0.0	-0.5	0.0	0.0	0.0	-1.8	0.0	0.0	0.0	Incremental Change	
				0.0	-0.4	-0.6	-6.7	-7.7	-7.7	-7.9	-7.9	-8.9	-8.8	-8.8	-8.8	-8.8	-9.4	-9.3	-9.3	-9.3	-11.1	-11.1	-11.1	-11.1	Cumulative Change	
<b>3+95</b>	N/A	-26.1	N/A	-25.7	-25.9	-26.3	-22.4	-22.4	-22.4	-21.9	-21.9	-16.1	-16.1	-16.1	-16.1	-16.1	-14.1	-14.1	-14.1	-14.1	-13.5	-13.5	-13.5	-13.5	Baseline Offset (In Feet)	
				-0.4	0.2	0.4	-3.9	0.0	0.0	-0.5	0.0	-5.8	0.0	0.0	0.0	0.0	-2.0	0.0	0.0	0.0	-0.6	0.0	0.0	0.0	Incremental Change	
				-0.4	-0.2	0.2	-3.7	-3.8	-3.8	-4.2	-4.2	-10.1	-10.0	-10.0	-10.0	-10.0	-12.0	-12.0	-12.0	-12.0	-12.6	-12.6	-12.6	-12.6	Cumulative Change	
<b>4+00</b>	N/A	-29.9	-30.0	-29.5	-29.7	-30.2	-21.2	-21.2	-21.2	-21.9	-21.9	-18.6	-18.6	-18.6	-18.6	-18.6	-15.9	-15.9	-15.9	-15.9	-15.9	-15.9	-15.9	-15.9	Baseline Offset (In Feet)	
			0.1	-0.5	0.2	0.5	-9.0	0.0	0.0	0.7	0.0	-3.3	0.0	0.0	0.0	0.0	-2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change	
			0.1	-0.4	-0.2	0.3	-8.7	-8.7	-8.7	-8.0	-8.0	-11.3	-11.3	-11.3	-11.3	-11.3	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	Cumulative Change	
<b>4+05</b>	N/A	-29.8	N/A	-29.4	-29.4	-29.9	-19.5	-19.5	-19.5	-19.5	-19.5	-21.7	-21.7	-21.7	-21.3	-21.3	-20.4	-20.5	-20.5	-20.5	-15.7	-15.7	-15.7	-15.7	Baseline Offset (In Feet)	
				-0.4	0.0	0.4	-10.4	0.0	0.0	0.0	0.0	2.2	0.0	0.0	-0.4	0.0	-0.9	0.0	0.0	0.0	-4.8	0.0	0.0	0.0	Incremental Change	
				-0.4	-0.4	0.1	-10.3	-10.3	-10.3	-10.3	-10.3	-8.1	-8.1	-8.1	-8.5	-8.5	-9.4	-9.4	-9.4	-9.4	-14.1	-14.1	-14.1	-14.1	Cumulative Change	
<b>4+15</b>	N/A	N/A	N/A	-30.7	-30.6	-27.3	2.7	2.6	2.6	2.6	2.6	2.7	2.7	2.5	2.5	2.5	2.5	2.5	2.5	2.4	3.7	3.7	3.7	3.7	Baseline Offset (In Feet)	
				-0.1	-3.4	-29.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	-1.3	0.0	0.0	0.0	Incremental Change	
				-0.1	-3.4	-33.4	-33.3	-33.3	-33.3	-33.3	-33.3	-33.4	-33.4	-33.2	-33.2	-33.2	-33.2	-33.2	-33.2	-33.2	-33.1	-34.4	-34.4	-34.4	-34.4	Cumulative Change
<b>4+25</b>	N/A	N/A	N/A	-8.6	-5.4	-1.0	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	4.7	4.7	4.7	4.6	4.6	5.4	5.4	5.4	5.4	5.4	Baseline Offset (In Feet)	
				-3.2	-4.4	-6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	-0.7	0.0	0.0	0.0	0.0	Incremental Change	
				-3.2	-7.6	-13.7	-13.7	-13.7	-13.7	-13.7	-13.7	-13.7	-13.7	-13.7	-13.3	-13.3	-13.3	-13.2	-13.2	-13.2	-14.0	-14.0	-14.0	-14.0	-14.0	Cumulative Change
<b>4+35</b>	N/A	N/A	N/A	-5.6	-5.4	-0.7	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.9	4.9	5.0	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	Baseline Offset (In Feet)
				-0.2	-4.6	-5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change	
				-0.2	-4.8	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.1	-10.1	-10.1	-10.5	-10.5	-10.5	-10.5	-10.5	-10.5	-10.5	-10.5	-10.5	-10.5	-10.5	Cumulative Change
<b>4+45</b>	N/A	N/A	N/A	N/A	N/A	-5.1	1.3	1.2	1.2	1.9	1.9	1.9	1.9	1.9	1.6	1.6	1.6	1.6	1.6	1.6	7.8	7.8	7.8	7.8	Baseline Offset (In Feet)	
						-6.4	0.1	0.0	-0.7	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	-6.2	0.0	0.0	0.0	Incremental Change	
						-6.4	-6.3	-6.3	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-12.9	-12.9	-12.9	-12.9	Cumulative Change
<b>4+50</b>	N/A	N/A	N/A	N/A	N/A	-6.3	1.9	1.8	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	5.0	5.0	5.0	5.0	8.4	8.4	8.4	8.4	Baseline Offset (In Feet)	
						-8.2	0.1	-2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-0.1	0.0	0.0	-3.4	0.0	0.0	0.0	Incremental Change	
						-8.1	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-11.3	-11.3	-11.3	-11.3	-14.7	-14.7	-14.7	-14.7	Cumulative Change	

