Appendix 19

Meadowbank In-pit disposal thermal modelling report

Title of document: **In-Pit Tailings Deposition Thermal Modelling**

Client: **AGNICO EAGLE MINES LIMITED – MEADOWBANK MINE**

Project: **In-Pit Tailings Deposition Detailed Engineering**

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NOTICE TO READER

TABLE OF CONTENTS

1.0 Introduction 1

2.0 Geological Description 1

3.0 Existing Thermal Regime 1

4.0 Thermal Modeling 2
4.1 Model Assumptions and Limitations 6
4.2 Material Thermal Properties 6
4.3 Model Calibration 8
4.4 Thermal Modeling Analysis 14
4.4.1 General 14
4.4.2 Short-term Analysis 15
4.4.3 Long-term Analysis 15
4.5 Analysis Results 17
4.5.1 Goose Pit 17
4.5.2 Portage Pit E 19
4.5.3 Portage Pit A 19

5.0 Conclusions 20

6.0 References 21

LIST OF TABLES

Table 4-1: Material Thermal Properties 7
Table 4-2 : Applied South Cell Tailings Deposition and Closure Schedule 19

LIST OF FIGURES

Figure 4-1 : Site Plan showing thermistor location and sections analyzed 3
Figure 4-2 : Temperature Profiles - 2017 Hydrogeological Field Investigation 4
Figure 4-3: Temperature Profiles - 2017 Hydrogeological Field Investigation 5
Figure 4-4: Summary of Measured and Estimated Thermal Conductivities – IRME September 2017 7
Figure 4-5: Ground Temperature Profile from 1997 to 2005 at Borehole TP97-196 9
Figure 4-6: Ground Temperature Profile in 2015 at Borehole BG-GPIT17 10
Figure 4-7: Ground Temperature Profile in 2017 at Borehole - IPD-17-07 11
Figure 4-8: Mean Monthly Temperature (2012-2016).. 12
Figure 4-9: Calibrated and Measured Temperature Profile - Borehole BG-GPIT17......................... 13
Figure 4-10: Calibrated and Measured Ground Temperature Profile - Borehole IPD-17-07 14
Figure 4-11: Climate Change Predictions Based on Various Emission Scenarios (IPCC, AR4, 2007).. 16
Figure 4-12: Observed and projected changes in annual average surface temperature (IPCC, AR5, 2014).. 16
Figure 4-13: Projected Air Temperature (4 °C increase over a 100-year period)............................. 17
Figure 4-14 : Temperature Profile – Middle of the Pit 18

LIST OF APPENDICES

APPENDIX A: Thermal Analysis Results
APPENDIX B: Proposed Tailings Deposition Plan and Schedule

1.0 Introduction

SNC-Lavalin Inc. (SNC) has been retained by Amigo Eagle Meadowbank (AEM) to carry out the detailed engineering of in-pit tailings deposition at the Meadowbank project site. As a part of the study, a series of two dimensional (2D) ground thermal analyses were carried out for the three open pits, Goose Pit, Portage Pit E and Portage Pit A, to estimate the short-and long-term impacts of the proposed in-pit tailings deposition on the ground thermal regime and permafrost conditions. The modelling is aimed to support the hydrogeological modeling of groundwater flow at the project site. This technical note presents a summary of the ground thermal modeling analyses and results.

2.0 Geological Description

The surficial geology in the project site is dominated by discontinuous thin veneers of organic material, and glacial till, with an approximate thickness of 5.0 m, overlying bedrock. Bedrock consists predominantly of felsic-intermediate volcanic sedimentary rocks and minor intrusive rocks comprised generally of quartz and feldspar minerals (Geological Survey of Canada, Geological map of the Woodburn Lake Group in the Meadowbank area, Zaleski et al 1997a and 1999a). Post-glacial frost action shattered the exposed and near-surface bedrock over a thickness varies from 10 m to 30 m.

3.0 Existing Thermal Regime

The Meadowbank project site is located in continuous permafrost zone of Canada with a Mean Annual Ground Temperature MAGT (at a depth of zero annual amplitude) varying between -1^{0}C to -9.8^{0}C (Geological Survey of Canada, 2013). Most of the area covered by the three (3) pits were originally beneath the Second or Third Portage Lakes (see Figure 3-1) which are large and deep enough to support through talik formation in continuous permafrost. The three pits are presently bounded on the east by the current limits of the Second and Third Portage Lakes.

Mining activities at the project site including the lake dewatering, construction of the Goose Dike, East Dike, and Central Dike, Goose and Portage NAG Waste Stockpiles, and mining of the pits have affected the thermal regime of permafrost and resulted in changes in permafrost temperature and extents which would affect the groundwater regime at the project site.

In order to characterize the existing thermal regime at the project site, a review of historical thermistor data collected from 1997 to 2005, and the more recent thermistor data collected from 2010 to 2017 was carried out, a summary of which is provided in the TSFE – In-Pit Tailings Deposition Prefeasibility Study Final Report (SNC-Lavalin, 2017).

Based on the review of available data the estimated thickness of permafrost at the project site reaches up to 470 m below ground surface (bgs). The estimated depth of the active layer ranges from 1.3 m in areas with shallow overburden to 4.0 m in areas adjacent to the lakes. The active layer appears to extend to a depth of approximately 6.5 m beneath the streams connecting Third Portage and Second Portage lakes.

As part of the 2017 Hydrogeological Field Investigation and in order to determine the prevailing ground thermal regime, four (4) deep thermistors were installed in boreholes IPD-17-01, and IPD-17-02, at the East Road and boreholes IPD-17-06 and IPD-17-07 near the Goose pit to an approximate depth of 200 m below ground surface. Figure 3-1 shows the plan view of three pits and the location of thermistor stations at the project site. Figures 3-2 and 3-3 show the temperature profiles recorded in boreholes IPD-17-01, IPD-17-02, IPD-17-06 and IPD-17-07.

The data collected from boreholes IDP-17-01, IDP-17-02, and IDP-17-07 during a four-month period from July 2017 to October 2017 indicate the presence of shallow permafrost extending to depths ranging from 15 to 30 m bgs. This is generally consistent with data available from previous investigations, which suggests permafrost depths along the East Road ranging from 15 to 20 m bgs.

The data collected from borehole IDP-17-06 indicate above zero temperatures varying between 0°C to 3.5°C during a four-month period starting from July 2017. This indicates the existence of a talik zone at the southwest corner of the Goose Pit which may be as a result of conduit flow along Bay Fault.

4.0 Thermal Modeling

Thermal modeling of the effects of the proposed in-pit tailings deposition on permafrost is carried out using 2-Dimensional (2D) models based on the existing ground temperature profiles which reflect the lake dewatering and pit development histories. Changes in existing underlying permafrost is examined in both the short term corresponding to the in-pit tailings deposition period, and the long term which encompasses both mine closure and the climate change effect over a period of 100 years.

A series of Finite Element (FE) analyses are carried out by implementing an integrated thermal and seepage analyses using Temp/W from Geo-Studio (2016) developed by Geo-Slope International Inc.. The analyses account for both conductive heat transfer and convective heat transfer via groundwater flow in the models. Figures A-1-a to A-1-d in Appendix A present the configuration of the two-dimensional models developed along cross-sections GG'1, GG'2, EE', and AA' as shown in Figure 3-1, respectively, and the FEM mesh used in the analysis.

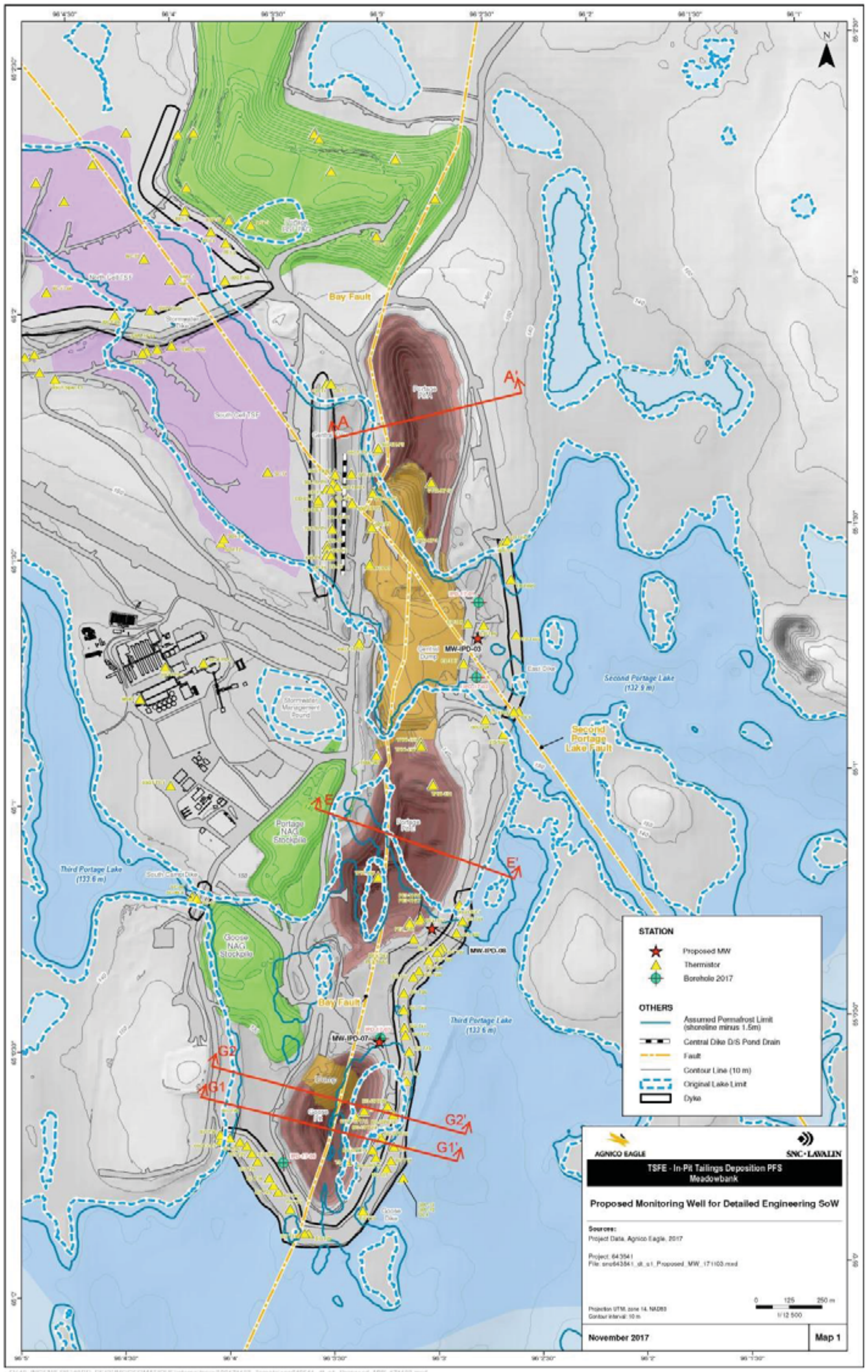
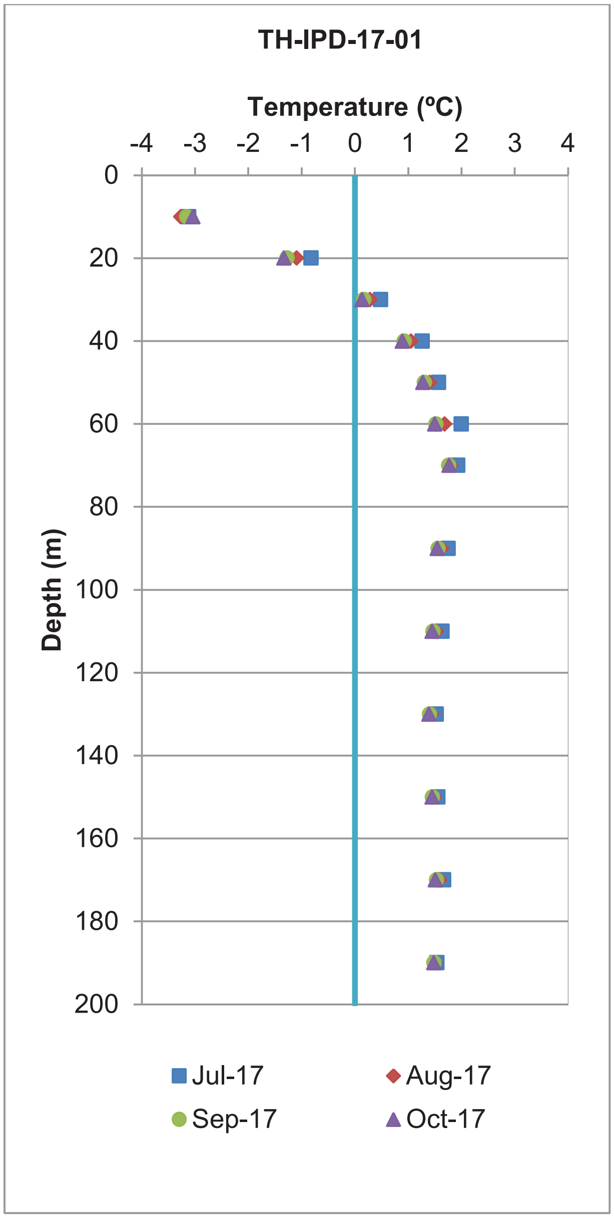


Figure 4-1 : Site Plan showing thermistor location and sections analyzed



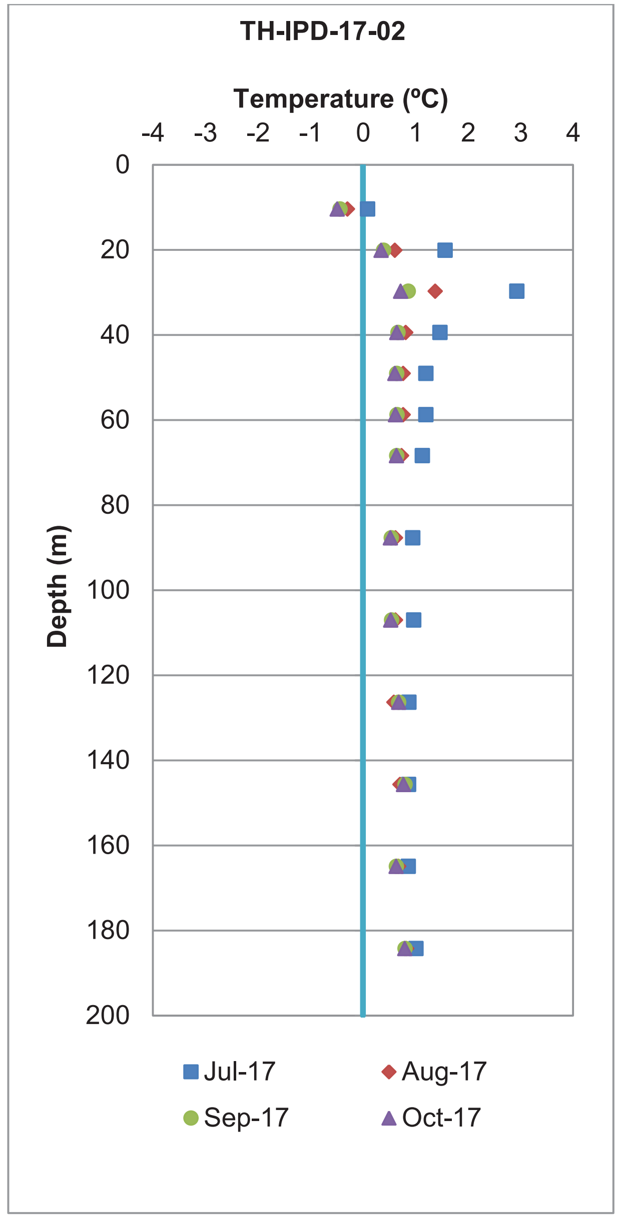
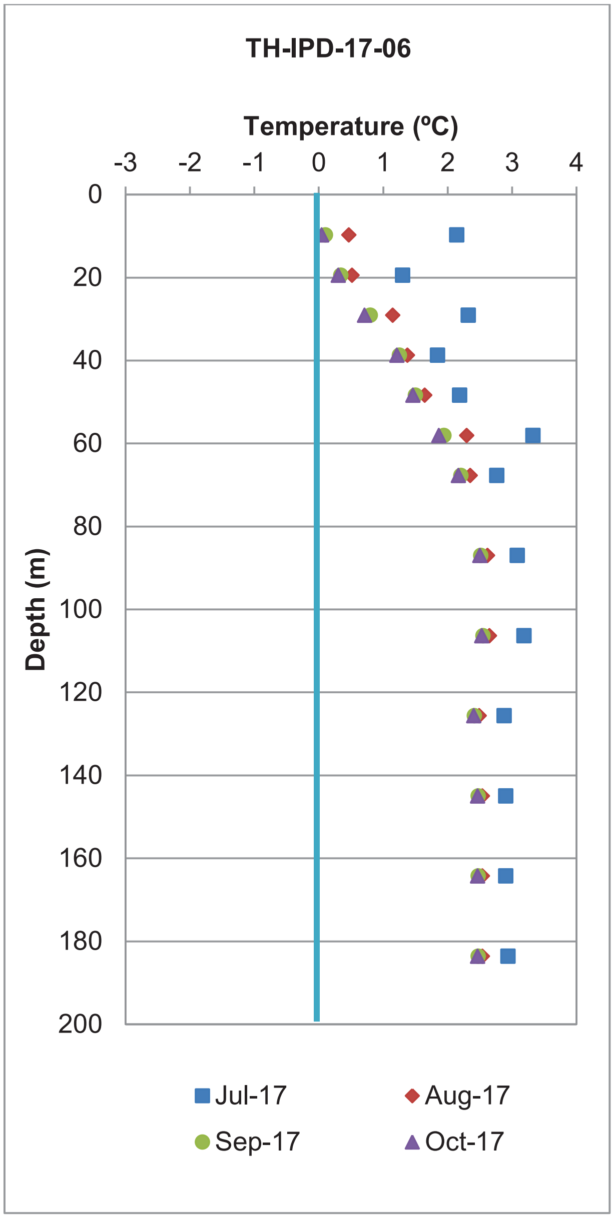


Figure 4-2 : Temperature Profiles - 2017 Hydrogeological Field Investigation



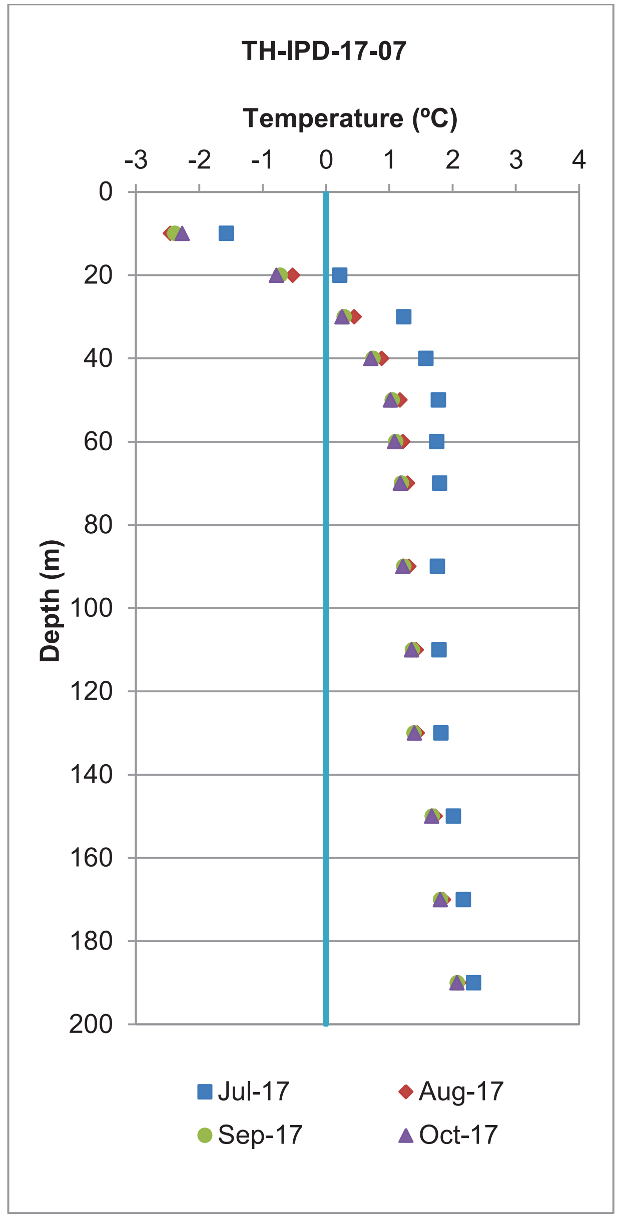


Figure 4-3: Temperature Profiles - 2017 Hydrogeological Field Investigation

4.1 Model Assumptions and Limitations

The key assumptions made for the thermal modelling are summarized below:

> The bottom of the Second and Third Portage lakes is assumed at a constant temperature of 4 °C since the two major lakes considered in the modelling support through talik zones.

> No measured tailings temperature at discharge is available. An annual average temperature of 10°C is considered a reasonable assumption considering the seasonal effects that affect the pipeline flow during winter months. Note that the assumption is confirmed by AEM through email correspondence on April 2018.

> Global warming with increase of average air temperature by 4°C over a 100 year period (IPCC AR5, 2014) is taken into account in the modeling.

> The in-pit tailings deposition occurs instantaneously at the start of each stage for modeling simplification.

> It should be noted that the permafrost variation involves three-dimensional (3D) heat conduction and convection which cannot be fully captured in two-dimensional modelling.

4.2 Material Thermal Properties

In the absence of pertinent measured data, material thermal properties for various geological units were defined based on available information from the literature (Andersland, 2004), previous studies at the project site, and reasonable assumptions.

The unfrozen and frozen saturated thermal conductivities of tailings were defined based on the results of thermal conductivity tests conducted on Meadowbank's tailings by the Research Institute on Mines and the Environment (2017), as shown in Figure 4-1.

The material properties used in the thermal analysis are summarized in Table 4-1.

Table 4-1: Material Thermal Properties

Item	Till	Bedrock	Weathered bedrock	Fault Zone	Settled Tailings
$K_{sat,\,unfrozen}$ Saturated thermal conductivity $kJ/(day\ m\ °C)$	170	211	198	201	320
$K_{sat,\,frozen}$ Saturated thermal conductivity $kJ/(day\ m\ °C)$	210	215	214	215	185
$C_{unfrozen}$ Volumetric heat capacity of overburden soil $kJ/(m^3/°C)$	2366	2028	2125	2103	3085
C_{frozen} Volumetric heat capacity of soil $kJ/(m^3/°C)$	2046	1998	2005	2003	2199
Hydraulic Conductivity $cm\ /s$	5e-4	6e-5	1e-4	6e-5	6e-8

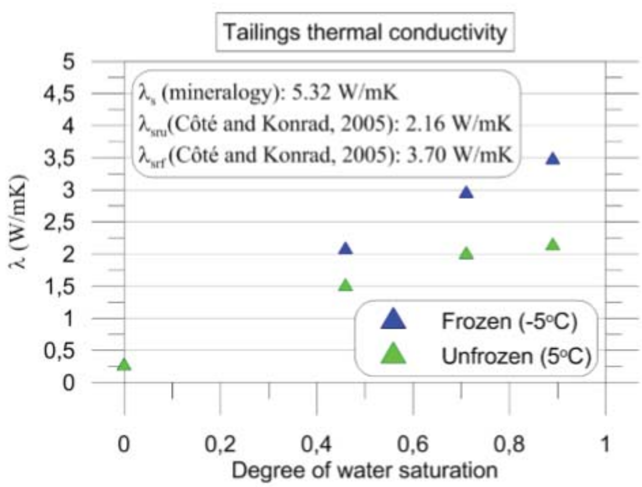


Figure 4-4: Summary of Measured and Estimated Thermal Conductivities – IRME September 2017

4.3 Model Calibration

Model calibration is required for the thermal modeling to ensure that a certain level of confidence and accuracy in model predictions is achieved. In line with this, a calibration procedure was developed the details of which are outlined below.

