Appendix I Hydrogeology Assessment

Fast-Track Approvals Act 2024 Substantive Application

Hinuera Solar Farm

Harmony Energy NZ #6 Limited

SLR Project No.: 880.016894.00001

19 August 2026

Hydrogeology Assessment

Hinuera Solar Farm Project
Fast Track Approvals Application

Harmony Energy NZ #6 Limited

Prepared by:

SLR Consulting New Zealand Limited

SLR Project No.: 880.016894.0001

29 June 2026

Revision: 1.0

Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
0.1	11 March 2026	GMH	TB	TB
1.0	24 June 2026	GMH	TB	TB
	Click to enter a date.			
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Basis of Report

This report has been prepared by SLR Consulting New Zealand Limited (SLR), on the instruction of Harmony Energy NZ #6 Limited (the Client), in accordance with the agreed scope of work. It is intended to support the Client's application under the Fast Track Approvals Act 2024 and may be relied upon by the Expert Panel and relevant administering agencies for the purposes of assessing the application. While SLR has exercised due care in preparing this report, it does not accept liability for any use of the report beyond its intended purpose. Where information has been supplied by the Client or obtained from external sources, it has been assumed to be accurate unless otherwise stated.

Statement of Qualifications and Experience

Gillian Margaret Holmes – Principal Consultant – Hydrology and Hydrogeology

Gillian is a Hydrogeologist with over 20 years' experience with particular expertise in water management policy and assessment of effects on the environment. She is highly experienced in assessing effects related to anthropogenic impacts to the natural environment, including landuse change and associated water quality impacts. Gillian has experience in preparing and presenting evidence for Council hearings for a range of clients.

As the author of this report, Gillian confirms she has read and abides by the Environment Court of New Zealand Practice Note 2023, specifically section 9 – the Code of Conduct for Expert Witnesses.

Tim Baker – Principal Consultant – Hydrology and Hydrogeology

Tim has 20 years' experience across a broad range of water resource projects with a technical specialisation in groundwater, groundwater quality and management of discharges to land.

Tim is a certified hearings Commissioner, having completed the Making Good Decisions Course (2023). He provides regular advice to Regional Councils, many of which carry through to Council level hearings and Environment Court. Tim has also acted as expert witness at Board of Inquiry and Special Tribunal and is currently on a Fast Track Approvals decision panel.

As reviewer of this report, Tim confirms he has read and abides by the Environment Court of New Zealand Practice Note 2023, specifically section 9 – the Code of Conduct for Expert Witnesses

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1.0 Introduction

SLR has been engaged by Harmony Energy NZ #6 Limited to assess the potential dewatering effects associated with the construction and operation of the proposed Hinuera Solar Farm (the **Proposal**).

The Proposal comprises a 70 MW AC / 100 MW DC solar farm with decentralised Battery Energy Storage System (**BESS**) providing up to 400 MWh of storage capacity.

The assessment supports the Client's application under the Fast Track Approvals Act 2024 and addresses compliance with relevant regional plan requirements.

The purpose of this report is to:

- Define the hydrogeological conceptualisation of the site and surrounding area.
- Outline the proposed excavations and determine whether groundwater dewatering is required.
- Assess the potential effects of the proposed groundwater dewatering on surrounding groundwater users and surface water bodies.

2.0 Site Location and Project Description

2.1 Site Description

The site is located at the intersection of State Highway 29 and State Highway 27, Hinuera, within the Matamata-Piako District, approximately 10 km south of Matamata. The proposal spans four Records of Title, covering approximately 150 hectares currently used for dairy farming.

2.2 Project Description

The proposal is designed based on a single-axis tracking photovoltaic (**PV**) system which allows panels to rotate along one axis to follow the sun's movement, optimising energy generation throughout the day. The tracking system determines the orientation of the solar array panels (north to south) and the placement of associated infrastructure (such as the BESS and central inverters units). An overall site layout plan (concept only) is included in Error! Reference source not found. while an infrastructure and cable layout (concept only) is included in **Appendix A**.

The proposal includes approximately 170,000 photovoltaic (**PV**) modules and the electricity generated will be converted from direct current (**DC**) to alternating current (**AC**) through the central inverter units spread across the site. Each of the central inverter units will be accompanied by a BESS unit (collectively referred to as **BESS Area**). Each BESS Area will comprise up to three batteries and associated infrastructure (such as a power control system and transformer). The decentralised BESS component will provide storage capacity for discharge during peak electricity periods or when required.

