Stantec

Memo

To:	C/O Lindsay Strachan (Earthtech Consulting) National Green Steel Limited	From:	Stantec New Zealand Level 4 105 Carlton Gore Road Newmarket, Auckland 1023 NEW ZEALAND Mail to: PO Box 13052, Christchurch 8140
Project/File:	310003448 Green Steel Hydrogeological Assessment of Environmental Effects	Date:	9 June 2025

Reference: Green Steel Hydrogeological AEE

1 Introduction

National Green Steel Limited (the client) have engaged Stantec New Zealand (Stantec) to carry out an Assessment of Environmental Effects (AEE) for a proposed groundwater supply. The client is proposing to develop an integrated metals resource recovery and steel manufacturing plant at 61 Hampton Downs Road, Hampton Downs, Waikato. The project, referred to as the Green Steel Project, requires water for key operational requirements of the utility and auxiliary facilities, with the primary use being cooling. National Green Steel Limited are investigating the possibility of using up to four boreholes onsite to supply 1000 m^3/day of water utilising groundwater within the fractured Waitematā Sandstone (referred herein as the Waitematā Sandstone Aquifer). The proposal presented by National Green Steel Limited originally estimated that 1,500 m^3/day may be required from the groundwater supply but further communications with the client have provided an updated estimate of 1000 m^3/day.

This memorandum reviews the hydrogeological testing and information provided by the client and provides a hydrogeological AEE based on the proposed water supply volume.

The following technical reports were provided by the client and reviewed as part of this AEE:

- Engineering Report (Earthtech 2025)
- Memorandum regarding: Air Lift Yield Results for BH54 Test Bore – Green Steel Project at 61 Hampton Downs Road (Earthtech 2025)
- Water Take and Supply Plan for the Green Steel Project: Groundwater, Surface Water and Harvesting Rainfall Runoff (Earthtech 2025)
- Preliminary Geotechnical Assessment Report (Earthtech 2024)

Additionally, Stantec have also undertaken a review of publicly available information for the geology and hydrogeology for the area including:

- The Waikato Regional Council's (WRC) wells data base[1]
- Technical reports for the Waitematā Sandstone aquifer
- GNS geology web maps[2]

2 Environmental Site Setting

2.1 Site Location

The proposed Green Steel Project is located at 61 Hampton Downs Road, Hampton Downs, Waikato. The site location, including the investigation boreholes, is shown in Figure 1, as provided by the client.

[1] Well and Bore locations - Waikato Region | Waikato Open Data and OneView
[2] https://www.gns.cri.nz/data-and-resources/geoscience-webmap/

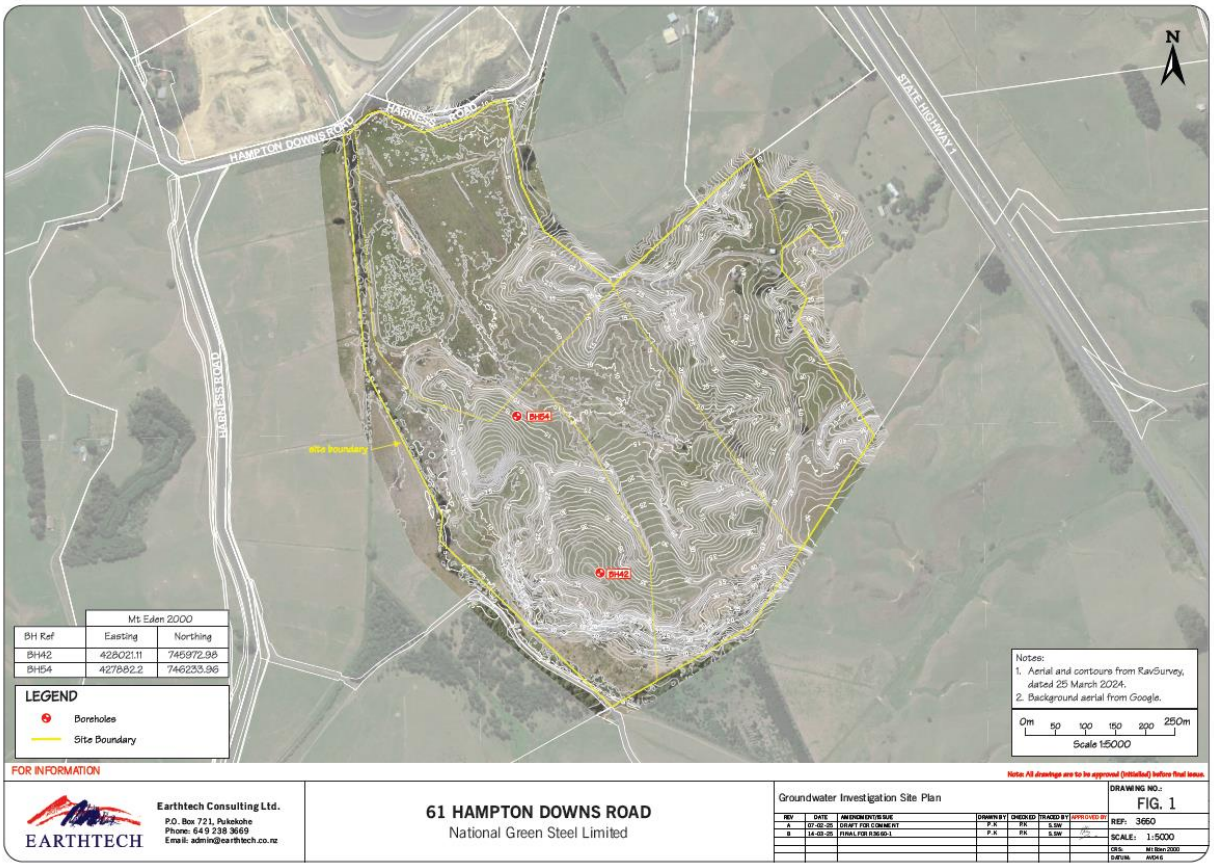

Figure 1 Site location, as provided by the client.

2.2 Mapped Geology

The regional mapped geology shows that three main units underlie the site; these are shown in Figure 2, as mapped by the New Zealand Geological Map (GNS Science, 2025). Ground investigations and reporting by the client show that the groundwater resource at the site is situated within the Waitematā Sandstone Aquifer, a fractured aquifer comprised of interbedded sandstone and siltstone.

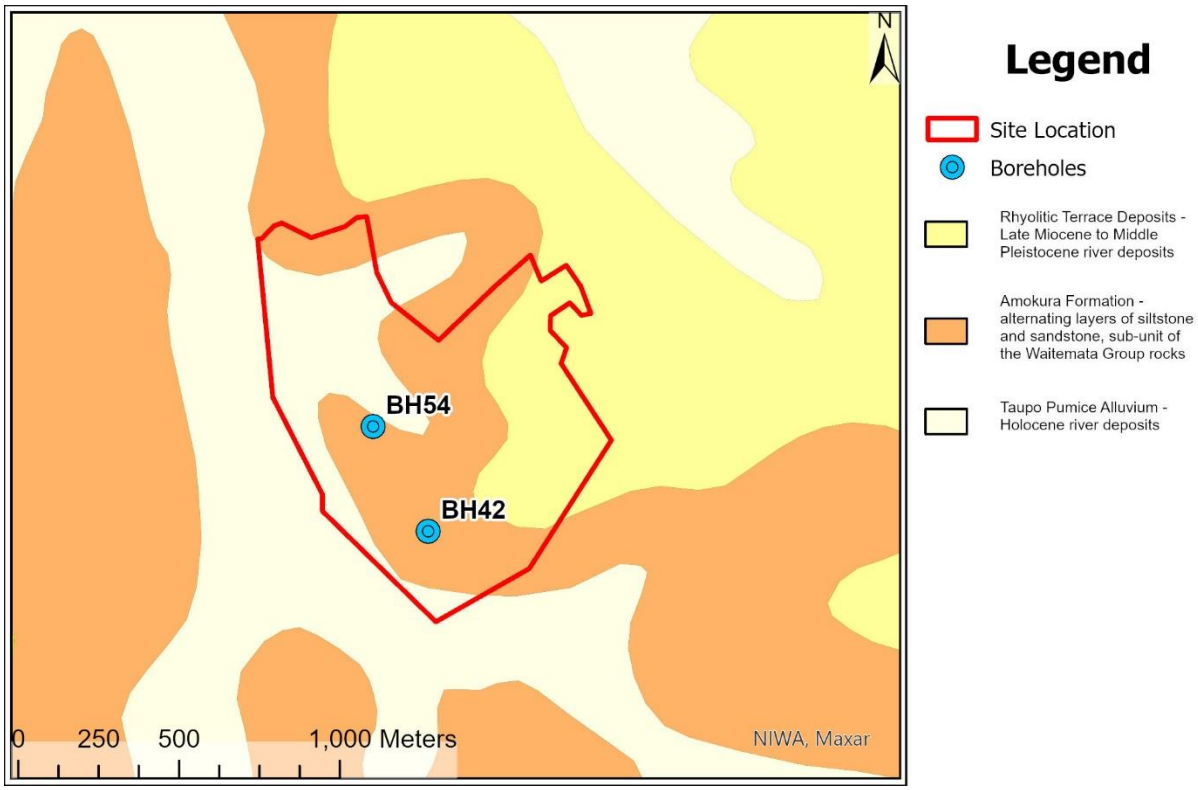

Figure 2 Mapped regional geology at the site location

2.3 Hydrology

The nearest surface water body is the Waipapa Stream, which is situated along the western boundary of the site (Figure 3). It is approximately 220 m from the closest onsite borehole and a stream depletion assessment from the proposed groundwater take has been completed (Section 4.2).

The Waikato River is situated 3.2 km from the site boundary at its closest point; at this distance it is unlikely to be an issue with this groundwater take. There are no wetlands mapped near the site.

