SALDANHA BAY WATER QUALITY FORUM TRUST

BEACH EROSION/ACCRETION MONITORING PROGRAM

PROGRESS REPORT No. 2

(MAY 2019 – OCTOBER 2019)

NOVEMBER 2019

CONTENT

ERRATUM

Progress Report no 1 (November 2018 – April 2019)

Chapter 5. “Summary” – page 7; Third sub-summary “Total sand loss of 11040 m^3” , must be read as “Total sand loss of 1740m^3.”

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BEACH EROSION/ACCRETION MONITORING PROGRAMME PROGRESS REPORT NO. 2

1. INTRODUCTION

In 1994, after a work session between the Langebaan Municipality and the consultants it was decided to start an ongoing monitoring program of the changes (erosion/accretion) of the beaches between Leentjiesklip 1 (Strandloper restaurant) and Alabama Street as part of a beach protection investigation.

The beach survey, on 24 Standard measure lines, are done two times a year (after – summer and after – winter) during spring tide low – water and then between the top of high – water mark and approximately two metre below mean sea level (MSL).

During the year, wave measurements are done at the entrance of Saldanha Bay. These were with permission of TNPA obtained and the results are analysed.

The Municipality of Saldanha Bay aborted the original monitoring programme, started in 1994, at the end of 2017.

In 2019, the Saldanha Water Quality Forum Trust (SWQFT) started the monitoring programme again with the first measurement programme starting from April 2019.

The breaching between the old programme (1994 – 2017) and the current programme (May 2019 onwards) is described in the Preliminary Report published in May 2019.

2. WAVE DATA

Wave measurement data, height and period, measured at the entrance of Saldanha Bay (located one kilometre southeast of Marcus Island) by wave rider buoy and analysed by the CSIR (Stellenbosch), has been made available by TNPA (Saldanha). The table with wave data is in the Appendix.

NB. Due to contractual problems the CSIR only received data for 4 months (1 July – 31 October 2019) in stead of the 6 months needed for the winter half year period.

- The statistically calculated average wave height of 1.32m has been exceeded 488 times (58%).
- The wave height of 3m was only 5 times exceeded.
  Namely:
  - once during the short semi – storm on 8 August 2019 and 4 times during the only storm on 24 July 2019.
  - The wave height of 4m was exceeded twice namely on the 09h00 recording and the 12h00 recording.
  - The maximum 4.40m wave height on the 09h00 recording has a statistical occurrence of 0.85 times per year.

After analysing the 842 measurements (20 – minute records, 8 times per day) from 1 July 2019 – 31 October 2019 conditions in the winter half year can be qualified as calm.

3. SURVEY

This after winter survey was conducted between 27 – 31 October 2019.

The position of the measured lines (beach sections) are shown on Figure 3 in the Appendix. The results of the latest survey are shown on Figure 1A to 1K and 2A to 2F (Appendix) and are compared with previous surveys.

Where available the May 1997 survey done just before the “major storm” of June 1997 is shown on the Figures.

A summary of the land or seawards displacement of the beach/stonewall base/dune vegetation line, since the last survey is tabulated on various horizontal levels above and below Mean Sea Level (MSL) or zero level in Table 1 on page 3. Landwards displacement (erosion) is indicated with a minus (-) sign and seaward displacement (accretion) with a plus (+) sign. Table 1 also indicates accretion/erosion of sand in the beach areas either side of the representative measure line.

*For the northern and southern beaches, the comparison is made with the May 2019 survey.

Table 1 Summary of the land or seawards displacement

LAND/SEAWARDS DISPLACEMENT IN METERS																											REMARKS	
Horisontal Level in meters M.S.L.	Line Nr.	2A	2X	3C	4D	5B	5X	6B	6X	7B	7X	8E	8X	9AN	10B	10A1	10A2	11	11X	12A	13	13X	13B	13D	14		A. Dune boundary B. Dune Footline C. Footline revetment D. Beach Ridge
	+4.0																											
	+3.5																											
	+3.0																											
	+2.5											+2[C]							0									
	+2.0											+2	0	0[C]	+2				-2									
	+1.5									0		+1	-2	-19	+50	+7		-12	-1	0				-				
	+1.0									-3	-3[C]	-2	-13	-18	0	-8	+18	-9	-	-2	0	+9	0	+3	-1			
	+0.5	0[C]	0[C]					0[C]		-5	-5	-5	-14	-21	-1	0	+25	-6	+1	+2	+10	+18	14	+12	14			
	0.0	2	-2				0[C]	-5		-6	-5	-17	-13	-8	-10	+1	+36	-3	0	+4	-6	+9	+17	0	+5			
	-0.5	2	-4			0[C]	-4	-10	2c	-5	-9	-21	-5	7	-8	+3	+60	-3	0	+1	-7	0	-3	0	+5			
	-1.0	0	-4	-10c	-10	0	+6	-15	-25	-26	-26	-28	+5	0	0	+32	-28	-3	0	+3	0	0	0	0	+2			
	-1.5	0	0	+5	+9	+12	+7	+6	+7	+18	+14	-9	+4	+10	+5	+49	+51	+2	0	+1	+1	+1	0	0	+1			
	-2.0	0	+2	+10	+8	+8	+10	+19	+20	+23	+21	0	0	+8	0	+48	+28	+1	0	+3	+2	+2	0	0	0			
SAND EROSION			1500					1575		800	1690	7400	1615	1870	1848	5460	14430	2030	1800							TOTAL LOSS 20510 m^3		
SAND ACCRETION		60		570	2240	840	230													900	960	2185	1260	540	910	TOTAL GAIN 30730 m^3		

4. RESULTS

For the position of the measure lines discussed below, reference is made to Figure 3 (colour aerial photo) and for the plotted heights to Figures 1A to 1K and 2A to 2F in the Appendix.

Summary of level information:

• Upper beach	: beach area above +1m M.S.L (mean sea level or zero level)
• High Water Level (HWL)	: +1m M.S.L
• Low Water Level (LWL)	: -0.6m M.S.L
• Tidal range	: +1m to -0.6 M.S.L
• Lines 2A – 10A1 distance	: measured from bottom of stonewall
• Lines 13X – 13D distance	: measured from the erf boundaries

Line 2A — Low accretion from below the zero level to the LW level (with maximum sea bottom rise of 0.2m). Further seawards to the -2m level, no mentionable change.

Line 2X — Low erosion from HWL, increasing to a sea bottom drop of 0.5m at LW level and further seaward a change to low accretion up to and past the -2m level.

Line 3C — From stone wall low – mild erosion (maximum 0.4 drop). Erosion changes to accretion at bottom level -1.3m and 17m from stone wall. At the -2m level is the sea bottom rise 0.25m

Line 4D — From stone wall to 23m further seaward (-1.2m GSS) low erosion, changing at this point to increasing accretion till past the -2m level. Maximum bottom raises 0.35m.

Line 5B — Low erosion from stone wall and 23m seawards with maximum drop of 0.2m. The erosion changes at this point (at -1.0m level) to increasing accretion till past -2m level. Maximum rise at this point 0.5m.

Line 5X — Erosion (maximum bottom drop 0.25m) from stone wall till 40m seaward. Sea bottom -1m at this point the low erosion changes increasing accretion till past the -2m level at a distance of 75m from stone wall. (bottom rise 0.25m).

Line 6B — At the stonewall the medium erosion (bottom drop 0.55m) starts decreasing till nil at a distance of 54m from stone wall and a bottom level of -1.2m further seaward an increasing accretion is measured till past the -2m level 30m seaward and makes bottom rise of 0.45m.

Line 6X — Low erosion is measured as from the stone wall till a point 45m further sea ward with sea bottom level of -1.35m and at this point the erosion is changed to increasing accretion. This accruement is running till past the -2m level (70m from stone wall.

Line 7B — Strong, local, erosion is measured between stone wall and 10m seaward. A sea bottom drop of 1.5m was measured. Further

down the profile low to medium erosion was measured. Which ran up to a point on 80m from stone wall and at a bottom level of -1.2m GSS and reached a maximum drop of 0.3m. Further seaward the erosion changed to increasing accretion and runs past the -2m GSS, another 30m seaward. Maximum bottom rises 0.5m.

Line 7X — From stone wall low – medium erosion was measured for a distance of 105m (from stone wall) with maximum bottom drop of 0.35m. At this point the erosion changed to increasing accretion which ended at the -2m level with a bottom rise at 0.5.

Line 8E — Low accretion from stone wall till 20m seaward was measured (bottom rise 0.15 – 0.2m). From the point, 20m seaward, accretion changed to increasing low – medium erosion. Which did run to the -2m GSS level. Where it became nil. (160m distance from stone wall).

In the area between Leentjiesklip 1 and groyne 2 (just north of Noord Street, two areas are identified namely:

- The northerly part, measure lines 2A to 5X from Strandloper Restaurant to just south of the Seabreeze Caravan Park. This area shows low accretion which didn't occur in previous "after winter" surveys, and a sand gain of 2440m^3 was calculated.
- The area between just south of Seabreeze Caravan Park and groyne 2 (just north of Noord Street – lines 6B to 8B). In this area the same patern as previous years namely low to medium erosion did occur and the calculated sand loss was calculated to 11695m^3.

Line 8X — Just south of groyne 2 local medium erosion was measured, the 10m wide beach and the beach ridge were eroded away. The medium erosion decreased to low erosion till the LW line was reached and decreased further till the -2m level was reached and the erosion became nil.

Line 9BN — From the foot of the stone wall till a 46m distance low – medium accretion was measured (with a bottom rise at 0.3m). Further seawards the accretion changed to strong erosion. The beach ridge was eroded and replaced 22m landwards as well as the beach slope. The strong erosion ended on the zero-line 54m from the beach ridge where low erosion (0.1m rise) started and ended another 45m further seaward where erosion changed to low accretion and bottom did rise another 0.2 – 0.25m at the -2.m level.

Line 10B — Survey station at Sleigh Street (as well on line 10A$_1$ and 10A2). Changing erosion/accretion in dune area caused by wind erosion. At a distance of 75m from survey station the flat beach starts. From dune foot to 90m seaward low increasing to medium accretion ending at the new beach ridge (maximum bottom raised 0.3m on +1.5m level. Seaward of beach ridge changing low erosion/ accretion (over distance 170 – 330m) ending at the -2m level.

Line 10A1 — Between the dune foot (on 30m from survey station) and the foot at the stone wall accretion is measured (deposit by wind and trapped). Bottom rise maximum 0.45m Seaward from foot line of stone wall till 60m seawards no change in beach profile. On 70m seaward foot stone wall begin of low accretion right up to groyne 1. South of groyne 1, over a distance of 75m (at the -2m level) a larger quantity of sand deposited between -0.5m and -2m level. The deposited quantity is calculated as ±3800m^3.

In the area between groyne 2 (north of Noord Street) and groyne 1 (at Sleigh Street) with a coastline length of 435m is in total a gain of 3820m^3 sand calculated. South of groyne 2 a medium erosion is measured and about half way to the area accretion did start with a maximum gain on line 10A1.

Line 10A2 — The dune foot (on +1.5m GSS) is 4m seaward displaced and strong accretion pushed the beach ridge and beach slope 22m seaward. Strong accretion with a bottom rise of 0.75m is measured over a distance of 140m from the new beach ridge and reaching the tidal channel at the -2m level. The gain of sand is calculated on 14400m^3.

Line 11 — Low erosion started on the flat beach. The beach ridge is 12m landwards displaced as well as the beach slope. The beach ridge height (on +1.4m0 stayed the same, but the beach slope became steeper. The “damage” is reduced to zero on a 75m seaward distance from the survey station and on a depth of -1.2m M.S.L. The tidal channel started at 140m distance from survey station.

Line 11X — On 30m from the survey station starts an 30m flat beach. By erosion the beach was lowered by 0.5m. The position of the beach ridge and beach slope was not affected seriously. The “erosion damage” became zero at the bottom of the beach slope. The tidal channel starts at 70m from the beach ridge.

In the area between groyne 1 (Sleigh Street) and the sandpit (between Cloete and Dwars Street). Low to medium erosion is measured on the flat beaches. In the north of the area strong – very strong accretion was measured just south of groyne 1 with a gain of 14400m^3 sand. Low erosion was measured on the southern part of the area. For the total area, gain of sand is calculated at 14430m^3.

Line 12A — Just North of line 12A is the boundary of the Northern beaches and the southern beaches of Langebaan. The survey station is near the gate to the beach and the entrance of the public parking area. The survey starts at ±40 m from the station, where the wind-blown low dunes start. The foot of the low dunes at 103mfrom the station, is also the begin of the beach slope (no beach ridge). On the beach slope a changing low accretion/erosion was measured with maximum beach drop 0.25m and beach rises of maximum 0.5m. The low accretion is changing to minimum, till past the -2m level on 180m distance

from station. The tidal channel (at -2m level) is 2m seawards displaced.

Line 13 — End of Breë Street. No change at the flat beach except at the end where slight accretion took place by filling up a 25m area. The beach edge moved 4m landwards. The beach slope is streamlined by filling up (maximum rise 0.7m in area between +1m level and +0.25m level). At the lover part of the beach slope erosion did start with maximum lowering of slope by maximum 0.5m. This process stopped at the -0.7m level and the beach slope was connected with the slope of the tidal channel. The channel was also displaced 2m seaward.

Line 13X — At 130m south of Breë Street. The "undulated" slope started at 60m distance from the station. On the flat beach between 35 and 60m from station slight infill was measured. The beach ridge is re-positioned 4m seaward. The beach slope is re-shaped, by strong accretion, in a fluent line right up to the -0.5m level (from chainage 65 – 105m to station). Maximum rise 0.6m minimum 0.0m. At the chainage 105m (depth -0.5m) a step was created and after the step (at chainage 130m) the strong accretion was changed to low erosion. The tidal channel's position moved 1.0m seaward.

Line 13B — At the first house south of Smith Street. On this line a smoothing process of the undulated profile took place from the edge of the grassy flat area at ch15 the process started with filling in at two places. Maximum infill 0.25m and lower down another infill of maximum 0.3m. Between ch 90 and 110m slight erosion was measured (maximum 0.1m). The position of the tidal channel is unchanged.

Line 13D — At 75m north of Alabama Street. Also, on this line the profile was changed to a more fluent profile. The maximum height of infill needed was 0.35 – 0.4m. Below the zero level up to the -2m level no change was measured. The tidal channel remained on the same position.

Line 14 — At Alabama Street. As at the previous lines a smoothing of the undulated profile was achieved. Low (and in the beginning medium) accretion was needed. Seaward between ch25 – 70m the infill needed was 0.3m and further seaward the infill needed was minimal. The -2m level at ch 82 was unchanged.

In the area between the sandpit (between Dwars and Cloete Streets) and Alabama Street, the so - called southern beaches, a smoothing of the profile lines has occurred. This was done, by low (sometimes medium) accretion/erosion. The gain of sand in this area is calculated at 6755m^3. The position of the tidal channel changed minimal.

5. SUMMARY

- The “winter half year” from 1 May to 31 October 2019 can be classified as calm.

- The wave height of 3m (minimum criteria for a semi – storm event) occurred twice namely on 8 August 2019 and on the only storm on 24 July 2019 when the maximum wave height of 4.40m was recorded with a statistical occurrence of 0.85 time per year.

- In the area between Leentjiesklip 1 (Standloper) and groyne 2 (just north of Noord Street), two areas were identified namely:
    - The most northerly part (measure lines 2A to 5X from Strandloper to just South of the Seabreeze Caravan Park. This area shows low accretion which didn’t occur in previous “after winter” survey and a sand gain of 2440m^3 was calculated.
    - The southerly park (between the southern border of Seabreeze Park and groyne 2 (just north of Noord Street lines 6B to 8E. In this area the same pattern as previous years namely low to medium erosion was measured and the calculated sand loss was 11695m^3.

- In the area between groyne 2 (just North of Noord Street) and groyne 1 (at Sleigh Street) with a coastline length of 435m is in total a gain of 2820m^3 sand calculated and south of groyne 2 medium erosion is measured and about half way the area accretion did start with a maximum gain on line 10A1 at groyne 1 of 5460m^3.

- In the area between groyne 1 (Sleigh Street) and the sandpit in (between Cloete- and Dwars Street) the north of the area strong to very strong accretion was measured just south of groyne 1 with a gain of 14400m^3 sand. Low erosion was measured on the flat beaches of the southern part of the area. For the total area, gain of sand is calculated 14430m^3.
    - Note: The sandpit just north of line 12A defines the boundary between the northern and southern beaches of Langebaan.