Supporting infrastructure includes a switching station (no high voltage transformer – no acoustic significant equipment), an operations and maintenance building, and storage buildings. The site will be enclosed by a security fence. The facility will operate primarily under automated control, with minimal on-site staffing.

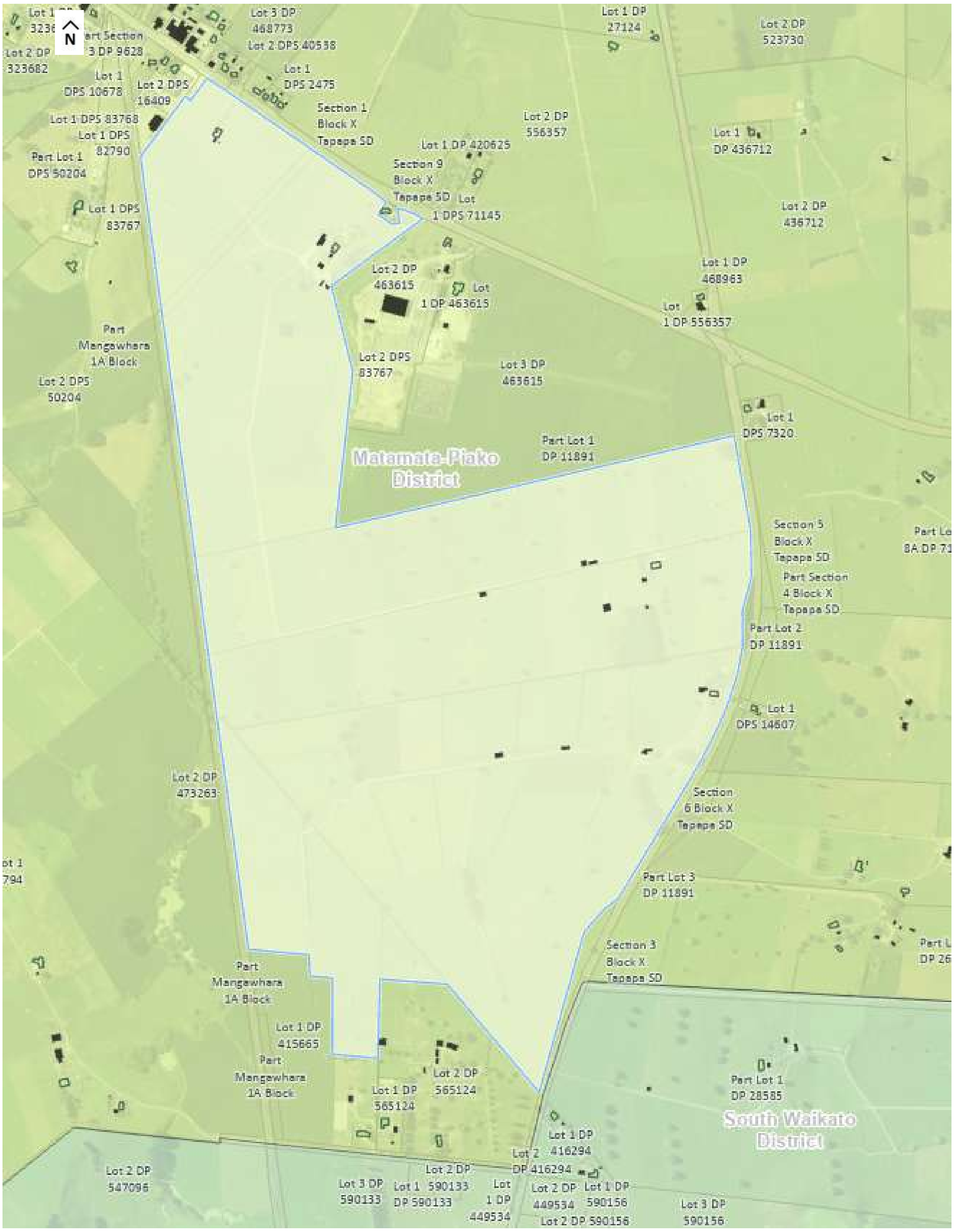


Figure 1: Solar Farm Location and Surroundings

3.0 Environmental Setting

There have been numerous site investigations undertaken at the Hinuera Solar Farm site to support the consenting of the solar farm. Investigations relevant to this dewatering assessment are the geotechnical investigation undertaken by CMW (2025) and the ecological assessment undertaken by SLR (2025).

