December 2, 2024

Alberta Transportation and Economic Corridors
Main Floor, Provincial Building
9621 – 96th Avenue
Peace River, Alberta
T8S 1T4

Robert Senior
Construction Technologist

Dear Mr. Senior:

CON0022166 Peace Region (Grande Prairie District – South) GRMP Instrumentation Monitoring Site GP007; H40:36, km 29.339 Wanyandie Road Slide
Section C – 2024 Fall Readings

1 GENERAL

Nine slope inclinometers (SIs) (SI98-4, SI98-6, SI98-7, SI03-11, SI03-12, and SI22-1 through SI22-4), ten pneumatic piezometers (PNs) (PN-4, PN-5, PN-6, PN-7, PN-11A/B, PH-12A/B/C, and PN-13A), nineteen vibrating wire piezometers (VWPs) (VW20-2A/B, VW20-3A/B, VW20-6A/B, VW22-1A/B/C, VW22-2A/B/C/D, VW22-3A/B/C/D, VW22-4A/B), and three standpipe piezometers (SPs) (SP20-1, SP20-4, and SP20-8) were read at the GP007 site in the Peace Region (Grande Prairie District – South) (GP South Region) on October 17 and 18, 2024, by Courtney Mulhall, P.Eng. and Min Hou, E.I.T. of Klohn Crippen Berger Ltd. (KCB). These instruments were read as part of the GP South Region Geohazard Risk Management Program (GRMP). The site is located on Hwy 40:36, km 29.339, near the intersection with Wanyandie Road. The approximate site coordinates are 5993890 N, 372875 E (UTM Zone 11, NAD 83). A site plan is presented on Figure 1.

The geohazard at the GP007 site consists of a deep-seated landslide (or nested slide) along the north valley slope of the Smoky River.

Previous remedial actions completed at the GP007 site include asphalt overlays in 2018 and 2019, and ongoing pavement patching, and sub-excavation and backfilling of surface voids with granular fill. In 2020 and 2021, the highway surface was returned to gravel in the summer/fall then paved for winter and in 2024, the north highway ditch at the west end of the site was regraded.

Geotechnical site investigations were conducted at the GP007 site in 1998, 2002, 2003, and 2020 by the previous consultants. During these investigations, 14 SIs and 21 piezometers were installed. KCB conducted a more recent geotechnical site investigation in 2022, during which 4 deep SIs and 13 VWPs (with data loggers) were installed to improve the understanding of movement and groundwater conditions at the site, respectively.

Klohn Crippen Berger Ltd.
109, 4208 97 St NW ▪ Edmonton AB T6E 5Z9 ▪ Canada
t 780.444.0706 ▪ www.klohn.com

The stratigraphy encountered during the 2022 investigation varied, but generally consisted of silt, colluvium, till, or some combination thereof, overlying bedrock (clay shale, siltstone, and sandstone). At the west end of the site, the depth to bedrock observed during the 2022 investigation was deeper than the depth to bedrock observed during the 1998 investigations, which could indicate some of the SIs installed in 1998 were not anchored in bedrock as previously reported by others.

1.1 Instrumentation

KCB has been reading the instruments at this site since the spring of 2021. Instrumentation installation details are tabulated in Table 1.1. Instrument locations are shown on Figure 1. Any instruments not included in Table 1.1 or shown on Figure 1 are assumed to be inoperable and are not presented or discussed herein.

As discussed above, 18 SIs and 34 piezometers have been installed at the site between 1998 and 2022 by the previous consultants and KCB. Some of these instruments are now inoperable (e.g., sheared, or damaged) as detailed in Table 1.1 (see table notes). For the instruments installed by previous consultants (14 SIs and 21 piezometers) it is noted that:

- Several of these piezometers have been dry or near dry (i.e., recording water levels below or near their tip elevations) since installation with a water level above tip elevation only being recorded in spring 2020, spring 2021, and/or fall 2024. Relatively steady water levels (±1 m) have been recorded in PN98-1 and PN98-3 (both now inoperable), and the piezometers (VW20-02A/B, VW20-03B, and VW20-06A/B, SP20-4, and SP20-8) at the east end of the site.
- Several of the SIs did not record clear movement patterns before they became inoperable (SI98-1), were not anchored in bedrock (TH20-2, TH20-3, and TH20-6), or may not have been installed deep enough (SI98-4 and SI98-6, SI03-11 and SI03-12) since the movement or lack of movement recorded in the instrument is inconsistent with movement recorded in other nearby SIs and/or, as discussed in Section 1, the instrument may not have been anchored in bedrock.

Most of the instruments are protected by above-ground casing protectors, excluding SI98-4 through SI98-7, and PN-4 through PN-7.

The operable SIs were read using the same metric RST Digital MEMS Inclinometer System that has been used to read the SIs since KCB took over the readings in June 2021.The operable PNs and SPs were read using an RST C109 pneumatic piezometer readout box and a Heron Water Level Meter, respectively.

Between March and May 2022, the VWPs were connected to multi-channel data loggers (Model No. DT2055B from RST Instruments Ltd.)in February 2023, small-diameter VWPs connected to single channel data loggers (Model No. DT2011B from RST Instruments Ltd.) were installed inside SP20-4 and SP20-8. The multi and single-channel data loggers are programmed to take a reading every 12 hours and 6 hours, respectively, to assess if short-term fluctuations (i.e., increases and decreases) in water level are occurring in response to periods of heavy or prolonged rainfall or freshet infiltration

between spring and fall readings. Data from the data loggers was downloaded using an RST USB-serial cable and DT Logger Host software.

Table 1.1 Instrumentation Installation Details[1]

Instrument ID	Instrument Type	Date Installed	UTM Coordinates (m)		Ground Surface Elevation (m)	Stick Up (m)	Depth (mbgs[2])	Condition
			Northing	Easting				
~~SI98-1~~	~~SI~~	~~Mar. 10, 1998~~	~~5993897~~	~~372794~~	~~965.4~~	~~Unknown~~	~~29.3~~	~~Inoperable[3]~~
~~SI98-2~~	~~SI~~	~~Mar. 05, 1998~~	~~5993849~~	~~372785~~	~~961.0~~	~~Unknown~~	~~30.9~~	~~Inoperable[4]~~
~~SI98-3~~	~~SI~~	~~Mar. 05, 1998~~	~~5993519~~	~~372798~~	~~903.7~~	~~Unknown~~	~~29.1~~	~~Inoperable[3]~~
SI98-4	SI	Oct. 24, 1998	5993908	372881	964.9	0.6	20.2	Operable
~~SI98-5~~	~~SI~~	~~Oct. 20, 1998~~	~~5993851~~	~~372889~~	~~954.5~~	~~Unknown~~	~~25.7~~	~~Inoperable[4]~~
SI98-6	SI	Oct. 22, 1998	5993878	373084	967.3	0.9	27.9	Operable
SI98-7	SI	Oct. 21, 1998	5993777	373101	943.5	0.7	29.1	Operable
~~SI98-8~~	~~SI~~	~~Oct. 26, 1998~~	~~5993585~~	~~373184~~	~~926.7~~	~~Unknown~~	~~23.3~~	~~Inoperable[5]~~
SI03-11	SI	Nov. 25, 2003	5993966	372951	991.5	0.6	44.7	Operable
SI03-12	SI	Nov. 27, 2003	5993964	373058	991.4	0.9	44.9	Operable[6]
~~SI03-13~~	~~SI~~	~~Nov. 22, 2003~~	~~5993972~~	~~373167~~	~~995.2~~	~~Unknown~~	~~41.5~~	~~Inoperable[5]~~
~~SI20-2~~	~~SI~~	~~Jul. 28, 2020~~	~~5993885~~	~~373238~~	~~970.5~~	~~1.0~~	~~34.2~~	~~Operable[4]~~
~~SI20-3~~	~~SI~~	~~Jul. 23, 2020~~	~~5993917~~	~~373251~~	~~981.1~~	~~0.9~~	~~33.9~~	~~Inoperable[4]~~
~~SI20-6~~	~~SI~~	~~Jul. 27, 2020~~	~~5993875~~	~~373300~~	~~964.6~~	~~0.8~~	~~29.4~~	~~Inoperable[4]~~
SI22-1	SI	May 19, 2022	5993925	372803	965.0	0.4	40.3	Operable
SI22-2	SI	May 06, 2022	5993906	372920	966.0	0.6	40.6	Operable
SI22-3	SI	May 11, 2022	5993906	373081	971.0	0.6	49.1	Operable
SI22-4	SI	May 17, 2022	5993936	373239	980.0	0.2	54.6	Operable
~~PN98-1~~	~~PN~~	~~Mar. 10, 1998~~	~~5993897~~	~~372794~~	~~965.4~~	~~N/A~~	~~16.8~~	~~Inoperable~~
~~PN98-3~~	~~PN~~	~~Mar. 05, 1998~~	~~5993519~~	~~372798~~	~~903.7~~	~~N/A~~	~~10.7~~	~~Inoperable~~
PN98-4	PN	Oct. 24, 1998	5993908	372881	964.9	N/A	7.3	Operable
PN98-5	PN	Oct. 20, 1998	5993851	372889	954.5	N/A	11.3	Operable
PN98-6	PN	Oct. 22, 1998	5993878	373084	967.3	N/A	10.1	Operable
PN98-7	PN	Oct. 21, 1998	5993777	373101	943.5	N/A	4.6	Operable
PN03-11A	PN	Nov. 25, 2003	5993966	372951	991.5	N/A	6.1	Operable
PN03-11B	PN	Nov. 25, 2003	5993966	372951	991.5	N/A	15.2	Operable
PN03-12A	PN	Nov. 27, 2003	5993964	373058	991.4	N/A	6.6	Operable
PN03-12B	PN	Nov. 27, 2003	5993964	373058	991.4	N/A	14.9	Operable
PN03-12C	PN	Nov. 27, 2003	5993964	373058	991.4	N/A	22.7	Operable
PN03-13A	PN	Nov. 22, 2003	5993972	373167	995.2	N/A	6.4	Operable
VW20-2A	VWP	Jul. 28, 2020	5993885	373238	970.5	N/A	11.3	Operable
VW20-2B	VWP	Jul. 28, 2020	5993885	373238	970.5	N/A	22.9	Operable
VW20-3A	VWP	Jul. 23, 2020	5993917	373251	981.1	N/A	17.4	Operable
VW20-3B	VWP	Jul. 23, 2020	5993917	373251	981.1	N/A	28.2	Operable
VW20-6A	VWP	Jul. 27, 2020	5993875	373300	964.6	N/A	16.2	Operable
VW20-6B	VWP	Jul. 27, 2020	5993875	373300	964.6	N/A	24.1	Operable
VW22-1A	VWP	May 19, 2022	5993925	372803	965.0	N/A	29.2	Operable
VW22-1B	VWP	May 19, 2022	5993925	372803	965.0	N/A	32.9	Operable
VW22-1C	VWP	May 19, 2022	5993925	372803	965.0	N/A	40.0	Operable
VW22-2A	VWP	May 06, 2022	5993906	372920	966.0	N/A	21.3	Operable
VW22-2B	VWP	May 06, 2022	5993906	372920	966.0	N/A	33.1	Operable
VW22-2C	VWP	May 06, 2022	5993906	372920	966.0	N/A	36.3	Operable
VW22-2D	VWP	May 06, 2022	5993906	372920	966.0	N/A	40.0	Operable
VW22-3A	VWP	May 11, 2022	5993906	373081	971.0	N/A	19.9	Operable
VW22-3B	VWP	May 11, 2022	5993906	373081	971.0	N/A	37.9	Operable
VW22-3C	VWP	May 11, 2022	5993906	373081	971.0	N/A	42.5	Operable
VW22-3D	VWP	May 11, 2022	5993906	373081	971.0	N/A	49.4	Operable
VW22-4A	VWP	May 17, 2022	5993936	373239	980.0	N/A	33.9	Operable

Instrument ID	Instrument Type	Date Installed	UTM Coordinates (m)		Ground Surface Elevation (m)	Stick Up (m)	Depth (mbgs[2])	Condition
			Northing	Easting				
VW22-4B	VWP	May 17, 2022	5993936	373239	980.0	N/A	45.2	Operable
SP20-1	SP	Jul. 30, 2020	5993951	373592	961.8	0.9	7.5	Operable[8]
SP20-4	SP	Jul. 26, 2020	5993970	373309	976.5	0.9	19.5	Operable[8]
SP20-8	SP	Jul. 30, 2020	5994000	373791	997.3	0.9	10.0	Operable[8]

Notes:

[1] Instrument installation details were taken from reports and data files prepared or provided by the previous consultant(s) or TEC. Ground surface elevations for SI98-4, SI98-6, and SI03-12 vary from the adjacent piezometers (PN98-4, PN98-6, PN03-12A/B/C). Also, ground surface elevations were not provided for SI20-2, SI20-3, or SI20-6, so ground surface elevations from the adjacent/nested piezometers were used (VW20-2A/B, VW20-3A/B, and VW20-6A/B). Instrument coordinates and stick ups (where applicable) were confirmed by KCB using a handheld GPS (accuracy of ± 5 m) and a tape measure, respectively.

[2] Meters below ground surface (mbgs). Bottom reading depth for operable SIs, and tip or screen depth for piezometers. Either bottom reading or casing depth for inoperable SIs.

[3] SI98-1 and SI98-3 were damaged near the top of casing in 2006.

[4] SI98-2, SI98-5, SI20-2, SI20-3, and SI20-6 have sheared at approximate depths of 21.5, 22.0 m, 28.5 m, 24.9 m, and 27.0 m below ground surface (approximate elevations of 939.5 m, 932.0 m, 956.5 m, 956.2 m, and 940.0 m, respectively).

[5] SI98-8 and SI03-13 are blocked at an approximate depth of 15.0 m (approximate elevation of 912.0 m) and 33.5 m below ground surface, respectively. It is unclear if these instruments have sheared as no previous movement had been recorded in them.

[6] SI03-12 has been re-sleeved twice (i.e., had a smaller diameter casing installed in it) (dates unknown).

[7] In 2022, multi-channel data loggers (Model No. DT2055B from RST Instruments Ltd.) were connected to the VWPs. The data loggers are programmed to record a reading of the instruments every 12 hours.

[8] In 2023, small-diameter VWPs connected to single-channel data loggers (Model No. DT2011B from RST Instruments Ltd.) were installed inside SP20-4 and SP20-8. The data loggers are programmed to record a reading of the instruments every 6 hours.

2 INTERPRETATION

2.1 General

For the operable SIs, the cumulative displacement, incremental displacement, and displacement-time data was plotted in the A-direction (i.e., the direction of the A0-grooves) and, where applicable, the X-direction (i.e., the direction of maximum movement obtained at a skew angle from the A0-grooves). SI98-7 and SI22-4 have skew angles of 100° and 230°, respectively, measured clockwise from the direction of the A0-grooves.

For the operable PNs and VWPs, the recorded porewater pressures were converted to an equivalent water/piezometric elevation and plotted relative to ground surface elevation and the tip elevation for each instrument.

For the operable SPs, the water level data was plotted relative to ground surface elevation and the screen elevation for each instrument.

The SI and piezometer data plots are included in Appendix I, and a summary of the SI and piezometer data is provided in Table 2.1 through Table 2.3, respectively.

Table 2.1 Slope Inclinometer Reading Summary

Instrument ID	Date				Ground Surface Elevation[2] (m)	Depth of Movement (mbgs[1])	Direction of Movement, Skew Angle[2]	Movement (mm)				Rate of Movement (mm/year)		
	Initialized (Re-initialized)	Previous Maximum Cumulative Movement Recorded	Previous Reading	Most Recent Reading				Maximum Cumulative			Incremental Since Previous Maximum Cumulative	Previous Maximum	Most Recent Reading	Change from Previous Reading
								Before Re-Initialization	After Re-Initialization	Total				
SI98-4	Oct. 25, 1998	N/A – no discernible movement recorded	May 23, 2024	Oct. 17, 2024	964.9	N/A – No discernible movement recorded.								
SI98-6[3]	Oct. 23, 1998 (Jun. 22, 2018)	N/A – no discernible movement recorded	May 23, 2024	Oct. 17, 2024	967.3	N/A[3] – No discernible discrete movement recorded. Data is noisy as discussed in Section 2.1								
SI98-7	Oct. 23, 1998	Jun. 17, 2017	May 23, 2024	Oct. 18, 2024	943.5	N/A[3] – No discernible discrete movement recorded. Data is noisy as discussed in Section 2.1.								
SI03-11	Dec. 07, 2003 (Jun. 12, 2016)[4]	Jun. 07, 2023	May 23, 2024	Oct. 18, 2024	991.5	N/A[3] – No discernible discrete movement recorded. Data is noisy as discussed in Section 2.1.								
SI03-12[3]	May 24, 2007 (Jun. 12, 2016)	N/A – no discernible movement recorded	May 23, 2024	Oct. 18, 2024	991.4	N/A[3] – No discernible discrete movement recorded, but some potential post-installation casing settlement/flexure. Data is noisy as discussed in Section 2.1.								
SI22-1	Jun. 22, 2022	N/A – no discernible movement recorded	May 23, 2024	Oct. 18, 2024	965.0	N/A – No discernible movement recorded, but some potential post-installation casing settlement/flexure recorded								
SI22-2	Jun. 22, 2022	Sept. 07, 2023	May 23, 2024	Oct. 18, 2024	966.0	6.6 – 10.6	A-direction	N/A		17.7	0.6	20.8	1.4	-3.7
SI22-3	Jun. 21, 2022	N/A – no discernible movement recorded	May 23, 2024	Oct. 17, 2024	971.0	N/A – No discernible movement recorded, but some potential post-installation casing settlement/flexure recorded								
SI22-4	Jun. 22, 2022	Jun. 07, 2023	May 23, 2024	Oct. 17, 2024	980.0	2.6 – 53.6	X-Direction, 230°	N/A		10.1	0.6	11.8	13.0	19.5

Notes:
[1] Meters below ground surface (mbgs).
[2] Skew angle of the X-direction measured clockwise from the A-direction. The azimuths of the A0-grooves in the SIs were measured by KCB with a magnetic compass in spring 2022.
[3] As discussed in Section 2.1, data for SI98-6 and SI03-12 is noisy and difficult to interpret.
[4] A large data shift was previously recorded in SI03-11 between the May 2015 and June 2016 readings when the SI reading equipment was changed by the previous consultant. The data obtained by KCB is consistent with the data obtained after June 2016, so the instrument was re-initialized to the June 2016 reading.

Table 2.2 Pneumatic Piezometer Reading Summary

Instrument ID	Serial No.	Date			Ground Surface Elevation (m)	Tip Depth (mbgs[1])	Water Level		
		Installed	Previous Reading	Most Recent Reading			Previous Reading (mbgs[1])	Most Recent Reading (mbgs[1])	Change from Previous Reading (m)
PN98-4	51191	Oct. 24, 1998	May 23, 2024	Oct. 17, 2024	964.9	7.3	7.0	6.1	0.9
PN98-5	51190	Oct. 20, 1998	May 23, 2024	Oct. 18, 2024	954.5	11.3	11.2	10.4	0.8
PN98-6	51194	Oct. 22, 1998	May 23, 2024	Oct. 17, 2024	967.3	10.1	9.4	9.0	0.4
PN98-7	51193	Oct. 21, 1998	May 23, 2024	Oct. 18, 2024	943.5	4.6	4.4	3.7	0.7
PN03-11A	28835	Nov. 25, 2003	May 23, 2024	Oct. 17, 2024	991.5	6.1	6.0	5.5	0.5
PN03-11B	28828	Nov. 25, 2003	May 23, 2024	Oct. 17, 2024	991.5	15.2	15.2	14.6	0.6
PN03-12A	28902	Nov. 27, 2003	May 23, 2024	Oct. 17, 2024	991.4	6.6	6.3	5.3	1.0
PN03-12B	28899	Nov. 27, 2003	May 23, 2024	Oct. 17, 2024	991.4	14.9	14.6	13.6	1.0
PN03-12C	28827	Nov. 27, 2003	May 23, 2024	Oct. 17, 2024	991.4	22.7	22.6	22.2	0.4
PN03-13A	28834	Nov. 22, 2003	May 23, 2024	Oct. 17, 2024	995.2	6.4	6.3	6.0	0.3

Notes:
[1] Meters below ground surface (mbgs).

Table 2.3 Standpipe Piezometer Reading Summary

Instrument ID	Date			Ground Surface Elevation (m)	Screen Depth (mbgs[1])	Water Level		
	Installed	Previous Reading	Most Recent Reading			Previous Reading (mbgs[1])	Most Recent Reading (mbgs[1])	Change from Previous Reading (m)
SP20-1	Jul. 30, 2020	May 23, 2024	Oct. 17, 2024	961.8	7.5	7.4	7.4	0.0
SP20-4	Jul. 26, 2020	May 23, 2024	Oct. 17, 2024	976.5	19.5	18.4	18.9	-0.5
SP20-8	Jul. 30, 2020	May 23, 2024	Oct. 17, 2024	997.3	10.0	5.3	6.2	-0.9

Notes:
[1] Meters below ground surface (mbgs).
[2] Small-diameter VWPs connected to single-channel data loggers are installed in SP20-4 and SP20-8. The data loggers are programmed to record a reading of the instruments every 6 hours.

Table 2.4 Vibrating Wire Piezometer Reading Summary[1]

Instrument ID	Serial No.	Date			Ground Surface Elevation (m)	Tip Depth (mbgs[2])	Water Level		
		Installed	Previous Reading	Most Recent Reading			Previous Reading (mbgs[2])	Most Recent Reading (mbgs[2])	Change from Previous Reading (m)
VW20-2A	67078	Jul. 28, 2020	May 23, 2024	Oct. 17, 2024	970.5	11.3	10.4	10.4	0.0
VW20-2B	67099	Jul. 28, 2020	May 23, 2024	Oct. 17, 2024	970.5	22.9	13.3	13.7	-0.4
VW20-3A	67093	Jul. 23, 2020	May 23, 2024	Oct. 17, 2024	981.1	17.4	N/A – instrument is dry		
VW20-3B	67095	Jul. 23, 2020	May 23, 2024	Oct. 17, 2024	981.1	28.2	26.6	26.7	-0.1
VW20-6A	67088	Jul. 27, 2020	May 23, 2024	Oct. 17, 2024	964.6	16.2	14.8	15.1	-0.3
VW20-6B	67096	Jul. 27, 2020	May 23, 2024	Oct. 17, 2024	964.6	24.1	14.5	15.1	-0.6
VW22-1A	VW145733	May 19, 2022	May 23, 2024	Oct. 18, 2024	965.0	29.2	12.4	12.5	-0.1
VW22-1B	VW143171	May 19, 2022	May 23, 2024	Oct. 18, 2024	965.0	32.9	N/A – instrument is dry		
VW22-1C	VW140853	May 19, 2022	May 23, 2024	Oct. 18, 2024	965.0	40.0	N/A – instrument is dry		
VW22-2B[3]	VW145722	May 06, 2022	May 23, 2024	Oct. 18, 2024	966.0	33.1	13.1	13.2	-0.1
VW22-2C	VW145742	May 06, 2022	May 23, 2024	Oct. 18, 2024	966.0	36.3	12.9	13.0	-0.1
VW22-2D	VW140069	May 06, 2022	May 23, 2024	Oct. 18, 2024	966.0	40.0	N/A – instrument is dry		
VW22-2A	SN1910356	May 19, 2022	May 23, 2024	Oct. 18, 2024	966.0	21.3	20.7	20.7	0.0
VW22-3A	VW145498	May 11, 2022	May 23, 2024	Oct. 17, 2024	971.0	19.9	16.4	16.5	-0.1
VW22-3B	VW145717	May 11, 2022	May 23, 2024	Oct. 17, 2024	971.0	37.9	16.6	16.7	-0.1
VW22-3C	VW145708	May 11, 2022	May 23, 2024	Oct. 17, 2024	971.0	42.5	16.8	17.0	-0.2
VW22-3D	VW143066	May 11, 2022	May 23, 2024	Oct. 17, 2024	971.0	49.4	N/A – instrument is dry		
VW22-4A	VW145746	May 17, 2022	May 23, 2024	Oct. 17, 2024	980.0	33.9	25.2	25.3	-0.1
VW22-4B	VW139732	May 17, 2022	May 23, 2024	Oct. 17, 2024	980.0	45.2	N/A – instrument is dry		

Notes:
[1] All vibrating wire piezometers are connected to multi-channel data loggers, which are programmed to record a reading of the instruments every 12 hours.
[2] Meters below ground surface (mbgs).

In 2021, KCB reviewed the instrumentation data provided by the previous consultant and removed corrections applied to the historical SI data based on our experience. The instrumentation data obtained by KCB is consistent with the data obtained by the previous consultants and no re-initialization of the SIs is recommended. The SI data plots presented herein include data for readings taken with both the previous consultants' and KCB's SI reading equipment.

It is noted that the data for SI98-6, SI98-7, and SI03-12 is noisy and difficult to interpret. Based on the absolute plots for these instruments, SI98-6 has kinks in the casing at an approximate depth of 11.9 m and 13.9 m below ground surface (mbgs), and SI98-7 and SI03-12 are tilted approximately 1.3 m and 1.5 m in the A direction, respectively. SI98-12 has also been re-sleeved twice (i.e., had a small-diameter casing installed in it) (dates unknown).

2.2 Zones of Movement

West End of Site

At the west end of the site, discrete movement (i.e., movement occurring on a defined failure plane) was being recorded in SI98-2 and SI98-5 before the instruments sheared at approximate depths of 21.5 mbgs and 22.0 mbgs, respectively. SI98-2 was located along the south (eastbound) shoulder of the highway and SI98-5 was located below the highway along Wanyandie Road. No discernible movement has been recorded in SI98-4, which is still operable and located upslope of SI98-5 in the north (westbound) highway ditch. However, as discussed in Section 1.1, SI98-4 may not have been installed deep enough. In May 2022, an adjacent deeper SI (SI22-1) was installed, and a "kink" has been recorded at an approximate depth of 6.3 mbgs to 9.8 mbgs (elevation 958.7 m to 955.2 m), in a zone of softer material observed during drilling, which may indicate post-installation casing settlement/flexure.

Middle of Site

Near the middle of the site, no discernible movement has been recorded in SI98-6, SI98-7, SI03-11, or SI03-12 since installation. Some possible movement maybe occurring in SI98-7 at an approximate depth of 22.1 mbgs and 24.1 mbgs (elevation 921.5 m and 919.5 m), but data for this instrument is noisy. SI98-6 is located along the south shoulder of the highway, SI03-11 and SI03-12 are located above the highway along the backslope, and SI98-7 is located below the highway along Wanyandie Road.

As discussed in Section 1.1, SI98-6, SI03-11, and SI03-12 may not have been installed deep enough. In May 2022, two deeper SIs (SI22-2 and SI22-3) were installed in the north highway ditch to assess if deeper movements are occurring near the middle of the site. Distributed movement has been recorded in SI22-2 from an approximate depth of 6.6 mbgs to 10.6 mbgs (elevation 959.4 m to 955.4 m), which is confined to the colluvium/till unit, and post-installation casing settlement/flexure has been recorded in SI22-3 to an approximate depth of 6 mbgs, which may be caused by grout loss in a more granular zone in the colluvium unit.

East End of Site

At the east end of the site, discrete movement was being recorded in SI20-2, SI20-3, and SI20-6 before the instruments sheared at approximate depths of 28.5 mbgs, 24.9 mbgs, and 27.0 mbgs (elevation 942.0 m, 956.2 m, and 937.6 m). All three instruments were located on the south side of the highway.

In May 2022, a deeper SI (SI22-4) was installed on the north side of the highway to assess if deeper movements are occurring at the east end of the site. Distributed movement is being recorded along the entire length of the instrument (i.e., from near ground surface to the base of the instrument) since installation, with no discrete movement zones.