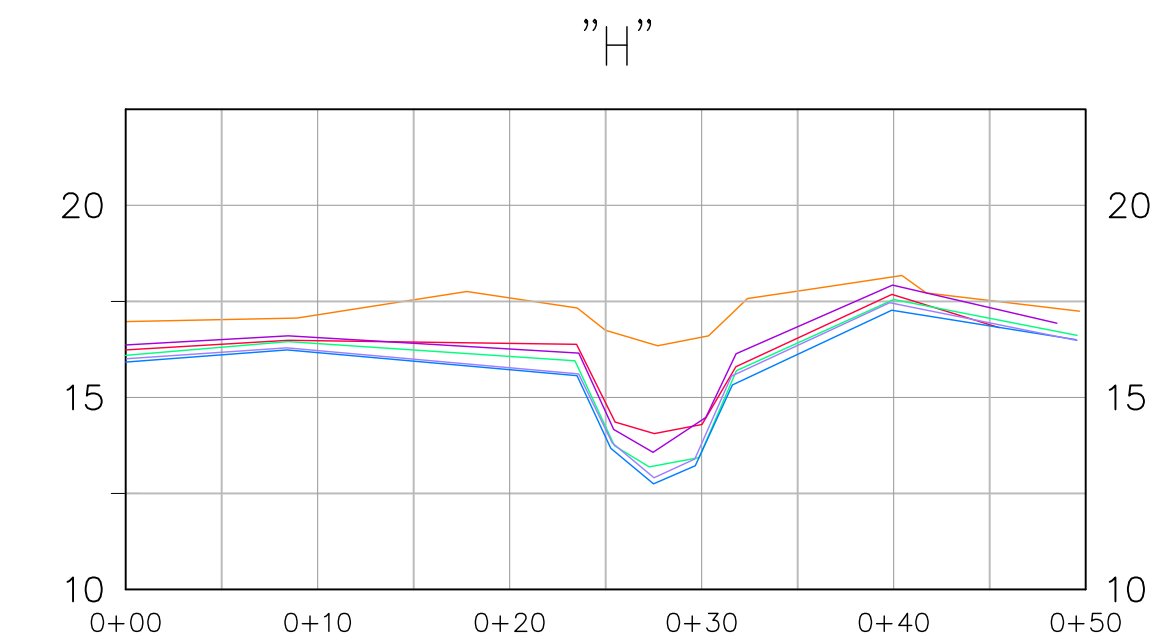
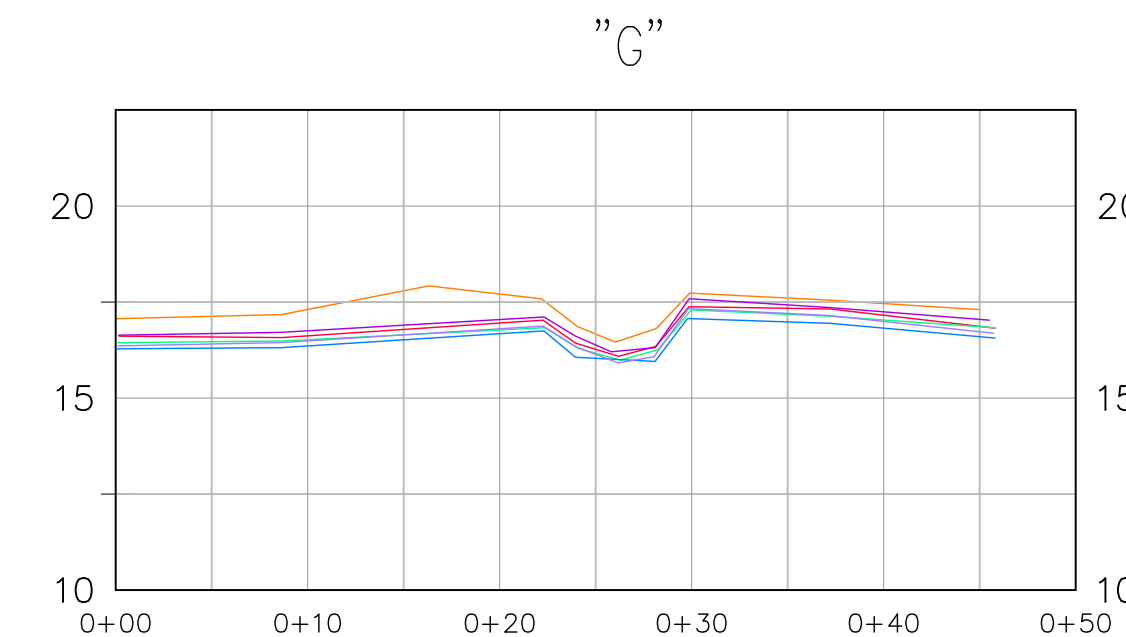
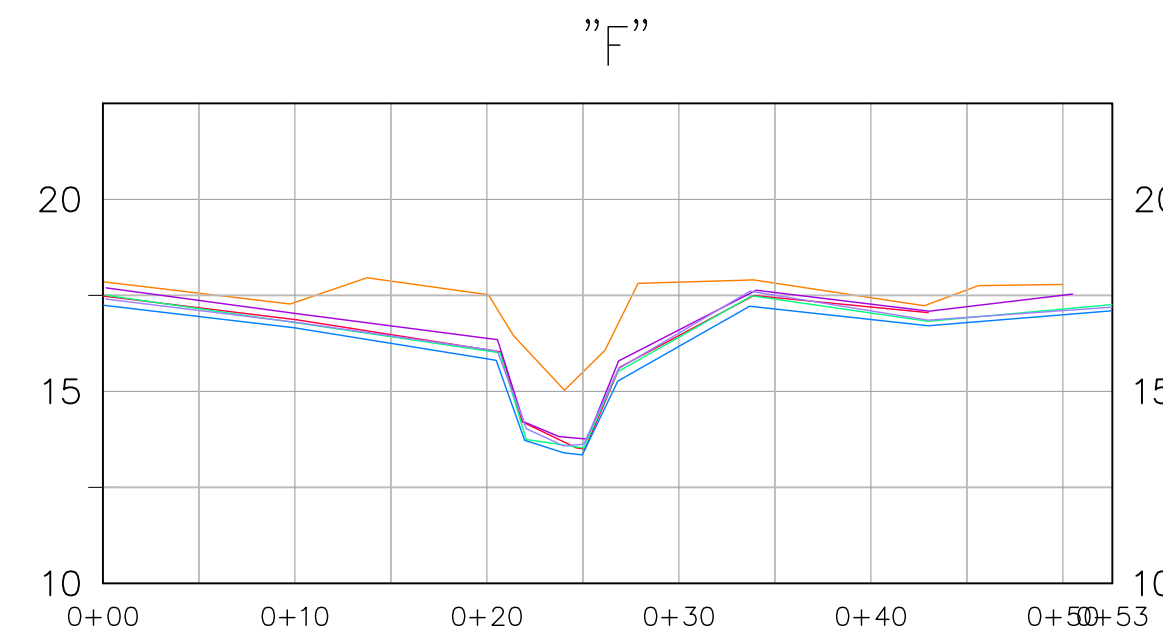
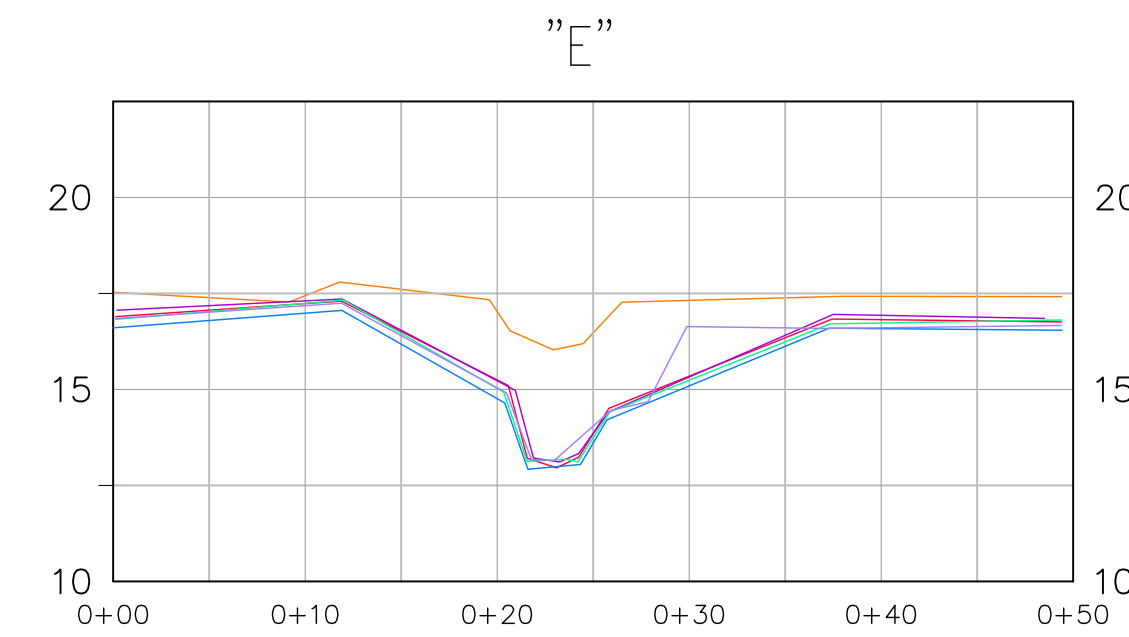
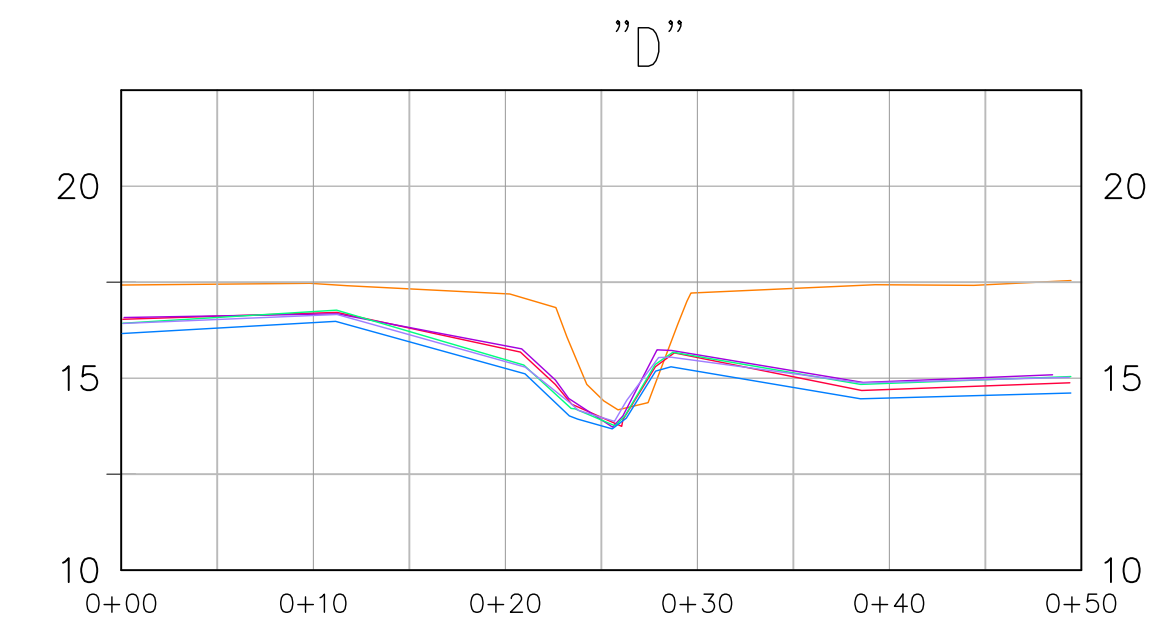
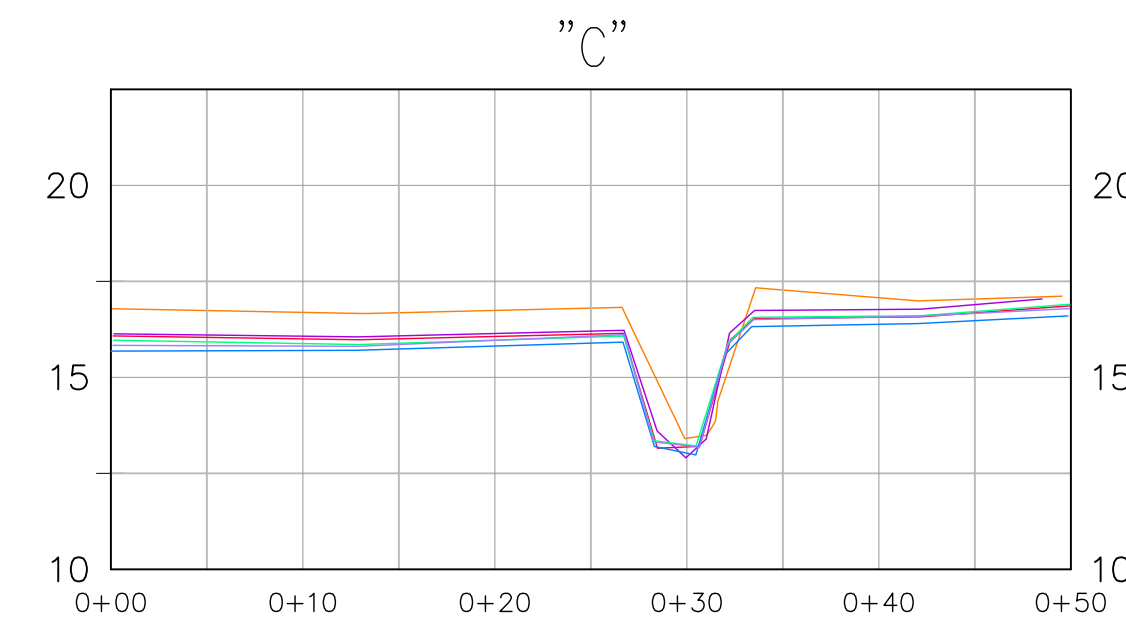
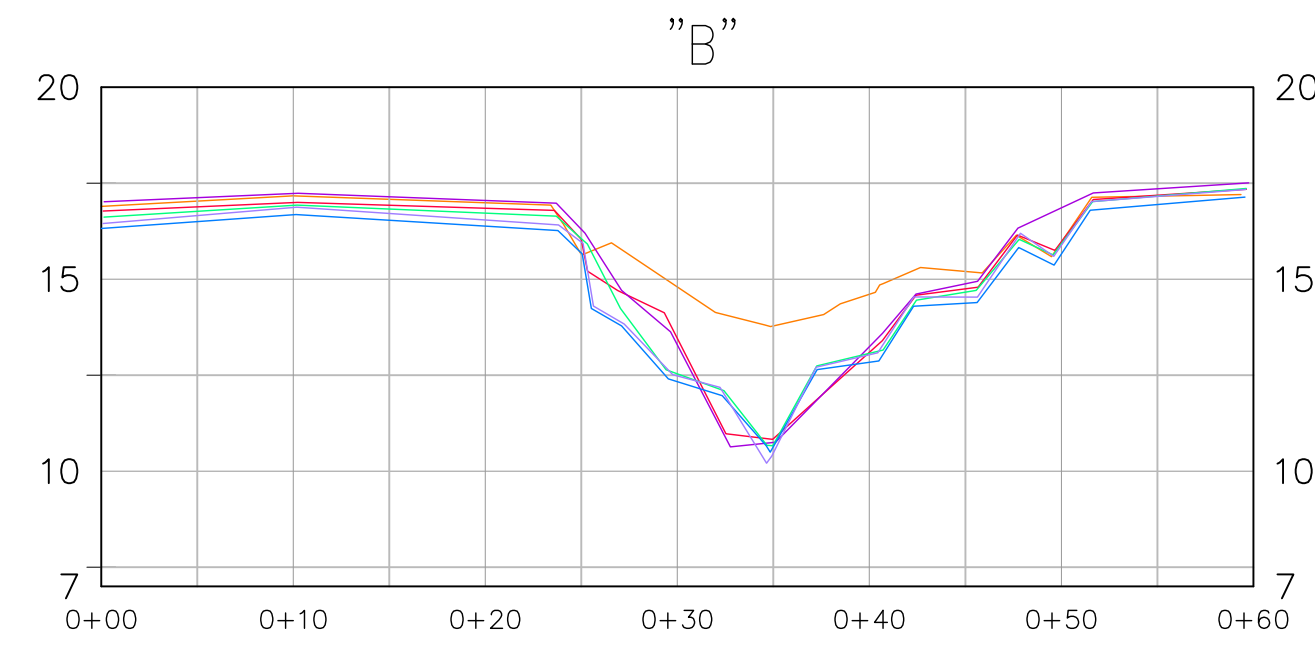
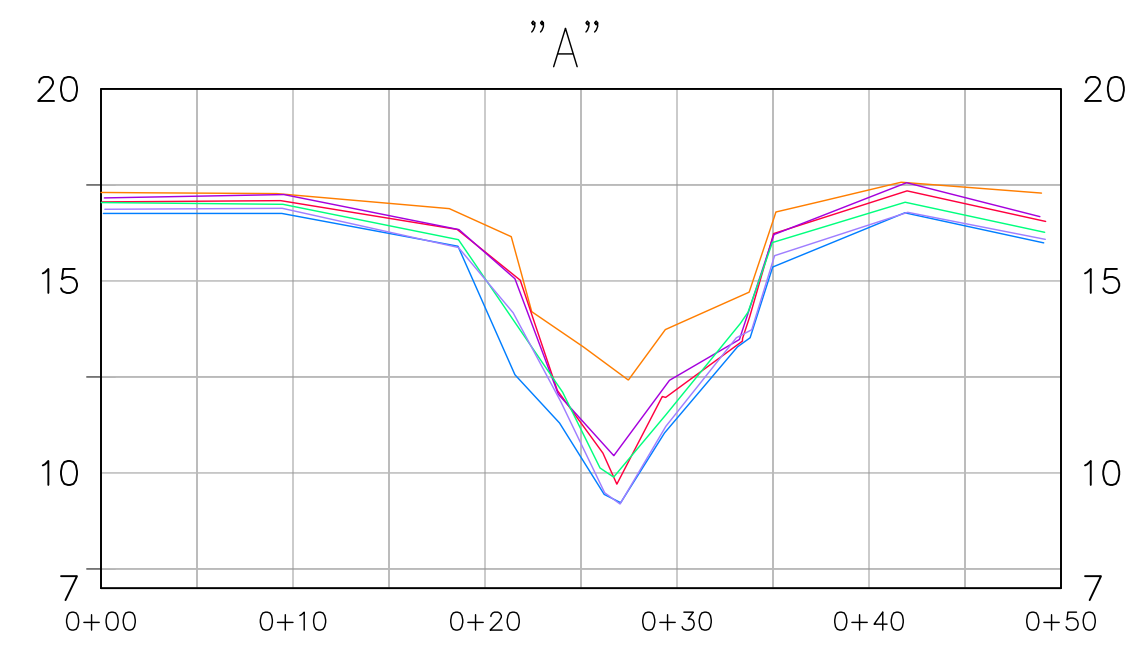
\*\*\*Note: Field Survey dated 8/7/01 was used for baseline data to compute Incremental/Cumulative Change. Negative numbers indicate erosion.