The findings of these investigations have been used to determine the geology, hydrogeology, hydrology and identification of wetlands as outlined in **Section 2.1**, **2.2** and **2.3**.

3.1 Geology

The published geology underlying and surrounding the site is shown in **Figure 2**. The geology identified is late Pleistocene aged River Deposits of the Hinuera Formation comprising interbedded layers of silt and sand with minor gravels and organic peat. To the east of the site, middle Pleistocene aged river deposits comprised of moderately to poorly sorted gravel with minor sand and silt are located underlying the low hills.

Site investigations of the soils and geology within the Hinuera Solar Farm were undertaken by CMW in October 2025, which involved:

- Five cone penetrometer tests, CPT01 to CPT05, to depths between 12.3 and 20 m.
- Five test pits, TP01 to TP05, to depths between 2.5 and 3.4 m. It was proposed to complete the test pits to a depth of 5 m however the test pits all collapsed early due to the presence of shallow groundwater.
- Two electrical resistivity transects, ERT01 and ERT02, each 20 m in length.
- Three piezometers were installed with CPT test holes, P1 to P3. Level loggers were installed with the piezometers to record groundwater levels.

The location of the hand augers and test pits are shown in **Figure 3**.

The ground conditions encountered by CMW (2025) were generally consistent with the published geology for the area, with sandy silt overlying sand. A generalised overview of the geology encountered is shown in **Table 1**. It should be noted that the Sandy SILT and SAND unit encountered was only encountered in TP25-03 and CPT25-03 – 05 only.

Table 1: Summary of Stratigraphic Units on Hinuera Solar Farm (Source: CMW, 2023b)

Unit	Typical Thickness Range (m)	Maximum Depth to Top of Unit (m)
Top soil	0.2 -0.3	0
Sandy SILT (stiff to very stiff)	0.5 – 1.0	0.3
Sandy SILT interbedded with medium dense to dense sand (stiff to very stiff)	5.5 – 9.0	2.8
Sand (dense)	3.0 - >13.0	10.2
Sandy SILT and SAND (very stiff and very dense)	5.0 - >9.0	15.0