2.3 Interpretation of Monitoring Results

Slope Inclinometer Data

Based on site observations and the SI data, portions of the landslide that appear most active coincide with areas of high fill at the west end of the site below and adjacent to the intersection with Wanyandie Road, and at the east end of the site near the deep gully. The landslide appears less active near the middle of the site, and there is no sign of recent landslide movements immediately above the highway in the backslope. However, relict landslide features have been observed by KCB and TEC well above the highway on the natural slope.

Based on the surface expression of the 2005 bare-earth LiDAR data and historic air photos, the landslide appears most active downslope of Hwy 40:36 and Wanyandie Road at the west end of the site as shown on Figure 1. In 2022, a series of ridges and troughs were observed, which could be the result of blocks sliding and eroding overtime with vegetation growth, becoming more rounded. The direction of movement recorded in SI98-2 and SI98-5 was towards the area of ridges and troughs before they sheared.

As discussed above, no discernible movement has been recorded in SI98-4 installed upslope of SI98-5 or SI98-6 near the middle of the landslide, but these instruments may not have been installed deep enough. Three deeper SIs (SI22-1, SI22-2, and SI22-3) were installed and anchored in bedrock by KCB in 2022 near the west end and middle of the site to assess if deeper movements are occurring at these locations. No discernible movement has been recorded in SI22-1 or SI22-3 (excluding potential post-installation casing settlement/flexure). Distributed movement has been recorded in SI22-2 from an approximate depth of 6.6 mbgs to 10.6 mbgs (elevation 959.4 m to 955.4 m) at an overall rate of less than 10 mm/year. Movement at this elevation appears to be localized to this instrument, as it has not been recorded in SI98-4 or SI03-11, located west and north/upslope of SI22-2, respectively. Ground cracking has been observed in the north highway ditch during previous site visits, and fluctuations in recorded movement rate may be attributed to seasonal variations in precipitation or freshet infiltration.

As of the spring of 2024, SI20-2, SI20-3, and SI20-6 have sheared at an approximate elevation of 942.0 m, 956.2 m, and 937.6 m, respectively, with an overall resultant towards the south to

southeast. The movement recorded in these instruments appears to be in response to ground loading by the high fill at this location in the ravine on the east side of the site and is below the water level recorded in nearby SP20-4 (between elevation 957.5 m and 958.0 m). There could be seasonal weakening due to rising and falling groundwater levels. Alternatively, the extent of valley-wall instability could be such that natural slope movements have A- and B-direction components due to the shape of the basal failure plane, potentially more stable zones, or other unknown factors. Since these instruments were anchored in clay till (not bedrock), a deeper SI (SI22-4) anchored in bedrock was installed by KCB in 2022 to assess if deeper movements are occurring at this location. Distributed movement has been recorded along almost the entire depth of SI22-4 at an overall approximate rate of less than 5 mm/year, but no discrete zones of movement have been recorded.

Less active portions of the landslide above the highway may not be as influenced by fill placement or water infiltration into the backscarp at highway level. However, without any changes to the slide or highway geometry, continued movement of the lower portions of the slide or an increase in groundwater levels (e.g., in response to prolonged periods of precipitation or freshet after a deeper-than-normal snowpack) could eventually result in movements further upslope.

Piezometer Data

Porewater pressures/water levels recorded in the SPs, VWPs and PNs have been relatively steady (±1.0 m) or below tip elevation (i.e., dry) since installation, except for:

- Between July 2020 and June 2021, a 6.7 m increase was recorded in VW20-2B which has been attributed to the instrument likely stabilizing from the grout backfill after installation in July 2020.
- A 0.3 m to 1.0 m increase recorded in the PNs between October 2020 and June 2021, and between June 2024 and September 2024. Historically, the porewater pressures recorded in the PNs have been near the tip elevation of each instrument (i.e., the instruments have been dry), except in PN-4. A porewater pressure approximately 1.0 m above the tip elevation of PN-4 was recorded between July 2019 and October 2019. The increases recorded in the PNs between October 2020 and June 2021, and between June 2024 and September 2024, may indicate the PNs are sensitive to the reading equipment being used or perhaps starting to fail, since a decrease was recorded in the VWPs and SPs during the same time period. The PNs are between 21 years to 26 years old..

The grout used to backfill the 2020 and 2022 boreholes may be muting the response of the VWPs to changing water levels, or the water level variations are too rapid to be recorded by the data loggers. However, the data loggers installed in SP20-4 and SP20-8, in February 2023, have also not captured short-term water level variations. Deeper SPs with long screens and data loggers should be installed to assess for short-term water level variations. The SPs should be backfilled with sand around the screen and sealed with bentonite.

3 RECOMMENDATIONS

3.1 Future Work

All operable instruments should continue to be read twice per year (spring and fall). Spring readings should be completed after late-May or early-June, due to the risk of water inside the instrument casings being frozen earlier in the year.

The site should continue to be inspected by the Maintenance Contract Inspector (MCI) and as part of the GP South Region GRMP Section B inspections.

Interferometric Synthetic Aperture Radar (InSAR) monitoring could be used to further study the slide and assess how the slope is moving and over what extent, particularly in difficult to assess areas with no instrumentation (e.g., above the highway where landslide terrain is visible on the surface expression of the 2005 bare-earth light detection and ranging (LiDAR) data).

3.2 Instrument Installs, Repairs, and Maintenance

As discussed in Section 2.3, deeper SPs should be installed to assess for short-term water level variations.

No instrument repairs or maintenance is required.

4 CLOSING

This report is an instrument of service of Klohn Crippen Berger (KCB). The report has been prepared for the exclusive use of Alberta Transportation and Economic Corridors (Client) for the specific application to the Peace Region (Grande Prairie District – South) Geohazard Risk Management Program (Contract No. CON0022166), and it may not be relied upon by any other party without KCB's written consent.

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered. KCB makes no warranty, express or implied.

Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

1. The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.
2. The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.
3. The report is based on information provided to KCB by the Client or by other parties on behalf of the client (Client-supplied information). KCB has not verified the correctness or accuracy of

such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.

4. KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.
5. This report is electronically signed and sealed and its electronic form is considered the original. A printed version of the original can be relied upon as a true copy when supplied by the author or when printed from its original electronic file.

Yours truly,

KLOHN CRIPPEN BERGER LTD.

Courtney Mulhall, M.Sc., P.Eng.
Geotechnical Engineer

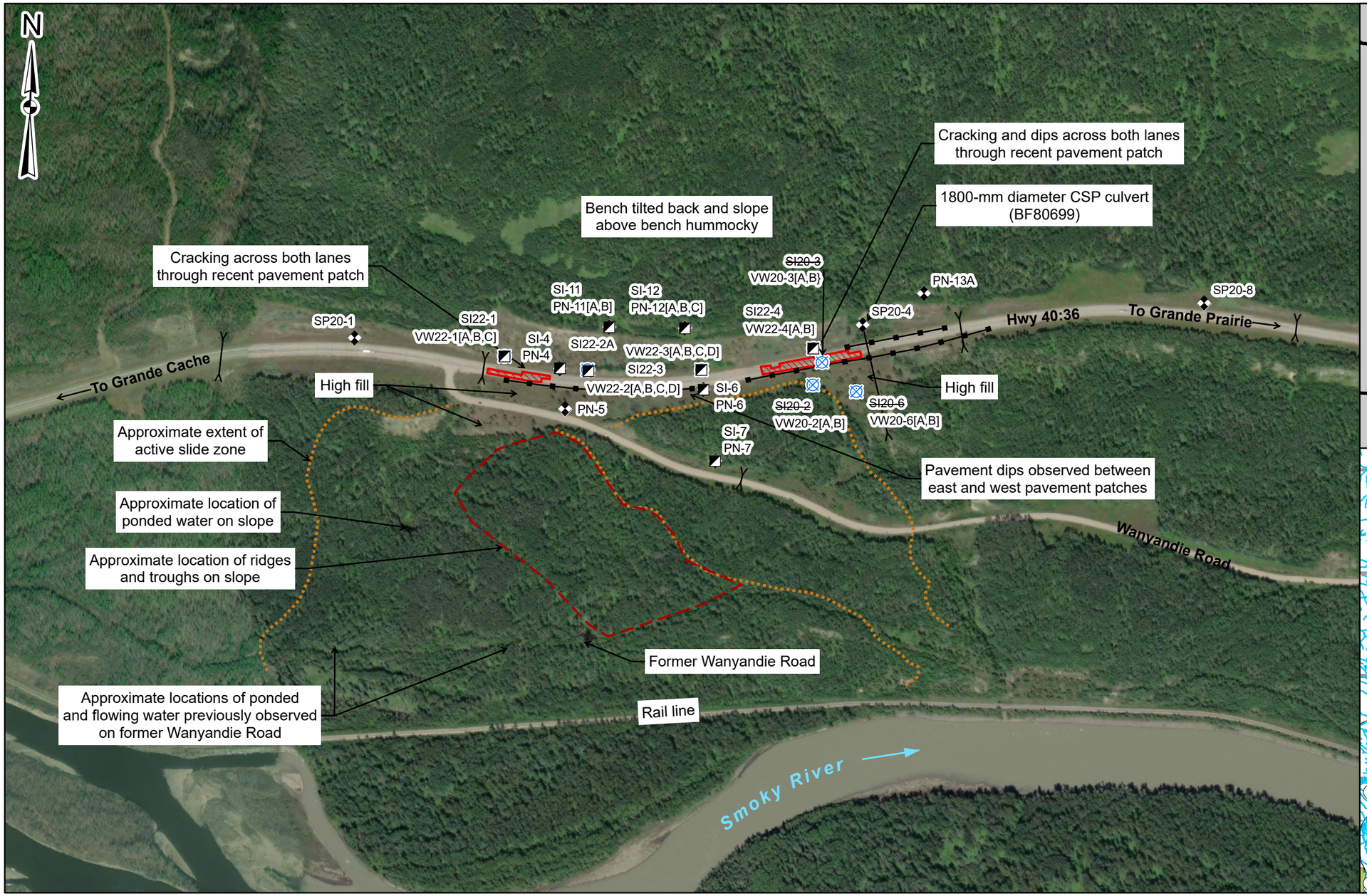
CM/EV/GB:bb

Cc: Chris Grapel, M.Eng., P.Eng.

PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.
RM SIGNATURE: _____
RM APEGA ID #: 187607
DATE: 2 Dec. 2024
PERMIT NUMBER: P009196
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

ATTACHMENTS
Figure
Appendix I Instrumentation Plots

FIGURE



Legend

- Approximate Pneumatic Piezometer Location
- Approximate Slope Inclinometer Location
- Approximate Vibrating Wire Piezometer Location
- Flow Direction
- Culvert
- Guardrail
- Active Slide Zone
- Ridges and Troughs
- Pavement Patch

0 200 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 11N
3. IMAGE SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. STRIKETHROUGH INDICATES INSTRUMENT IS INOPERABLE. INSTRUMENTS INOPERABLE PRIOR TO 2021 NOT SHOWN.

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: PEACE REGION (GRANDE PRAIRIE DISTRICT-SOUTH) GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

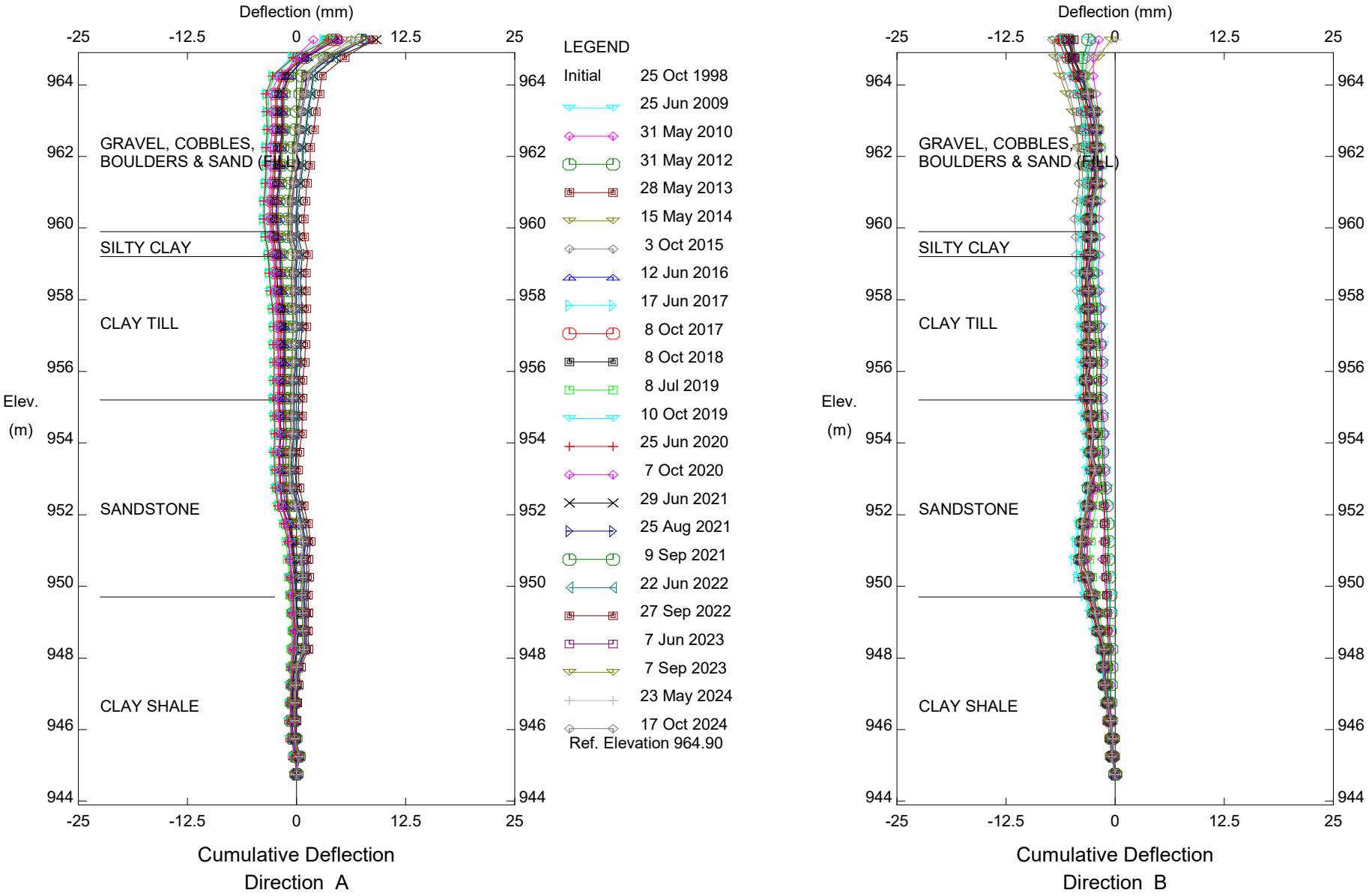
SCALE	PROJECT No.	FIG No.
1:6,000	A05116A01	1

File: Z:\AEDM\A05116\A01 ABT Grande Prairie South GRMP\H400 Drawings\GIS\MXD\2024\Section B\GP044\AT_GPSouth_GP044_20240524\AT_GPSouth_GP044_20240524.aprx Date: Time: Creator: : AHarrison

APPENDIX I

Instrumentation Plots

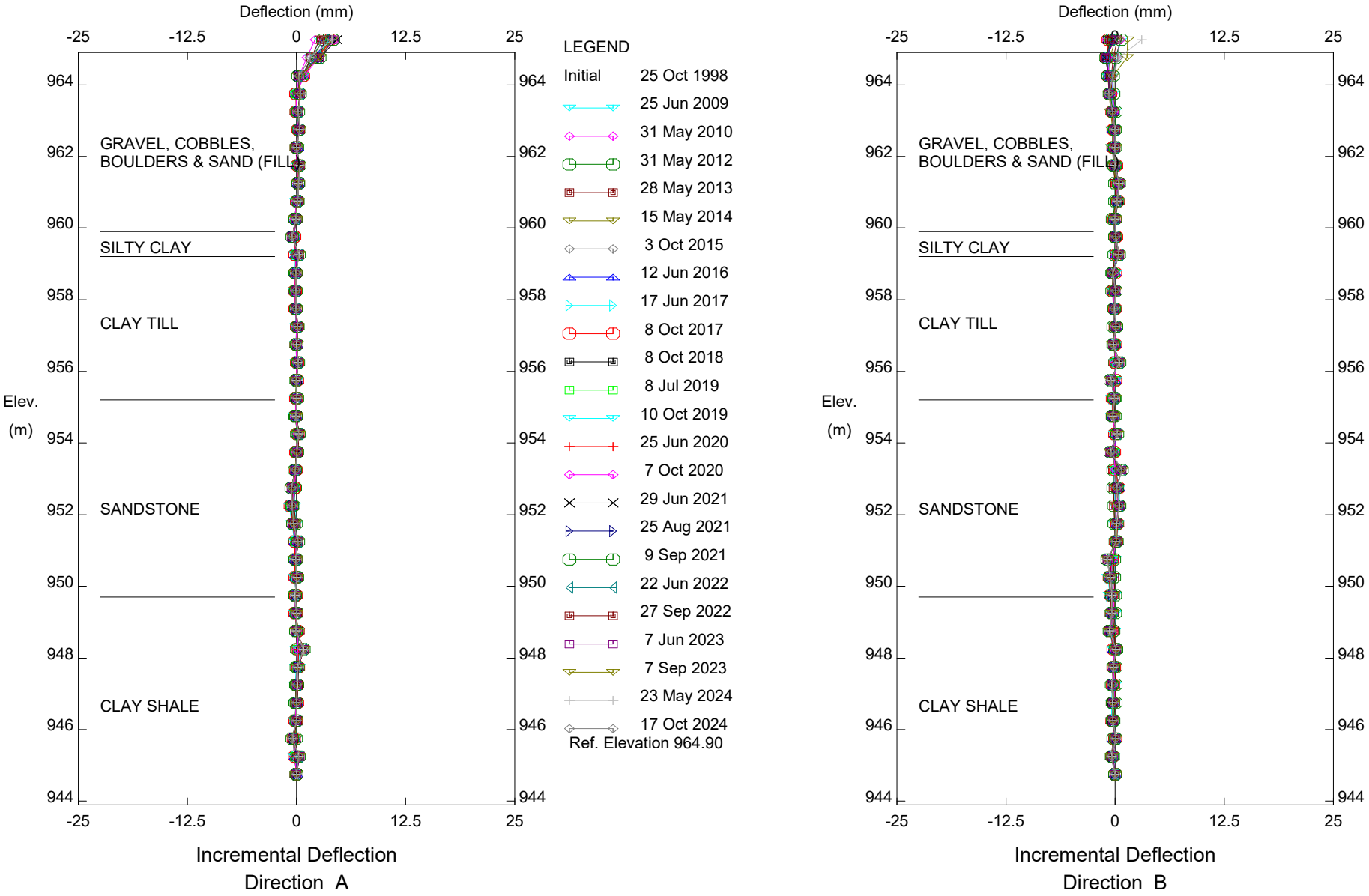
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI98-04

Alberta Transportation

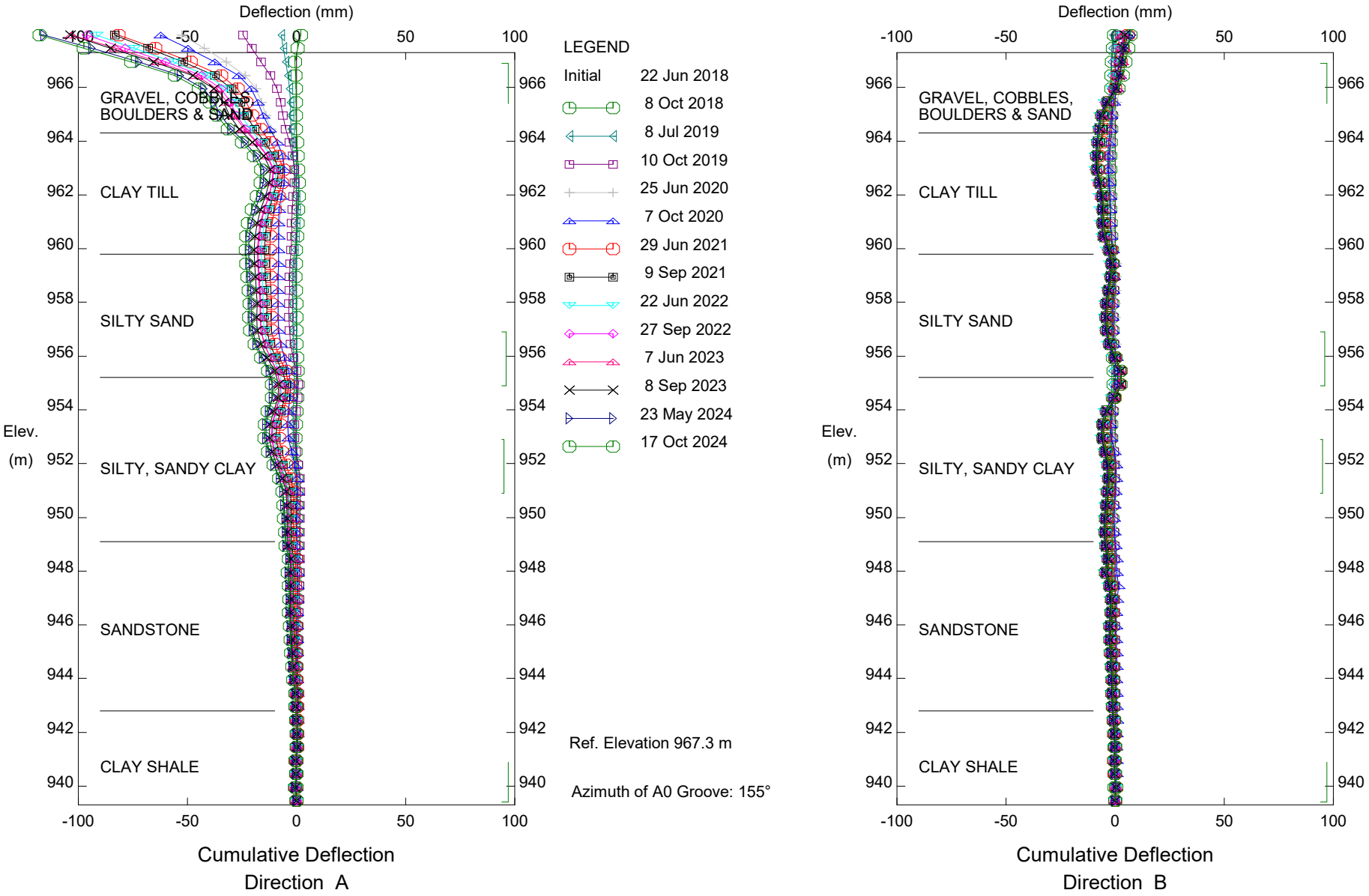
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI98-04

Alberta Transportation

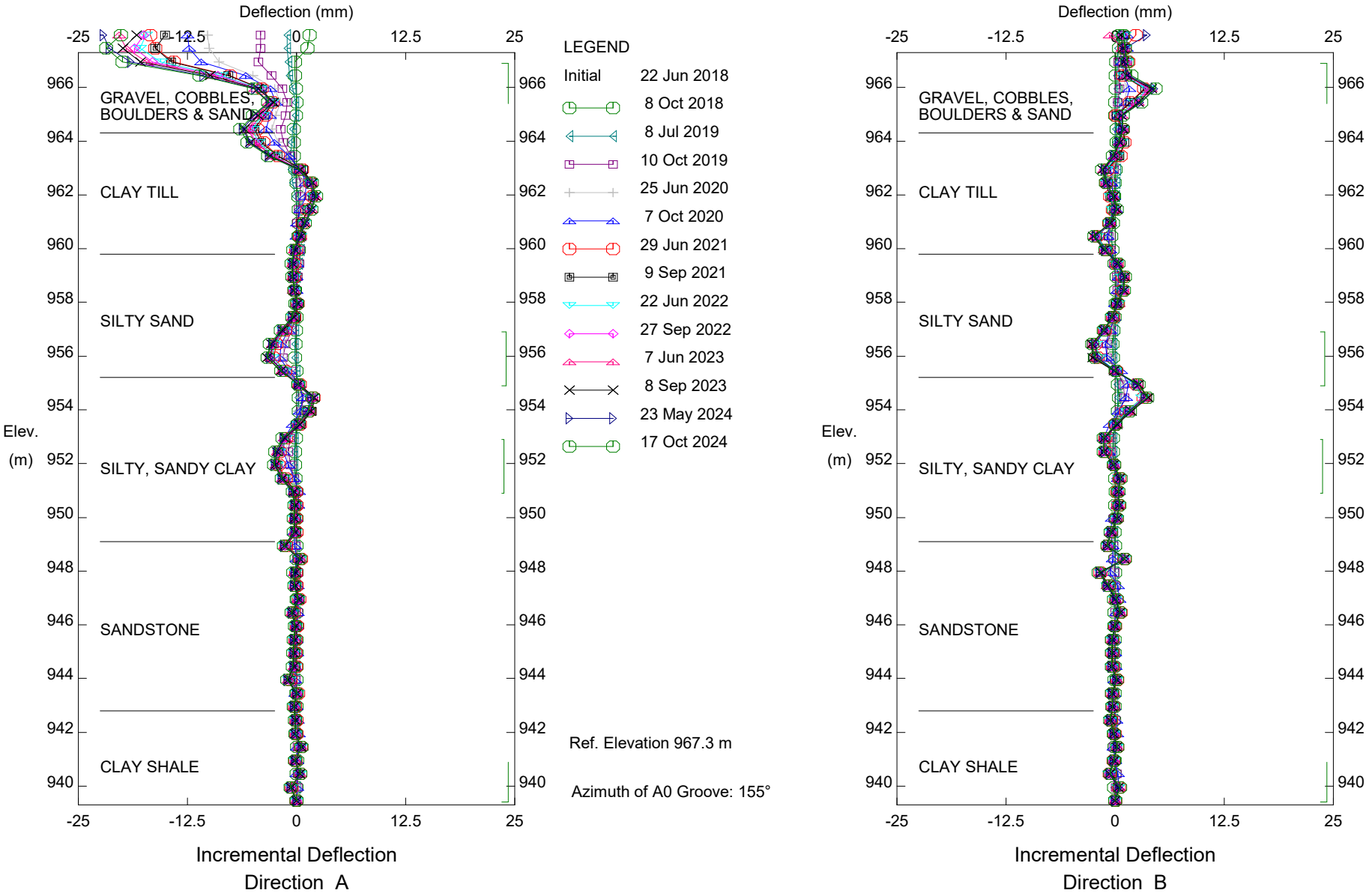
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI98-06