The numerical model is calibrated against available field data including historical thermal data at the project site. The material properties presented in Table 4-1 along with the ground thermal profiles of boreholes TP97-196, BG-GPIT17 and IPD-17-07 were used for model calibration. Figure 4-2 presents the historical ground temperature profiles along borehole TP97-196 whereas Figures 4-3 and 4-4 present more recent ground temperature profiles along boreholes BG-GPIT17 and IPD-17-07.

The numerical calibration is carried out using recent ground temperature data from years 2015 and 2017 as shown in Figures 4-3, and 4-4, respectively. The model calibration was completed based on the following:

> A transient analysis carried out for the Goose Pit from the start of pit development in 2012 to the end of pit development in 2015.

> A coupled convective heat transfer and fluid flow analysis is carried out from the end of pit development in 2015 to the start of in-pit tailings deposition in 2018. The results of the analysis from January 2015 and October 2017 were compared with the ground temperature data available from boreholes BG-GPIT17 and IPD-17-07. It is assumed that water was impounded in the pit up to elevation 54.9 m during this period.

> The air temperature used in the analysis is based on the air temperature data at the weather station CR1000_Airport close to the project site, as shown in Figure 4-5.

Figures 4-6 and 4-7 show the estimated ground temperature profile compared to measured temperature profiles along boreholes BG-GPIT17 and IPD-17-07, respectively. Figure A-2 in Appendix A illustrates the temperature contour along with the location of the sections AA' and BB' which were used in model calibration.

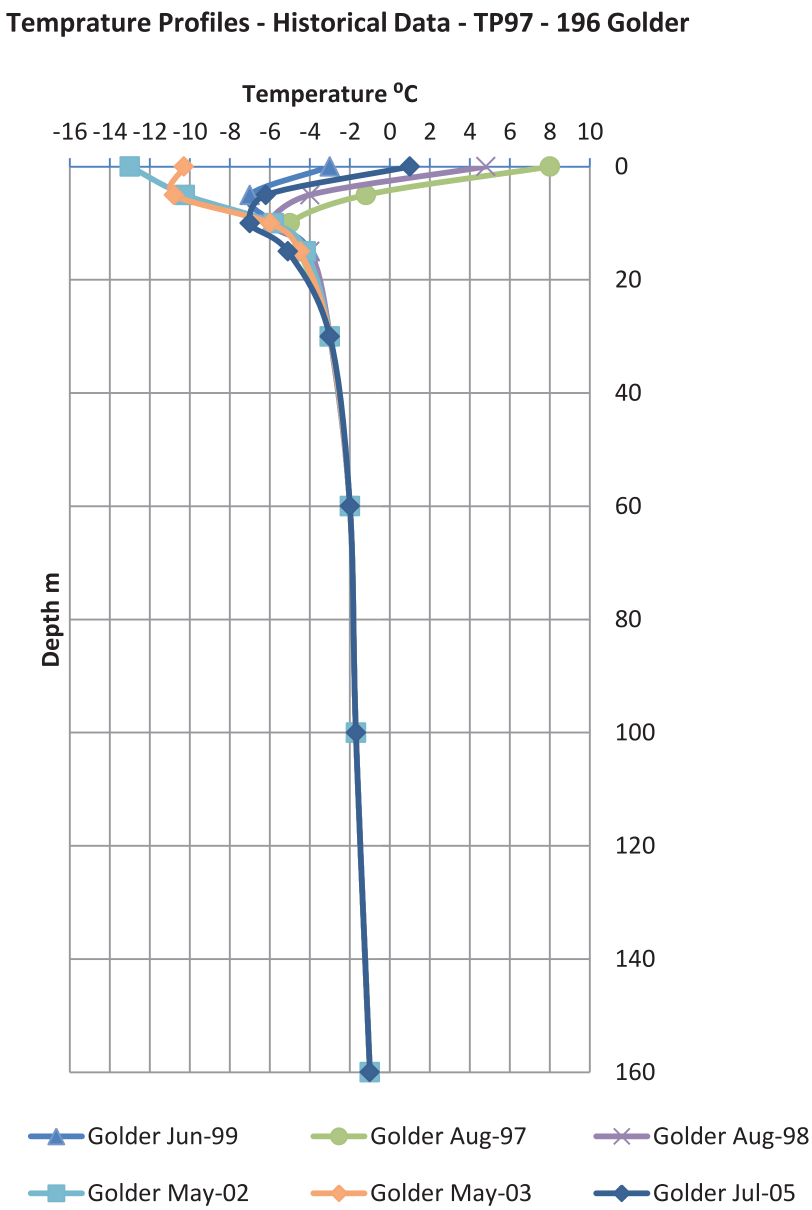


Figure 4-5: Ground Temperature Profile from 1997 to 2005 at Borehole TP97-196

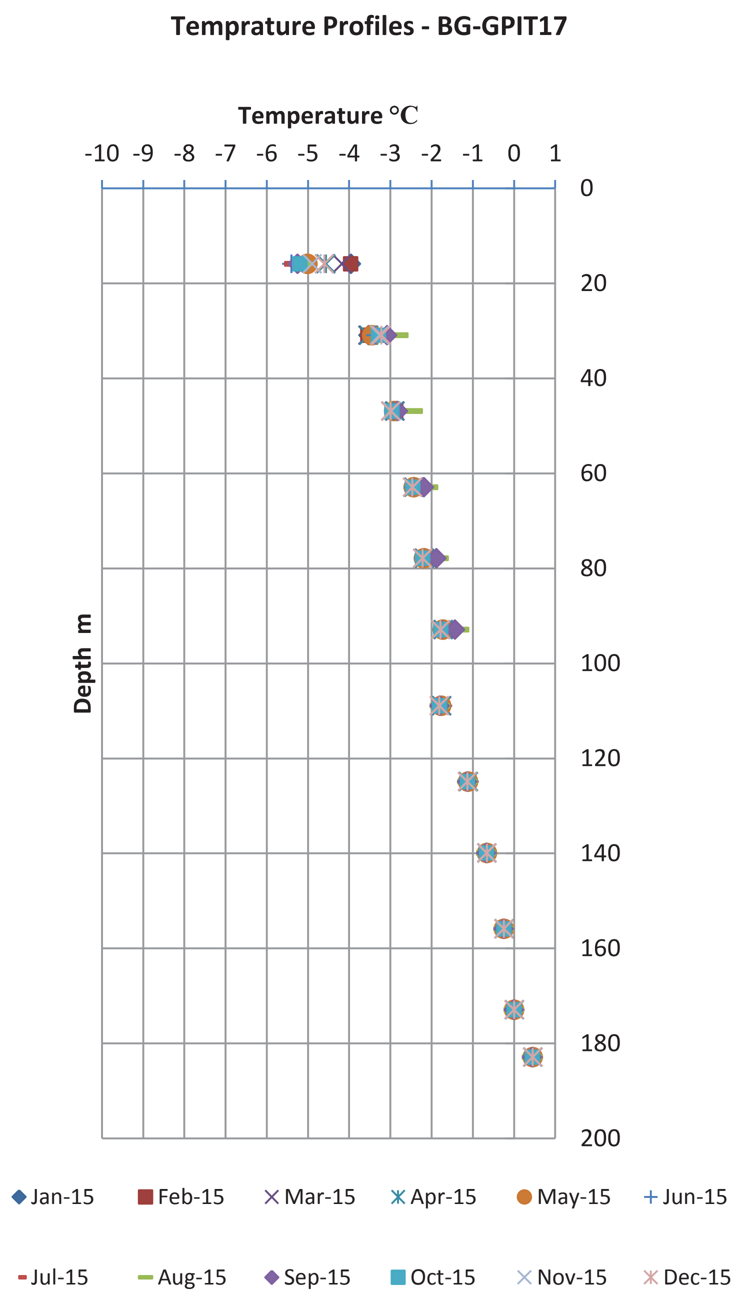


Figure 4-6: Ground Temperature Profile in 2015 at Borehole BG-GPIT17

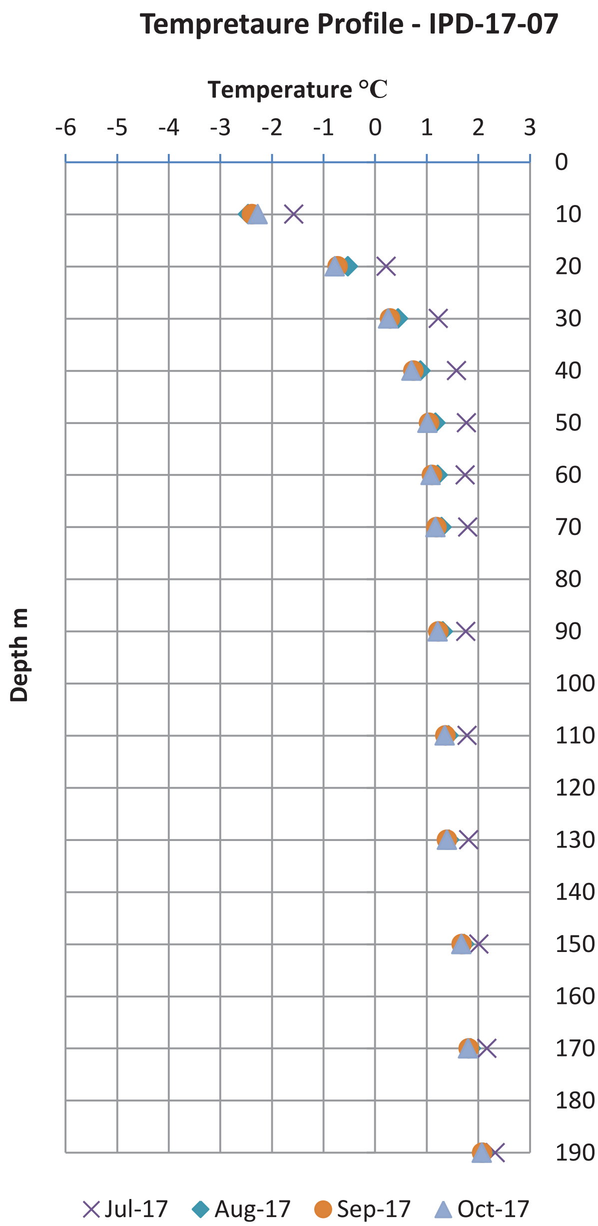


Figure 4-7: Ground Temperature Profile in 2017 at Borehole - IPD-17-07

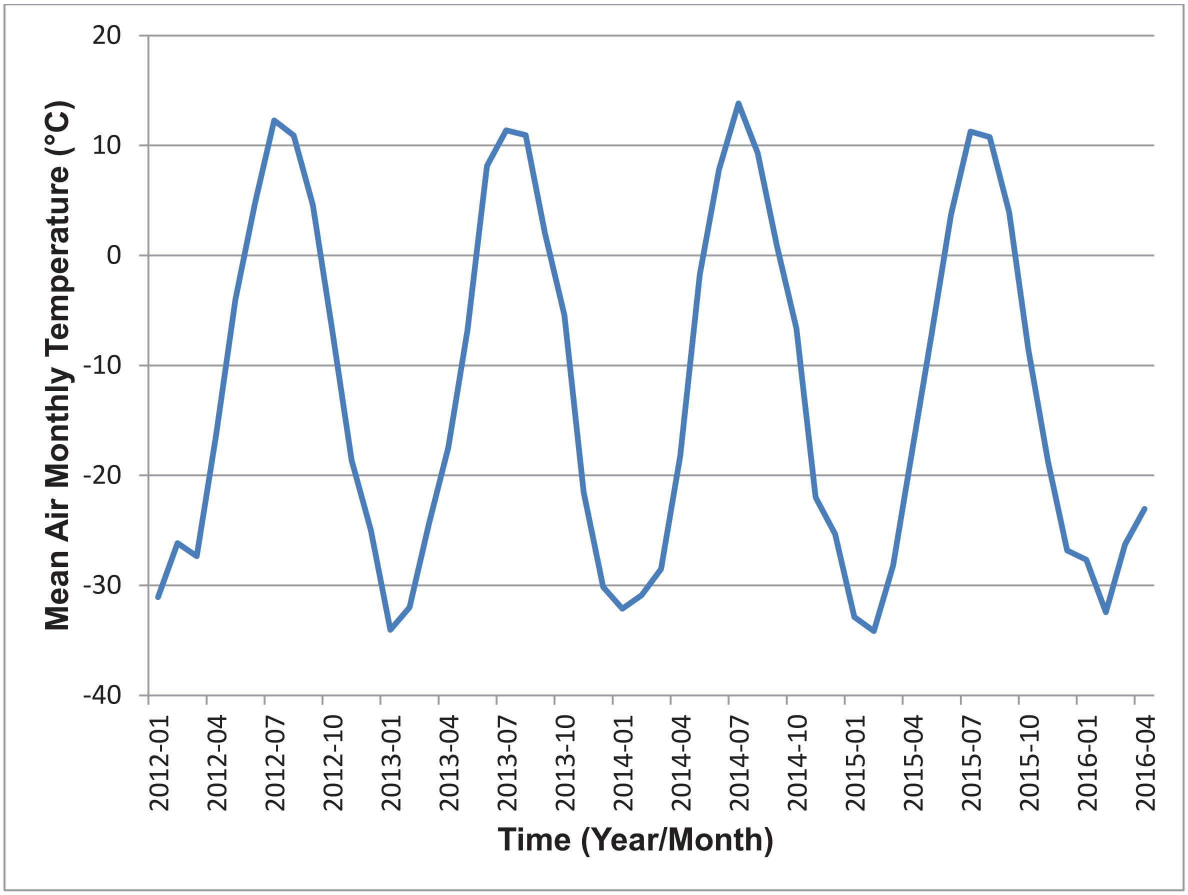


Figure 4-8: Mean Monthly Temperature (2012-2016)

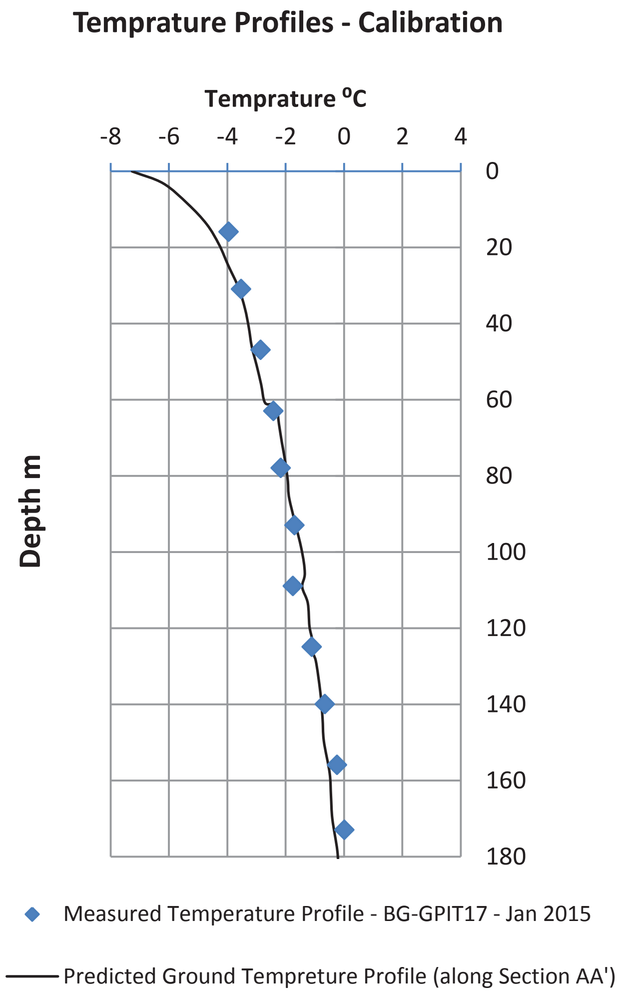


Figure 4-9: Calibrated and Measured Temperature Profile - Borehole BG-GPIT17

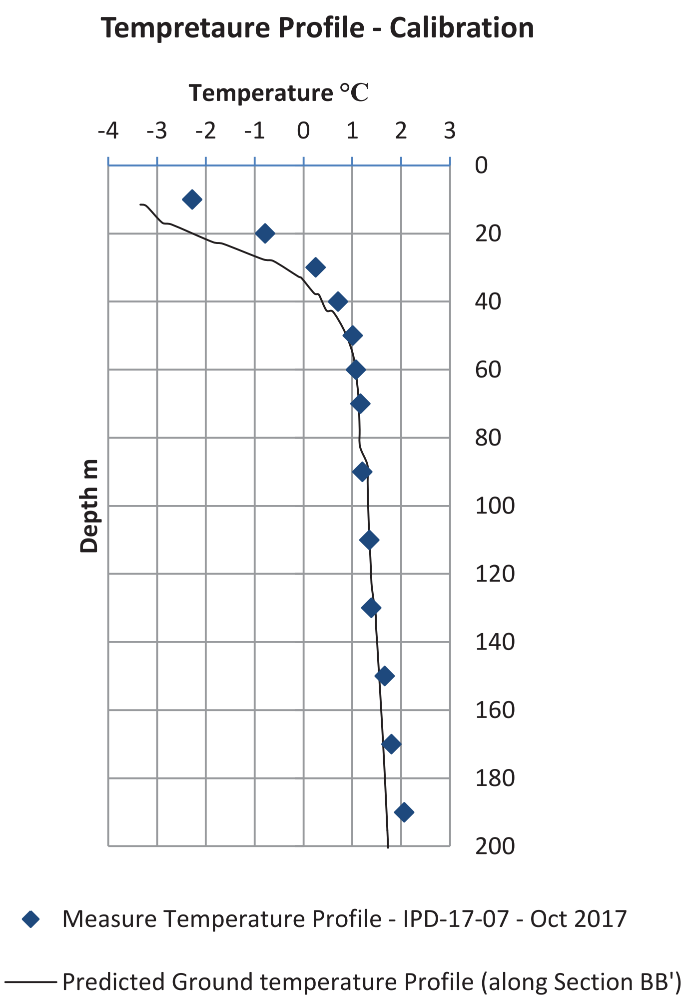


Figure 4-10: Calibrated and Measured Ground Temperature Profile - Borehole IPD-17-07

4.4 Thermal Modeling Analysis

4.4.1 General

The past mining activities at the project site from lake dewatering to development of the open pits have altered the ground thermal regime, resulting in localized permafrost degradation and newly-developed talik formations. In areas where a talik existed, the pit excavation may have caused freeze-back where pit walls were exposed to air temperature during winter months.

The upcoming in-pit deposition of warm tailings would act as a heat source inducing heat flow to the surrounding permafrost and talik zones and cause the existing permafrost to shrink. This could impact the migration of contaminant from the pit to the surrounding environment.

Both short-term and long-term analyses were carried out. The short-term analysis corresponds to the in-pit tailings deposition period whereas the long-term analysis corresponds to the mine closure, and the climate change effect over a period of 100 years with, and without climate warming consideration.

4.4.2 Short-term Analysis

The permafrost degradation that may occur due to deposition of warm tailings into the Goose Pit, Portage E and A Pits is assessed. Table B-1 in Appendix B summarizes the tailings deposition plan and schedule used in the analysis. It is important to note that the tailings deposition plan has been updated after the present thermal analysis was completed; therefore the ground thermal condition maybe impacted by the change in the deposition plan and schedule due to variations in starting/ending time of deposition, deposition stages, temperature and spatial configuration of the deposited tailings layers.

Based on the tailings deposition plan provided in Table B-1, the deposition of tailings will start with the Goose Pit followed by the Portage Pit E, and Portage Pit A.

4.4.3 Long-term Analysis

4.4.3.1 At Mine Closure

It is understood that the closure strategy is to return the existing surrounding lakes to pre-mining state by joining the in-pit water bodies to the surrounding receiving environment. Table B-2 in Appendix B summarizes the tailing surface and pit water level elevations at closure.

4.4.3.2 Long Term Scenarios (Post Closure)

The long term evolution of the permafrost starting from the proposed year of mine closure, i.e., end of year 2035, is assessed with two scenarios, namely with, and without climate warming.

The most recent report of the Intergovernmental Panel on Climate Change (IPCC AR5, 2014) gives a broad view of observed impacts attributed to climate change reported in the scientific literature. In the last two recent IPCC reports (AR4, 2007 and AR5, 2014), various scenarios are considered for different population growth or industry developments. Based on various scenarios considered in the fourth Assessment Report of IPCC (2007), a range of 1.1 ^{0}C to 6.4 ^{0}C is forecasted as the likely increase in global temperature over the next century (Figure 4-8).

In the IPCC fifth assessment report (IPCC AR5, 2014), based on recent studies and modified emission scenarios, new global and regional temperature increases are predicted. As indicated in Figure 4-9, the best estimate for global mean temperature increase is approximately between 1^{0}C and 4 ^{0}C. A mean temperature increase of 4 ^{0}C over a 100-year period is considered for the purpose of thermal analysis. Figure 4-10 shows the projected air temperature used in the long-term thermal analysis to incorporate the impact of climate warming.