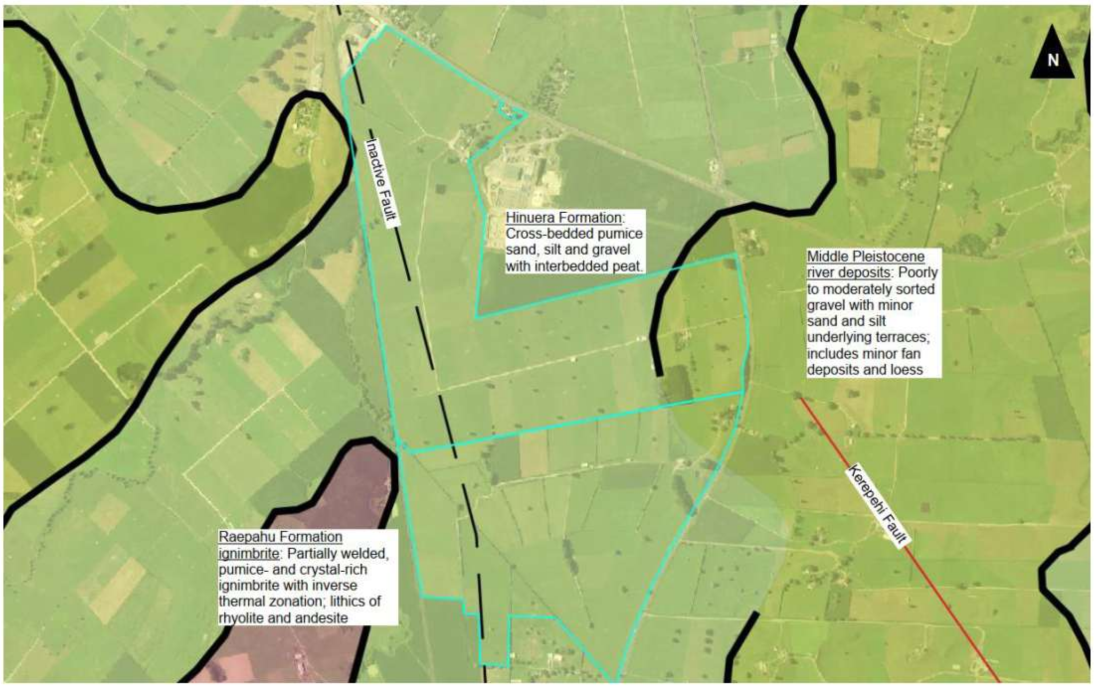


Figure 2: Regional Geology from Leonard, G. S., Briggs, J. G., (2002), Geological Map 11: Geology of the Wairarapa Area, 1:250,000 (Source: CMW (2025)).

