

TECHNICAL MEMORANDUM

DATE June 2, 2020

Project No. 20138294

TO Vanessa Heilman, P.Eng.
City of Saskatoon

CC Hung Vu; Greg Misfeldt

FROM Blaise Wilson; Phil Bruch

EMAIL blaise_wilson@golder.com;
phil_bruch@golder.com

NUTANA SLOPE INSTABILITY UPDATE – MAY 2020

This memorandum presents monitoring data for the slope failures (referred to as the west slide and east slide) at the Nutana Slope Instability site. Locations of survey pins are shown in Figure 1. Locations of slope inclinometers, piezometers, settlement points, crack meters, and tilt plates are shown in Figure 2. Locations of the Saskatoon Light & Power (SL&P) tilt plates and survey pins installed on power poles are shown in Figure 3.

The west slide occurred in June 2012 and impacted a slope area approximately 70 m (230 ft) long and 40 m (130 ft) wide. It is most pronounced in the back yards of 229, 231, 233/235, and 237/239 11th Street East, through the back alley, and into the back yard of 222 Saskatchewan Crescent East.

The east slide occurred in June 2013 and impacted a slope area of approximately 50 m (165 ft) long and 30 m (100 ft) wide. It is most pronounced in the back yards of 303, 305, 307, and 309 11th Street East, through the back alley, and into the back yard of 306, 310 and 316 Saskatchewan Crescent East.

The monitoring results and photographs from this monitoring period are attached. A summary of the monitoring results is provided below.

Survey Pin Data:

- Monitoring of the survey pins at the site was not performed during this monitoring period.

Slope Inclinometer Data:

- Inclinometers COS-13-002, COS-13-004, and COS-13-005 indicate insignificant movement (less than 2 mm or 0.08 in) between August 20, 2019 and May 26, 2020.
- Inclinometer COS-13-006 indicates some slight shifting (less than 4 mm or 0.16 in) between August 20, 2019 and May 26, 2020.

Vibrating Wire (VW) & Standpipe Piezometer Data:

- Piezometers were monitored by the City of Saskatoon during this period, and are not presented in this memorandum.

Tilt Plate Data:

- The results of tilt plate monitoring are shown on Figure 4 for the City of Saskatoon tilt plates, and in Figure 5 for the tilt plates installed on SL&P power poles.
- Tilt plates TP4, TP5, TP6, and TP7 indicate insignificant changes in angle of tilt (less than 0.05 degrees) between May 25/26, 2020 and August 20, 2019.
- Tilt plates installed on SLP4 and SLP 6 indicated insignificant changes in angle of tilt (less than 0.05 degrees) between August 20, 2019 and May 25, 2020.
- Tilt plate installed on SLP3 indicates a change in angle of tilt of approximately 0.06 degrees, towards the south, between August 20, 2019 and May 25, 2020. Seasonal movements/shifting has been measured at his power pole since the tilt plate was installed in 2015.
- Tilt plate installed on SLP5 indicates a change in angle of tilt of approximately 0.1 degrees, towards the north, between August 20, 2019 and May 25, 2020.

Crack Meter Data:

- Crack meters were not read during this monitoring period.

Settlement Points:

- Settlement points were not read during this monitoring period.

Path: \\golder\gldg\saskatoon\gis\clients\cityofsaskatoon\saskatoon\92_PROJECTS\20138294\Phase 100002_PRODUCTION\DWG_1 File Name: 20138294_FG003 Monitoring\Plns\FG003series.dwg | Last Edited By: jearthy Date: 2020-06-03 Time: 9:08:13 AM | Printed By: jearthy Date: 2020-06-03 Time: 9:15:29 AM



LEGEND

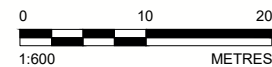
● PIN LOCATION

303 LOT NUMBER

REFERENCE(S)

AERIAL PHOTOGRAPH PROVIDED BY CITY OF SASKATOON, MAY 15, 2011

CITY OF SASKATOON DATUM



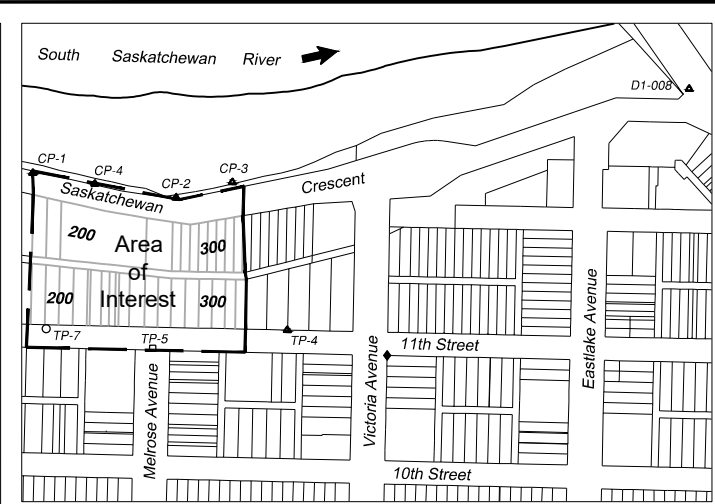
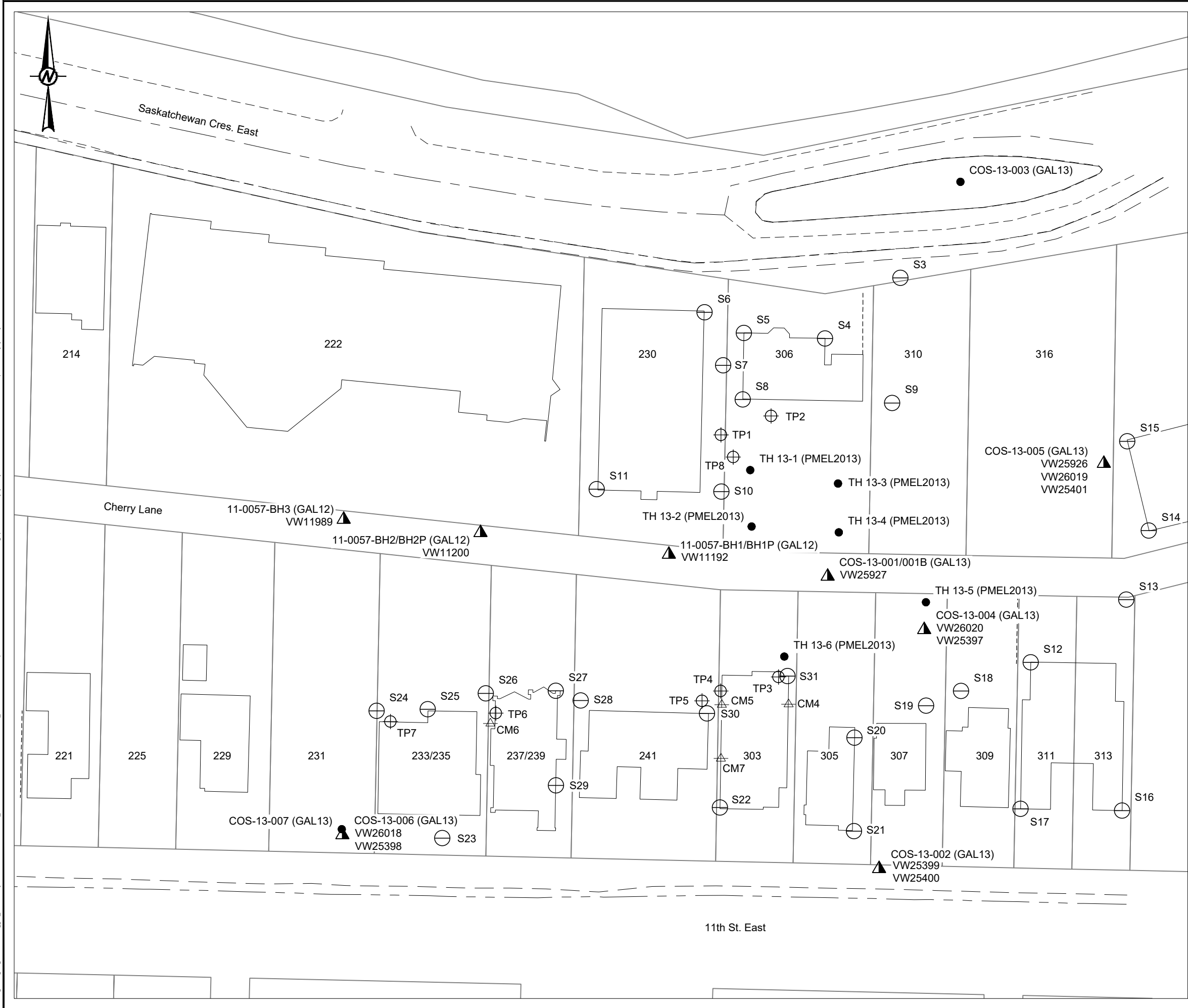
CLIENT					
PROJECT				NUTANA SLOPE INSTABILITY	
TITLE				INSTRUMENTATION PLAN No. 1	
CONSULTANT				YYYY-MM-DD	2020-06-02
				DESIGNED	BW
				PREPARED	JMC
				REVIEWED	
				APPROVED	
PROJECT NO.	PHASE	REV.	FIGURE		
20138294	1000	A	1		



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

25 mm

Path: \\golder-g4s-gall-saskatoon\gis\clients\CityOfSaskatoon\Saskatoon\09_PROJECT\320138294\Phase_00002_PRODUCTION\DWG_1 File Name: 20138294-FG002 InstLocPlan.dwg | Last Edited By: jearthy Date: 2020-06-03 Time: 9:08:19 AM | Printed By: jearthy Date: 2020-06-03 Time: 9:15:55 AM



