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January 16, 2020
Project#01349-0001

Bowie Resources, LLC
43659 Bowie Road
Paonia, Colorado 81428

Attention: Mr. Basil Bear

Subject: Summary of Instrumentation Monitoring
4th Quarter 2019
Bowie Coal Waste Disposal Area No. 2
Paonia, Colorado

Reference: *Summary of Instrumentation Monitoring, 3rd Quarter 2018, Bowie Coal Waste Disposal Area No. 2, Paonia, Colorado* by Huddleston-Berry Engineering & Testing, LLC for Bowie Resources, LLC, October 16, 2019.

Stability Evaluation, Technical Revision #85, Gob Pile #2 Drying Area, Bowie No. 2 Mine by Huddleston-Berry Engineering & Testing, LLC for Bowie Resources, LLC, June 3, 2014.

Dear Mr. Bear,

At the request of the Colorado Division of Reclamation, Mining and Safety (DRMS), Huddleston-Berry Engineering & Testing, LLC (HBET) prepared this letter regarding quarterly monitoring of vibrating wire piezometers and inclinometers at Coal Waste Disposal Area No. 2 (CWDA No. 2) at the Bowie mine near Paonia, Colorado. The intent of the monitoring was to detect significant changes in the pore water pressures or significant displacements within the coal waste which may impact the stability of the waste pile.

Inclinometers

In 2005, three inclinometers, designated BG05-04, BG05-05, and BG05-07, were installed at CWDA No. 2 through the coal refuse and into the native foundation soils. The inclinometers have been monitored quarterly since August 2005. The 4th Quarter 2019 monitoring was completed by DOWL on December 12th, 2019. The monitoring report prepared by DOWL includes a site plan showing the locations of the inclinometers and cumulative displacement curves relative to the baseline readings in 2005. Axis "A" reflects deformation with depth in the direction of anticipated movement perpendicular to the face of the gob. Axis "B" reflects deformation with depth parallel to the face of the gob.

Discussion of Inclinometer Monitoring

The 2nd and 3rd Quarter readings showed deflection in BG05-5. However, the deflection was perpendicular to the slope direction. In addition, the 4th Quarter data does not show this deflection. As a result, HBET does not believe that the reported deflection is an indication of instability. However, the next quarterly reading will provide additional information for evaluation. No significant movements were reported for the other inclinometers.

Vibrating Wire Piezometers

Between 2005 and 2012, a total of ten vibrating wire piezometers were installed in CWDA No. 2. However, several of the piezometers have been damaged or have otherwise ceased to function. Currently, five of the piezometers are functional.

Monitoring of the functioning piezometers was completed by DOWL December 12th, 2019. The attached monitoring report prepared by DOWL includes the piezometer monitoring data and the data is summarized in the following table.

VWP ID	Initial Pore Pressure (psi)	09/30/19 Pore Pressure (psi)	12/12/19 Pore Pressure (psi)	Difference Since Installation (psi)	Difference Since Last Reading (psi)
VWP-05	6.8	1.9	2.0	-4.8	+0.1
VWP-06	11.3	12.0	12.0	+0.7	0.0
VWP-08	8.2	8.8	8.8	+0.6	0.0
VWP-09	2.8	2.8	2.9	+0.1	+0.1
VWP-10	-1.9	-1.8	-1.7	+0.2	+0.1

Discussion of Vibrating Wire Piezometers

VWP-05

VWP-05 was installed on August 3, 2005 near the toe of CWDA No. 2 adjacent to the access road/bench. The pore pressures recorded at VWP-05 have shown some seasonal fluctuations; however, the range of pore pressure changes is fairly small. In general, HBET does not believe that the pore pressures in VWP-05 are cause for concern regarding stability of the gob pile.

VWP-06

VWP-06 was installed on June 5, 2009 near the existing top of CWDA No. 2. The pore pressures recorded at VWP-06 have fluctuated since installation. In general, the fluctuations have been seasonal and reflect the level of coal mine waste placement activity on top of CWDA No. 2. In general, HBET does not believe that the measured pore pressures are an indication of any instability in CWDA No. 2.

VWP-08

VWP-08 was installed on June 5, 2009 at a slightly lower elevation than VWP-06. The pore pressures recorded at VWP-08 have fluctuated since installation. However, the fluctuations have generally been within a narrow range of values. The measured pore pressures are generally consistent with the level of coal mine waste placement activity at CWDA No. 2.

As indicated in the referenced *Stability Evaluation* report, the stability of CWDA No. 2 is sensitive to increases in pore pressures in VWP-08. An increase in the pore pressure of 7 psi in VWP-08 would result in a reduction of the Factor of Safety to below 1.5.

The current pore pressure reflects a piezometric surface elevation of approximately 6096 feet which is much less than the critical elevation of 6113 feet. As a result, HBET does not believe that the measured pore pressures in VWP-08 are any indication of instability in CWDA No. 2.