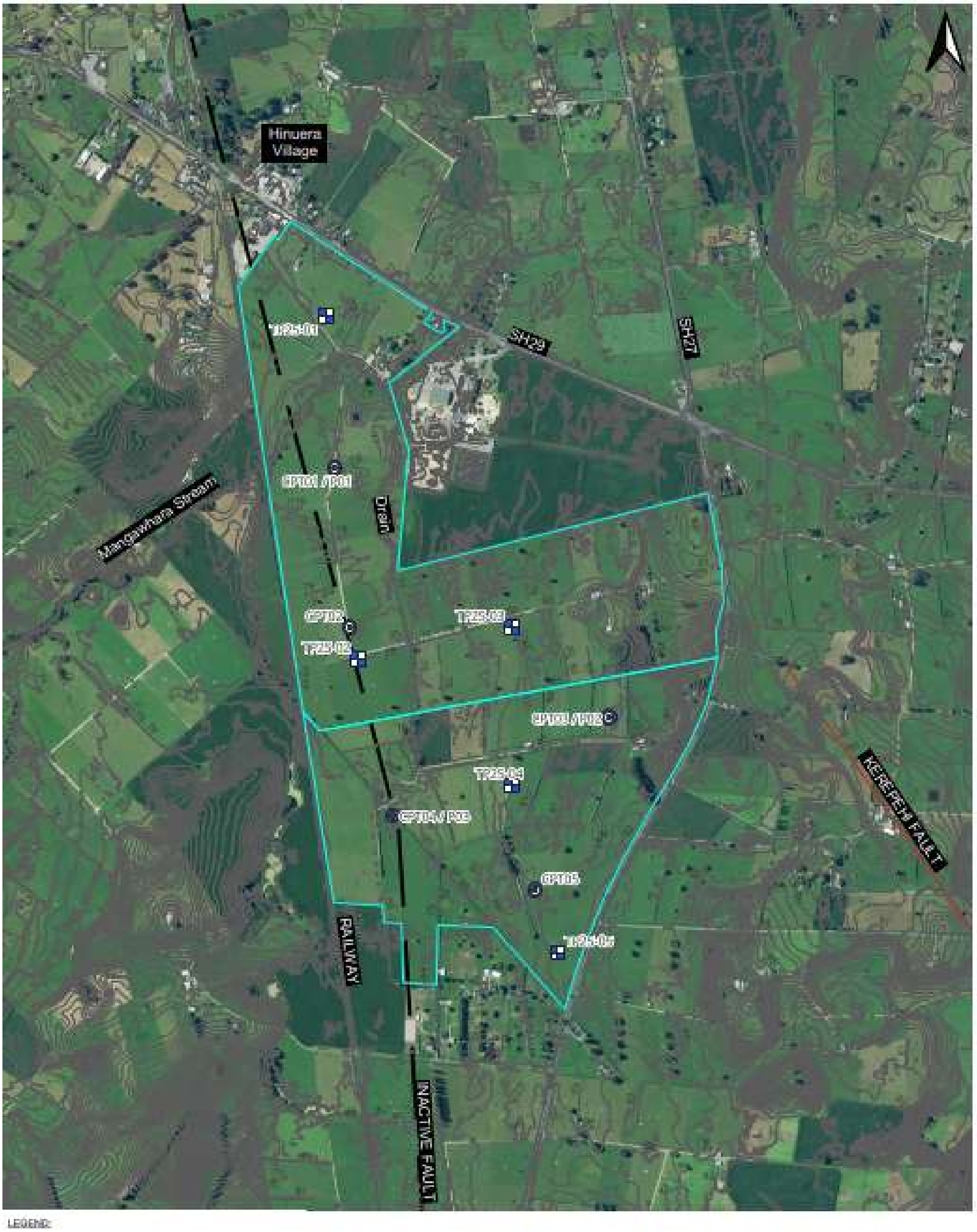


Figure 3: Site Investigation Plan for Hinuera Solar Fam (Source: CMW (2025)).

3.2 Hydrogeology

The site is located over an area identified as the South Hauraki Aquifer. Hadfield (2001) describes the aquifer as a large leaky hydraulic system comprising numerous lensoidal aquifers. The highly variable nature of the sediments results in a large range of transmissivities ranging from less than 5 m^2/d to around 25,000 m^2/d.

The site-specific geotechnical investigations undertaken in October 2025 by CMW found the following with respect to groundwater:

- Groundwater was encountered in all five test pits at depths ranging from 0.4 m bgl (TP25-02) and 1.5 m bgl (TP25-01, -03 and -05).
- Groundwater was encountered in all five CPT's at depths ranging from 0.6 m bgl (CPT25-04) and 2.0 m bgl (CPT25-02).

In addition to the information above, groundwater levels were recorded within piezometers P1, P2 and P3 using level loggers recording groundwater levels every 30 mins between 17 October to 20 November 2025. **Figure 4** shows the groundwater levels RL, while **Table 2** provides further information on the piezometers.

The groundwater information provides the following information about the groundwater levels across the site:

- Groundwater levels are variable across the site, with the shallowest levels found in the southern part of the Site.
- The groundwater levels recorded in the piezometers and test pits across the site are likely reflective of perched groundwater tables due to the low permeability sediments underlying the Site.
- The increases in groundwater levels during the monitoring period are likely due to rainfall recharge, although it is likely to be delayed recharge to the low permeability nature of the silty sands. A review of the rainfall record in the closest rainfall gauge, Rapurapu Stream at Kaimai Summit shows around 130 mm of rainfall fell over 11 and 12 November 2025, with the increase in groundwater levels in all three piezometers recorded on 19 November 2025.

Table 2: Hinuera Solar Farm Piezometer Information

Piezometer Name	Depth (m bgl)	Groundwater Level Range	
		m bgl	m RL
P1	5.95	1.13- 2.16	75.68 – 74.85
P2	6.03	1.75 -2.80	79.25 – 78.19
P3	5.60	0.25 – 0.85	81.25 – 80.65

For the purpose of this conservative dewatering assessment, a depth to groundwater of 0.2 m is assumed. This depth is consistent with the shallowest groundwater levels identified in the piezometers and test pits and will be very conservative for the north of the property due to the depth of groundwater being recorded as higher in this area.

No aquifer tests were undertaken on site and as such literature values have been used to determine aquifer parameters for use within the dewatering assessment. Table 5.1 of the GHD (2024) Guidance on Dewatering Abstractions provides a range of saturated hydraulic conductivities for unconsolidated materials. The range for sand (fine) and silty sands, which is consistent with the geology found on site during the geotechnical investigations, are as follows:

- Minimum: 0.01 m/day
- Mean: 0.4 m/day
- Maximum: 10 m/day

A specific yield of 0.1 is assumed and is consistent with the values in Table 5.2 of GHD (2024).