Alberta Transportation

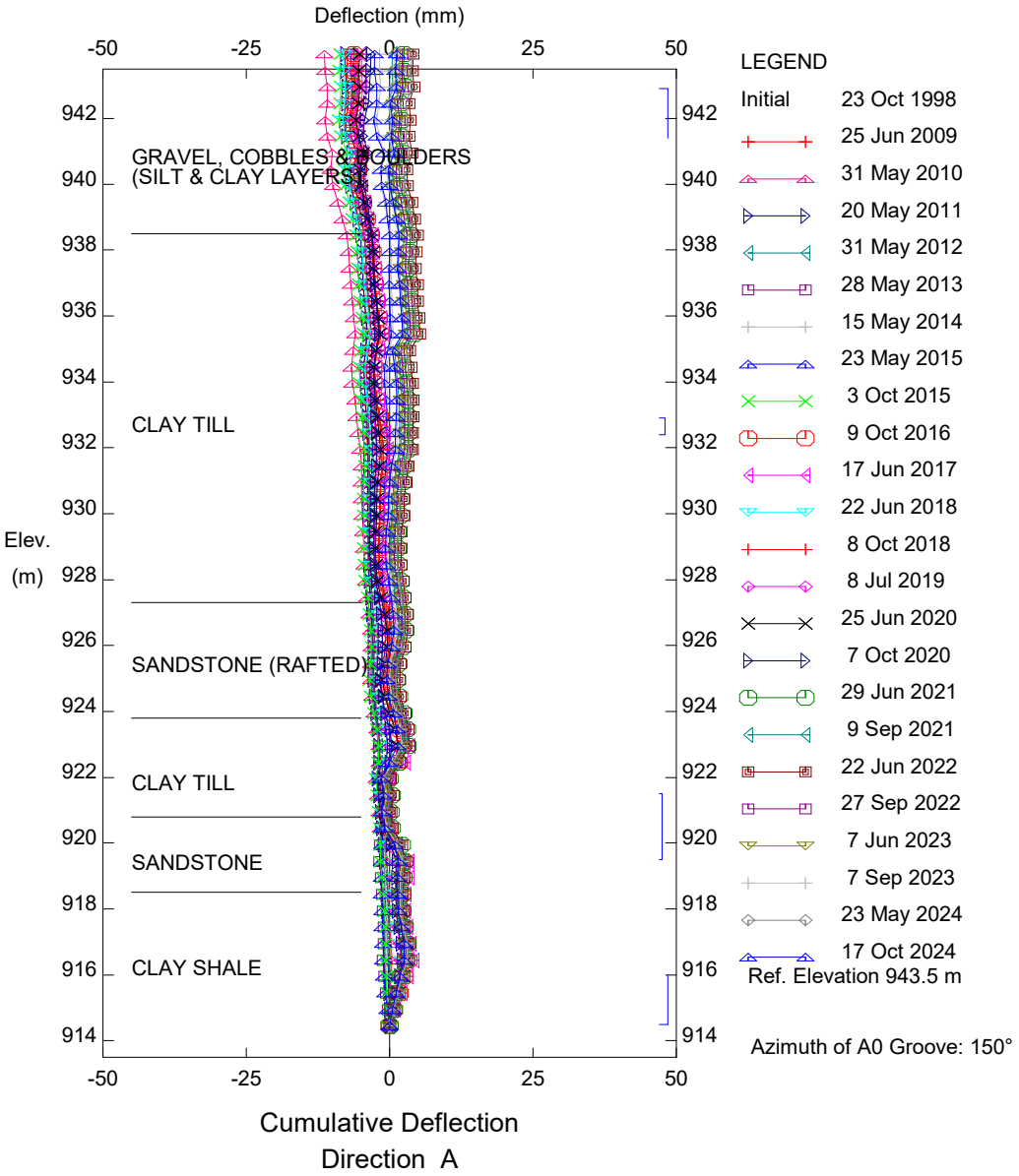
Klohn Crippen Berger - Edmonton

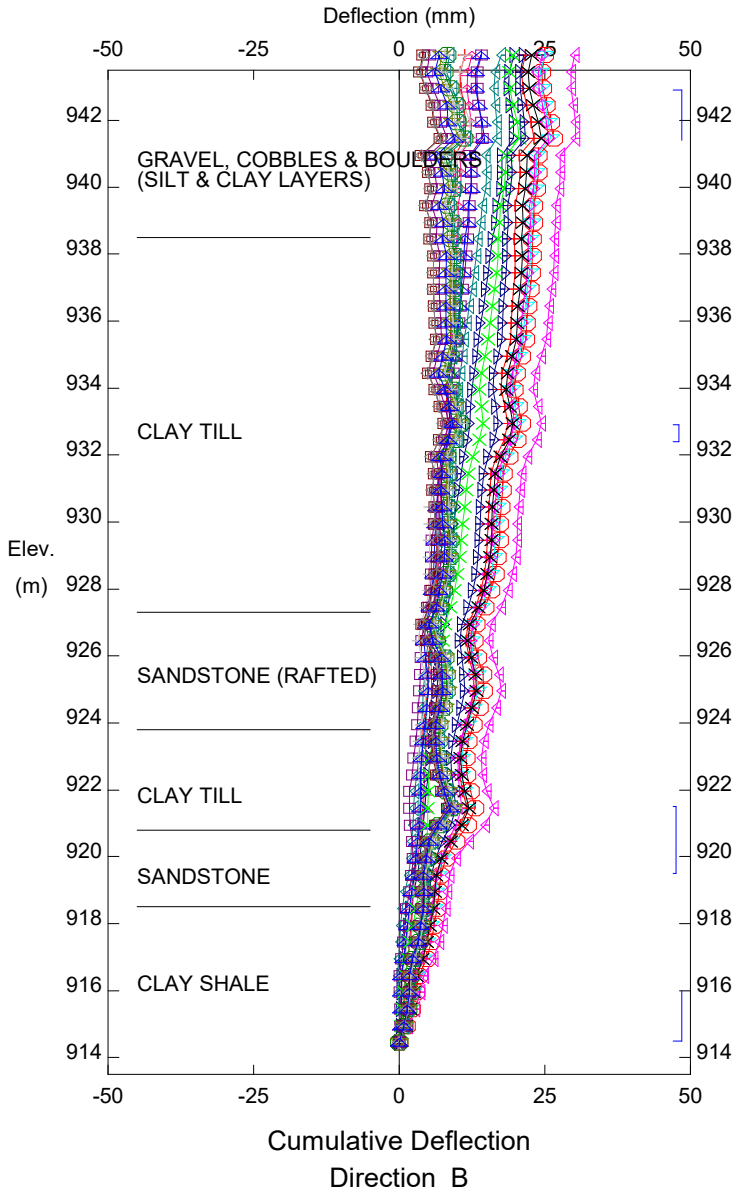


GP007; H40:36, Wanyandie Road Slide, Inclinometer SI98-06

Alberta Transportation

Klohn Crippen Berger - Edmonton

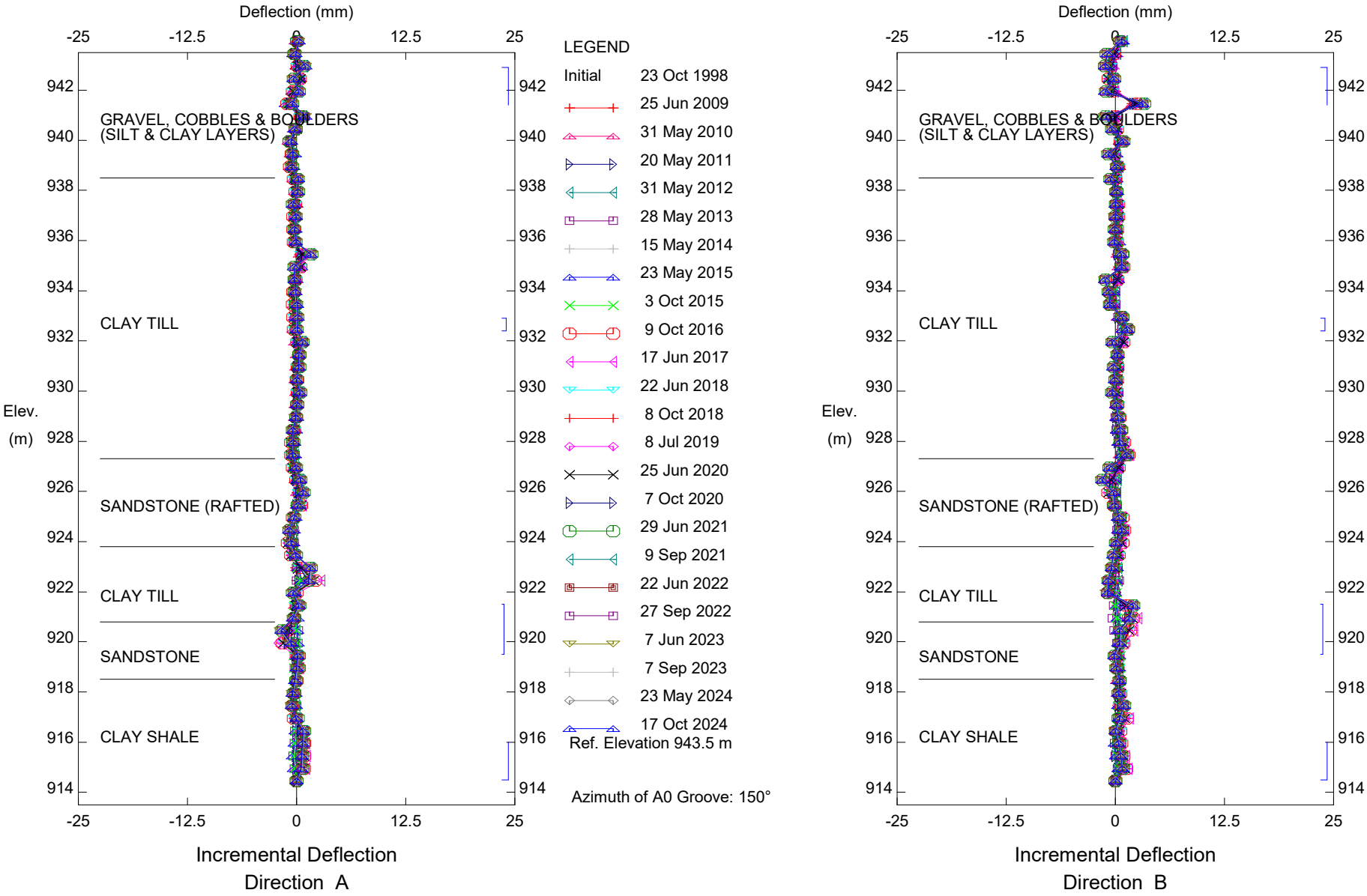




GP007; H40:36, Wanyandie Road Slide, Inclinometer SI98-07

Alberta Transportation

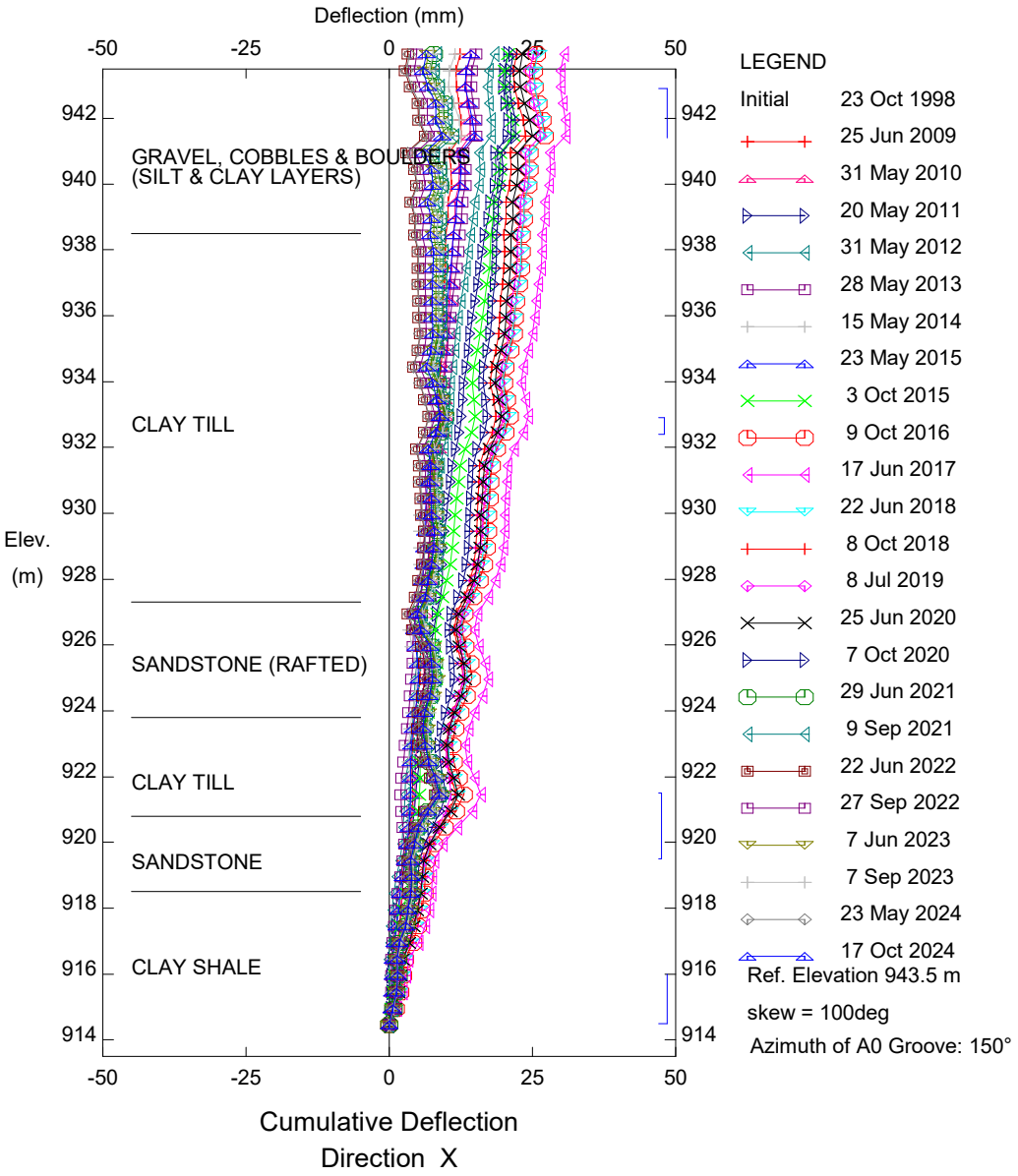
Klohn Crippen Berger - Edmonton

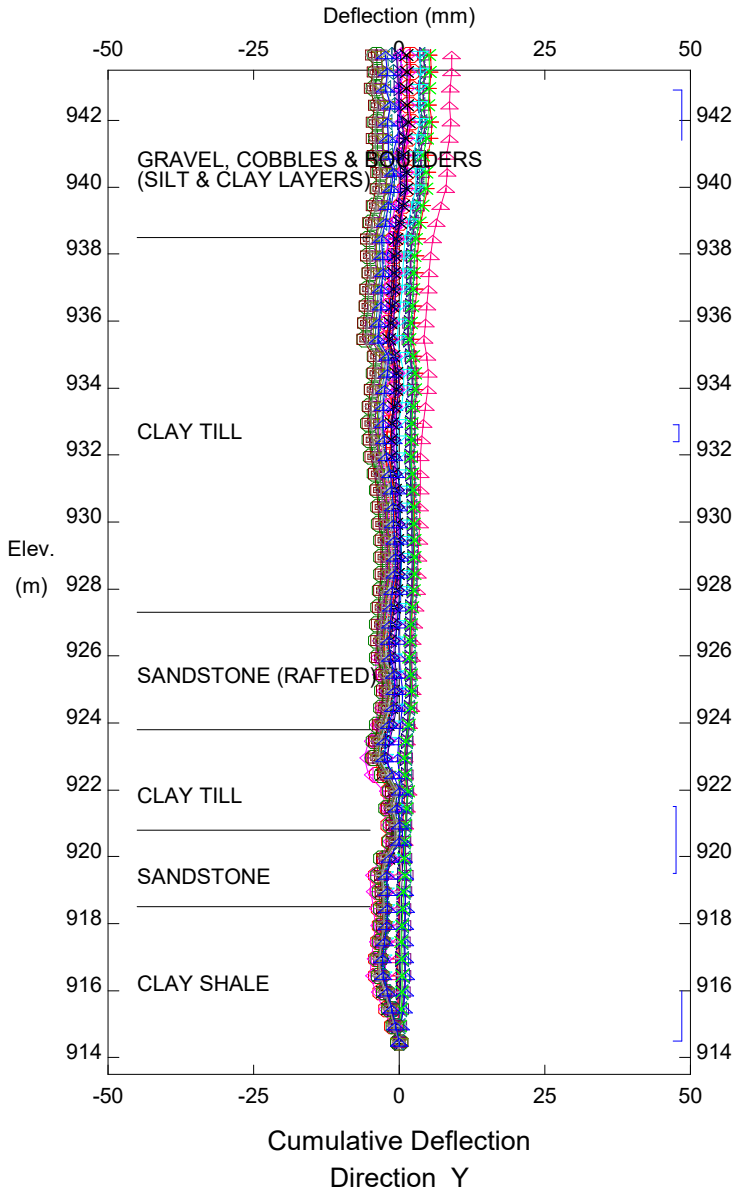


GP007; H40:36, Wanyandie Road Slide, Inclinometer SI98-07

Alberta Transportation

Klohn Crippen Berger - Edmonton

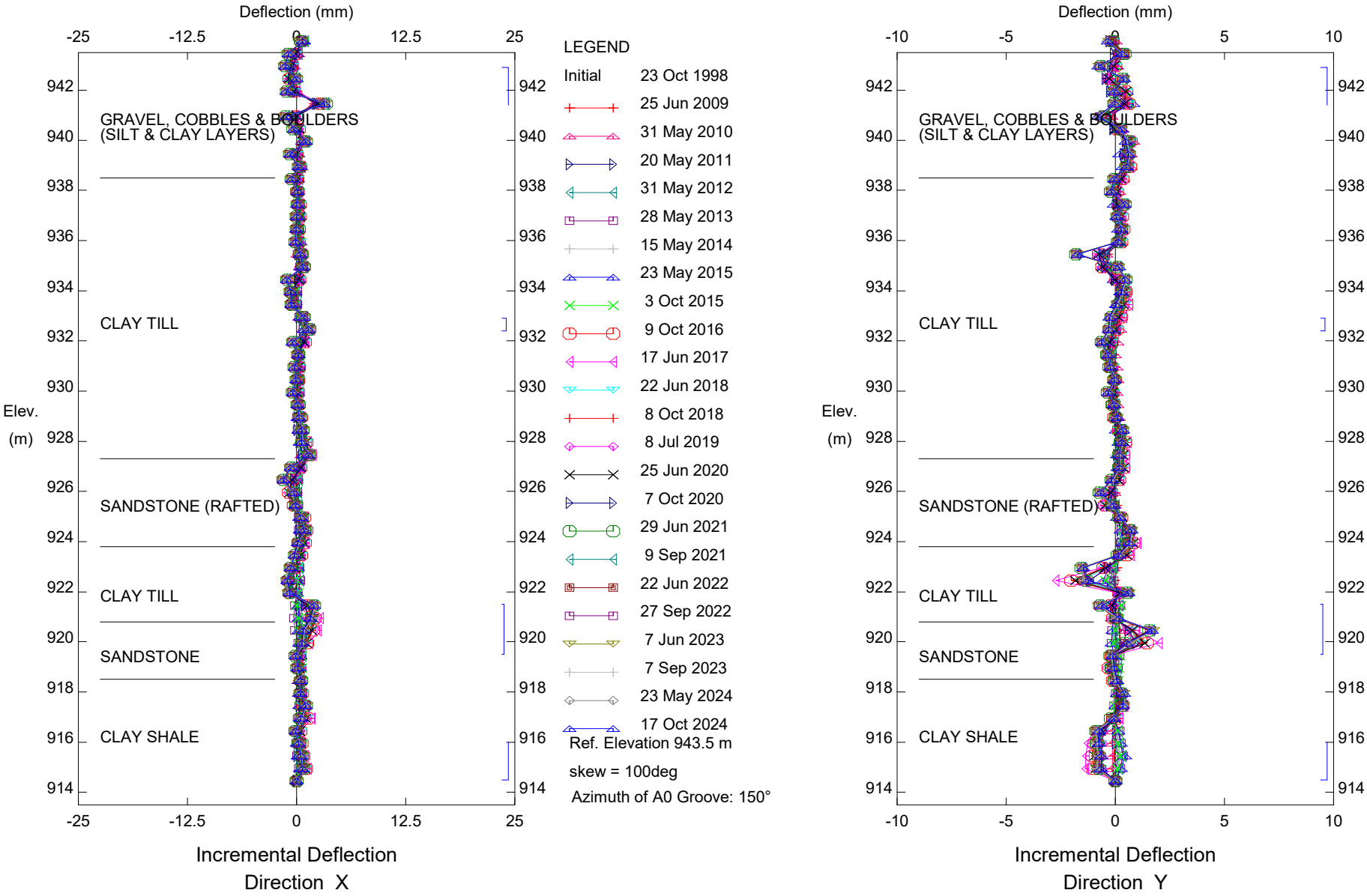




GP007; H40:36, Wanyandie Road Slide, Inclinometer SI98-07

Alberta Transportation

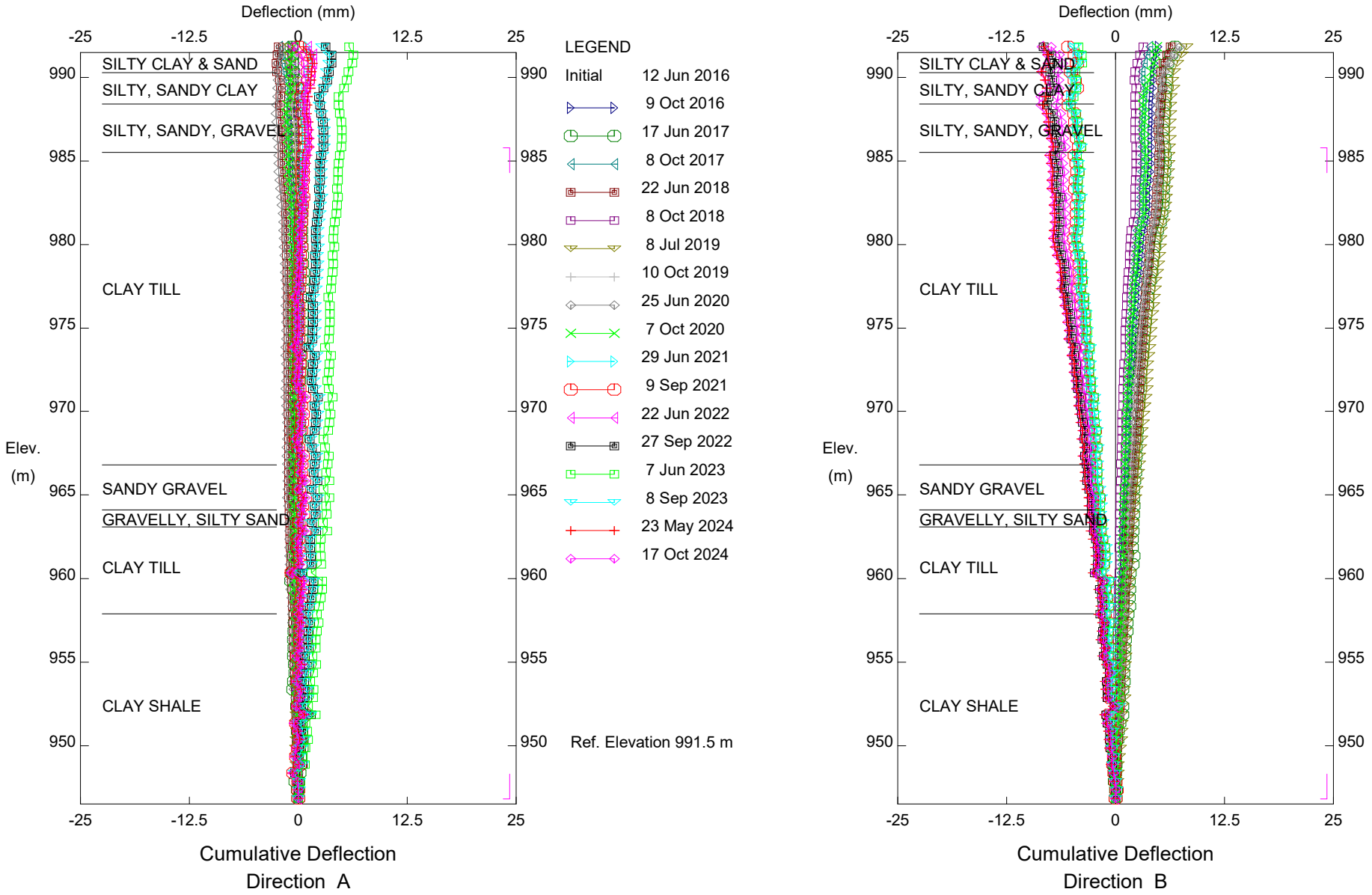
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI98-07

Alberta Transportation

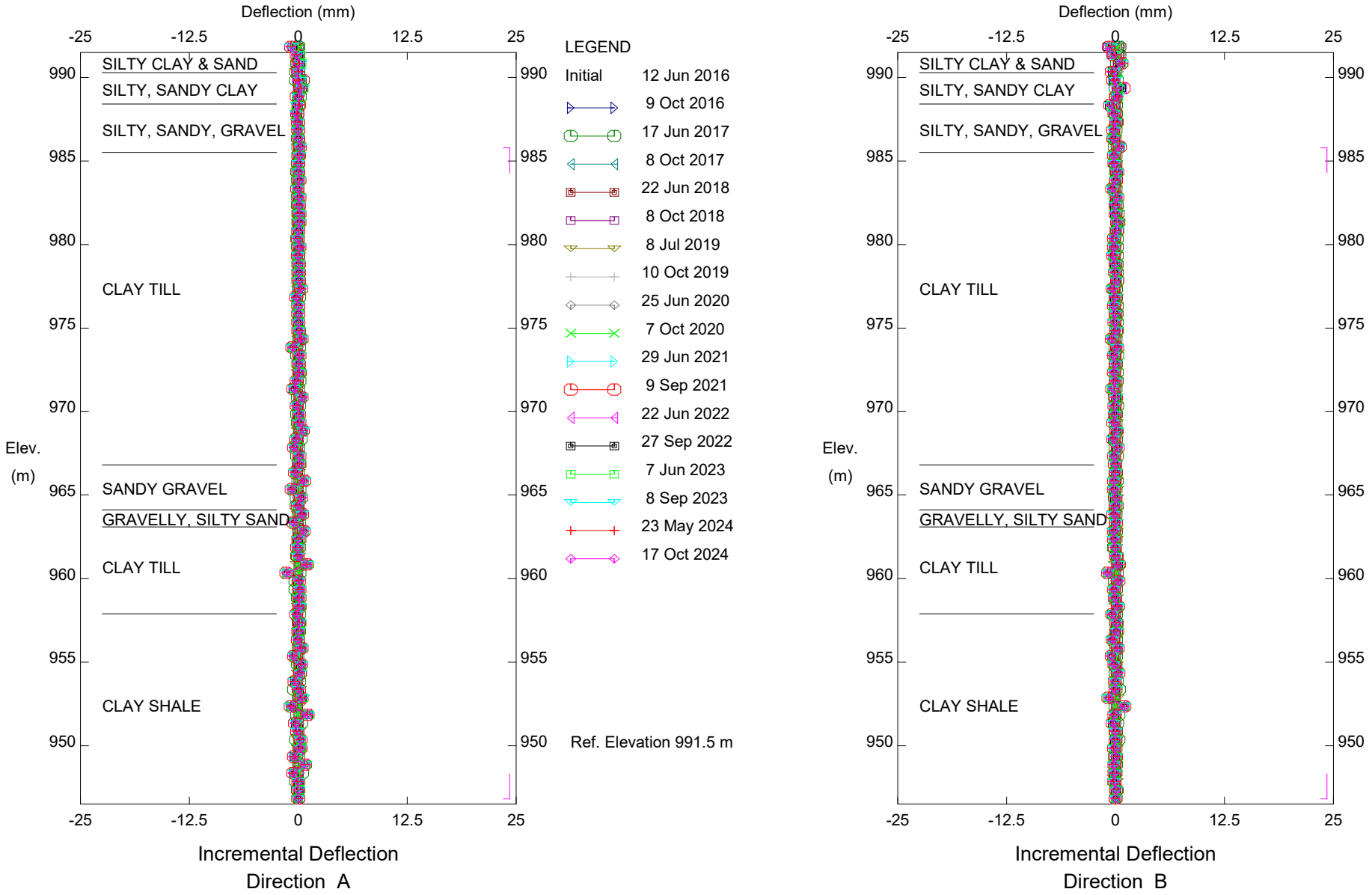
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI03-11