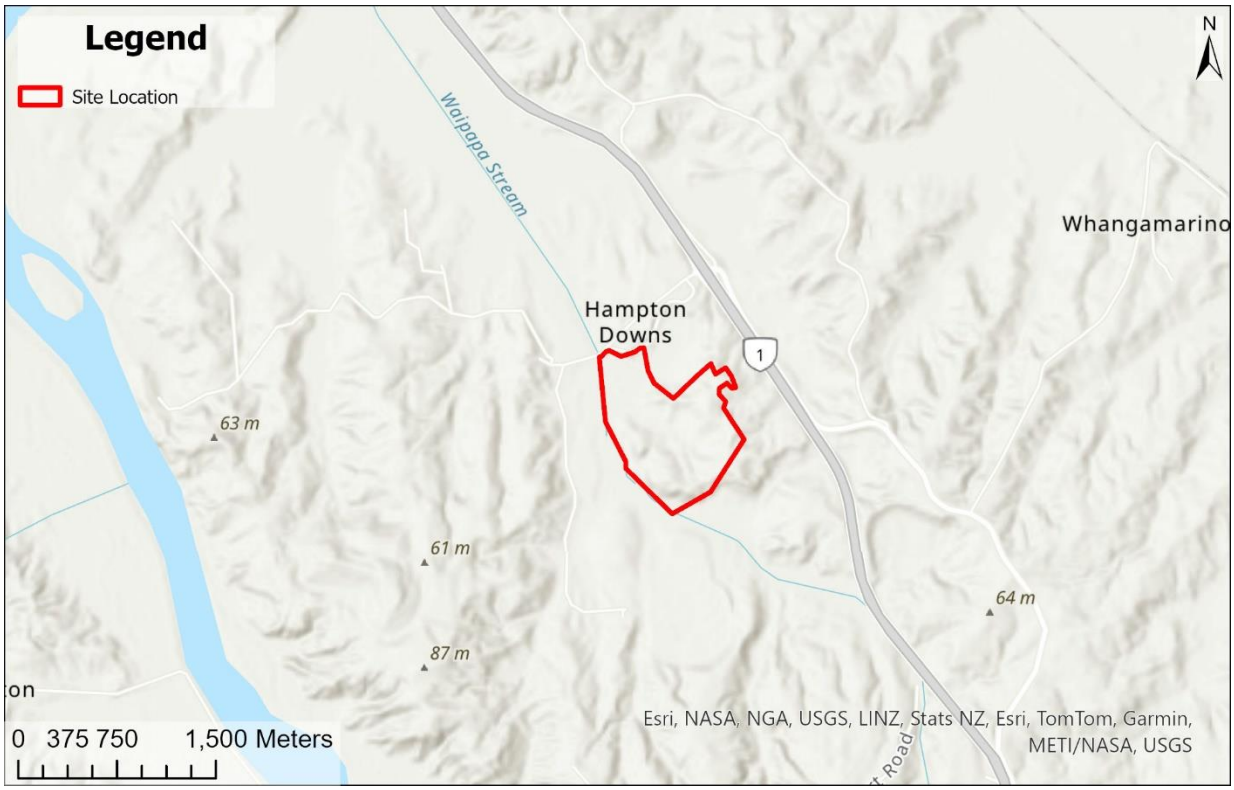

Figure 3 Nearby surface water bodies

2.4 Hydrogeology

A report by Pattle Delamore Partners Ltd described the Waitematā Sandstone Aquifer in the Karaka/Drury region, which is located approximately 35 km north of the Green Steel Project site location (Pattle Delamore Partners Ltd, 2012). The Waitematā Sandstone Aquifer was described as confined interlayering sandstone and mudstone sequences, with groundwater flow being mostly horizontal through fractures and sandstone beds and the mudstone sequences acting as aquitards. A transmissivity range of 6 – 62 m^2/day was provided.

Another report (Viljevac et al., 2002) describes the Waitematā Sandstone Aquifer in a similar manner, describing it as a confined aquifer of interbedded sandstone and mudstone with faulting. It was described as having low permeability, with an estimated hydraulic conductivity value of 2.72×10^{-2} m/day. North to south geological cross sections were provided; these are located further north than the project site area but provide a conceptual understanding of the geological formations that underlie the sit. The southern end of cross section 12 is closest to the site but is still approximately 12 km north (Figure 4).

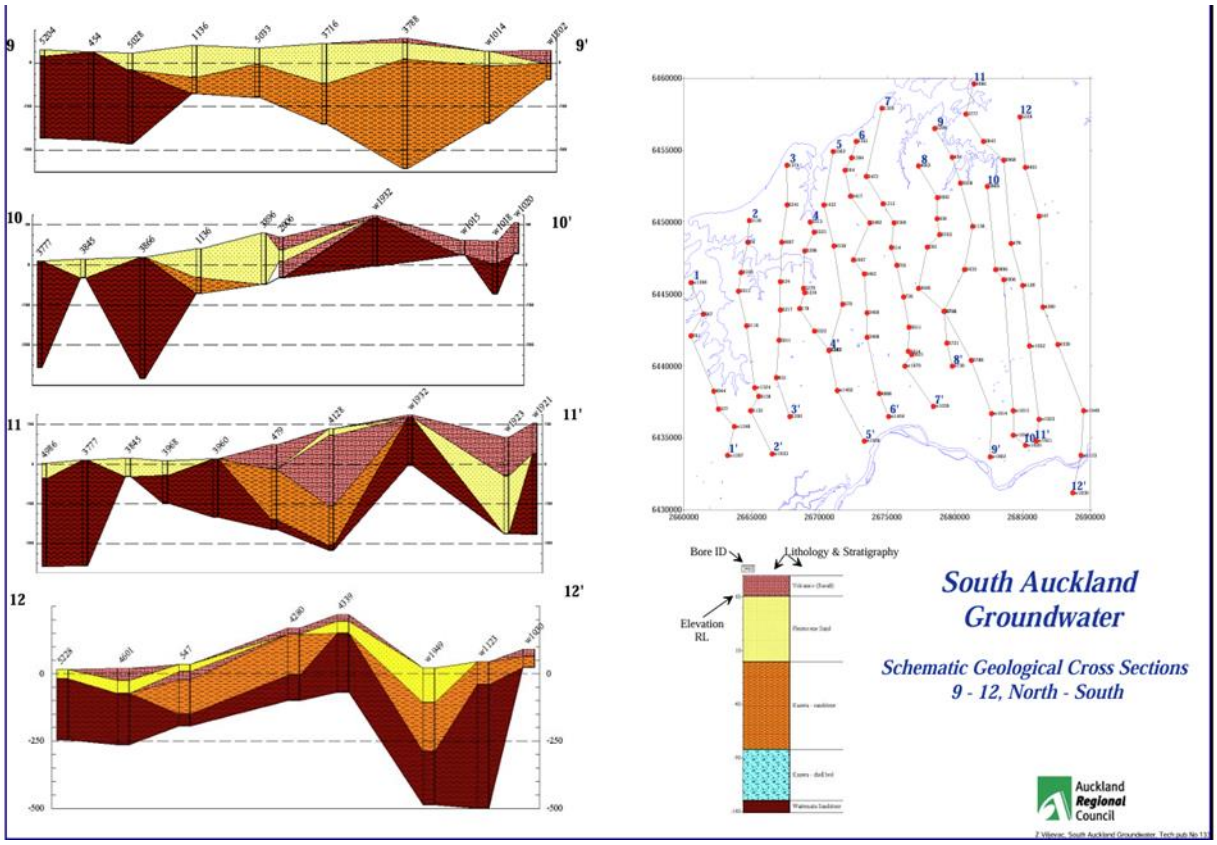

Figure 4 *North to south cross section of the Waitematā Sandstone group. Sourced from Viljevac et al., 2002.*

2.5 Other Groundwater Users

Groundwater bore data from Waikato Regional Council was reviewed. Bores within a 1 km radius of the site are shown in Figure 5.

There are two bores recorded on the site and another four bores within a 1 km radius of the site boundary. There is no information on the usage of the bores. A summary of the depths and the recorded groundwater levels (where recorded) is provided in Table 1.

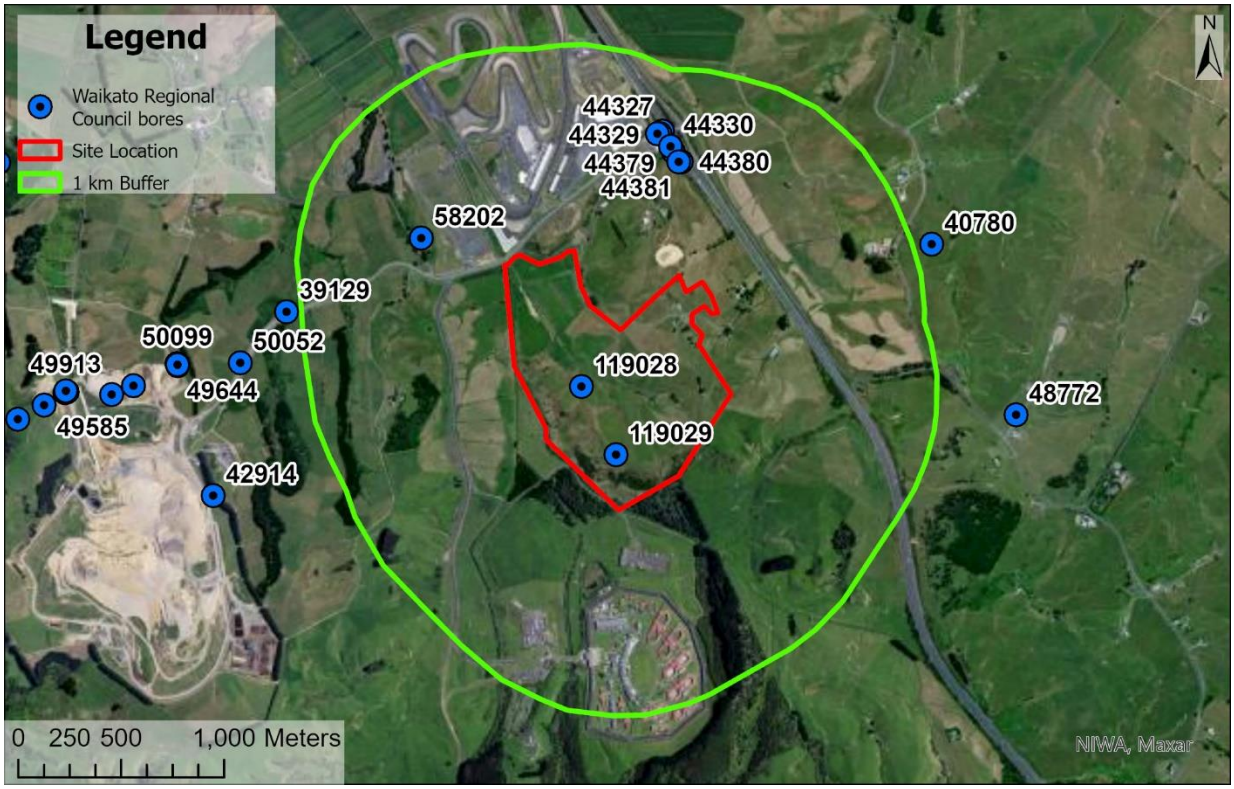

Figure 5 Waikato Regional Council bores within 1 km of the site

Table 1 Summary of Waikato Regional Council recorded bores within 1 km of site

Well Name	Distance to Site Boundary (m)	Well Depth (m)	Groundwater level (m below ground level)
119028	On site (BH54)	250	8
119029	On site (BH42)	300	33