VWP-09

VWP-09 was installed on May 18, 2012 near the toe of CWDA No. 2. The pore pressures recorded at VWP-09 have been fairly steady since installation. This suggests that dewatering of the gob in this area is likely nearly complete. It is anticipated that the pore pressures at VWP-09 will remain fairly steady over time.

VWP-10

VWP-10 was installed on May 18, 2014 near the toe of CWDA No. 2. The pore pressures recorded at VWP-10 have been fairly steady since installation. This suggests that dewatering of the gob in this area is likely nearly complete. It is anticipated that the pore pressures at VWP-10 will remain fairly steady over time.

General

In general, based upon the results of the recent VWP and inclinometer monitoring data, HBET does not believe that there is any reduction in the stability of CWDA No. 2. Due to the limited activity at the mine, HBET recommends that the monitoring frequency be reduced to semi-annually.

We are pleased to be of service to your project. Please contact us if you have any questions or comments regarding the contents of this report.

Respectfully Submitted:
Huddleston-Berry Engineering and Testing, LLC

Michael A. Berry, P.E.
Vice President of Engineering

ATTACHMENTS

DOWL
970-249-6828 ■ 800-865-9847 (fax) ■ 222 South Park ■ Montrose, Colorado 81401 ■ www.dowl.com
Alaska ■ Arizona ■ Colorado ■ Montana ■ Oregon ■ Washington ■ Wyoming

December 23, 2019

Mike Berry
Huddleston-Berry Engineering and Testing, LLC
640 White Avenue
Grand Junction, CO 81501

SUBJECT: Summary Report, 4th Quarter 2019, Inclinometer and Active Vibrating Wire Piezometer Data October – December 2019, Bowie Mine #2 Coal Waste Disposal Area (CWDA) #2

Greetings, Mr. Berry:

DOWL conducted quarterly monitoring of inclinometers and vibrating wire piezometers (VWP) at Coal Waste Disposal Area #2 (CWDA #2), Bowie Resources, LLC. This report is intended to cover the period of October through December 2019. Inclinometer data was recorded on 12/12/19 and 12/17/19 and VWP data was recorded on12/12 and 12/21/19. We made multiple trips to the site because of instrumentation errors due to the cold weather. Per CDRMS and your instructions, vibrating wire piezometer and inclinometer readings for all active instruments are taken quarterly.

Vibrating Wire Piezometers

The physical locations of the piezometers are shown on the attached Instrumentation Site Plan (Map 1). As seen on this map, five of the original VWP's were damaged and some were replaced. Currently, there are five active VWP's, and three of them are adjacent to inclinometers. The graph of historical data from 5/16/05 through 5/21/14 is presented for reference as Figure 1. A graph of measured pore pressures of active piezometers is presented on the attached Figure 2 and is presented numerically in Table 1 below.

Table 1. Summary of VWP Pore Pressure Readings

VWP ID #	Measured Pore Pressures (psi)				Pore Pressure Difference (psi)		
	Installation	12/6/19	9/30/19 (Q3)	12/12/19 (Q4)	Since Installation	Last Year	Last Quarter
VWP-05	6.8	1.6	1.9	2.0	-4.8	0.4	0.1
VWP-06	11.3	12.5	12.0	12.0	0.7	-0.5	0.0
VWP-08	8.2	9.0	8.8	8.8	0.6	-0.2	0.0
VWP-09	2.8	2.8	2.8	2.9	0.1	0.1	0.1
VWP-10	-1.9	-1.8	-1.8	-1.7	0.2	0.1	0.1

As seen on Figure 2, the VWP readings are consistent either with previous recent or historic readings. Pore pressure readings went up slightly (0.1 psi) in two piezometers and stayed the same in two piezometers when compared to the Q3 readings.

Inclinometers

Three inclinometers, designated BG05-4, BG05-5, and BG05-7, were installed at CWDA #2 in August 2005. The inclinometers were installed through the coal refuse and approximately 20 feet into the native foundation soils. The physical locations of the inclinometers are shown on the attached Instrumentation Site Plan (Map 1). Baseline readings were taken on 8/10/05 and subsequent readings have generally been taken quarterly since that time. Displacement curves for each of the three inclinometers for the current and the prior three readings are presented as attachments to this letter in Figure 3. Axis "A" reflects deformation with depth in the direction of anticipated movement (downslope), while Axis "B" is orthogonal to Axis A.