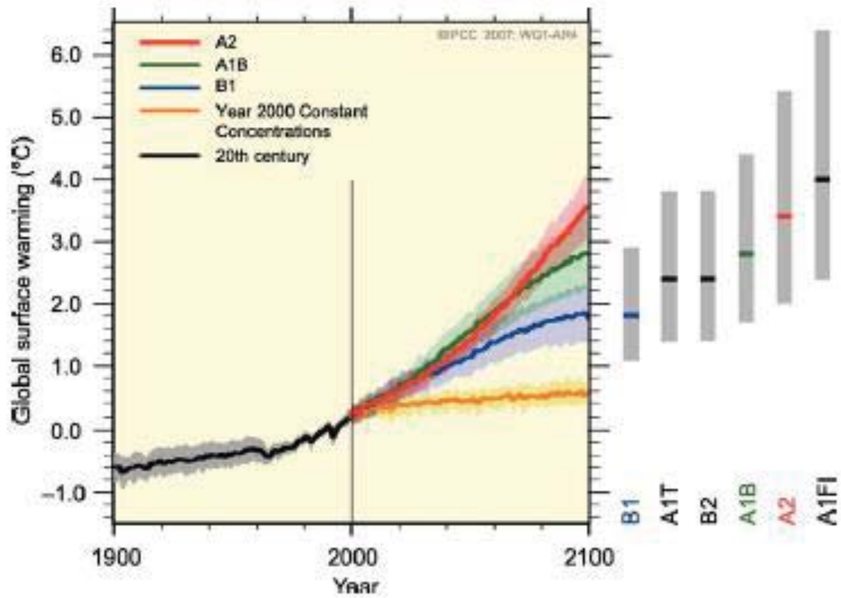


Figure 4-11: Climate Change Predictions Based on Various Emission Scenarios (IPCC, AR4, 2007)

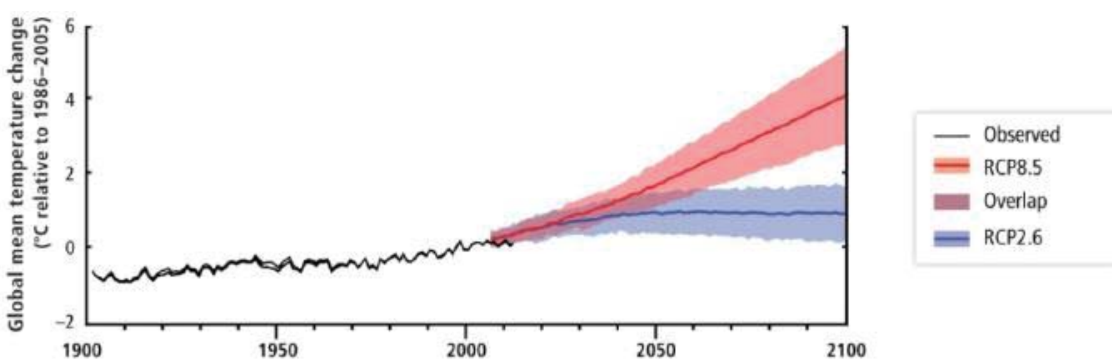


Figure 4-12: Observed and projected changes in annual average surface temperature (IPCC, AR5, 2014)

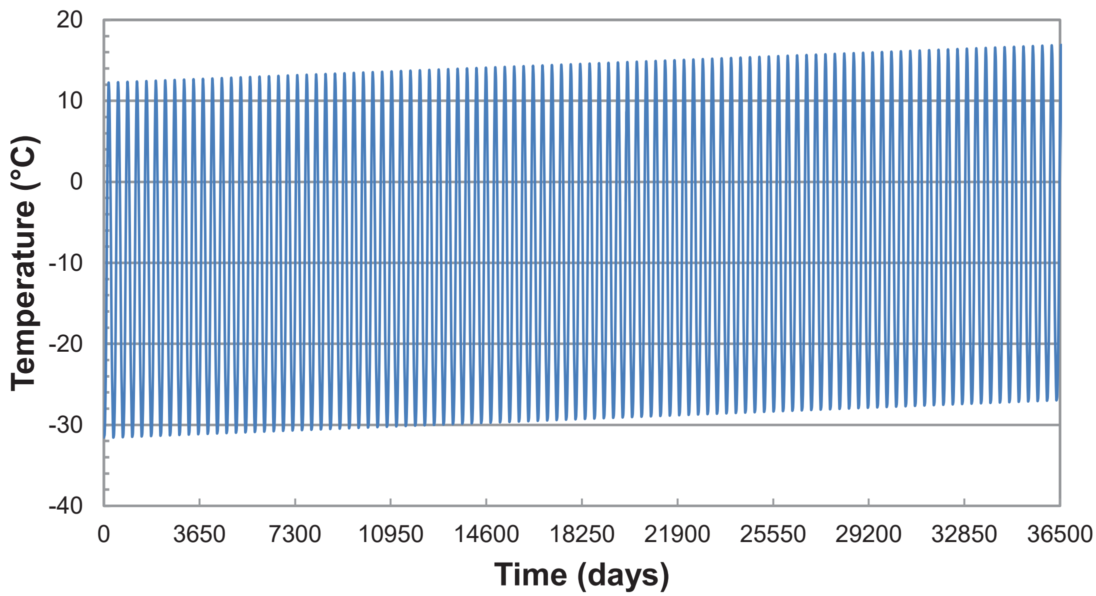


Figure 4-13: Projected Air Temperature (4 °C increase over a 100-year period)

4.5 Analysis Results

4.5.1 Goose Pit

Figure A-3 shows the initial temperature field before excavation at cross section GG'1. Since the ground surface boundary is exposed directly to the air temperature, there are some noticeable thermal changes occurring over a thin layer. Figure A-4 shows the temperature field after the excavation is completed along cross-section GG'1, in April 2018 (proposed start of the tailings deposition). Note that the thermal modeling presented in this report were carried out based on the Deposition Plan Schedule as of January 12, 2018. Tailings deposition proceeds afterwards in two stages over a period of 3.5 years. For details on deposition stages refer to In-pit Tailings Deposition Plan and Schedule Table provided in Appendix B. Figures A-5 and A-6 shows the temperature fields corresponding to June 2021, and October 2021 when the first and second stages of tailings deposition are completed. The deposition of the warm tailings appears to cause some thawing of the permafrost at the pit/tailings interface. A warming trend is observed during the post-dispositioning period which spans over 7 years and 8 months, corresponding to the end of operational time, aimed for June 2029 (Figure A-7). This warming trend results in the thawing of the frozen ground at the pit walls near the ground surface. Figure A-8 shows the temperature field at closure corresponding to end of year 2035.

The long-term temperature fields corresponding to a 100-year period with and without climate warming are shown on Figures A-9 and A-10. The temperature fields indicate that the permafrost may eventually vanish in the vicinity of the pit although formation of discontinuous permafrost is anticipated beneath the islands as shown on Figure A-9. For the case with no climate warming (Figure A-10), the results suggest that the area beneath the islands may potentially freeze back.

Similarly, the temperature fields along cross-section GG'2 for short and term thermal analyses are shown on Figures A-11 to A-18. As can be seen the permafrost boundary extends to a deeper depth as compared to cross section GG'1 due to higher width of the Goose Island on the east side of the pit. As shown on Figure A-17 the results suggest that the talik zone may expand to the east side of the pit resulting in formation of a discontinuous permafrost.

Figure 4-11, shows the evolution of the temperature profiles with time along a cross section in the middle of the Goose Pit.

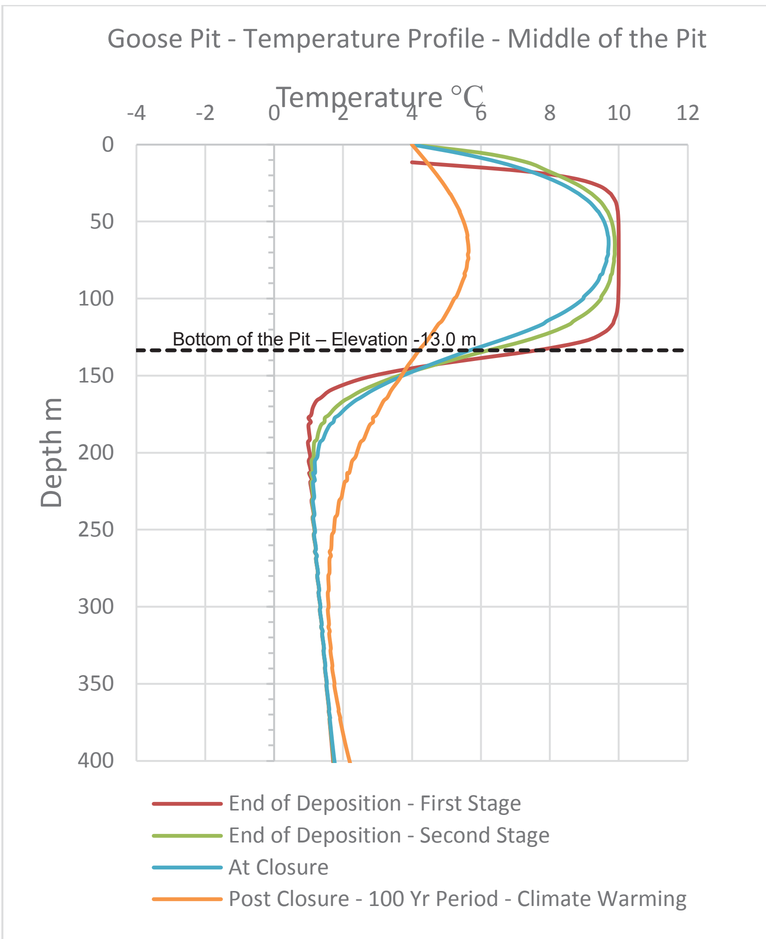


Figure 4-14 : Temperature Profile – Middle of the Pit

As can be seen, the bottom of the pit becomes warmer due to the deposition of warm tailings while a cooling trend is observed within the deposited tailings over time.

4.5.2 Portage Pit E

Figure A-19 shows the temperature field along the cross section EE' when the first stage of tailings deposition is completed. As indicated by Figure A-19 the permafrost boundary reaches a depth of approximately 280 m below ground surface, consistent with ground temperature measurements in borehole TP97-196. The results suggest formation of a talik zone beneath the limits of the Third Portage Lake, west side of the pit, which is surrounded by frozen ground. Tailings deposition proceeds afterwards in six stages over a period of 8 years and 9 months. Figure A-20 and A-21 show the temperature field after completion of tailings deposition in the fourth and seventh stages, respectively. The modelled temperature regime suggest that the deposition of the warm tailings may cause some thawing of the permafrost at the pit/tailings interface. The results at closure (End of 2035) indicate the initiation of an open talik along the boundaries of the pit. The long-term analysis results (as shown on Figures A-23 and A-24) indicate that an open talik formed beneath the pit boundaries may expand further merging to the unfrozen zone on the east side of the pit for the case with climate warming (Figure A-23). Note that insignificant change in permafrost bottom depth is anticipated after 100 years.

4.5.3 Portage Pit A

Portage Pit A is located immediately east of the South Cell of the tailings storage facility. The South Cell tailings deposition was started in 2014 and is currently ongoing. In order to take into account the thermal impact(s) of the South Cell tailings deposition on Portage Pit A, South Cell tailings deposition is incorporated in the thermal models of the Portage Pit A, based on the starting, proposed ending and closure schedule of the South Cell tailings deposition presented in Table 4-2.

Table 4-2 : Applied South Cell Tailings Deposition and Closure Schedule

	Start of Tailings Deposition	End of tailings Deposition	Year of Closure
South Cell TSF	2014	2019	2025
Maximum elevation of tailings: El.144.5 m			

Notes:

1. End of tailings deposition refers to the time when tailings deposition is completed.
2. Year of closure refers to the time when the South Cell will be closed by placing a cover system.

Figure A-25 shows the temperature field along the cross section AA' when the first stage of tailings deposition is completed. Tailings deposition proceeds afterwards in six stages over a period of 8 years and 1 month. Figure A-26 and A-27 show the temperature field after completion of tailings deposition in the fourth and seventh stages, respectively. The modelled temperature regime suggest that the deposition of the warm tailings may cause some thawing of the permafrost at the pit/tailings interface.

The analysis results at closure (End of 2035) indicates that an open talik may be formed along the west boundary of the pit (Figure A-28). The long-term analysis results (as shown on Figures A-29 and A-30) indicate that the open talik formed along the west boundary of the pit may expand further towards the South Cell.

5.0 Conclusions

The main conclusions from the thermal modeling are presented as follows:

> The ground thermal condition at pit areas varies spatially and has been impacted by historical mining activities. It will generally experience warming up due to the upcoming deposition of warm tailings (which acts as a heat source), as well as the projected climate warming condition;

> The pit walls and the vicinities, which used to be talik zones before lake dewatering, have been experiencing freeze back and formation of permafrost pockets due to exposure to the air temperature. The analysis results suggest that these permafrost pockets may contract when warm tailings are deposited into the pits.

> Goose Pit has the least favorable condition in terms of permafrost barriers compared to other pits. The results suggest that the existing talik zones beneath the pit may expand due to the tailings deposition. The permafrost pockets formed after lake dewatering on side walls may contract due to the tailings deposition. Very limited permafrost barriers are expected to be left in place around the pit walls under long-term conditions (with, and without climate warming).

> For Portage Pit E, the results suggest that under the short term condition, at closure, and long term condition without climate warming, a permafrost barrier around the northeastern part of the pit may prevail, however, under the long term condition with climate warming, this permafrost barrier may disappear over a 100 year period after closure. The southwestern part of the pit (which used to be a talik zone before lake dewatering) has a less favorable condition in terms of permafrost barrier compared to the northeastern part, under both short term and long term conditions.

> At Portage Pit A, the results suggest that a permafrost zone exists to the north of the Central Dump and beneath the pit. This permafrost zone forms a barrier that may prevail over a 100 year period after closure, despite the fact that, a talik zone is expected to form beneath the pit due to tailings deposition. It is important to note that the unfrozen zone of the Central Dump and the talik zone beneath the pit may form a hydraulic connection which could pose a potential risk for contaminant migration to the Second Portage Lake.

6.0 References

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O'Kane Consultant Inc. (2015) TSF North Cell Closure Design Report Construction Plan