58202	420	N/A	N/A
44381	555	10	N/A
44380	555	11	N/A
44331	600	9	N/A
44379	625	13	N/A
44330	625	11	N/A
44329	700	14	N/A
44328	700	11	1.6
44327	700	11	1.2

Notes: N/A = not available

The location of these bores was compared with data on the New Zealand Geotechnical Database (NZGD) to access any bore logs. Only one bore log was recorded for wells within in 1 km radius of the site; this was not present on the Waikato Regional Council wells database. The well location is shown in Figure 6. The bore log is provided in Appendix A, and the information is summarised as follows:

- The borehole is 15 m deep. Sandy gravel and sand was found within the first 1.5 m. The rest of the borehole is comprised of sandy silt, silt and sand, with a layer of clayey silt at 12.5 m. The names of the geological formations were not provided in the bore log.

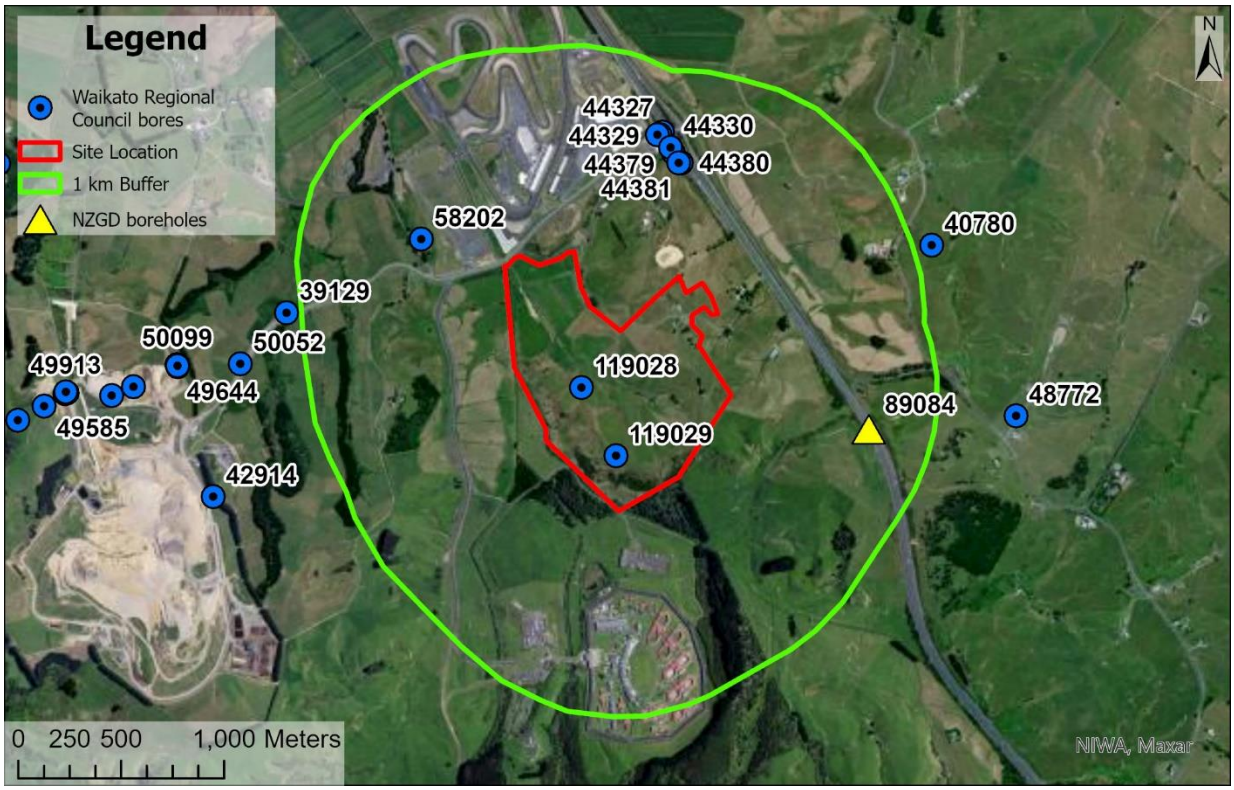

Figure 6 NZGD borehole location

2.6 Surrounding surface water bodies, wetlands and groundwater dependent ecosystems (GDES)

As discussed in Section 2.3, the nearest surface water body to the site is the Waipapa Stream, which is 220 m from bore 119029 at its closest point. No wetlands or other GDEs were identified nearby.

3 Technical Site Reports

The following is a summary of information provided by the client.

Preliminary Geotechnical Assessment Report, 61 Hampton Downs Road, Hampton Downs

The geotechnical assessment report summarised the site visits conducted from 28 December 2023 to 9 January 2024. Ten cone penetrometer tests (CPTs) were conducted, and eight hand augers were drilled. Field mapping also took place.

CPT data was collected from the locations shown in Figure 7. An interpretation of the geological formations at the site was presented; these are shown in Appendix B. The cross sections provided present layers of peat, stream alluvium, and the Amokura Formation as the main geological layers across the site.

Reference: Green Steel Hydrogeological AEE

Groundwater levels during the site investigation were presented. The range of groundwater levels encountered across the site were from 0.5 – 3 m below ground level.

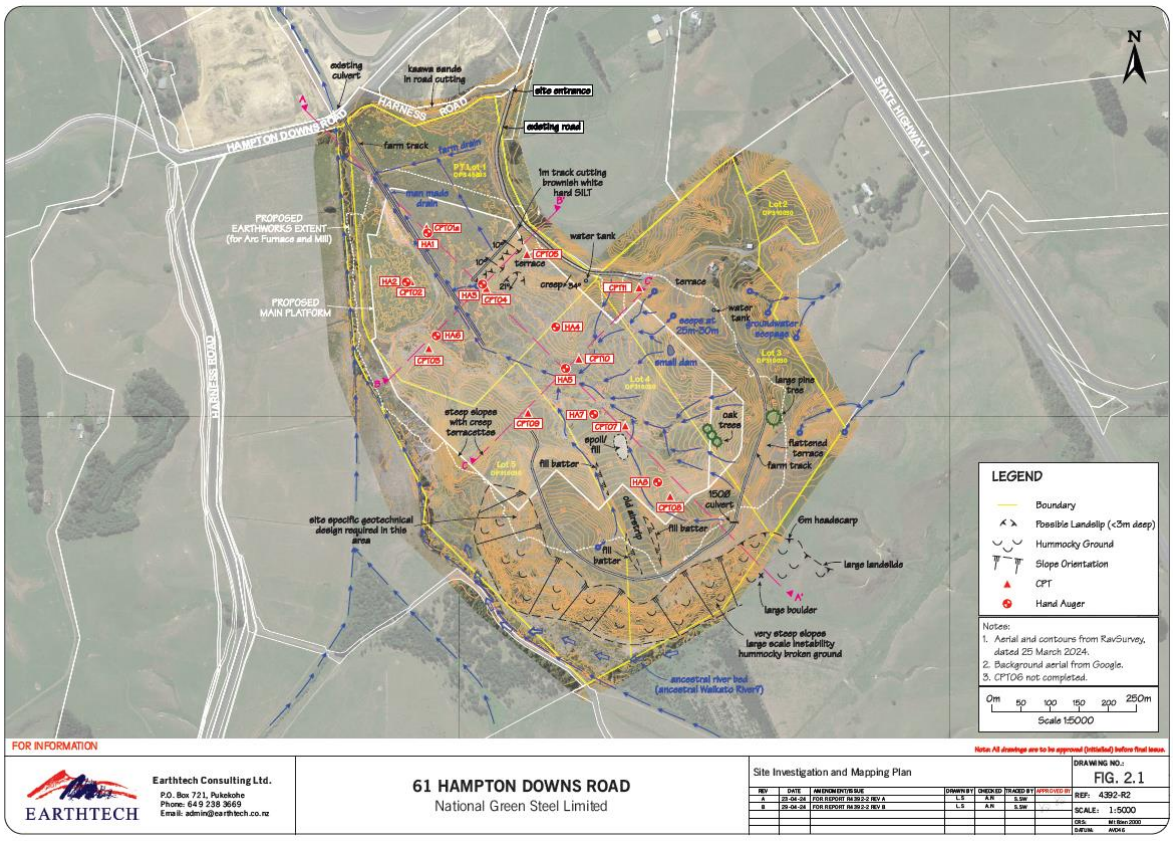

Figure 7 Location of CPT investigations during the geotechnical site investigations

Engineering Report, Green Steel Monofill, Hampton Downs

The engineering report addresses the design of the Green Steel Project, including stormwater drainage controls, leachate management and disposal, ancillary works and contingency management controls for the site. A conceptual geological model from the report is presented in Figure 8.