As described in previous reports, we believe historic displacements indicated on the plots for the approximate upper ten feet of the inclinometers are likely due to placement of cover soil on the face of the waste pile during normal maintenance and revegetation operations. Based on the inclinometer readings, there hasn't been downslope movement (Axis A) are generally consistent with previous readings. As we mentioned in our October report, there appeared to have be some displacement in the orthogonal direction (Axis B) for inclinometer BG05-5B in the 3rd quarter. However, in December 2019 the displacement graph appeared to be very similar to the march and June readings. It is likely that the displacement calculated in October may have been due to an error near 42 feet. We will evaluate the data again in March to conform whether there is additional movement. It should be noted that water was standing in the BGI 05-05 inclinometer pipe at a depth of about 4 feet below grade, but there was no water in inclinometer BGI 05-07 and water was at around 50 feet in BGI 05-07. There is no downslope displacement of any of the three inclinometers. This discrepancy should be evaluated during the next (2020 Q1) reading.

If you have any questions regarding this letter or the instrumentation monitoring at CWDA #2, please contact me at (970) 497-8821 or LBrandt@dowl.com.

Respectfully Submitted,
DOWL

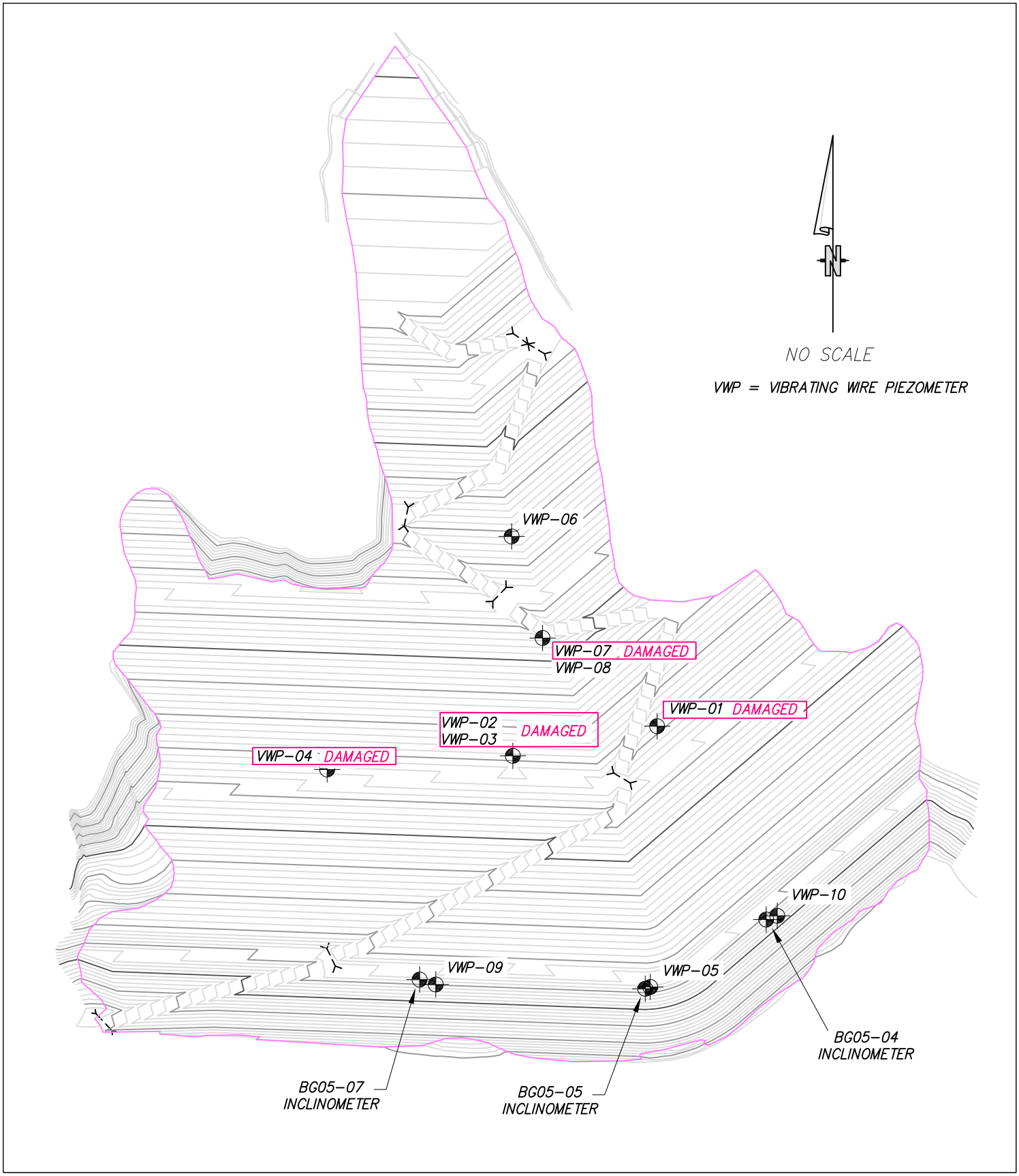
Laurie Brandt, CPG
Professional Geologist