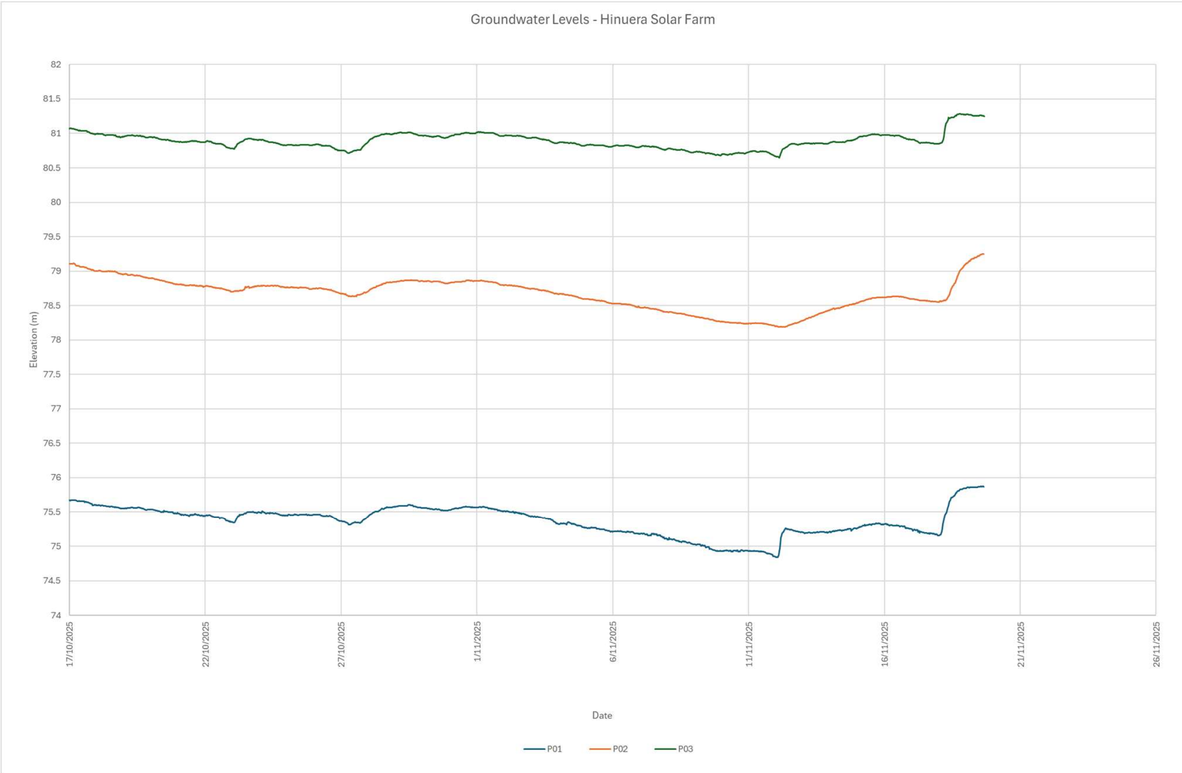


Figure 4: Groundwater Levels at Hinuera Solar Farm

3.3 Hydrology

SLR completed a field assessment of the aquatic habitat characteristics of the site and surrounding area in July 2023. The main findings, related to this dewatering assessment include:

- Two streams were identified on site, namely the Mangawhero Stream and its tributary. The streams drain in a generally northern to north easterly direction towards the Waihou River. The unnamed tributary has been extensively modified through channel straightening, likely to assist with land drainage.
- An extensive network of shallow, well vegetated drains and swales are present across the site, all around 1 m deep.
- A total of 31 discreet wetlands were identified during the site visit (a total of 0.71 ha). These wetlands were located along the banks of the Mangawhero Stream on the northern portion of the Site.

All of these hydrology features are shown on **Figure 5**.

3.4 Groundwater Users

Figure 6 shows the location of groundwater bores located in the vicinity of the Hinuera Solar Farm, with this data provided by the Wells Aotearoa New Zealand Database. The groundwater bores range in depth between 9.75 and 76 m bgl, with the depths of 2 bores unknown. The depths of bore indicate that the bores are abstracting from the shallow sediments as well as the deeper geological units.

Four bores are identified within the Hinuera Solar Farm property boundary, with details of these bores below:

- 64_772 – drilled depth of 40.20 m
- 64_350 – drilled depth of 48.70 m
- 64_847– drilled depth of 23.70 m
- 64_650 – drilled depth of 24.00 m
- 72_8752 – drilled depth of 18.00 m