Reference: Green Steel Hydrogeological AEE

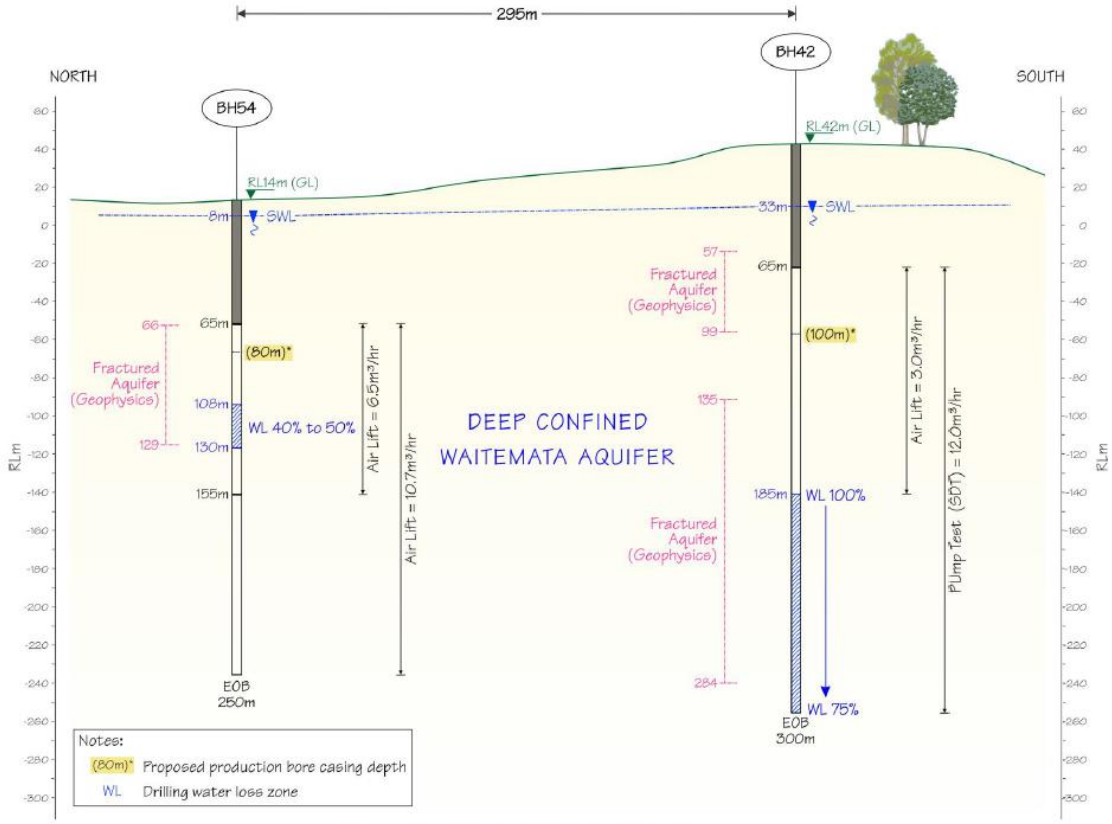

Figure D1: BH42 and BH54 Test Bore Results

Figure 8 Conceptual model and testing results from client

Water Take and Supply Plan for the Green Steel Project: Groundwater, Surface Water and Harvesting Rainfall Runoff

Information on the water supply requirements and options are provided in this report.

Details regarding the test bores, air lift yield and step drawdown test were provided. The results of the air lift yield test provided an estimated yield of 336 m^3/day for BH42 and 432 m^3/day for BH54, with a combined yield of 768 m^3/day. Based on this, it was estimated that four production boreholes (with a larger radius of 150 mm compared to the 100 mm radius test bores) could yield up to 1,540 m^3/day. As noted, based on our communications with the client, the proposed demand has reduced to 1000 m^3/day. This information was used in Stantec's assessment to calculate the drawdown effects.

The interpreted transmissivity from the air lift tests was 12 m^2/day. A separation distance of 300 m between the wells was recommended based on this.

A storativity of 7 x 10^{-4} was applied in the report based on a bulk average storativity data from the Franklin deep confined Waitematā Sandstone Aquifer. These values of transmissivity and storativity were used in Stantec's drawdown calculations.

The report provided bore logs for BH54 and BH42. The bore log for BH42 shows approximately 30 m of confining materials (silts, clays and mudstone). The bore log for BH54 shows 10 m of confining material (clay). The aquifer underlying the confining material is described by the drillers as mudstone / sandstone. The Waitematā Sandstone Aquifer is also described by others (see Section 2.4) as being “interlayered sandstone and mudstone sequences, with groundwater flow being mostly horizontal through fractures and sandstone beds”.

Based on the bore logs from the wells onsite, have assumed that there is at least 10 m of silt, clay or mudstone overlying the screened zone, confining the aquifer. Based on the literature, a conservative value for the permeability of these layers is 0.01 m/day.

There is limited information available regarding the location and extent of the fracture network within the Waitematā Sandstone Aquifer at the site. The nature of fractured aquifers means that the actual transmissivity, yield, and drawdown could vary greatly depending on the fracture system beneath the site.

4 Analytical Modelling

4.1 Drawdown Impacts

There is little to no information on how extensive the fracture network within the area is or the direction of the fracturing. For the purpose of modelling drawdown impacts we have used the Theis function to calculate drawdown vs time and drawdown vs distance for radial flow (under confined conditions).

We have modelled two scenarios, described as follows:

Scenario 1: Four bores with a combined pumping rate of 1000 m^3/day (as proposed by the client). Although in reality these bores will be spread out, we have modelled the groundwater take as being pumped from one point. This is to assess the combined take impacts on other users within a 1 km radius of the site boundary.

Scenario 2: One individual bore pumping 500 m^3/day. This is to review the potential interference between the two bores onsite, which are located approximately 300 m apart. This is a conservative calculation given the total take will be split between four evenly spaced bores but does not consider the impact of cumulative drawdown on the bore.

4.1.1 Model Inputs

The data inputs used in our drawdown calculations are based on investigations undertaken by a third party, as discussed in Section 3. Stantec have not undertaken any additional testing. However, based on a review of technical information supplied, we considered that the hydraulic properties presented are reasonable for the type of aquifer (confined). Table 2 summarises the input data we have used in our drawdown calculations. The full model inputs and outputs are provided in Appendix C.

Table 2 Summary of aquifer properties used in drawdown calculations

Scenario	**Pumping rate Q (L/s)**	**Transmissivity (T) [m^2/d]**	**Storativity (S)**	**Origin of data**
Scenario 1	11.5 (1000 m^3/d)	12	0.0007	Water Take and Supply Plan for the Green Steel Project: Groundwater, Surface Water and Harvesting Rainfall Runoff report
Scenario 2	5.75 (500 m^3/d)			

4.1.2 Model Outputs

The results of the drawdown calculations for each scenario are summarised below in Table 3.

Table 3 Summary of drawdown results

	Drawdown (m)			
	Scenario 1		**Scenario 2**	
Distance (m)	1 Day	1 Week	1 Day	1 Week
100	9.8	21.8	5.0	11.0
300	0.9	8.4	0.4	4.2
1000	0.0	0.3	0.0	0.1

Results of continuous pumping with time are considered conservative given the type of calculation used does not consider recharge.

4.2 Stream Depletion

The potential stream depletion impacts on the Waipapa Stream were assessed using the Hunt (2003) analytical equation. This analysis assesses stream depletion for an aquifer with a confining layer. For the purposes of our analysis we have assumed that the confining layer is 10 m based on the bore logs provided. The model inputs and outputs are provided below.

4.2.1 Model Inputs

The inputs to the stream depletion calculation are summarised below in Table 4. The full model input and outputs are provided in Appendix D.

Table 4 Stream depletion model inputs

	Pumped aquifer	**Aquitard**	**Streambed**	**Well**	**Origin of information**
Transmissivity (m^2/d)	12	N/A	N/A	N/A	Water Take and Supply Plan for the Green Steel Project: Groundwater, Surface Water and Harvesting Rainfall Runoff report
Storativity / specific yield	0.0007	0.01	N/A	N/A	
Hydraulic conductivity (m/d)	N/A	0.01	0.1	N/A	Wider literature
Pumping rate (L/s)	N/A	N/A	N/A	11	Water Take and Supply Plan for the Green Steel Project: Groundwater, Surface Water and Harvesting Rainfall Runoff report
Separation distance (m)	N/A	N/A	N/A	220	

4.2.2 Model Outputs

The outputs of the stream depletion analysis show that after one day, only 1% of the daily take will be from the Waipapa Stream. After seven days, only 3% of the daily take will be from the Waipapa Stream. This calculation is overly conservative as it is unlikely that the bores would be pumped at full capacity for a week or longer and the calculation does not consider recharge. It is also noted that for modelling purposes, the assessment conservatively assumes a pumping rate of 1000 m^3/day from one borehole (closest to the stream). In reality, it is proposed that four boreholes will supply the pumping rate, which will decrease the stream depletion impact as the boreholes will be spread out. Therefore, the results show that the stream depletion impacts will be insignificant. The results are summarised in Table 5 and provided in full in Appendix D.

Table 5 Summary of stream depletion model outputs

Time (days)	Stream depletion	Stream depletion (L/s)
1	1%	0.1
7	3%	0.3

5 Assessment of Environmental Effects

The nearest third-party bore (58202) is approximately 1 km from the closest onsite borehole (BH54). As shown in Table 3, after one day of continuous pumping the drawdown impact at 1000 m is 0.0 m. After one week of continuous pumping, the drawdown effect is 0.3 m. The results of the drawdown calculations show that there is minimal impact on nearby boreholes due to the proposed pumping.

The results of Scenario 2 show that after one day of continuous pumping the drawdown impacts on each of the pumping wells due to interference is 0.4 m (Table 3). After one week of continuous pumping, the drawdown is 4.2 m. The drawdown impact on each of the pumping wells due to interference is minimal considering available drawdown in the bore.

The nearest surface water body is the Waipapa Stream, which is situated along the western boundary of the site and 220 m from the nearest onsite borehole. The results of the stream depletion assessment show that the effects will be insignificant. The Waikato River is 3.2 km from the site boundary, and it is unlikely that there will be any drawdown impacts due to the proposed pumping. There are no other surface water bodies or GDEs within the vicinity of the site (Section 2.6).

Therefore, the calculations show that the impacts of the proposed take of 1000 m^3/day on other groundwater users, nearby surface water bodies and GDEs are not significant.