Appendix A

Thermal Analysis Results

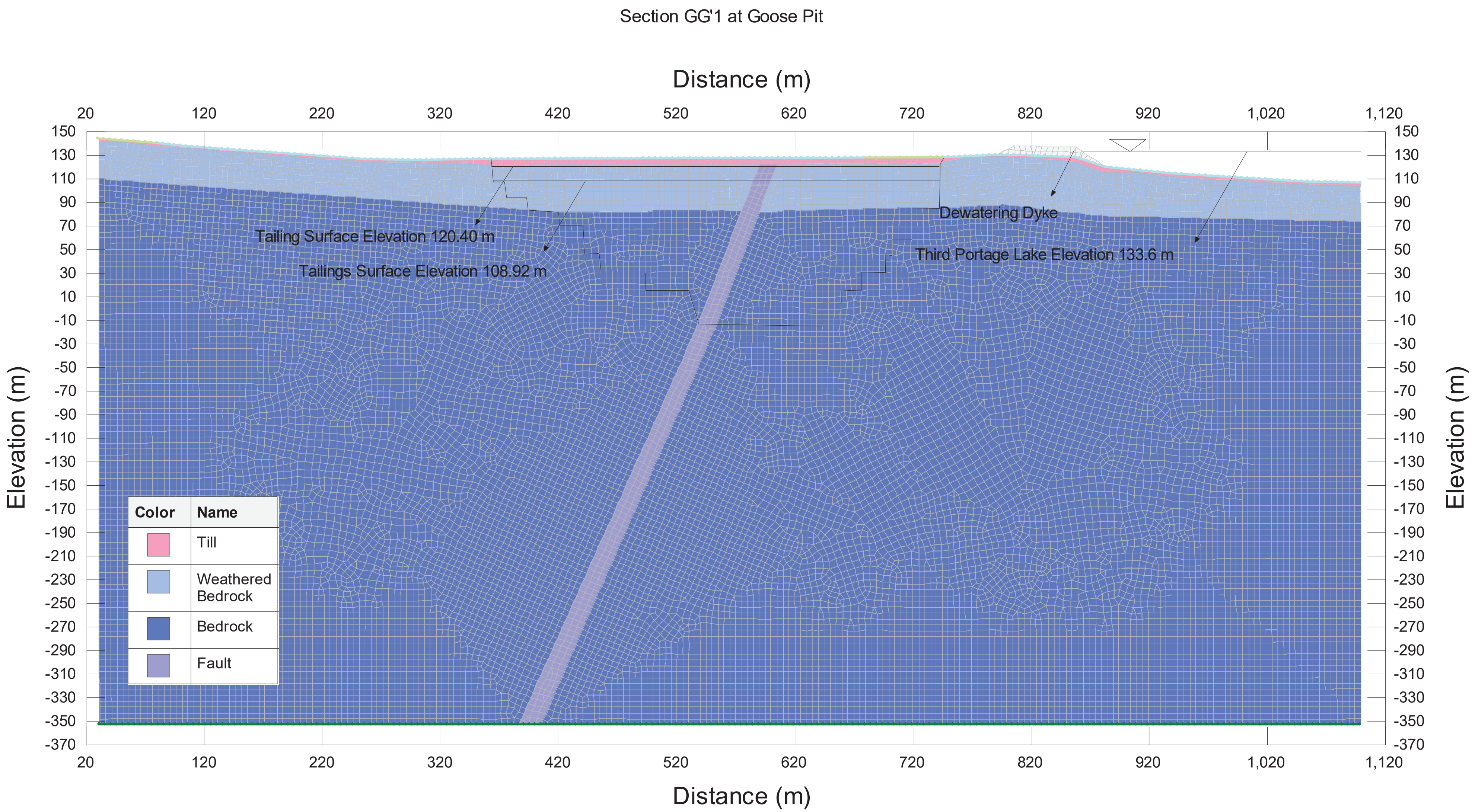

Figure A-1-a Section GG'1 Model Configuration and Mesh

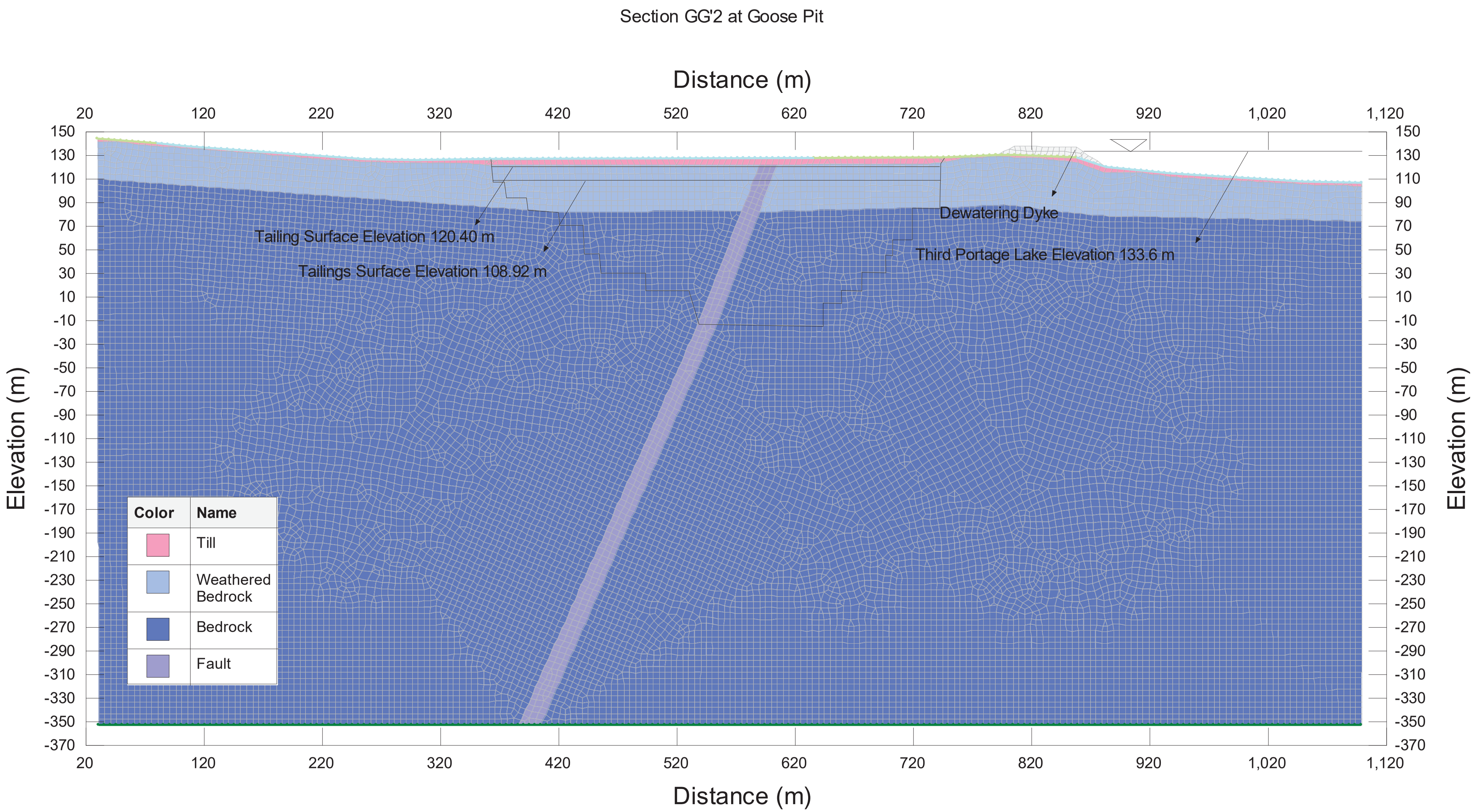

Figure A-1-b Section GG'2 Model Configuration and Mesh

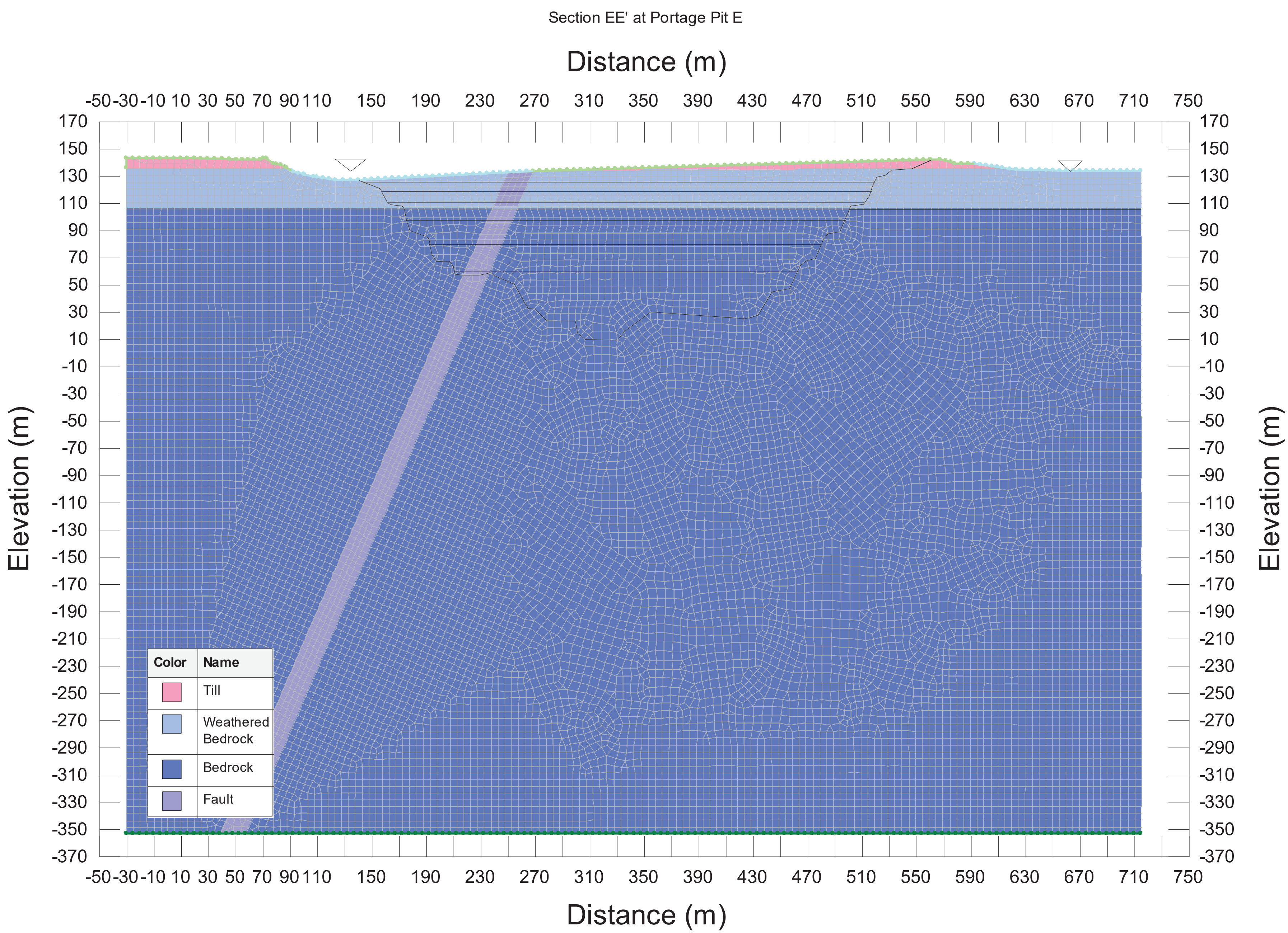

Figure A-1-c Section EE' Model Configuration and Mesh

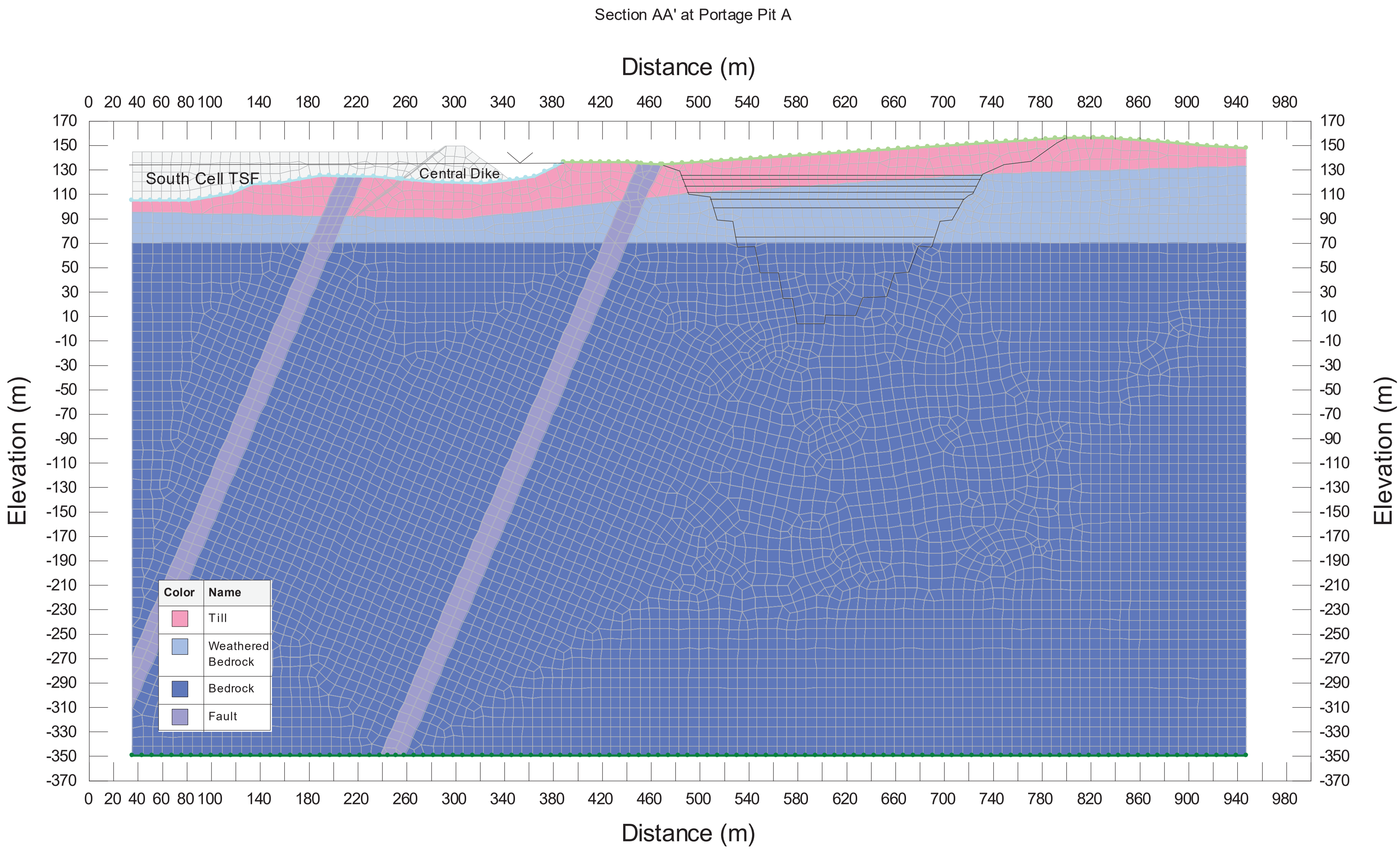

Figure A-1-d Section AA' Model Configuration and Mesh

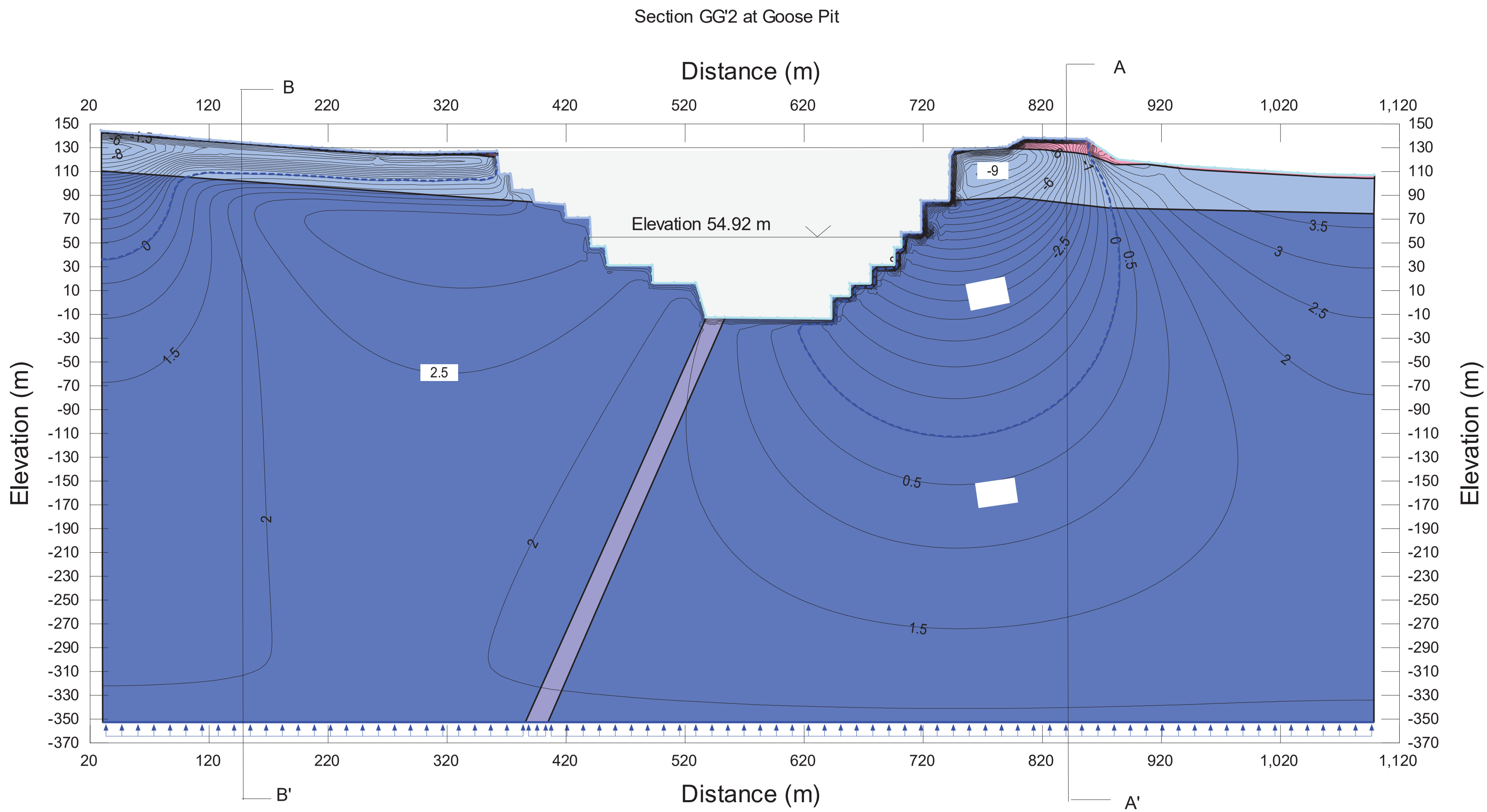

Figure A-2 Temperature Field and Location of Sections AA' and BB' used in model Calibration

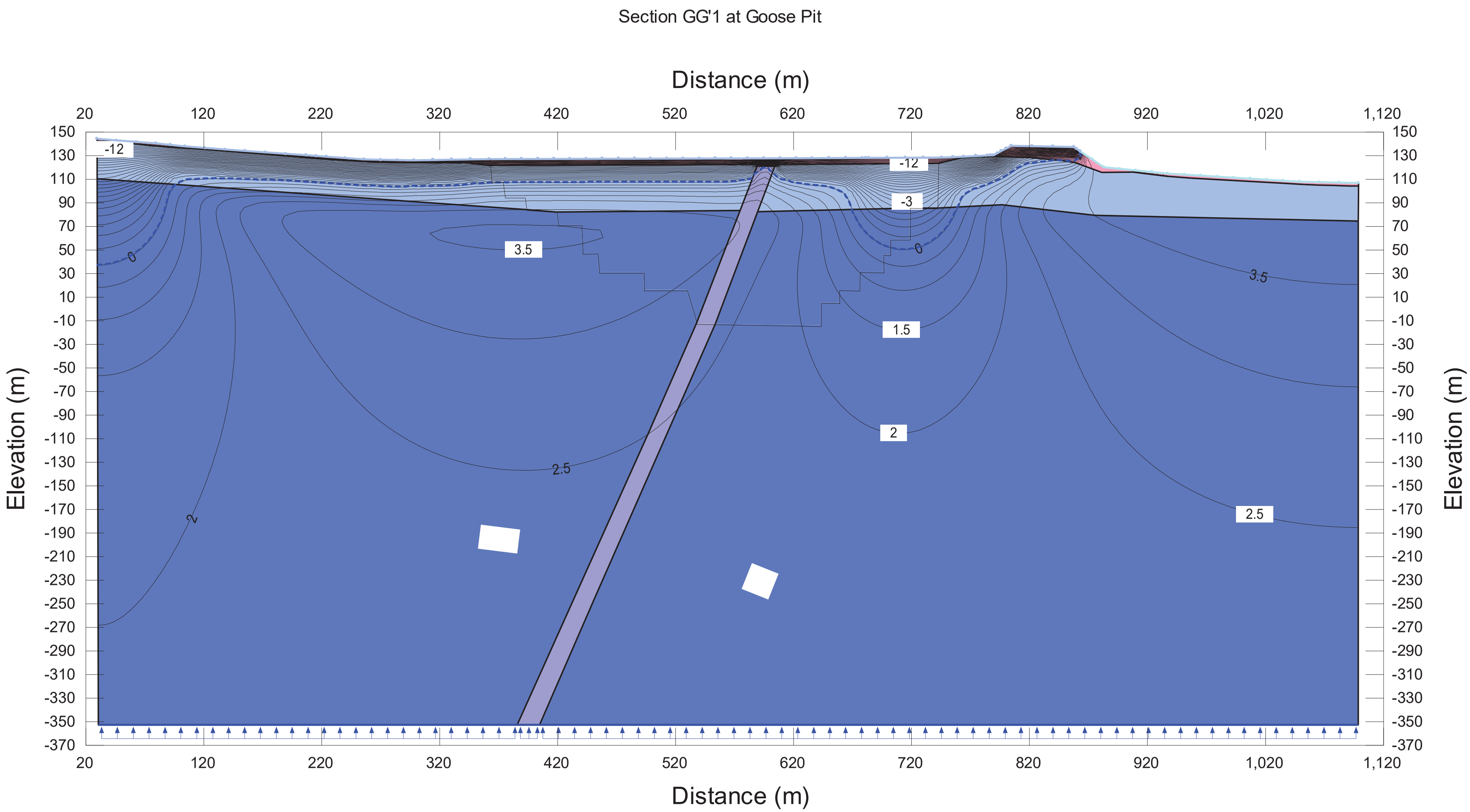

Figure A-3 Thermal Initial Condition at Goose Pit – Cross Section GG'1

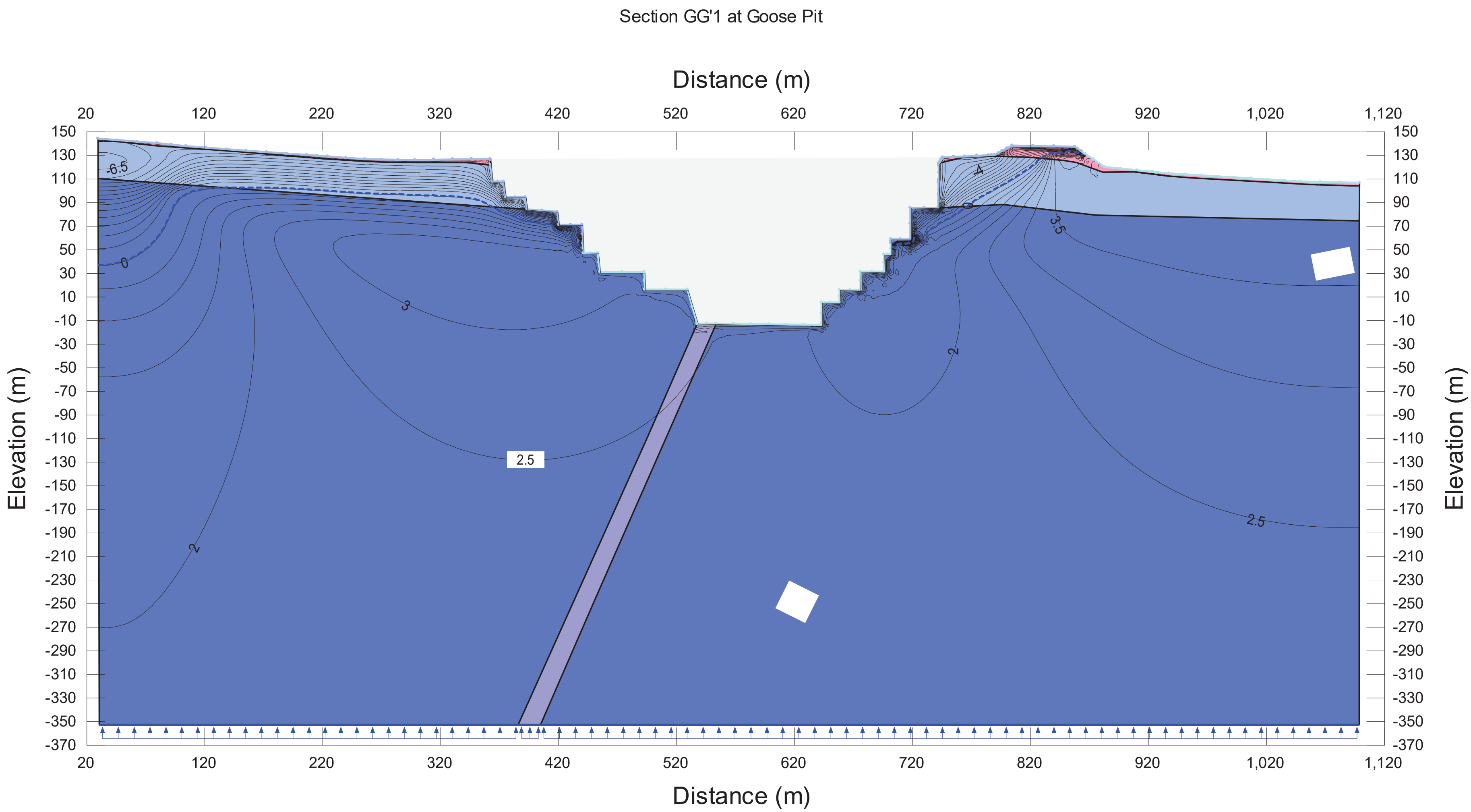

Figure A-4 Thermal Condition at Goose Pit, Cross section GG'1 before start of the tailings deposition (April 2018)

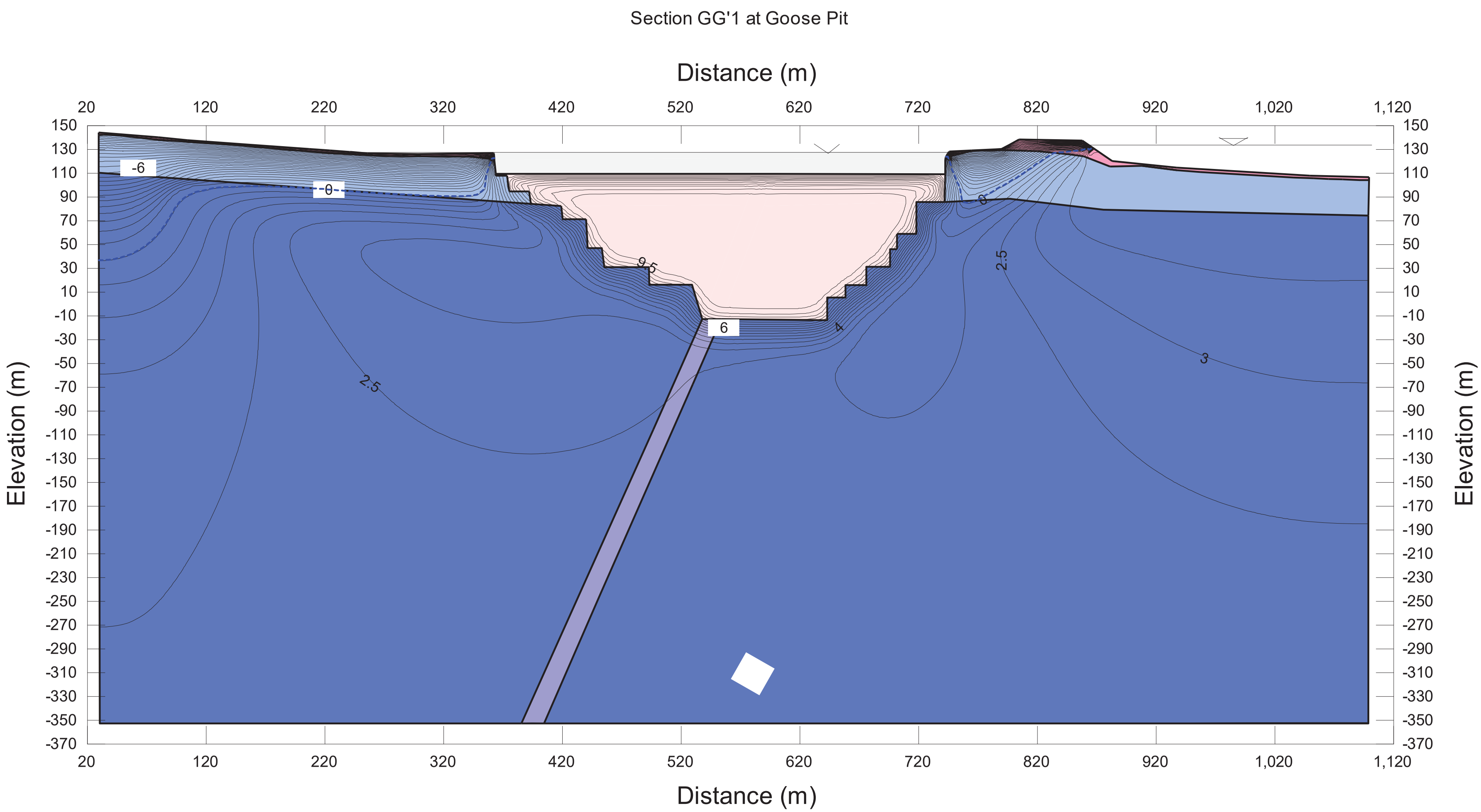

Figure A-5 Thermal Condition at Goose Pit, Cross section GG’1 After Completion of Tailings Deposition (First Layer, June 2021)

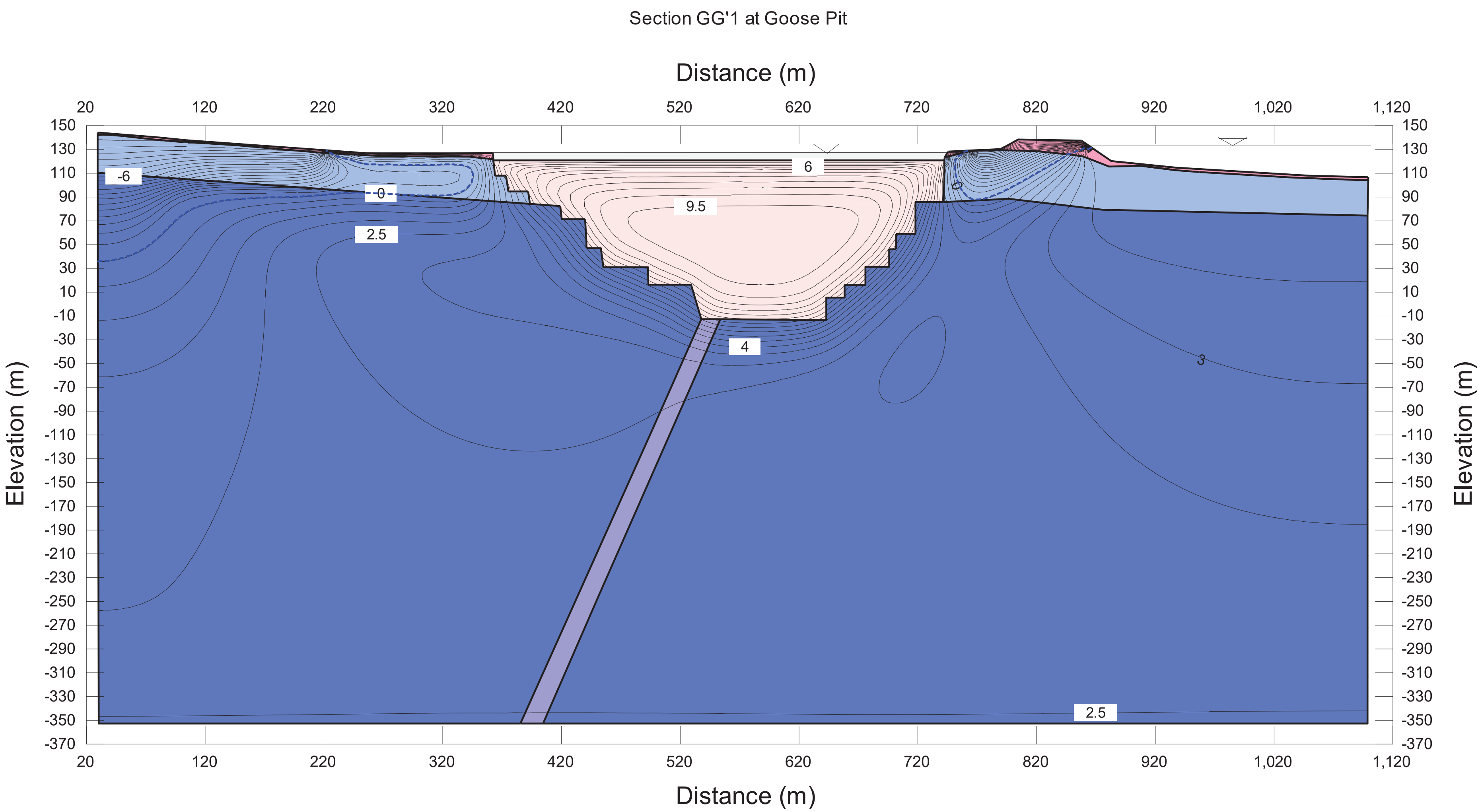

Figure A-6 Thermal Condition at Goose Pit, Cross section GG’1 After Completion of Tailings Deposition (Second Layer, October 2021)