- In the area between the sandpit and Alabama Street, with a coastline length of 725m, a total sand gain of 3755m^3 was calculated. In the area the bottom was changed by a smoothing process caused by low (sometime medium) occurrence and erosion (filling and removing). The position of the tidal channel changed minimal.

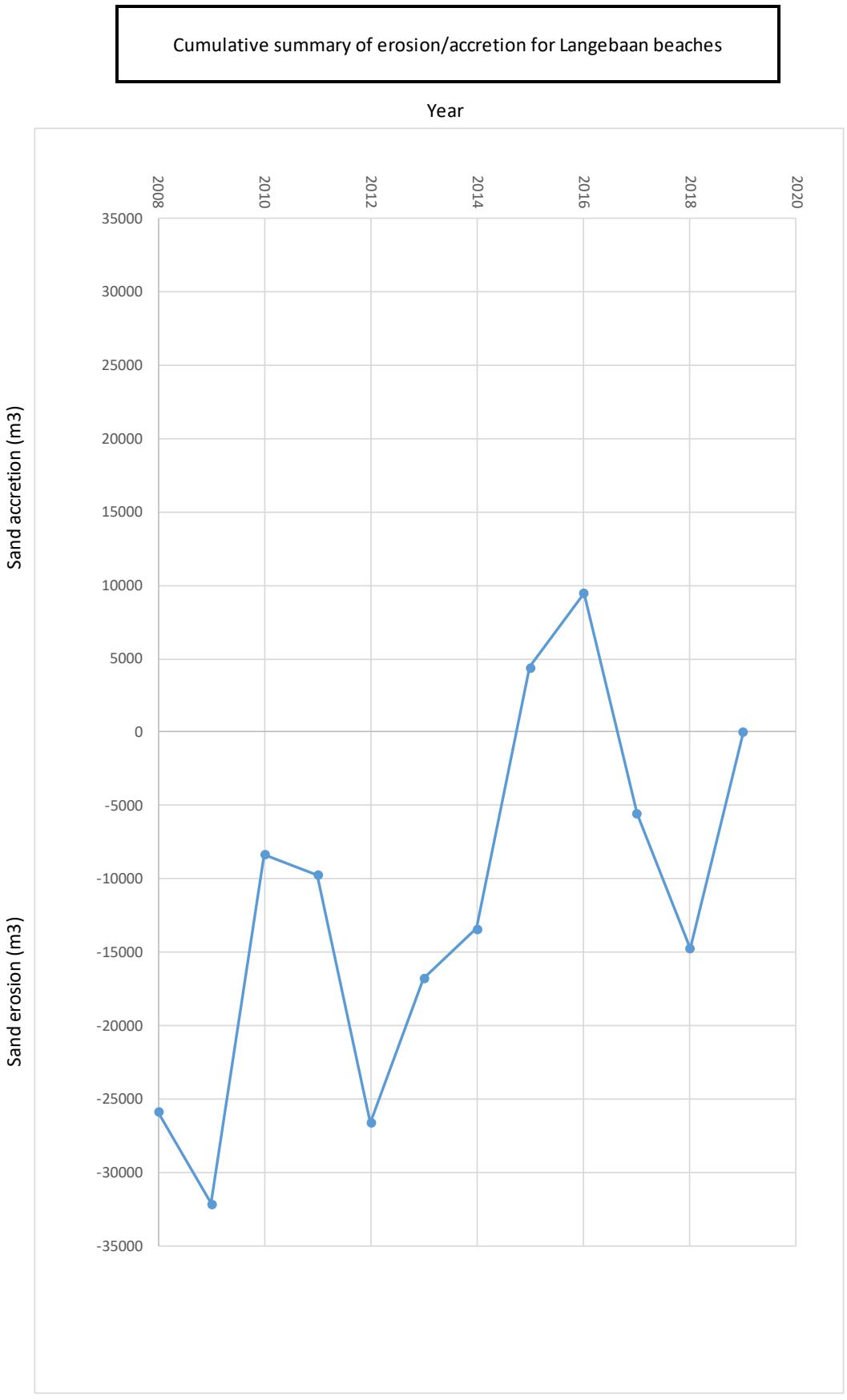
- The sand movement balance for the total area between the Strandloper Restaurant (Leentjiesklip 1) in the north and Alabama Street in the South is calculated at a gain of 10220m^3 sand.
    - Note: On the next pages a summary of sand loss/gain for the Northern and Southern beaches for the last 12 years is tabulated (on table 2) and a graphical version is shown of table 2.

Table 2 Historic sand loss/gain results in m3

DATE	NORTH BEACH			SOUTH BEACH			SEASON
	Accretion	**Erosion**	**Balance**	**Accretion**	**Erosion**	**Balance**	
May-08	34680	-28555	6125	360	-1235	-875	Summer
Nov-08	1540	-43925	-42385	11250	0	11250	Winter
May-09	28265	-2630	25635	375	-5030	-4655	Summer
Dec-09	5435	-45045	-39610	12370	0	12370	Winter
May-10	7860	-10490	-2630	1500	-460	1040	Summer
Nov-10	27745	-7595	20150	5245	0	5245	Winter
May-11	21740	-1100	20640	140	-5720	-5580	Summer
Nov-11	4600	-29820	-25220	8775	0	8775	Winter
May-12	12730	-6010	6720	0	-6180	-6180	Summer
Nov-12	7275	-33175	-25900	8450	0	8450	Winter
May-13	41625	-220	41405	0	-5625	-5625	Summer
Nov-13	6330	-45750	-39420	13515	0	13515	Winter
May-14	26590	-1000	25590	390	-3845	-3455	Summer
Nov-14	1945	-34650	-32705	13955	0	13955	Winter
May-15	27225	0	27225	0	-8830	-8830	Summer
Dec-15	7650	-9905	-2255	2155	-490	1665	Winter
May-16	10640	-22250	-11610	500	-1655	-1155	Summer
Dec-16	18870	-5625	13245	4740	-140	4600	Winter
May-17	16675	-4770	11905	0	-10870	-10870	Summer
Nov-17	9240	-32585	-23345	7255	0	7255	Winter
May-18	15080	-14080	1000	690	-10880	-10190	Summer
Nov-18							Winter
Jun-19	21375	-3925	17450	0	-6590	-6590	Summer
Nov-19	18845	-20490	-1645	6755	0	6755	Winter
Total:	**352585**	**-399670**		**+98420**	**-67550**		
Balance:			**-47085**			**+30650**	

Note: For a graphical version of this table 2 see next page (pg 10)

Graphical Version of Table 2



6. APPENDIX

Table	Wave measurements data (A – D)
Figures 1A to 1K	Graphs – northern beach profiles
Figures 2A to 2F	Graphs – southern beach profiles
Figure 3	Map – location of measure lines

Station :SALDANHA BAY
Latitude :33.05
Longitude :17.97333
Water Depth :23
Date range :2019-01-01 to 2019-10-31
Instrument Type:New Waverider

Date	Time	Hmo	Tp
2019 07 01	0000	1.41	10.00
2019 07 01	0300	1.34	18.10
2019 07 01	0600	1.51	16.60
2019 07 01	0900	1.59	16.60
2019 07 01	1200	1.58	16.60
2019 07 01	1500	1.70	15.30
2019 07 01	1800	1.56	15.30
2019 07 01	2100	1.31	15.30
2019 07 02	0000	1.27	14.20
2019 07 02	0300	1.38	14.20
2019 07 02	0600	1.36	14.20
2019 07 02	0900	1.37	13.30
2019 07 02	1200	1.65	11.70
2019 07 02	1500	1.99	11.70
2019 07 02	1800	1.95	11.70
2019 07 02	2100	2.03	11.70
2019 07 03	0000	1.78	11.10
2019 07 03	0300	2.04	11.10
2019 07 03	0600	1.83	11.70
2019 07 03	0900	1.75	12.50
2019 07 03	1200	2.01	11.10
2019 07 03	1500	2.10	12.50
2019 07 03	1800	1.86	10.50
2019 07 03	2100	1.83	11.10
2019 07 04	0000	1.64	11.70
2019 07 04	0300	1.99	13.30
2019 07 04	0600	2.06	15.30
2019 07 04	0900	2.16	14.20
2019 07 04	1200	1.80	15.30
2019 07 04	1500	1.91	12.50
2019 07 04	1800	1.74	11.10
2019 07 04	2100	1.79	13.30
2019 07 05	0000	2.03	13.30
2019 07 05	0300	1.81	11.70
2019 07 05	0600	1.76	13.30
2019 07 05	0900	1.81	12.50
2019 07 05	1200	2.05	12.50
2019 07 05	1500	1.95	12.50
2019 07 05	1800	2.06	12.50
2019 07 05	2100	2.12	15.30
2019 07 06	0000	2.03	14.20
2019 07 06	0300	1.86	12.50
2019 07 06	0600	1.57	14.20
2019 07 06	0900	1.59	12.50
2019 07 06	1200	1.52	13.30
2019 07 06	1500	1.50	12.50
2019 07 06	1800	1.53	13.30
2019 07 06	2100	1.74	10.50
2019 07 07	0000	1.68	10.50
2019 07 07	0300	1.64	12.50
2019 07 07	0600	1.72	10.00
2019 07 07	0900	1.86	11.10
2019 07 07	1200	2.02	11.10
2019 07 07	1500	1.88	11.10
2019 07 07	1800	1.81	13.30
2019 07 07	2100	1.62	13.30
2019 07 08	0000	1.53	10.50
2019 07 08	0300	1.38	10.00
2019 07 08	0600	1.20	10.00
2019 07 08	0900	1.18	10.50
2019 07 08	1200	1.07	10.00
2019 07 08	1500	1.19	10.00
2019 07 08	1800	1.20	10.50
2019 07 08	2100	1.33	10.50
2019 07 09	0000	1.50	10.00
2019 07 09	0300	1.43	10.50
2019 07 09	0600	1.33	10.50
2019 07 09	0900	1.29	10.50
2019 07 09	1200	1.29	10.50
2019 07 09	1500	1.37	11.70
2019 07 09	1800	1.49	10.50
2019 07 09	2100	1.51	12.50
2019 07 10	0000	1.46	11.70
2019 07 10	0300	1.38	11.10
2019 07 10	0600	1.23	11.70
2019 07 10	0900	1.21	12.50
2019 07 10	1200	1.33	11.70
2019 07 10	1500	1.44	11.10
2019 07 10	1800	1.57	13.30
2019 07 10	2100	1.48	11.70
2019 07 11	0000	1.37	10.50
2019 07 11	0300	1.28	10.00
2019 07 11	0600	1.38	11.70
2019 07 11	0900	1.26	10.00
2019 07 11	1200	1.15	11.70
2019 07 11	1500	1.13	10.50
2019 07 11	1800	1.10	10.00
2019 07 11	2100	1.05	11.10
2019 07 12	0000	1.13	10.50
2019 07 12	0300	1.17	11.10
2019 07 12	0600	1.27	10.00
2019 07 12	0900	1.39	11.10
2019 07 12	1200	1.49	16.60
2019 07 12	1500	1.66	11.70
2019 07 12	1800	2.12	13.30
2019 07 12	2100	1.94	14.20
2019 07 13	0000	2.03	14.20
2019 07 13	0300	1.80	15.30
2019 07 13	0600	2.04	15.30
2019 07 13	0900	1.77	14.20
2019 07 13	1200	1.74	14.20
2019 07 13	1500	1.76	13.30
2019 07 13	1800	1.55	12.50
2019 07 13	2100	1.48	12.50
2019 07 14	0000	1.43	12.50
2019 07 14	0300	1.28	12.50
2019 07 14	0600	1.28	12.50
2019 07 14	0900	1.22	11.70
2019 07 14	1200	1.10	11.70
2019 07 14	1500	1.22	12.50
2019 07 14	1800	1.25	13.30
2019 07 14	2100	1.17	13.30
2019 07 15	0000	1.18	14.20
2019 07 15	0300	1.57	13.30
2019 07 15	0600	1.38	12.50
2019 07 15	0900	1.50	13.30
2019 07 15	1200	1.79	12.50
2019 07 15	1500	1.70	13.30
2019 07 15	1800	1.55	12.50
2019 07 15	2100	1.55	12.50
2019 07 16	0000	1.45	11.70
2019 07 16	0300	1.52	12.50
2019 07 16	0600	2.03	16.60
2019 07 16	0900	2.22	16.60
2019 07 16	1200	2.11	16.60
2019 07 16	1500	2.12	15.30
2019 07 16	1800	1.96	15.30
2019 07 16	2100	1.99	15.30
2019 07 17	0000	1.88	15.30
2019 07 17	0300	1.57	12.50
2019 07 17	0600	1.69	15.30
2019 07 17	0900	1.62	12.50
2019 07 17	1200	1.48	14.20
2019 07 17	1500	1.79	14.20
2019 07 17	1800	1.92	13.30
2019 07 17	2100	1.99	11.70
2019 07 18	0000	1.64	13.30
2019 07 18	0300	1.70	10.50
2019 07 18	0600	1.64	10.00
2019 07 18	0900	1.58	12.50
2019 07 18	1200	1.64	12.50
2019 07 18	1500	1.68	11.10
2019 07 18	1800	1.48	12.50
2019 07 18	2100	1.61	11.70
2019 07 19	0000	1.83	11.70
2019 07 19	0300	2.07	12.50
2019 07 19	0600	2.36	12.50
2019 07 19	0900	2.65	12.50
2019 07 19	1200	2.48	14.20
2019 07 19	1500	2.51	13.30
2019 07 19	1800	2.68	13.30
2019 07 19	2100	2.81	14.20
2019 07 20	0000	2.32	13.30
2019 07 20	0300	2.47	12.50
2019 07 20	0600	2.53	14.20
2019 07 20	0900	2.08	13.30
2019 07 20	1200	1.84	12.50
2019 07 20	1500	1.50	12.50
2019 07 20	1800	1.59	11.70
2019 07 20	2100	1.41	11.10
2019 07 21	0000	1.03	10.00
2019 07 21	0300	0.95	11.10
2019 07 21	0600	0.78	10.00
2019 07 21	0900	0.61	11.10
2019 07 21	1200	0.61	10.00
2019 07 21	1500	0.56	10.50
2019 07 21	1800	0.61	16.60
2019 07 21	2100	0.73	15.30
2019 07 22	0000	0.84	15.30
2019 07 22	0300	0.87	15.30
2019 07 22	0600	0.86	14.20
2019 07 22	0900	1.07	14.20
2019 07 22	1200	0.98	14.20
2019 07 22	1500	1.07	13.30
2019 07 22	1800	1.21	14.20
2019 07 22	2100	1.25	14.20
2019 07 23	0000	9999.999	99.99
2019 07 23	0300	9999.999	99.99
2019 07 23	0600	9999.999	99.99
2019 07 23	0900	9999.999	99.99
2019 07 23	1200	9999.999	99.99
2019 07 23	1500	9999.999	99.99
2019 07 23	1800	9999.999	99.99
2019 07 23	2100	9999.999	99.99
2019 07 24	0000	2.71	12.50
2019 07 24	0300	2.90	12.50
2019 07 24	0600	3.26	13.30
2019 07 24	0900	4.40	16.60
2019 07 24	1200	4.06	16.60
2019 07 24	1500	3.81	16.60
2019 07 24	1800	2.83	15.30
2019 07 24	2100	2.53	15.30
2019 07 25	0000	2.36	15.30
2019 07 25	0300	2.18	13.30
2019 07 25	0600	2.35	14.20
2019 07 25	0900	1.91	12.50
2019 07 25	1200	1.92	11.10
2019 07 25	1500	1.94	13.30
2019 07 25	1800	2.27	12.50
2019 07 25	2100	2.08	12.50
2019 07 26	0000	2.23	13.30
2019 07 26	0300	2.14	12.50
2019 07 26	0600	2.22	12.50
2019 07 26	0900	2.14	13.30
2019 07 26	1200	2.48	11.70
2019 07 26	1500	2.10	15.30
2019 07 26	1800	2.17	11.70
2019 07 26	2100	2.19	15.30
2019 07 27	0000	2.12	16.60
2019 07 27	0300	1.87	15.30
2019 07 27	0600	1.82	12.50
2019 07 27	0900	1.70	15.30
2019 07 27	1200	1.63	15.30
2019 07 27	1500	1.51	13.30
2019 07 27	1800	1.45	14.20
2019 07 27	2100	1.27	11.70
2019 07 28	0000	1.35	14.20
2019 07 28	0300	1.28	10.50
2019 07 28	0600	1.57	12.50
2019 07 28	0900	1.56	15.30
2019 07 28	1200	1.76	15.30
2019 07 28	1500	1.44	14.20
2019 07 28	1800	1.35	13.30
2019 07 28	2100	1.21	12.50
2019 07 29	0000	1.22	12.50
2019 07 29	0300	1.00	11.70
2019 07 29	0600	0.94	11.10
2019 07 29	0900	0.98	11.70
2019 07 29	1200	1.10	12.50
2019 07 29	1500	1.36	10.50
2019 07 29	1800	1.74	11.70
2019 07 29	2100	1.84	11.70
2019 07 30	0000	1.77	11.70
2019 07 30	0300	1.64	10.50
2019 07 30	0600	2.01	11.10
2019 07 30	0900	2.77	13.30
2019 07 30	1200	2.48	11.70
2019 07 30	1500	2.66	11.70
2019 07 30	1800	2.42	13.30
2019 07 30	2100	2.43	13.30
2019 07 31	0000	2.17	13.30
2019 07 31	0300	2.09	12.50
2019 07 31	0600	2.52	12.50