# ALPINE PIPELINE HYDROLOGY MONITORING

## C.2 POLYGON TROUGH SUBSIDENCE SURVEY

CROSS SECTIONS, POLYGON TROUGH

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

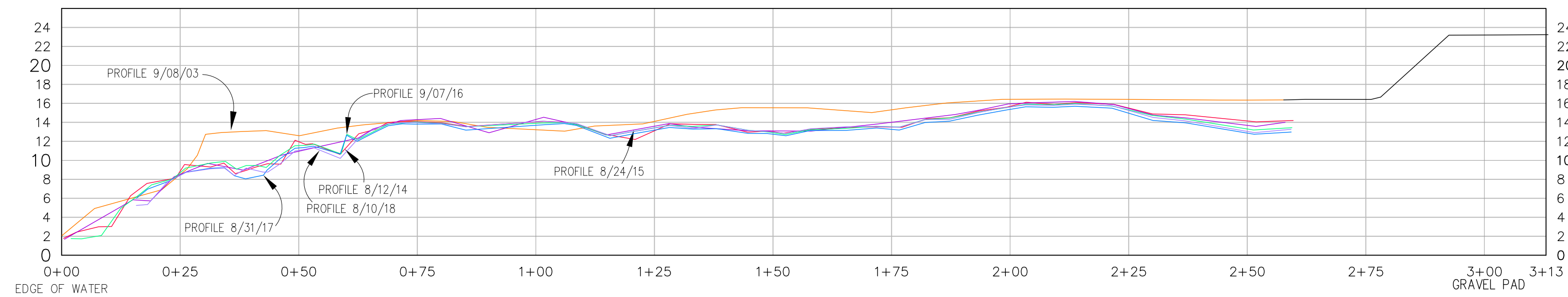


LEGEND


- CROSS SECTION 9/8/03
- CROSS SECTION 8/12/14
- CROSS SECTION 8/24/15
- CROSS SECTION 9/07/16
- CROSS SECTION 8/31/17
- CROSS SECTION 8/10/18

CENTERLINE PROFILE, POLYGON TROUGH


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



REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP	REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
12	8/14/14	UPDATED PER 20306694ACS	TB	GD				6	8/6/08	UPDATED PER 5538034ACS	CZ	GD			
11	7/21/13	UPDATED PER 9670829ACS	CZ	DB				5	8/30/07	UPDATED PER 4810351ACS	CZ	DB			
10	7/16/12	UPDATED PER 9101901ACS	AG	GD				16	8/13/18	UPDATED PER 22572487ACS	RR	CZ			
9	8/5/11	UPDATED PER 8292382ACS	AG	DB				15	9/02/17	UPDATED PER 222259977ACS	CZ	GD			
8	7/21/10	ISSUED PER 7224503ACS	AG	DB				14	9/08/16	UPDATED PER 21654942ACS	CZ	GD			
7	8/6/09	UPDATED PER 6370813ACS	AG	GD				13	9/01/15	UPDATED PER 20967693ACS	CZ	DB			



**Kuukpiik LCMF LLC**  
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	
DO NOT SCALE				ABOVE SCALE FOR REFERENCE ONLY	
DATE: 12/31/03		DRAWN: GD/CZ	DESIGN: JZ	ECM NO: 2094387ACS	
SCALE: 1"=20'		CHECKED: JZ	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: 16	