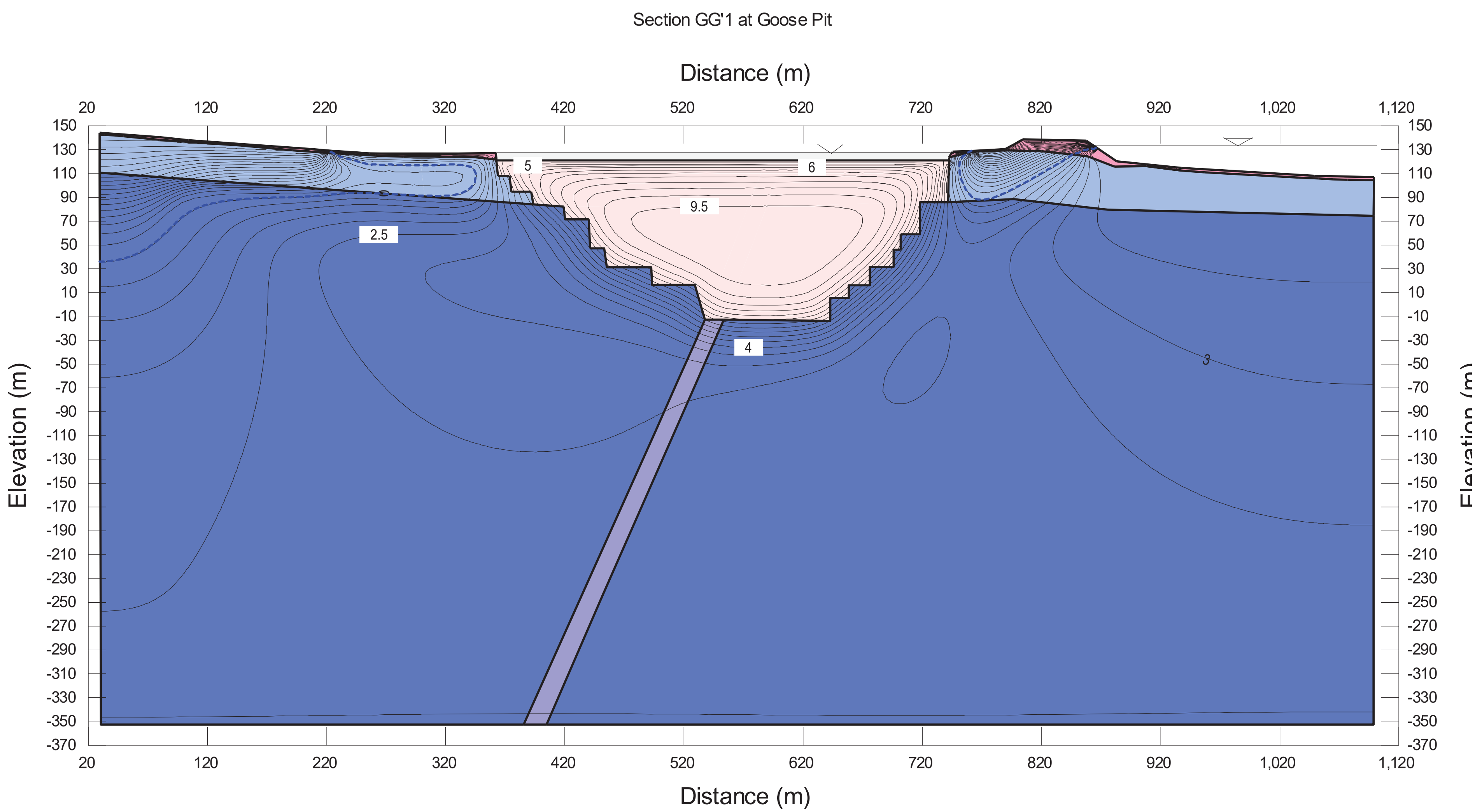

Figure A-7 Thermal Condition at Goose Pit, Cross section GG'1 After Completion of Tailings Deposition (Second Layer, June 2029)

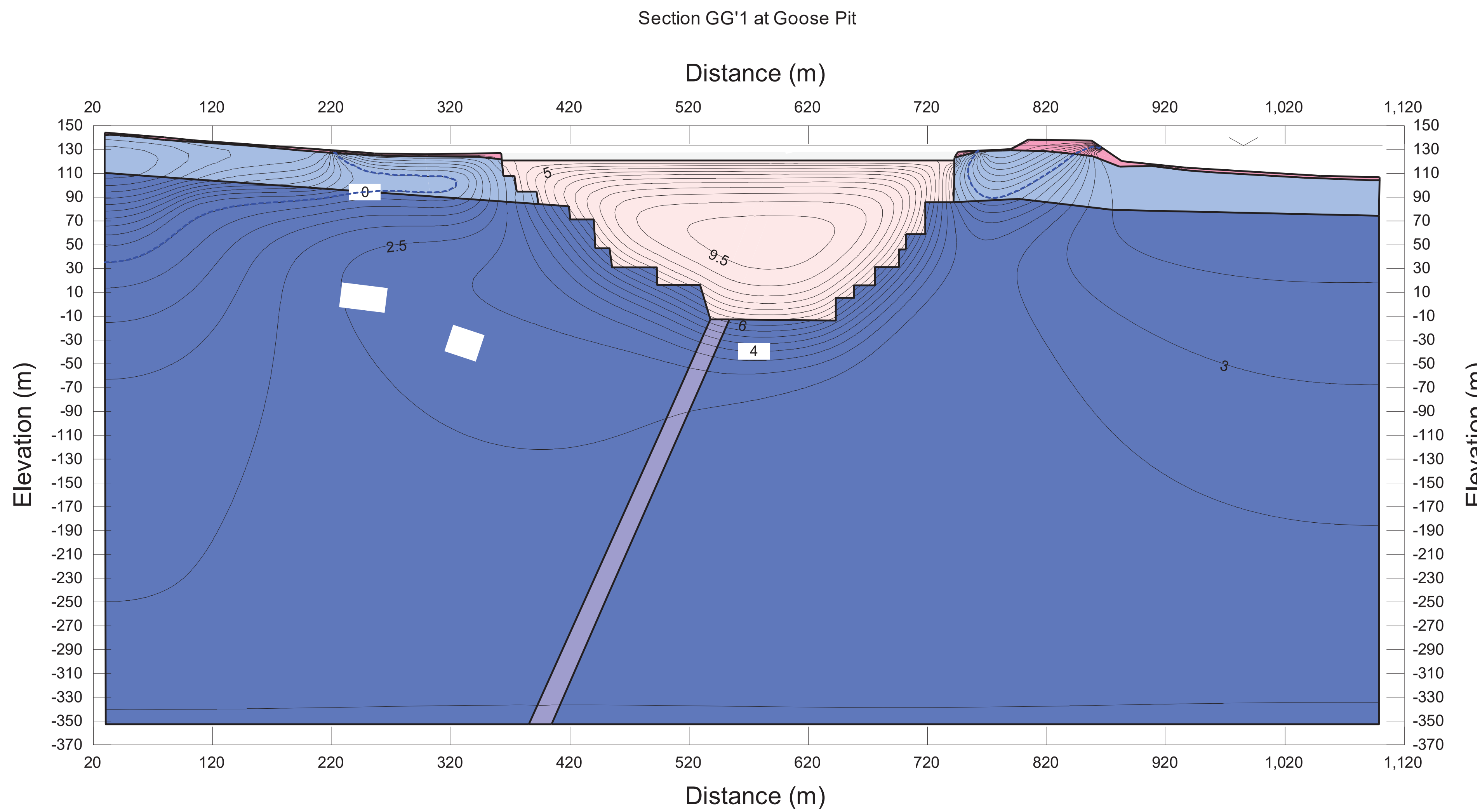

Figure A-8 Thermal Condition at Goose Pit, Cross section GG'1 A Closure (End of 2035)

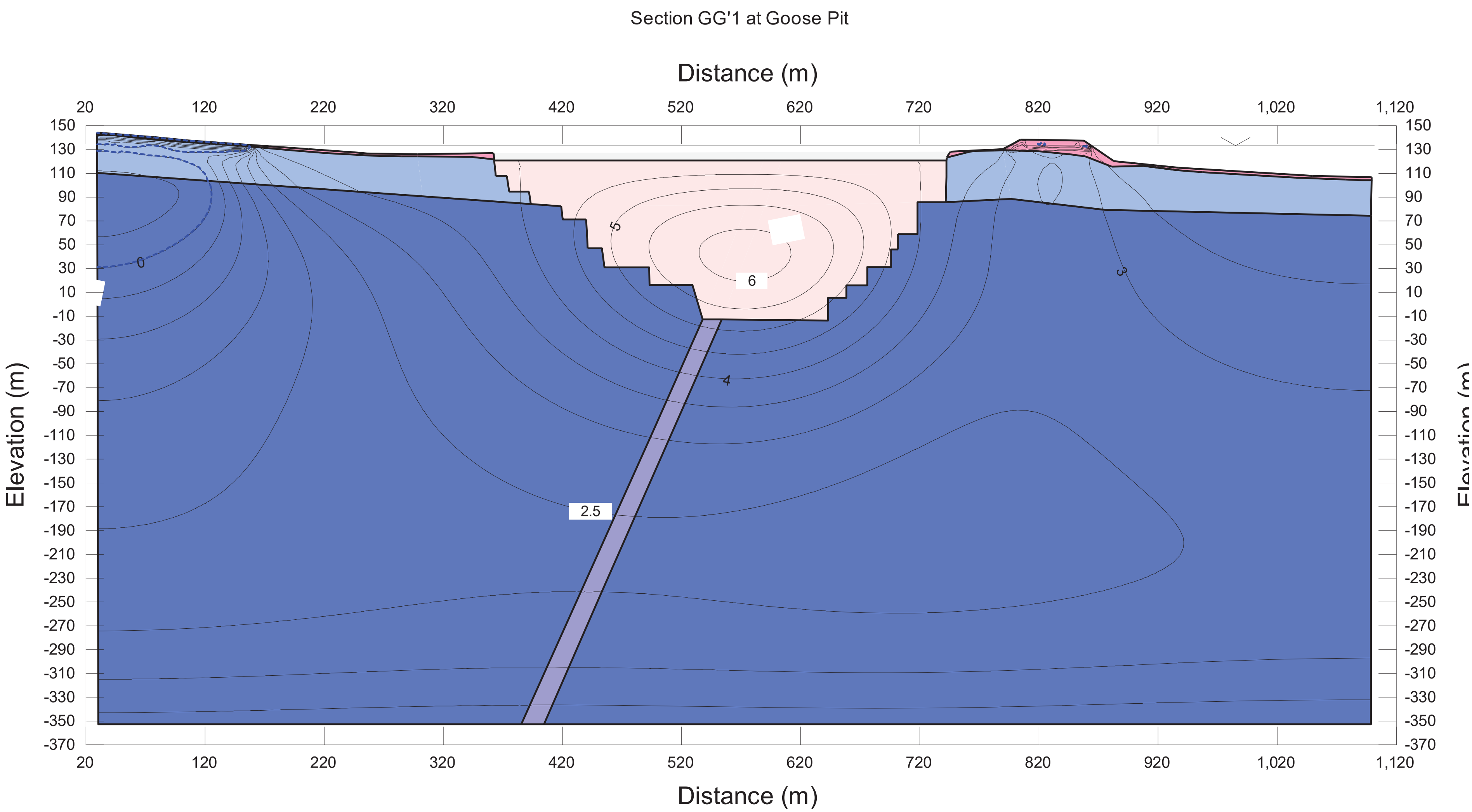

Figure A-9 Thermal Condition at Goose Pit, Cross section GG'1, Long term, at the end of a 100-year period – Climate Warming

Section GG'1 at Goose Pit

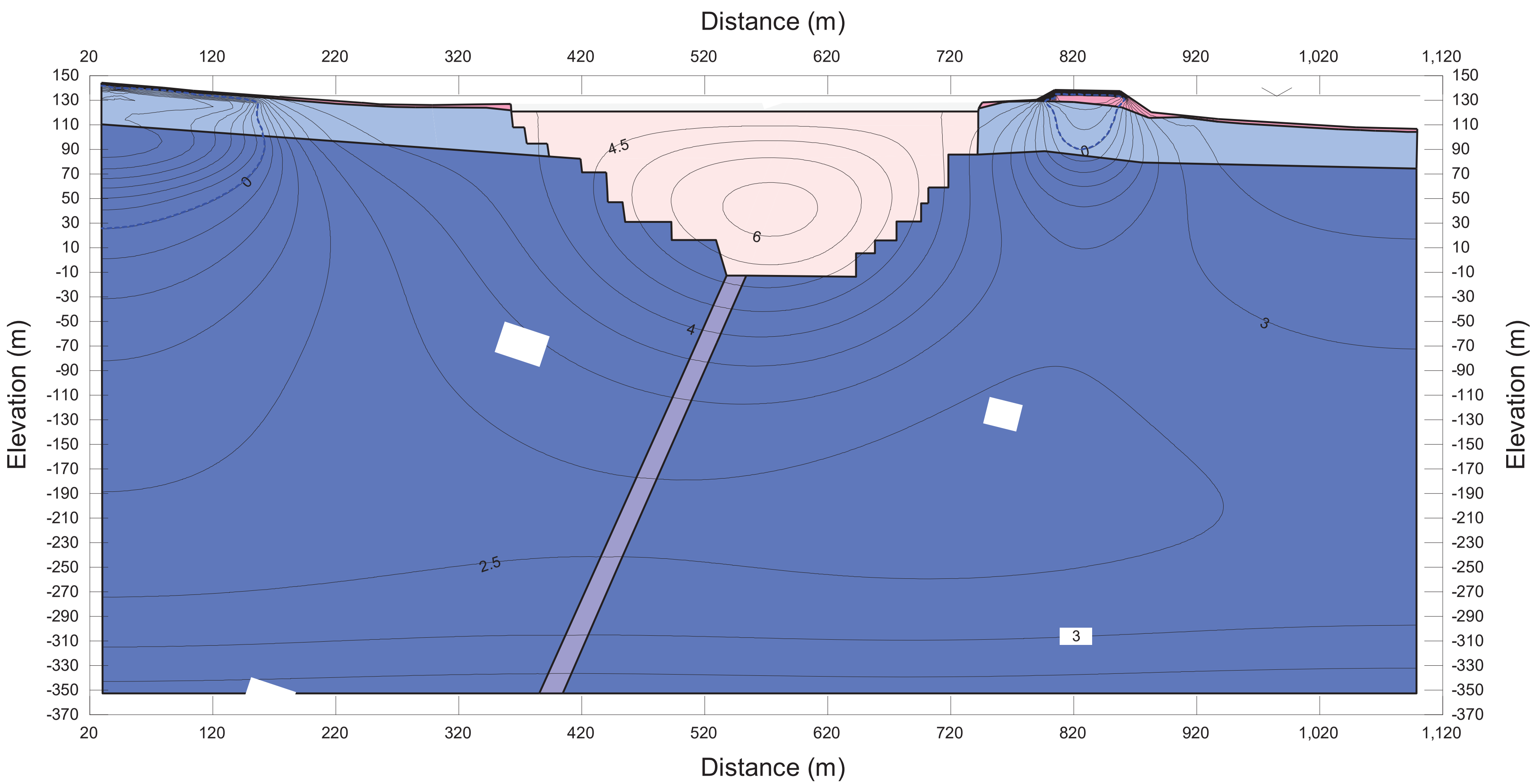

Figure A-10 Thermal Condition at Goose Pit, Cross section GG'1, Long term, at the end of a 100-year period - No Climate Warming

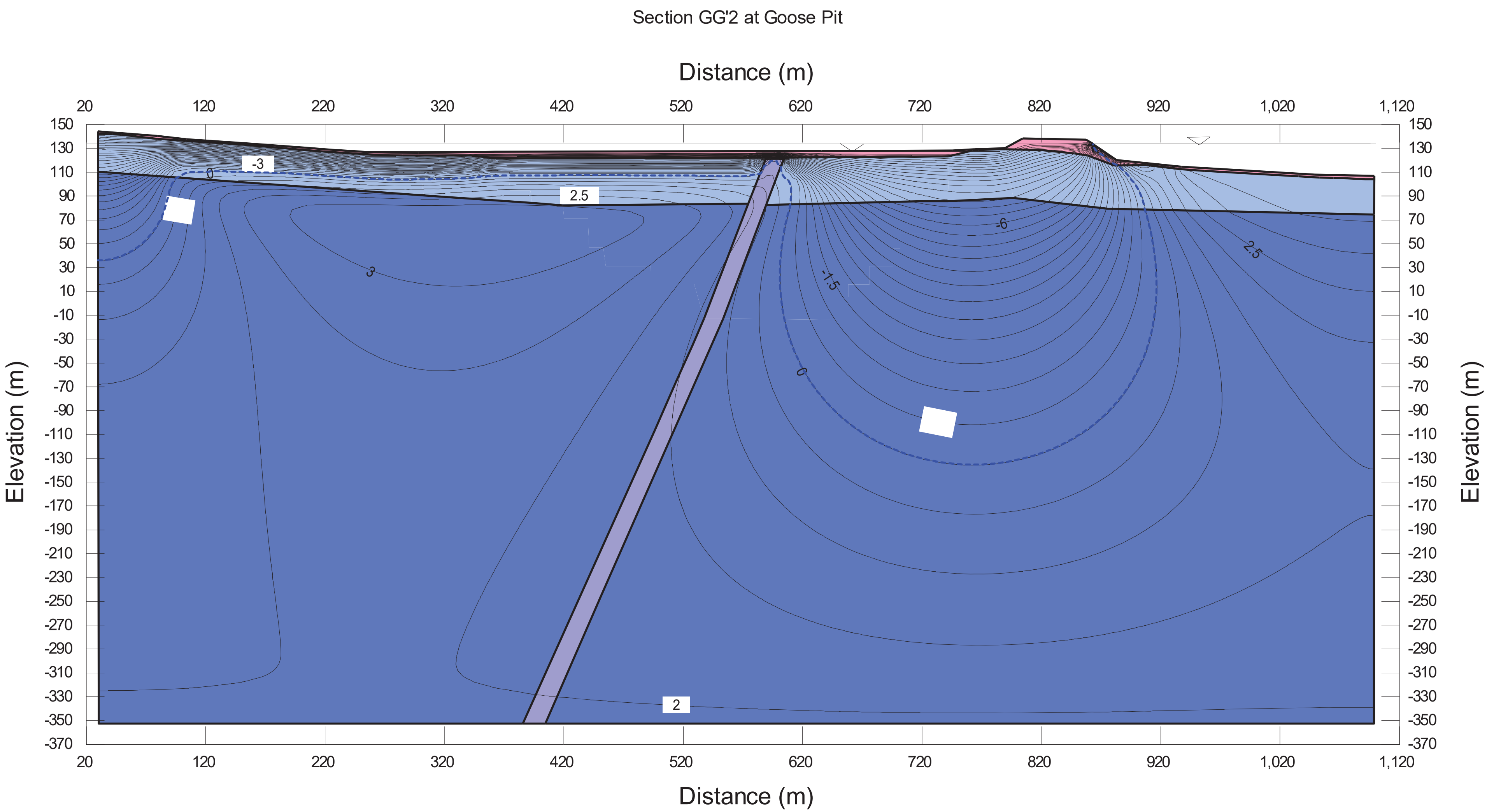

Figure A-11 Thermal Initial Condition at Goose Pit – Cross Section GG'2

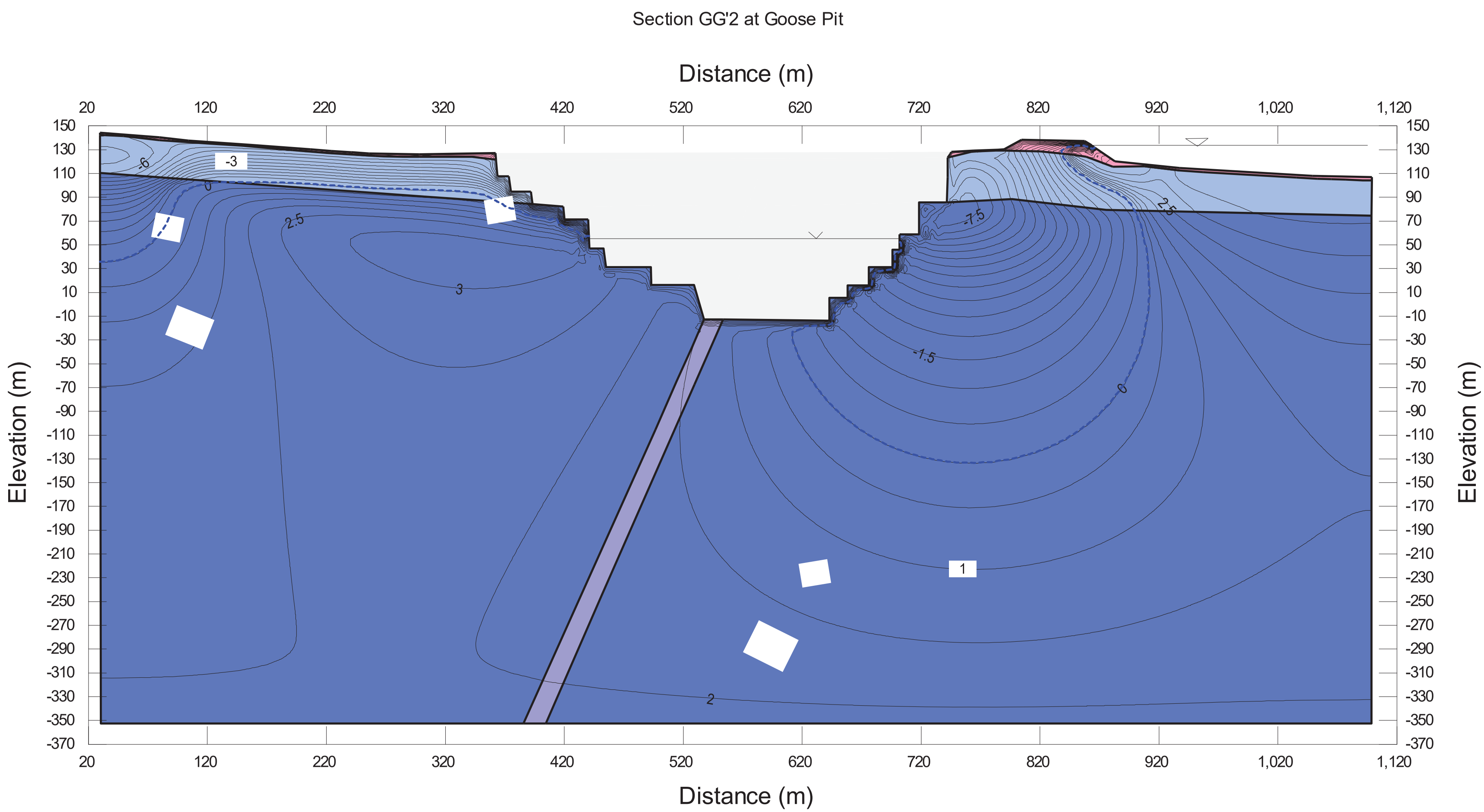

Figure A-12 Thermal Condition at Goose Pit, Cross section GG'2 before start of the tailings deposition (April 2018)