6 Conclusion

A hydrogeological AEE has been completed for National Green Steel Limited, for a proposed take of 1000 m^3/day from the Waitematā Sandstone Aquifer. The assessment included a review of the groundwater investigations undertaken by Earthtech Consulting, groundwater well information held by Waikato Regional Council and technical reports providing general information on the Waitematā Sandstone Aquifer.

Four groundwater wells within a 1 km radius of the project site were identified. The Waipapa Stream was identified near the border of the site. No wetlands or groundwater dependent ecosystems were identified.

Drawdown vs distance and drawdown vs time calculations were undertaken using the Theis function. The results show that continuous pumping for one week would have negligible drawdown effects on the nearby bores. Drawdown at the nearest site bore (300 m from the modelled pumped borehole) after one week of continuous pumping would be 4.2 m. Given the available drawdown in the onsite bores and the conservative nature of the calculations (do not consider recharge) the well intererence is not considered significant. Therefore, based on our drawdown calculations, the impacts on other users and onsite well interference from the proposed pumping are not significant.

Stream depletion analysis was undertaken using Hunt (2003) to assess the potential impacts on the nearby Waipapa Stream. Based on this analysis, the impacts on the nearby Waipapa Stream from the proposed pumping rate will not be significant (only 3% of the daily take is from the Waipapa Stream after one week of continuous pumping).

We recommend further onsite testing to better understand sustainable take rates and recharge. Testing should consist of a step test followed by a constant rate pumping test at the maximum sustainable pumping rate for three days or greater.

Yours Sincerely,

Stantec New Zealand

References

Earthtech Consulting Limited, 2024. Preliminary Geotechnical Assessment Report: 61 Hampton Downs Road, Hampton Downs. Prepared for National Green Steel Limited by Earthtech Consulting Limited.

Earthtech Consulting Limited, January 2025. Re: Air Lift Yield Results for BH54 Test Bore – Green Steel Project at 61 Hampton Downs Road.

Earthtech Consulting Limited, March 2025. Water Take and Supply Plan for the Green Steel Project: Groundwater, Surface Water and Harvesting Rainfall Runoff. Prepared for National Green Steel Limited by Earthtech Consulting Limited.

Earthtech Consulting Limited, March 2025. Engineering Report, Green Steel Monofill, Hampton Downs: 61 Hampton Downs Road, Hampton Downs, Waikato. Prepared for National Green Steel Limited by Earthtech Consulting Limited.

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Pattle Delamore Partners Ltd, 2012. Karaka Rural Urban Boundary Waitemata Aquifer Recharge Assessment.

Viljevac, Z., Murphy, G., Smaill, A., Crowcroft, G., and Bowden, D. 2002. South Auckland Groundwater, Kaawa Aquifer Recharge Study and Management of The Volcanic And Kaawa Aquifers.

Appendix A NZGD Bore log

Hamilton Laboratory
Private Bag 3057
Hamilton
New Zealand
Tel. 64 7 856 2870
Fax 64 7 856 2873

Borehole No: 1

Project Name: Hampton Downs Slumping
Client: New Zealand Transport Agency
Location: SH1 RP 486/9.3 Northbound Shoulder
Project No. 2-31560.AS **Lab Ref.** 10/949/001

Co-ordinates: N645861.895, E328969.688
Grid: Datum-NZ Geodetic 1949 / Circuit-Mt Eden 1949
Elevation: 24.411m **Datum:** Ellipsoidal Heights
Inclination: Vertical **Azimuth:** N/A

Depth	Drilling Method	Casing	Description	Graphic Log	Depth/Elev	Type	Recovery	Vane Test kPa (0 20 60 100) / SPT N (0 10 30 50)	Additional Lab Tests/Notes	Piezometer Installation
			Ground Surface							
0	HQ, Triple Tube, Wireline Rotary Coring (Castle Bit)	Casing to 3.0m at 3.5m Depth	**Sandy GRAVEL** Greyish brown sandy GRAVEL. "Loose to medium dense", wet, non plastic, well graded. Gravel is fine to coarse, angular, slightly weathered.		0.00				Total water used for hole approx 850L	
			SAND Brown fine to medium SAND, minor fine gravel. "Loose to medium dense", wet, non plastic, poorly graded.		0.35					
1			**Silty CLAY** Yellowish white silty CLAY, some fine sand. Firm to stiff, wet, moderately plastic.		0.65	HQ	61		Lab Test (0.65-1.5m): LL=75, PL=29, PI=46, Nat WC=37.8%	
								>100	SV: 101kPa	
			Sandy SILT Greyish brown fine sandy SILT, some clay. Stiff, wet, slightly plastic.		1.60	SPT	53	3	2//1/0/1/1	
2			2.00m - Firm.							
			2.30m - Stiff. 2.40m - Yellowish brown, grey mottled, minor clay.			HQ	105			
								>100	SV: 130/30kPa	
3			**SILT** Brown, orange, grey mottled SILT, some clay & fine sand. Stiff, wet, slightly to moderately plastic.		2.90	SPT	96	6	2//1/1/2/2	
									Lab Test (3.0-3.6m): LL=55, PL=29, PI=26, Nat WC=40.0%	
4						HQ	90			
			Sandy SILT Yellowish brown, pink and white mottled fine sandy SILT, trace clay. Stiff, moist to wet, slightly plastic.		4.15				SV: Refusal	
						PT	70			
5						SPT	87	15	3//2/4/4/5	
						HQ	87			
6			**SILT** Yellowish brown, pink and white mottled SILT, some fine sand, minor clay. Stiff, moist to wet, slightly plastic.		5.80	SPT	100	14	2//2/2/4/6	
						HQ	100			
7			7.15m & 7.35m - Very thin bedding layers of brown SILT, minor fine sand, trace wood.							
						SPT	71	20	3//4/3/6/7	
8						HQ	91			
9						SPT	67	2	3//2/2/3/5	
			SILT Light brownish white, orange mottled SILT, some fine sand. Soft to firm, wet, slightly plastic. 9.90m - Brown, minor clay.		9.40					
10						HQ	100			

Remarks:
SPT = Standard Penetration Test (Split Spoon)
PT = Thin Walled Push Tube
_____ = Boundary
- - - - - - - = Unknown boundary
SV = Shear Vane

Logged: G Tait **Date:** 11/11/10
Checked: S Amoore
Drill Rig: Perry's Tractor
Start Date: 11/11/10 **Finish Date:** 11/11/10
Scale: 1:50 Approximately

NZGD ID: 89084

Hamilton Laboratory
Private Bag 3057
Hamilton
New Zealand
Tel. 64 7 856 2870
Fax 64 7 856 2873

Borehole No: 1

Project Name: Hampton Downs Slumping
Client: New Zealand Transport Agency
Location: SH1 RP 486/9.3 Northbound Shoulder
Project No. 2-31560.AS Lab Ref. 10/949/001

Co-ordinates: N645861.895, E328969.688
Grid: Datum-NZ Geodetic 1949 / Circuit-Mt Eden 1949
Elevation: 24.411m Datum: Ellipsoidal Heights
Inclination: Vertical Azimuth: N/A

Depth	Drilling Method	Casing	Description	Graphic Log	Depth/Elev	Type	Recovery	Vane Test (Δ kPa Δ) 0 20 60 100 / SPT (■ N ■) 0 10 30 50	Additional Lab Tests/Notes	Piezometer Installation
11	HQ, Triple Tube, Wireline Rotary Coring (Castle Bit)		**Sandy SILT** Grey fine sandy SILT. Firm to stiff, wet, slightly plastic.		10.40	SPT	0	0	0//0/0/0/0	
						HQ	70			
12			**SILT** Brownish orange SILT, some fine sand, minor clay. Firm to stiff, wet, slightly plastic.		11.40	SPT	100	4	0//1/1/1/1	
			Clayey SILT Grey clayey SILT, minor fine sand. Soft to firm, wet, moderately plastic. 12.55m - Greyish brown, soft. 12.85m - Minor fine to medium sand.		12.40	HQ	84			
13						PT	175			
			SAND Grey fine SAND, some silt. Dense, wet, non plastic, poorly graded.		13.65	SPT	100	43	9//7/8/12/16	
14			**Sandy SILT** Grey fine sandy SILT. Hard, moist, slightly plastic.		14.17	HQ	100			
			Silty SAND Grey silty fine SAND. Dense, wet, nonplastic to slightly plastic, poorly graded. 14.80m - Thinly laminated extremely closely spaced silt bedding.		14.48	HQ	100			
15			**SAND** Grey fine SAND, minor silt. Very dense, wet, non plastic, uniformly graded.		15.12	SPT	100	>50	10//8/11/17/14 for 30mm Hole bridged @ 1.9m, unable to take water level.	
			End of Log		15.41					
16										
17										
18										
19										
20										

Remarks:

SPT = Standard Penetration Test (Split Spoon)
PT = Thin Walled Push Tube
_____ = Boundary
- - - - - - - = Unknown boundary
SV = Shear Vane

Logged: G Tait Date: 11/11/10
Checked: S Amoore
Drill Rig: Perry's Tractor
Start Date: 11/11/10 Finish Date: 11/11/10
Scale: 1:50 Approximately