Alberta Transportation

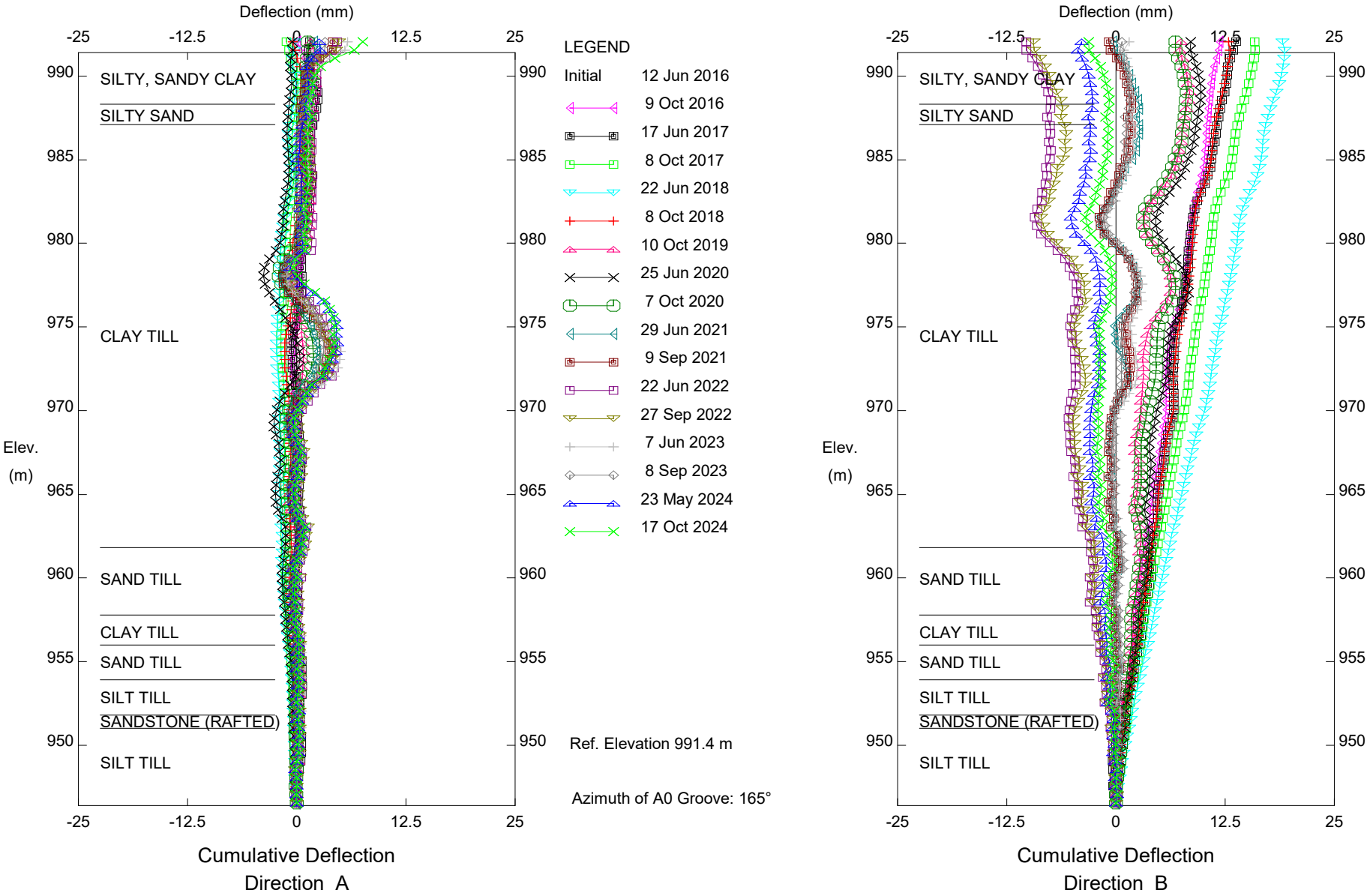
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI03-11

Alberta Transportation

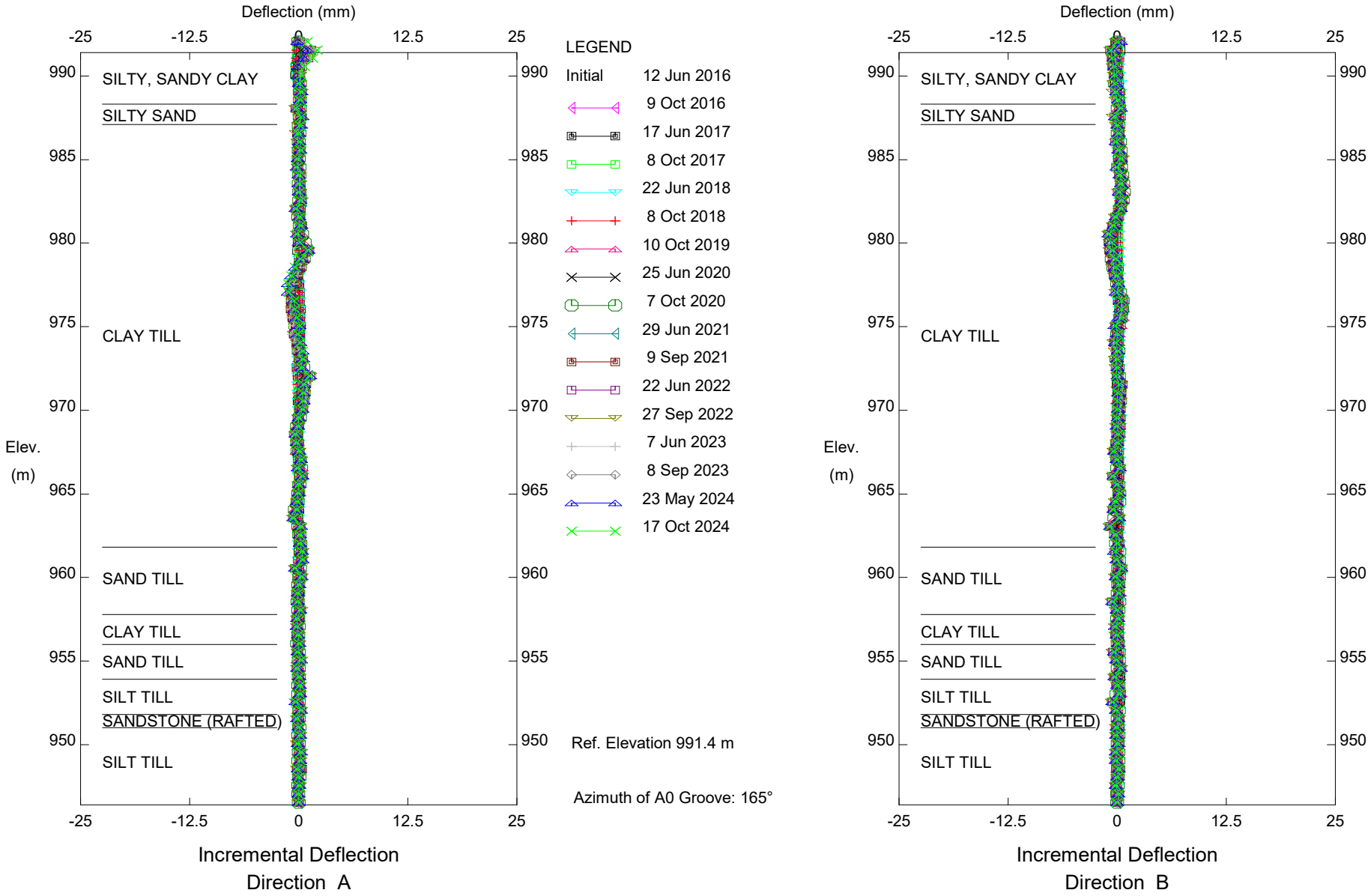
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI03-12

Alberta Transportation

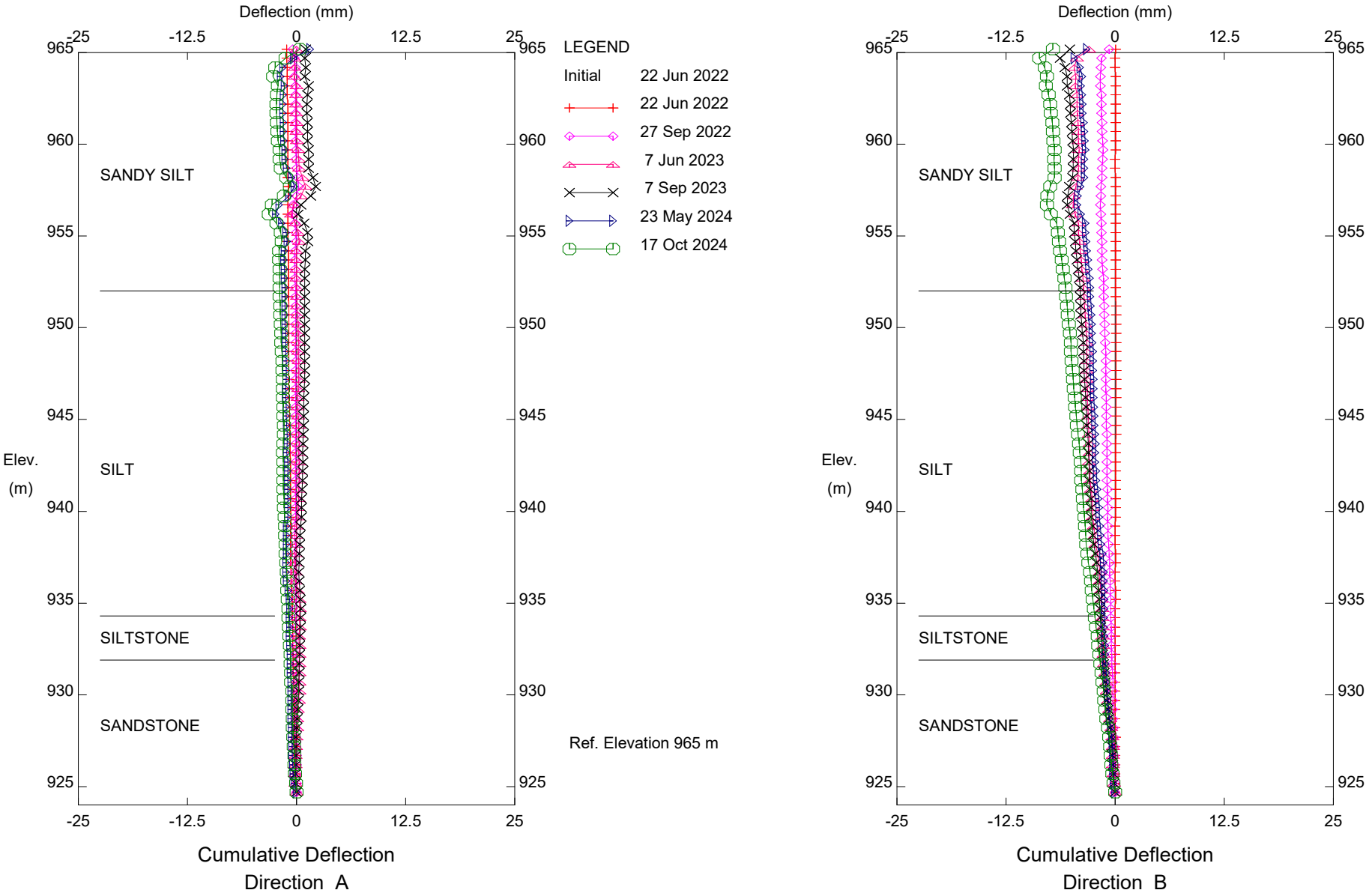
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI03-12