2019	07	31	0900	2.37	13.30	2019	08	10	2100	1.61	10.50
2019	07	31	1200	1.85	11.10	2019	08	11	0000	1.75	12.50
2019	07	31	1500	1.75	11.70	2019	08	11	0300	1.84	13.30
2019	07	31	1800	1.81	10.00	2019	08	11	0600	2.14	13.30
2019	07	31	2100	1.79	11.70	2019	08	11	0900	2.17	11.70
2019	08	01	0000	1.62	11.70	2019	08	11	1200	2.60	14.20
2019	08	01	0300	1.53	11.70	2019	08	11	1500	2.35	14.20
2019	08	01	0600	1.31	11.70	2019	08	11	1800	2.44	13.30
2019	08	01	0900	1.11	11.10	2019	08	11	2100	2.56	12.50
2019	08	01	1200	0.94	11.70	2019	08	12	0000	2.44	13.30
2019	08	01	1500	0.95	10.50	2019	08	12	0300	2.83	13.30
2019	08	01	1800	0.90	11.10	2019	08	12	0600	2.51	13.30
2019	08	01	2100	0.74	10.00	2019	08	12	0900	2.44	13.30
2019	08	02	0000	0.64	10.50	2019	08	12	1200	2.51	15.30
2019	08	02	0300	0.70	11.70	2019	08	12	1500	2.92	13.30
2019	08	02	0600	0.76	13.30	2019	08	12	1800	2.82	16.60
2019	08	02	0900	0.76	10.50	2019	08	12	2100	3.32	16.60
2019	08	02	1200	0.79	12.50	2019	08	13	0000	3.16	12.50
2019	08	02	1500	0.85	11.10	2019	08	13	0300	2.74	16.60
2019	08	02	1800	0.83	12.50	2019	08	13	0600	2.69	16.60
2019	08	02	2100	0.99	11.70	2019	08	13	0900	2.49	16.60
2019	08	03	0000	0.98	11.10	2019	08	13	1200	2.47	15.30
2019	08	03	0300	1.09	13.30	2019	08	13	1500	2.15	15.30
2019	08	03	0600	0.98	14.20	2019	08	13	1800	2.02	13.30
2019	08	03	0900	0.97	13.30	2019	08	13	2100	2.01	14.20
2019	08	03	1200	0.88	14.20	2019	08	14	0000	1.98	14.20
2019	08	03	1500	0.93	11.70	2019	08	14	0300	1.93	15.30
2019	08	03	1800	0.88	11.70	2019	08	14	0600	2.04	14.20
2019	08	03	2100	0.80	10.50	2019	08	14	0900	2.09	14.20
2019	08	04	0000	0.82	11.70	2019	08	14	1200	2.03	14.20
2019	08	04	0300	0.76	11.70	2019	08	14	1500	2.05	12.50
2019	08	04	0600	0.87	12.50	2019	08	14	1800	1.75	14.20
2019	08	04	0900	0.74	11.10	2019	08	14	2100	1.65	12.50
2019	08	04	1200	0.69	10.50	2019	08	15	0000	1.60	12.50
2019	08	04	1500	0.71	11.10	2019	08	15	0300	1.64	13.30
2019	08	04	1800	0.65	11.10	2019	08	15	0600	1.44	12.50
2019	08	04	2100	0.64	11.70	2019	08	15	0900	1.51	11.10
2019	08	05	0000	0.71	11.70	2019	08	15	1200	1.41	11.70
2019	08	05	0300	0.95	10.00	2019	08	15	1500	1.46	11.70
2019	08	05	0600	1.12	7.60	2019	08	15	1800	1.45	12.50
2019	08	05	0900	1.55	7.60	2019	08	15	2100	1.10	11.70
2019	08	05	1200	1.36	9.00	2019	08	16	0000	1.37	11.10
2019	08	05	1500	1.56	9.00	2019	08	16	0300	1.32	12.50
2019	08	05	1800	1.86	11.70	2019	08	16	0600	1.36	11.70
2019	08	05	2100	2.36	12.50	2019	08	16	0900	1.38	11.70
2019	08	06	0000	2.12	12.50	2019	08	16	1200	1.34	11.70
2019	08	06	0300	2.16	13.30	2019	08	16	1500	1.57	15.30
2019	08	06	0600	2.27	12.50	2019	08	16	1800	1.62	14.20
2019	08	06	0900	1.92	13.30	2019	08	16	2100	1.78	14.20
2019	08	06	1200	2.12	12.50	2019	08	17	0000	1.78	15.30
2019	08	06	1500	1.88	11.10	2019	08	17	0300	1.81	15.30
2019	08	06	1800	1.86	12.50	2019	08	17	0600	1.91	15.30
2019	08	06	2100	1.70	11.10	2019	08	17	0900	1.70	14.20
2019	08	07	0000	1.80	11.70	2019	08	17	1200	1.42	13.30
2019	08	07	0300	1.59	11.10	2019	08	17	1500	1.40	14.20
2019	08	07	0600	1.52	11.70	2019	08	17	1800	1.62	14.20
2019	08	07	0900	1.60	11.70	2019	08	17	2100	1.51	15.30
2019	08	07	1200	2.54	7.10	2019	08	18	0000	1.54	14.20
2019	08	07	1500	2.98	10.50	2019	08	18	0300	1.30	11.70
2019	08	07	1800	2.75	11.70	2019	08	18	0600	1.25	13.30
2019	08	07	2100	2.87	12.50	2019	08	18	0900	1.22	12.50
2019	08	08	0000	3.02	13.30	2019	08	18	1200	1.21	13.30
2019	08	08	0300	2.67	14.20	2019	08	18	1500	1.11	13.30
2019	08	08	0600	2.68	13.30	2019	08	18	1800	1.09	12.50
2019	08	08	0900	2.46	12.50	2019	08	18	2100	1.05	13.30
2019	08	08	1200	2.42	11.10	2019	08	19	0000	0.98	11.70
2019	08	08	1500	2.24	11.70	2019	08	19	0300	1.00	10.50
2019	08	08	1800	1.92	12.50	2019	08	19	0600	1.18	12.50
2019	08	08	2100	1.71	11.70	2019	08	19	0900	1.06	11.70
2019	08	09	0000	1.47	11.10	2019	08	19	1200	1.10	8.30
2019	08	09	0300	1.27	10.50	2019	08	19	1500	1.13	7.10
2019	08	09	0600	1.32	10.50	2019	08	19	1800	1.14	8.30
2019	08	09	0900	1.26	10.00	2019	08	19	2100	1.17	8.30
2019	08	09	1200	1.33	9.00	2019	08	20	0000	1.29	13.30
2019	08	09	1500	1.44	9.00	2019	08	20	0300	1.41	12.50
2019	08	09	1800	1.37	10.00	2019	08	20	0600	1.52	12.50
2019	08	09	2100	1.37	10.50	2019	08	20	0900	1.46	12.50
2019	08	10	0000	1.36	10.50	2019	08	20	1200	1.30	12.50
2019	08	10	0300	1.61	10.50	2019	08	20	1500	1.25	11.70
2019	08	10	0600	1.82	10.50	2019	08	20	1800	1.24	10.50
2019	08	10	0900	2.03	13.30	2019	08	20	2100	1.33	10.50
2019	08	10	1200	1.85	13.30	2019	08	21	0000	1.08	10.50
2019	08	10	1500	1.84	13.30	2019	08	21	0300	1.18	11.10
2019	08	10	1800	1.67	14.20	2019	08	21	0600	1.10	11.10
2019	08	21	0900	1.03	11.10						
2019	08	21	1200	1.10	10.50						
2019	08	21	1500	1.29	14.20						
2019	08	21	1800	1.48	14.20						
2019	08	21	2100	1.55	13.30						
2019	08	22	0000	1.71	14.20						
2019	08	22	0300	1.46	12.50						
2019	08	22	0600	1.76	15.30						
2019	08	22	0900	1.45	14.20						
2019	08	22	1200	1.37	14.20						
2019	08	22	1500	1.40	14.20						
2019	08	22	1800	1.31	14.20						
2019	08	22	2100	1.44	13.30						
2019	08	23	0000	1.30	14.20						
2019	08	23	0300	1.34	14.20						
2019	08	23	0600	1.57	14.20						
2019	08	23	0900	1.45	13.30						
2019	08	23	1200	1.42	12.50						
2019	08	23	1500	1.24	12.50						
2019	08	23	1800	1.25	13.30						
2019	08	23	2100	1.23	13.30						
2019	08	24	0000	1.23	12.50						
2019	08	24	0300	1.23	11.70						
2019	08	24	0600	1.16	13.30						
2019	08	24	0900	1.39	12.50						
2019	08	24	1200	1.08	13.30						
2019	08	24	1500	1.31	12.50						
2019	08	24	1800	1.27	12.50						
2019	08	24	2100	1.18	12.50						
2019	08	25	0000	1.29	13.30						
2019	08	25	0300	1.30	13.30						
2019	08	25	0600	1.35	12.50						
2019	08	25	0900	1.21	13.30						
2019	08	25	1200	1.30	14.20						
2019	08	25	1500	1.36	13.30						
2019	08	25	1800	1.42	14.20						
2019	08	25	2100	1.50	14.20						
2019	08	26	0000	1.48	12.50						
2019	08	26	0300	1.57	12.50						
2019	08	26	0600	1.77	11.70						
2019	08	26	0900	1.90	13.30						
2019	08	26	1200	1.82	12.50						
2019	08	26	1500	1.67	11.70						
2019	08	26	1800	1.78	11.70						
2019	08	26	2100	1.74	13.30						
2019	08	27	0000	1.87	13.30						
2019	08	27	0300	2.03	13.30						
2019	08	27	0600	2.14	12.50						
2019	08	27	0900	2.08	13.30						
2019	08	27	1200	2.31	13.30						
2019	08	27	1500	2.25	13.30						
2019	08	27	1800	2.03	14.20						
2019	08	27	2100	2.35	14.20						
2019	08	28	00009999.999999.99								
2019	08	28	03009999.999999.99								
2019	08	28	06009999.999999.99								
2019	08	28	09009999.999999.99								
2019	08	28	12009999.999999.99								
2019	08	28	15009999.999999.99								
2019	08	28	18009999.999999.99								
2019	08	28	21009999.999999.99								
2019	08	29	0000	1.47	14.20						
2019	08	29	0300	1.68	13.30						
2019	08	29	0600	1.53	13.30						
2019	08	29	0900	1.40	11.10						
2019	08	29	1200	1.32	11.70						
2019	08	29	1500	1.47	12.50						
2019	08	29	1800	1.43	12.50						
2019	08	29	2100	1.40	11.10						
2019	08	30	0000	1.47	12.50						
2019	08	30	0300	1.47	11.70						
2019	08	30	0600	1.60	11.70						
2019	08	30	0900	1.48	11.10						
2019	08	30	1200	1.51	11.70						
2019	08	30	1500	1.68	11.10						
2019	08	30	1800	1.48	11.10						
2019	08	30	2100	1.80	12.50						
2019	08	31	0000	1.78	11.70						
2019	08	31	0300	1.78	12.50						
2019	08	31	0600	1.97	11.70						
2019	08	31	0900	1.99	11.10						
2019	08	31	1200	1.73	11.10						
2019	08	31	1500	1.64	12.50						
2019	08	31	1800	1.80	11.70						