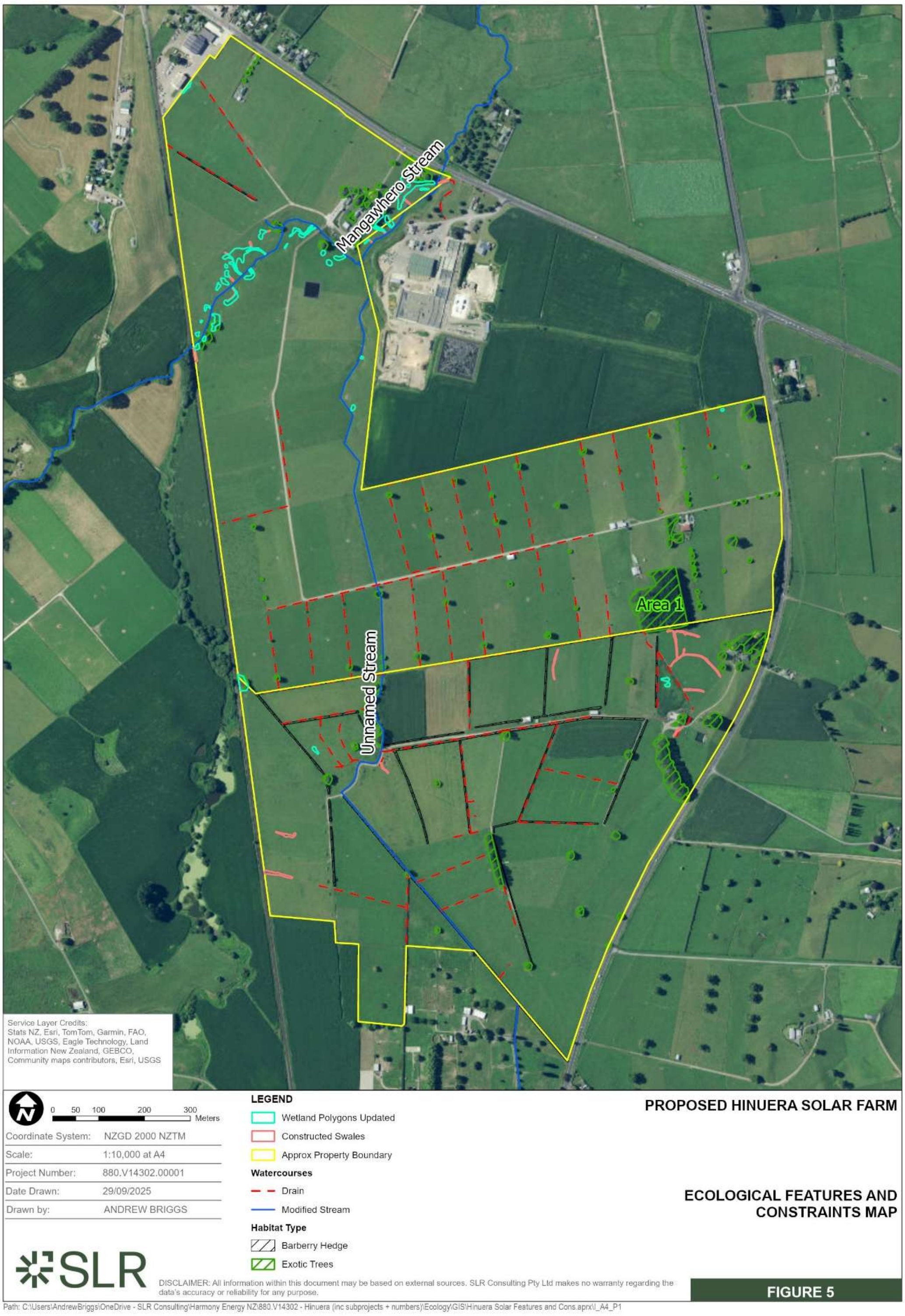


Figure 5: Hydrology Features on Hinuera Solar Farm site.