Alberta Transportation

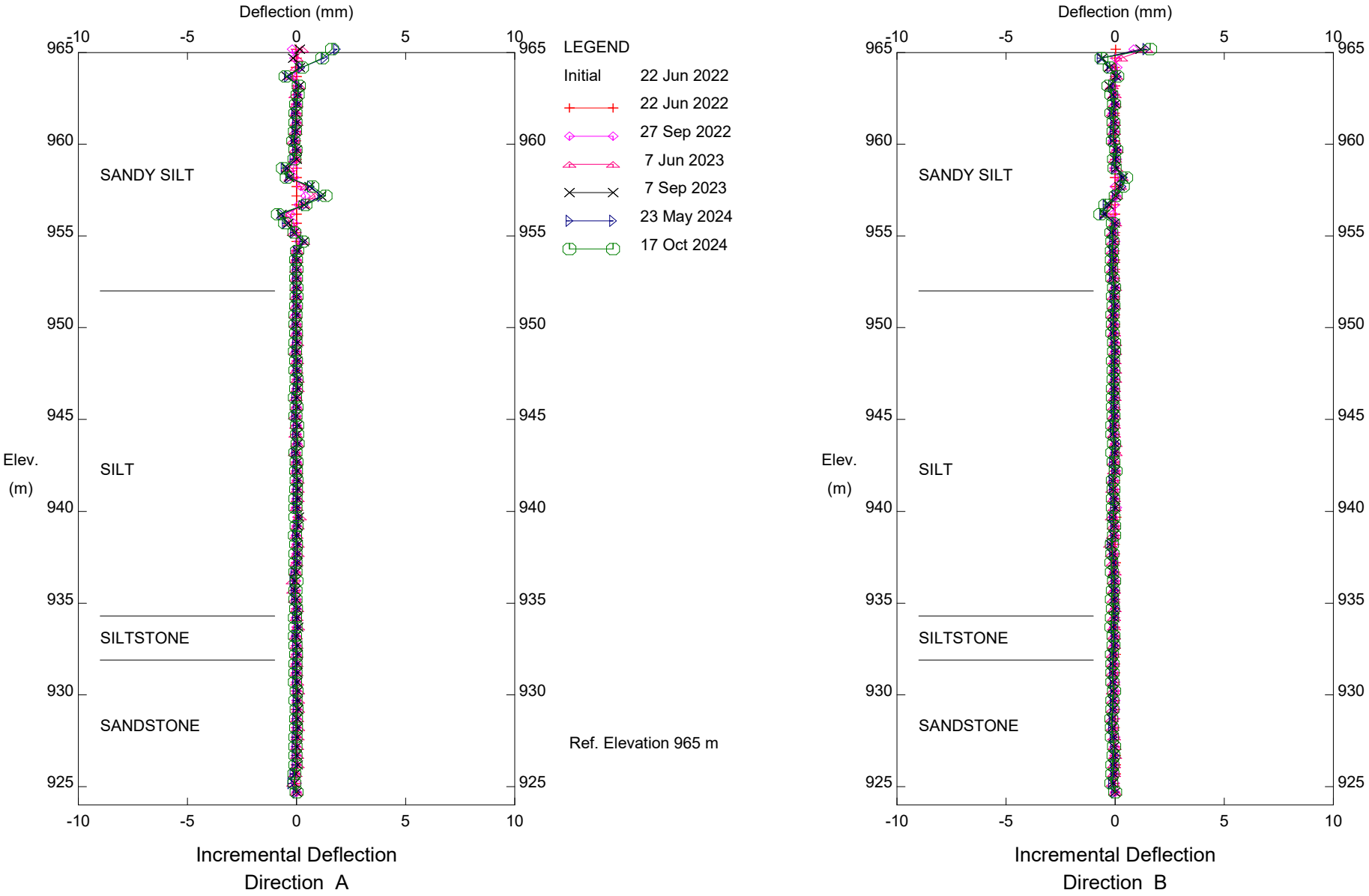
Klohn Crippen Berger - Edmonton



Peace Region - Grande Prairie South, Inclinometer SI22-01

Alberta Transportation

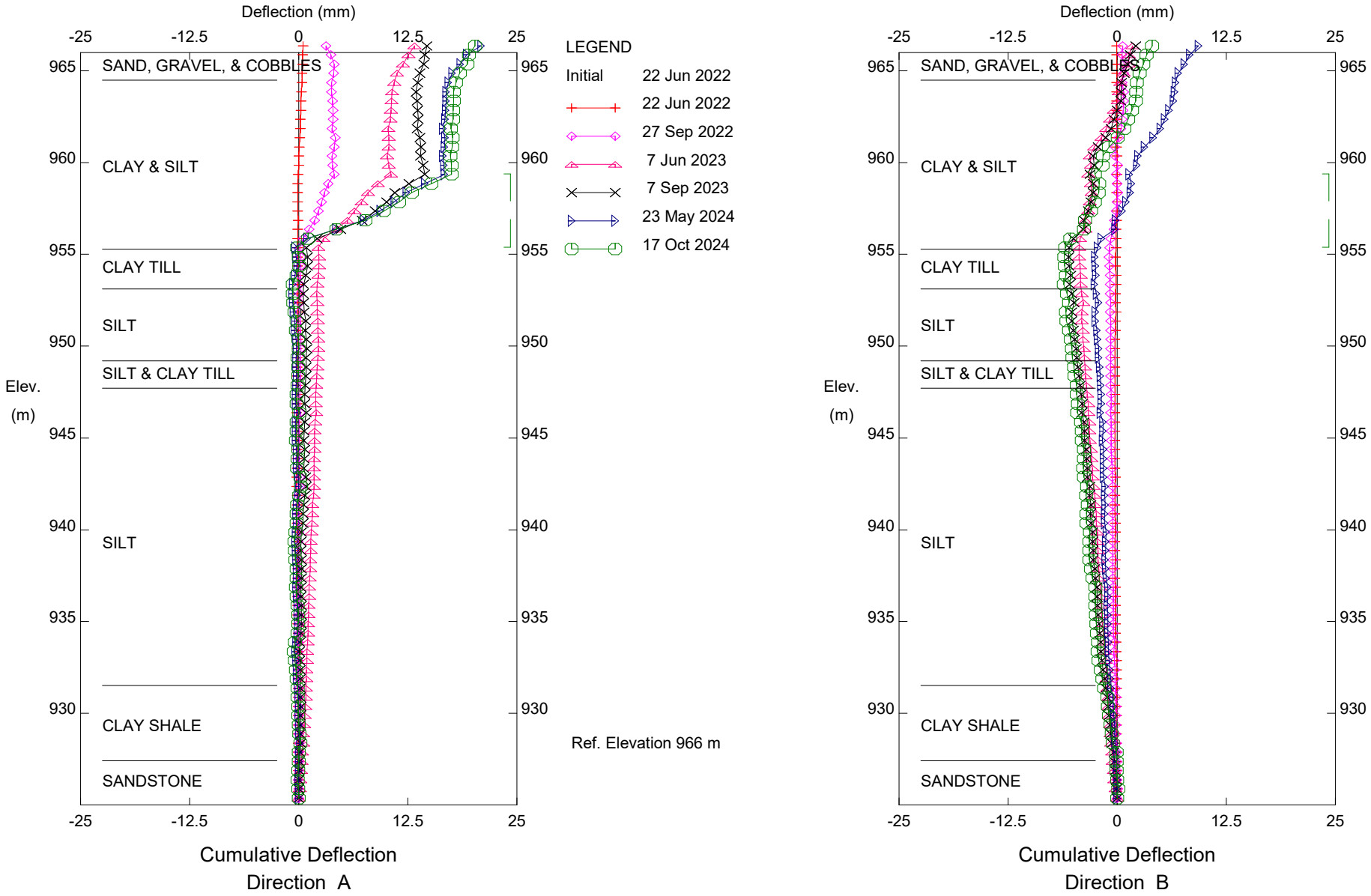
Klohn Crippen Berger - Edmonton



Peace Region - Grande Prairie South, Inclinometer SI22-01

Alberta Transportation

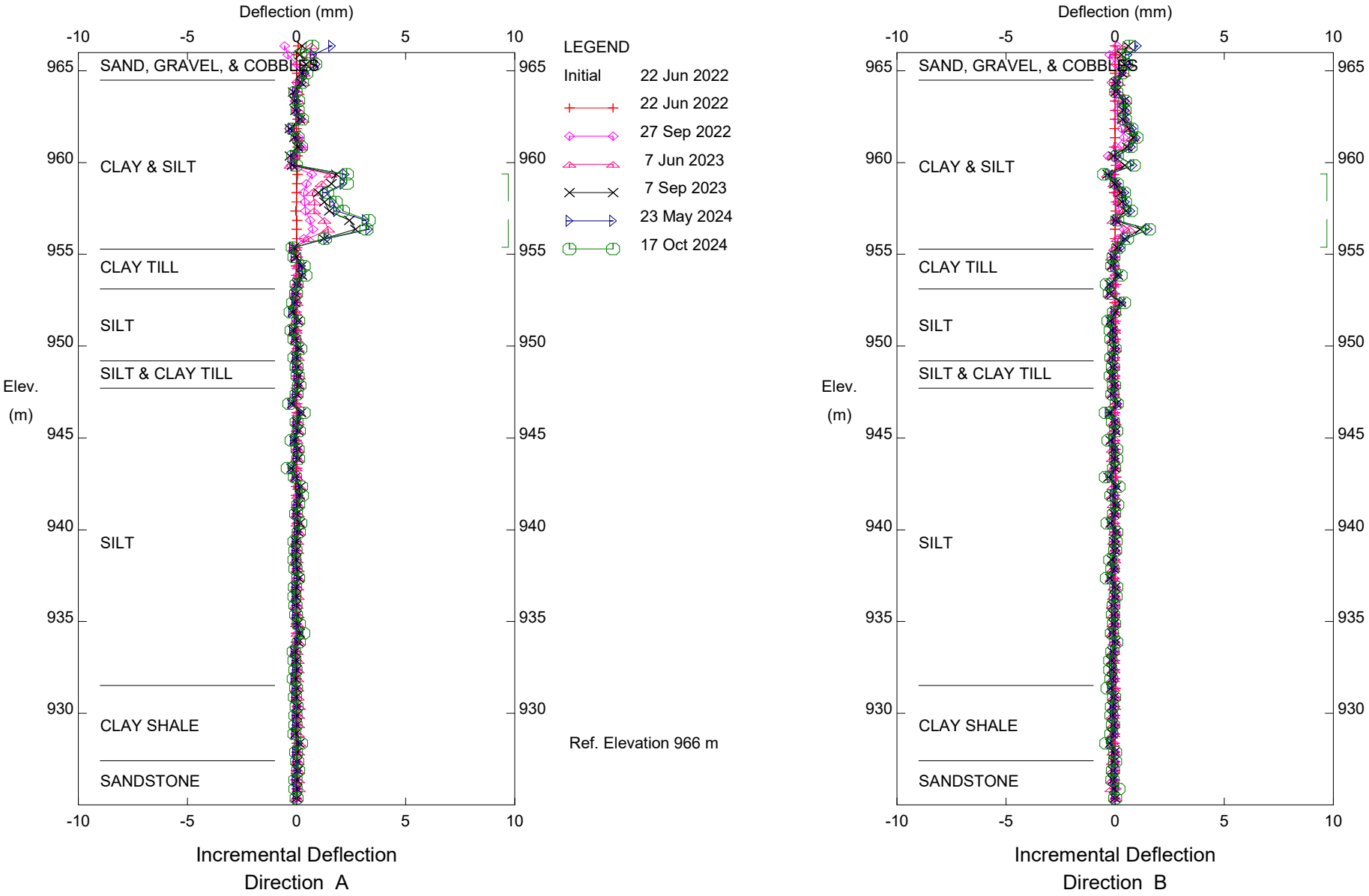
Klohn Crippen Berger - Edmonton



Peace Region - Grande Prairie South, Inclinometer SI22-02

Alberta Transportation

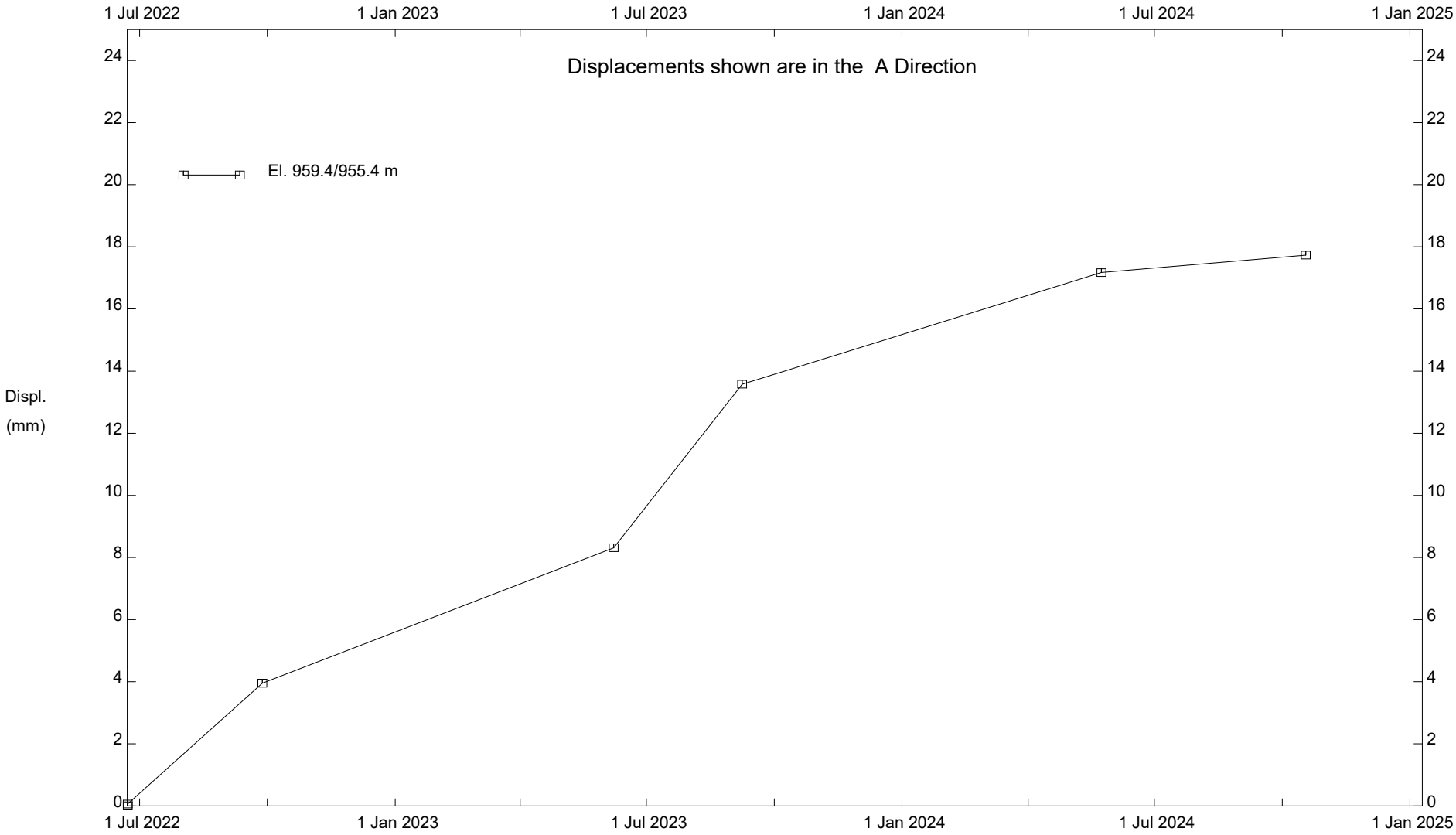
Klohn Crippen Berger - Edmonton



Peace Region - Grande Prairie South, Inclinometer SI22-02

Alberta Transportation

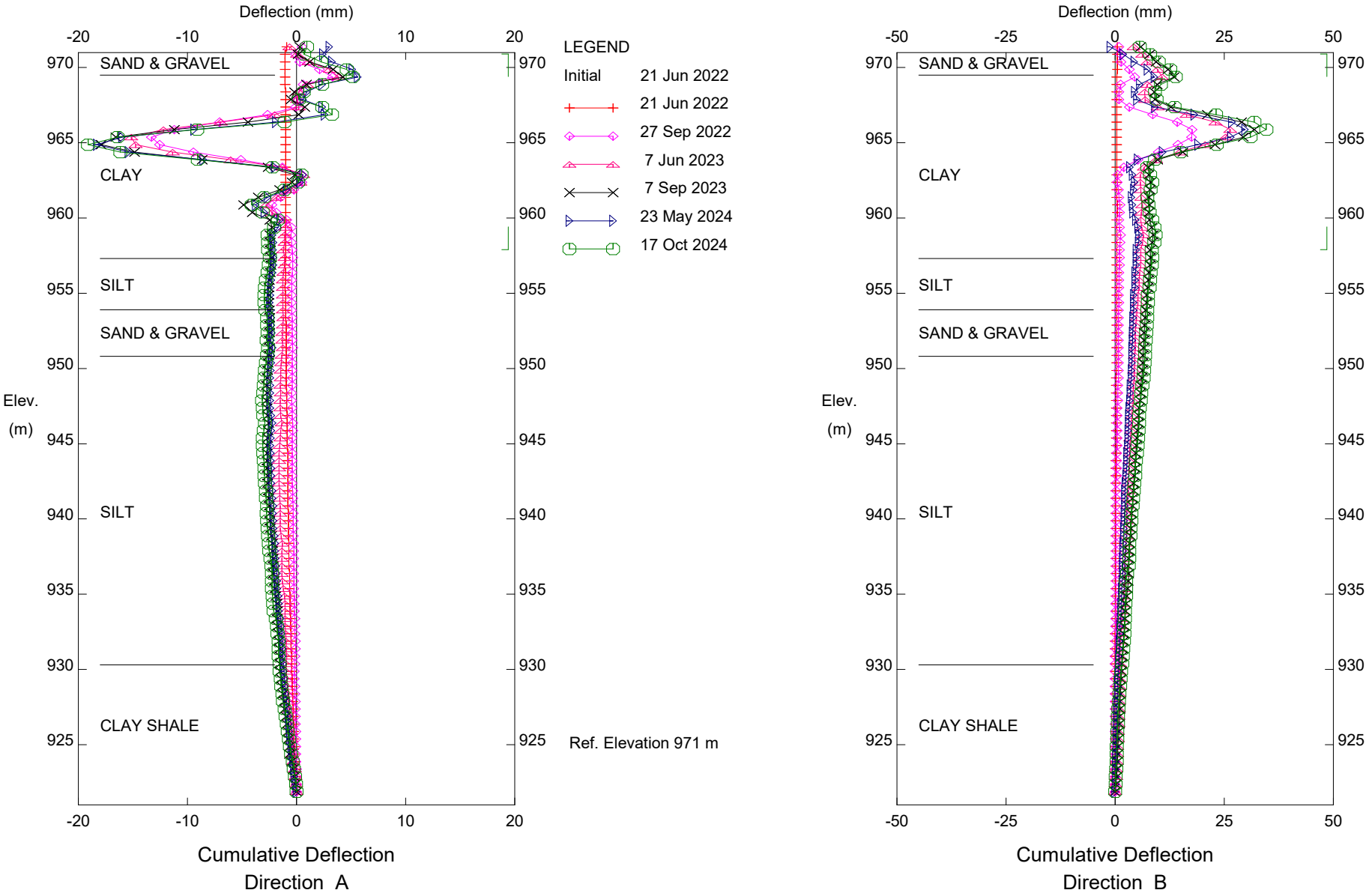
Klohn Crippen Berger - Edmonton



Peace Region - Grande Prairie South, Inclinometer SI22-02

Alberta Transportation

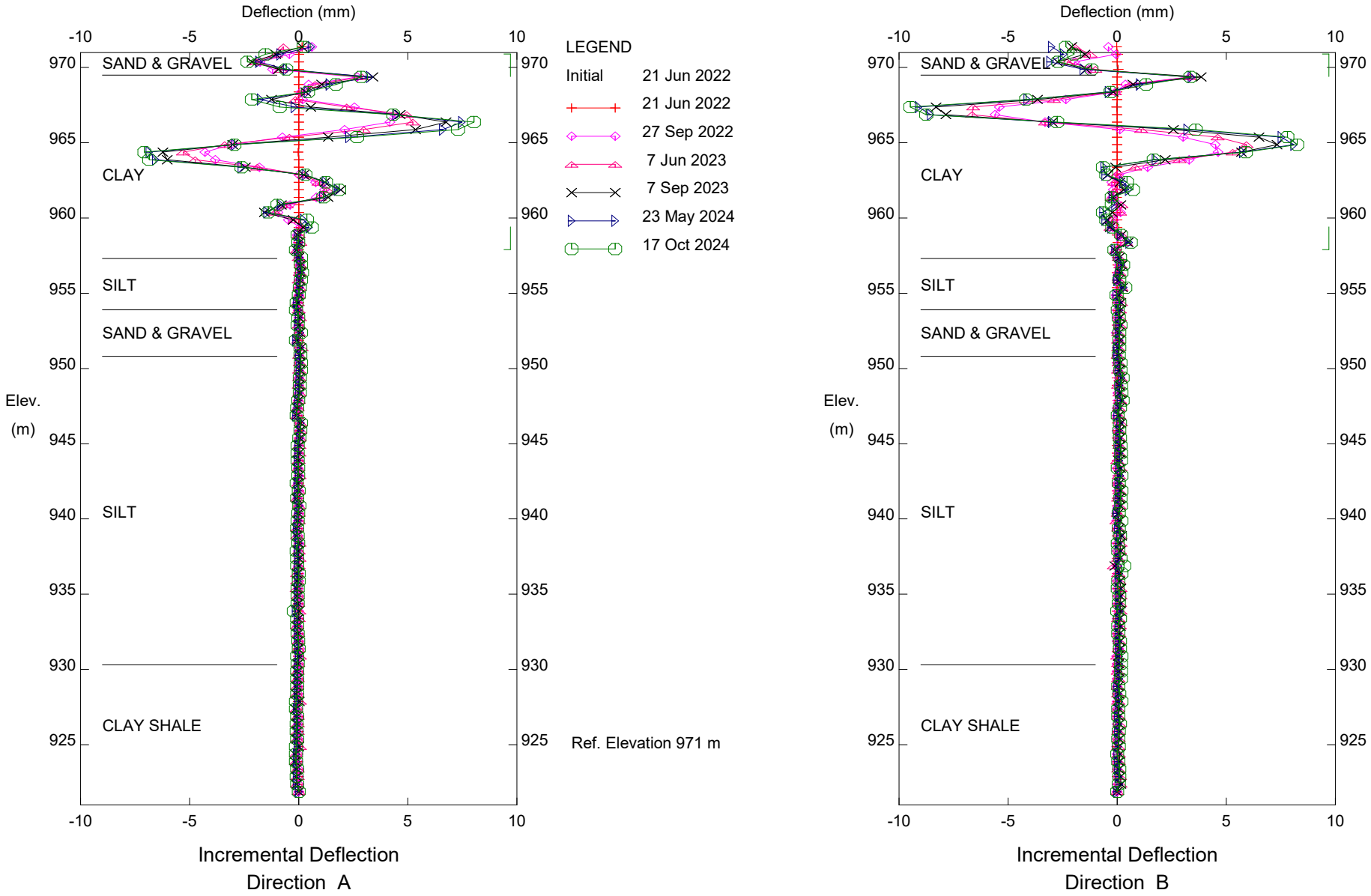
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI22-03

Alberta Transportation

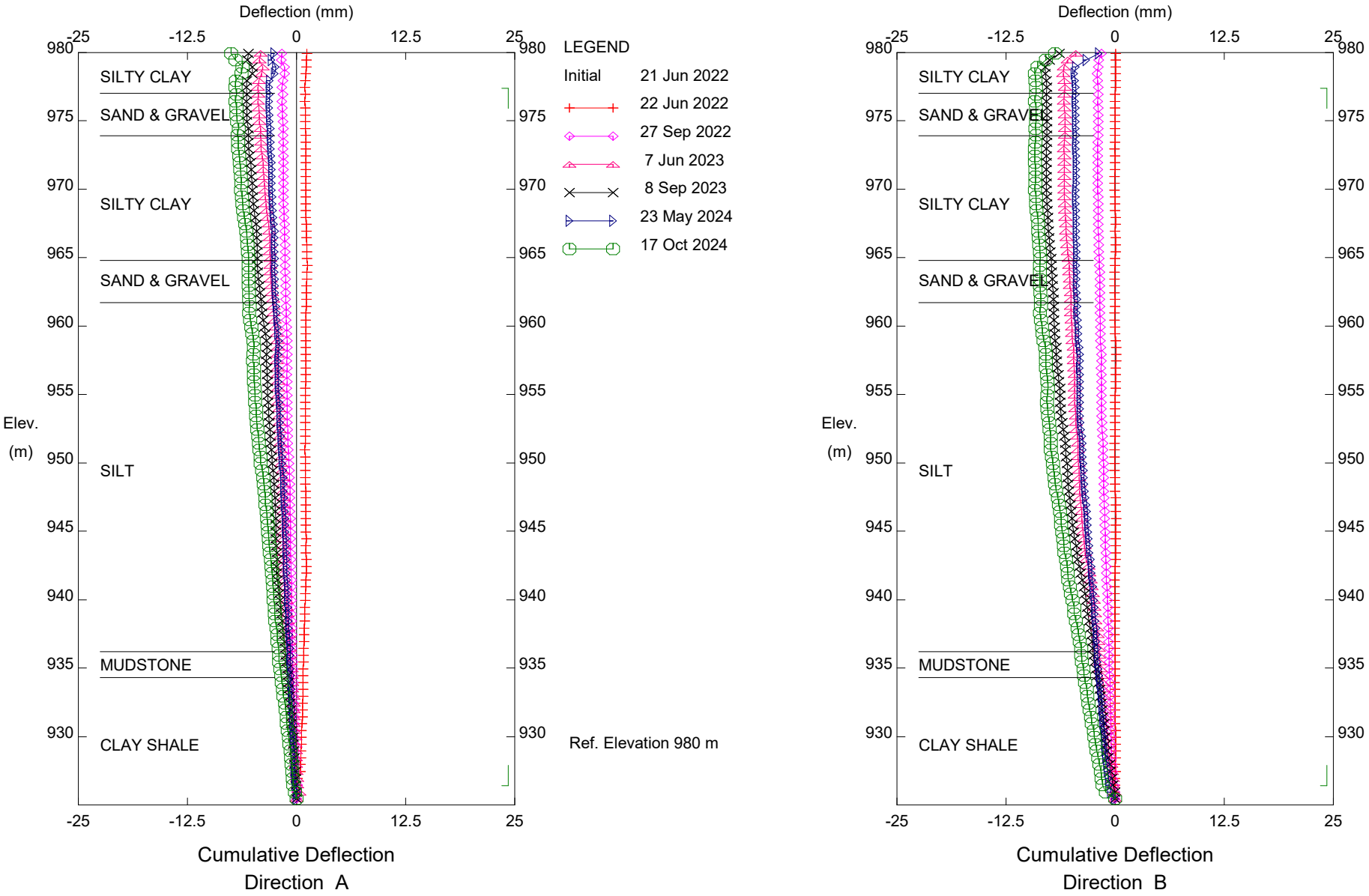
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI22-03

Alberta Transportation

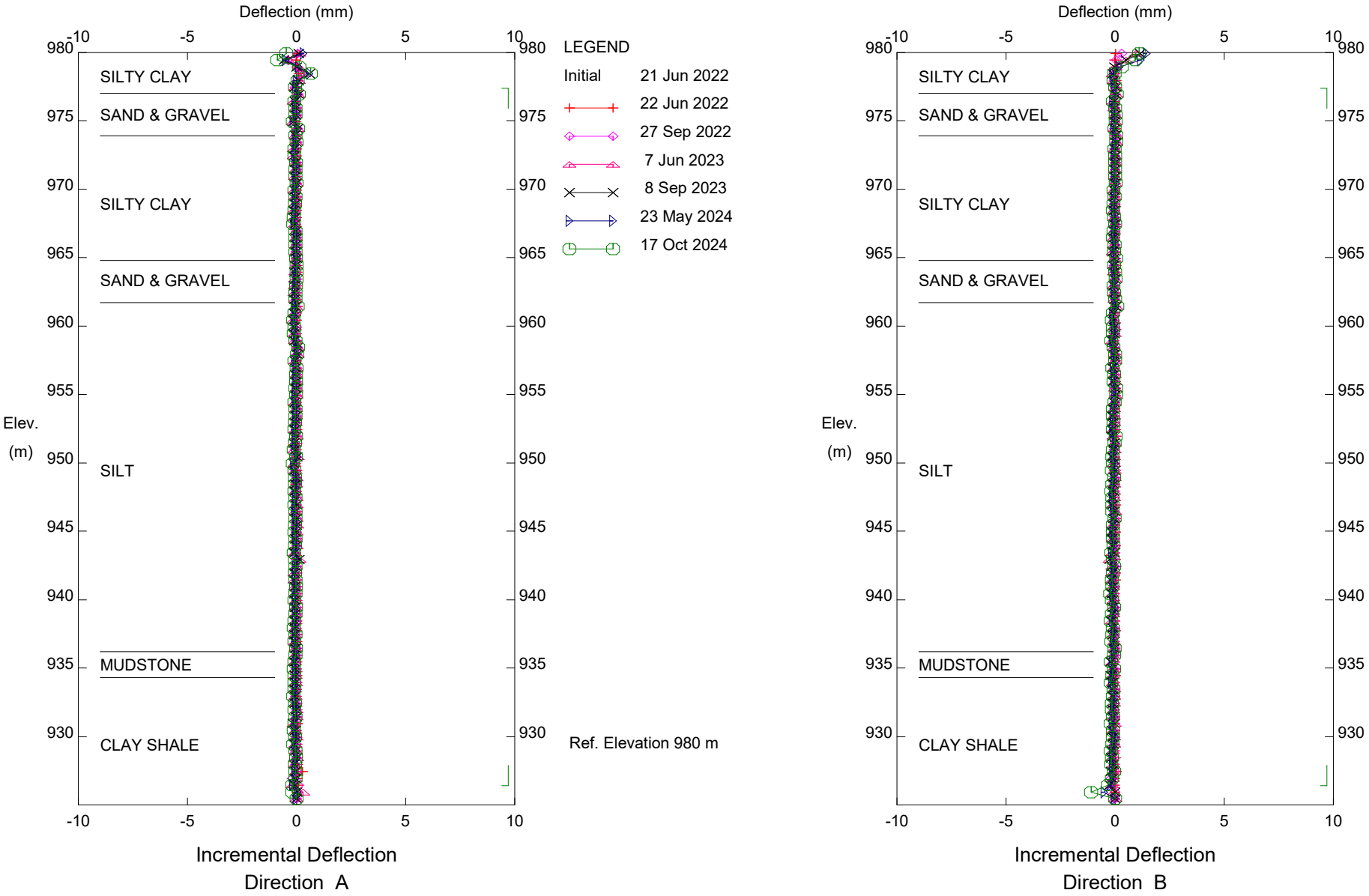
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI22-04

Alberta Transportation

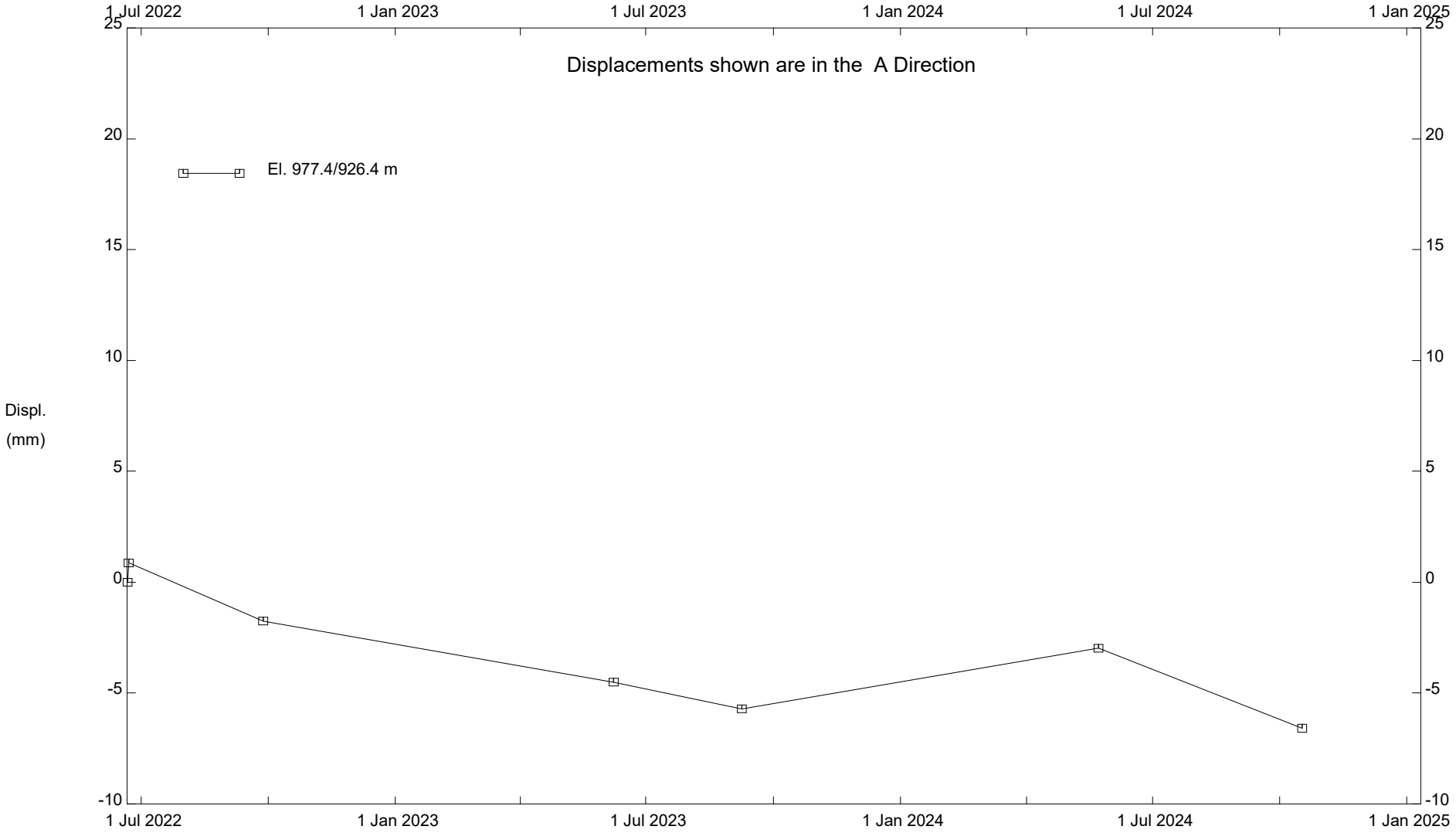
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI22-04

Alberta Transportation

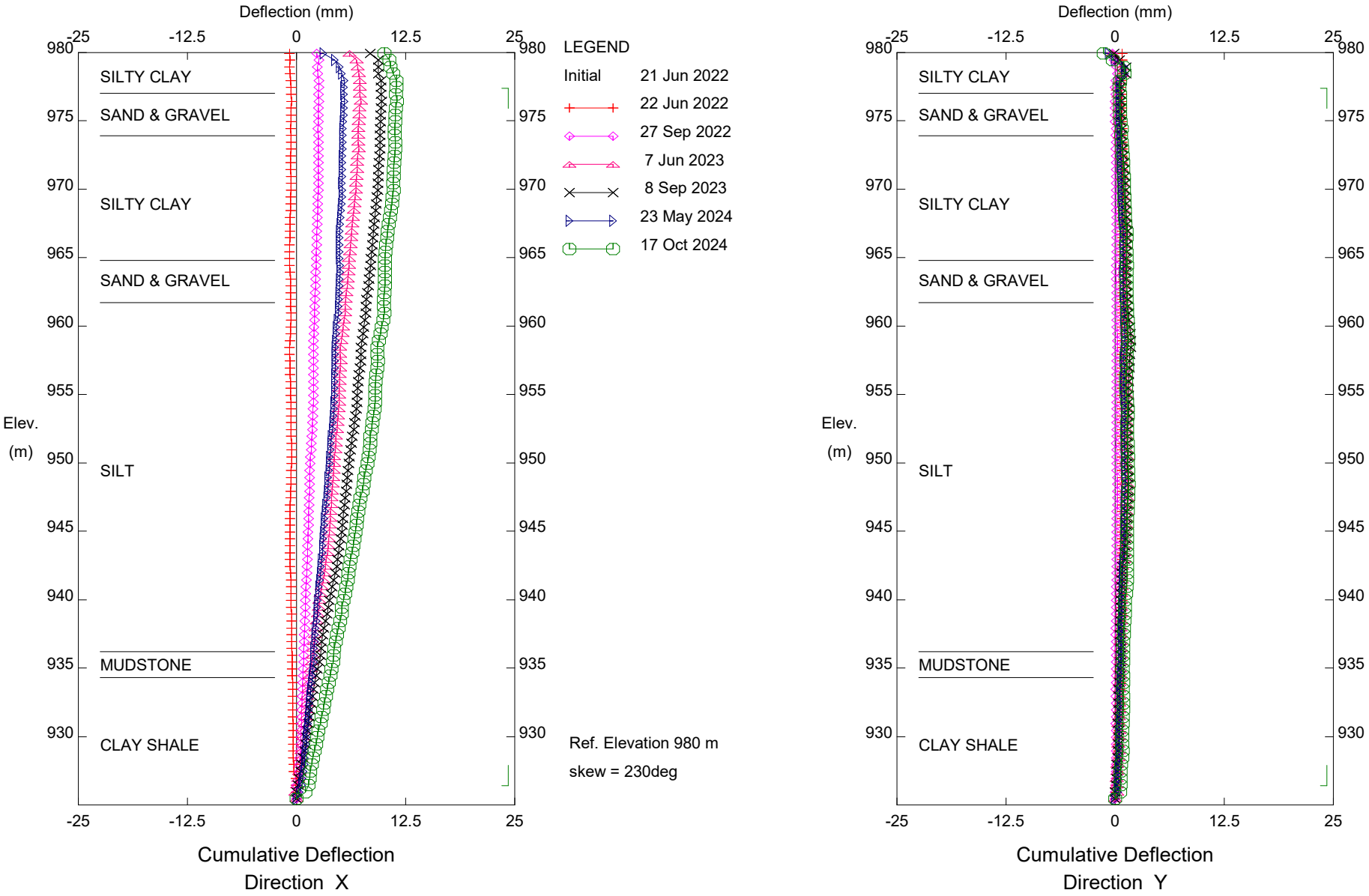
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI22-04

Alberta Transportation

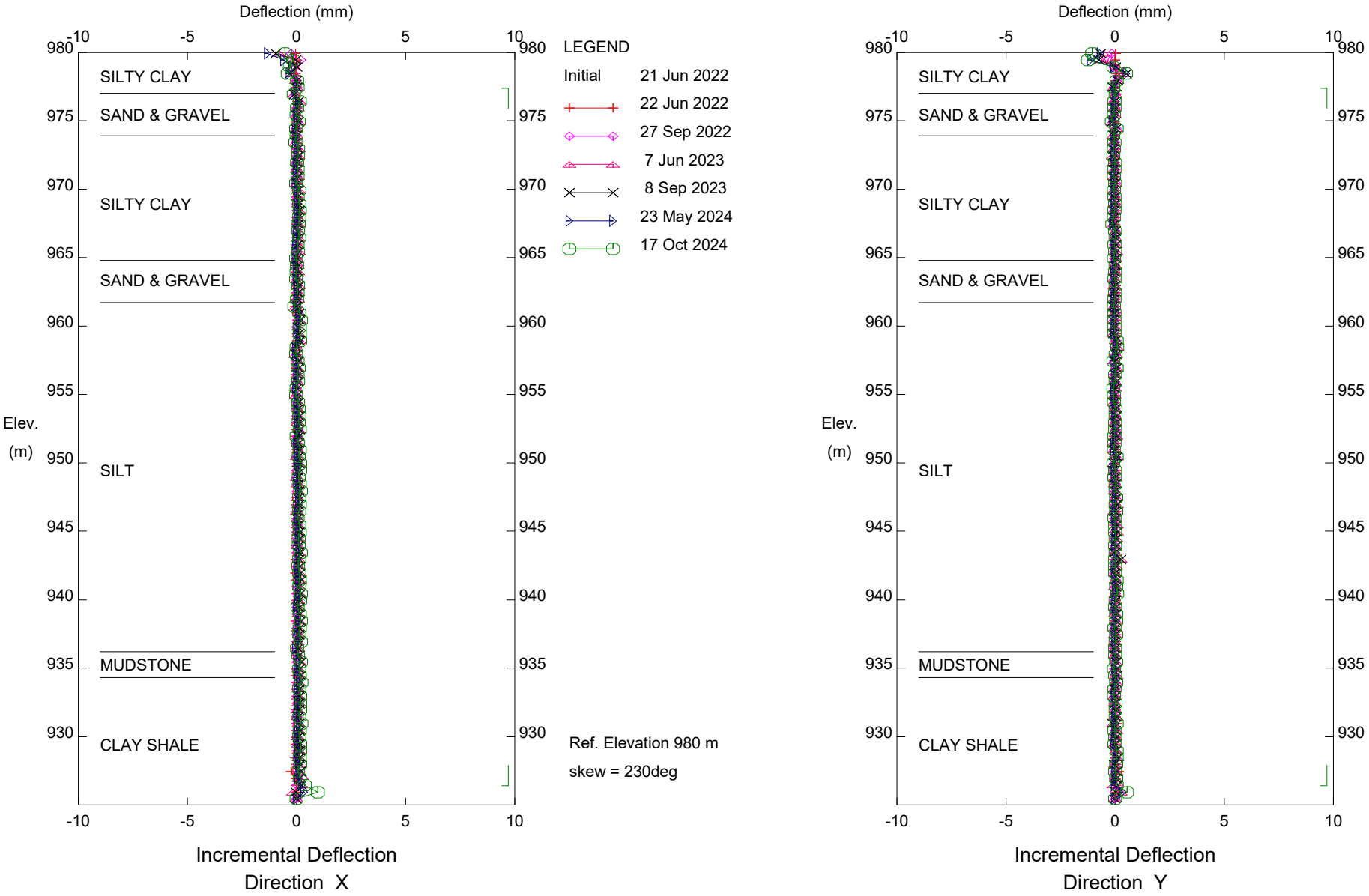
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI22-04