2019	08	31	2100	1.67	11.70	2019	09	11	0900	1.04	12.50	2019	09	21	2100	1.32	12.50
2019	09	01	0000	1.54	10.50	2019	09	11	1200	0.98	13.30	2019	09	22	0000	1.43	9.00
2019	09	01	0300	1.43	11.10	2019	09	11	1500	1.03	12.50	2019	09	22	0300	1.55	10.00
2019	09	01	0600	1.36	11.10	2019	09	11	1800	1.10	12.50	2019	09	22	0600	1.63	11.70
2019	09	01	0900	1.40	11.10	2019	09	11	2100	1.01	13.30	2019	09	22	0900	1.86	11.70
2019	09	01	1200	1.25	11.10	2019	09	12	0000	1.11	13.30	2019	09	22	1200	1.90	10.50
2019	09	01	1500	1.38	11.10	2019	09	12	0300	1.06	11.70	2019	09	22	1500	1.94	12.50
2019	09	01	1800	1.51	11.10	2019	09	12	0600	1.05	12.50	2019	09	22	1800	1.92	10.00
2019	09	01	2100	1.54	11.10	2019	09	12	0900	1.11	11.10	2019	09	22	2100	1.79	10.50
2019	09	02	0000	1.66	11.70	2019	09	12	1200	1.36	11.10	2019	09	23	0000	1.77	14.20
2019	09	02	0300	1.67	11.70	2019	09	12	1500	1.75	10.00	2019	09	23	0300	1.50	13.30
2019	09	02	0600	1.65	13.30	2019	09	12	1800	1.92	10.00	2019	09	23	0600	1.55	13.30
2019	09	02	0900	1.56	12.50	2019	09	12	2100	1.76	10.50	2019	09	23	0900	1.47	13.30
2019	09	02	1200	1.61	12.50	2019	09	13	0000	1.62	10.00	2019	09	23	1200	1.47	13.30
2019	09	02	1500	1.59	12.50	2019	09	13	0300	1.68	11.10	2019	09	23	1500	1.28	13.30
2019	09	02	1800	1.75	11.70	2019	09	13	0600	1.53	11.70	2019	09	23	1800	1.30	13.30
2019	09	02	2100	1.57	12.50	2019	09	13	0900	1.49	11.10	2019	09	23	2100	1.30	12.50
2019	09	03	0000	1.51	13.30	2019	09	13	1200	1.26	11.10	2019	09	24	0000	1.21	11.10
2019	09	03	0300	1.35	12.50	2019	09	13	1500	1.05	11.70	2019	09	24	0300	1.28	11.70
2019	09	03	0600	1.40	12.50	2019	09	13	1800	1.04	11.70	2019	09	24	0600	1.09	12.50
2019	09	03	0900	1.17	12.50	2019	09	13	2100	0.92	11.70	2019	09	24	0900	1.09	12.50
2019	09	03	1200	1.42	11.70	2019	09	14	0000	0.84	11.70	2019	09	24	1200	1.10	11.70
2019	09	03	1500	1.24	12.50	2019	09	14	0300	0.80	10.00	2019	09	24	1500	1.15	11.70
2019	09	03	1800	1.33	11.70	2019	09	14	0600	0.82	11.10	2019	09	24	1800	1.08	12.50
2019	09	03	2100	1.17	12.50	2019	09	14	0900	0.76	10.50	2019	09	24	2100	0.96	11.70
2019	09	04	0000	1.47	11.70	2019	09	14	1200	0.68	13.30	2019	09	25	0000	0.80	11.70
2019	09	04	0300	1.46	13.30	2019	09	14	1500	0.67	12.50	2019	09	25	0300	0.73	11.10
2019	09	04	0600	1.67	12.50	2019	09	14	1800	0.67	14.20	2019	09	25	0600	0.67	11.10
2019	09	04	0900	1.58	11.70	2019	09	14	2100	1.15	14.20	2019	09	25	0900	0.68	12.50
2019	09	04	1200	1.61	12.50	2019	09	15	0000	1.57	13.30	2019	09	25	1200	0.61	12.50
2019	09	04	1500	1.50	12.50	2019	09	15	0300	1.85	13.30	2019	09	25	1500	0.64	11.70
2019	09	04	1800	1.40	11.70	2019	09	15	0600	1.61	11.70	2019	09	25	1800	0.67	14.20
2019	09	04	2100	1.57	12.50	2019	09	15	0900	1.95	12.50	2019	09	25	2100	0.63	14.20
2019	09	05	0000	1.42	11.70	2019	09	15	1200	1.69	16.60	2019	09	26	0000	0.65	11.70
2019	09	05	0300	1.31	11.70	2019	09	15	1500	2.12	16.60	2019	09	26	0300	0.63	11.10
2019	09	05	0600	1.40	11.70	2019	09	15	1800	2.30	14.20	2019	09	26	0600	0.71	13.30
2019	09	05	0900	1.27	12.50	2019	09	15	2100	2.21	14.20	2019	09	26	0900	0.72	14.20
2019	09	05	1200	1.09	11.10	2019	09	16	0000	2.18	13.30	2019	09	26	1200	0.72	13.30
2019	09	05	1500	1.00	12.50	2019	09	16	0300	1.81	15.30	2019	09	26	1500	0.75	13.30
2019	09	05	1800	1.00	10.00	2019	09	16	0600	1.79	14.20	2019	09	26	1800	0.76	13.30
2019	09	05	2100	0.93	11.70	2019	09	16	0900	1.85	12.50	2019	09	26	2100	0.63	13.30
2019	09	06	0000	0.90	11.70	2019	09	16	1200	1.90	13.30	2019	09	27	0000	0.66	13.30
2019	09	06	0300	0.81	11.10	2019	09	16	1500	1.99	12.50	2019	09	27	0300	0.64	13.30
2019	09	06	0600	0.81	11.70	2019	09	16	1800	1.70	13.30	2019	09	27	0600	0.76	12.50