NZGD ID: 89084

Hampton Downs Slumping: SH1 RP 486/9.3

Project No : 2-31560.AS
Lab Ref No : 10/949/001

Core Photos

BH: 1

Northbound Shoulder

Pg 1 of 2

NZGD ID: 89084

Hampton Downs Slumping: SH1 RP 486/9.3

Project No : 2-31560.AS
Lab Ref No : 10/949/001

Core Photos

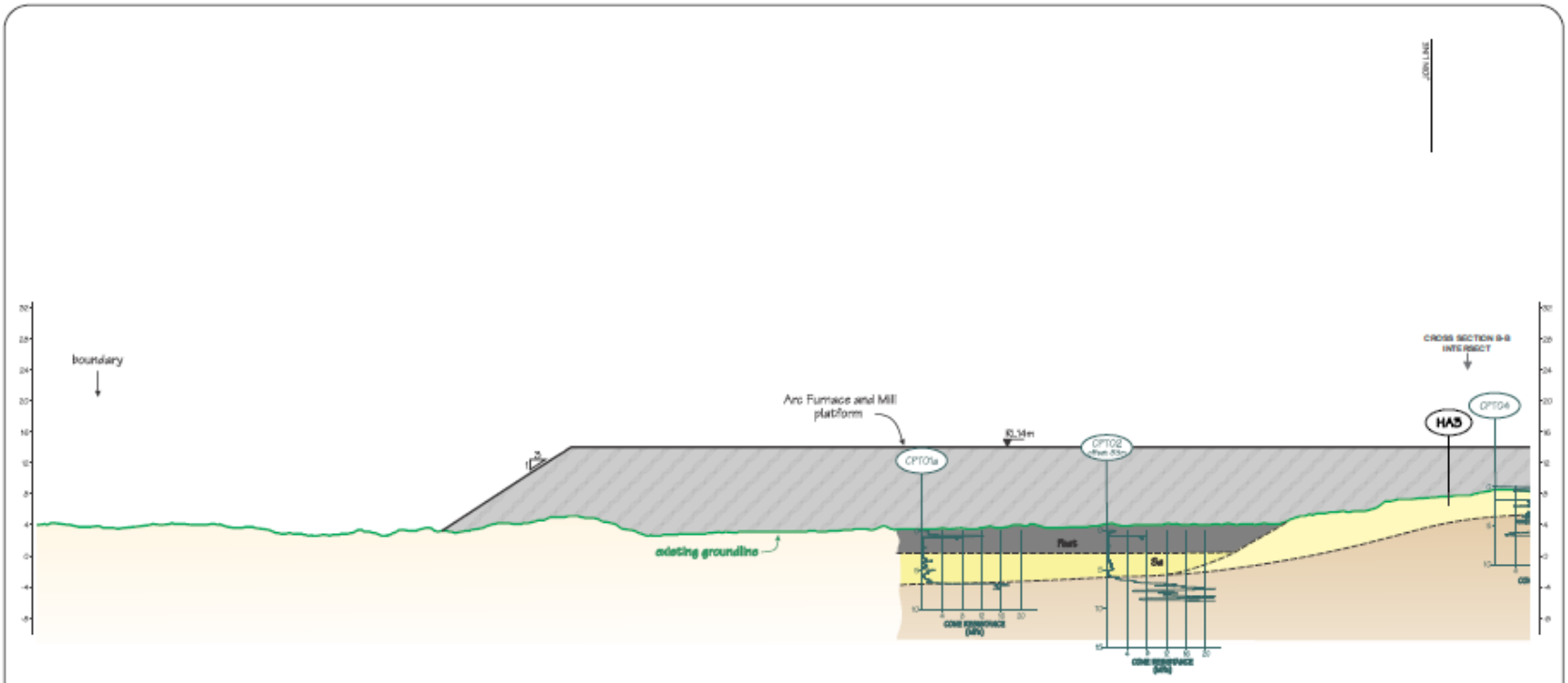
BH: 1

Northbound Shoulder

Pg 2 of 2

NZGD ID: 89084

Appendix B Geological cross sections



LEGEND

- Peat
- Se — Stream Alluvium
- Terrace Alluvium
- H-K Ash
- Am — Amokura Formation

Note:
1. Geology shown is as mapped by GNS and needs to be proven by site investigations, which include test pits and deep boreholes.
2. Groundline and design line from RavSurvey drawing DRSL371 Rev B, Long Section Line A, dated 10 Mar 24.

0m 10 20 30 40 50m
Scale 1:1000

FOR INFORMATION

Note: All drawings are to be approved (initialled) before final issue.

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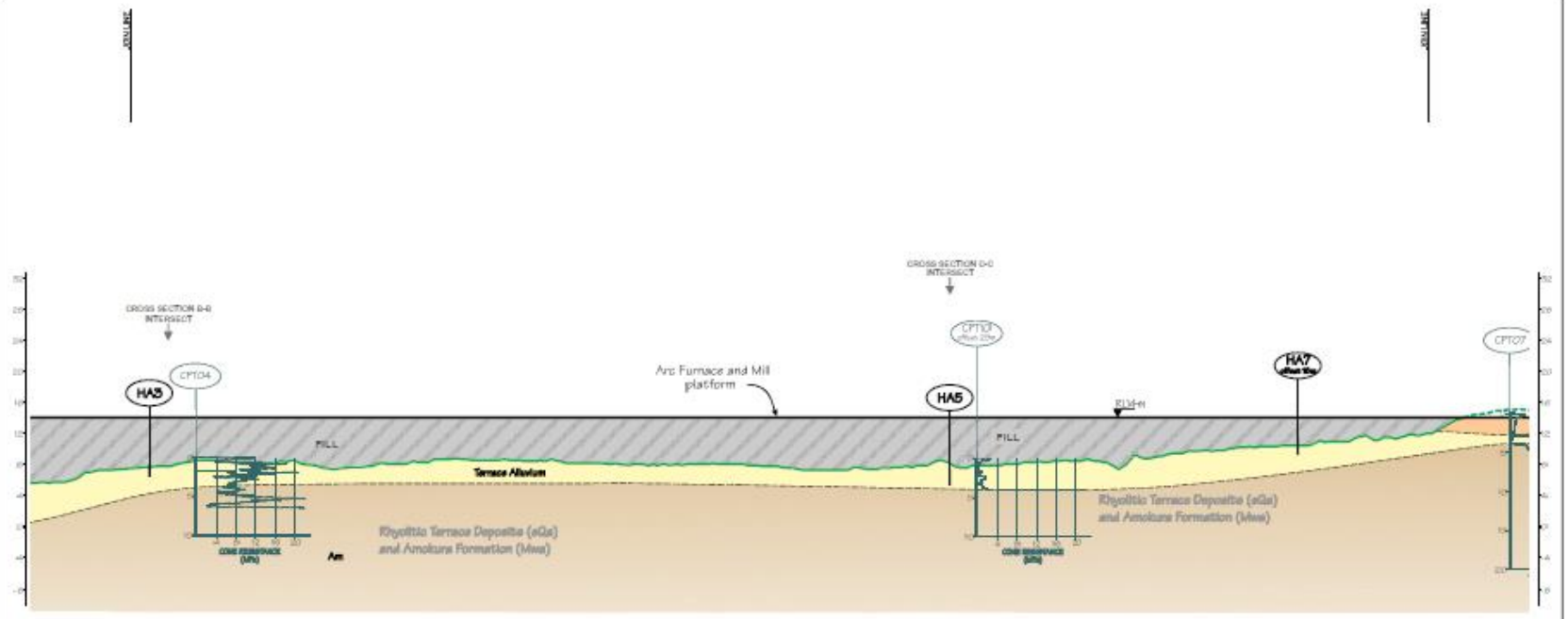
National Green Steel Limited

Long Section A-A - Page 1 of 3

REV	DATE	AMENDMENTS	DRAWN BY	CHECKED	TRACED BY	APPROVED BY
A	28.04.26	FOR REPORT R2892.2REVA	L.S	A.N	S.S.W	
B	29.04.26	FOR REPORT R2892.2REVB	L.S	A.N	S.S.W	

DRAWING NO.: FIG. PD5.1/1
REF: 4392
SCALE: 1:1000(H) 1:500(V)



LEGEND

- Peat
- Sa — Stream Alluvium
- Terrace Alluvium
- H-K Ash
- Am — Amokura Formation

Notes:

1. Geology shown is as mapped by GNS and needs to be proven by site investigations, which include test pits and deep boreholes.
2. Groundline and design line from RavSurvey drawing DRSL371 Rev B, Long Section Line A, dated 10 Mar 24.

0m 10 20 30 40 50m
Scale 1:1000

FOR INFORMATION

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Long Section A-A - Page 2 of 3

REV	DATE	AMENDMENTS	DRAWN BY	CHECKED	READY BY	APPROVED BY
A	26-04-24	FOR REPORT RAWD 2 REV A	LS	AR	S.BW	
B	29-04-24	FOR REPORT RAWD 2 REV B	LS	AR	S.BW	

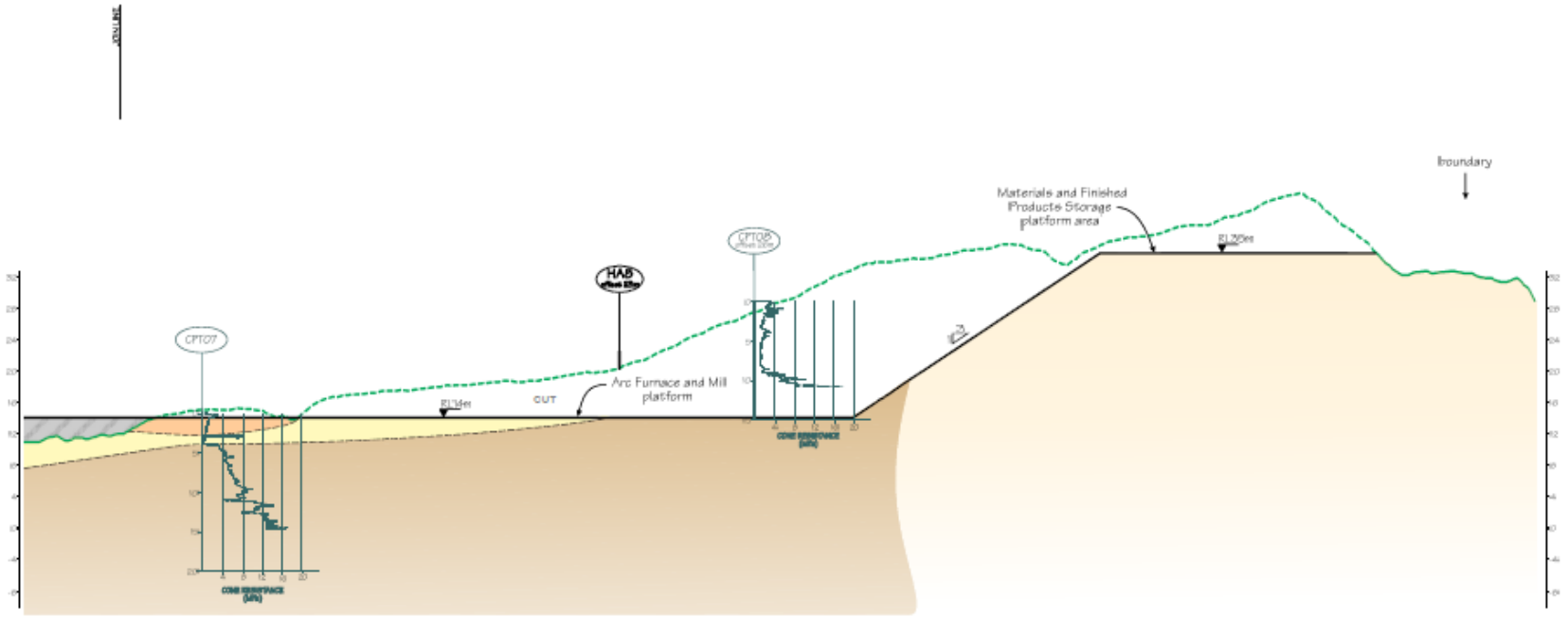
DRAWING NO.: **FIG. PD5.1/2**

REF: 4392

SCALE: 1:1000(H) 1:500(V)

GRID: NZTM 2000

DATUM: MVD53



LEGEND

- Peat
- Qa — Stream Alluvium
- Terrace Alluvium
- H-K Ash
- Am — Amokura Formation

Notes:

1. Geology shown is as mapped by GNS and needs to be proven by site investigations, which include test pits and deep boreholes.
2. Groundline and design line from RavSurvey drawing DRSL371 Rev B, Long Section Line A, dated 10 Mar 24.