Dennis A. Russell, P.E.
Geotechnical Engineer

COLORADO LICENSED PROFESSIONAL ENGINEER
PE.0056538
12-22-19

Enclosures: Map 1 – Instrumentation Location Plan
Figure 1 – Active and Damaged Piezometer Data Graph (2005-2014)
Figure 2 – Active Vibrating Wire Piezometer Data Graph (to present)
Figure 3 – Inclinometer Displacement Curves

INSTRUMENTATION SITE PLAN



Map 1 OF 1	DATE 2017 JOB NO. 7131.74699.01	Huddleston-Berry BOWIE #2 GOB PILE DELTA COUNTY, COLORADO	DOWL WWW.DOWL.COM 222 South Park Avenue Montrose, Colorado 81401 970-249-6828

Figure 1 - Bowie Mine #2 - CWDA #2
Active and Damaged Vibrating Wire Piezometer Data

Inception (5/16/05) through 5/21/14

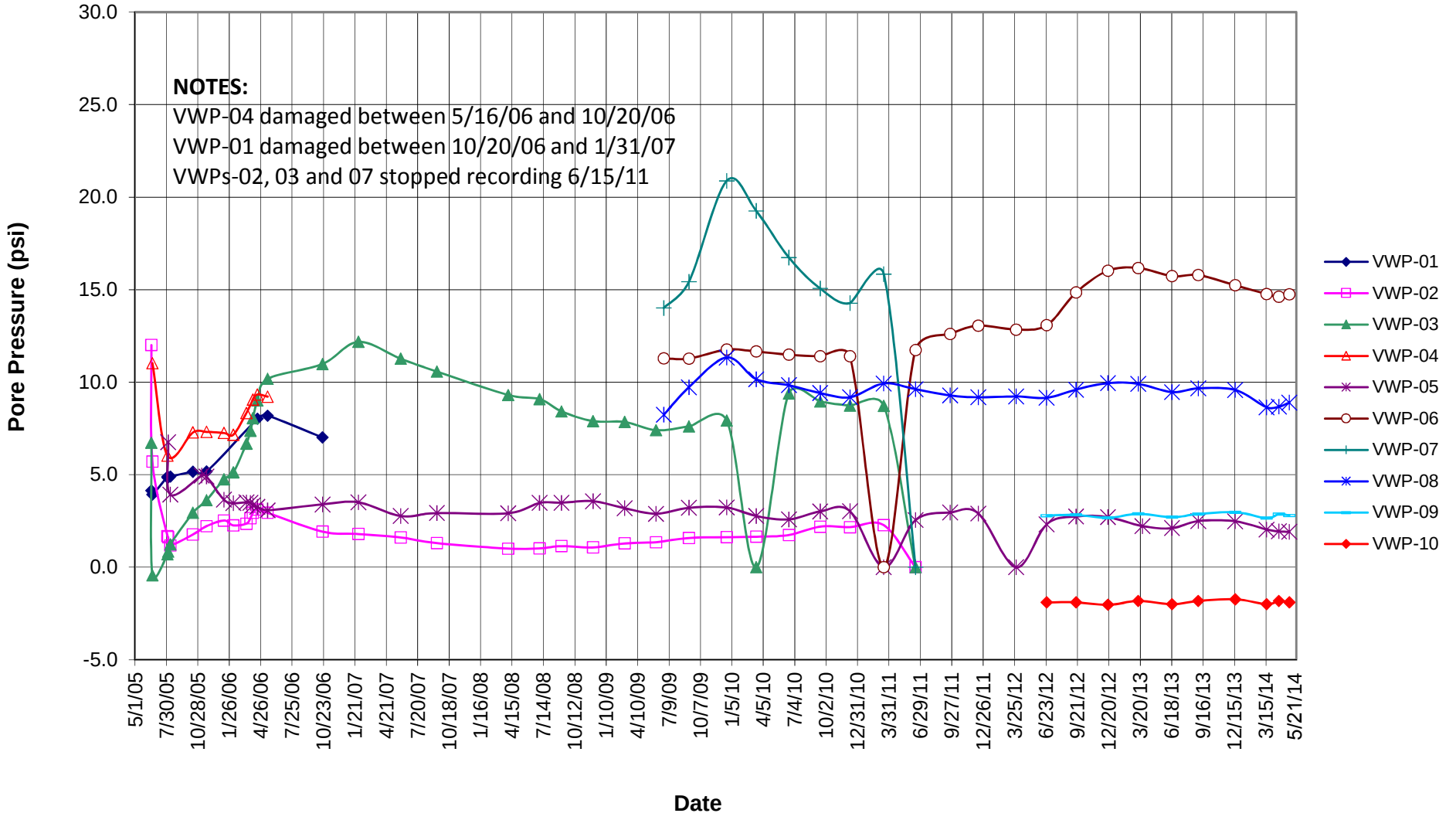


Figure 2 - Bowie Mine #2 - CWDA #2
Active Vibrating Wire Piezometer Data

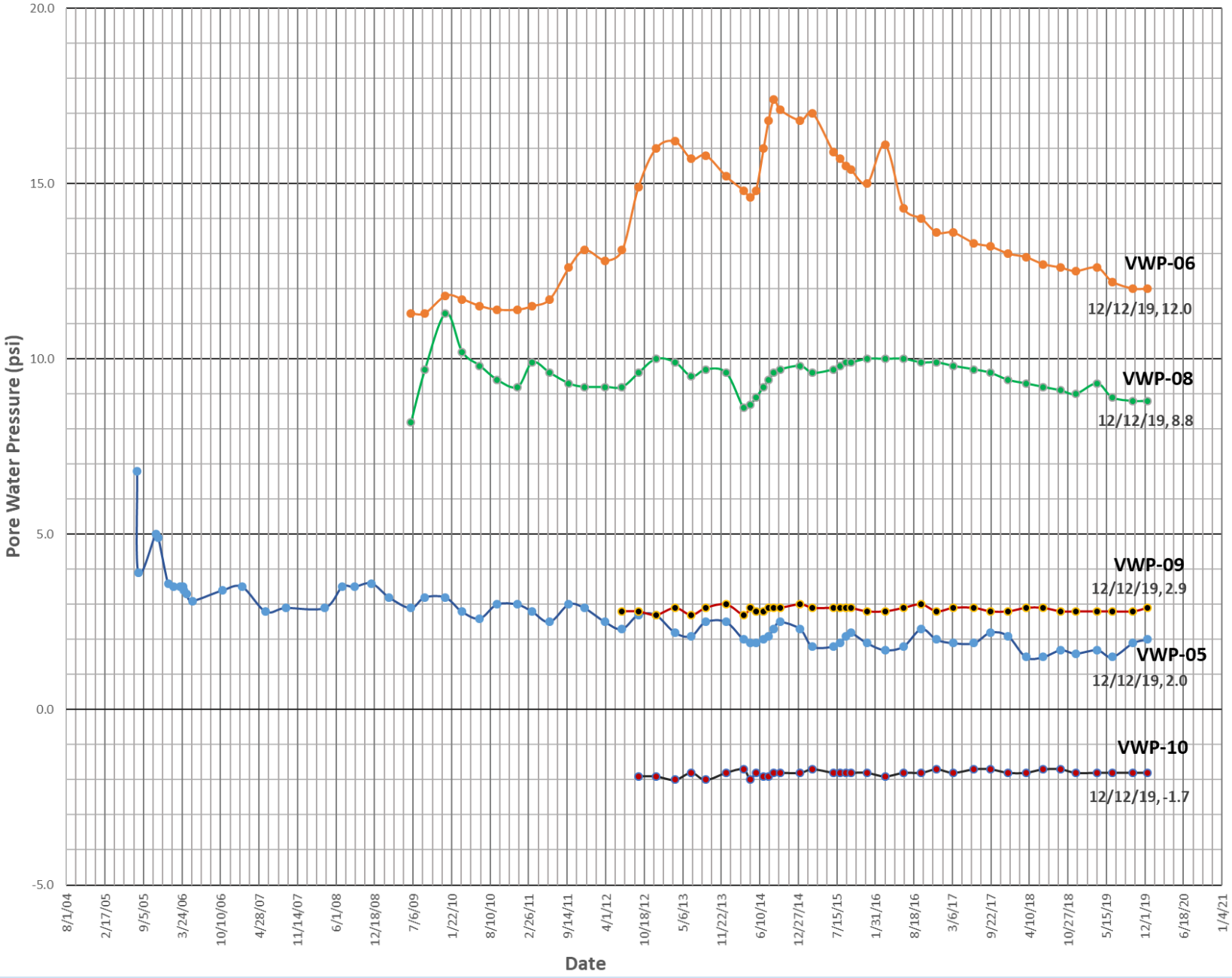
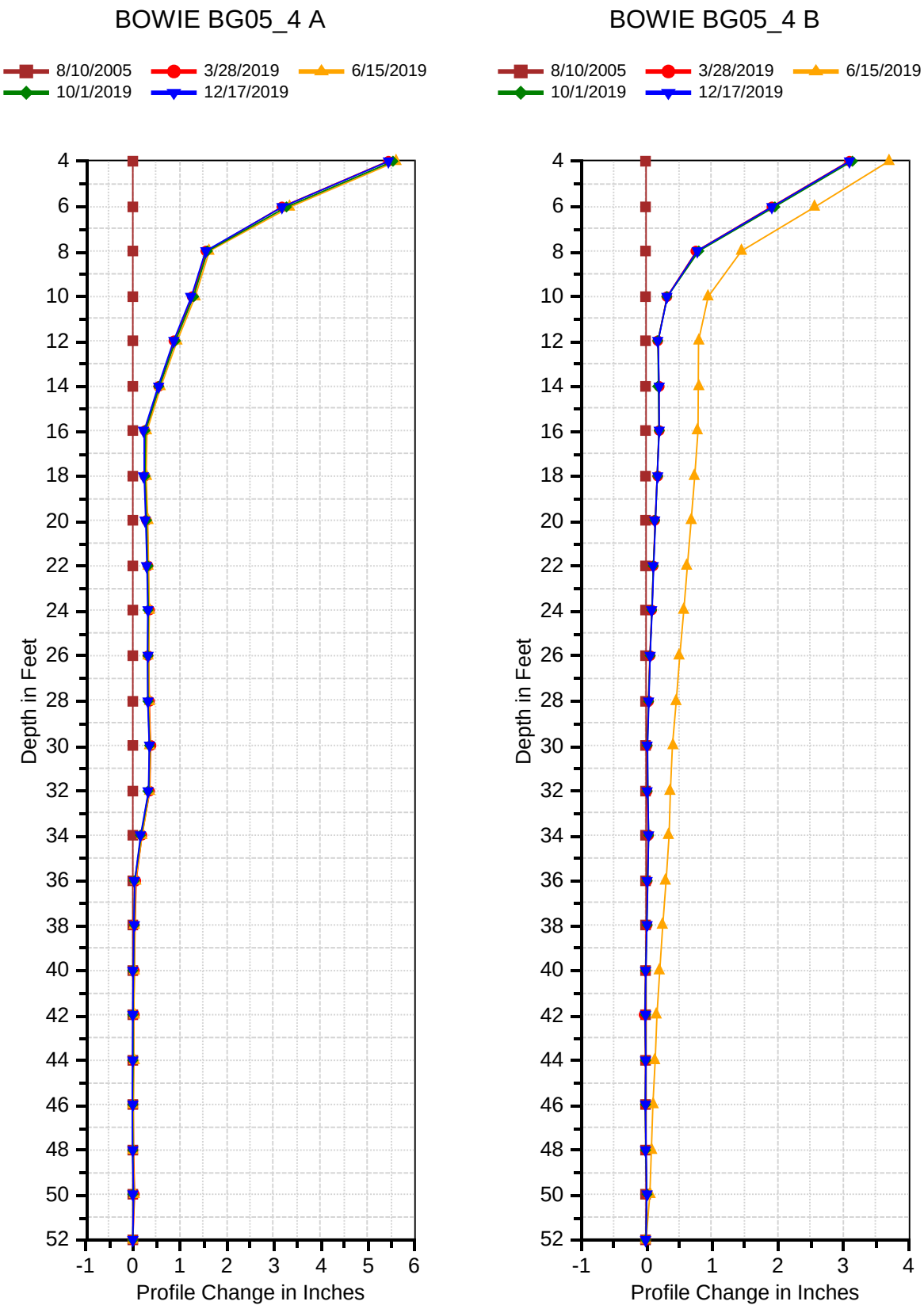
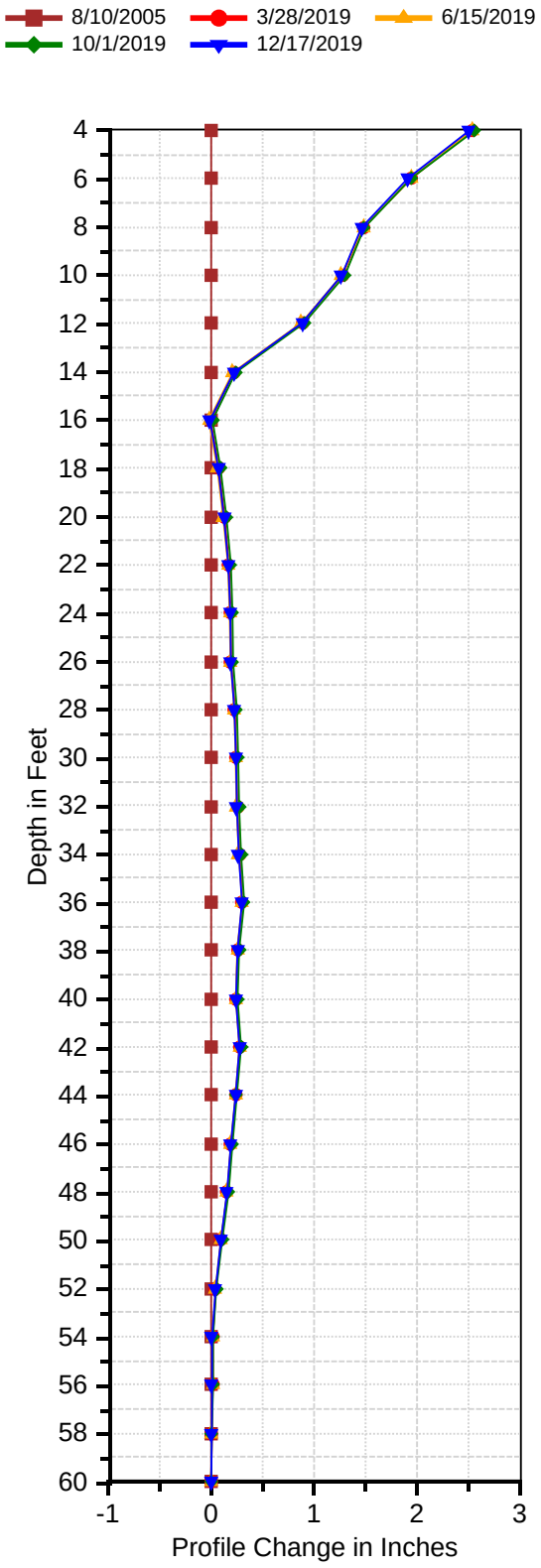