2019	09	06	0900	0.68	11.70	2019	09	16	2100	1.73	11.70	2019	09	27	0900	0.67	12.50
2019	09	06	1200	0.71	11.70	2019	09	17	0000	1.52	12.50	2019	09	27	1200	0.70	13.30
2019	09	06	1500	0.65	11.10	2019	09	17	0300	1.44	12.50	2019	09	27	1500	0.72	13.30
2019	09	06	1800	0.56	11.70	2019	09	17	0600	1.32	11.70	2019	09	27	1800	0.74	11.70
2019	09	06	2100	0.49	11.70	2019	09	17	0900	1.24	11.10	2019	09	27	2100	0.78	11.70
2019	09	07	0000	0.47	10.00	2019	09	17	1200	1.20	11.70	2019	09	28	0000	0.81	11.70
2019	09	07	0300	0.42	10.50	2019	09	17	1500	1.30	11.10	2019	09	28	0300	0.83	11.70
2019	09	07	0600	0.38	11.10	2019	09	17	1800	1.23	11.10	2019	09	28	0600	0.86	11.70
2019	09	07	0900	0.37	10.50	2019	09	17	2100	1.27	11.10	2019	09	28	0900	0.83	15.30
2019	09	07	1200	0.47	10.50	2019	09	18	0000	1.06	11.10	2019	09	28	1200	0.86	15.30
2019	09	07	1500	0.36	10.50	2019	09	18	0300	0.96	11.10	2019	09	28	1500	0.83	14.20
2019	09	07	1800	0.33	11.10	2019	09	18	0600	0.85	11.10	2019	09	28	1800	0.85	14.20
2019	09	07	2100	0.42	11.10	2019	09	18	0900	0.89	10.00	2019	09	28	2100	0.82	13.30
2019	09	08	0000	0.48	10.00	2019	09	18	1200	0.84	10.00	2019	09	29	0000	0.84	13.30
2019	09	08	0300	0.59	10.50	2019	09	18	1500	0.76	9.00	2019	09	29	0300	0.79	11.10
2019	09	08	0600	0.47	10.00	2019	09	18	1800	0.77	10.50	2019	09	29	0600	0.83	12.50
2019	09	08	0900	0.58	10.00	2019	09	18	2100	0.88	10.50	2019	09	29	0900	1.02	13.30
2019	09	08	1200	0.59	10.50	2019	09	19	0000	0.68	10.50	2019	09	29	1200	1.10	10.50
2019	09	08	1500	0.62	10.00	2019	09	19	0300	0.64	10.50	2019	09	29	1500	1.36	13.30
2019	09	08	1800	0.53	10.50	2019	09	19	0600	0.76	9.00	2019	09	29	1800	1.35	12.50
2019	09	08	2100	0.64	10.00	2019	09	19	0900	0.66	10.50	2019	09	29	2100	1.12	12.50
2019	09	09	0000	0.72	10.50	2019	09	19	1200	0.78	10.00	2019	09	30	0000	1.01	11.70
2019	09	09	0300	0.84	11.70	2019	09	19	1500	0.76	9.00	2019	09	30	0300	1.13	11.10
2019	09	09	0600	0.91	12.50	2019	09	19	1800	0.74	10.00	2019	09	30	0600	1.22	11.70
2019	09	09	0900	0.96	16.60	2019	09	19	2100	0.72	10.50	2019	09	30	0900	0.97	12.50
2019	09	09	1200	1.13	15.30	2019	09	20	0000	0.72	10.50	2019	09	30	1200	1.00	10.50
2019	09	09	1500	1.35	15.30	2019	09	20	0300	0.72	10.00	2019	09	30	1500	0.99	11.70
2019	09	09	1800	1.42	15.30	2019	09	20	0600	0.82	7.60	2019	09	30	1800	0.92	11.10
2019	09	09	2100	1.33	15.30	2019	09	20	0900	1.52	9.00	2019	09	30	2100	0.89	11.70
2019	09	10	0000	1.42	15.30	2019	09	20	1200	1.15	8.30	2019	10	01	0000	1.00	11.10
2019	09	10	0300	1.39	14.20	2019	09	20	1500	1.08	7.10	2019	10	01	0300	1.00	10.50
2019	09	10	0600	1.27	14.20	2019	09	20	1800	0.97	13.30	2019	10	01	0600	0.96	10.50
2019	09	10	0900	1.33	13.30	2019	09	20	2100	0.98	6.60	2019	10	01	0900	0.84	11.10
2019	09	10	1200	1.31	13.30	2019	09	21	0000	1.03	11.70	2019	10	01	1200	0.77	10.50
2019	09	10	1500	1.48	14.20	2019	09	21	0300	1.04	12.50	2019	10	01	1500	0.81	11.10
2019	09	10	1800	1.38	13.30	2019	09	21	0600	1.14	8.30	2019	10	01	1800	0.81	10.50
2019	09	10	2100	1.12	14.20	2019	09	21	0900	1.18	8.30	2019	10	01	2100	0.83	10.50
2019	09	11	0000	1.15	12.50	2019	09	21	1200	1.50	9.00	2019	10	02	0000	0.84	10.50
2019	09	11	0300	1.11	12.50	2019	09	21	1500	1.44	8.30	2019	10	02	0300	0.86	11.10
2019	09	11	0600	1.12	13.30	2019	09	21	1800	1.43	13.30	2019	10	02	0600	1.00	15.30

```
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2019 10 02 1500   0.93  13.30
2019 10 02 1800   0.86  14.20
2019 10 02 2100   0.86  12.50
2019 10 03 0000   0.82  12.50
2019 10 03 0300   0.73  12.50
2019 10 03 0600   0.77  12.50
2019 10 03 0900   0.75  12.50
2019 10 03 1200   0.74  11.70
2019 10 03 1500   0.71  11.70
2019 10 03 1800   0.81   6.20