CONTROL POINTS				
COORDINATE TABLE NAD 83 (CSRS)			UTM ZONE 13	
POINT	NORTHING (m)	EASTING (m)	ORTHOMETRIC ELEVATION (m) HTv2.0	DESCRIPTION
CP-1	5,775,701.84	385,897.84	477.97	24" REBAR WITH PLASTIC CAP
CP-2	5,775,680.32	386,022.25	478.99	24" REBAR WITH PLASTIC CAP
CP-3	5,775,693.72	386,071.10	479.49	24" REBAR WITH PLASTIC CAP
CP-4	5,775,692.40	385,951.67	477.95	GPS CONTROL POINT
TP-4	5,775,565.50	386,118.76	499.32	X IN CONCRETE
TP-5	5,775,549.79	386,001.87	498.05	X IN NORTH RIM CATCH BASIN
TP-7	5,775,566.48	385,909.52	491.32	X IN SOUTH RIM MANHOLE
TP-8	5,775,560.37	385,809.26	484.62	X IN WEST RIM MANHOLE
D1-008	5,775,775.85	386,467.62	499.033	CONTROL TABLET

LEGEND	
	SETTLEMENT POINT LOCATION
	TELL-TALE CRACK LOCATION MONITOR
	TILT PLATE LOCATION
	SI & VIBRATING WIRE PIEZOMETER LOCATION
	STANDPIPE PIEZOMETER LOCATION
303	LOT NUMBER

REFERENCE(S)
LOT LOCATIONS PROVIDED BY CITY OF SASKATOON
CITY OF SASKATOON DATUM

CLIENT

PROJECT

NUTANA SLOPE INSTABILITY

TITLE

INSTRUMENTATION LOCATION PLAN No. 2

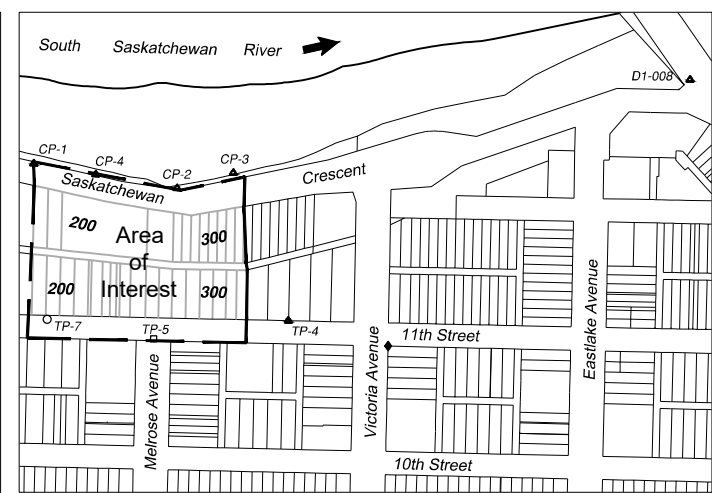
CONSULTANT

YYYY-MM-DD	2020-06-02
DESIGNED	BW
PREPARED	JMC
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
20138294	1000	A	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI 'B' 25 mm

Path: \\golder-g4s-gall-saskatoon\gis\clients\cityofsaskatoon\saskatoon\92_projects\20130224\Phase 1\00002_PRODUCTION\DWG_1 File Name: 20130224-FG001_MonitorPlan.dwg | Last Edited By: jashy Date: 2020-06-03 Time: 9:08:24 AM | Printed By: jashy Date: 2020-06-03 Time: 9:15:17 AM



CONTROL POINTS				
COORDINATE TABLE NAD 83 (CSRS)			UTM ZONE 13	
POINT	NORTHING (m)	EASTING (m)	ORTHOMETRIC ELEVATION (m) HTv2.0	DESCRIPTION
CP-1	5,775,701.84	385,897.84	477.97	24" REBAR WITH PLASTIC CAP
CP-2	5,775,680.32	386,022.25	478.99	24" REBAR WITH PLASTIC CAP
CP-3	5,775,693.72	386,071.10	479.49	24" REBAR WITH PLASTIC CAP
CP-4	5,775,692.40	385,951.67	477.95	GPS CONTROL POINT
TP-4	5,775,565.50	386,118.76	499.32	X IN CONCRETE
TP-5	5,775,549.79	386,001.87	498.05	X IN NORTH RIM CATCH BASIN
TP-7	5,775,566.48	385,909.52	491.32	X IN SOUTH RIM MANHOLE
TP-8	5,775,560.37	385,809.26	484.62	X IN WEST RIM MANHOLE
D1-008	5,775,775.85	386,467.62	499.033	CONTROL TABLET

LEGEND

- TILT PLATE LOCATION
- POWER POLE LOCATION
- LOT NUMBER
- VECTOR OF TILT OF POLES (MAY 5, 2015)

REFERENCE(S)
LOT LOCATIONS PROVIDED BY CITY OF SASKATOON
CITY OF SASKATOON DATUM

0 12.5 25
1:750 METRES

CLIENT

City of Saskatoon

PROJECT
NUTANA SLOPE INSTABILITY

TITLE
INSTRUMENTATION LOCATION PLAN No. 3

CONSULTANT	YYYY-MM-DD	2020-06-02
GOLDER	DESIGNED	BW
	PREPARED	JMC
	REVIEWED	
	APPROVED	

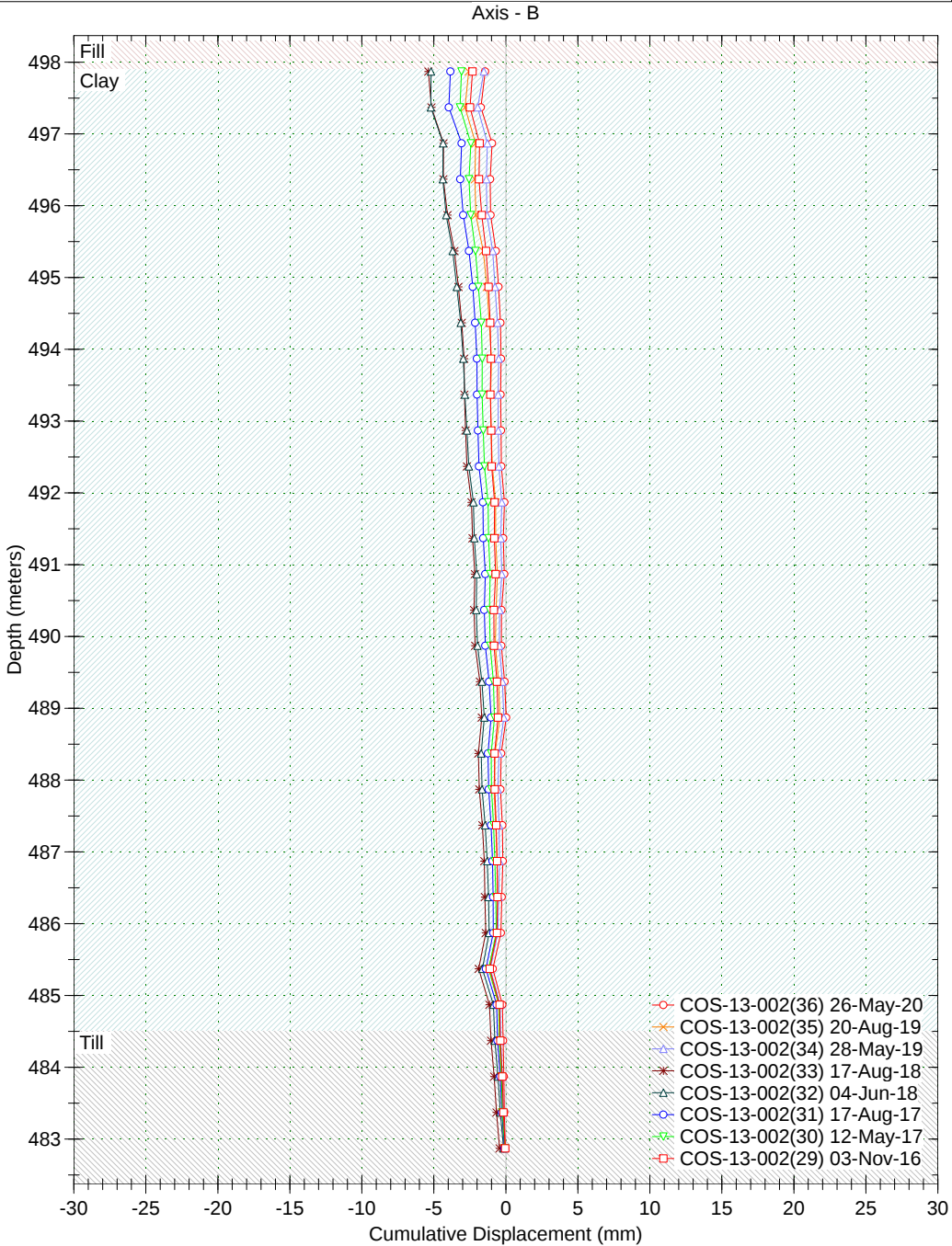
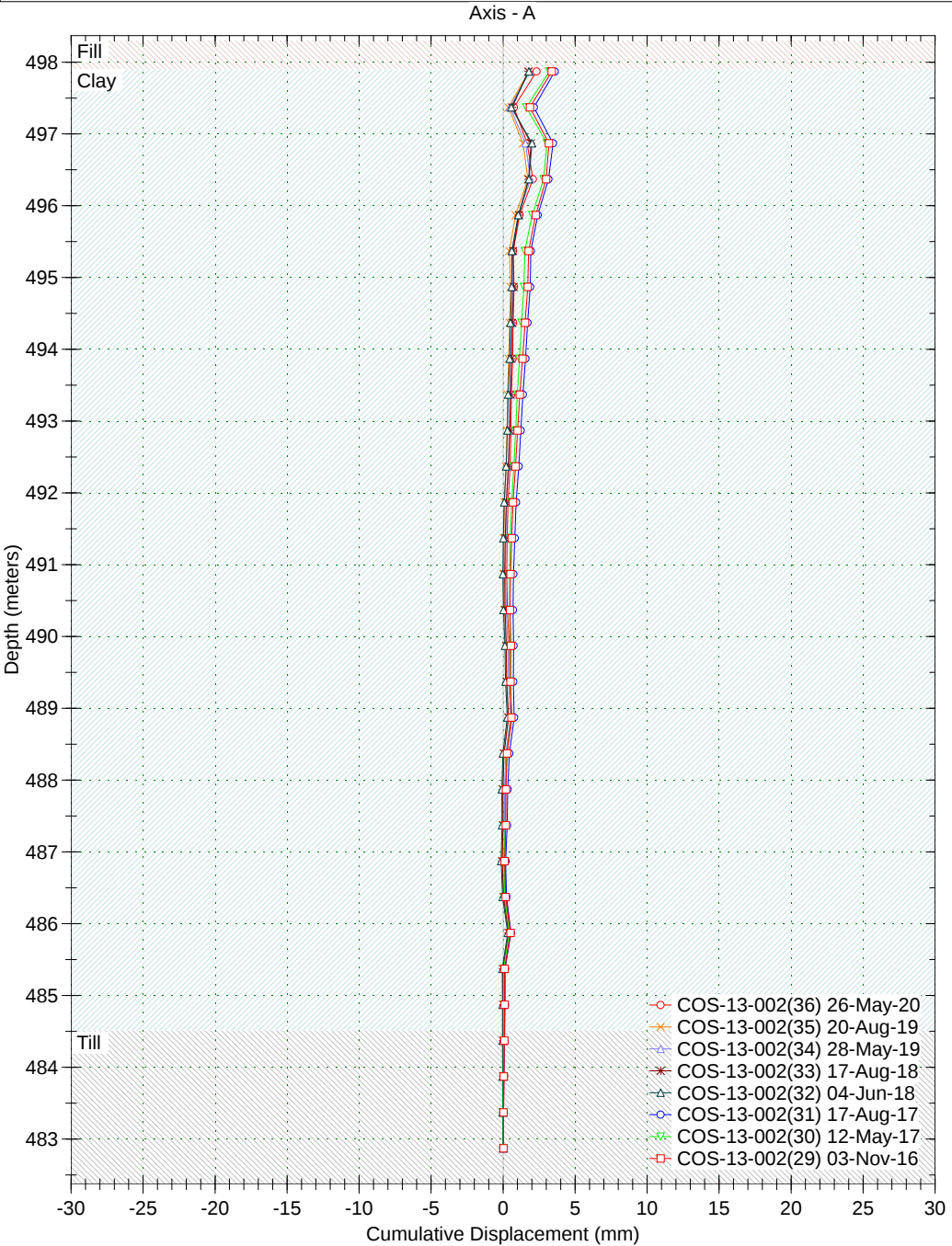
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20138294	1000	A	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI 'B' 25 mm