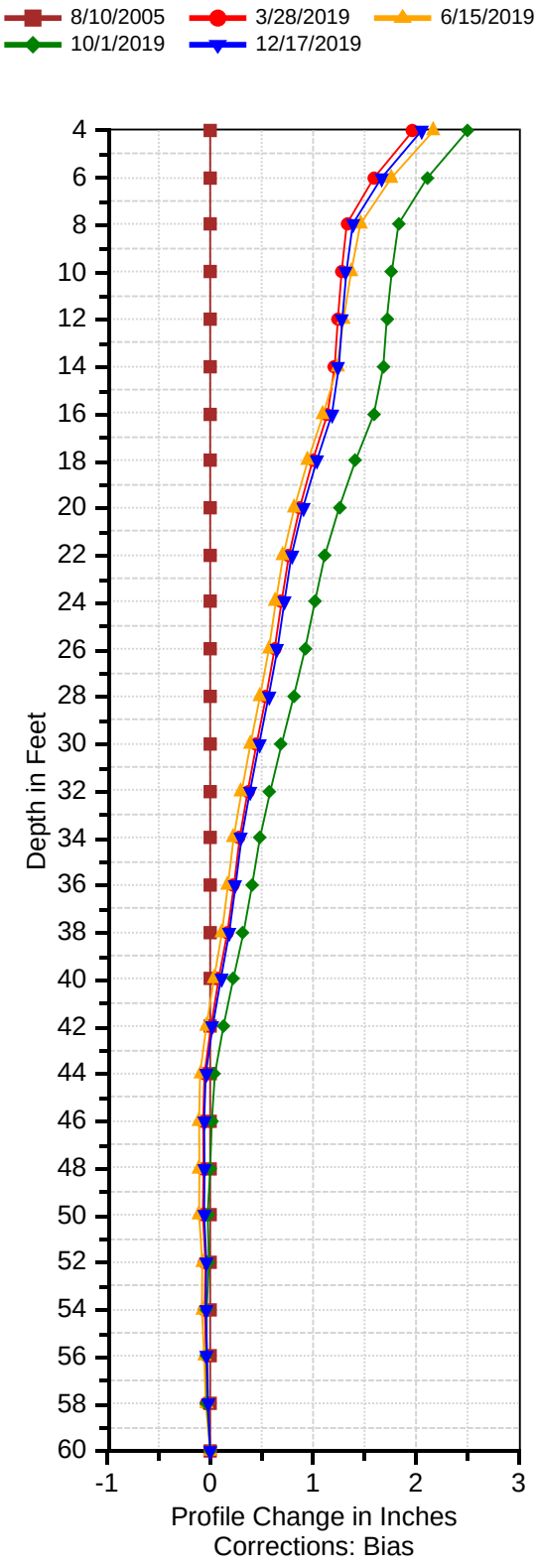
Figure 3 - Inclinometer Displacement Curves