0m 10 20 30 40 50m
Scale 1:1000

FOR INFORMATION

Note: All drawings are to be approved (initialled) before final issue.

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Long Section A-A - Page 3 of 3

REV	DATE	AMENDMENT DETAILS	DRAWN BY	CHECKED	PROVED BY	APPROVED BY
A	26-04-24	FOR REPORT R4393-2 REV A	LS	KN	SJW	
B	29-05-24	FOR REPORT R4393-2 REV B	LS	KN	SJW	

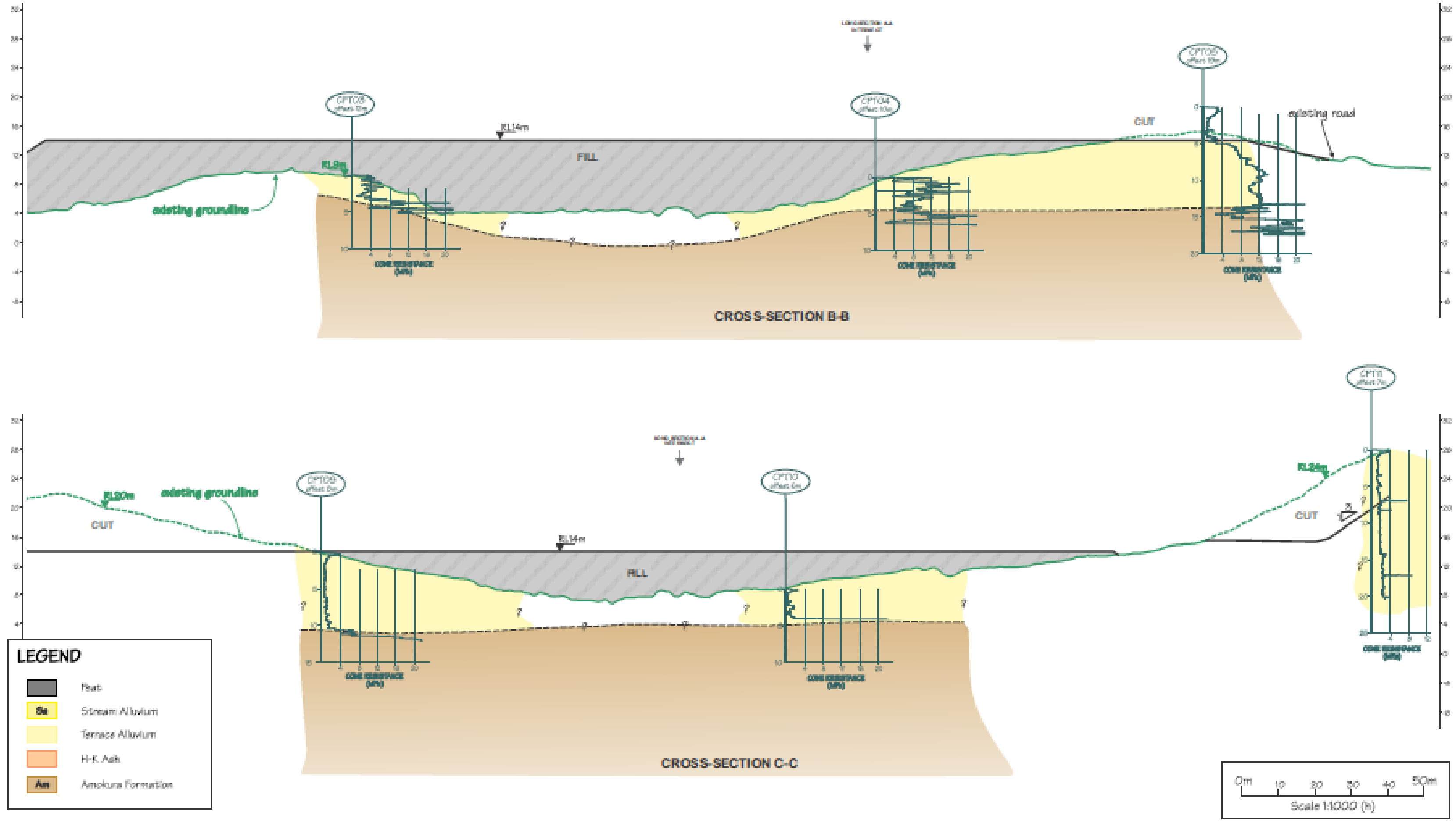
DRAWING NO.: **FIG. PD5.1/3**

REF: 4392

SCALE: 1:1000(H) 1:500(V)

DRN: Bill Eden 2022

DATUM: AVG46



FOR INFORMATION Notes: Groundline and design line from Ravsurvey Drawing DRSL372 Rev B, Long Section Line B-C, dated 10 Mar 24.

Note: All drawings are to be approved (initialled) before final issue.

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Cross-Section B-B and C-C

DRAWING NO.: FIG. PD5.2

REF: 4392

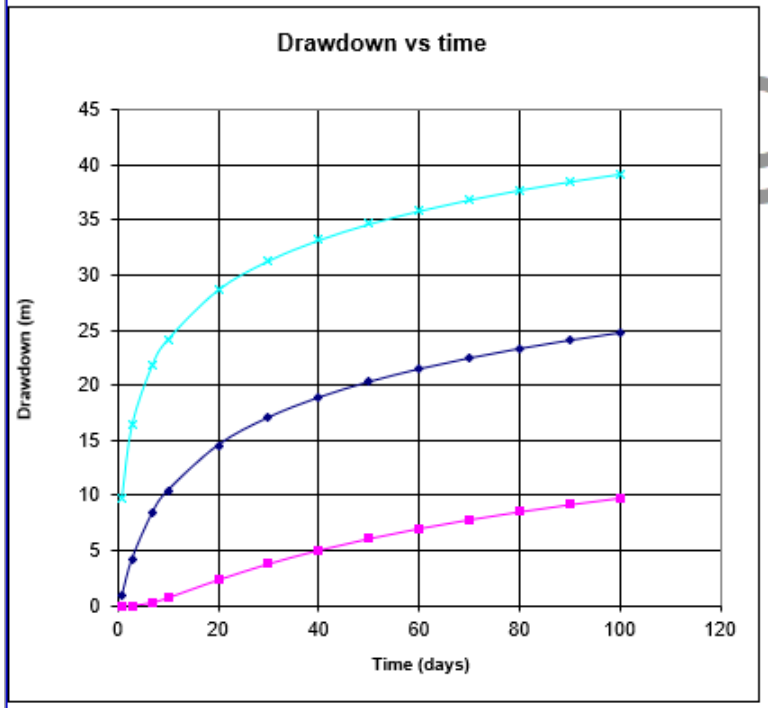
SCALE: 1:1000(h) 1:500(v)

Appendix C Outputs of drawdown calculations

Scenario 1
Time-drawdown calculations using Theis equation

Aquifer parameters		
T	12	m2/d
S	0.0007	
B		
Pumping rate		
Q	11.5	l/s

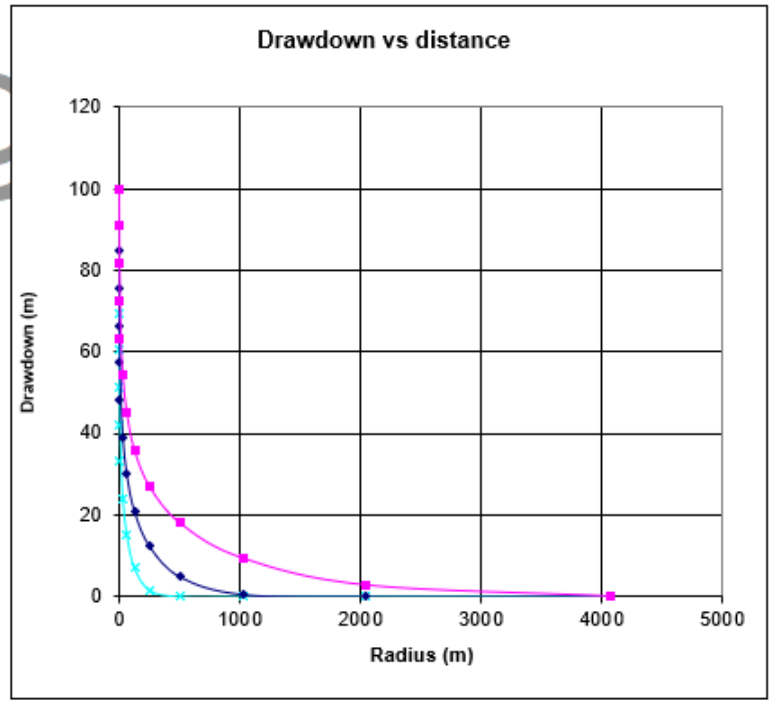
Radius (m)	100	300	1000
Time (days)	Drawdown (m)	Drawdown (m)	Drawdown (m)
1	9.809	0.875	0.000
3	16.438	4.239	0.009
7	21.841	8.406	0.287
10	24.150	10.414	0.701
20	28.669	14.569	2.331
30	31.325	17.101	3.802
40	33.213	18.925	5.045
50	34.678	20.353	6.106
60	35.876	21.526	7.026
70	36.890	22.521	7.837
80	37.768	23.386	8.561
90	38.543	24.150	9.214
100	39.236	24.835	9.809