SLOPE INCLINOMETERS

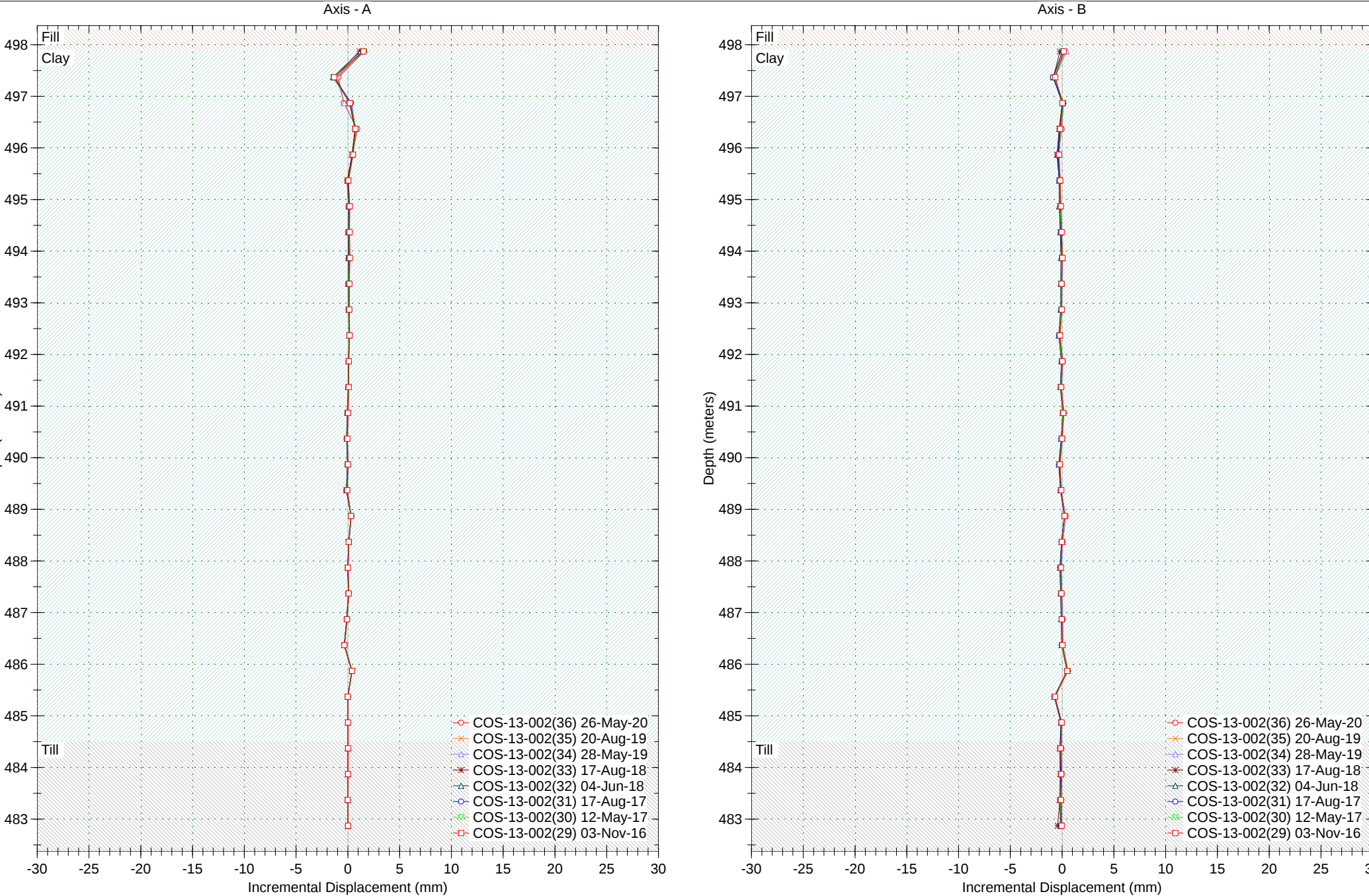
Borehole : COS-13-002
Project : Nutana Slope
Location : 307 11th St. E. (Front)
Northing : 5775567.41
Easting : 386043.54
Collar : -0.113

Spiral Correction : N/A
Collar Elevation : 498.4 meters
Borehole Total Depth : 15.5 meters
A+ Groove Azimuth :
Base Reading : 2013 Jul 30 16:18
Applied Azimuth : 0.0 degrees