2019 10 03 2100   0.77  11.70
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2019 10 04 06009999.999999.99
2019 10 04 09009999.999999.99
2019 10 04 12009999.999999.99
2019 10 04 15009999.999999.99
2019 10 04 18009999.999999.99
2019 10 04 21009999.999999.99
2019 10 05 0000   1.79  11.70
2019 10 05 0300   1.81  13.30
2019 10 05 0600   1.92  11.70
2019 10 05 0900   1.61  11.70
2019 10 05 1200   1.93  12.50
2019 10 05 1500   1.99  13.30
2019 10 05 1800   2.12  13.30
2019 10 05 2100   2.14  14.20
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2019 10 06 0600   1.76  14.20
2019 10 06 0900   1.67  14.20
2019 10 06 1200   1.83  13.30
2019 10 06 1500   1.81  14.20
2019 10 06 1800   1.96  14.20
2019 10 06 2100   1.70  14.20
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2019 10 07 0300   1.52  12.50
2019 10 07 0600   1.58  12.50
2019 10 07 0900   1.80  12.50
2019 10 07 1200   1.83  14.20
2019 10 07 1500   1.78  12.50
2019 10 07 1800   1.91  12.50
2019 10 07 21009999.999999.99
2019 10 08 00009999.999999.99
2019 10 08 03009999.999999.99
2019 10 08 06009999.999999.99
2019 10 08 09009999.999999.99
2019 10 08 12009999.999999.99
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2019 10 08 18009999.999999.99
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2019 10 09 00009999.999999.99
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2019 10 09 06009999.999999.99
2019 10 09 09009999.999999.99
2019 10 09 12009999.999999.99
2019 10 09 15009999.999999.99
2019 10 09 18009999.999999.99
2019 10 09 21009999.999999.99
2019 10 10 00009999.999999.99
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2019 10 11 09009999.999999.99
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2019 10 11 15009999.999999.99
2019 10 11 18009999.999999.99
2019 10 11 21009999.999999.99
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2019 10 15 06009999.999999.99
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2019 10 16 2100   1.81  12.50
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2019 10 17 0600   1.74  15.30
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2019 10 17 1500   1.78  12.50
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2019 10 18 0600   2.03  15.30
2019 10 18 0900   1.76  14.20
2019 10 18 1200   1.51  12.50
2019 10 18 1500   1.66  14.20
2019 10 18 1800   1.52  13.30
2019 10 18 2100   1.60  13.30
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2019 10 19 0600   1.81  15.30
2019 10 19 0900   1.77  15.30
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2019 10 20 0600   1.15  13.30
2019 10 20 0900   1.11  13.30
2019 10 20 1200   1.01  11.10
2019 10 20 1500   0.97  11.70
2019 10 20 1800   0.94  11.10
2019 10 20 2100   0.96  11.10
2019 10 21 0000   1.02  12.50
2019 10 21 0300   1.08  10.50
2019 10 21 0600   1.14  10.00
2019 10 21 0900   1.33  10.00
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2019 10 21 1500   1.72  11.70
2019 10 21 1800   1.45  12.50
2019 10 21 2100   1.62  11.70
2019 10 22 0000   1.41  10.00
2019 10 22 0300   1.22  11.70
2019 10 22 0600   1.40  11.10
2019 10 22 0900   1.18  11.10
2019 10 22 1200   1.26  10.50
2019 10 22 1500   1.06  11.10
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2019 10 22 2100   1.00  10.00
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2019 10 23 0300   0.89  10.00
2019 10 23 0600   0.87  10.50
2019 10 23 0900   0.88  10.00
2019 10 23 1200   1.09  10.00
2019 10 23 1500   0.97  10.00
2019 10 23 1800   1.01  10.00
2019 10 23 2100   1.04  10.00
2019 10 24 0000   0.99   7.60
2019 10 24 0300   0.92   7.60