Alberta Transportation

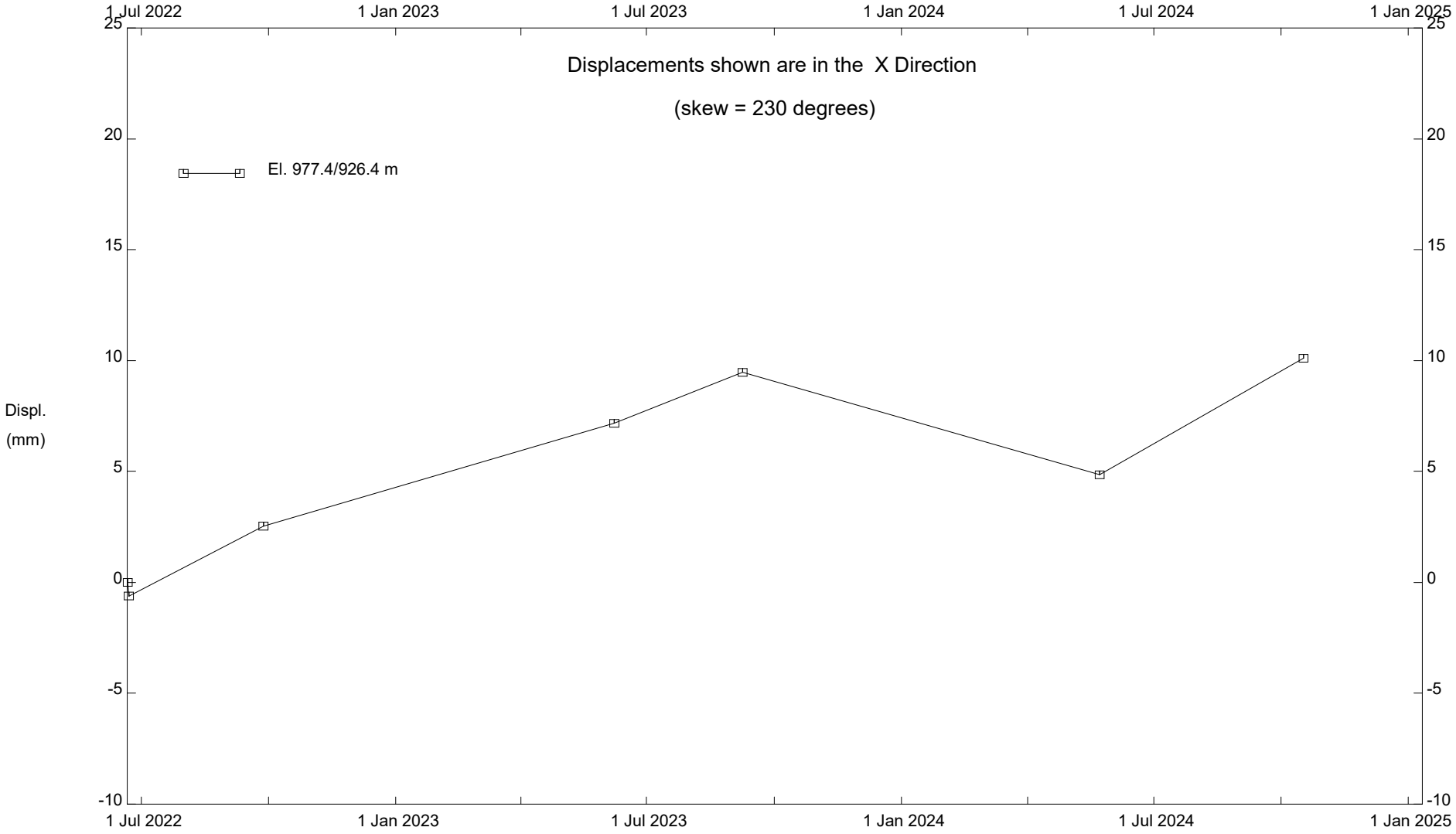
Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI22-04

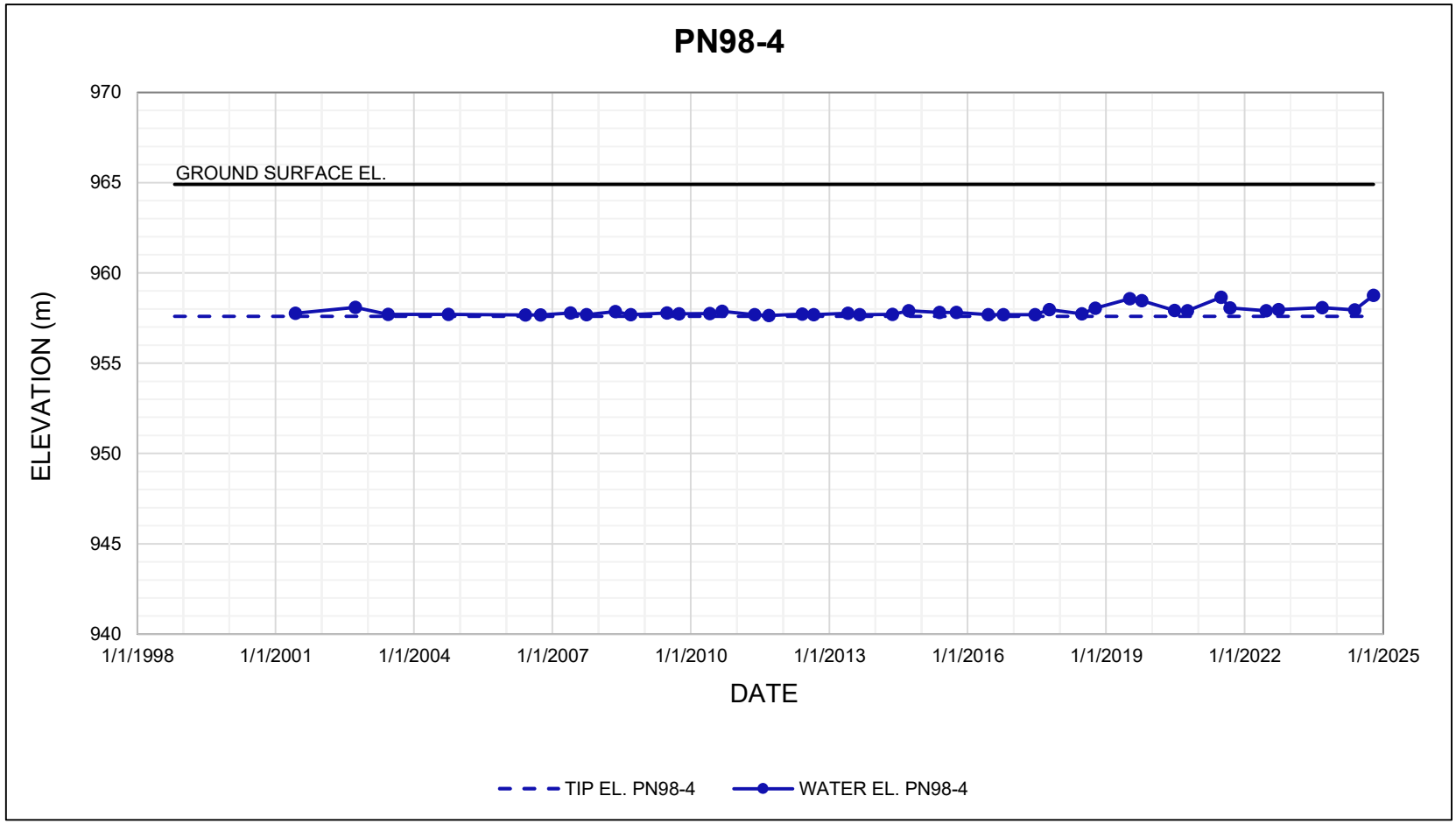
Alberta Transportation

Klohn Crippen Berger - Edmonton



GP007; H40:36, Wanyandie Road Slide, Inclinometer SI22-04

Alberta Transportation



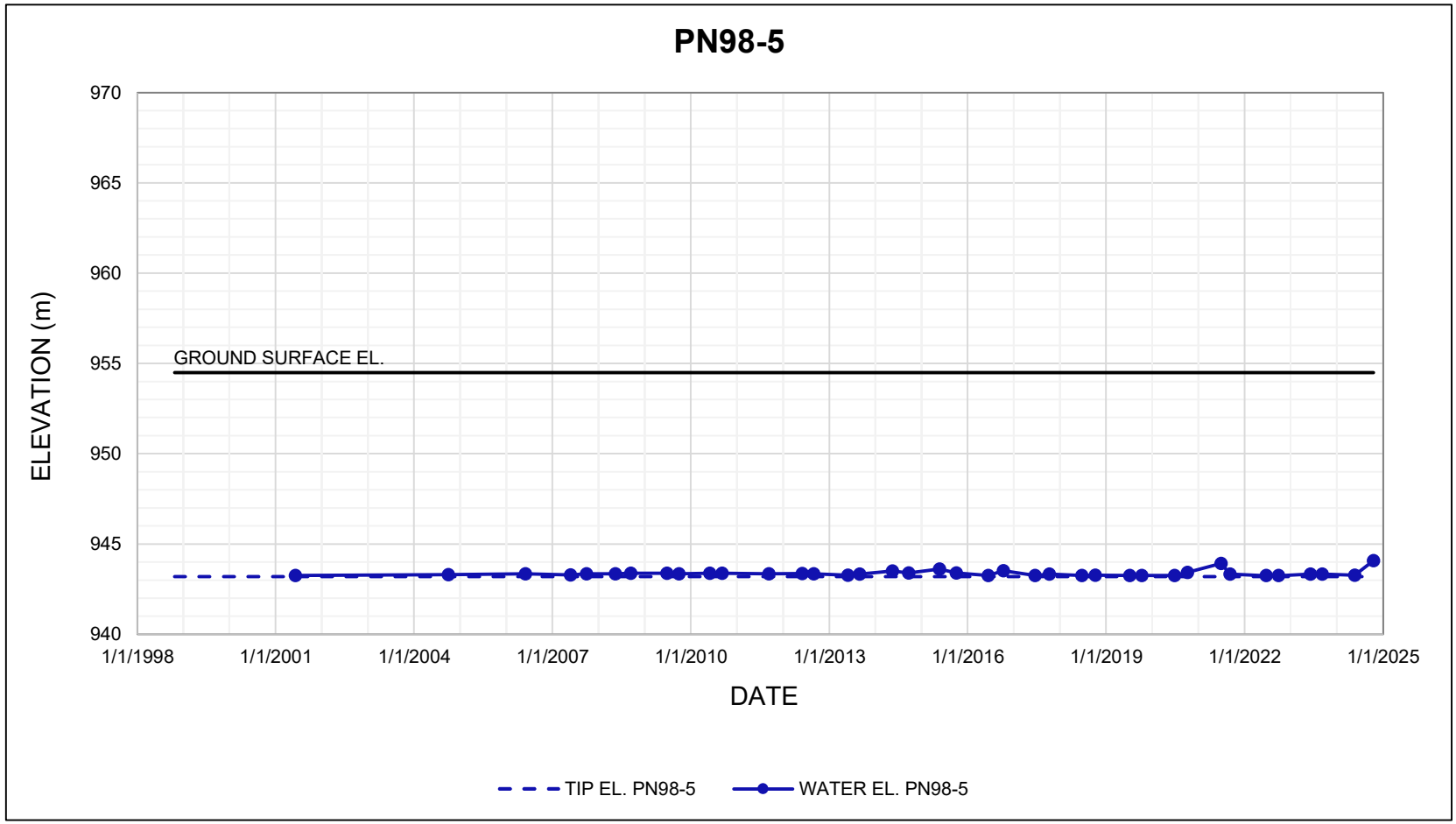
NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE JUNE 28, 2021, PROVIDED TO KLOHN CRIPPEN BERGER LTD. BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS ON JUNE 25, 2021.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



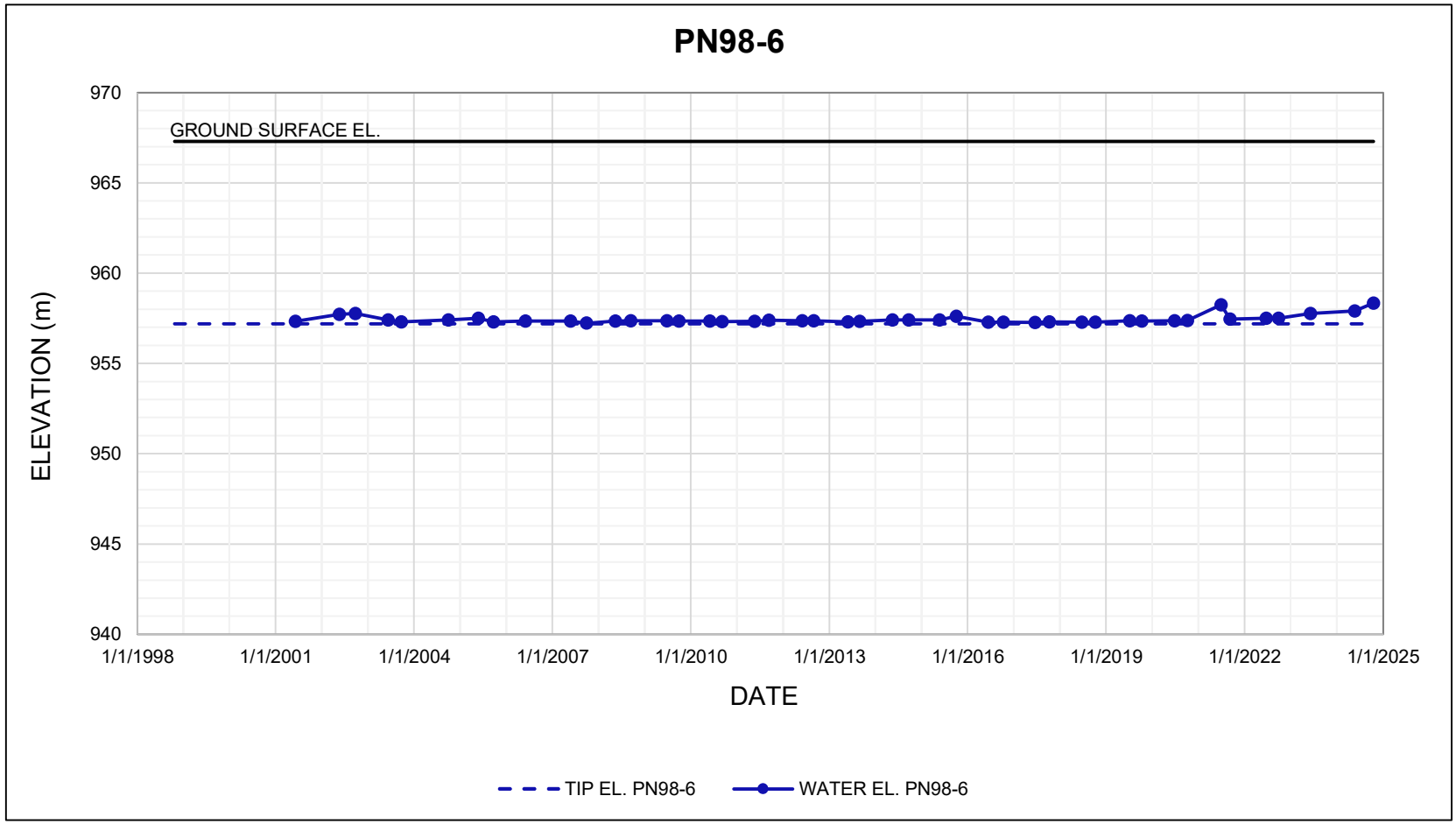
NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE JUNE 28, 2021, PROVIDED TO KLOHN CRIPPEN BERGER LTD. BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS ON JUNE 25, 2021.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



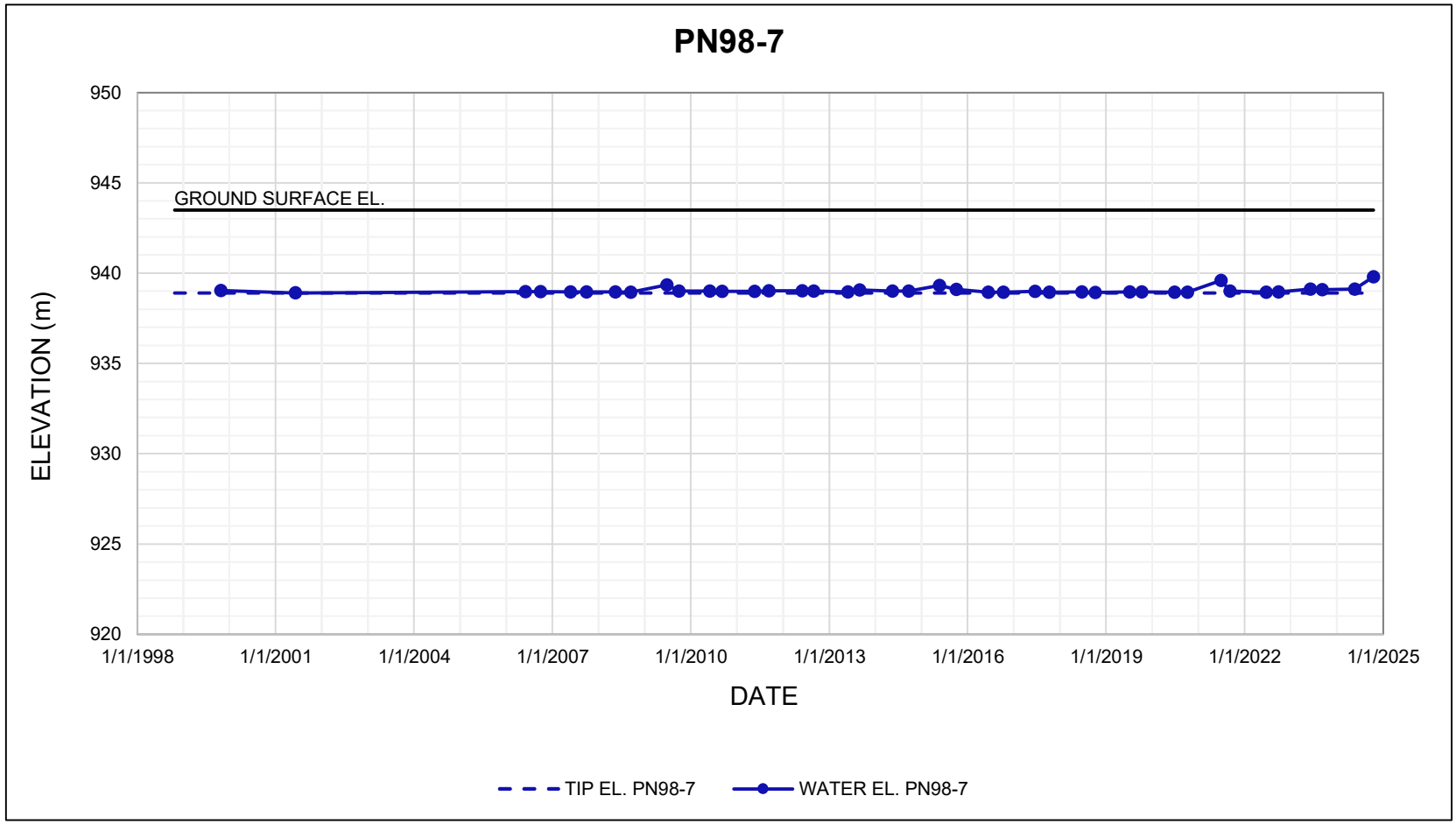
NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE JUNE 28, 2021, PROVIDED TO KLOHN CRIPPEN BERGER LTD. BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS ON JUNE 25, 2021.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



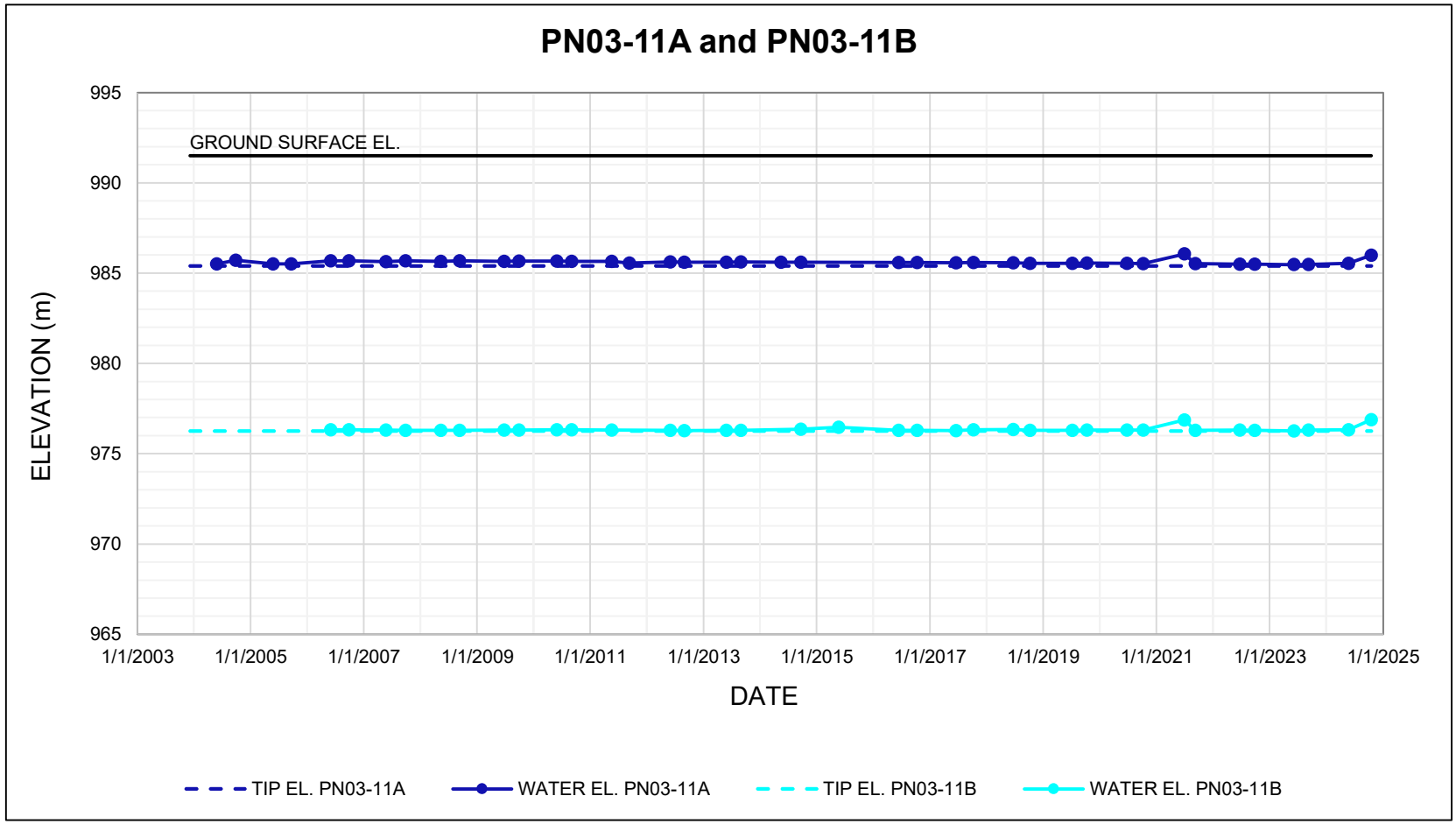
NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE JUNE 28, 2021, PROVIDED TO KLOHN CRIPPEN BERGER LTD. BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS ON JUNE 25, 2021.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



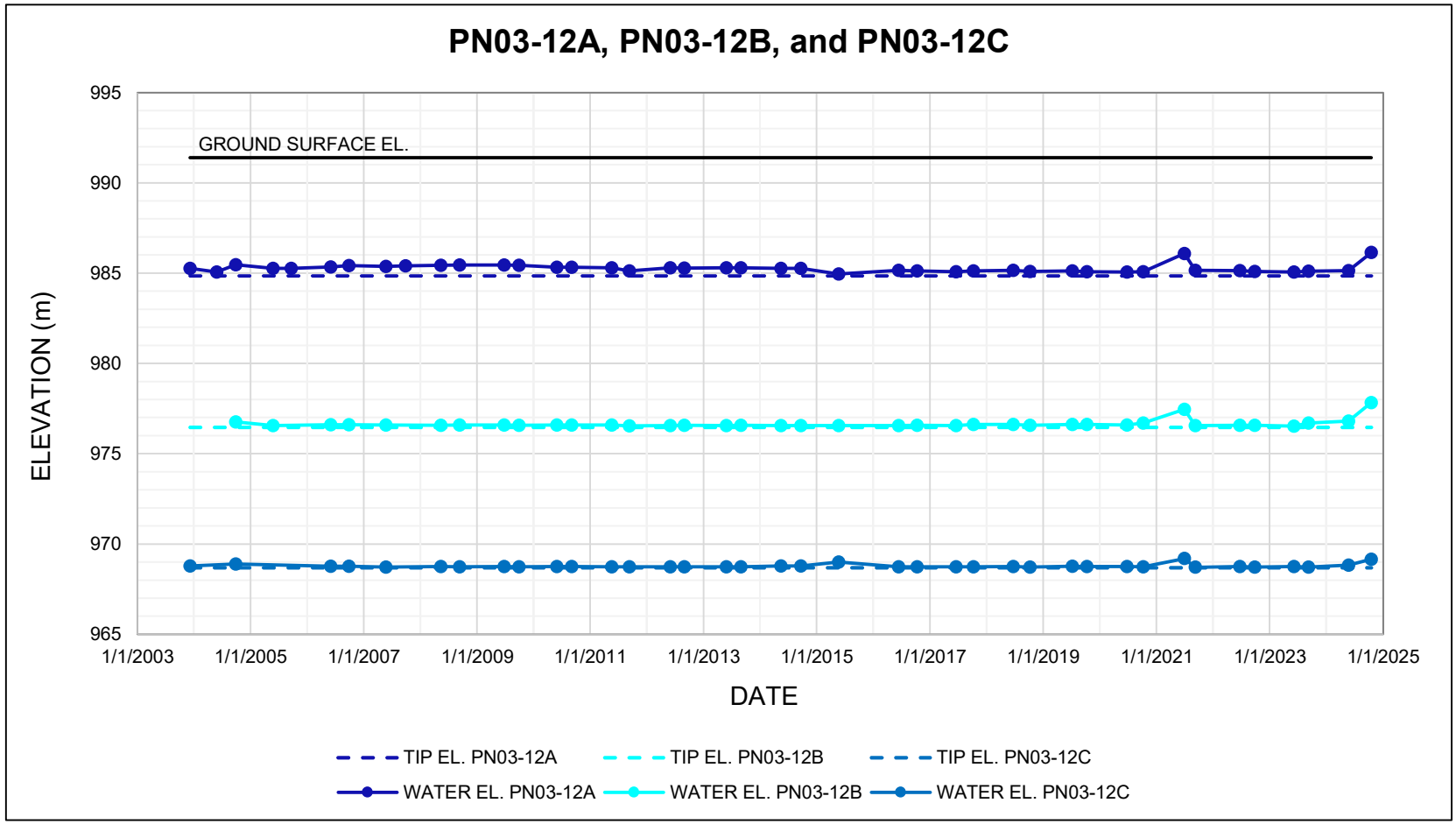
NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE JUNE 28, 2021, PROVIDED TO KLOHN CRIPPEN BERGER LTD. BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS ON JUNE 25, 2021.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