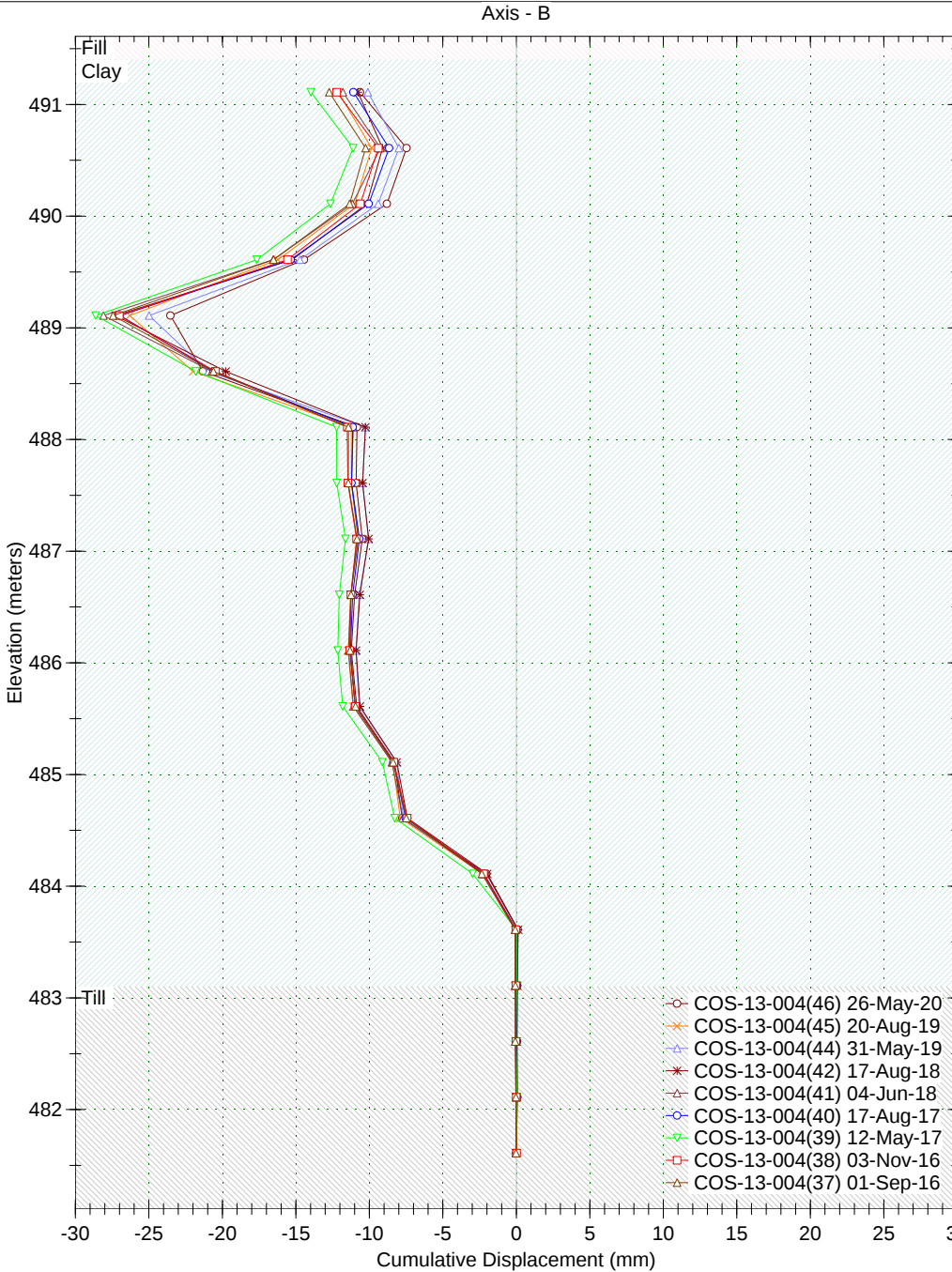
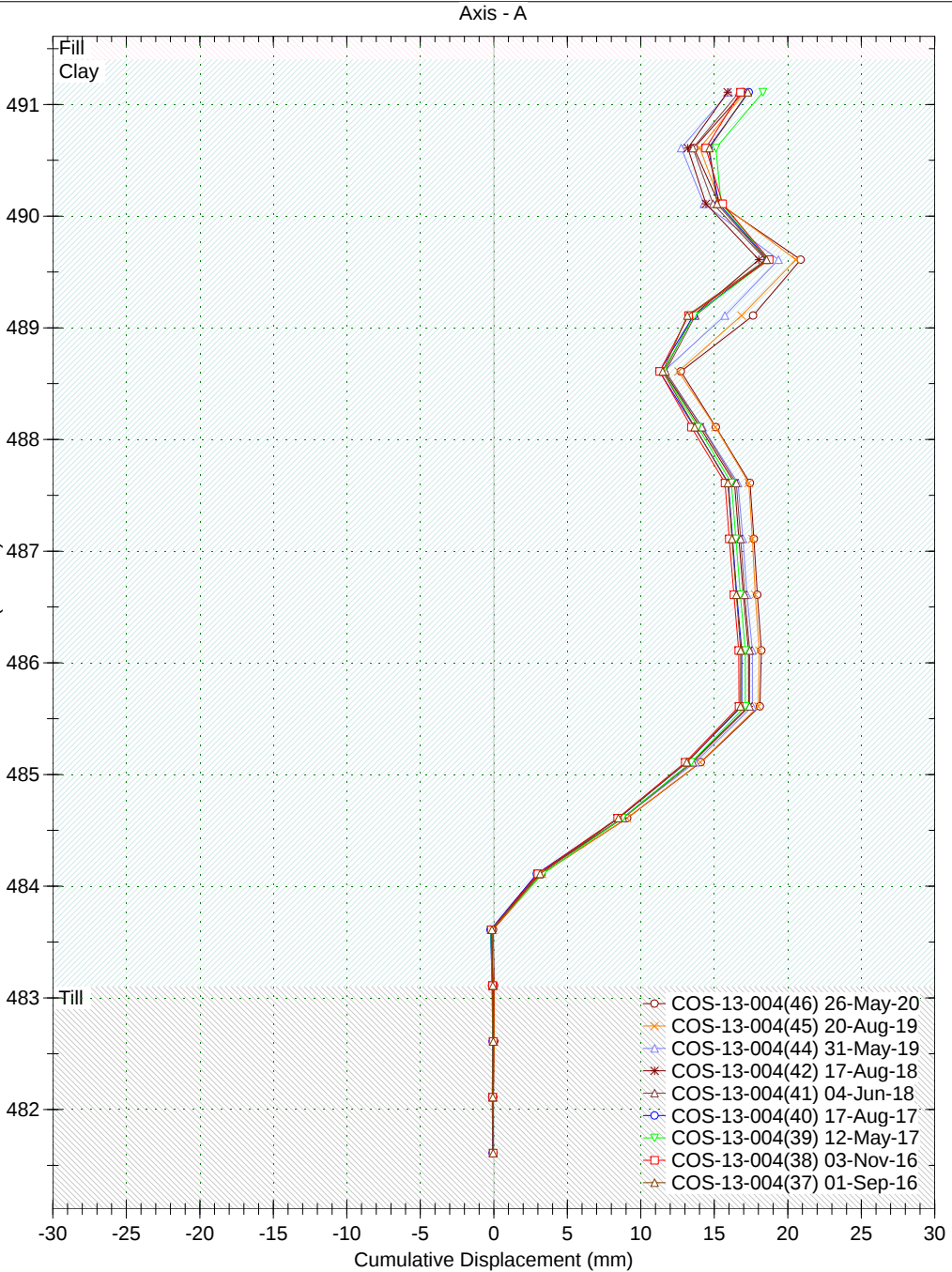
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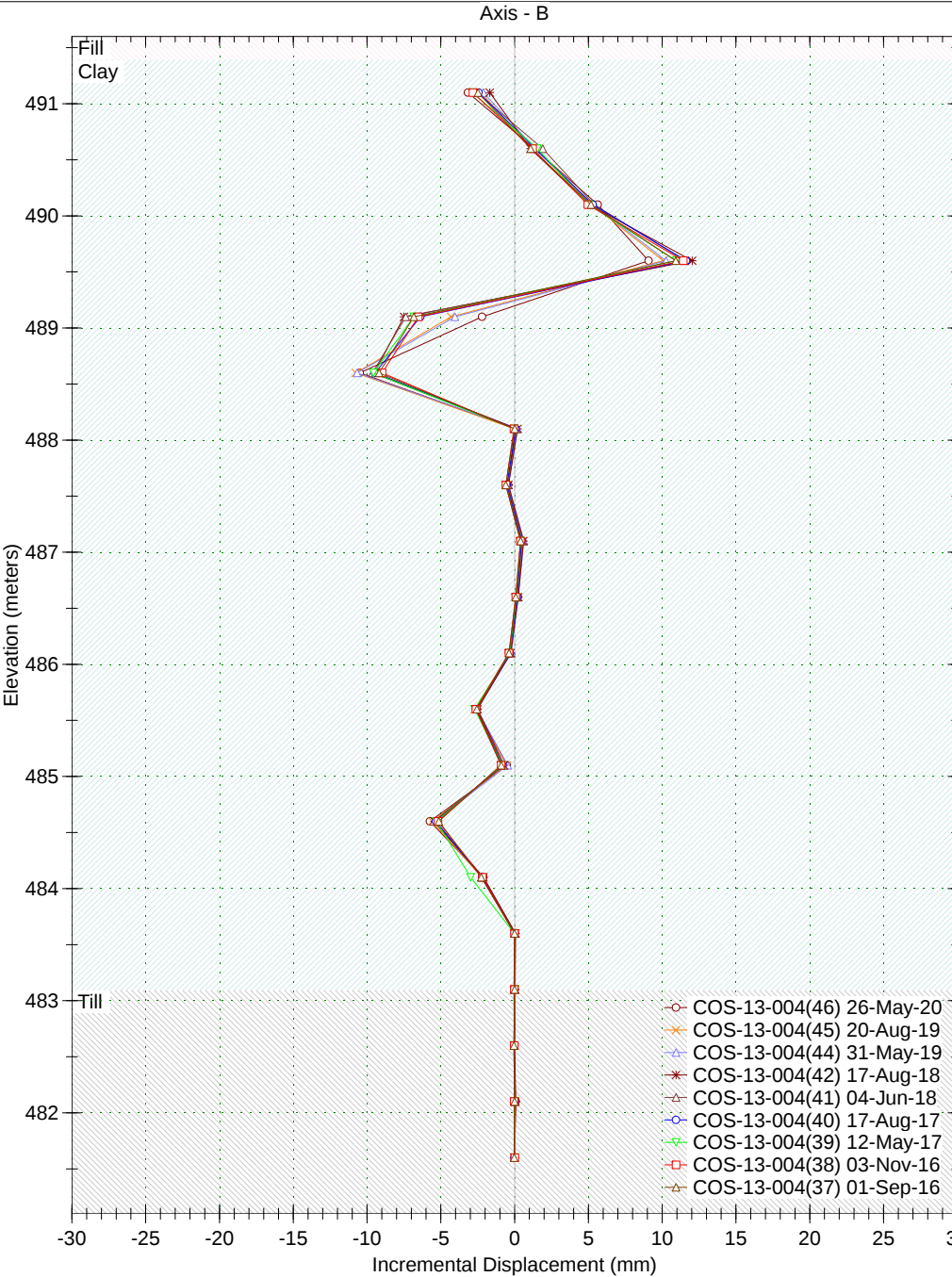
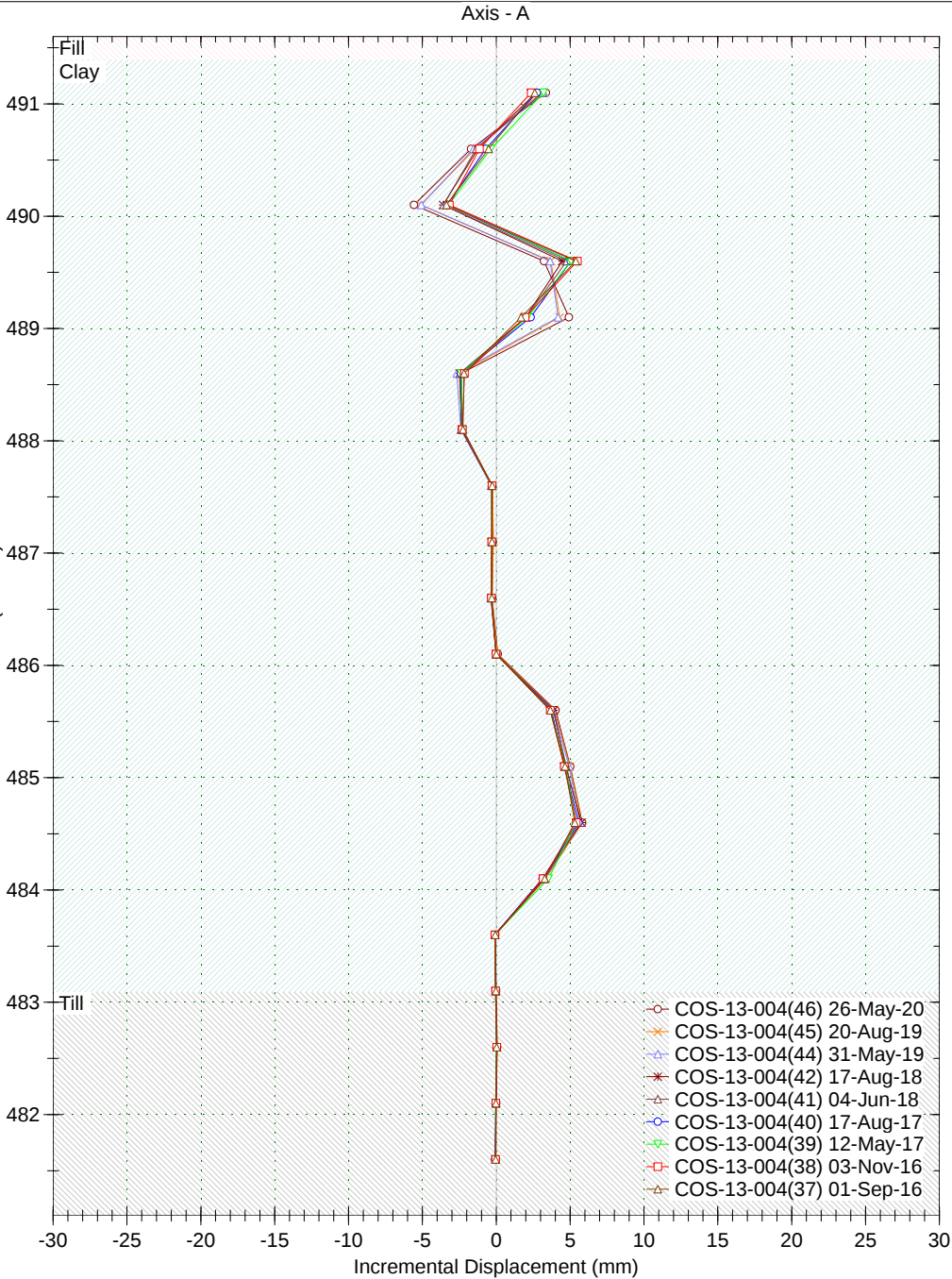
Borehole : COS-13-004
Project : Nutana Slope
Location : 307 11th. St. E. (back)
Northing : 5775604.97
Easting : 386050.63
Collar : -0.677