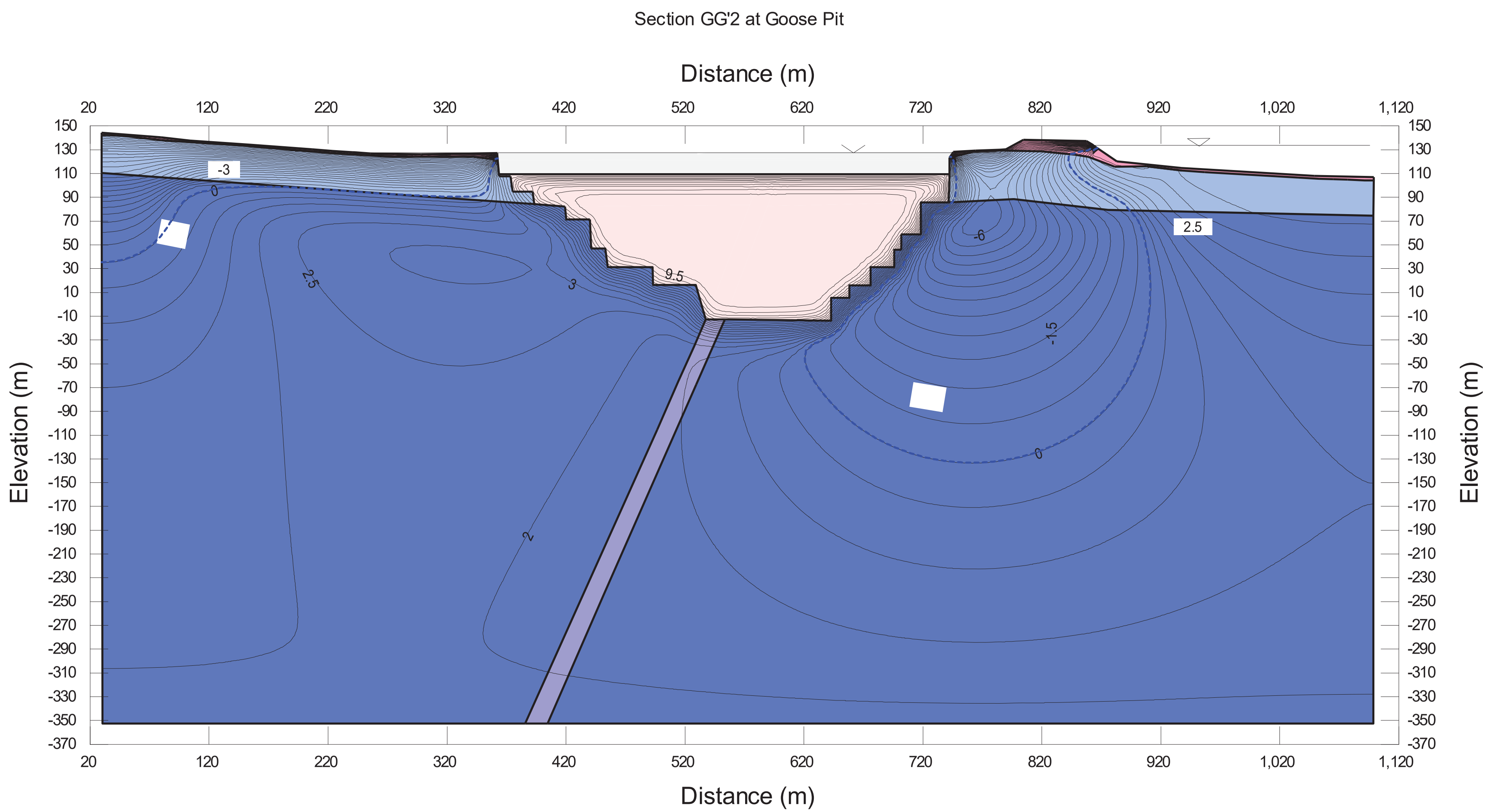

Figure A-13 Thermal Condition at Goose Pit, Cross section GG'2 After Completion of Tailings Deposition (First Layer, June 2021)

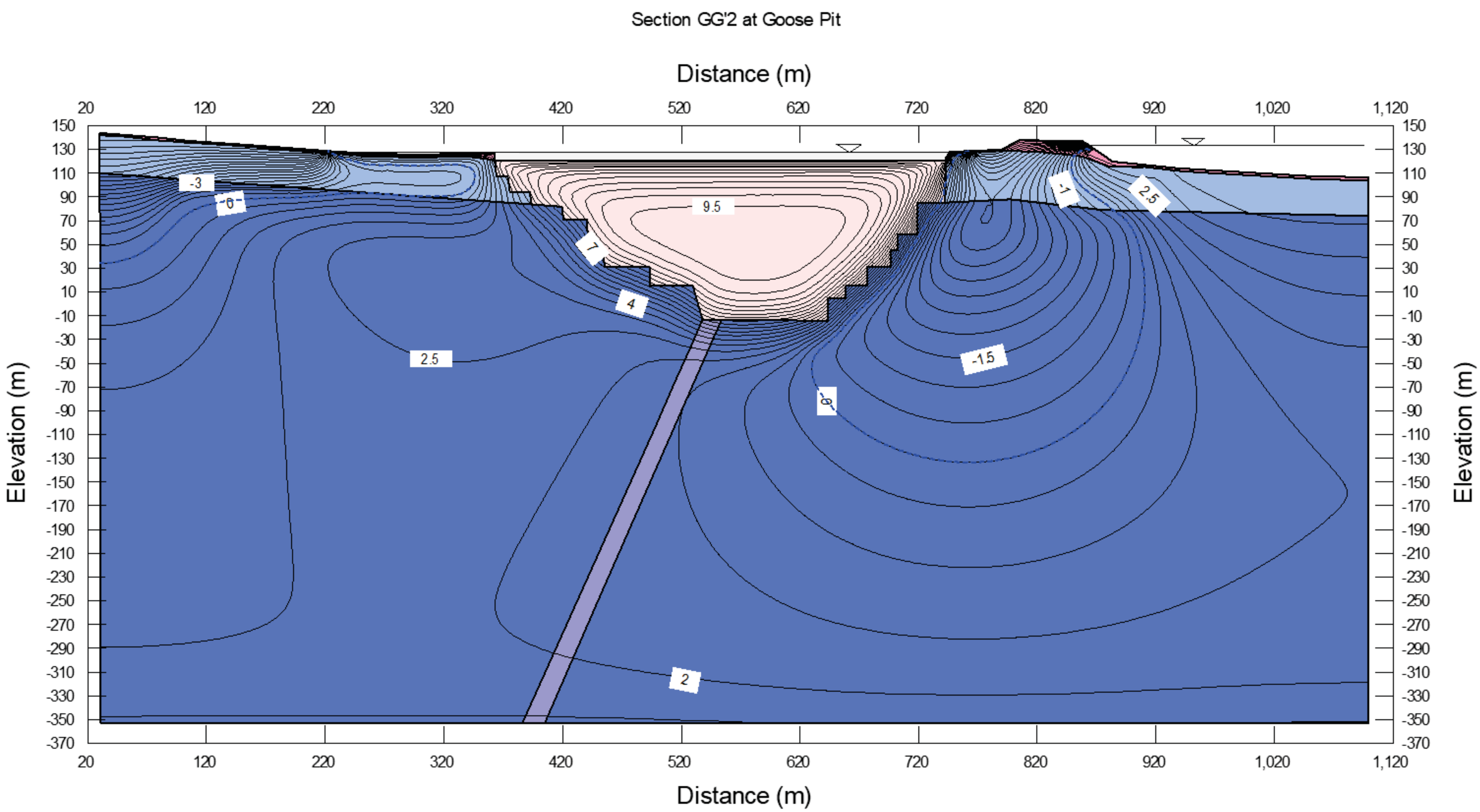

Figure A-14 Thermal Condition at Goose Pit, Cross section GG'2 After Completion of Tailings Deposition (Second Layer, October 2021)

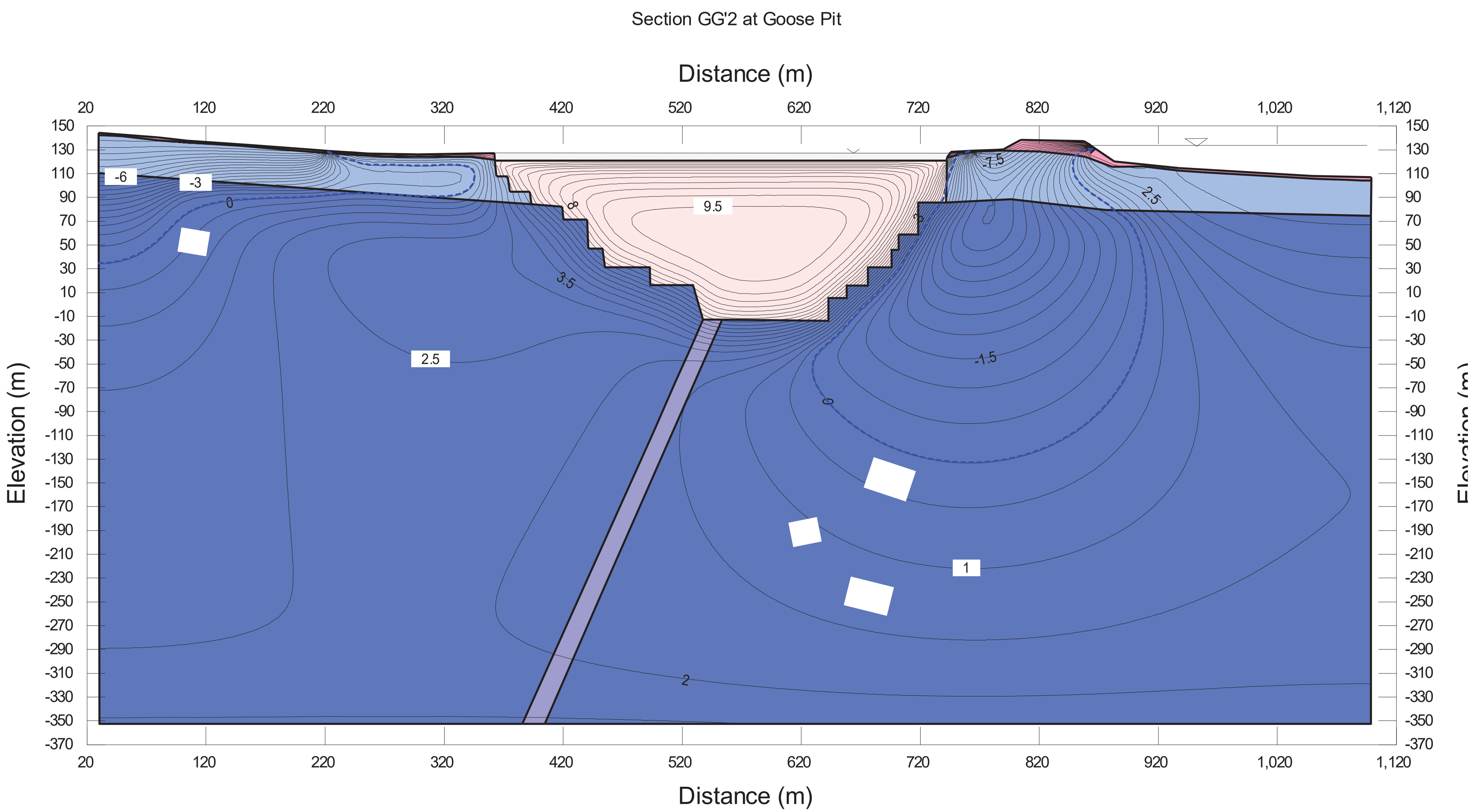

Figure A-15 Thermal Condition at Goose Pit, Cross section GG’2 After Completion of Tailings Deposition (Second Layer, June 2029)

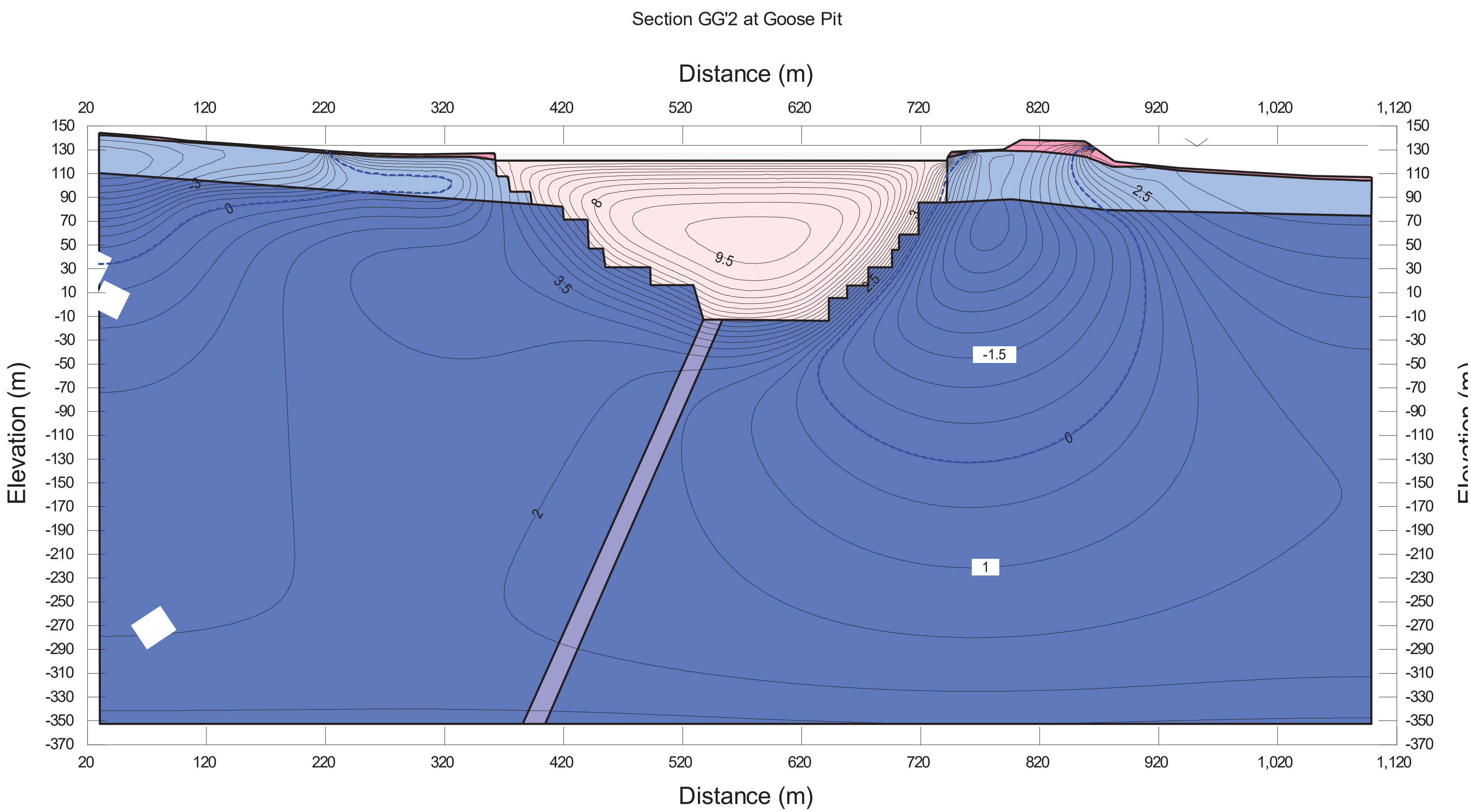

Figure A-16 Thermal Condition at Goose Pit, Cross section GG’2 A Closure (End of 2035)

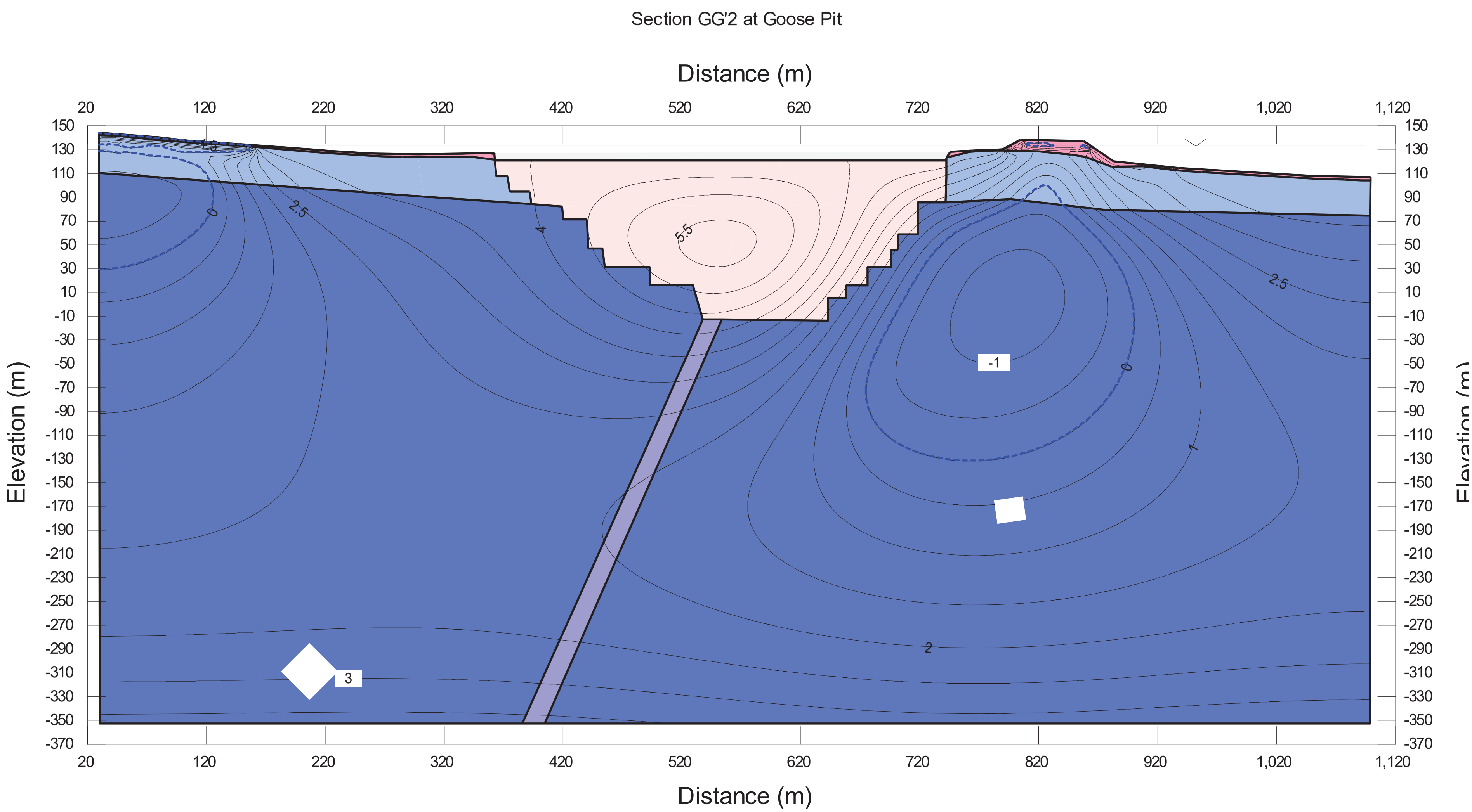

Figure A-17 Thermal Condition at Goose Pit, Cross section GG’2, Long term, at the end of a 100-year period – Climate Warming

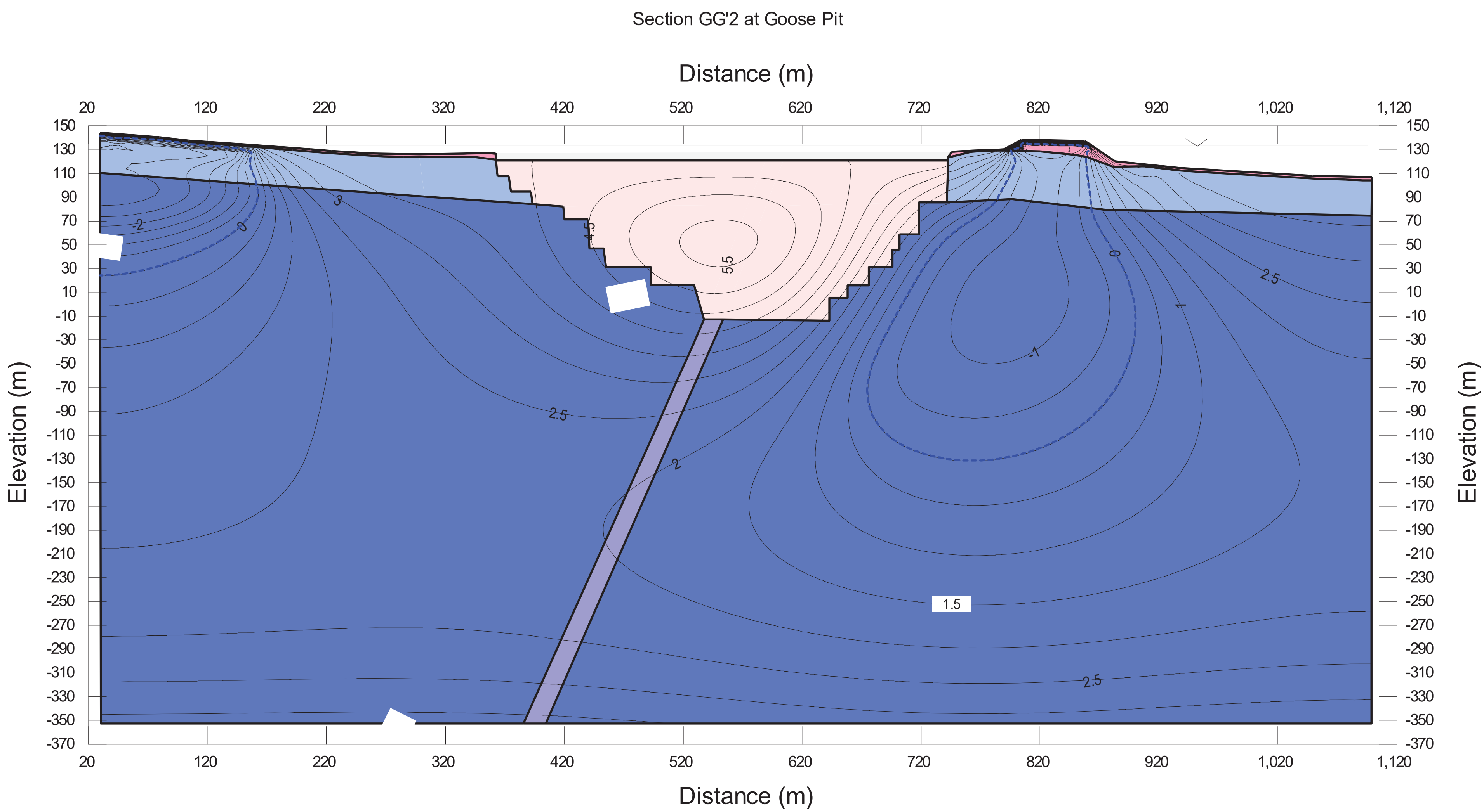

Figure A-18 Thermal Condition at Goose Pit, Cross section GG'2, Long term, at the end of a 100-year period - No Climate Warming

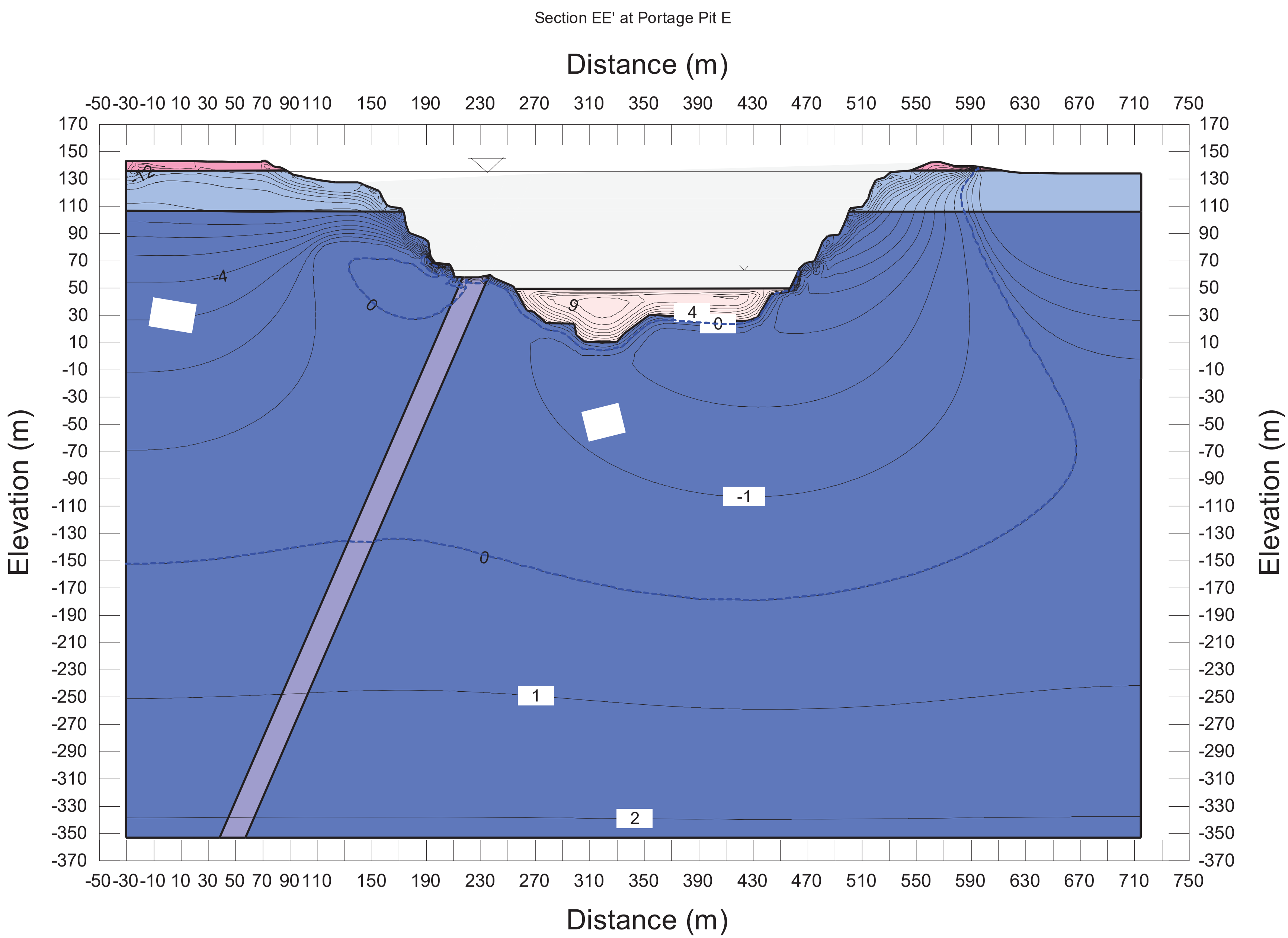

Figure A-19 Thermal Condition at Portage Pit E, Cross section EE', After completion of tailings deposition (First Layer, June 2020)