2019 10 24 0600   0.88  10.00
2019 10 24 0900   0.88  10.00
2019 10 24 1200   0.80   9.00
2019 10 24 1500   0.88   9.00
2019 10 24 1800   1.22  10.00
2019 10 24 2100   1.11   7.60
2019 10 25 0000   1.41  10.00
2019 10 25 0300   1.73  10.00
2019 10 25 0600   1.78  11.10
2019 10 25 0900   1.47  11.10
2019 10 25 1200   1.48  11.70
2019 10 25 1500   1.38  13.30
2019 10 25 1800   1.25  12.50
2019 10 25 2100   1.39  11.70
2019 10 26 0000   1.50  12.50
2019 10 26 0300   1.47  12.50
2019 10 26 0600   1.46  13.30
2019 10 26 0900   1.17  11.70
2019 10 26 1200   1.26  12.50
2019 10 26 1500   1.18  11.70
2019 10 26 1800   1.21  13.30
2019 10 26 2100   1.21  12.50
2019 10 27 0000   1.35  11.70
2019 10 27 0300   1.64  12.50
2019 10 27 0600   1.60  12.50
2019 10 27 0900   1.68  12.50
2019 10 27 1200   1.91  11.70
2019 10 27 1500   2.36  13.30
2019 10 27 1800   2.64  12.50
2019 10 27 2100   2.02  12.50
2019 10 28 0000   1.96  11.70
2019 10 28 0300   2.25  11.70
2019 10 28 0600   2.12  10.00
2019 10 28 0900   2.41  11.10
2019 10 28 1200   2.24  12.50
2019 10 28 1500   2.65  12.50
2019 10 28 1800   2.61  12.50
2019 10 28 2100   2.44  13.30
2019 10 29 0000   2.58  11.70
2019 10 29 0300   2.53  13.30
2019 10 29 0600   2.54  12.50
2019 10 29 0900   2.49  11.70
2019 10 29 1200   2.16  11.70
2019 10 29 1500   2.24  13.30
2019 10 29 1800   1.93  13.30
2019 10 29 2100   2.16  12.50
2019 10 30 0000   2.22  12.50
2019 10 30 0300   1.75  12.50
2019 10 30 0600   1.78  13.30
2019 10 30 0900   1.79  13.30
2019 10 30 1200   1.49  12.50
2019 10 30 1500   1.42  13.30
2019 10 30 1800   1.54  11.70
2019 10 30 2100   1.64  12.50
2019 10 31 0000   1.46  11.70
2019 10 31 0300   1.33  11.70
2019 10 31 0600   1.30  11.70
2019 10 31 0900   1.20  11.70
2019 10 31 1200   1.14  11.70
2019 10 31 1500   1.20  11.10
2019 10 31 1800   1.07  10.50
2019 10 31 2100   0.99  10.50
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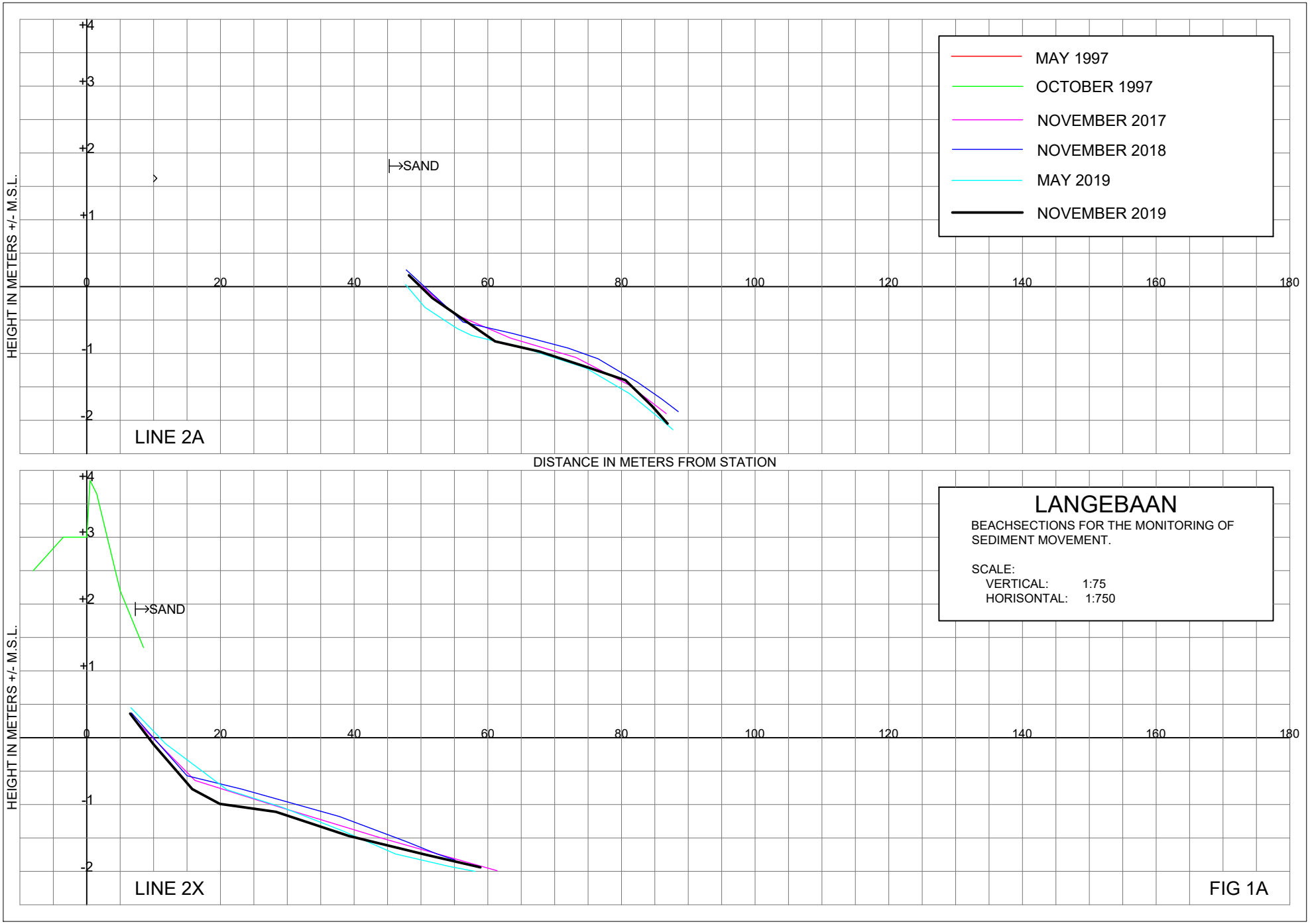
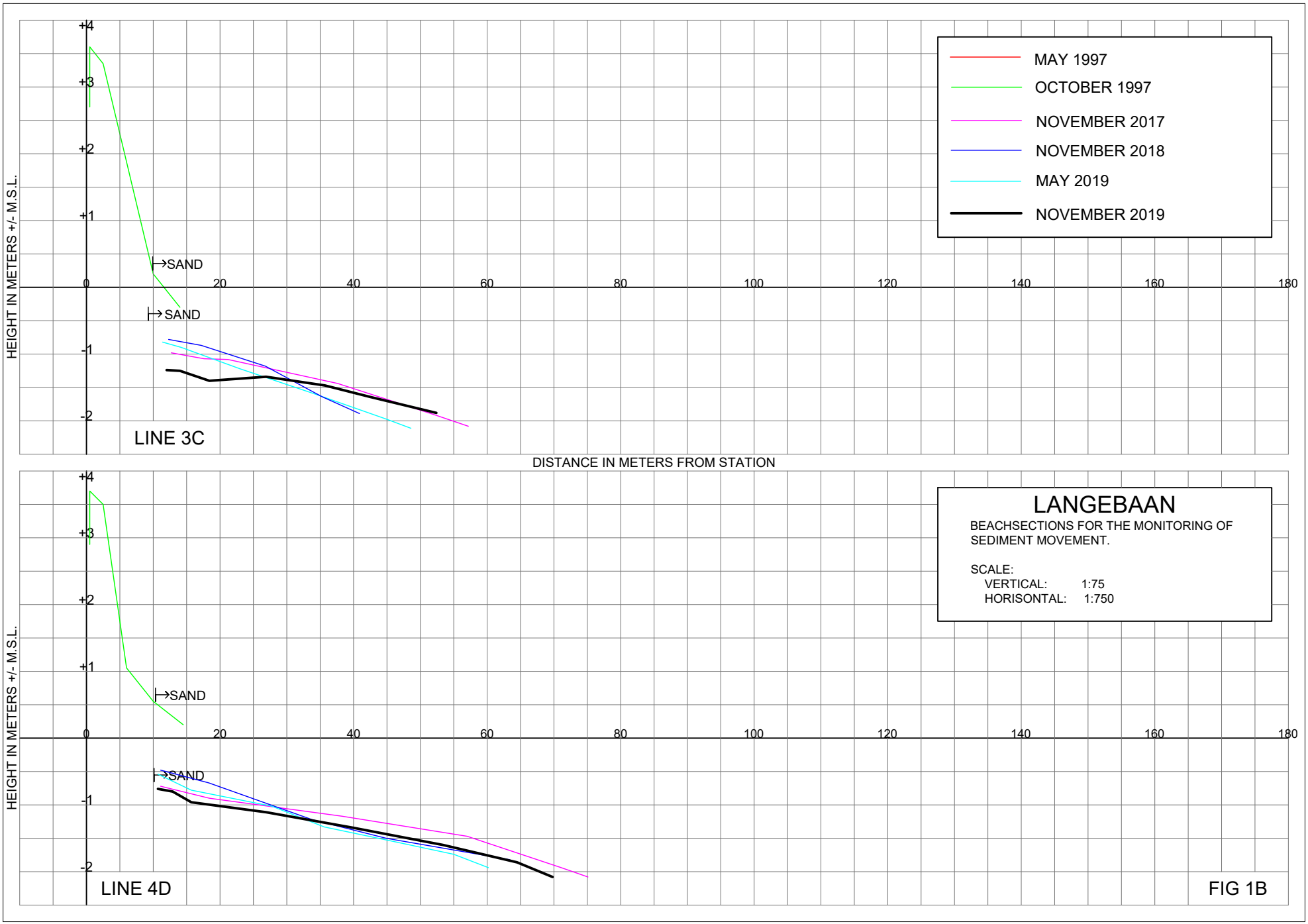


LANGEBAAN

BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.

SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750

FIG 1A

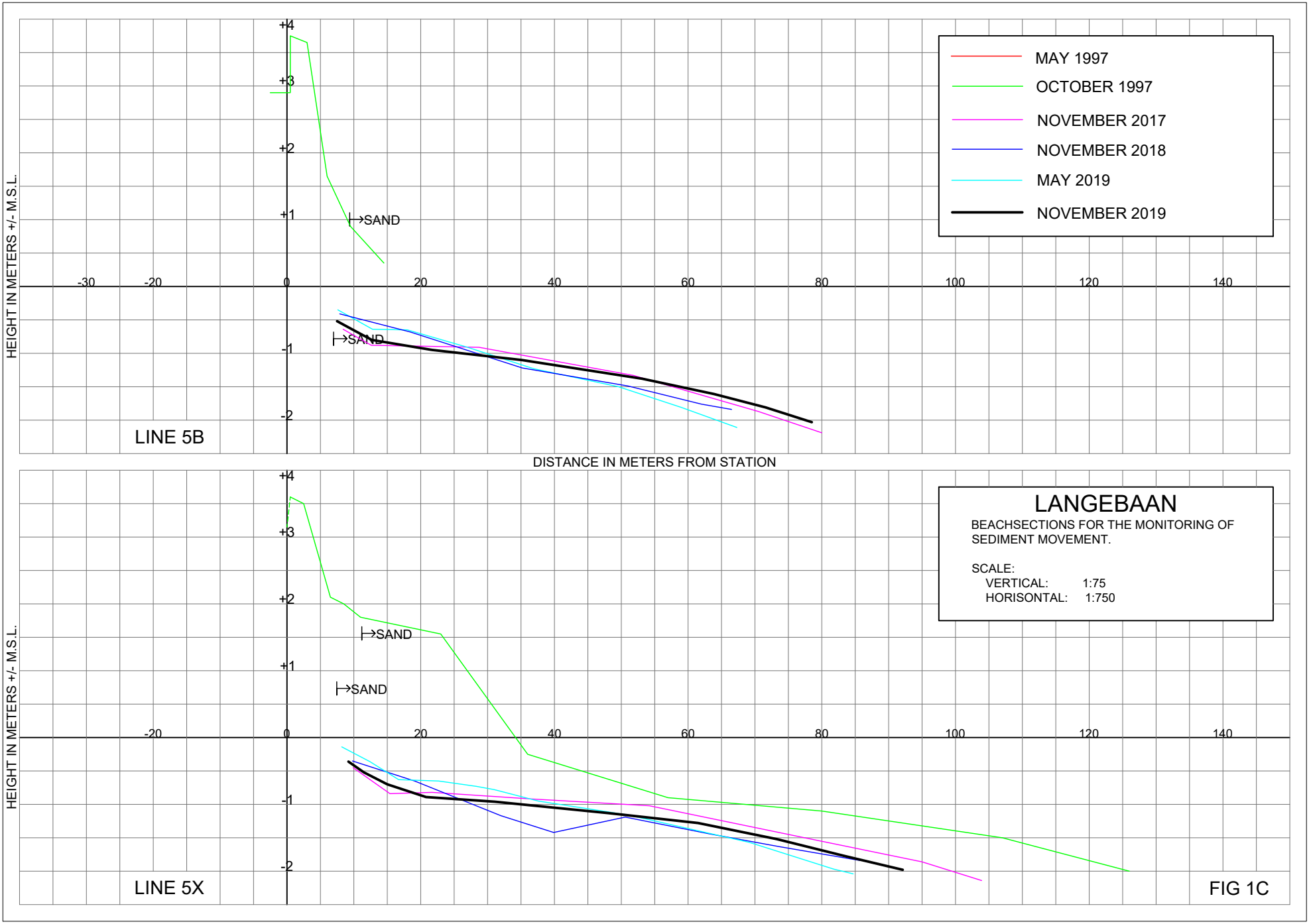


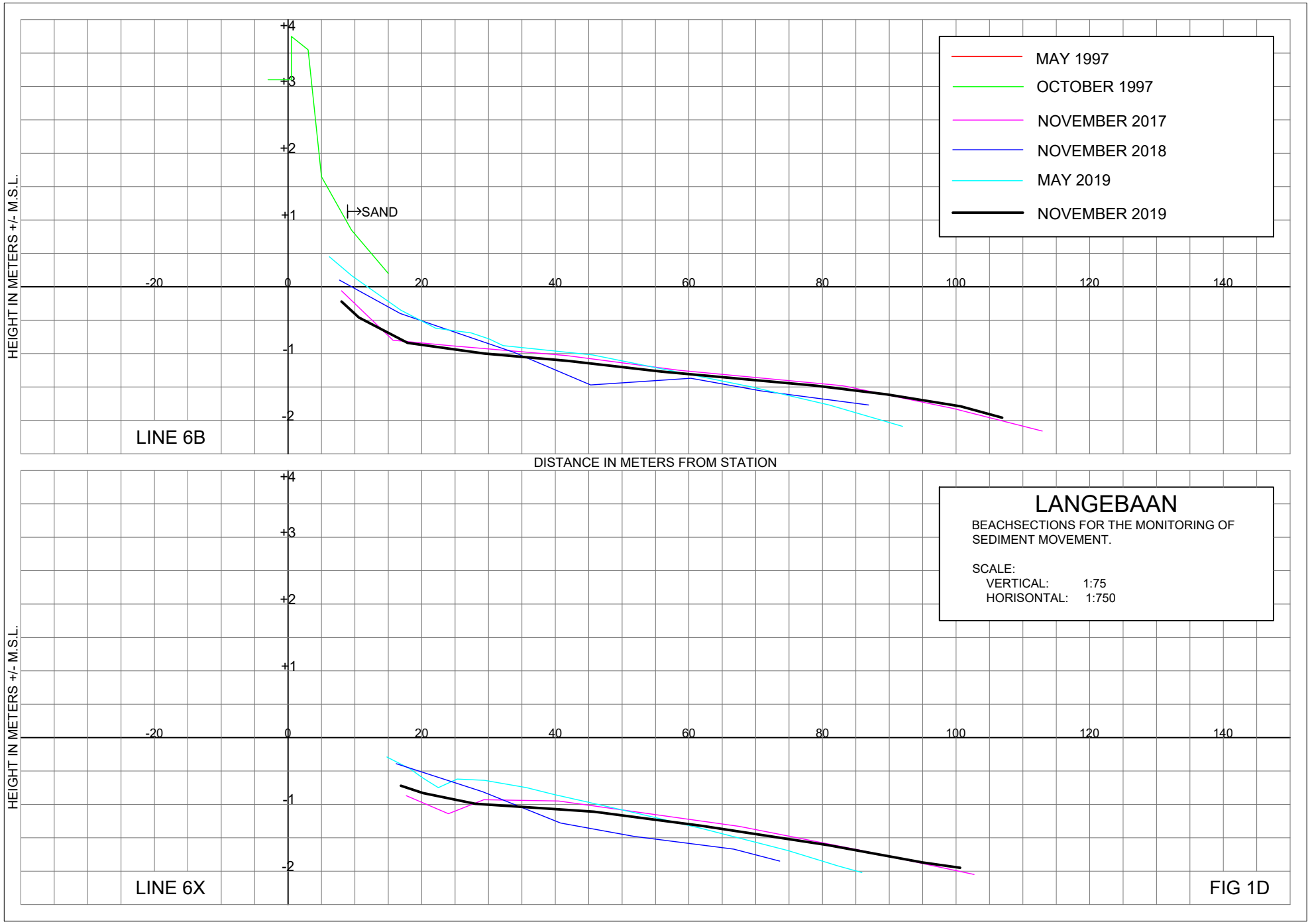
LANGEBAAN

BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.

SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750

FIG 1B


MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
HEIGHT IN METERS +/- M.S.L.
+4
+3
+2
+1
-1
-2
-30
-20
0
20
40
60
80
100
120
140
SAND
SAND
LINE 5B
DISTANCE IN METERS FROM STATION
HEIGHT IN METERS +/- M.S.L.
SAND
SAND
LINE 5X
LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750
FIG 1C


MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
HEIGHT IN METERS +/- M.S.L.
+4
+3
+2
+1
-1
-2
-20
0
20
40
60
80
100
120
140
SAND
LINE 6B
DISTANCE IN METERS FROM STATION
LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750
HEIGHT IN METERS +/- M.S.L.
LINE 6X
FIG 1D

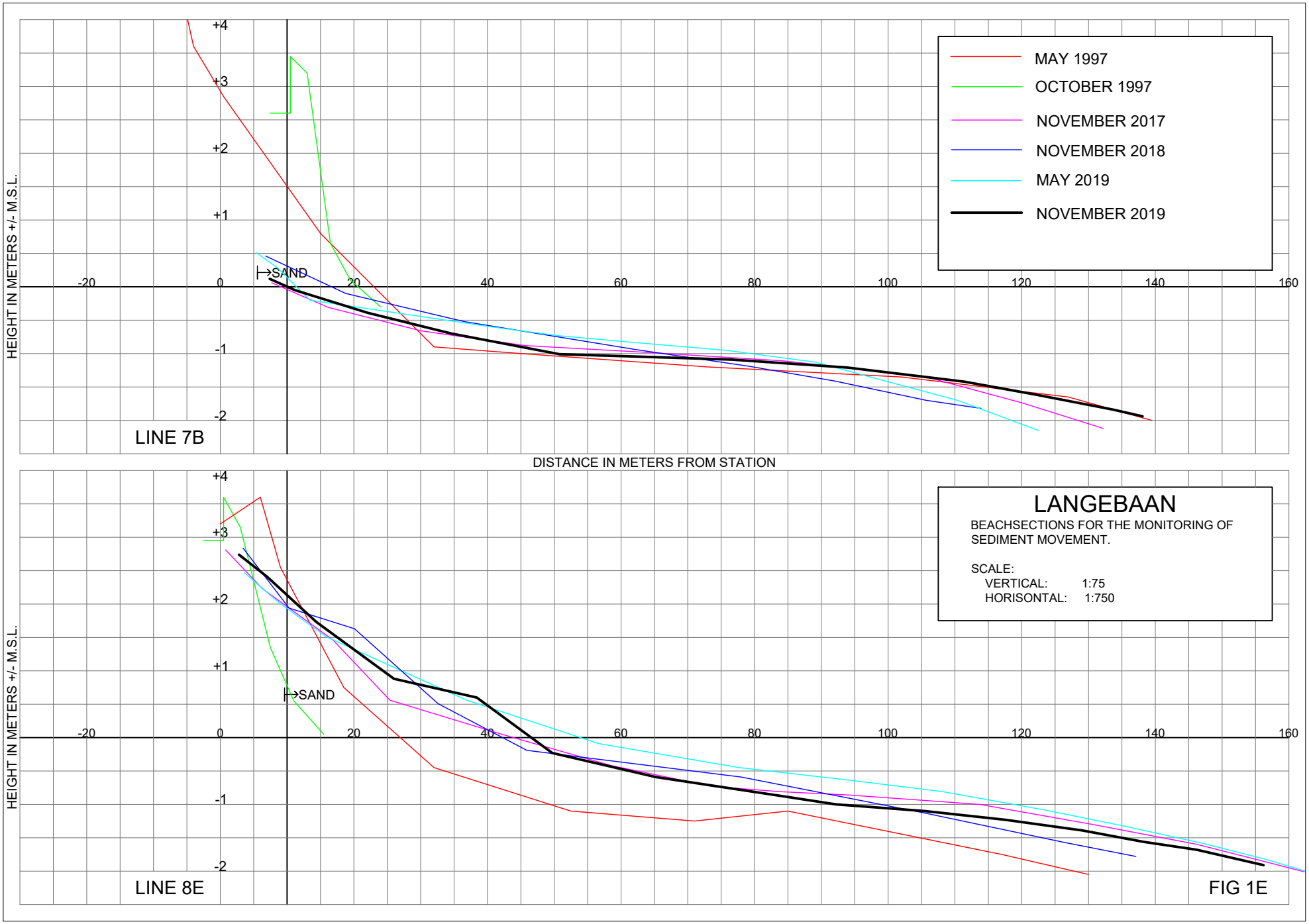
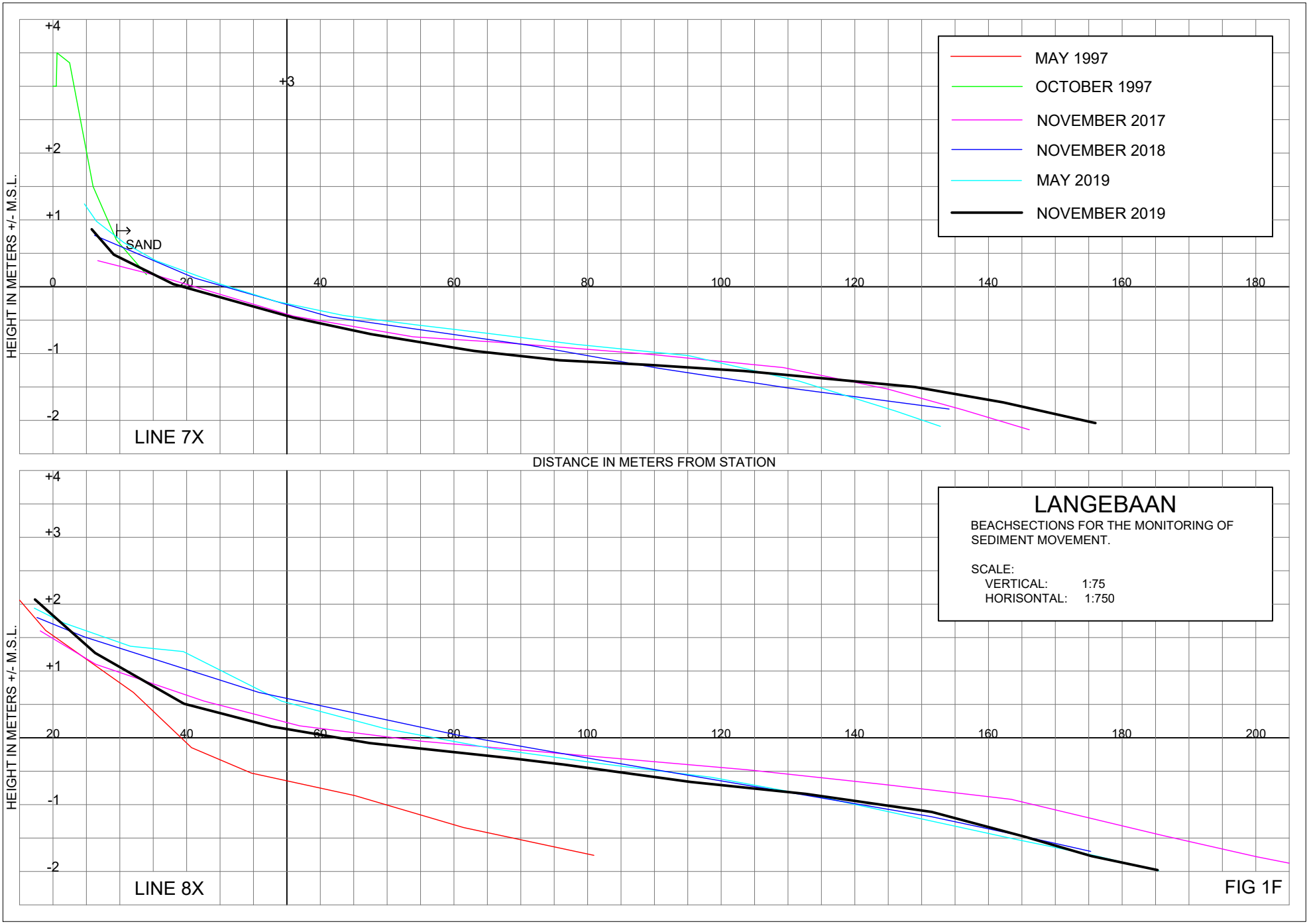
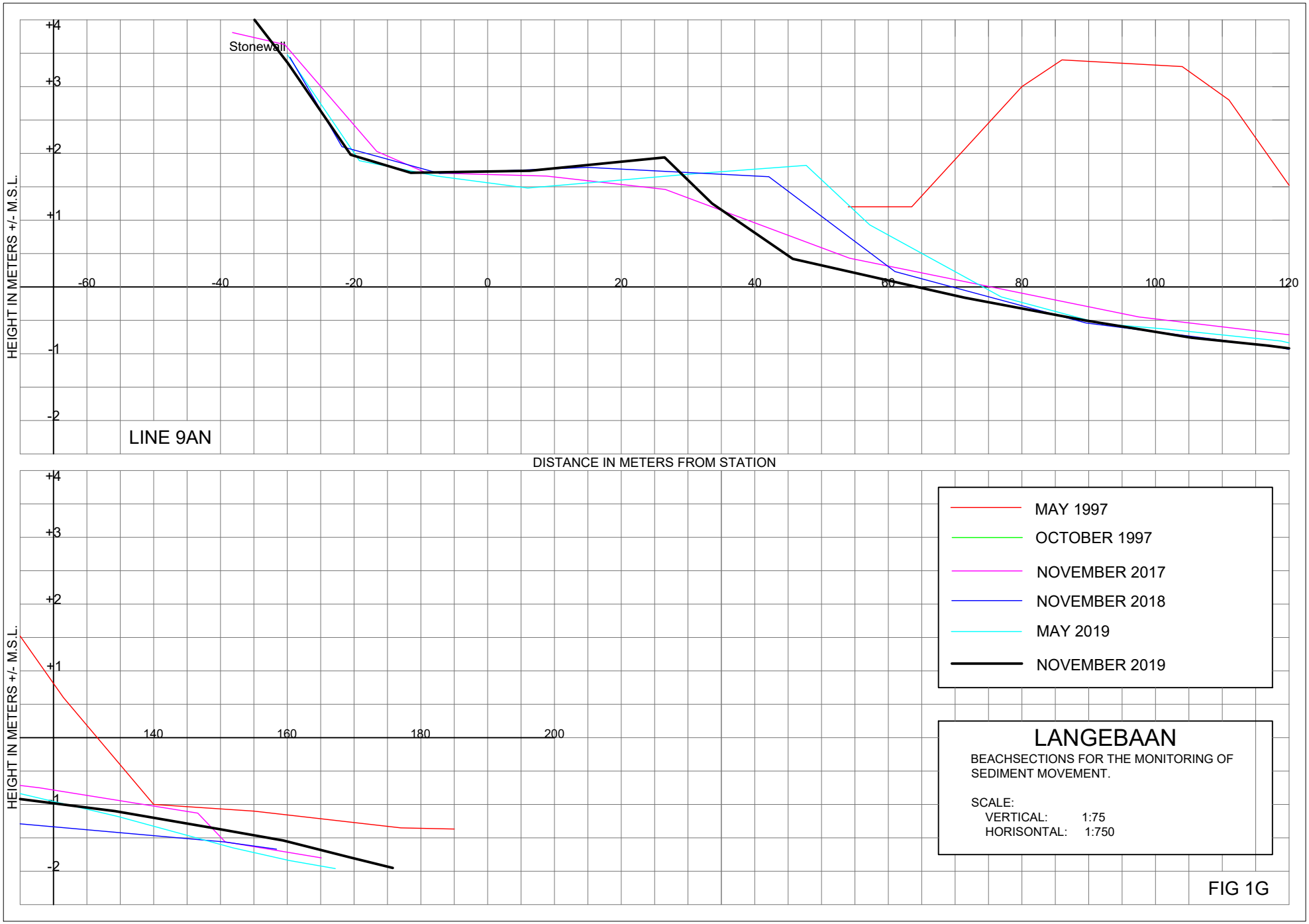
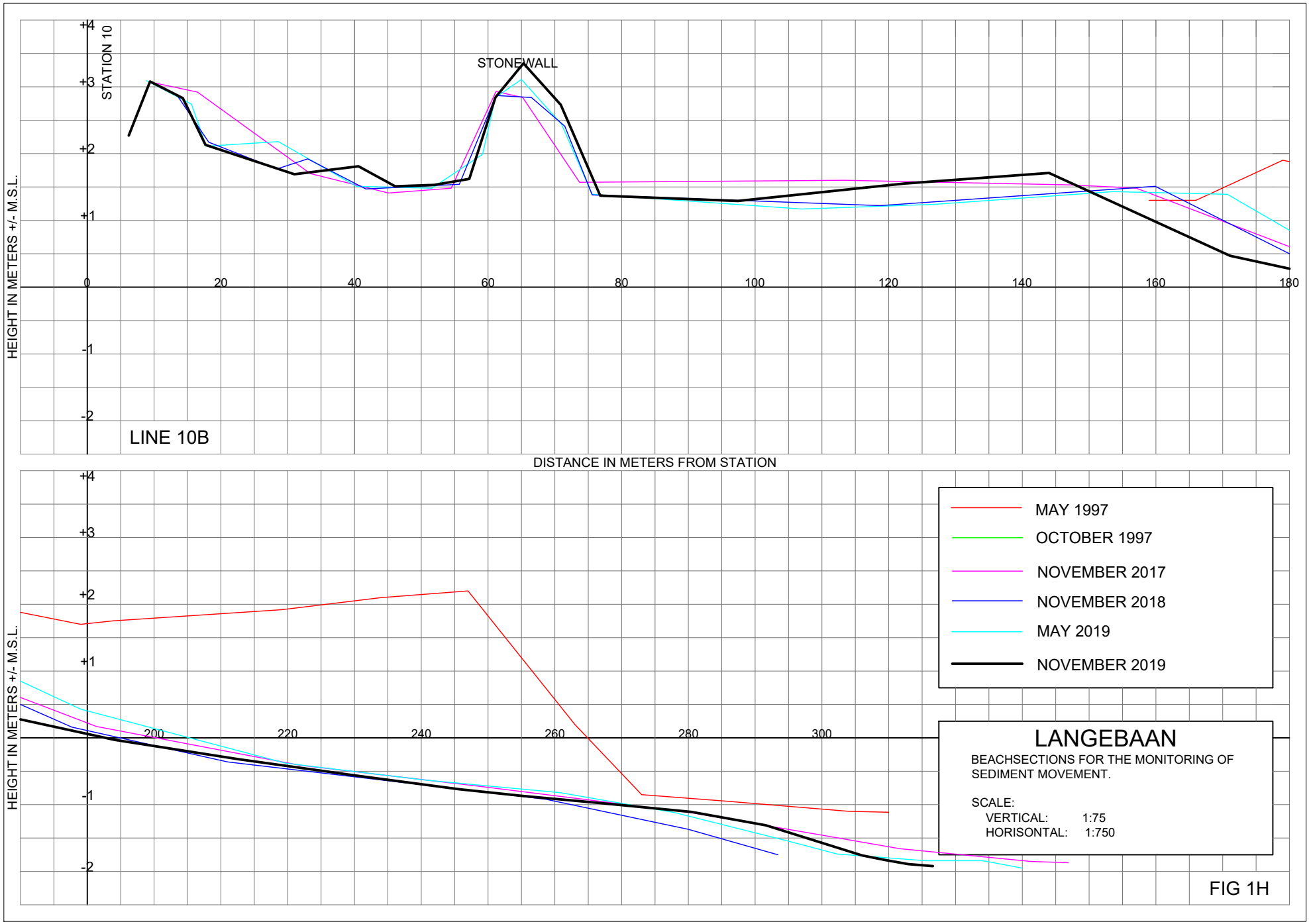
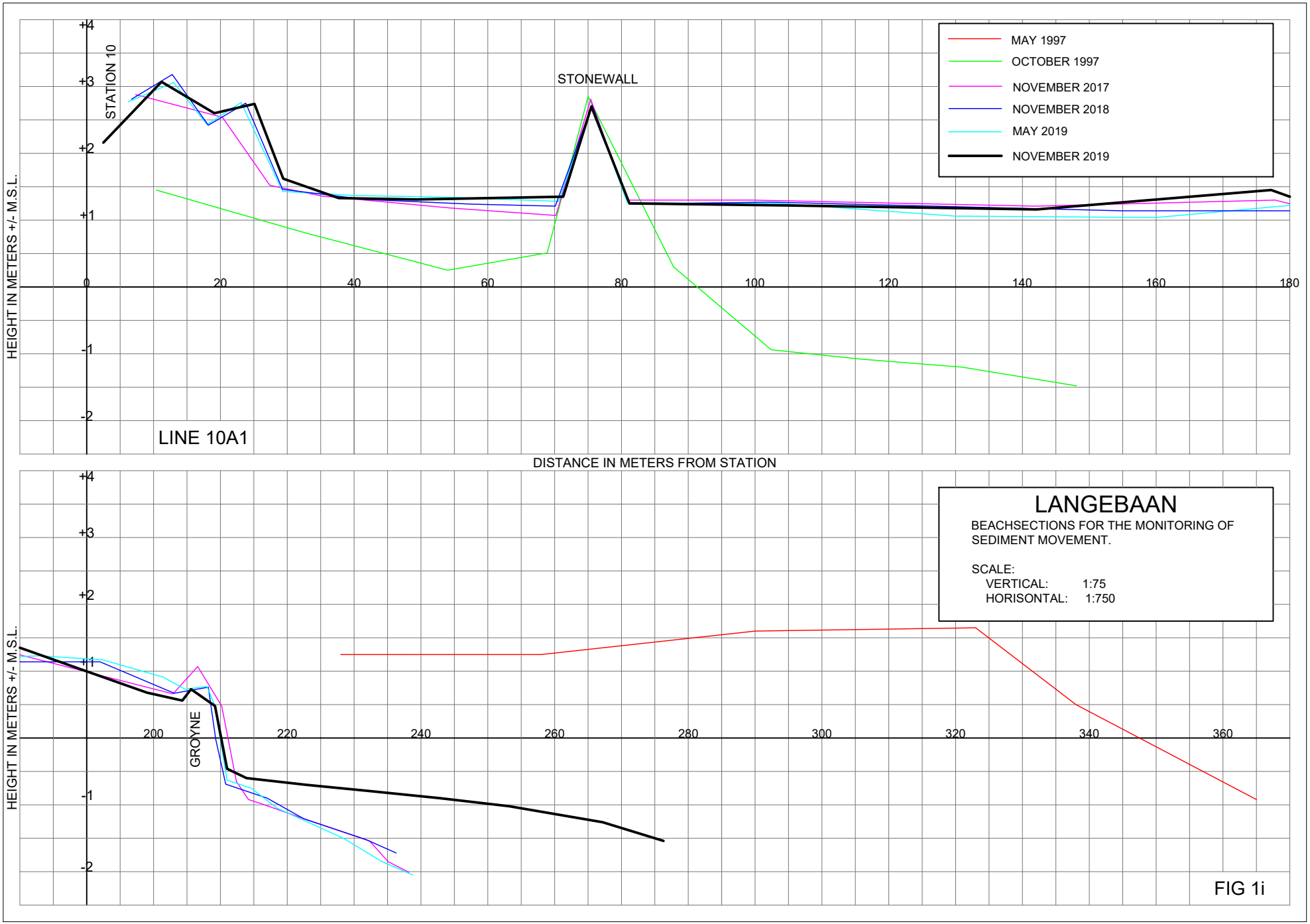

MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
HEIGHT IN METERS +/- M.S.L.
+4
+3
+2
+1
-1
-2
-20
0
20
40
60
80
100
120
140
160
SAND
LINE 7B
DISTANCE IN METERS FROM STATION
LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750
LINE 8E

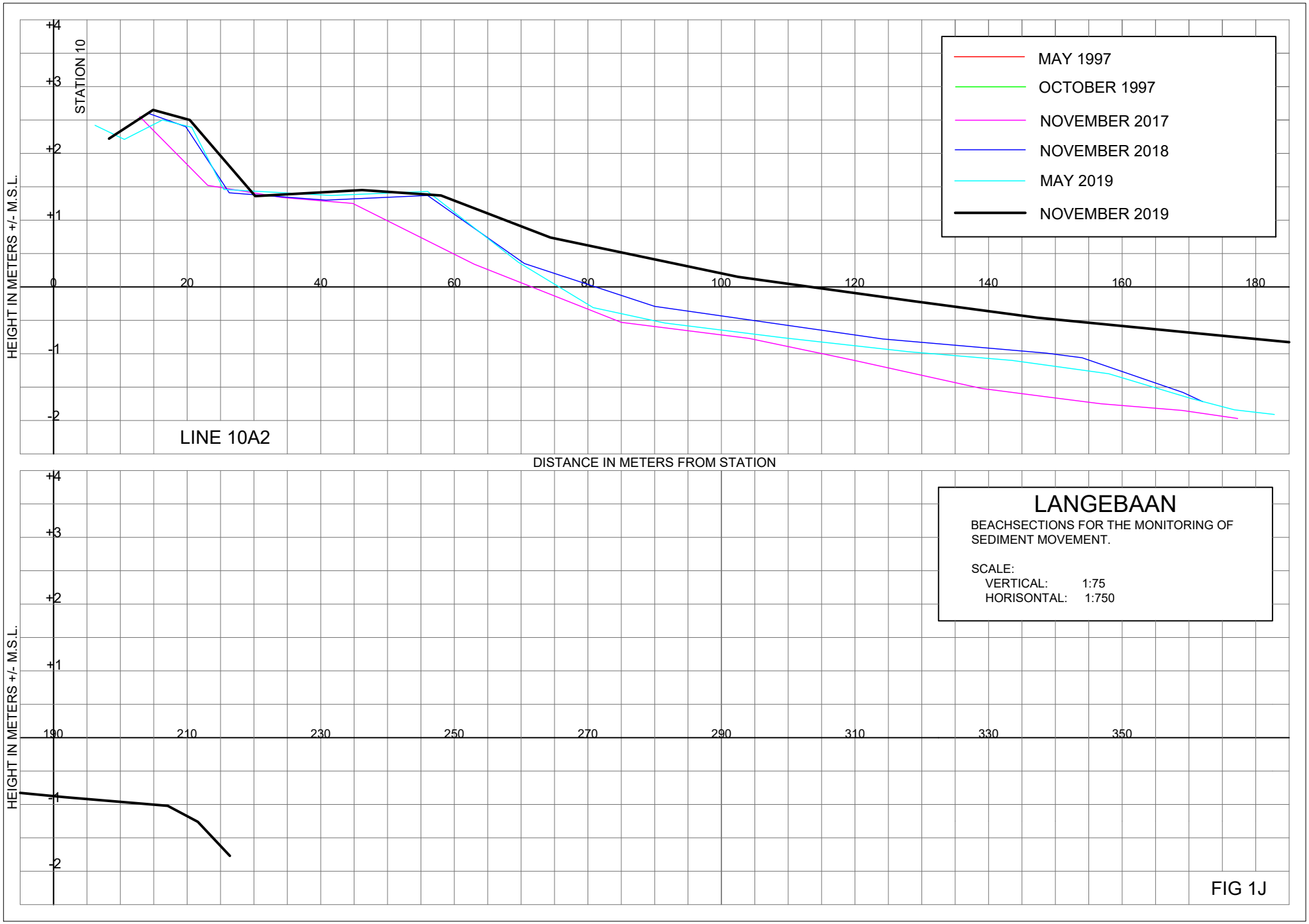
FIG 1E

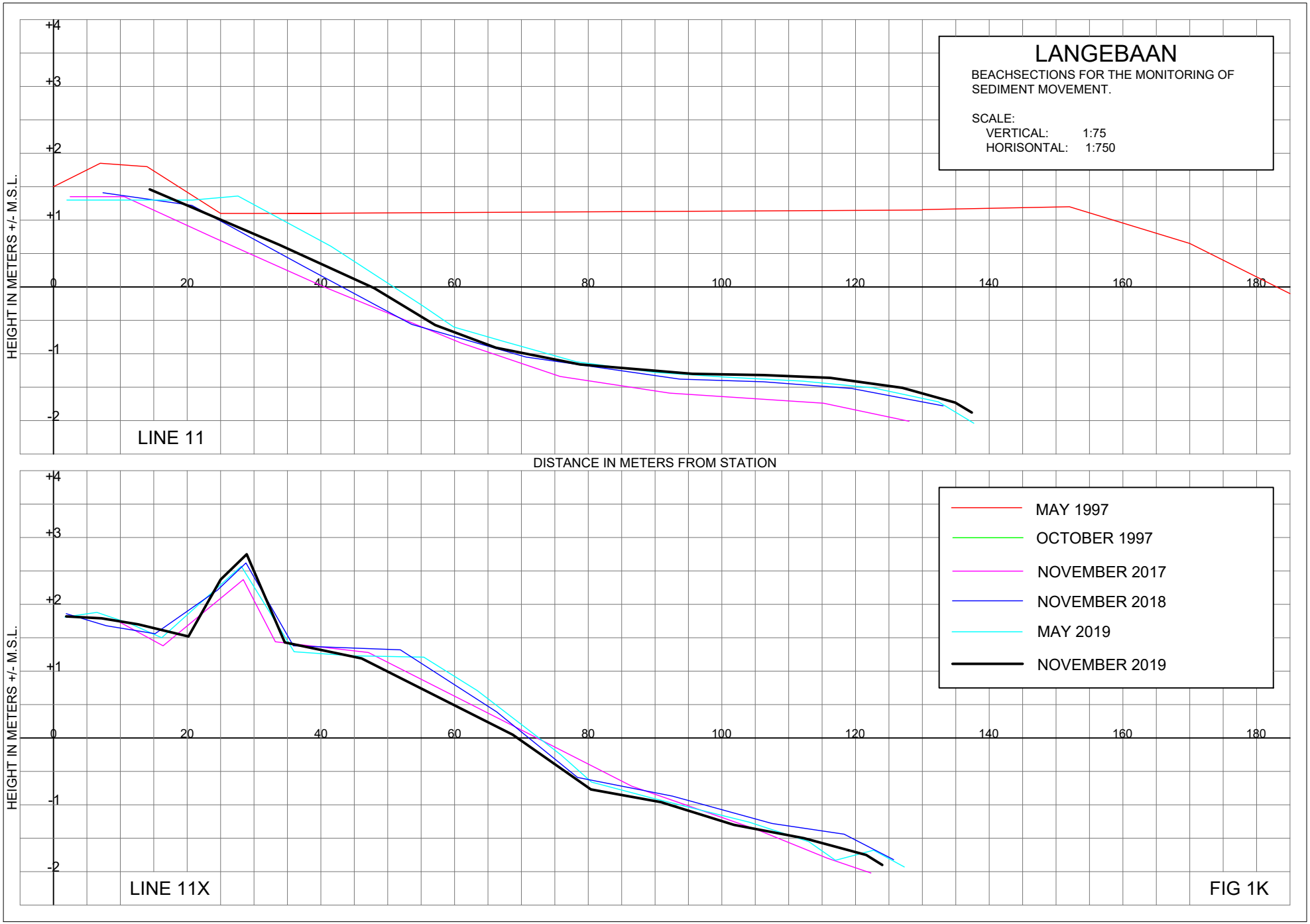

+4
+3
+2
+1
-1
-2
HEIGHT IN METERS +/- M.S.L.
SAND
0
20
40
60
80
100
120
140
160
180