Spiral Correction : N/A
Collar Elevation : 491.6 meters
Borehole Total Depth : 10.0 meters
A+ Groove Azimuth :
Base Reading :
Applied Azimuth : 0.0 degrees



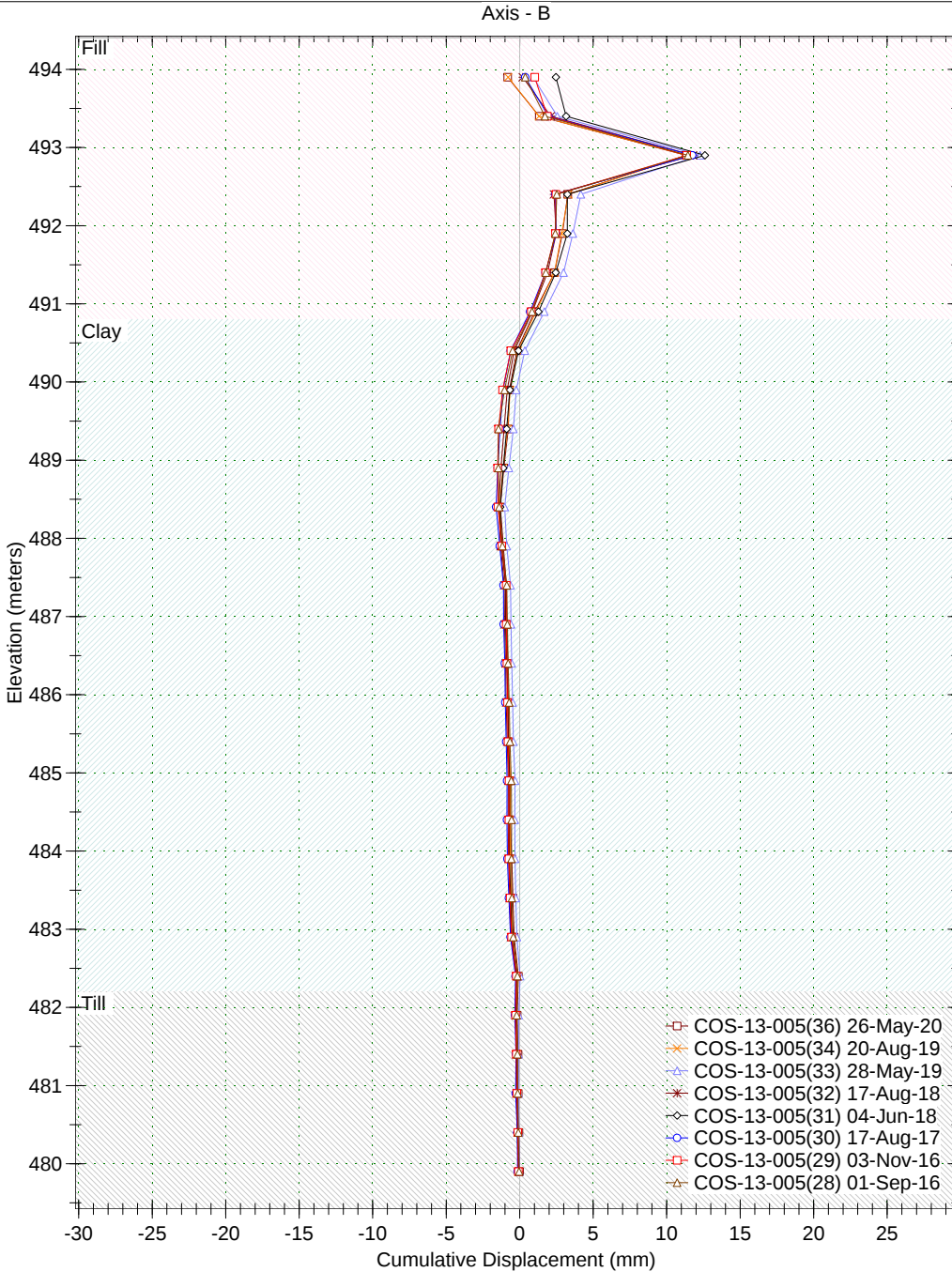
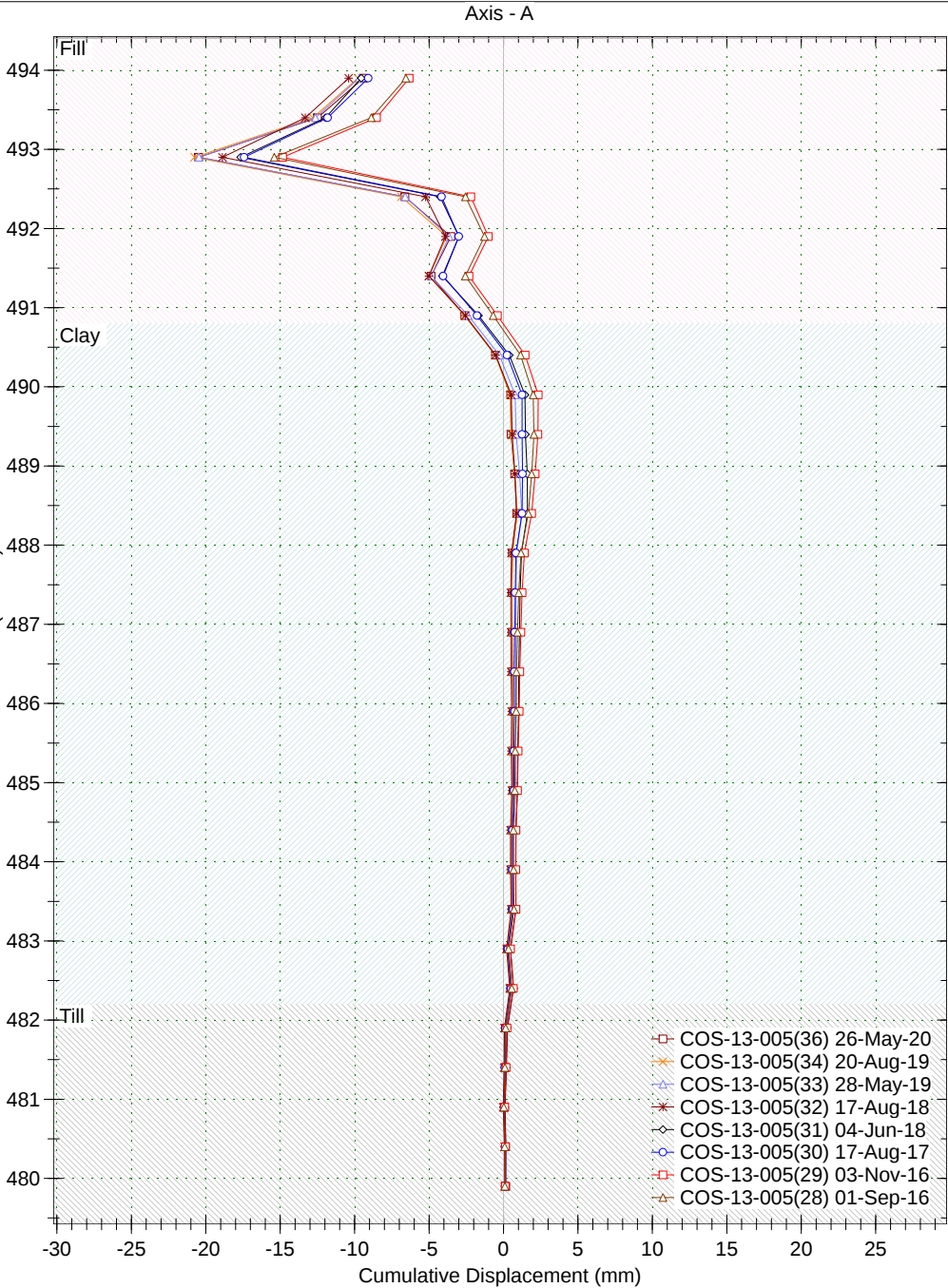
Borehole : COS-13-004
Project : Nutana Slope
Location : 307 11th. St. E. (back)
Northing : 5775604.97
Easting : 386050.63
Collar : -0.677