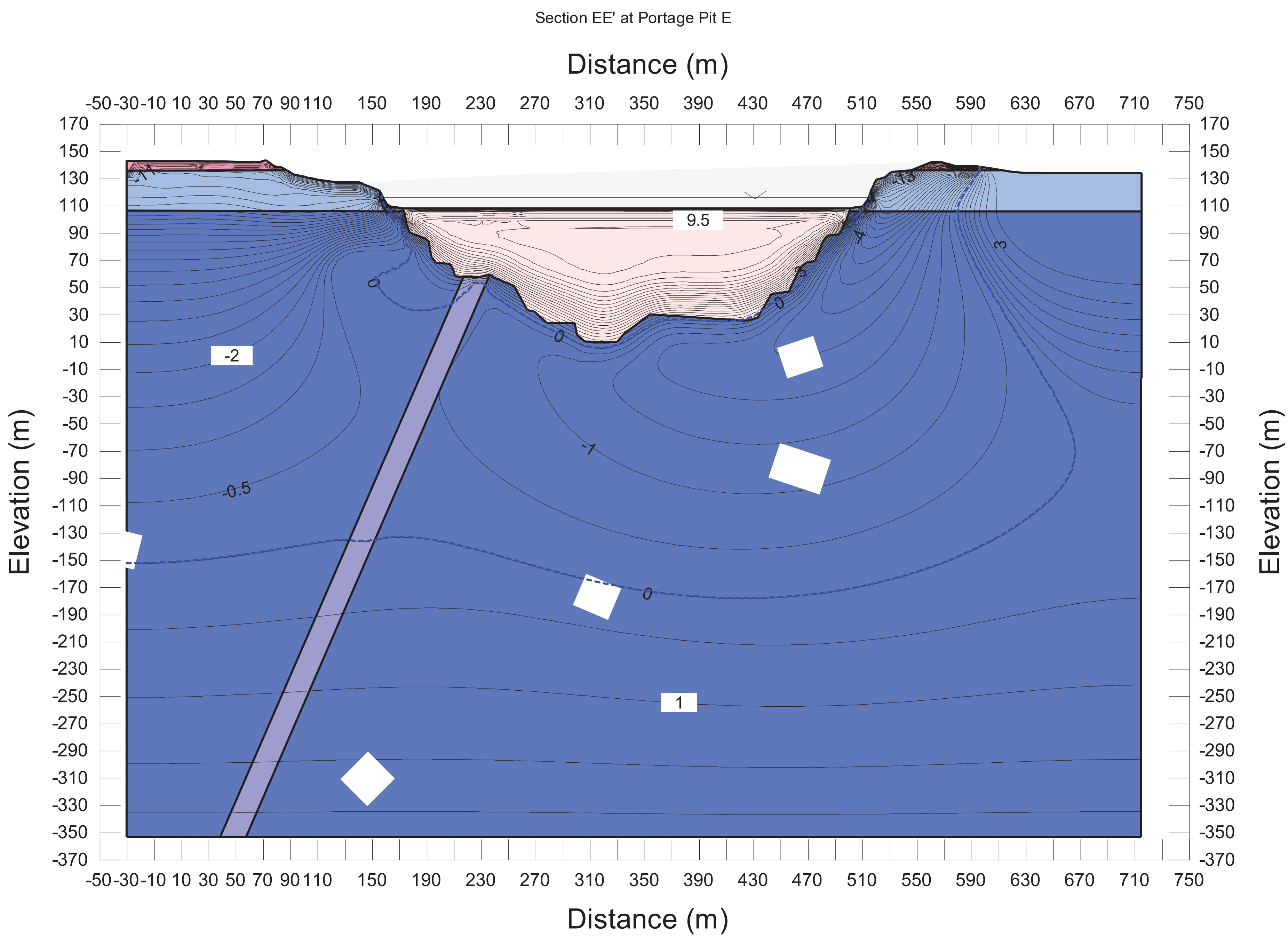

Figure A-20 Thermal Condition at Portage Pit E, Cross section EE', After completion of tailings deposition (Forth Layer, May 2026)

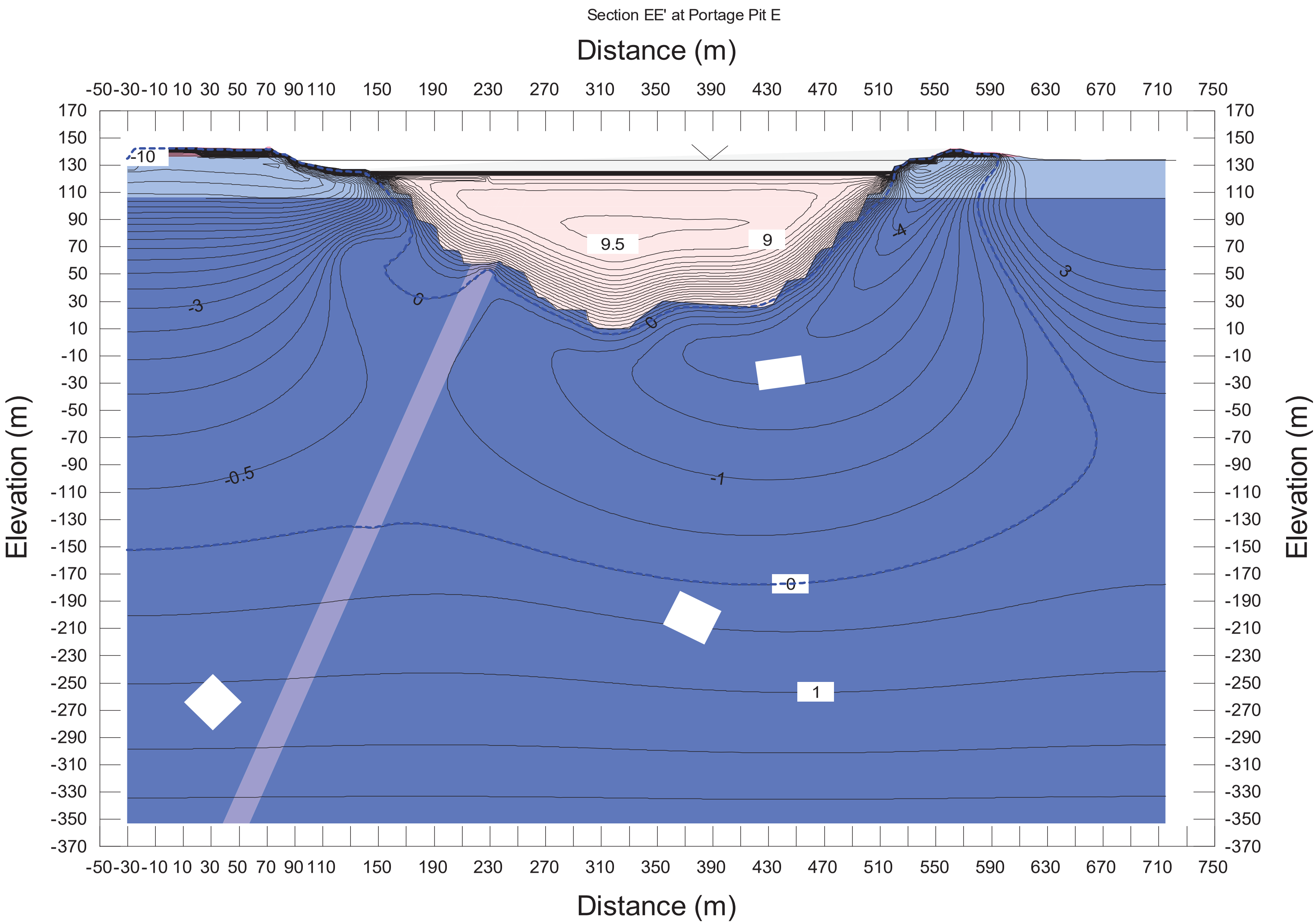

Figure A-21 Thermal Condition at Portage Pit, Cross section EE', After completion of tailings deposition (Seventh Layer, March 2029)

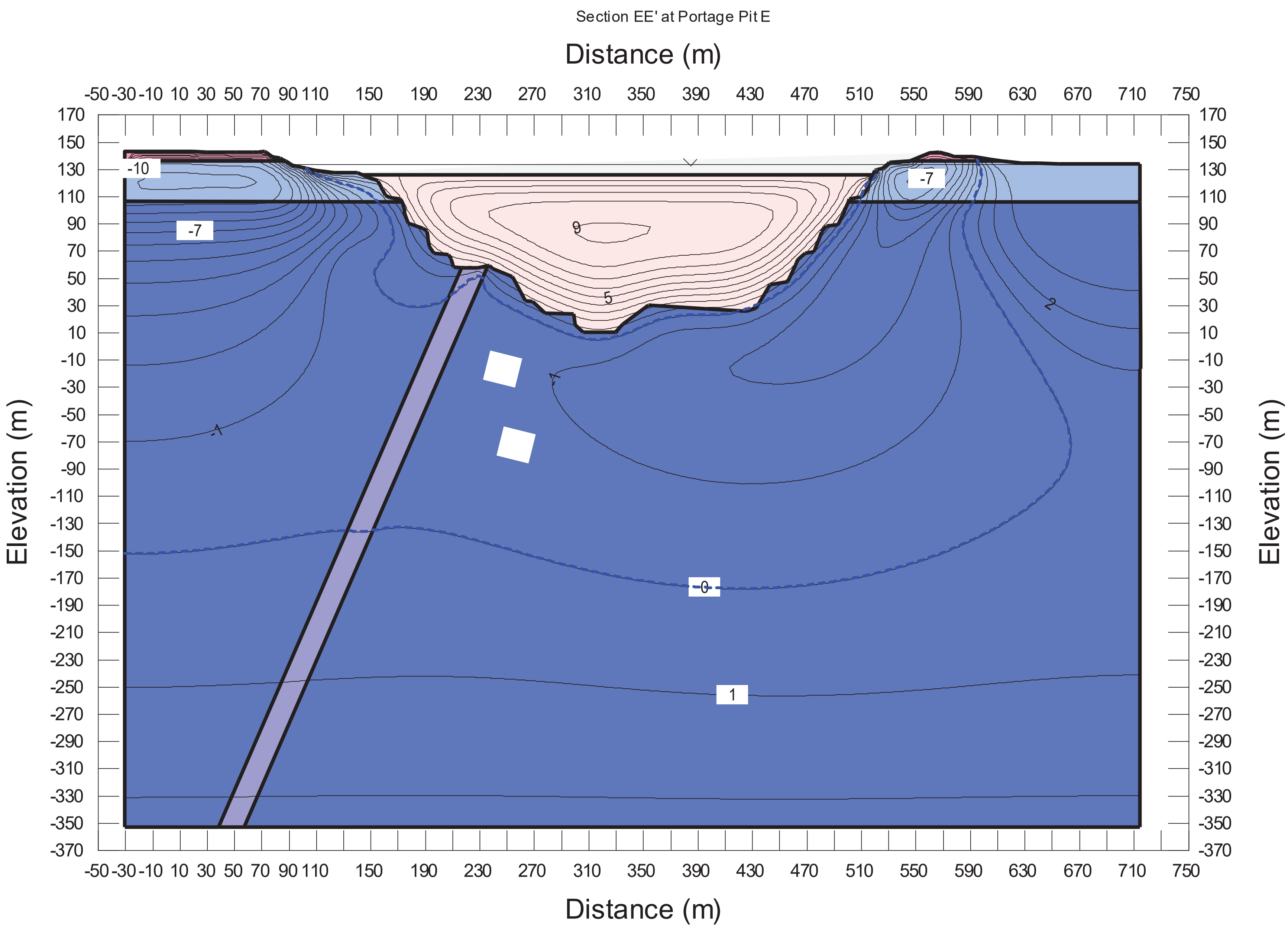

Figure A-22 Thermal Condition at Portage Pit E, Cross section EE’, At Closure, (End of 2035)

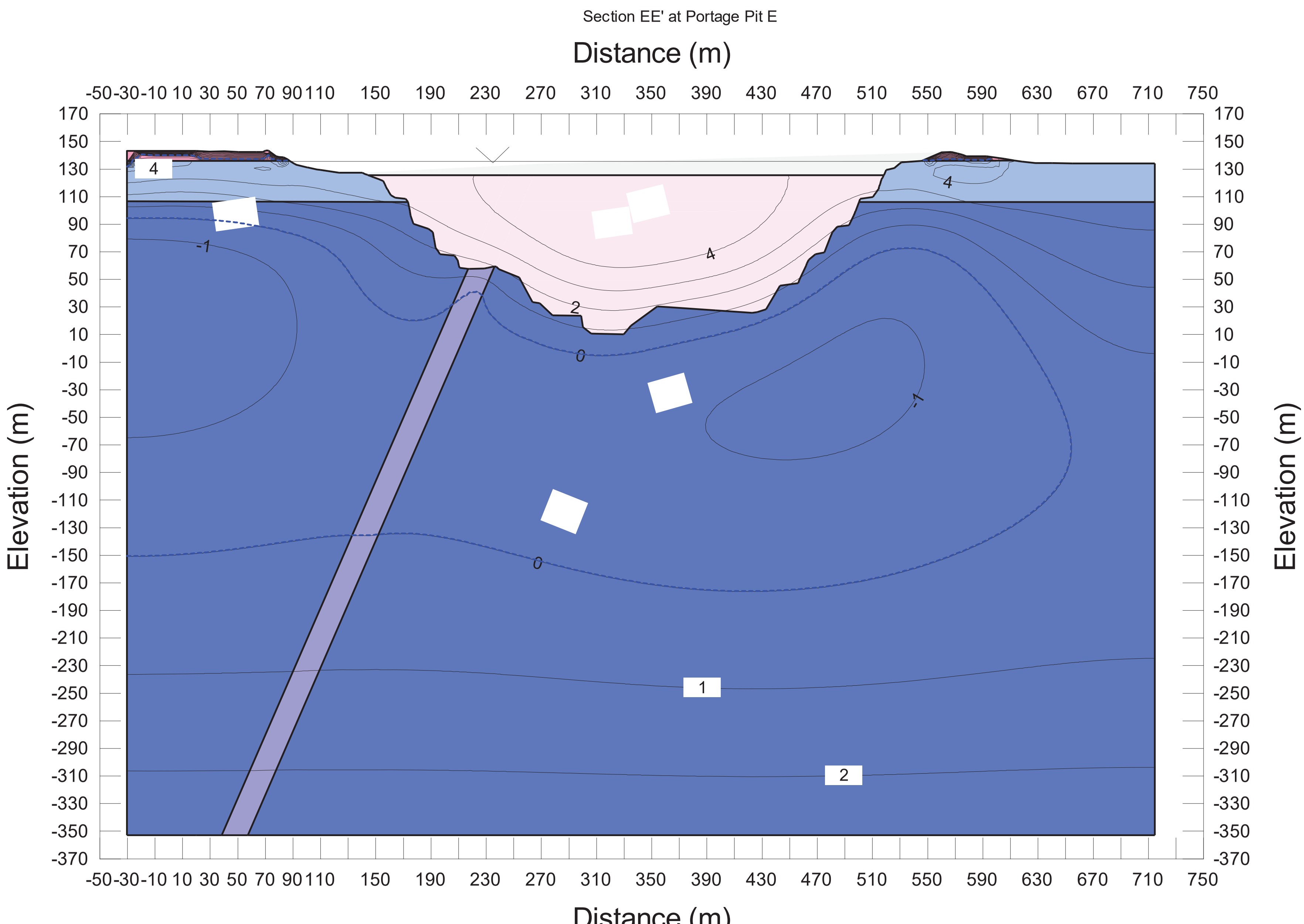

Figure A-23 Thermal Condition at Portage Pit E, Cross section EE', at the end of a 100-year period – Climate Warming

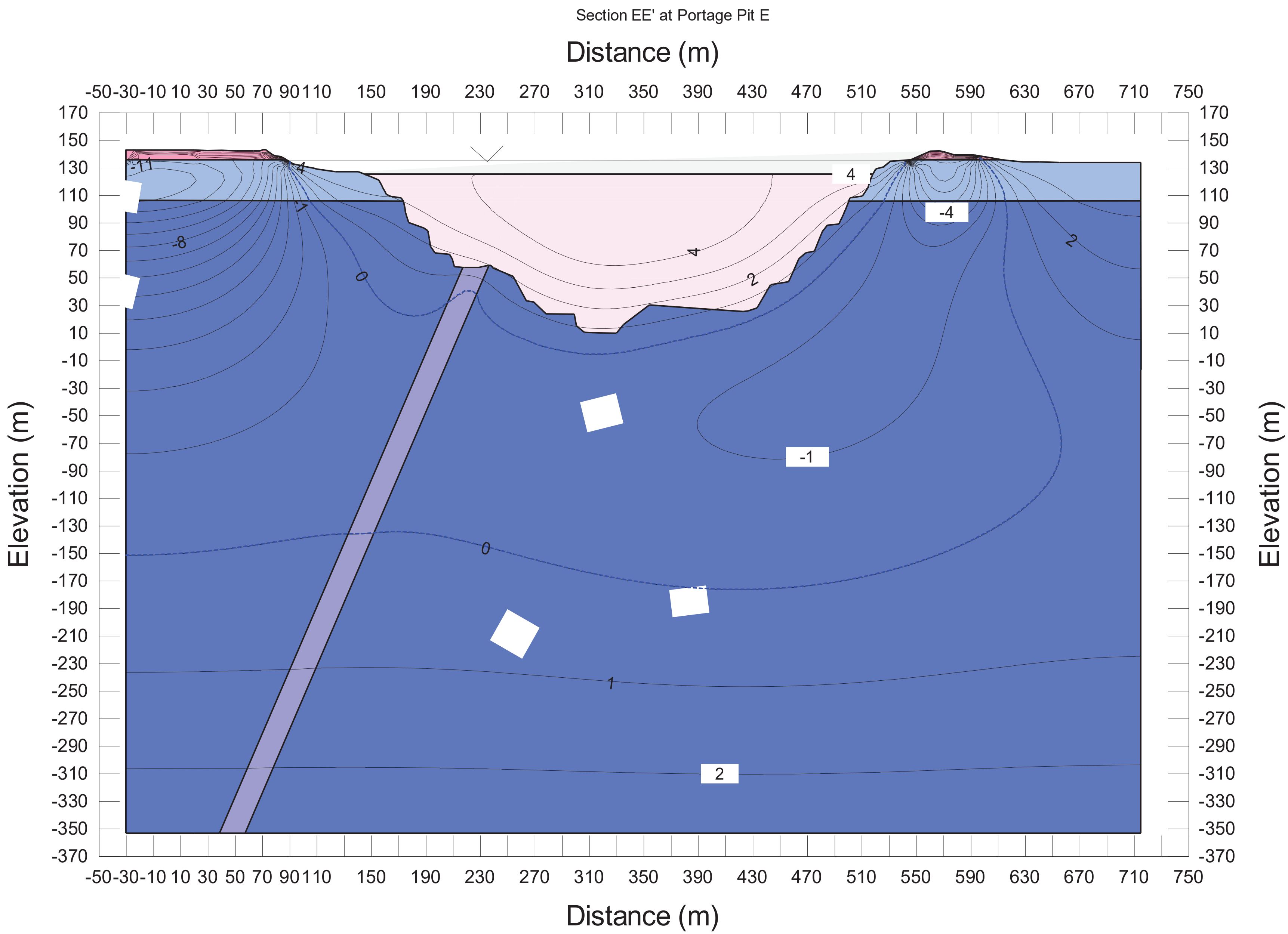

Figure A-24 Thermal Condition at Goose Pit, Cross section EE', at the end of a 100-year period – No Climate Warming

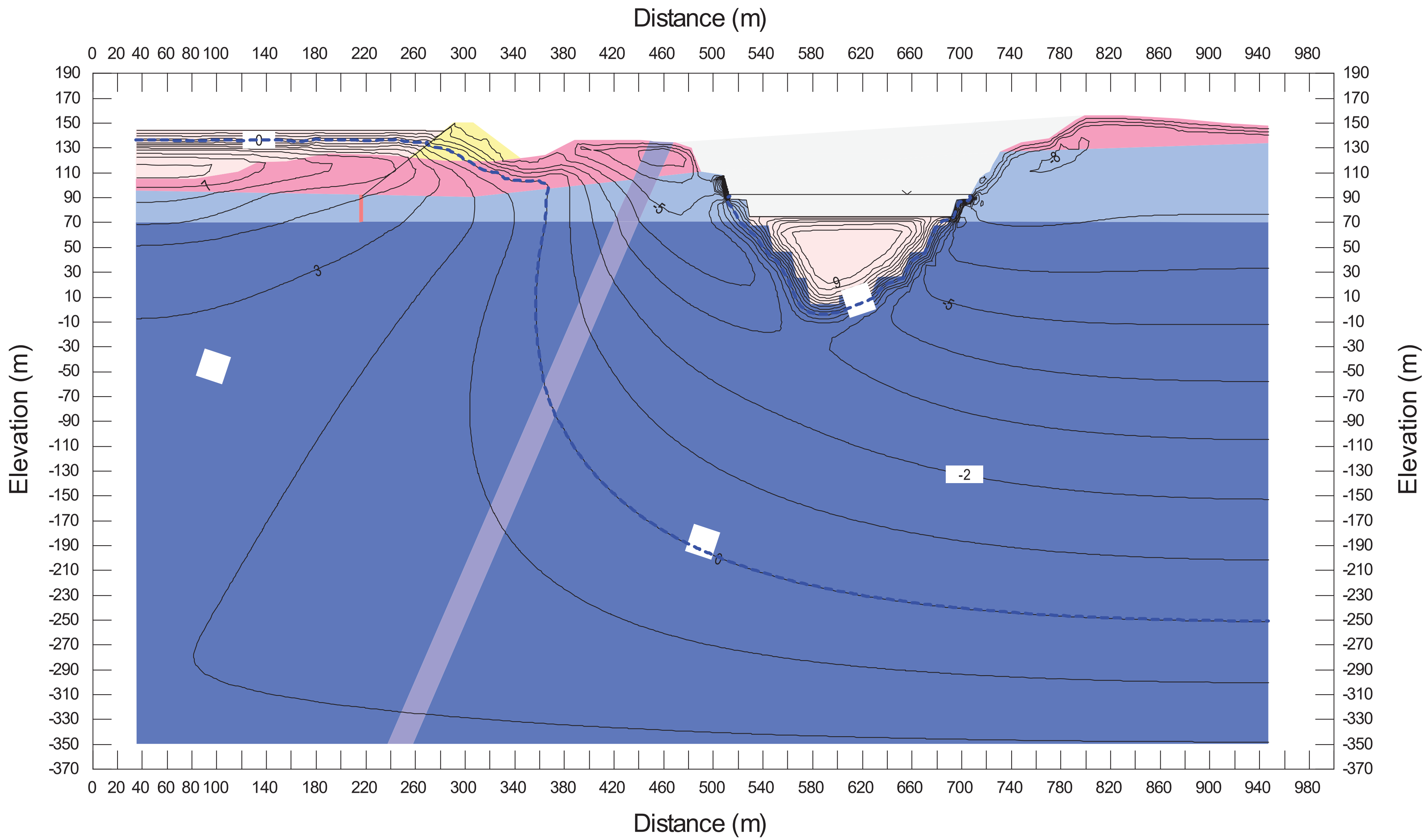

Figure A-25 Thermal Condition at Portage Pit A, Cross section AA', After completion of tailings deposition (First Layer, May 2021)