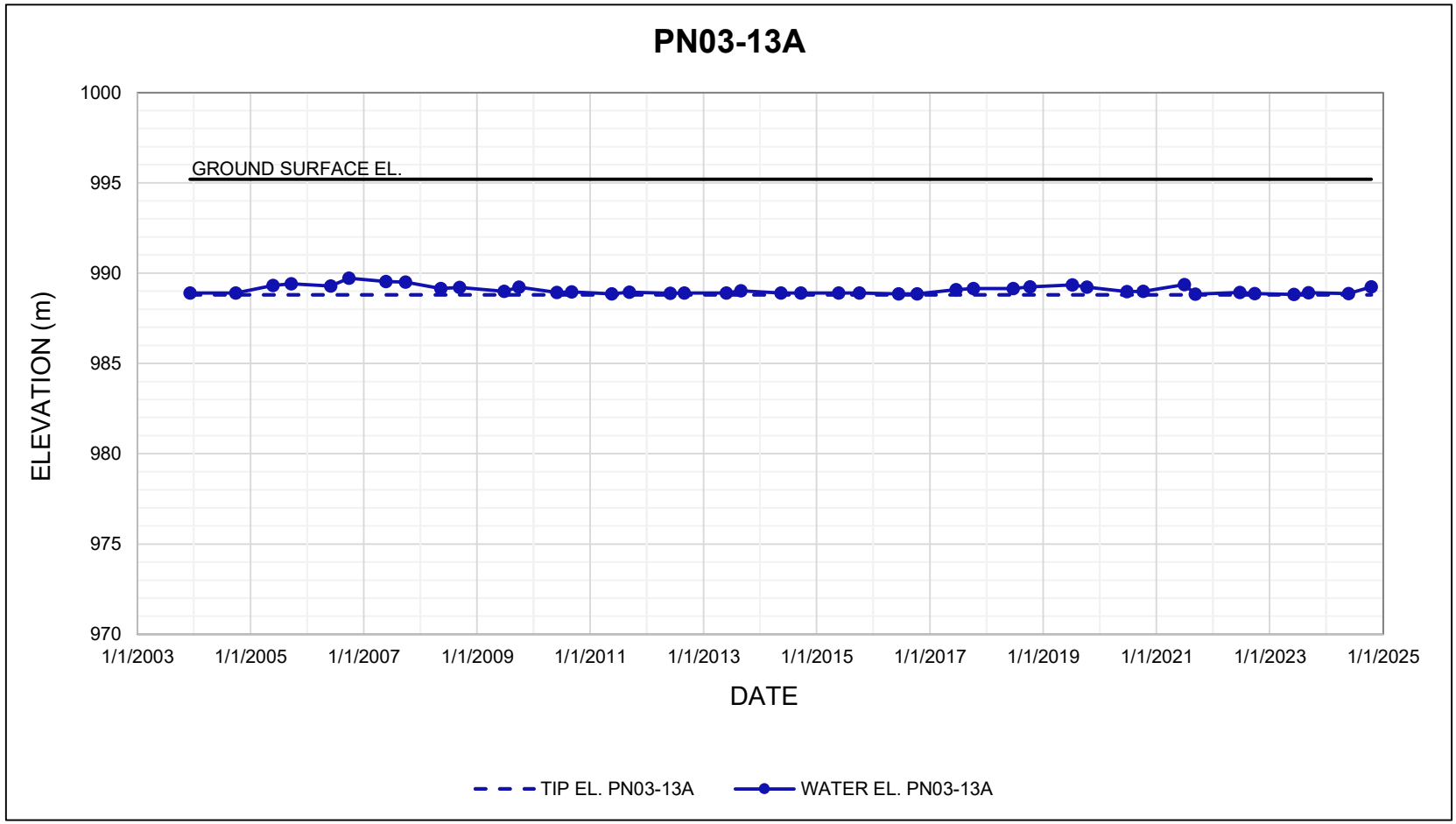
NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE JUNE 28, 2021, PROVIDED TO KLOHN CRIPPEN BERGER LTD. BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS ON JUNE 25, 2021.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



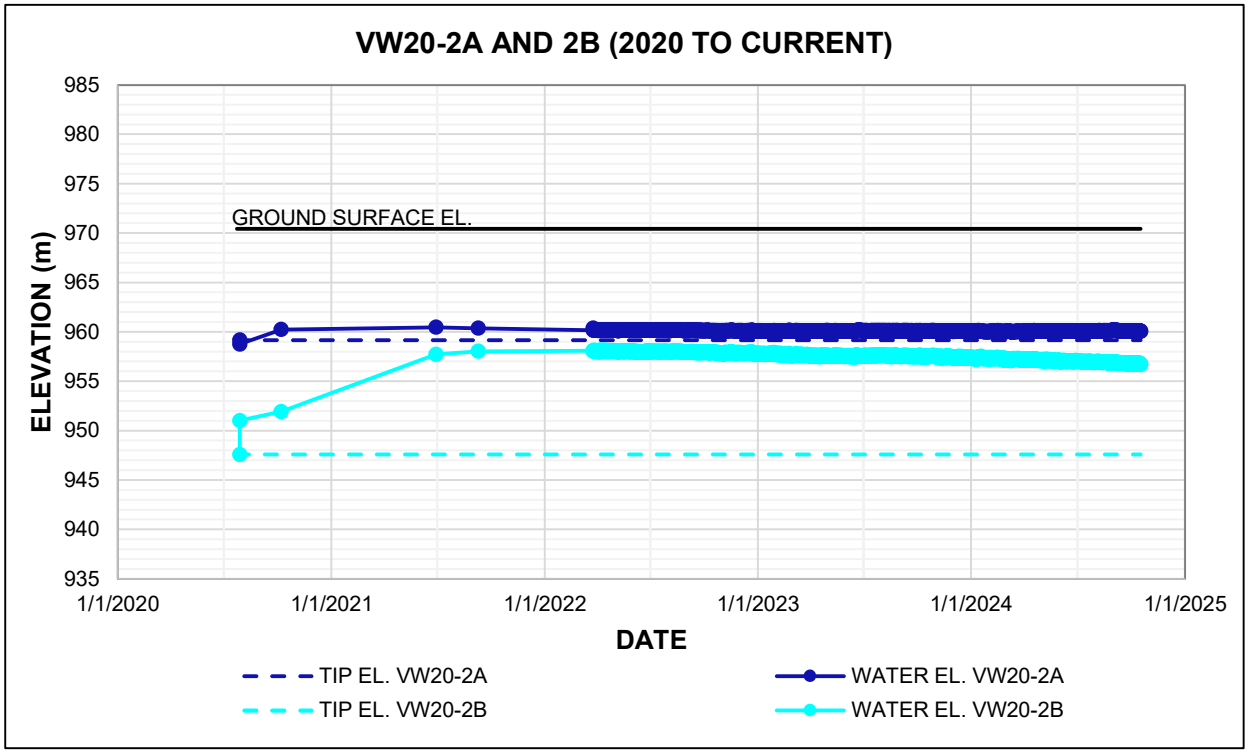
NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE JUNE 28, 2021, PROVIDED TO KLOHN CRIPPEN BERGER LTD. BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS ON JUNE 25, 2021.

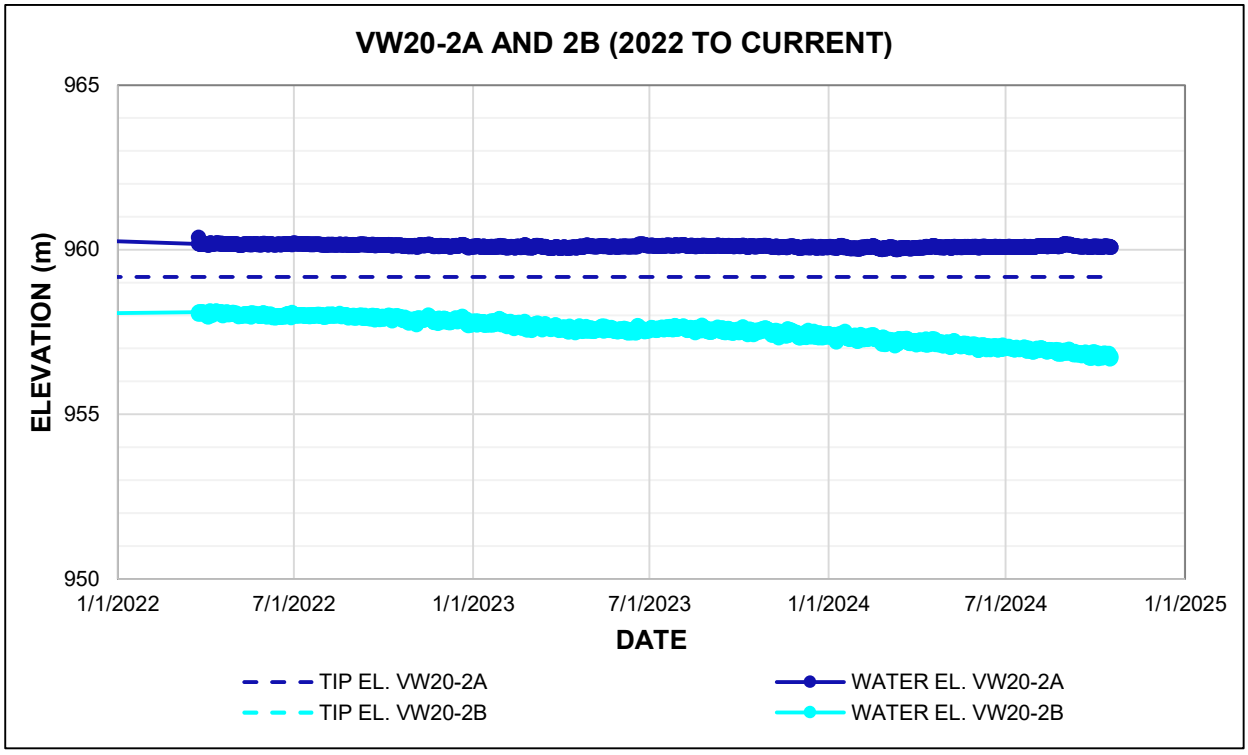
CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	





--

NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE THE SPRING 2021 READING ON JUNE 29, 2021 WAS PROVIDED TO KLOHN CRIPPEN BERGER LTD. (KCB) BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS (TEC) ON JUNE 25, 2021.
2. MULTI-CHANNEL DATA LOGGER CONNECTED TO THESE INSTRUMENTS IN MARCH 2022.

CLIENT

Alberta

Klohn Crippen Berger

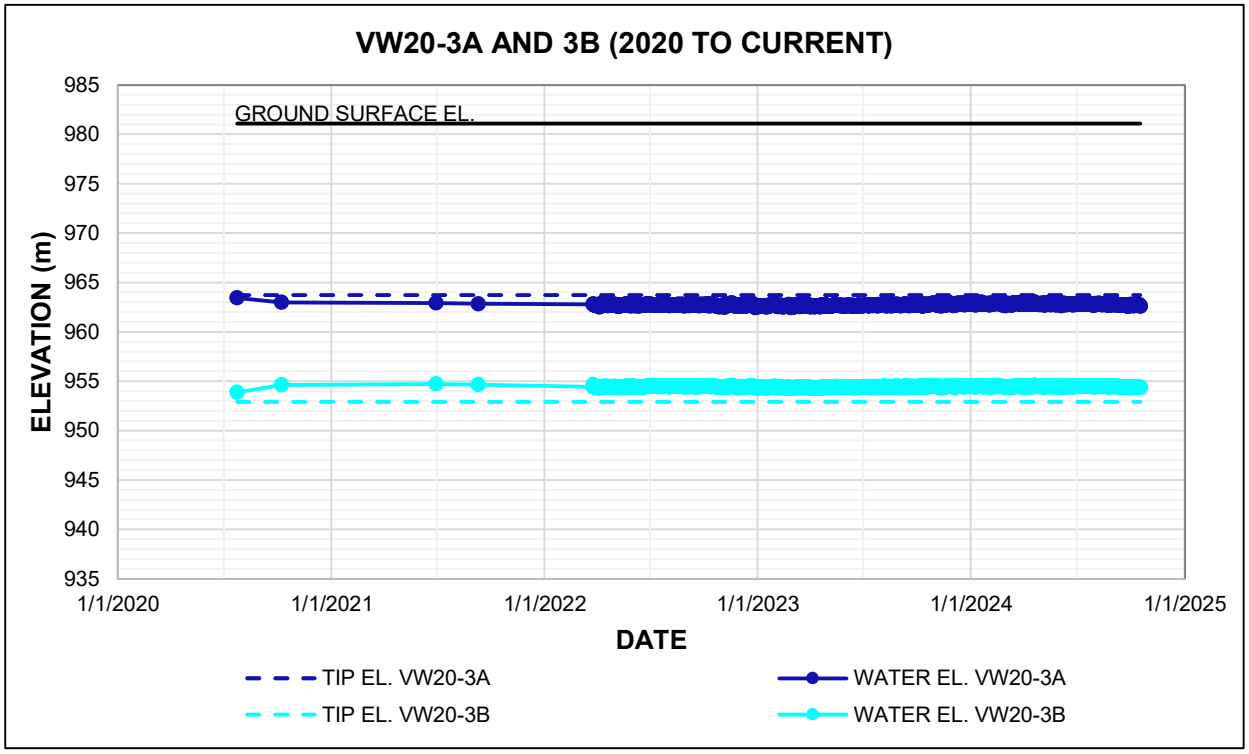
PROJECT

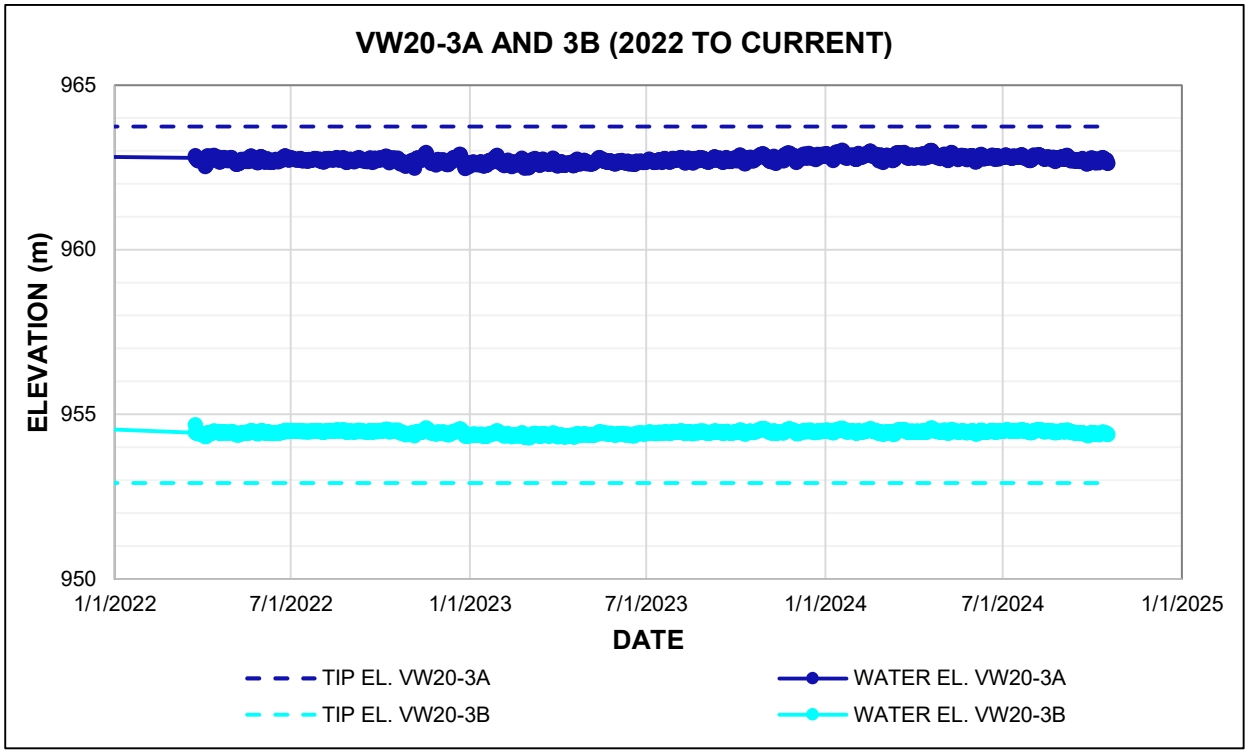
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE

Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	





--

NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE THE SPRING 2021 READING ON JUNE 29, 2021 WAS PROVIDED TO KLOHN CRIPPEN BERGER LTD. (KCB) BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS (TEC) ON JUNE 25, 2021.
2. MULTI-CHANNEL DATA LOGGER CONNECTED TO THESE INSTRUMENTS IN MARCH 2022.

CLIENT

Alberta

Klohn Crippen Berger

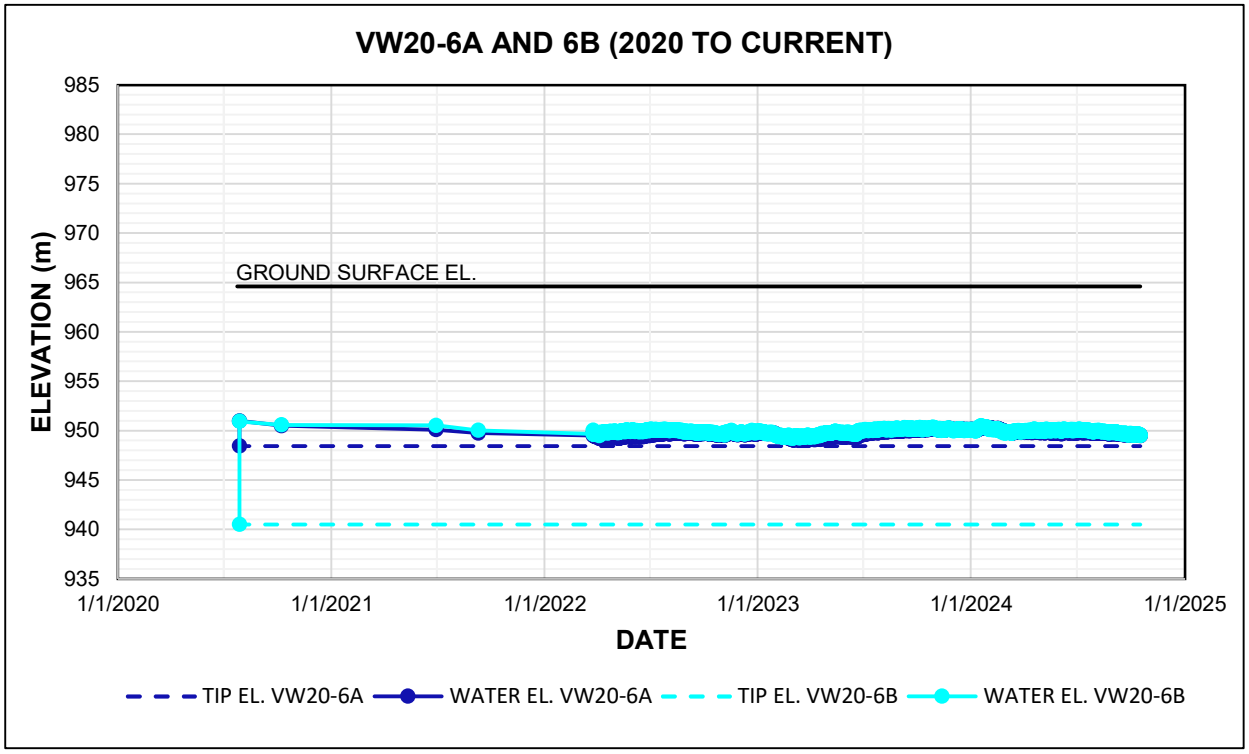
PROJECT

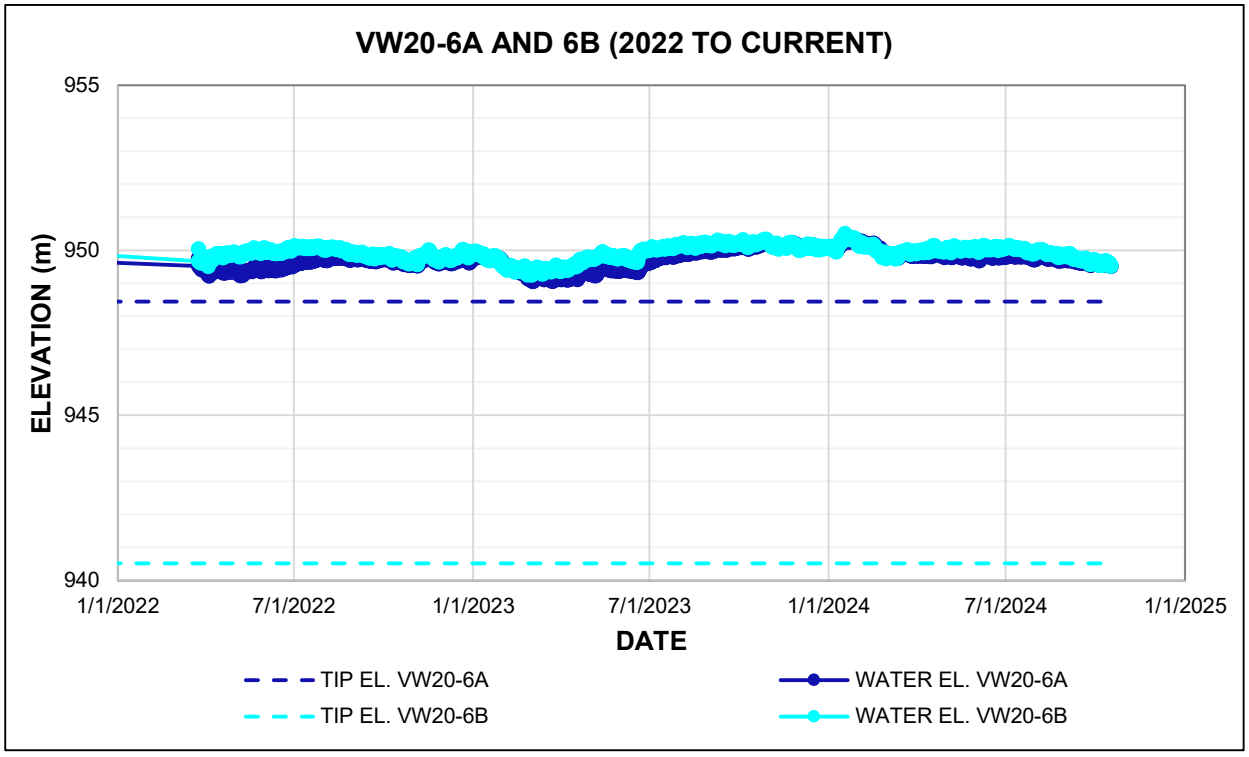
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE

Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	





--

NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE THE SPRING 2021 READING ON JUNE 29, 2021 WAS PROVIDED TO KLOHN CRIPPEN BERGER LTD. (KCB) BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS (TEC) ON JUNE 25, 2021.
2. MULTI-CHANNEL DATA LOGGER CONNECTED TO THESE INSTRUMENTS IN MARCH 2022.

CLIENT

Alberta

Klohn Crippen Berger

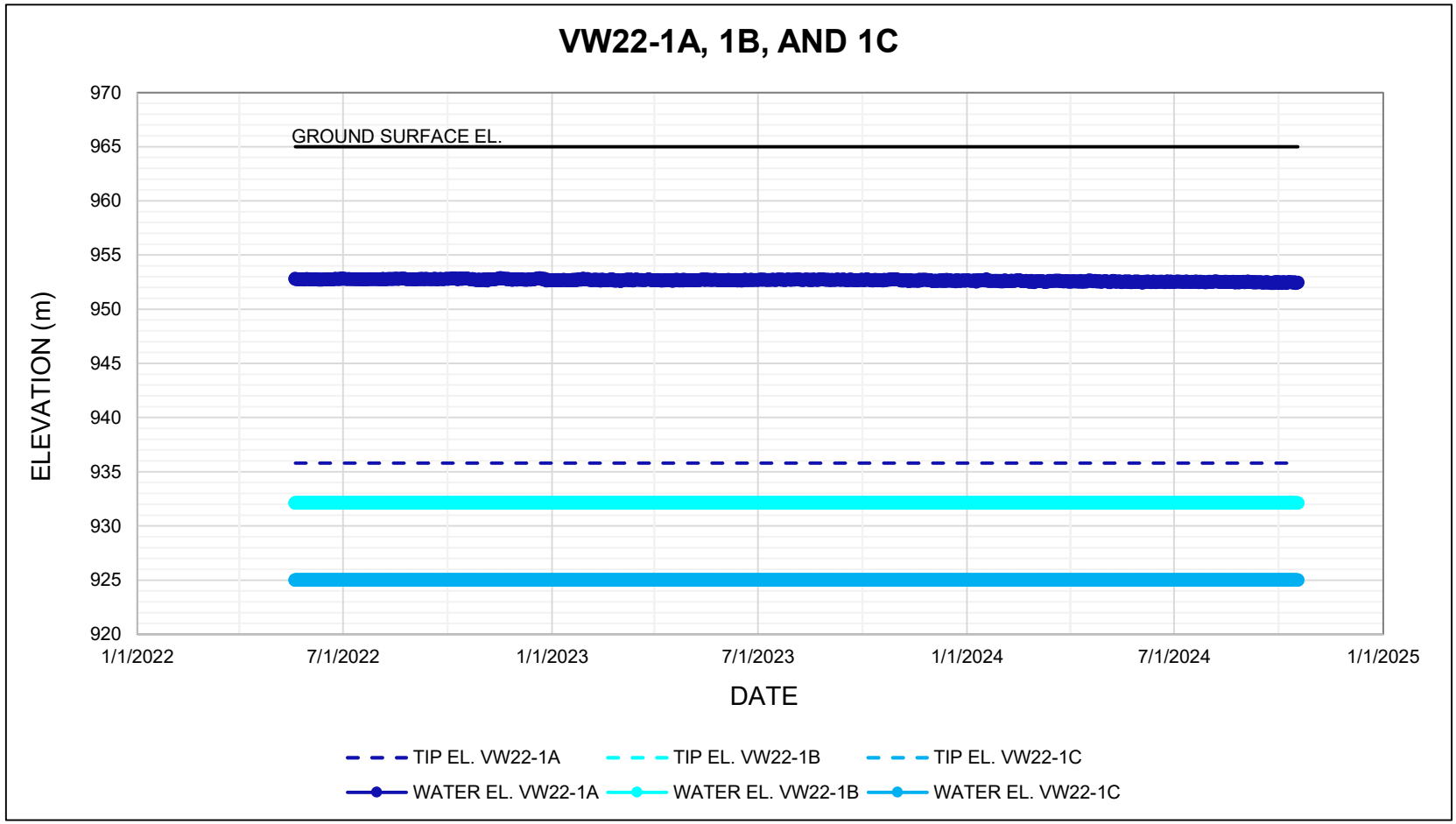
PROJECT

PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE

Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



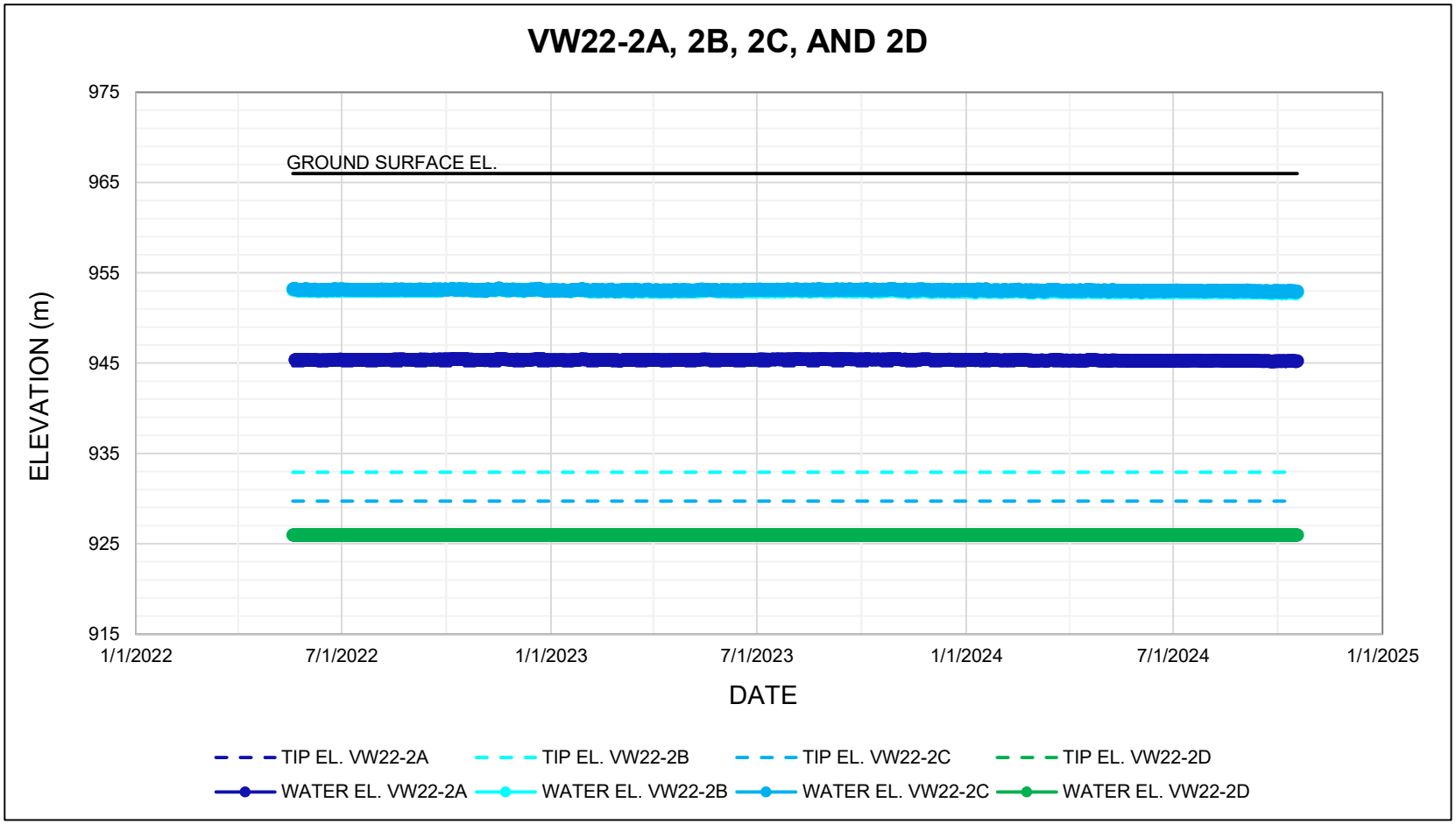
NOTES:
1. MULTI-CHANNEL DATA LOGGER CONNECTED TO THESE INSTRUMENTS IN MAY 2022.
2. GROUND SURFACE ELEVATION ESTIMATED FROM LiDAR DATA.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