Spiral Correction : N/A
Collar Elevation : 491.6 meters
Borehole Total Depth : 10.0 meters
A+ Groove Azimuth :
Base Reading :
Applied Azimuth : 0.0 degrees



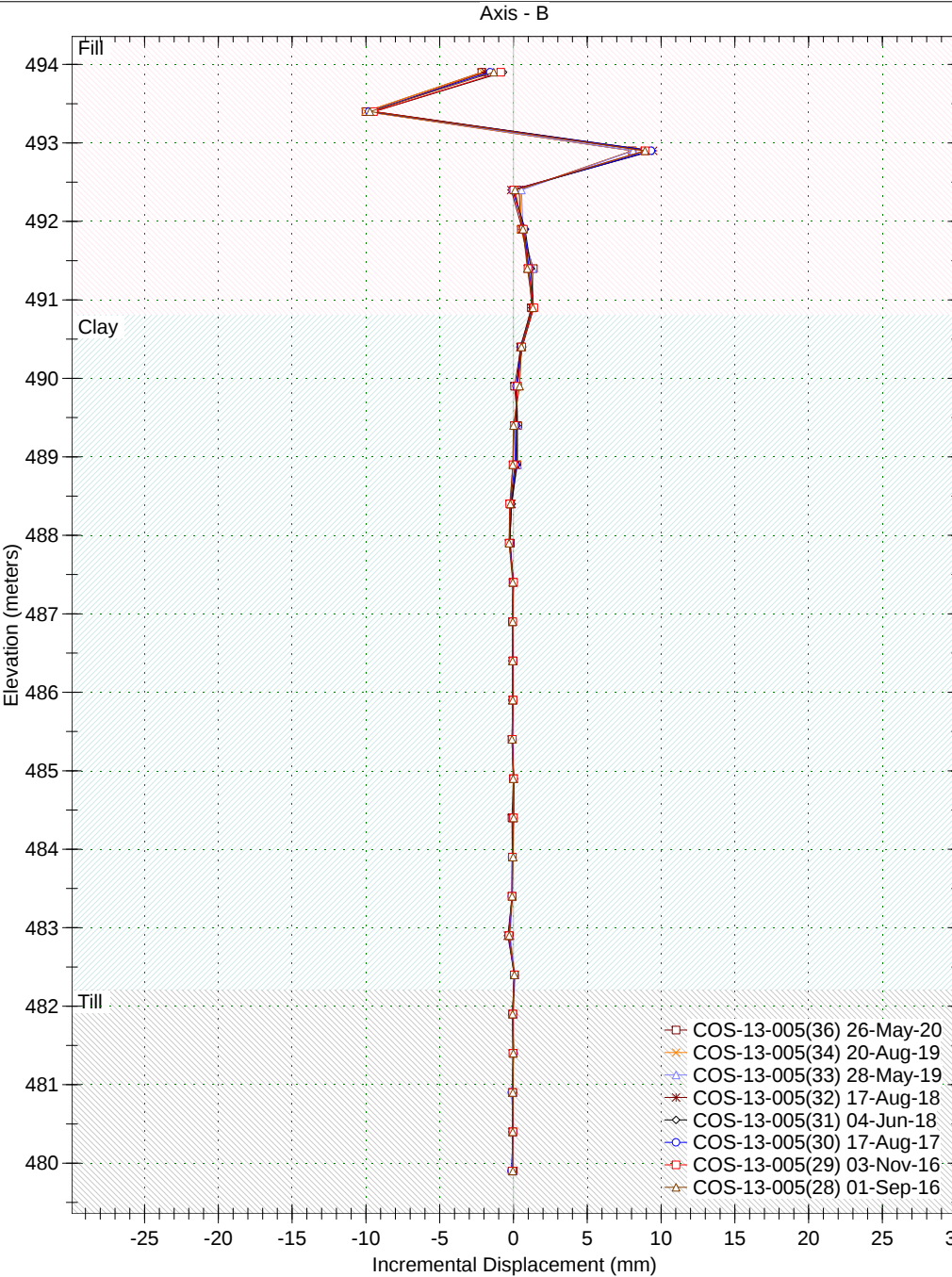
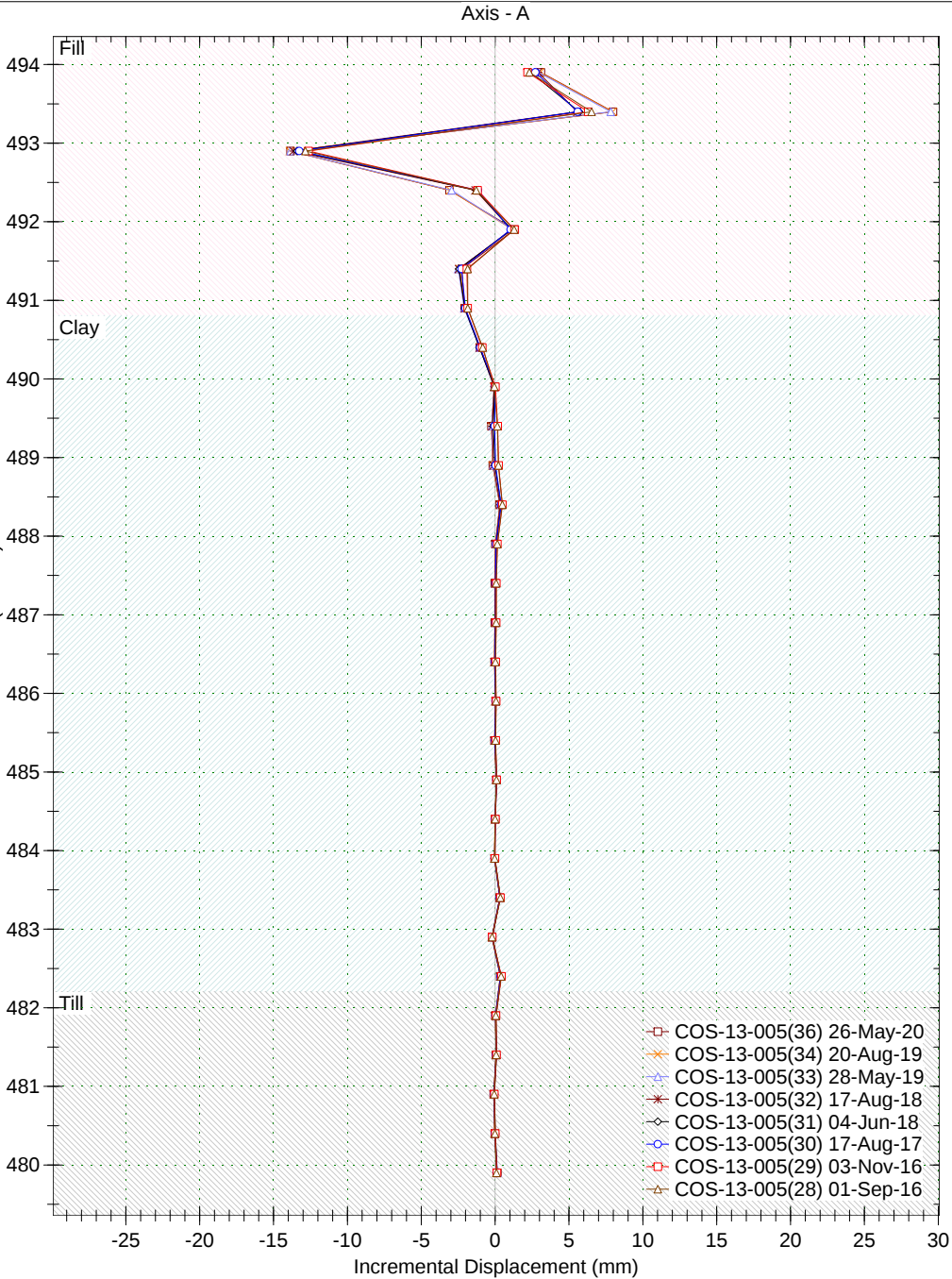
Borehole : COS-13-005
Project : Nutana Slope
Location : 316 Sask. Cres. E.
Northing : 5775631.299
Easting : 386078.8467
Collar : -0.1

Spiral Correction : N/A
Collar Elevation : 494.4 meters
Borehole Total Depth : 14.5 meters
A+ Groove Azimuth :
Base Reading : 2013 Aug 28 09:11
Applied Azimuth : 0.0 degrees