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
LINE 7X
DISTANCE IN METERS FROM STATION
+4
+3
+2
+1
-1
-2
HEIGHT IN METERS +/- M.S.L.
20
40
60
80
100
120
140
160
180
200
LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750
LINE 8X
FIG 1F

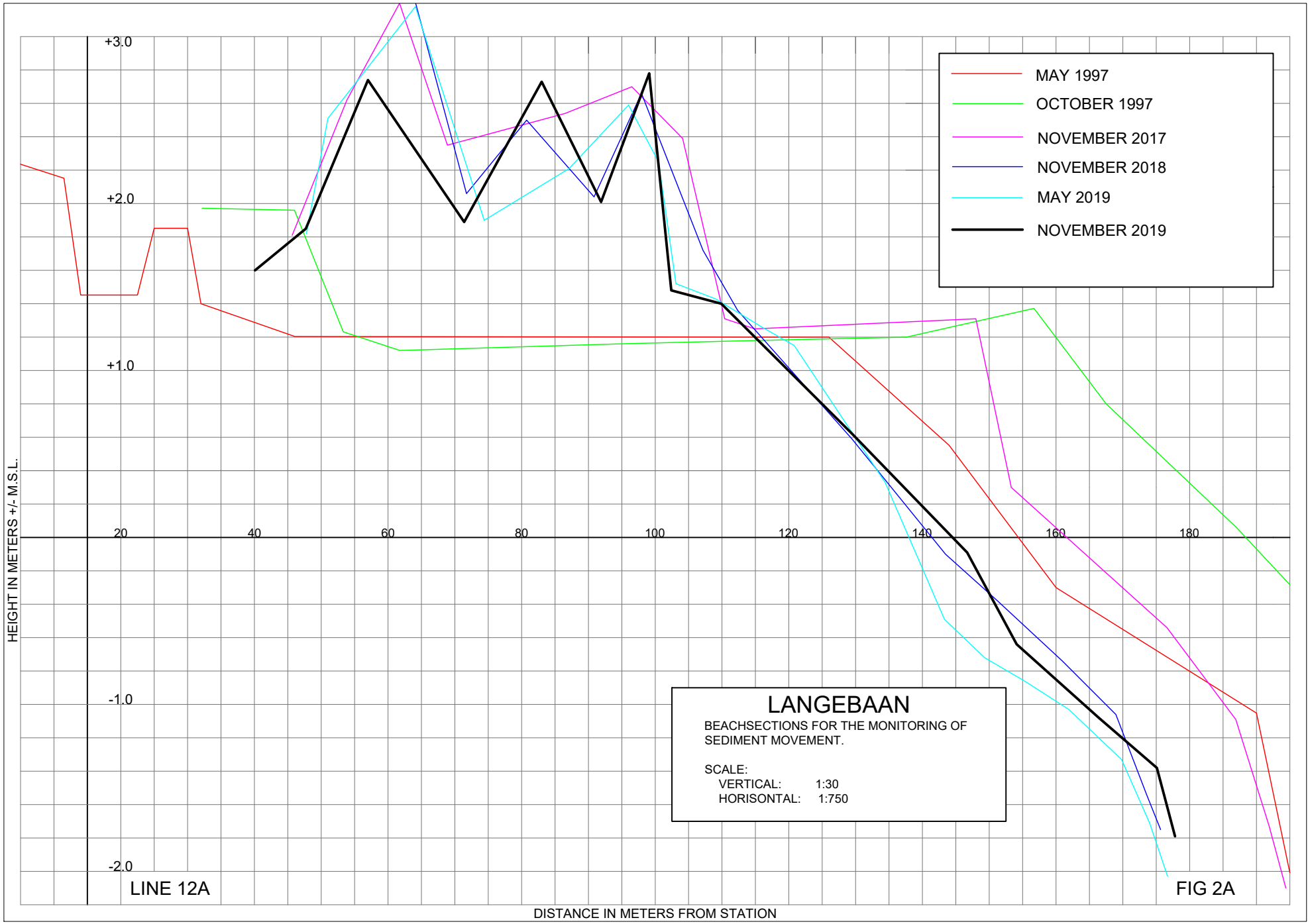

Stonewall
+4
+3
+2
+1
-1
-2
-60
-40
-20
0
20
40
60
80
100
120
HEIGHT IN METERS +/- M.S.L.
LINE 9AN
DISTANCE IN METERS FROM STATION
140
160
180
200
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750
FIG 1G

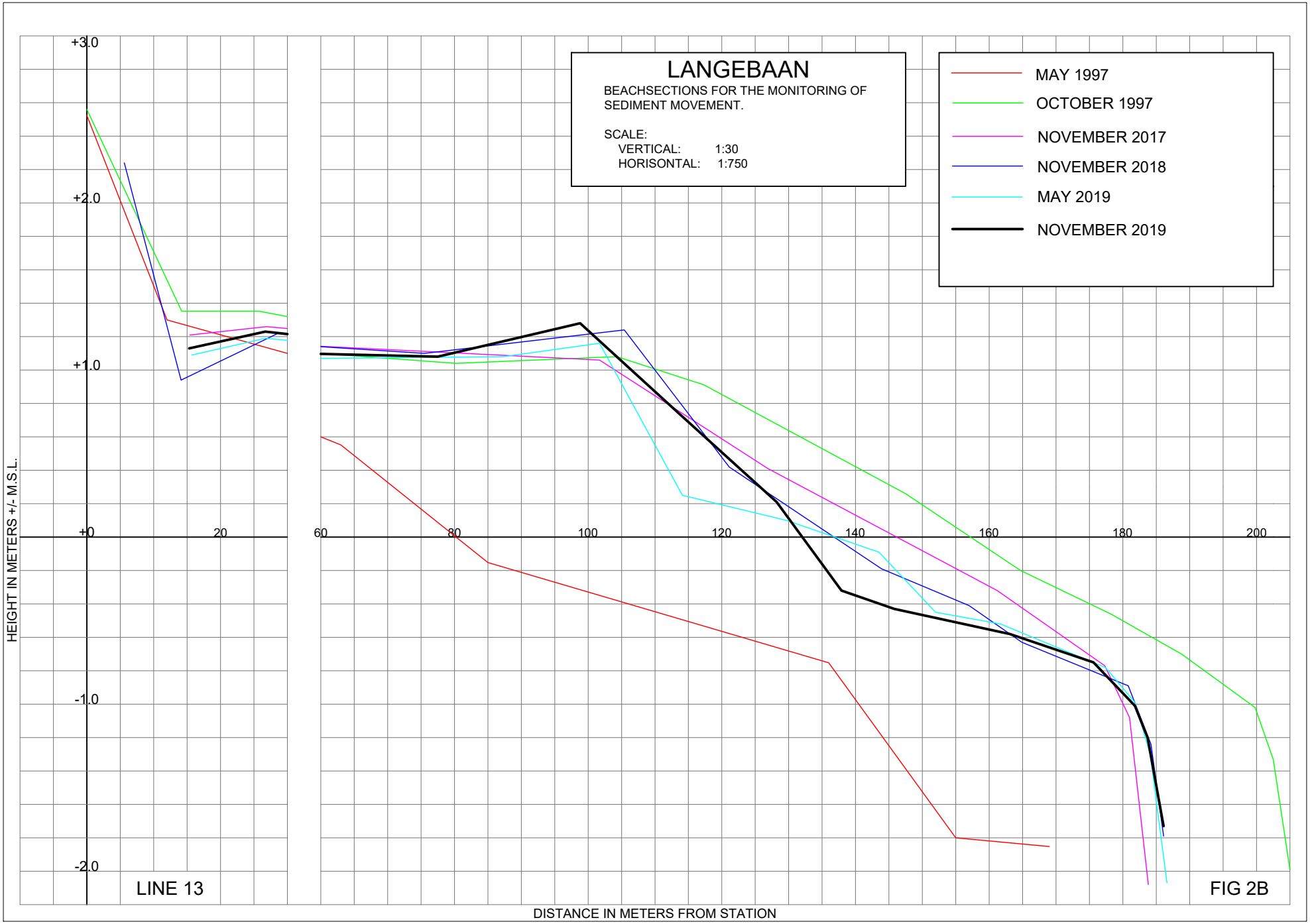

STATION 10
STONEWALL
HEIGHT IN METERS +/- M.S.L.
+4
+3
+2
+1
0
-1
-2
0
20
40
60
80
100
120
140
160
180
LINE 10B
DISTANCE IN METERS FROM STATION
200
220
240
260
280
300
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750
FIG 1H

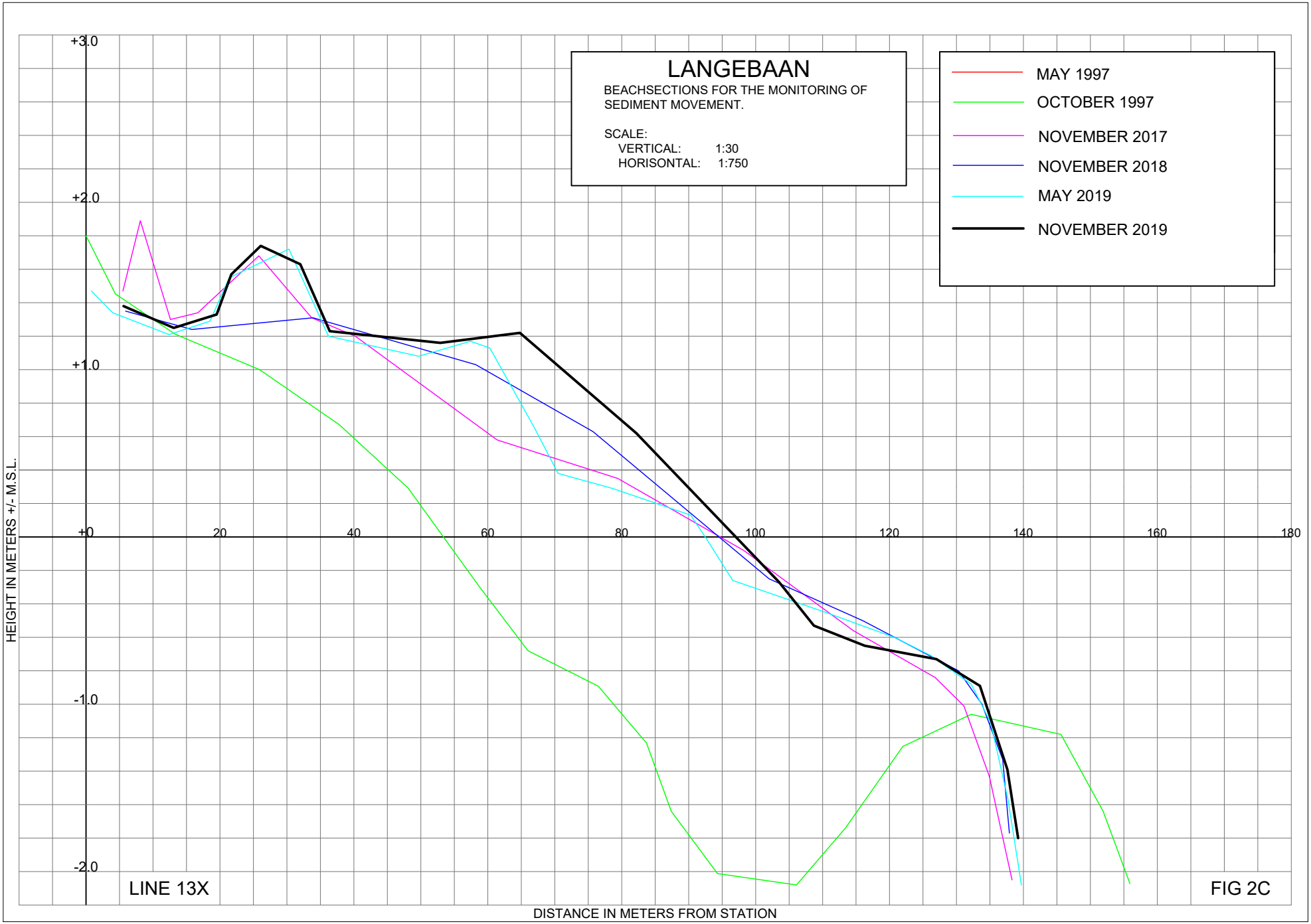

STATION 10
STONEWALL
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
HEIGHT IN METERS +/- M.S.L.
+4
+3
+2
+1
0
-1
-2
0
20
40
60
80
100
120
140
160
180
LINE 10A1
DISTANCE IN METERS FROM STATION
LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750
HEIGHT IN METERS +/- M.S.L.
GROYNE
200
220
240
260
280
300
320
340
360
FIG 1i

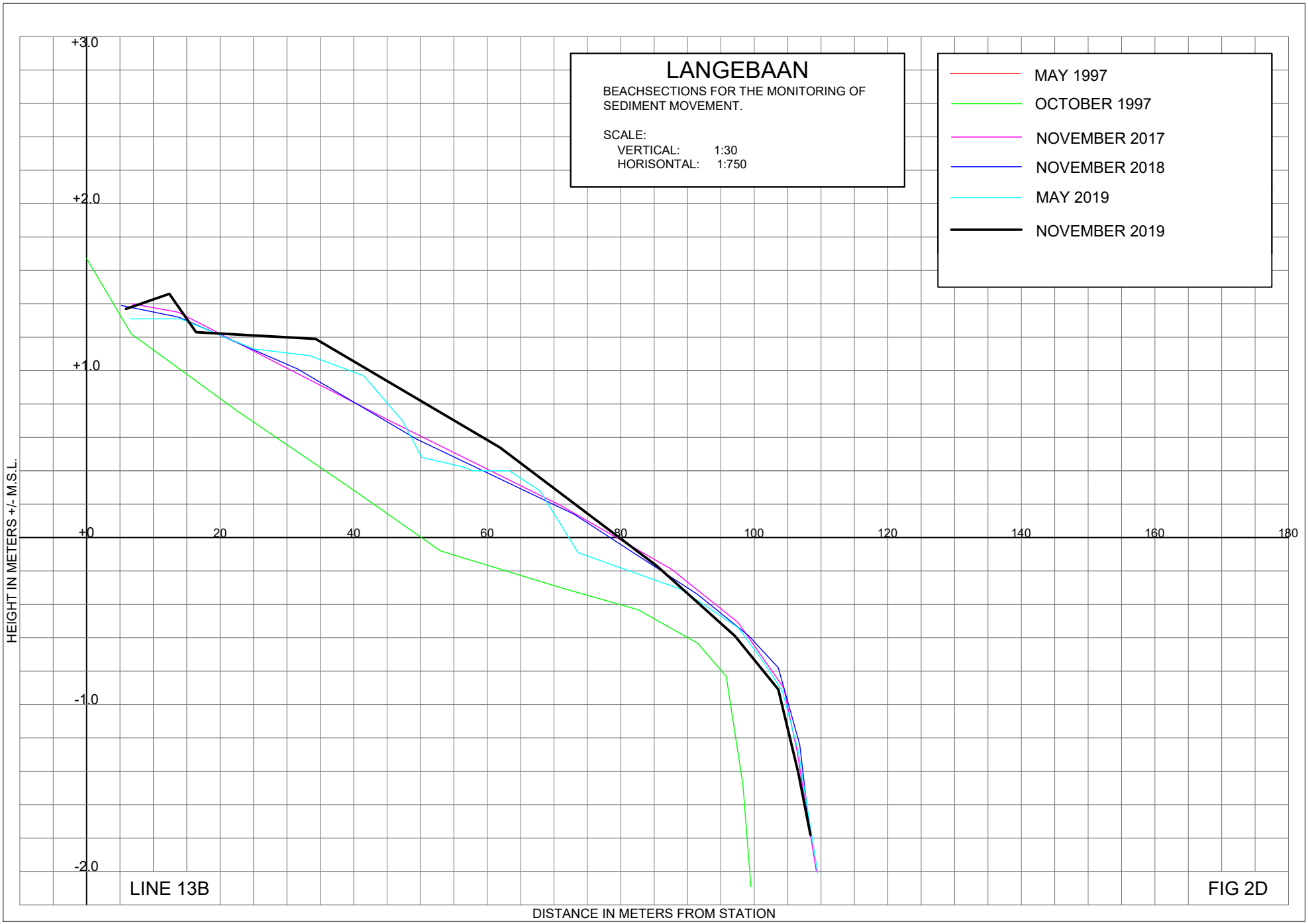

STATION 10
HEIGHT IN METERS +/- M.S.L.
+4
+3
+2
+1
0
-1
-2
20
40
60
80
100
120
140
160
180
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
LINE 10A2
DISTANCE IN METERS FROM STATION
190
210
230
250
270
290
310
330
350
LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750
FIG 1J

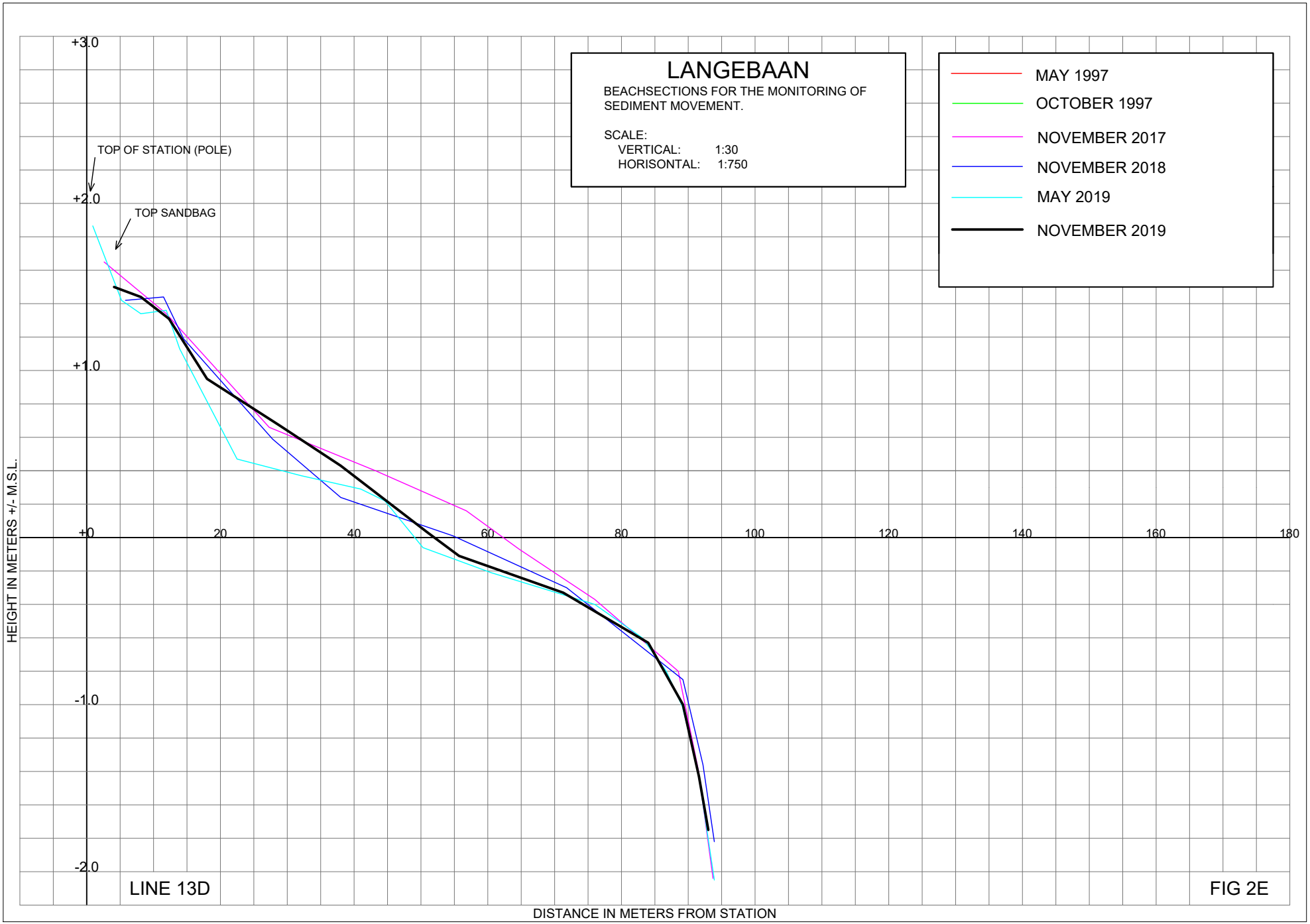

LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:75
HORISONTAL: 1:750
HEIGHT IN METERS +/- M.S.L.
+4
+3
+2
+1
0
-1
-2
20
40
60
80
100
120
140
160
180
LINE 11
DISTANCE IN METERS FROM STATION
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
LINE 11X
FIG 1K


+3.0
+2.0
+1.0
-1.0
-2.0
20
40
60
80
100
120
140
160
180
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
HEIGHT IN METERS +/- M.S.L.
DISTANCE IN METERS FROM STATION
LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:30
HORISONTAL: 1:750
LINE 12A
FIG 2A


LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:30
HORISONTAL: 1:750
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
+3.0
+2.0
+1.0
+0
-1.0
-2.0
20
60
80
100
120
140
160
180
200
HEIGHT IN METERS +/- M.S.L.
LINE 13
FIG 2B
DISTANCE IN METERS FROM STATION


LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:30
HORISONTAL: 1:750
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
+3.0
+2.0
+1.0
+0
-1.0
-2.0
20
40
60
80
100
120
140
160
180
HEIGHT IN METERS +/- M.S.L.
LINE 13X
FIG 2C
DISTANCE IN METERS FROM STATION


LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:30
HORISONTAL: 1:750
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
+3.0
+2.0
+1.0
+0
-1.0
-2.0
20
40
60
80
100
120
140
160
180
HEIGHT IN METERS +/- M.S.L.
DISTANCE IN METERS FROM STATION
LINE 13B
FIG 2D


LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:30
HORISONTAL: 1:750
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
TOP OF STATION (POLE)
TOP SANDBAG
+3.0
+2.0
+1.0
+0
-1.0
-2.0
20
40
60
80
100
120
140
160
180
HEIGHT IN METERS +/- M.S.L.
DISTANCE IN METERS FROM STATION
LINE 13D
FIG 2E

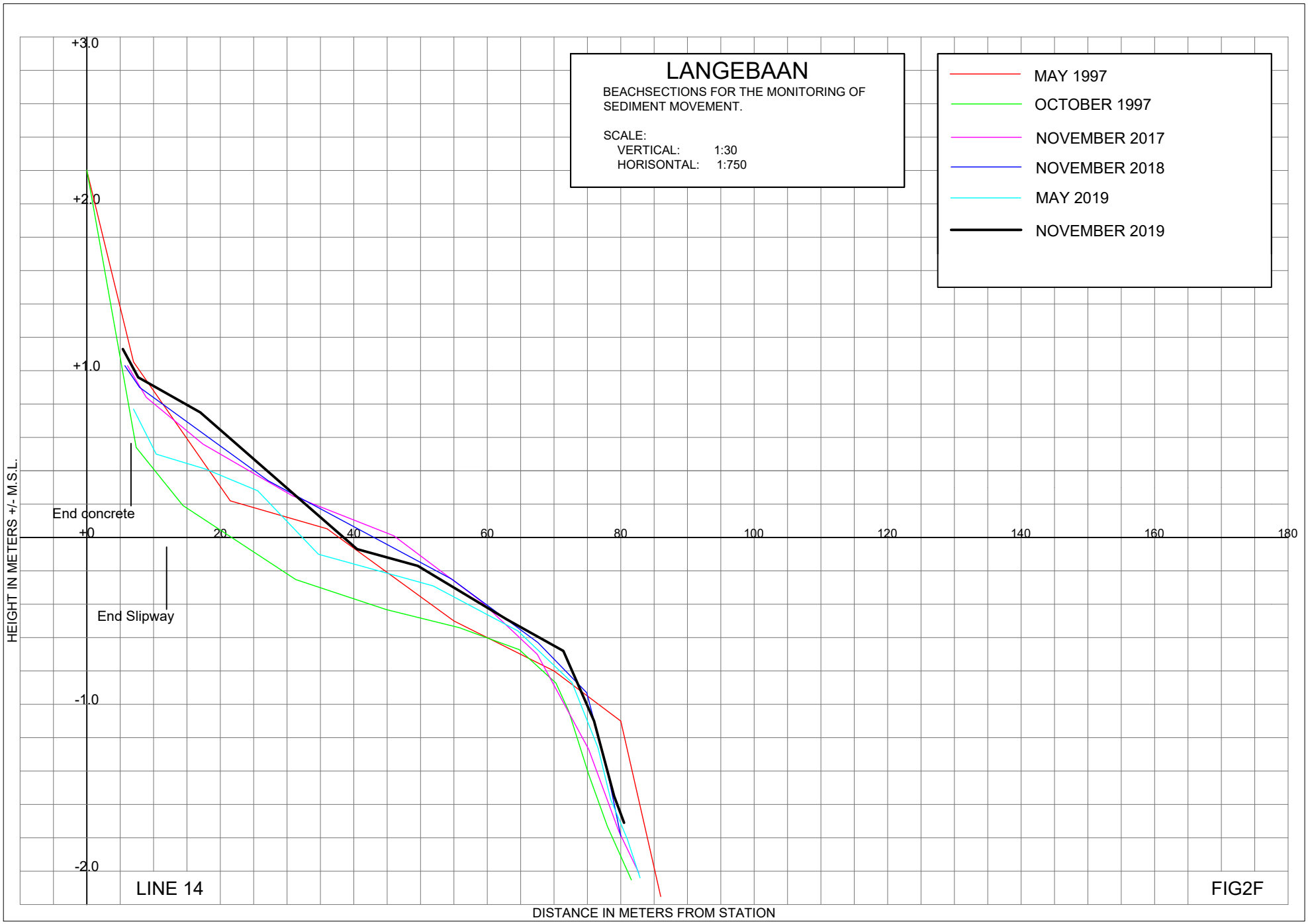

LANGEBAAN
BEACHSECTIONS FOR THE MONITORING OF SEDIMENT MOVEMENT.
SCALE:
VERTICAL: 1:30
HORISONTAL: 1:750
MAY 1997
OCTOBER 1997
NOVEMBER 2017
NOVEMBER 2018
MAY 2019
NOVEMBER 2019
+3.0
+2.0
+1.0
-1.0
-2.0
+0
20
40
60
80
100
120
140
160
180
End concrete
End Slipway
HEIGHT IN METERS +/- M.S.L.
DISTANCE IN METERS FROM STATION
LINE 14
FIG2F

FIGURE 3 Location of measure lines