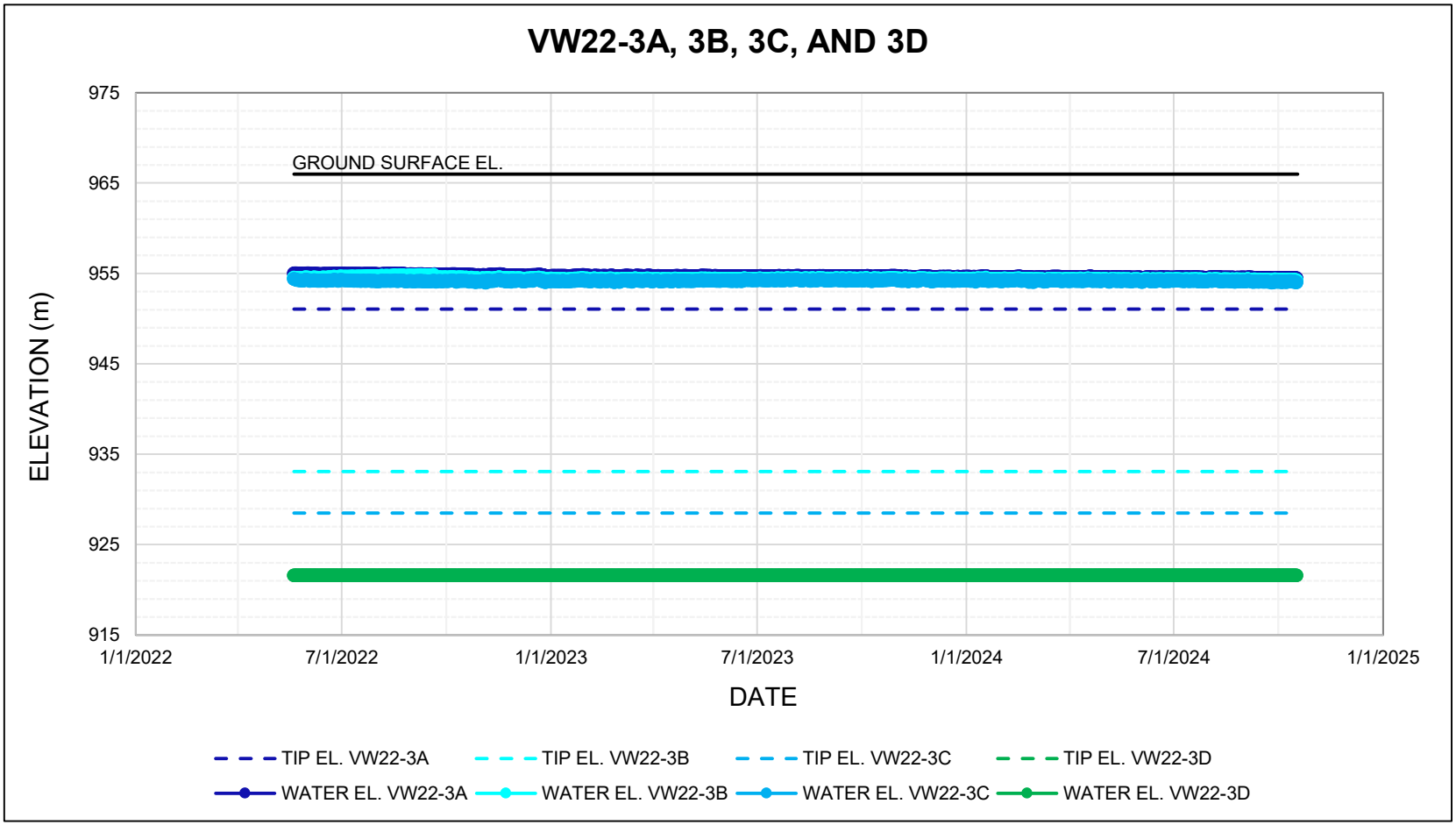
NOTES:
1. MULTI-CHANNEL DATA LOGGER CONNECTED TO THESE INSTRUMENTS IN MAY 2022.
2. GROUND SURFACE ELEVATION ESTIMATED FROM LiDAR DATA.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



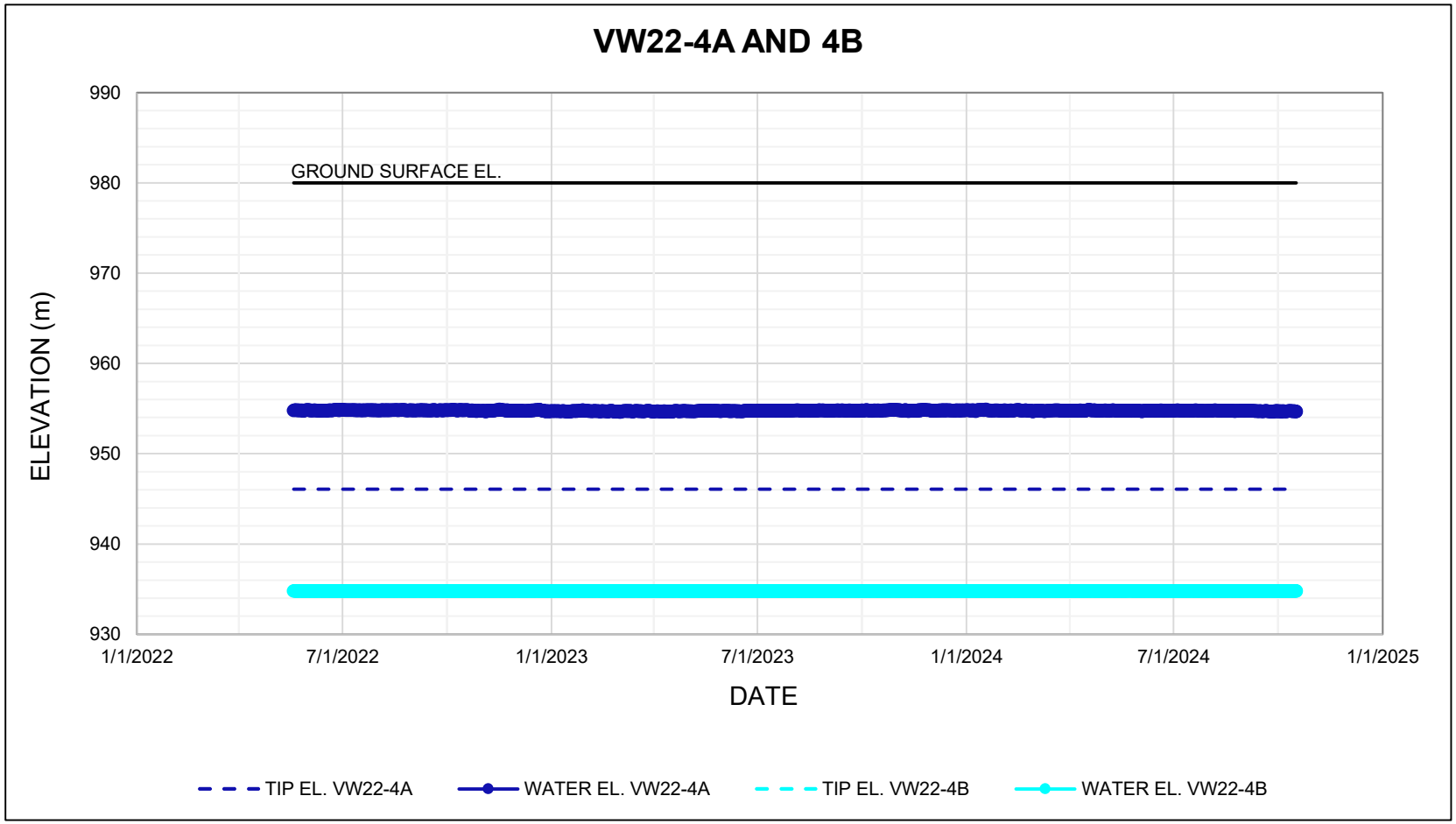
NOTES:
1. MULTI-CHANNEL DATA LOGGER CONNECTED TO THESE INSTRUMENTS IN MAY 2022.
2. GROUND SURFACE ELEVATION ESTIMATED FROM LiDAR DATA.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



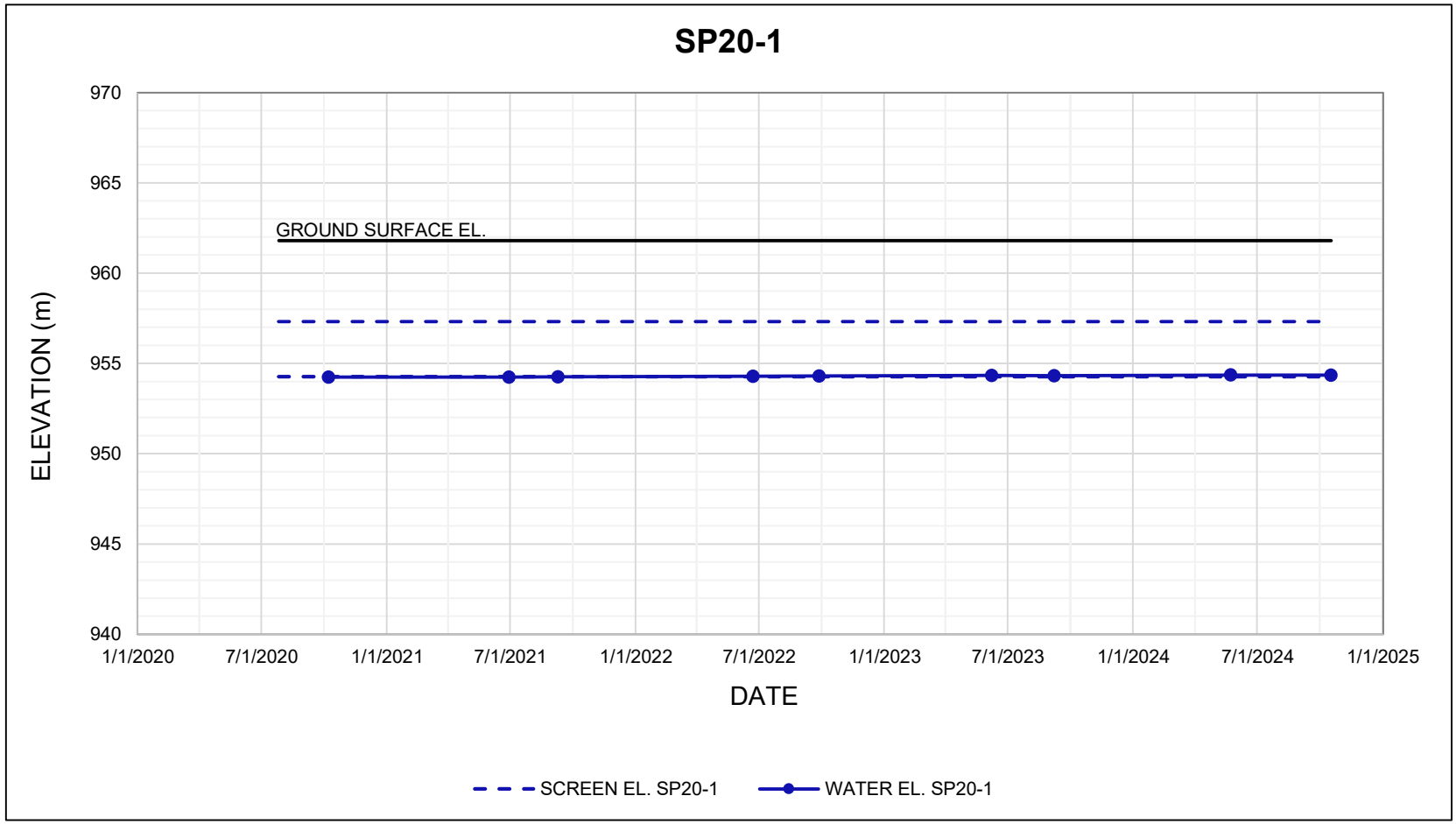
NOTES:
1. MULTI-CHANNEL DATA LOGGER CONNECTED TO THESE INSTRUMENTS IN MAY 2022.
2. GROUND SURFACE ELEVATION ESTIMATED FROM LiDAR DATA.

CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	



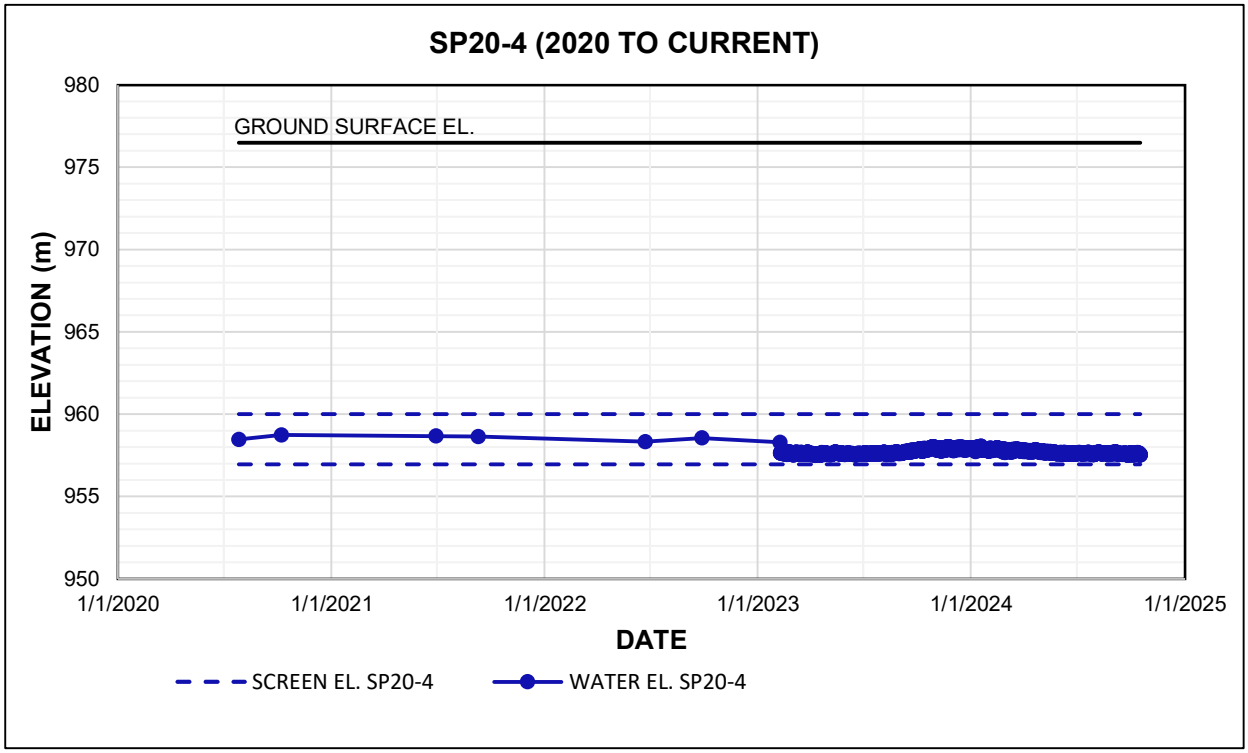
NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE THE SPRING 2021 READING ON JUNE 29, 2021 WAS PROVIDED TO KLOHN CRIPPEN BERGER LTD. (KCB) BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS (TEC) ON JUNE 25, 2021.
2. A SMALL-DIAMETER VIBRATING WIRE PIEZOMETER CONNECTED TO A SINGLE-CHANNEL DATA LOGGER INSTALLED IN THE INSTRUMENT CASING IN FEBRUARY 2023.

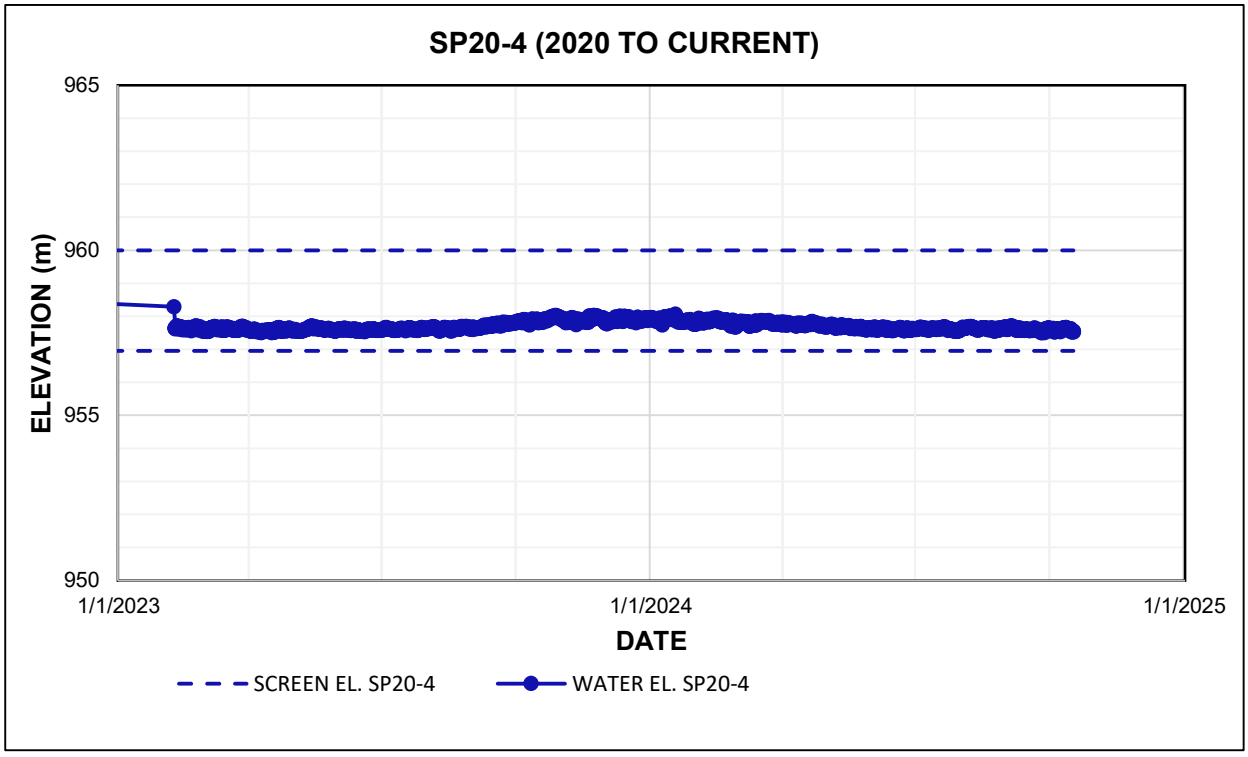
CLIENT
Alberta
Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	





NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE THE SPRING 2021 READING ON JUNE 29, 2021 WAS PROVIDED TO KLOHN CRIPPEN BERGER LTD. (KCB) BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS (TEC) ON JUNE 25, 2021.
2. A SMALL-DIAMETER VIBRATING WIRE PIEZOMETER CONNECTED TO A SINGLE-CHANNEL DATA LOGGER INSTALLED IN THE INSTRUMENT CASING IN FEBRUARY 2023.

CLIENT

Alberta

Klohn Crippen Berger

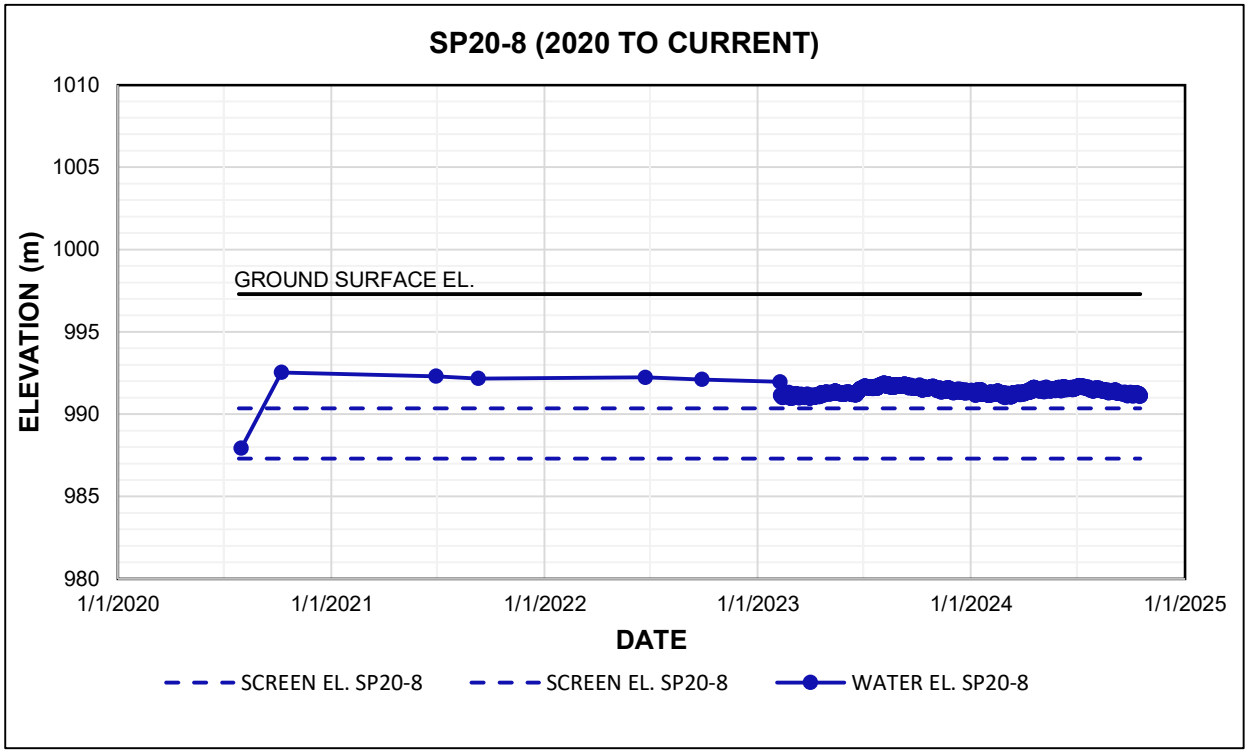
PROJECT

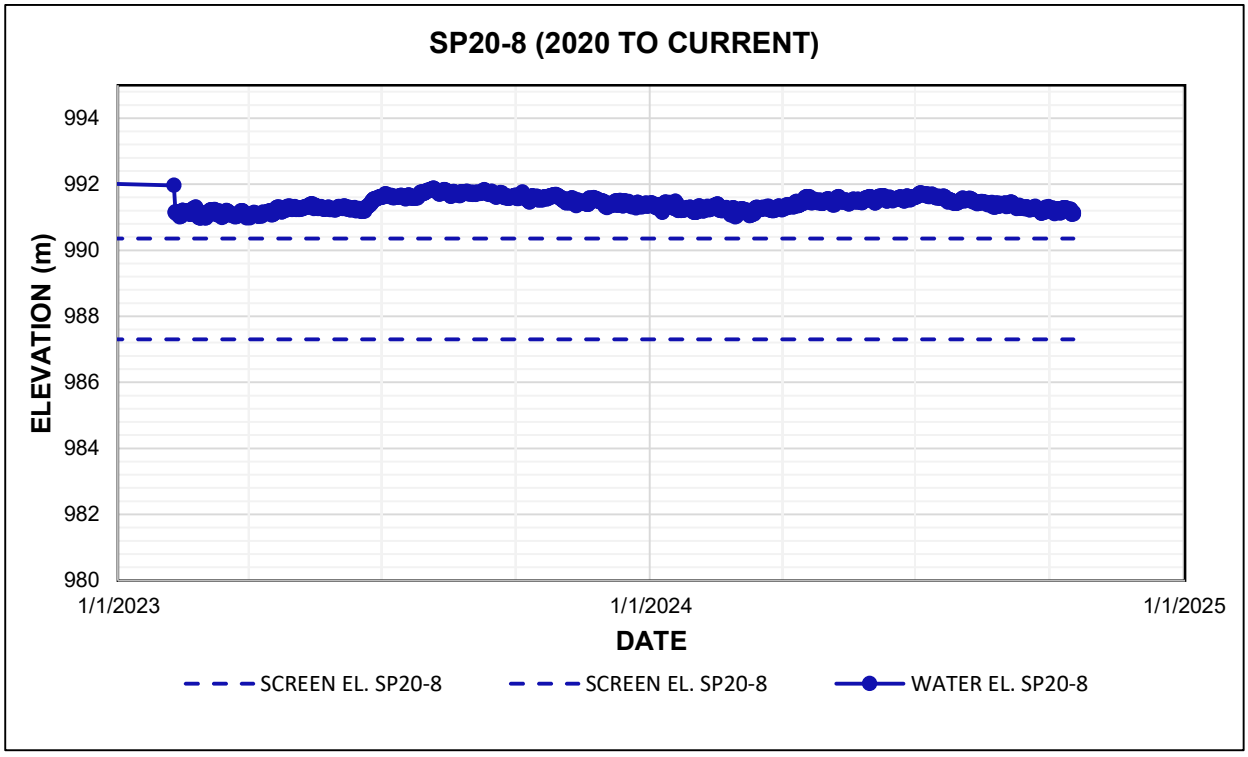
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE

Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	





NOTES:
1. PIEZOMETER DATA OBTAINED BEFORE THE SPRING 2021 READING ON JUNE 29, 2021 WAS PROVIDED TO KLOHN CRIPPEN BERGER LTD. (KCB) BY ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS (TEC) ON JUNE 25, 2021.
2. A SMALL-DIAMETER VIBRATING WIRE PIEZOMETER CONNECTED TO A SINGLE-CHANNEL DATA LOGGER INSTALLED IN THE INSTRUMENT CASING IN FEBRUARY 2023.

CLIENT

Alberta

Klohn Crippen Berger

PROJECT
PEACE REGION (GRANDE PRAIRIE DISTRICT - SOUTH)
GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE
Piezometer Data
GP007 - Wanyandie Road Slide
Hwy 40:36, km 29.339

SCALE	PROJECT No.	FIG No.
--	A05116A01	