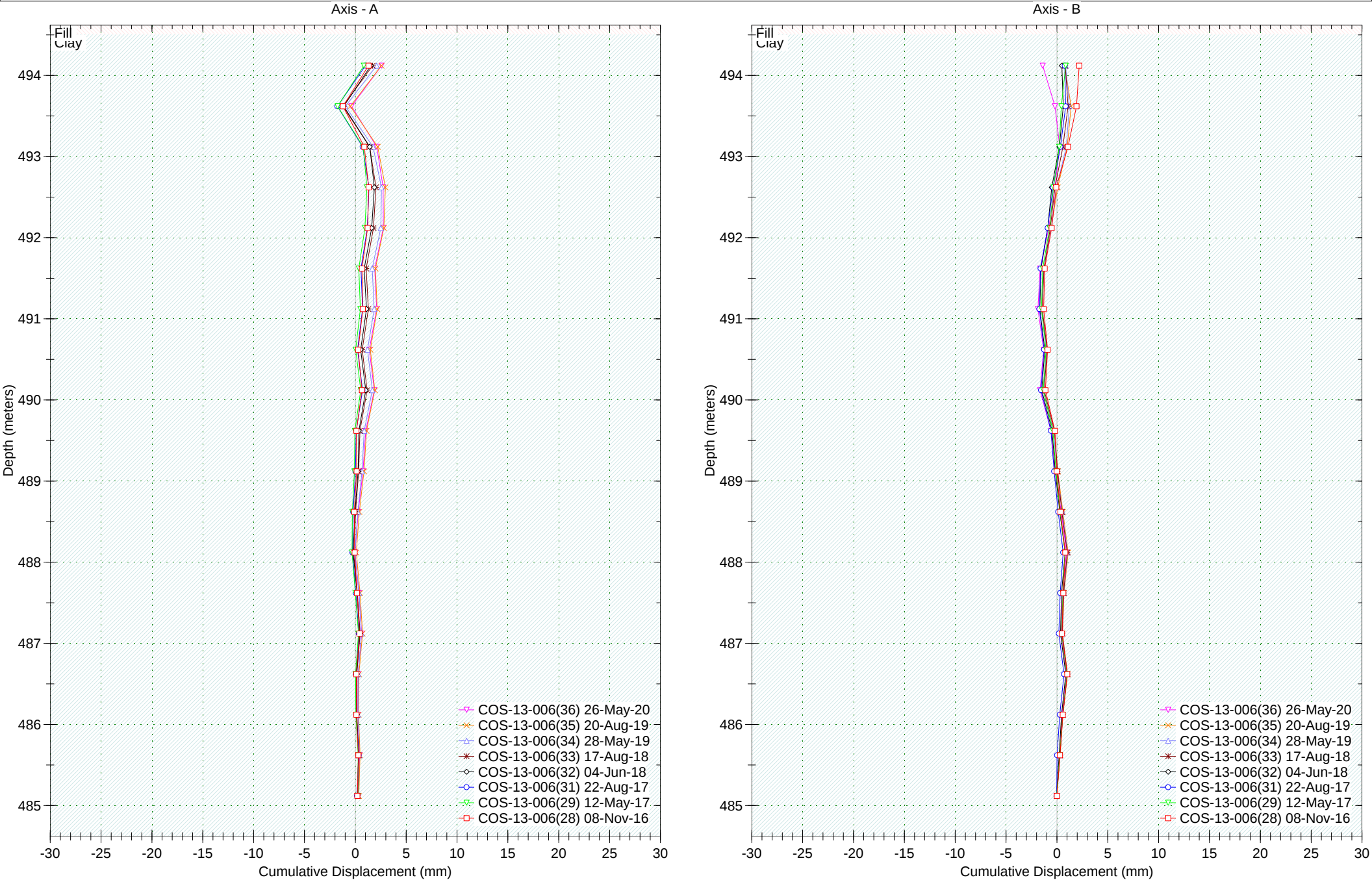
Borehole : COS-13-005
Project : Nutana Slope
Location : 316 Sask. Cres. E.
Northing : 5775631.299
Easting : 386078.8467
Collar : -0.1

Spiral Correction : N/A
Collar Elevation : 494.4 meters
Borehole Total Depth : 14.5 meters
A+ Groove Azimuth :
Base Reading : 2013 Aug 28 09:11
Applied Azimuth : 0.0 degrees



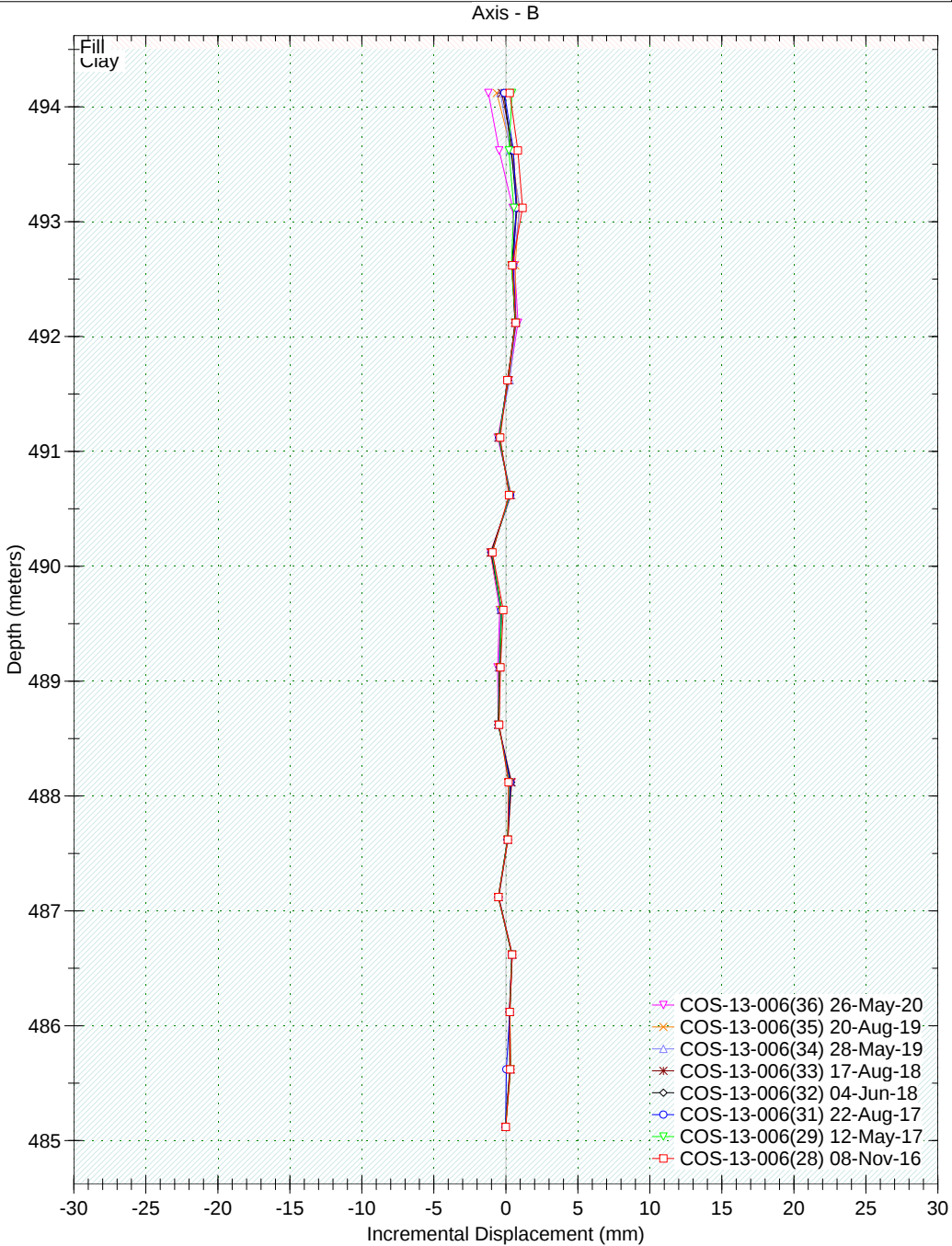
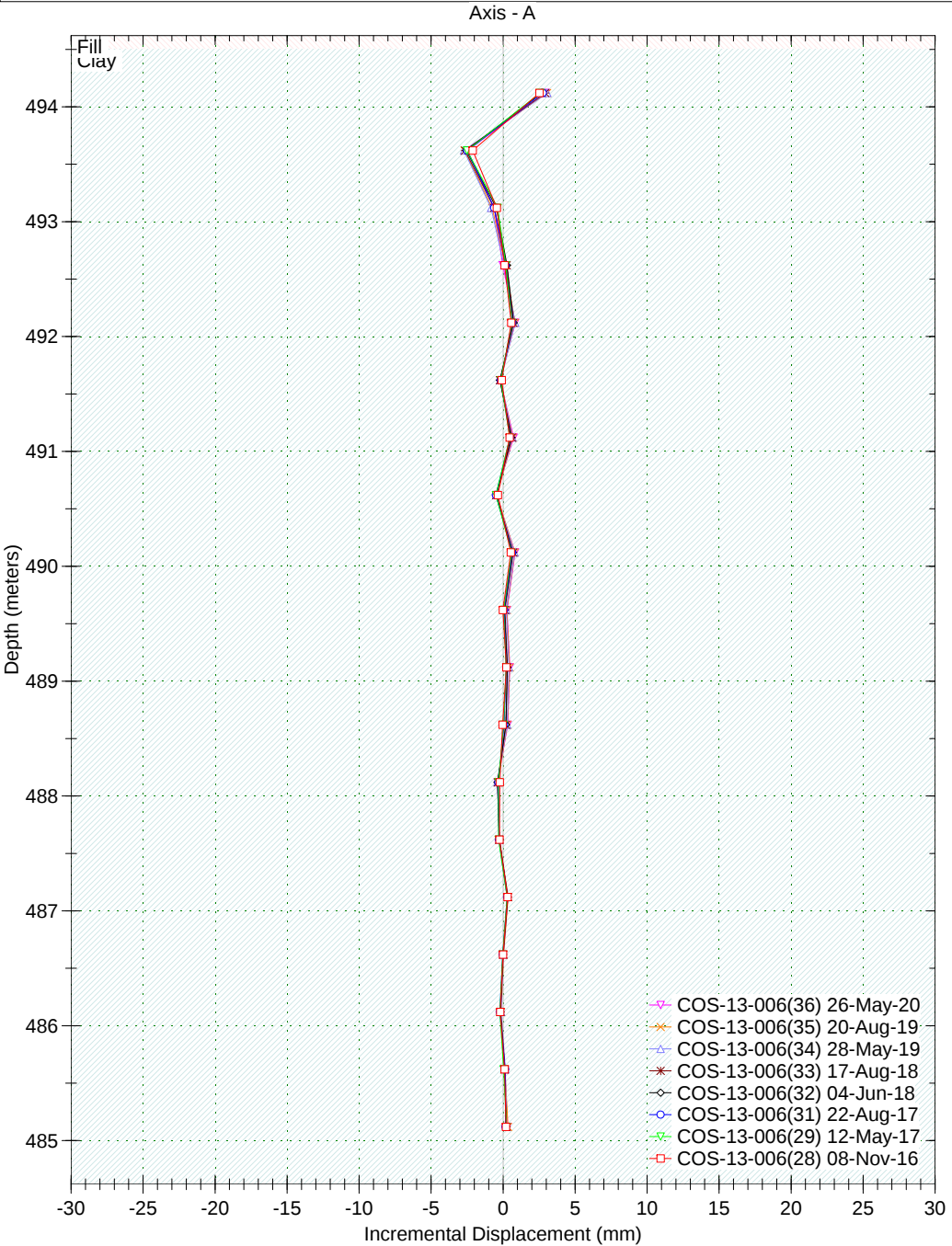
Borehole : COS-13-006 (9.5m)
Project : Nutana Slope
Location : 231 11th St. E.
Northing : 5775572.72
Easting : 385959.21
Collar : -0.147