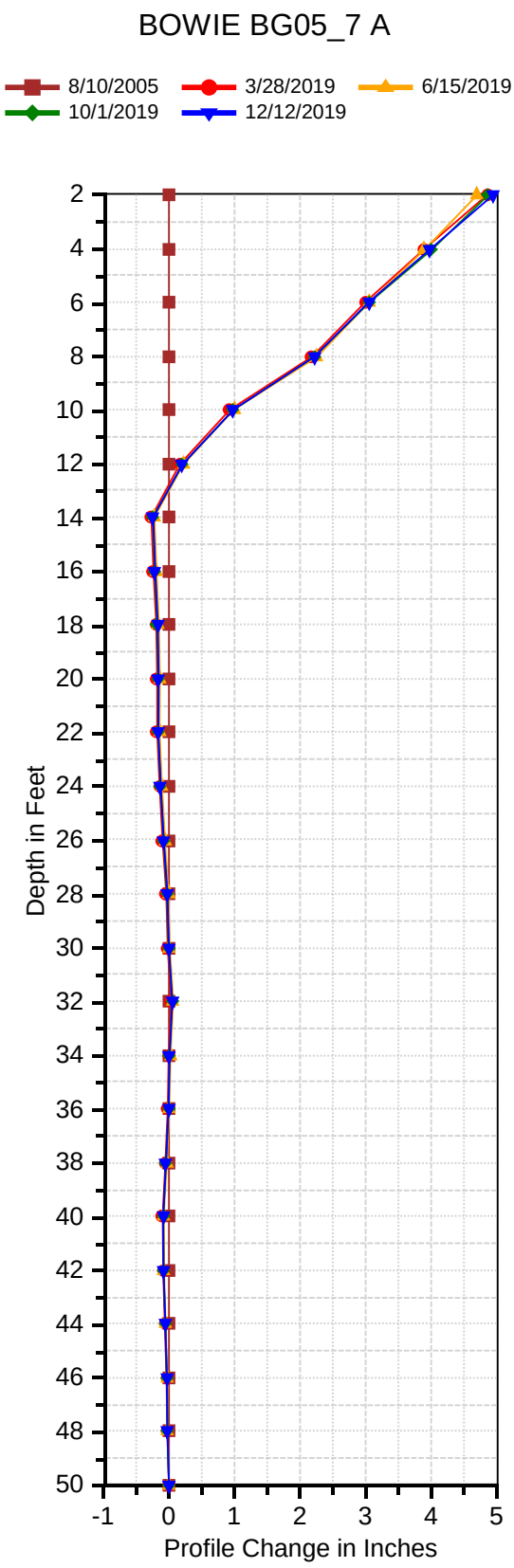


BOWIE BG05_5 A



BOWIE BG05_5 B




BOWIE BG05_7 A
8/10/2005
3/28/2019
6/15/2019
10/1/2019
12/12/2019
Depth in Feet
Profile Change in Inches
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
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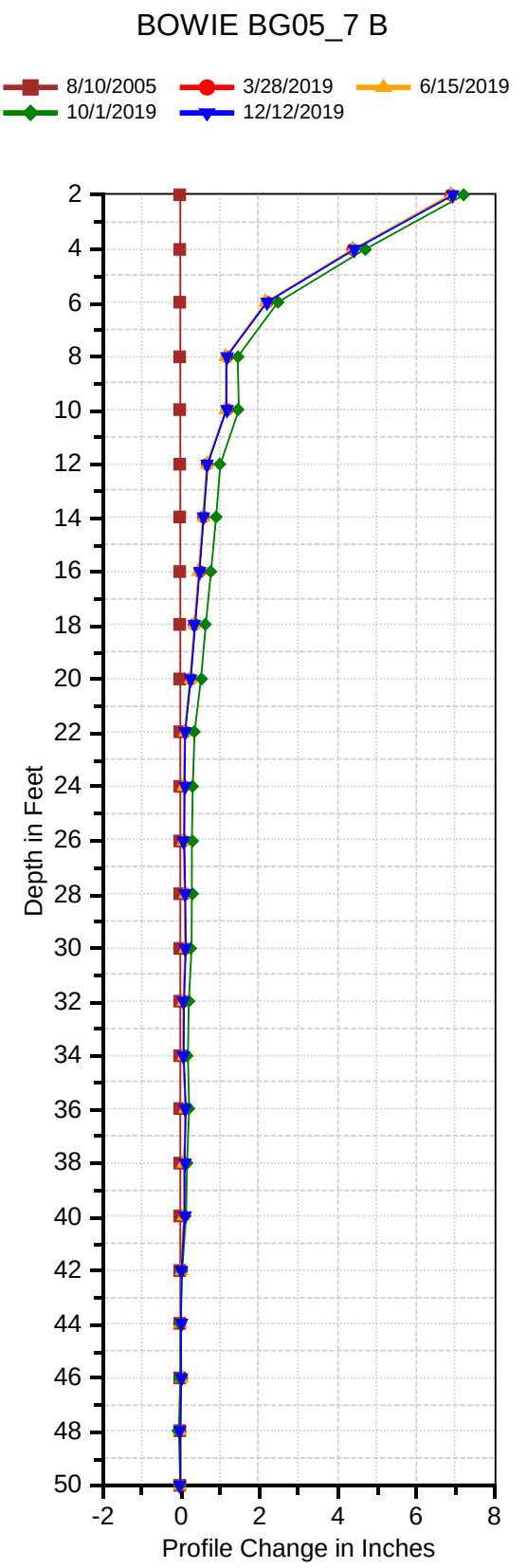
2
3
4
5


BOWIE BG05_7 B
8/10/2005
3/28/2019
6/15/2019
10/1/2019
12/12/2019
Depth in Feet
Profile Change in Inches
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
-2
0
2
4
6
8