**Alpine CP 00  
 HDD East Site  
 Subsidence Monitor - Seawater Line**

Baseline Station	Point Description	Subsidence Monitor - Cross-Section A																				Description			
		See Drawing CE-CP00-134 for Survey Cross-Section Locations																							
		8/15/2001	8/23/2001	9/8/2001	7/9/2002	9/14/2002	7/9/2003	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	8/3/2009	7/19/2010	8/4/2011	7/14/2012	7/20/2013	8/12/2014	8/24/2015	9/9/2016	8/31/2017	8/10/2018	Date	
0+00	Tundra	17.9	18.0	18.0	17.8	17.8	17.8	17.8	17.7	17.9	18.0	17.3	17.3	17.2	17.1	17.1	17.0	16.9	17.1	17.1	17.0	16.8	16.9	Elevation (In Feet)	
			0.1	0.0	-0.2	0.0	0.0	0.0	-0.1	0.2	0.1	-0.7	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	-0.2	0.1	Incremental Change
			0.1	0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	0.0	0.1	-0.6	-0.6	-0.7	-0.8	-0.8	-0.9	-1.0	-0.8	-0.8	-0.9	-1.1	-1.0	Cumulative Change
0+09	Tundra		17.9	18.0	17.8	17.8	17.8	17.8	17.7	17.8	17.9	17.2	17.3	17.2	17.0	17.0	17.1	17.1	17.1	17.1	17.2	17.0	16.8	16.9	Elevation (In Feet)
				0.1	-0.2	0.0	0.0	0.0	-0.1	0.1	0.1	-0.7	0.1	-0.1	-0.1	0.0	0.1	0.0	0.0	0.1	0.1	-0.2	-0.2	0.1	Incremental Change
				0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	0.0	-0.7	-0.6	-0.8	-0.9	-0.9	-0.8	-0.8	-0.8	-0.7	-0.9	-1.1	-1.0	Cumulative Change
0+18	Tundra	17.6	17.6	17.5	17.3	17.5	17.4	17.4	17.2	17.4	17.4	16.7	16.7	16.7	16.4	16.5	16.5	16.3	16.4	16.3	16.1	15.9	15.9	Elevation (In Feet)	
			0.0	-0.1	-0.2	0.2	-0.1	0.0	-0.2	0.2	0.0	-0.7	0.0	0.0	-0.3	0.1	-0.1	-0.1	0.0	-0.1	-0.2	-0.2	0.0	0.0	Incremental Change
			0.0	-0.1	-0.3	-0.1	-0.2	-0.2	-0.4	-0.2	-0.2	-0.2	-0.9	-0.9	-0.9	-1.2	-1.1	-1.2	-1.3	-1.2	-1.3	-1.5	-1.7	-1.7	Cumulative Change
0+21	Top Bank	16.8	16.7	16.7	16.6	16.5	16.8	16.8	16.4	16.6	16.6	15.8	15.9	15.8	15.3	15.4	15.3	15.0	15.3	15.0	14.1	12.6	14.2	Elevation (In Feet)	
			-0.1	0.0	-0.1	-0.1	0.3	0.0	-0.4	0.2	0.0	-0.8	0.1	-0.1	-0.5	0.1	-0.1	-0.3	0.3	-0.3	-0.9	-1.5	1.6	1.6	Incremental Change
			-0.1	-0.1	-0.2	-0.3	0.0	0.0	-0.4	-0.2	-0.2	-1.0	-0.9	-1.0	-1.5	-1.4	-1.5	-1.8	-1.5	-1.8	-2.7	-4.2	-2.6	-2.6	Cumulative Change
0+22.5	Gradebreak		15.4	15.4	14.9	14.8	14.8	14.8	14.8	14.6	14.4	13.5	13.6	13.7	13.4	13.1	13.0	12.5	14.3	13.2	12.1	11.3	11.9	Elevation (In Feet)	
				0.0	-0.5	-0.1	0.0	0.0	0.0	-0.2	-0.2	-0.9	0.1	0.2	-0.3	-0.3	-0.1	-0.5	1.8	-1.1	-1.1	-0.8	0.6	0.6	Incremental Change
				0.0	-0.5	-0.6	-0.6	-0.6	-0.6	-0.6	-0.8	-1.0	-1.9	-1.9	-1.7	-2.0	-2.3	-2.4	-2.9	-1.1	-2.2	-3.3	-4.1	-3.5	Cumulative Change
0+25	Toe Bank	13.6	14.1	13.9	13.6	13.6	13.7	13.7	13.0	13.3	13.0	12.3	12.3	12.3	12.0	11.6	11.5	10.4	11.7	11.3	10.1	9.4	9.8	Elevation (In Feet)	
			0.5	-0.2	-0.3	0.0	0.1	0.0	-0.7	0.3	-0.3	-0.7	0.0	0.0	-0.3	-0.4	-0.1	-1.1	1.3	-0.4	-1.2	-0.7	0.4	0.4	Incremental Change
			0.5	0.3	0.0	0.0	0.1	0.1	-0.6	-0.3	-0.6	-1.3	-1.3	-1.3	-1.6	-2.1	-2.1	-3.2	-1.9	-2.3	-3.5	-4.2	-3.8	-3.8	Cumulative Change
0+27	CL Swale		13.3	13.5	13.3	12.5	13.1	13.1	11.7	12.2	12.8	12.3	12.0	12.1	11.9	11.3	11.1	9.8	10.9	10.4	9.9	9.2	9.2	Elevation (In Feet)	
				0.2	-0.2	-0.8	0.6	0.0	-1.4	0.5	0.6	-0.5	-0.3	0.1	-0.2	-0.6	-0.1	-1.4	1.2	-0.5	-0.6	-0.7	0.0	0.0	Incremental Change
				0.2	0.0	-0.8	-0.2	-0.2	-1.6	-1.1	-0.5	-1.0	-1.3	-1.2	-1.4	-2.0	-2.2	-3.5	-2.4	-2.9	-3.4	-4.1	-4.1	-4.1	Cumulative Change
0+29	Toe Bank	13.3	13.6	13.5	13.5	14.2	14.5	14.5	13.9	14.1	14.0	13.4	13.5	13.3	13.3	13.1	13.1	12.1	11.9	12.0	11.5	11.0	11.2	Elevation (In Feet)	
			0.3	-0.1	0.0	0.7	0.3	0.0	-0.6	0.2	-0.1	-0.6	0.1	-0.2	0.0	-0.2	0.1	-1.0	-0.3	0.1	-0.5	-0.5	0.2	0.2	Incremental Change
			0.3	0.2	0.2	0.9	1.2	1.2	0.6	0.8	0.7	0.1	0.2	0.0	0.0	-0.2	-0.2	-1.2	-1.4	-1.3	-1.8	-2.3	-2.1	-2.1	Cumulative Change
0+34	Gradebreak		15.6	15.6	15.2	15.2	15.5	15.5	14.8	15.3	15.3	14.6	14.6	14.4	14.3	14.1	14.0	12.8	14.4	13.4	14.2	13.5	13.7	Elevation (In Feet)	
				0.0	-0.4	0.0	0.3	0.0	-0.7	0.5	0.0	-0.7	0.0	-0.2	-0.1	-0.2	-0.2	-1.1	1.6	-1.0	0.8	-0.7	0.2	0.2	Incremental Change
				0.0	-0.4	-0.4	-0.1	-0.1	-0.8	-0.3	-0.3	-1.0	-1.0	-1.2	-1.3	-1.5	-1.6	-2.8	-1.2	-2.2	-1.4	-2.1	-1.9	-1.9	Cumulative Change
0+35	Top Bank	17.6	17.6	17.6	17.4	17.4	17.4	17.4	17.6	17.2	17.2	16.5	16.5	16.3	16.3	16.3	16.5	16.2	16.2	16.2	16.0	15.4	15.7	Elevation (In Feet)	
			0.0	0.0	-0.2	0.0	0.0	0.0	0.2	-0.4	0.0	-0.7	0.0	-0.2	0.0	0.0	0.2	-0.3	0.1	0.0	-0.2	-0.6	0.3	0.3	Incremental Change
			0.0	0.0	-0.2	-0.2	-0.2	-0.2	0.0	-0.4	-0.4	-1.1	-1.1	-1.3	-1.3	-1.3	-1.2	-1.4	-1.4	-1.4	-1.6	-2.2	-1.9	-1.9	Cumulative Change
0+42	Tundra		18.3	18.4	18.1	18.1	18.1	18.1	18.0	18.1	18.1	17.5	17.5	17.4	17.3	17.4	17.3	17.2	17.3	17.5	17.1	16.8	16.8	Elevation (In Feet)	
				0.1	-0.3	0.0	0.0	0.0	-0.1	0.1	0.0	-0.6	0.0	-0.1	-0.1	0.1	0.0	-0.1	0.1	0.2	-0.4	-0.3	0.0	0.0	Incremental Change
				0.1	-0.2	-0.2	-0.2	-0.2	-0.3	-0.2	-0.2	-0.8	-0.8	-0.9	-1.0	-0.9	-1.0	-1.1	-1.0	-0.8	-1.3	-1.5	-1.5	-1.5	Cumulative Change
0+50	Tundra	18.0	18.0	18.1	17.9	17.8	17.8	17.8	17.7	17.8	17.8	17.1	17.1	16.9	16.6	16.7	16.6	16.5	16.5	16.6	16.3	16.0	16.1	Elevation (In Feet)	
			0.0	0.1	-0.2	-0.1	0.0	0.0	-0.1	0.1	0.0	-0.7	-0.1	-0.2	-0.3	0.1	-0.1	-0.2	0.1	0.1	-0.3	-0.3	0.1	0.1	Incremental Change
			0.0	0.1	-0.1	-0.2	-0.2	-0.2	-0.3	-0.2	-0.2	-0.9	-0.9	-1.1	-1.4	-1.3	-1.4	-1.6	-1.5	-1.4	-1.7	-2.0	-1.9	-1.9	Cumulative Change