Spiral Correction : N/A
Collar Elevation : 494.6 meters
Borehole Total Depth : 9.5 meters
A+ Groove Azimuth :
Base Reading : 2013 Aug 28 12:52
Applied Azimuth : 0.0 degrees

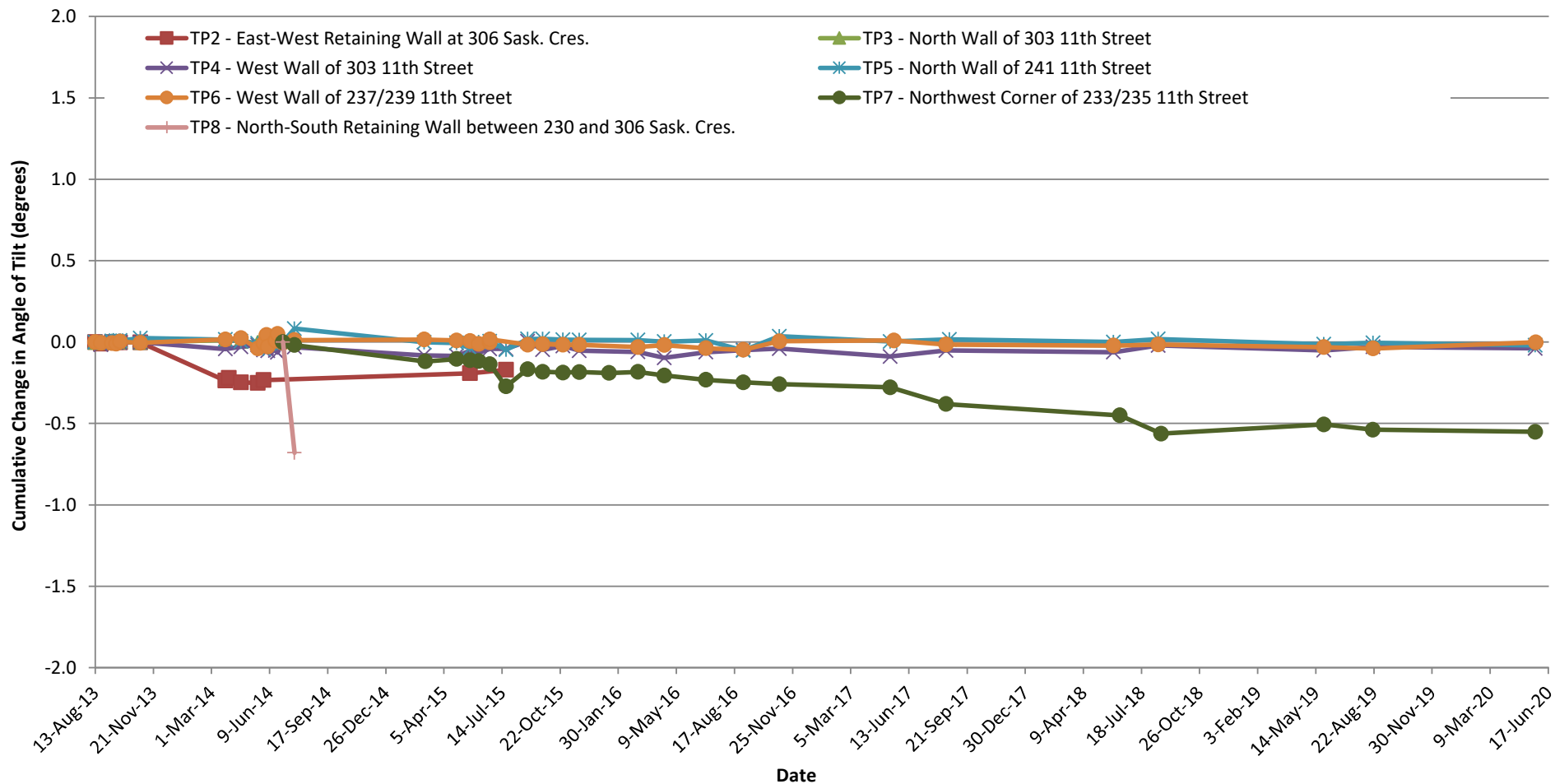


Borehole : COS-13-006 (9.5m)
Project : Nutana Slope
Location : 231 11th St. E.
Northing : 5775572.72
Easting : 385959.21
Collar : -0.147

Spiral Correction : N/A
Collar Elevation : 494.6 meters
Borehole Total Depth : 9.5 meters
A+ Groove Azimuth :
Base Reading : 2013 Aug 28 12:52
Applied Azimuth : 0.0 degrees



TILT PLATES



Notes:

- 1) Positive changes in tilt indicate tilting toward the monitoring structure.
- 2) TP1, located on the retaining wall between 230 and 306 Sask. Cres., is not monitored for health and safety reasons; monitoring results for this tilt plate show a change in angle of tilt of approximately 9 degrees between August 2013 and June 2014.
- 3) TP3 and TP8 are destroyed, and TP2 is buried.

DRAFT

PROJECT

City of
Saskatoon

NUTANA
SLOPE INSTABILITY

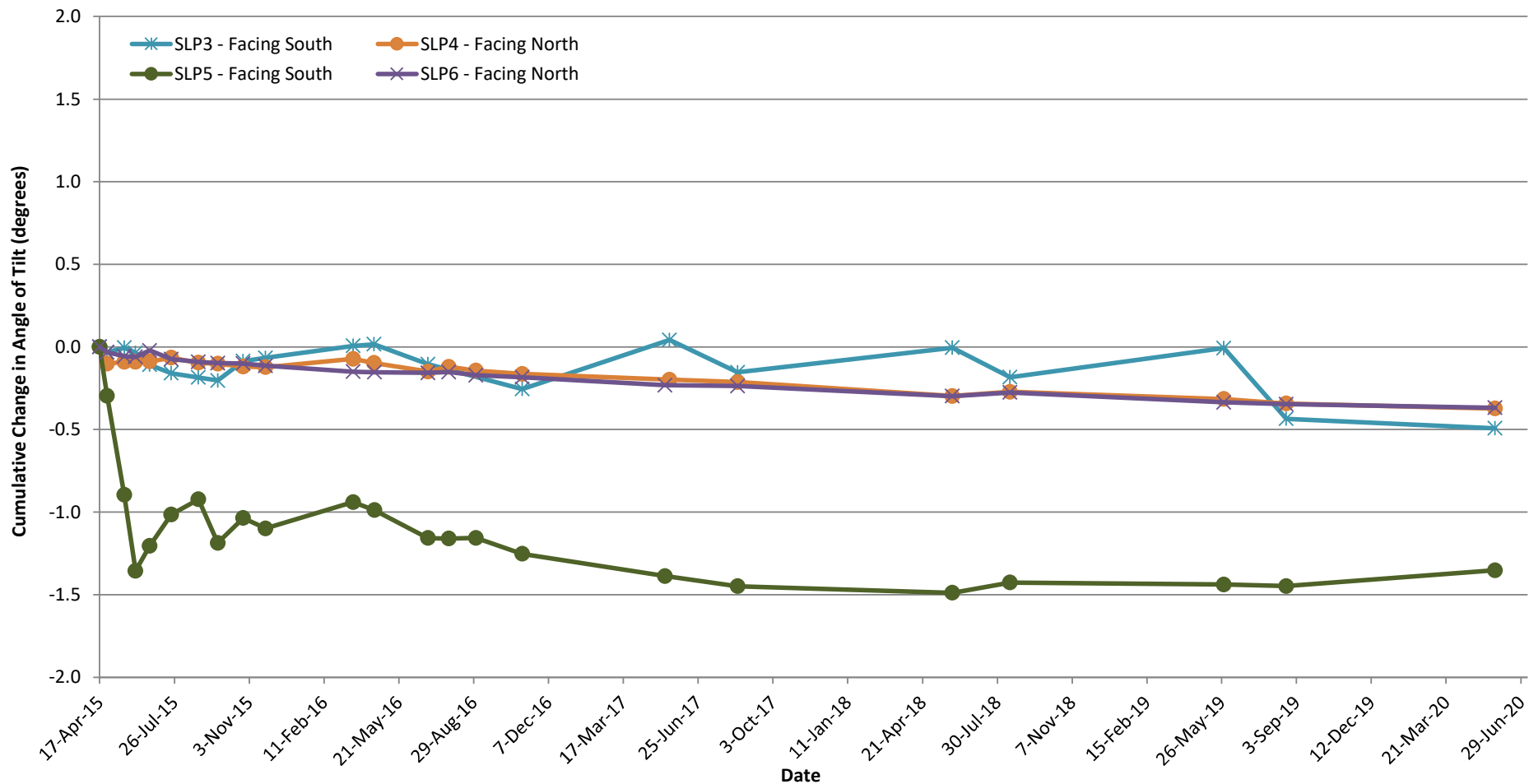
TITLE

RESULTS OF TILT MONITORING

May 2020 Monitoring

GOLDER

PROJECT	20138294	FILE No.		
DESIGN		SCALE	N/A	REV.
CADD		FIGURE: 4		
CHECK				
REVIEW				



Notes:
1) Positive changes in tilt indicate tilting toward the monitoring structure.

DRAFT

PROJECT		 NUTANA SLOPE INSTABILITY		
TITLE		RESULTS OF TILT MONITORING May 2020 Monitoring		
 GOLDER	PROJECT	20138294	FILE No.	
	DESIGN		SCALE	N/A
	CADD		REV.	
	CHECK		FIGURE: 5	
	REVIEW			

SITE PHOTOGRAPHS



Photograph 1: Looking east down the back alley at the East Failure (May 26, 2020)



Photograph 2: Looking west down the back alley at the West Failure (May 26, 2020)