Scenario 1
Distance-drawdown calculations using Theis equation

Aquifer parameters		
T	12	m2/d
S	0.0007	
B		
Pumping rate		
Q	11.5	l/s

Time (days)	1	10	100
Radius (m)	Drawdown (m)	Drawdown (m)	Drawdown (m)
1	69.570	84.741	99.913
2	60.436	75.607	90.779
4	51.303	66.473	81.645
8	42.173	57.339	72.510
16	33.057	48.207	63.376
32	23.996	39.080	54.243
64	15.151	29.975	45.111
128	7.114	20.958	35.989
256	1.558	12.282	26.901
512	0.031	4.830	17.954
1024	-	0.631	9.540
2048	-	0.002	2.925
4096	-	-	0.176

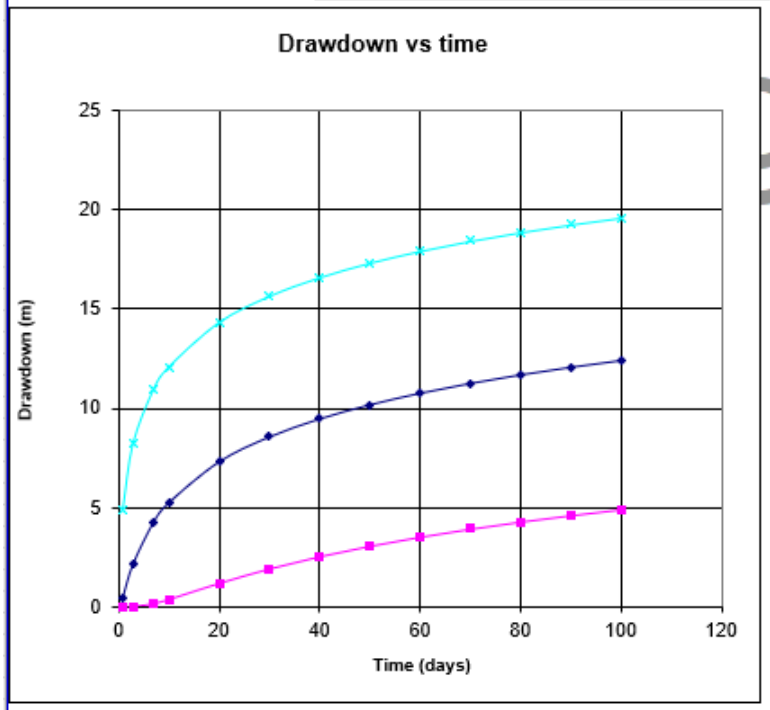


Scenario 2
Time-drawdown calculations using Theis equation

Aquifer parameters		
T	12	m2/d
S	0.0007	
B		

Pumping rate		
Q	5.75	l/s

Radius (m)	100	300	1000
Time (days)	Drawdown (m)	Drawdown (m)	Drawdown (m)
1	4.905	0.438	0.000
3	8.219	2.120	0.004
7	10.920	4.203	0.144
10	12.075	5.207	0.351
20	14.335	7.285	1.166
30	15.663	8.550	1.901
40	16.606	9.463	2.522
50	17.339	10.177	3.053
60	17.938	10.763	3.513
70	18.445	11.261	3.918
80	18.884	11.693	4.280
90	19.271	12.075	4.607
100	19.618	12.417	4.905

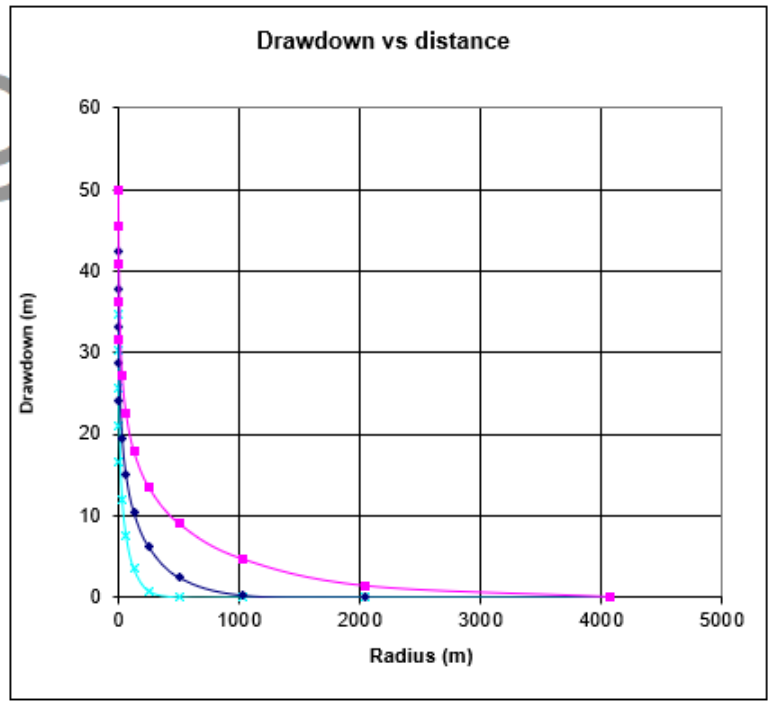


Scenario 2
Distance-drawdown calculations using Theis equation

Aquifer parameters		
T	12	m2/d
S	0.0007	
B		

Pumping rate		
Q	5.75	l/s

Time (days)	1	10	100
Radius (m)	Drawdown (m)	Drawdown (m)	Drawdown (m)
1	34.785	42.371	49.957
2	30.218	37.804	45.389
4	25.651	33.236	40.822
8	21.086	28.670	36.255
16	16.528	24.103	31.688
32	11.998	19.540	27.121
64	7.576	14.987	22.556
128	3.557	10.479	17.994
256	0.779	6.141	13.451
512	0.015	2.415	8.977
1024	-	0.316	4.770
2048	-	0.001	1.462
4096	-	-	0.088



Appendix D Inputs and outputs of stream depletion calculations

Stantec

Memo

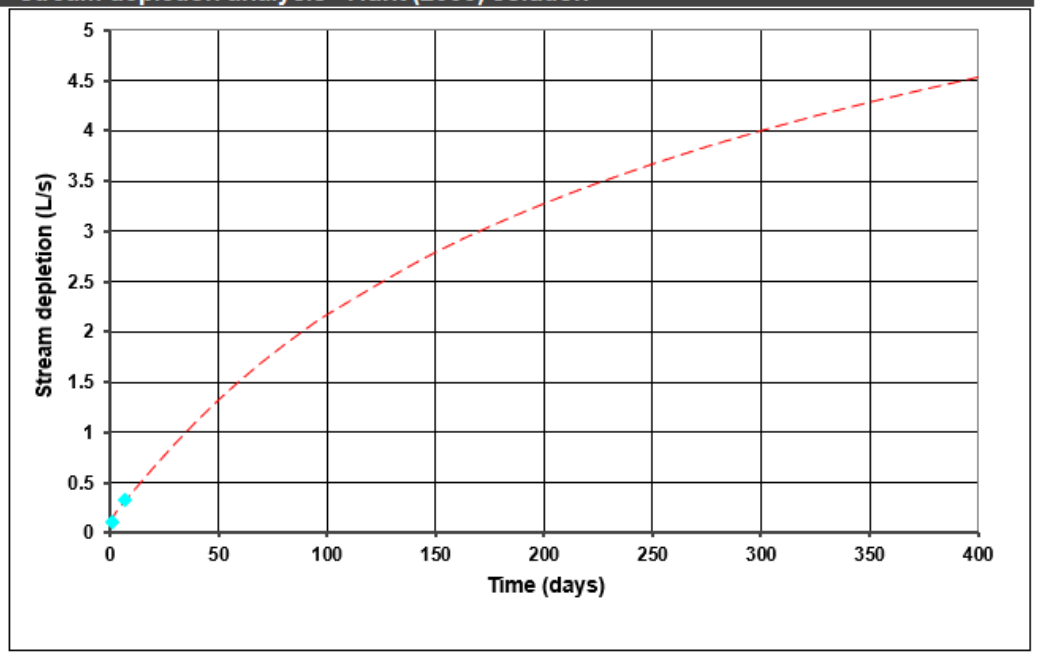
Stream depletion analysis - Hunt (2003) solution

Pumped aquifer		
Transmissivity (T)	12	(m^2/d)
Storage coefficient (S)	0.0007	-

Aquitard		
Hydraulic conductivity (K')	0.01	(m/d)
Thickness (B')	10	(m)
K'/B'	0.001	(d^{-1})
Specific yield (S_y)	0.01	-

Streambed		
Hydraulic conductivity (K'')	0.1	(m/d)
Thickness (B'')	9.5	(m)
Width (W)	3	(m)
Stream bed conductance (λ)	0.0315789	(m/d)

Well		
Pumping rate (Q)	11	(L/s)
Separation distance (L)	220	(m)



Time (days)	Depletion Rate (L/s)
1.0	0.1
2.0	0.2
3.0	0.2
4.0	0.3
5.0	0.3
6.0	0.3
7.0	0.3
8.0	0.4
9.0	0.4
10.0	0.4
20.0	0.7
30.0	0.9
40.0	1.1
50.0	1.3
60.0	1.5
70.0	1.7
80.0	1.9
90.0	2.0
100.0	2.2
150.0	2.8
200.0	3.3
250.0	3.7
300.0	4.0
350.0	4.3
400.0	4.5

Stream depletion after

Time (days)	q (L/s)	%
1	0	1%
7	0	3%
	0	0%
	0	0%

Only the values in shaded cells can be updated - all other cells are dependent on those input values.

Setting K'/B' to zreo gives Hunt 1999 solution