\*\*\*Note: Baseline Stationing Runs from North to South along Cross-Sections.  
 \*\*\*Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflect Actual Elevation 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 C																				Description			
		See Drawing CE-CP00-134 for Survey Cross-Section Locations																							
		8/15/2001	8/23/2001	9/8/2001	7/9/2002	9/14/2002	7/9/2003	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	8/3/2009	7/19/2010	8/4/2011	7/14/2012	7/20/2013	8/12/2014	8/24/2015	9/9/2016	8/31/2017	8/10/2018	Date	
0+00	Tundra	16.9	16.9	16.9	16.9	16.8	16.8	16.8	16.7	16.7	16.8	16.1	16.1	16.0	15.8	16.1	16.0	15.9	16.1	16.1	16.0	15.8	15.8	Elevation (In Feet)	
			0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	-0.7	0.0	-0.1	-0.2	0.3	0.0	-0.2	0.2	0.0	-0.1	-0.2	0.0	Incremental Change
			0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.1	-0.8	-0.8	-0.9	-1.1	-0.8	-0.9	-1.1	-0.8	-0.8	-0.9	-1.1	-1.1	-1.1
0+13	Tundra		16.8	16.7	16.7	16.6	16.7	16.7	16.6	16.7	16.8	16.1	16.2	16.0	15.9	16.0	15.9	15.8	16.0	16.1	15.9	15.7	15.8	Elevation (In Feet)	
				-0.1	0.0	-0.1	0.1	0.0	-0.1	0.1	0.1	-0.7	0.0	-0.2	-0.1	0.1	-0.1	-0.1	0.2	0.1	-0.2	-0.2	0.1	0.1	Incremental Change
				-0.1	-0.1	-0.2	-0.1	-0.1	-0.2	-0.1	0.0	-0.7	-0.7	-0.8	-0.9	-0.8	-0.9	-1.0	-0.8	-0.7	-1.0	-1.1	-1.1	15.8	Cumulative Change
0+27	Top Bank	17.0	17.0	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.9	16.2	16.2	16.2	16.0	16.2	16.1	16.0	15.7	16.2	16.1	15.9	16.1	Elevation (In Feet)	
			0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.7	0.0	0.0	-0.2	0.2	-0.1	-0.2	-0.3	0.5	-0.1	-0.2	0.2	Incremental Change
			0.0	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.8	-0.8	-0.8	-1.0	-0.8	-0.9	-1.1	-1.3	-0.8	-0.9	-1.1	-0.9	-0.9
0+29	Toe Bank	12.8	12.8	12.9	12.5	12.4	13.2	13.2	13.5	13.7	13.8	13.2	13.5	13.4	13.1	13.3	13.3	13.2	13.2	13.6	13.4	13.2	13.3	Elevation (In Feet)	
			0.0	0.1	-0.4	-0.1	0.8	0.0	0.3	0.2	0.1	-0.6	0.3	-0.1	-0.3	0.2	0.0	-0.1	0.0	0.4	-0.2	-0.2	0.1	0.1	Incremental Change
			0.0	0.1	-0.3	-0.4	0.4	0.4	0.7	0.9	1.0	0.4	0.7	0.6	0.3	0.5	0.5	0.4	0.4	0.8	0.6	0.4	0.5	0.5	Cumulative Change
0+31	Toe Bank	13.9	13.6	13.9	13.6	13.4	13.6	13.6	13.5	13.6	13.9	13.2	13.3	13.2	13.0	12.8	13.0	13.0	13.8	13.4	13.2	13.0	13.2	Elevation (In Feet)	
			-0.3	0.3	-0.3	-0.2	0.2	0.0	-0.1	0.1	0.3	-0.7	0.1	-0.1	-0.2	-0.2	0.3	0.0	0.8	-0.4	-0.2	-0.2	0.2	0.2	Incremental Change
			-0.3	0.0	-0.3	-0.5	-0.3	-0.3	-0.3	-0.4	-0.3	0.0	-0.7	-0.6	-0.7	-0.9	-1.1	-0.9	-0.9	-0.1	-0.5	-0.7	-0.9	-0.7	-0.7
0+32	Gradebreak	16.7	N/A	16.7	16.6	N/A	16.7	16.7	16.6	16.7	16.7	16.0	16.0	15.8	15.9	15.9	15.9	15.7	15.5	16.2	15.9	15.6	15.9	Elevation (In Feet)	
				0.0	-0.1		0.1	0.0	-0.1	0.1	0.0	-0.7	0.0	-0.2	0.1	-0.1	0.1	-0.2	-0.2	0.6	-0.3	-0.3	0.3	0.3	Incremental Change
				0.0	-0.1		0.0	0.0	-0.1	0.0	0.0	-0.7	-0.7	-0.9	-0.8	-0.9	-0.8	-1.0	-1.2	-0.6	-0.8	-1.1	-0.8	-0.8	Cumulative Change
0+33	Top Bank	17.3	17.5	17.5	17.1	17.2	17.2	17.2	17.1	17.1	17.5	16.7	16.7	16.5	16.5	16.5	16.6	16.4	16.3	16.7	16.6	16.3	16.5	Elevation (In Feet)	
			0.2	0.0	-0.4	0.1	0.0	0.0	-0.1	0.0	0.4	-0.8	0.0	-0.1	0.0	0.0	0.0	-0.2	-0.1	0.4	-0.2	-0.3	0.2	0.2	Incremental Change
			0.2	0.2	-0.2	-0.1	-0.1	-0.1	-0.2	-0.2	0.2	-0.6	-0.6	-0.8	-0.8	-0.8	-0.7	-0.9	-1.0	-0.6	-0.7	-1.0	-0.8	-0.8	Cumulative Change
0+42	Tundra		17.0	17.1	17.0	16.9	16.9	16.9	17.0	17.0	17.1	16.5	16.7	16.5	16.3	16.5	16.5	16.5	16.6	16.8	16.6	16.4	16.6	Elevation (In Feet)	
				0.1	-0.1	-0.1	0.0	0.0	0.1	0.0	0.1	-0.6	0.2	-0.2	-0.1	0.2	0.0	0.0	0.1	0.2	-0.2	-0.2	0.2	0.2	Incremental Change
				0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.1	-0.5	-0.3	-0.6	-0.7	-0.5	-0.5	-0.5	-0.4	-0.2	-0.4	-0.6	-0.6	16.6	Cumulative Change
0+50	Tundra	17.2	17.1	17.2	17.1	17.0	17.2	17.2	17.1	17.2	17.3	16.7	16.8	16.6	16.5	16.7	16.8	16.7	16.9	17.0	16.9	16.6	16.8	Elevation (In Feet)	
			-0.1	0.1	-0.1	-0.1	0.2	0.0	-0.1	0.1	0.1	-0.6	0.1	-0.1	-0.1	0.2	0.0	0.0	0.1	0.2	-0.1	-0.3	0.2	0.2	Incremental Change
			-0.1	0.0	-0.1	-0.2	0.0	0.0	-0.1	0.0	0.1	-0.5	-0.4	-0.6	-0.7	-0.5	-0.4	-0.5	-0.3	-0.2	-0.3	-0.6	-0.4	-0.4	Cumulative Change
0+60	Tundra	N/A	N/A	N/A	17.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)	
																								Incremental Change	
																									Cumulative Change

\*\*\*Note: Baseline Stationing Runs from North to South along Cross-Sections.