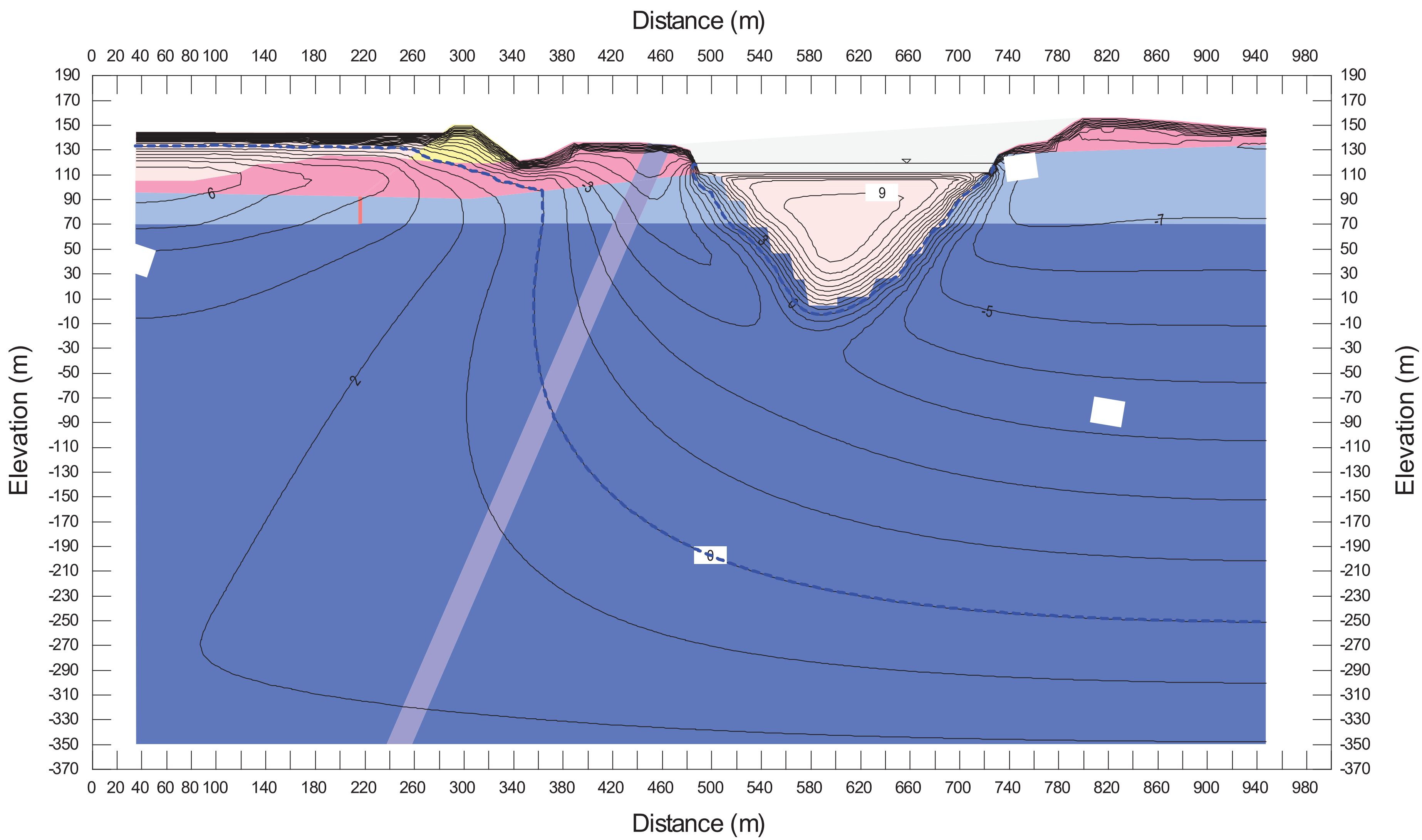

Figure A-26 Thermal Condition at Portage Pit A, Cross section AA', After completion of tailings deposition (Forth Layer, September 2026)

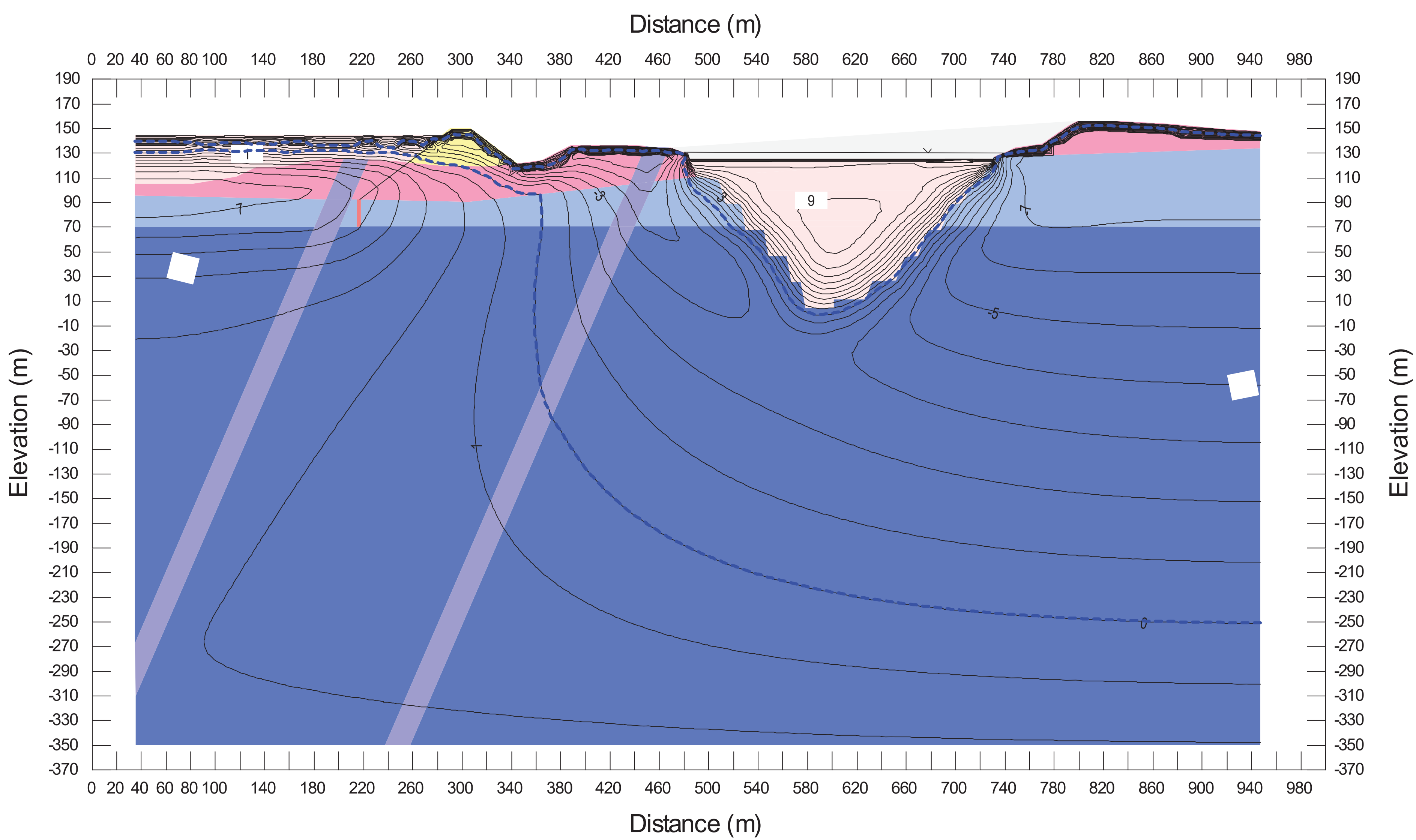

Figure A-27 Thermal Condition at Portage Pit A, Cross section AA', After completion of tailings deposition (Seventh Layer, June 2029)

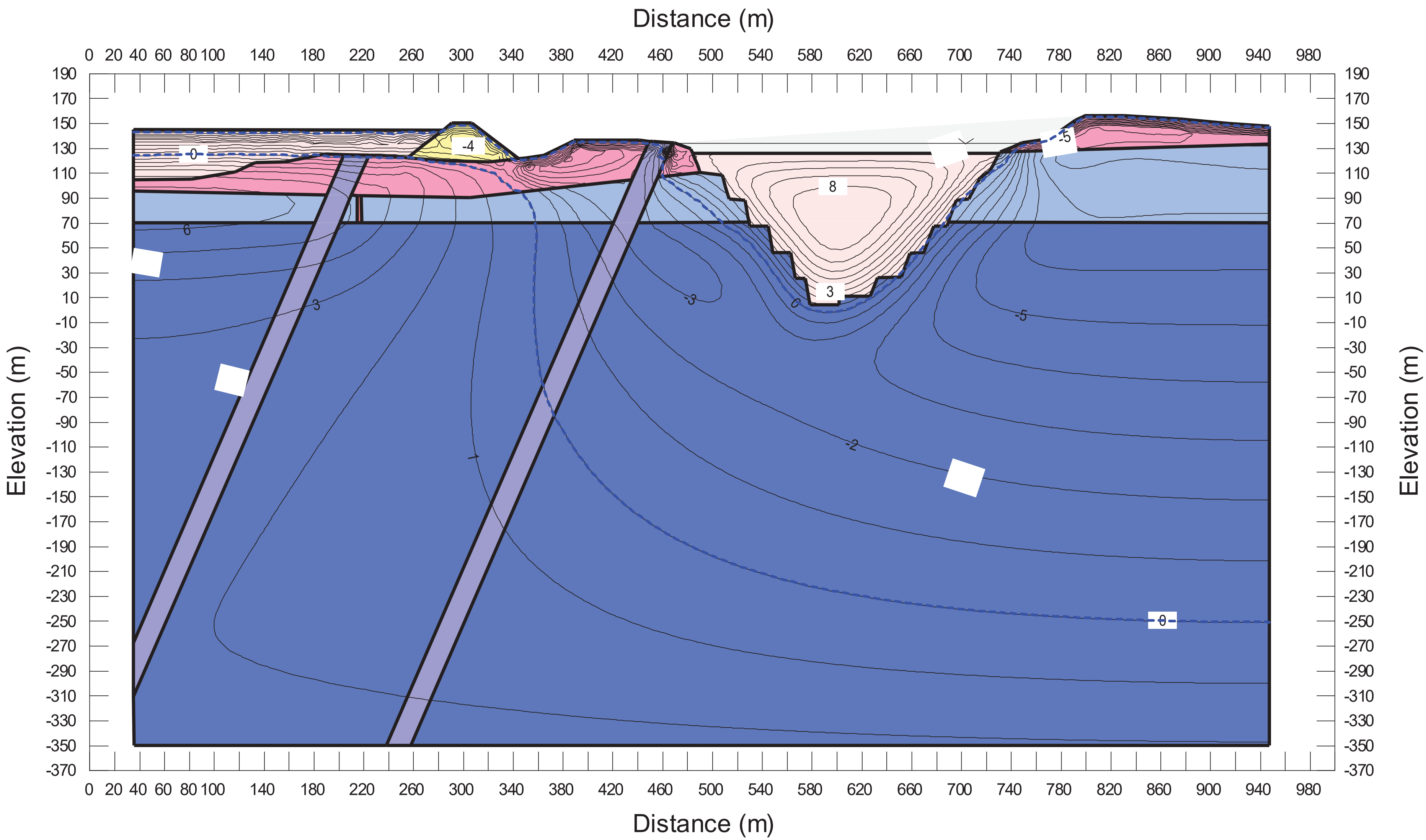

Figure A-28 Thermal Condition at Portage Pit A, Cross section AA', At Closure, (End of 2035)

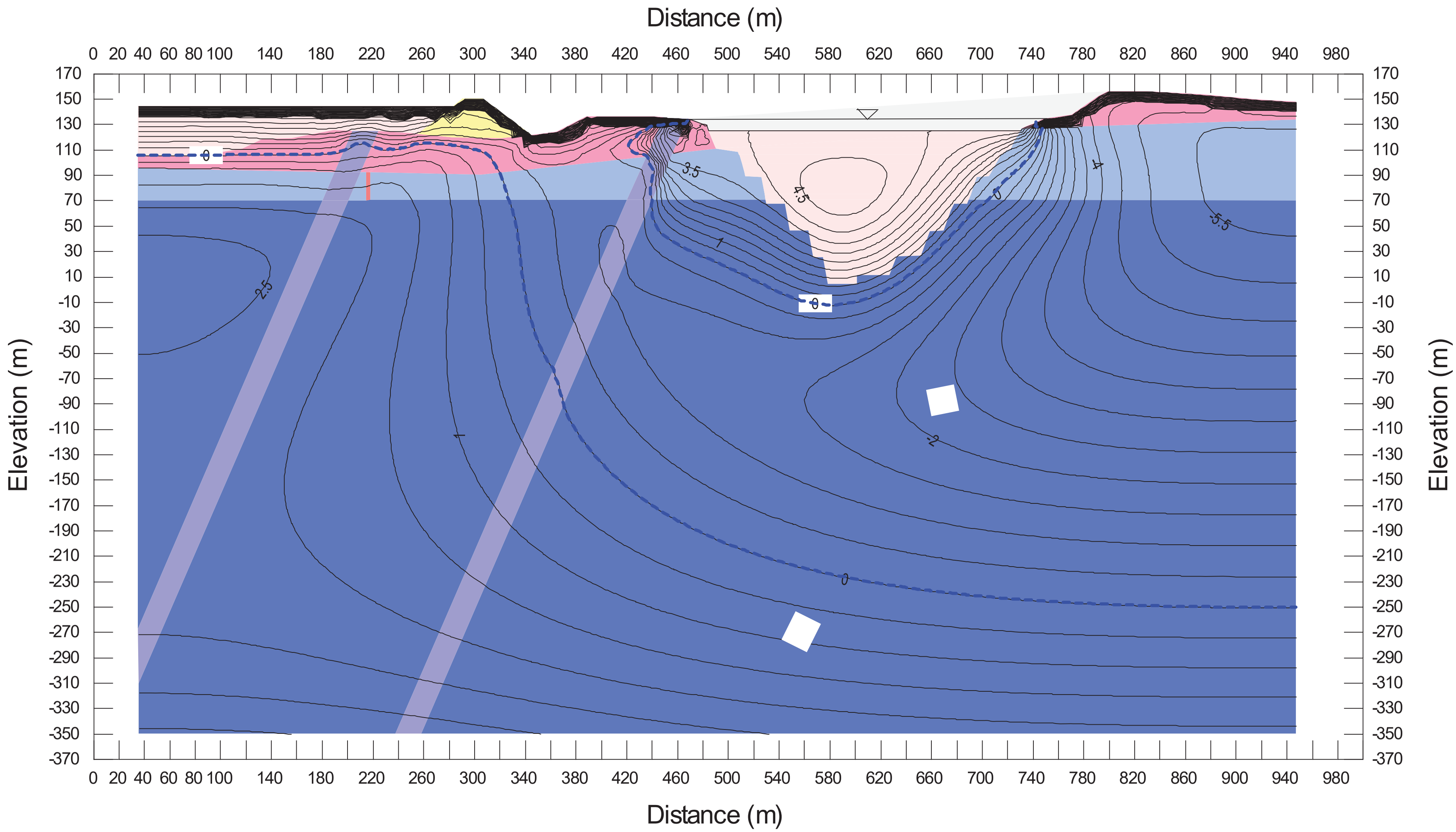

Figure A-29 Thermal Condition at Portage Pit A, Cross section AA', at the end of a 100-year period – Climate Warming

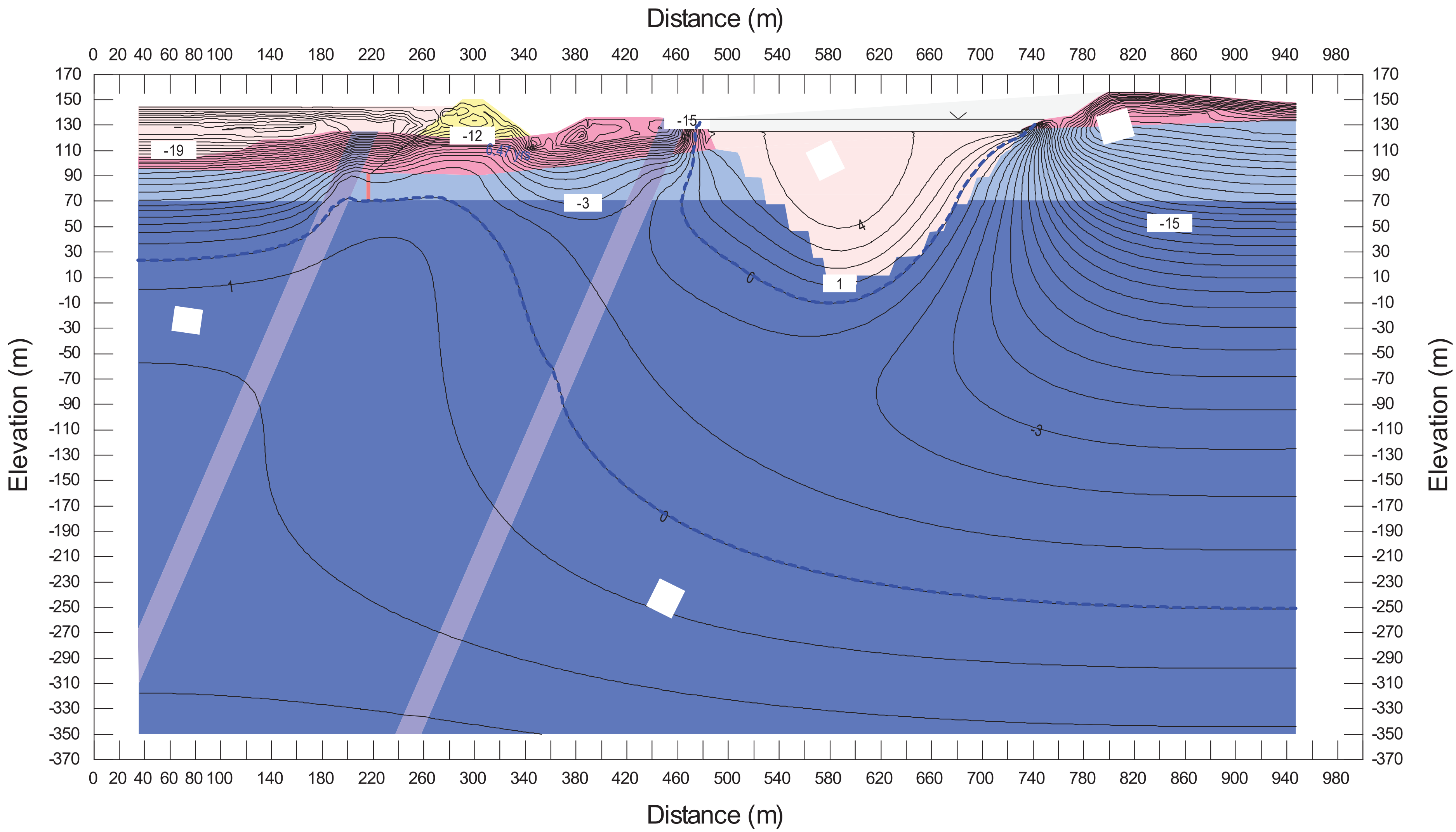

Figure A-30 Thermal Condition at Portage Pit A, Cross section AA', at the end of a 100-year period – No Climate Warming

Appendix B

Proposed Tailings Deposition Plan and Schedule

Proposed In-pit Tailings Deposition Plan and Schedule

AGNICO EAGLE MEADOWBANK IN-PIT DEPOSITION DETAIL
ENGINEERING
SUMMARY OF DEPOSITION
PLAN
BASED ON WATER/MASS BALANCE BASED ON FULL CAPACITY LOADING OF
TAILINGS IN THE PITS
BASED ON NEW TONNAGE
PROFILE

					Search Index:	*20*	*21*	*39*	*40*	*60*	*61*
						GOOSE PIT		PORTAGE PIT E		PORTAGE PIT A	
	Number of Deposition	Proposed Starting Time of Deposition	Proposed Ending Time of Deposition	Nb. Days	Location	Tailings Surface Elevation at end of Deposition (m)	Pit Water Level at end of Deposition (m)	Tailings Surface Elevation at end of Deposition (m)	Pit Water Level at end of Deposition (m)	Tailings Surface Elevation at end of Deposition (m)	Pit Water Level at end of Deposition (m)
START	1	April-18	June-19	426	Goose Pit	108.92	127.52	-23.00	4.62	-3.00	66.87
	2	July-19	June-20	336	Portage Pit E	108.92	125.13	49.11	63.16	-3.00	58.27
	3	July-20	May-21	304	Portage Pit A	108.92	121.09	49.11	64.21	74.94	92.25
	4	June-21	October-21	122	Goose Pit	120.40	127.78	49.11	87.38	74.94	90.02
	5	November-21	May-23	546	Portage Pit E	120.40	128.70	82.90	99.57	74.94	96.84
	6	June-23	April-24	305	Portage Pit A	120.40	128.57	82.90	102.44	99.21	105.11
	7	May-24	May-25	365	Portage Pit E	120.40	128.70	99.08	112.69	99.21	110.55
	8	June-25	September-25	92	Portage Pit A	120.40	127.63	99.08	113.40	105.99	115.78
	9	October-25	May-26	212	Portage Pit E	120.40	128.70	107.78	116.86	105.99	114.84
	10	June-26	September-26	92	Portage Pit A	120.40	127.63	107.78	117.51	111.65	119.72
	11	October-26	May-27	212	Portage Pit E	120.40	128.70	115.39	120.78	111.65	118.89
	12	June-27	September-27	92	Portage Pit A	120.40	127.63	115.39	122.74	116.44	124.68
	13	October-27	May-28	213	Portage Pit E	120.40	128.70	122.24	126.09	116.44	124.59
	14	June-28	November-28	153	Portage Pit A	120.40	127.91	122.24	127.59	122.74	128.85
	15	December-28	March-29	90	Portage Pit E	120.40	128.44	125.30	129.51	122.74	128.35
END	16	April-29	June-29	61	Portage Pit A	120.40	127.63	125.30	129.71	125.43	130.52

Summary of Mine Development Stages, and Final Tailings Surface and Pit Water Level Elevations

Item	Year of Excavation Started	Year of Excavation Completed	Proposed Year of Tailing Deposition started	Proposed Year of Tailing Deposition completed	Proposed Year of Closure	Final Elevation of Tailings Surface (m)	Pit Water Level at Closure (m)
Goose Pit	2012	2015	April 2018	October 2021	End 2035	120.40	133.6
Portage Pit A	2010	2018	July 2020	May 2028	End 2035	125.60	134.6
Portage Pit E	2010	2017	July 2019	May 2028	End 2035	125.61	135.6