\*\*\*Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflect Actual Elevation 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 D																				Description			
		See Drawing CE-CP00-134 for Survey Cross-Section Locations																							
		8/15/2001	8/23/2001	9/8/2001	7/9/2002	9/14/2002	7/9/2003	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	8/3/2009	7/19/2010	8/4/2011	7/15/2012	7/20/2013	8/12/2014	8/24/2015	9/9/2016	8/31/2017	8/10/2018	Date	
0+00	Tundra	17.6	17.6	17.6	17.6	17.3	17.5	17.5	17.5	17.4	17.5	16.8	16.9	16.6	16.5	16.6	16.5	16.4	16.5	16.5	16.4	16.2	16.4	Elevation (In Feet)	
			0.0	0.0	0.0	-0.3	0.2	0.0	0.0	0.0	-0.1	0.1	-0.7	0.1	-0.4	-0.1	0.1	-0.1	-0.1	0.1	0.0	-0.1	-0.2	0.2	Incremental Change
			0.0	0.0	0.0	-0.3	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.8	-0.7	-1.0	-1.1	-1.0	-1.1	-1.2	-1.1	-1.1	-1.2	-1.4	-1.2	Cumulative Change
0+10	Tundra		17.7	17.9	17.9	17.6	17.6	17.6	17.6	17.6	17.6	16.9	16.9	16.9	16.7	16.9	16.7	16.6	16.7	16.7	16.8	16.5	16.7	Elevation (In Feet)	
				0.2	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	-0.7	0.0	0.0	-0.2	0.2	-0.1	-0.2	0.1	0.0	0.1	-0.3	0.2	Incremental Change	
				0.2	0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.8	-0.8	-0.8	-1.0	-0.8	-1.0	-1.1	-1.0	-1.0	-0.9	-1.2	-1.0	Cumulative Change
0+20	Gradebreak		17.4	17.6	17.5	16.6	NA	NA	NA	17.2	17.2	16.4	16.5	16.0	15.9	15.8	15.8	15.6	15.8	15.8	15.3	15.1	15.3	Elevation (In Feet)	
				0.2	-0.1	-0.9				0.6	-0.1	-0.8	0.1	-0.5	-0.1	-0.1	0.1	-0.2	0.2	0.0	-0.4	-0.2	0.2	Incremental Change	
				0.2	0.1	-0.8				-0.2	-0.3	-1.0	-0.9	-1.4	-1.5	-1.6	-1.6	-1.8	-1.6	-1.6	-2.1	-2.3	-2.1	Cumulative Change	
0+22	Top Bank		16.8	16.7	16.8	16.6	16.8	16.8	16.8	16.5	16.5	15.7	15.7	14.9	14.9	14.8	14.8	14.7	15.1	15.0	14.9	14.6	14.3	Elevation (In Feet)	
				-0.1	0.1	-0.2	0.2	0.0	0.0	0.0	-0.3	-0.1	-0.8	0.0	-0.8	0.0	-0.1	0.0	-0.2	0.4	-0.2	-0.1	-0.3	-0.3	Incremental Change
				-0.1	0.0	-0.2	0.0	0.0	0.0	0.0	-0.3	-0.4	-1.1	-1.1	-1.9	-1.9	-2.0	-2.0	-2.1	-1.7	-1.9	-1.9	-2.2	-2.5	Cumulative Change
0+24	Toe Bank	14.7	14.6	14.7	14.8	14.3	14.8	14.8	14.8	13.9	14.9	14.2	14.5	14.2	13.9	14.3	14.3	14.1	14.2	14.5	14.2	14.0	14.2	Elevation (In Feet)	
			-0.1	0.1	0.1	-0.5	0.5	0.0	0.0	0.0	-0.9	1.0	-0.7	0.3	-0.3	-0.3	0.4	0.0	-0.2	0.2	0.2	-0.3	-0.2	0.2	Incremental Change
			-0.1	0.0	0.1	-0.4	0.1	0.1	0.1	0.1	-0.8	0.2	-0.5	-0.2	-0.5	-0.8	-0.4	-0.4	-0.6	-0.5	-0.2	-0.5	-0.7	-0.5	Cumulative Change
0+25	CL Swale		14.1	14.2	14.1	13.7	14.1	14.1	14.1	13.7	14.0	13.4	13.9	13.6	13.9	13.4	13.5	13.6	14.1	13.7	13.8	13.7	13.9	Elevation (In Feet)	
				0.1	-0.1	-0.4	0.4	0.0	0.0	0.0	-0.4	0.3	-0.6	0.4	-0.3	0.3	-0.5	0.1	0.2	0.5	-0.4	0.0	-0.1	0.2	Incremental Change
				0.1	0.0	-0.4	0.0	0.0	0.0	0.0	-0.4	-0.1	-0.7	-0.3	-0.5	-0.2	-0.7	-0.6	-0.5	0.0	-0.4	-0.3	-0.4	-0.2	Cumulative Change
0+27	Toe Bank	14.4	14.6	14.6	14.3	14.0	14.2	14.2	14.2	16.2	16.5	15.8	15.8	15.6	15.5	15.3	15.4	15.1	14.7	14.9	15.4	15.2	14.4	Elevation (In Feet)	
			0.2	0.0	-0.3	-0.3	0.2	0.0	0.0	0.0	2.0	0.3	-0.7	0.0	-0.1	-0.1	-0.2	0.0	-0.3	-0.4	0.2	0.5	-0.2	-0.8	Incremental Change
			0.2	0.2	-0.1	-0.4	-0.2	-0.2	-0.2	-0.2	1.8	2.1	1.4	1.4	1.2	1.1	0.9	1.0	0.7	0.3	0.5	1.0	0.8	0.0	Cumulative Change
0+29	Top Bank	17.3	17.3	17.4	17.1	16.9	17.1	17.1	17.0	17.0	17.0	16.4	16.5	15.9	15.8	15.8	15.7	15.6	15.6	15.7	15.7	15.3	15.5	Elevation (In Feet)	
				0.1	-0.3	-0.2	0.2	0.0	-0.1	0.0	0.0	-0.6	0.1	-0.5	-0.1	0.0	-0.1	-0.1	-0.1	0.1	0.1	0.0	-0.4	0.2	Incremental Change
				0.1	-0.2	-0.4	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.9	-0.9	-1.4	-1.5	-1.5	-1.6	-1.8	-1.7	-1.6	-1.6	-2.0	-1.8	Cumulative Change
0+38	Tundra		17.6	17.7	17.5	17.3	17.3	17.3	17.2	17.2	17.1	16.4	16.4	14.8	14.7	14.8	14.6	14.7	14.7	14.9	14.8	14.5	14.9	Elevation (In Feet)	
				0.1	-0.2	-0.2	0.0	0.0	-0.1	0.0	-0.1	-0.7	0.0	-1.6	-0.1	0.1	-0.3	0.1	0.1	0.2	-0.1	-0.3	0.4	Incremental Change	
				0.1	-0.1	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4	-0.5	-1.2	-1.2	-2.8	-2.9	-2.8	-3.0	-2.9	-2.9	-2.7	-2.8	-3.1	-2.7	Cumulative Change
0+50	Tundra	17.7	17.6	17.6	17.5	17.3	16.8	16.8	17.4	17.4	17.4	16.7	16.8	14.9	14.7	14.7	15.0	15.3	14.9	15.1	15.0	14.6	15.0	Elevation (In Feet)	
			-0.1	0.0	-0.1	-0.2	-0.5	0.0	0.6	0.0	0.0	-0.7	0.1	-1.9	-0.2	0.0	0.3	0.3	-0.4	0.2	-0.1	-0.4	0.4	Incremental Change	
			-0.1	-0.1	-0.2	-0.4	-0.9	-0.9	-0.3	-0.3	-0.3	-0.3	-1.0	-0.9	-2.8	-3.0	-3.0	-2.8	-2.4	-2.8	-2.6	-2.7	-3.1	-2.7	Cumulative Change

\*\*\*Note: Baseline Stationing Runs from North to South along Cross-Sections.  
 \*\*\*Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflect Actual Elevation 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															Description		
		See Drawing CE-CP00-134 for Survey Cross-Section Locations																	
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	8/3/2009	7/19/2010	8/4/2011	7/15/2012	7/20/2013	8/12/2014	8/24/2015	9/9/2016	8/31/2017	8/10/2018	Date	
0+00	Tundra	17.5	17.5	17.4	17.5	16.8	16.8	16.8	16.6	16.6	16.7	16.7	16.9	17.1	16.8	16.6	16.8	Elevation (In Feet)	
			0.0	-0.1	0.1	-0.7	0.0	-0.1	-0.2	0.0	0.1	0.0	0.2	0.2	-0.2	-0.2	0.2	Incremental Change	
			0.0	-0.1	0.0	-0.7	-0.7	-0.7	-0.9	-0.9	-0.8	-0.8	-0.6	-0.4	-0.7	-0.9	-0.7	Cumulative Change	
0+9	Tundra	17.3	17.3	17.3	17.8	17.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)	
			0.0	0.0	0.5	-0.7												Incremental Change	
			0.0	0.0	0.5	-0.2													Cumulative Change
0+12	Gradebreak	17.8	17.8	17.4	17.9	17.2	17.3	17.1	17.1	17.2	17.2	17.2	17.2	17.3	17.3	17.1	17.2	Elevation (In Feet)	
			0.0	-0.4	0.5	-0.7	0.1	-0.1	0.0	0.1	-0.1	0.0	0.0	0.1	0.0	-0.2	0.1	Incremental Change	
			0.0	-0.4	0.1	-0.6	-0.6	-0.7	-0.7	-0.6	-0.6	-0.6	-0.6	-0.6	-0.5	-0.5	-0.7	-0.6	Cumulative Change
0+20	Top Bank	17.3	17.3	17.3	17.3	16.2	15.8	15.8	15.5	15.2	15.1	15.0	15.2	15.0	14.9	14.6	14.9	Elevation (In Feet)	
			0.0	0.0	0.0	-1.1	-0.4	0.0	-0.3	-0.3	-0.1	-0.1	0.2	-0.3	0.0	-0.3	0.3	Incremental Change	
			0.0	0.0	0.0	-1.1	-1.5	-1.5	-1.8	-2.1	-2.2	-2.3	-2.1	-2.3	-2.4	-2.7	-2.4	Cumulative Change	
0+21	Toe Bank	16.5	16.5	16.5	16.2	14.8	14.3	13.4	15.0	13.1	13.4	13.1	14.2	13.2	13.6	12.9	13.2	Elevation (In Feet)	
			0.0	0.0	-0.3	-1.4	-0.5	-0.9	1.6	-1.9	0.2	-0.3	-0.3	1.1	-1.0	0.4	-0.7	0.3	Incremental Change
			0.0	0.0	-0.3	-1.7	-2.2	-3.1	-1.5	-3.4	-3.1	-3.4	-2.3	-3.3	-2.9	-3.6	-3.3	Cumulative Change	
0+23	CL Swale	16.0	16.0	16.0	14.7	13.8	13.2	13.0	12.7	12.8	12.9	13.1	13.2	13.1	13.2	12.8	13.1	Elevation (In Feet)	
			0.0	0.0	-1.3	-0.9	-0.6	-0.2	-0.3	0.1	0.2	0.2	0.1	-0.1	0.1	-0.4	0.3	Incremental Change	
			0.0	0.0	-1.3	-2.2	-2.8	-3.0	-3.3	-3.3	-3.1	-2.9	-2.8	-2.9	-2.8	-3.2	-2.9	Cumulative Change	
0+24	Toe Bank	16.2	16.4	16.3	14.8	13.1	13.8	13.1	13.1	13.1	13.0	13.2	13.2	13.3	13.1	13.0	13.2	Elevation (In Feet)	
			0.2	-0.1	-1.5	-1.7	0.7	-0.7	0.0	0.0	-0.1	0.2	0.1	0.1	-0.2	-0.1	0.2	Incremental Change	
			0.2	0.1	-1.4	-3.1	-2.4	-3.1	-3.1	-3.1	-3.1	-3.2	-3.0	-3.0	-2.9	-3.1	-3.2	-3.0	Cumulative Change
0+27	Top Bank	17.3	17.4	17.4	16.3	14.5	14.5	14.3	14.2	14.4	14.4	14.7	14.8	14.4	14.6	14.2	14.7	Elevation (In Feet)	
			0.1	0.0	-1.2	-1.8	0.0	-0.2	-0.1	0.2	0.0	0.3	0.1	-0.3	0.2	-0.4	0.5	Incremental Change	
			0.1	0.1	-1.1	-2.8	-2.8	-3.0	-3.1	-2.9	-2.9	-2.6	-2.6	-2.9	-2.7	-3.1	-2.6	Cumulative Change	
0+38	Tundra	17.4	17.4	17.5	17.5	16.8	16.8	16.7	16.7	16.8	16.8	16.7	16.8	17.0	16.7	16.6	16.6	Elevation (In Feet)	
			0.0	0.1	0.0	-0.7	0.0	-0.1	0.0	0.1	-0.1	-0.1	0.1	0.2	-0.2	-0.1	0.0	Incremental Change	
			0.0	0.1	0.1	-0.6	-0.6	-0.7	-0.7	-0.6	-0.6	-0.7	-0.6	-0.4	-0.7	-0.8	-0.8	Cumulative Change	
0+49	Tundra	17.4	17.4	17.4	17.4	16.7	16.8	16.7	16.6	16.9	16.7	16.5	16.7	16.8	16.8	16.5	16.7	Elevation (In Feet)	
			0.0	0.0	0.0	-0.7	0.1	-0.1	0.0	0.3	-0.2	-0.2	0.2	0.1	0.0	-0.3	0.2	Incremental Change	
			0.0	0.0	0.0	-0.7	-0.6	-0.8	-0.8	-0.5	-0.7	-0.9	-0.7	-0.6	-0.6	-0.9	-0.7	Cumulative Change	

\*\*\*Note: Baseline Stationing Runs from North to South along Cross-Sections.  
 \*\*\*Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflect Actual Elevation 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 F																Description	
		See Drawing CE-CP00-134 for Survey Cross-Section Locations																	
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	8/3/2009	7/19/2010	8/4/2011	7/15/2012	9/20/2013	8/12/2014	8/24/2015	9/9/2016	8/31/2017	8/10/2018	Date	
0+00	Tundra	17.9	17.9	18.2	18.3	17.7	17.7	17.3	17.3	17.3	17.3	17.3	17.5	17.7	17.5	17.2	17.4	Elevation (In Feet)	
			0.0	0.3	0.1	-0.6	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.2	0.2	-0.2	-0.3	0.2	Incremental Change
			0.0	0.3	0.4	-0.2	-0.2	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.4	-0.2	-0.4	-0.7	-0.5	Cumulative Change
0+10	Tundra	17.3	17.2	17.2	17.3	16.6	16.6	16.6	16.6	16.6	16.7	16.6	16.9	17.0	16.8	16.7	16.8	Elevation (In Feet)	
			-0.1	0.0	0.1	-0.7	0.0	0.0	0.0	0.0	0.1	-0.1	0.2	0.1	-0.2	-0.1	0.1	Incremental Change	
			-0.1	-0.1	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.6	-0.7	-0.4	-0.3	-0.5	-0.6	-0.5	Cumulative Change	
0+14	Gradebreak	18.0	18.0	18.0	18.0	16.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)	
			0.0	0.0	0.0	-1.4												Incremental Change	
			0.0	0.0	0.0	-1.4												Cumulative Change	
0+20	Top Bank	17.5	17.5	17.6	17.6	16.6	16.6	16.4	16.3	16.1	16.1	15.8	16.1	16.3	16.0	15.8	16.1	Elevation (In Feet)	
			0.0	0.1	0.0	-1.0	0.0	-0.2	-0.1	-0.2	0.0	-0.3	0.3	0.2	-0.3	-0.2	0.3	Incremental Change	
			0.0	0.1	0.1	-0.9	-0.9	-1.1	-1.2	-1.4	-1.4	-1.7	-1.4	-1.2	-1.5	-1.7	-1.5	Cumulative Change	
0+21	Toe Bank	16.5	16.3	16.3	16.0	15.1	15.0	14.7	14.4	14.3	14.2	13.9	15.5	14.2	13.7	13.7	14.0	Elevation (In Feet)	
			-0.2	0.0	-0.3	-0.9	-0.1	-0.3	-0.3	-0.2	-0.1	-0.3	1.7	-1.3	-0.5	0.0	0.3	Incremental Change	
			-0.2	-0.2	-0.5	-1.4	-1.5	-1.8	-2.1	-2.3	-2.4	-2.6	-1.0	-2.3	-2.8	-2.8	-2.5	Cumulative Change	
0+24	CL Swale	15.0	12.5	15.0	13.8	13.4	13.7	13.7	13.4	13.4	13.7	13.6	13.7	13.8	13.6	13.3	13.6	Elevation (In Feet)	
			-2.5	2.5	-1.2	-0.4	0.3	0.0	-0.3	0.0	0.3	-0.1	0.2	0.1	-0.2	-0.3	0.3	Incremental Change	
			-2.5	0.0	-1.2	-1.6	-1.4	-1.4	-1.6	-1.6	-1.3	-1.4	-1.3	-1.2	-1.4	-1.7	-1.4	Cumulative Change	
0+26	Toe Bank	16.1	12.5	13.1	13.6	15.2	13.6	15.8	13.5	13.3	13.4	14.4	14.6	14.7	14.6	14.2	13.6	Elevation (In Feet)	
			-3.6	0.6	0.5	1.6	-1.6	2.2	-2.3	-0.2	0.2	1.0	0.2	0.1	-0.1	-0.4	-0.6	Incremental Change	
			-3.6	-3.0	-2.5	-0.9	-2.5	-0.3	-2.6	-2.8	-2.7	-1.7	-1.5	-1.4	-1.5	-1.9	-2.5	Cumulative Change	
0+28	Top Bank	17.8	17.9	17.9	17.3	16.4	16.1	16.2	15.6	15.6	15.6	15.7	15.9	15.8	15.8	15.8	15.6	Elevation (In Feet)	
			0.1	0.0	-0.6	-0.9	-0.3	0.1	-0.6	0.0	0.0	0.0	0.1	0.2	-0.1	0.1	0.0	-0.2	Incremental Change
			0.1	0.1	-0.5	-1.4	-1.7	-1.6	-2.2	-2.2	-2.3	-2.1	-1.9	-2.0	-2.0	-2.0	-2.0	Cumulative Change	
0+34	Gradebreak	17.9	17.9	18.0	18.0	17.4	17.5	17.4	17.3	17.4	17.4	17.4	17.5	17.6	17.5	17.2	17.6	Elevation (In Feet)	
			0.0	0.1	0.0	-0.6	0.1	-0.1	-0.1	0.1	0.1	0.1	0.0	0.1	0.1	-0.1	-0.3	0.4	Incremental Change
			0.0	0.1	0.1	-0.5	-0.4	-0.5	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4	-0.3	-0.4	-0.7	-0.3	Cumulative Change
0+43	Gradebreak	17.2	17.3	17.2	17.4	16.8	16.8	16.7	16.7	16.8	16.9	16.7	17.1	17.1	16.8	16.7	16.9	Elevation (In Feet)	
			0.1	-0.1	0.2	-0.6	0.0	-0.1	0.0	0.1	0.1	-0.2	0.3	0.0	-0.3	-0.1	0.2	Incremental Change	
			0.1	0.0	0.2	-0.4	-0.4	-0.5	-0.5	-0.4	-0.3	-0.5	-0.1	-0.1	-0.4	-0.5	-0.3	Cumulative Change	
0+46	Gradebreak	17.8	17.8	17.8	17.6	17.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)	
			0.0	0.0	-0.2	-0.6												Incremental Change	
			0.0	0.0	-0.2	-0.8												Cumulative Change	
0+52	Tundra	17.8	17.9	17.9	18.0	17.3	17.4	17.3	17.1	17.1	17.3	17.2	17.4	17.5	17.3	17.1	17.2	Elevation (In Feet)	
			0.1	0.0	0.1	-0.7	0.1	-0.1	-0.2	0.0	0.2	0.0	0.1	0.1	-0.2	-0.2	0.1	Incremental Change	
			0.1	0.1	0.2	-0.5	-0.4	-0.5	-0.7	-0.7	-0.6	-0.6	-0.4	-0.3	-0.5	-0.7	-0.6	Cumulative Change	

\*\*\*Note: Baseline Stationing Runs from North to South along Cross-Sections.  
 \*\*\*Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflect Actual Elevation 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 G															Description		
		See Drawing CE-CP00-134 for Survey Cross-Section Locations																	
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	8/3/2009	7/19/2010	8/4/2011	7/15/2012	9/20/2013	8/12/2014	8/24/2015	9/9/2016	8/31/2017	8/10/2018	Date	
0+00	Tundra	17.1	17.3	17.4	17.5	16.8	16.9	16.4	16.3	16.5	16.5	16.4	16.6	16.6	16.4	16.3	16.4	Elevation (In Feet)	
			0.2	0.1	0.1	-0.7	0.1	-0.5	-0.1	0.2	0.1	-0.1	0.2	0.0	-0.2	-0.1	0.1	Incremental Change	
			0.2	0.3	0.4	-0.3	-0.2	-0.7	-0.8	-0.6	-0.6	-0.7	-0.5	-0.5	-0.7	-0.8	-0.7	Cumulative Change	
0+09	Tundra	17.2	17.1	17.2	17.3	16.6	16.9	16.5	16.4	16.4	16.5	16.5	16.6	16.7	16.5	16.3	16.4	Elevation (In Feet)	
			-0.1	0.1	0.1	-0.7	0.3	-0.4	-0.1	0.0	0.1	0.0	0.1	0.1	-0.2	-0.2	0.1	Incremental Change	
			-0.1	0.0	0.1	-0.6	-0.3	-0.7	-0.8	-0.8	-0.7	-0.7	-0.6	-0.5	-0.7	-0.9	-0.8	Cumulative Change	
0+16	Gradebreak	17.9	17.9	17.9	17.5	16.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)	
			0.0	0.0	-0.4	-0.7												Incremental Change	
			0.0	0.0	-0.4	-1.1													Cumulative Change
0+22	Top Bank	17.6	17.7	17.7	17.8	17.0	17.1	16.9	16.9	16.9	16.9	16.8	17.0	17.1	16.8	16.7	16.9	Elevation (In Feet)	
			0.1	0.0	0.1	-0.8	0.1	-0.1	0.0	0.0	0.0	-0.2	0.3	0.1	-0.3	-0.1	0.2	Incremental Change	
			0.1	0.1	0.1	-0.6	-0.5	-0.7	-0.7	-0.7	-0.7	-0.7	-0.8	-0.6	-0.5	-0.8	-0.9	-0.7	Cumulative Change
0+24	Toe Bank	16.9	17.0	17.0	17.0	16.2	16.3	16.2	16.3	16.4	16.4	16.3	16.4	16.6	16.3	16.1	16.3	Elevation (In Feet)	
			0.1	0.0	0.0	-0.8	0.1	0.0	0.1	0.1	0.1	0.0	-0.1	0.1	0.2	-0.3	-0.2	0.2	Incremental Change
			0.1	0.1	0.1	-0.7	-0.6	-0.7	-0.6	-0.5	-0.5	-0.5	-0.6	-0.5	-0.3	-0.6	-0.8	-0.6	Cumulative Change
0+26	CL Swale	16.5	16.5	16.5	16.5	16.3	16.1	16.0	16.0	15.9	16.0	16.4	16.4	16.2	16.0	15.7	15.9	Elevation (In Feet)	
			0.0	0.0	0.0	-0.2	-0.2	-0.1	0.0	-0.1	0.1	0.4	0.0	-0.2	-0.2	-0.3	0.2	Incremental Change	
			0.0	0.0	0.0	-0.2	-0.4	-0.5	-0.5	-0.6	-0.5	-0.1	-0.1	-0.3	-0.5	-0.8	-0.6	Cumulative Change	
0+28	Toe Bank	16.8	16.7	16.9	16.9	16.3	16.3	16.3	16.1	16.3	16.3	16.4	16.3	16.3	16.3	16.0	16.1	Elevation (In Feet)	
			-0.1	0.2	0.0	-0.6	-0.1	0.0	-0.2	0.2	0.0	0.1	0.0	0.0	-0.1	-0.3	0.1	Incremental Change	
			-0.1	0.1	0.1	-0.5	-0.6	-0.5	-0.7	-0.5	-0.5	-0.5	-0.4	-0.5	-0.5	-0.5	-0.8	-0.7	Cumulative Change
0+30	Top Bank	17.7	17.8	17.8	17.9	17.3	17.3	17.2	17.1	17.3	17.3	17.2	17.4	17.6	17.3	17.1	17.3	Elevation (In Feet)	
			0.1	0.0	0.1	-0.6	0.0	-0.1	-0.1	0.2	0.0	0.0	0.1	0.2	-0.3	-0.2	0.2	Incremental Change	
			0.1	0.1	0.2	-0.4	-0.4	-0.5	-0.6	-0.4	-0.4	-0.4	-0.5	-0.3	-0.1	-0.4	-0.6	-0.4	Cumulative Change
0+37	Tundra	17.6	17.6	17.6	17.7	17.0	17.3	17.1	16.9	17.1	17.2	17.0	17.3	17.3	17.1	16.9	17.2	Elevation (In Feet)	
			0.0	0.0	0.1	-0.7	0.3	-0.2	-0.2	0.2	0.0	-0.1	0.3	0.0	-0.2	-0.2	0.3	Incremental Change	
			0.0	0.0	0.1	-0.6	-0.3	-0.6	-0.7	-0.5	-0.5	-0.5	-0.6	-0.3	-0.3	-0.5	-0.7	-0.4	Cumulative Change
0+46	Tundra	17.3	17.3	17.3	17.4	16.8	16.8	16.7	16.6	16.7	16.7	16.7	16.8	17.0	16.8	16.6	16.7	Elevation (In Feet)	
			0.0	0.0	0.1	-0.6	0.0	-0.1	-0.1	0.1	0.0	0.0	0.1	0.2	-0.2	-0.2	0.1	Incremental Change	
			0.0	0.0	0.1	-0.5	-0.5	-0.6	-0.7	-0.6	-0.6	-0.6	-0.6	-0.5	-0.3	-0.5	-0.7	-0.6	Cumulative Change

\*\*\*Note: Baseline Stationing Runs from North to South along Cross-Sections.

\*\*\*Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflect Actual Elevation 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 H																Description					
		See Drawing CE-CP00-134 for Survey Cross-Section Locations																Date					
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	8/3/2009	7/19/2010	8/4/2011	7/15/2012	9/20/2013	8/12/2014	8/24/2015	9/9/2016	8/31/2017	8/10/2017	FUTURE	FUTURE	FUTURE	FUTURE		
0+00	Tundra	17.0	16.8	16.6	16.7	16.0	16.0	16.1	15.9	16.1	16.1	16.0	16.2	16.4	16.1	15.9	16.0					Elevation (In Feet)	
			-0.2	-0.2	0.1	-0.7	0.0	0.1	-0.2	0.2	0.0	-0.1	0.2	0.1	-0.3	-0.2	0.1					Incremental Change	
			-0.2	-0.4	-0.3	-1.0	-1.0	-0.9	-1.1	-0.9	-0.9	-1.0	-0.8	-0.6	-0.9	-1.1	-1.0					Cumulative Change	
0+09	Tundra	17.1	16.9	16.9	17.0	16.4	16.5	16.3	16.2	16.3	16.5	16.3	16.5	16.6	16.5	16.2	16.3					Elevation (In Feet)	
			-0.2	0.0	0.1	-0.6	0.1	-0.1	-0.1	0.1	0.1	-0.1	0.1	0.1	-0.2	-0.3	0.1					Incremental Change	
			-0.2	-0.2	-0.1	-0.7	-0.7	-0.8	-0.9	-0.8	-0.6	-0.8	-0.6	-0.5	-0.7	-0.9	-0.8					Cumulative Change	
0+18	Gradebreak	17.8	17.8	17.8	17.3	16.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A					Elevation (In Feet)	
			0.0	0.0	-0.5	-0.7																Incremental Change	
			0.0	0.0	-0.5	-1.2																	Cumulative Change
0+24	Top Bank	17.3	17.4	17.4	17.5	16.8	16.8	16.7	16.6	16.4	16.4	16.4	15.9	16.2	16.0	15.6	15.6					Elevation (In Feet)	
			0.1	0.0	0.1	-0.6	0.0	-0.1	-0.1	-0.2	0.0	-0.1	-0.5	0.3	-0.2	-0.4	0.0					Incremental Change	
			0.1	0.1	0.1	-0.5	-0.5	-0.6	-0.7	-0.9	-0.9	-0.9	-1.5	-1.1	-1.4	-1.7	-1.7					Cumulative Change	
0+25	Toe Bank	16.8	16.4	16.6	16.6	15.9	15.9	15.7	15.3	15.1	14.9	14.3	14.9	14.2	13.7	13.7	13.8					Elevation (In Feet)	
			-0.4	0.2	0.0	-0.7	0.0	-0.3	-0.4	-0.2	-0.2	-0.5	0.5	-0.7	-0.4	0.0	0.1					Incremental Change	
			-0.4	-0.2	-0.2	-0.9	-0.9	-1.1	-1.5	-1.7	-1.9	-2.5	-2.0	-2.6	-3.1	-3.1	-3.0					Cumulative Change	
0+28	CL Swale	16.3	16.3	16.3	16.3	15.8	15.6	15.5	15.0	14.8	14.7	14.1	14.3	13.5	13.2	12.7	12.9					Elevation (In Feet)	
			0.0	0.0	0.0	-0.5	-0.3	-0.1	-0.5	-0.2	-0.1	-0.6	0.2	-0.8	-0.3	-0.5	0.2					Incremental Change	
			0.0	0.0	0.0	-0.5	-0.8	-0.8	-1.3	-1.5	-1.6	-2.2	-2.0	-2.8	-3.1	-3.6	-3.4					Cumulative Change	
0+30	Toe Bank	16.6	16.6	16.4	16.5	15.8	15.9	15.9	15.5	15.2	14.9	14.0	14.3	14.5	13.4	13.2	13.4					Elevation (In Feet)	
			0.0	-0.2	0.1	-0.7	0.1	0.0	-0.4	-0.3	-0.3	-0.9	0.3	0.2	-1.0	-0.2	0.2					Incremental Change	
			0.0	-0.2	-0.1	-0.8	-0.7	-0.7	-1.1	-1.4	-1.7	-2.7	-2.3	-2.1	-3.2	-3.4	-3.2					Cumulative Change	
0+32	Top Bank	17.6	17.7	17.6	17.6	16.9	17.0	16.8	16.8	16.5	16.3	15.8	15.8	16.1	15.7	15.3	15.6					Elevation (In Feet)	
			0.1	-0.1	0.0	-0.7	0.1	-0.2	0.0	-0.4	-0.2	-0.4	0.0	0.3	-0.4	-0.4	0.3					Incremental Change	
			0.1	0.0	0.0	-0.7	-0.6	-0.8	-0.8	-1.2	-1.3	-1.8	-1.8	-1.5	-1.9	-2.3	-2.0					Cumulative Change	
0+40	Gradebreak	18.2	18.2	18.2	18.3	17.6	17.7	17.6	17.5	17.6	17.6	17.5	17.7	17.9	17.6	17.3	17.5					Elevation (In Feet)	
			0.0	0.0	0.1	-0.7	0.1	-0.1	-0.1	0.1	0.0	-0.1	0.1	0.3	-0.4	-0.3	0.2					Incremental Change	
			0.0	0.0	0.1	-0.6	-0.5	-0.6	-0.7	-0.6	-0.6	-0.6	-0.7	-0.5	-0.3	-0.6	-0.9	-0.7					Cumulative Change
0+42	Gradebreak	17.7	17.7	17.8	17.9	17.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A					Elevation (In Feet)	
			0.0	0.1	0.1	-0.7																	Incremental Change
			0.0	0.1	0.2	-0.5																	Cumulative Change
0+50	Tundra	17.2	17.2	17.3	17.4	16.7	16.7	16.7	16.7	16.7	16.7	16.6	16.8	16.9	16.6	16.5	16.5					Elevation (In Feet)	
			0.0	0.1	0.1	-0.7	0.0	0.0	0.0	0.0	0.0	-0.1	0.2	0.1	-0.3	-0.1	0.0					Incremental Change	
			0.0	0.1	0.2	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.6	-0.4	-0.3	-0.6	-0.7	-0.7					Cumulative Change

\*\*\*Note: Baseline Stationing Runs from North to South along Cross-Sections.  
 \*\*\*Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflect Actual Elevation per Differential Levels from CD-1, ran August 2007.