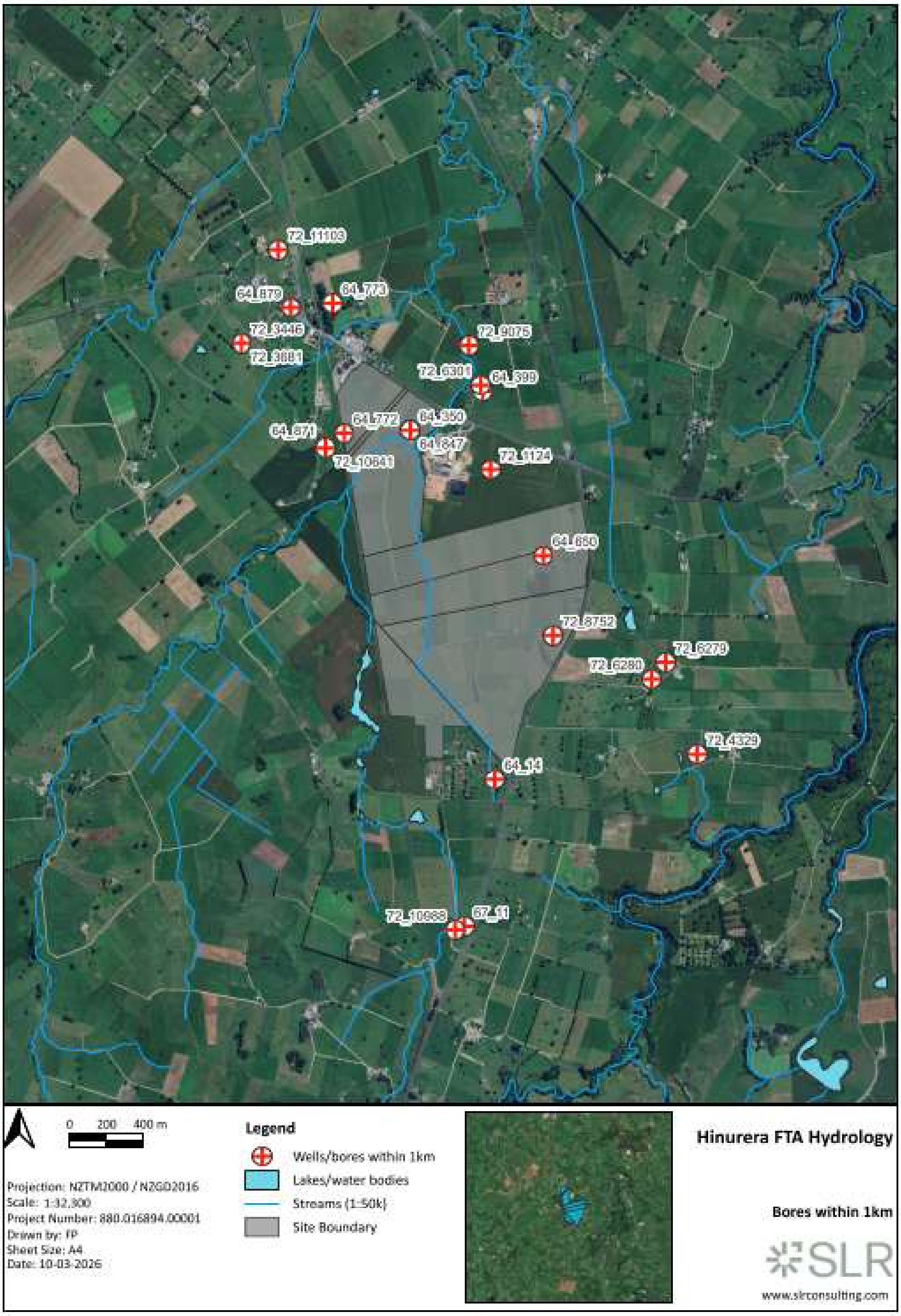


Figure 6: Groundwater Wells Within 1km of Hinuera Solar Farm Site

4.0 Proposed Excavations

Multiple excavations will be undertaken during the construction of the Hinuera Solar Farm, with the specific methodology of the excavations to be confirmed during the detailed design stage of the project. However, Harmony provided SLR with summary details of the excavations, with details found in the AEE document. For the purposes of the assessment completed in this report, **Table 3** outlines the proposed sizes of each type of excavation and length of time the excavations are expected to be open, given the solar farm will be constructed in sections. Maximum open trench lengths for each excavtion have been estimated. In addition, although it is the aim to finish an excavation within one month, this assessment will consider the potential in the event the excavations are unexpectedly open for longer. For the purposes of this assessment, it is assumed the excavations will be open for 30 days.

In addition, **Table 2** identifies whether it is effects expected that groundwater will be intercepted during the excavation based on the assumed groundwater level of 0.2 m bgl across the Hinuera Solar Farm site. Overall, given the shallow nature of the perched groundwater table across the site, all of the trenches have been assessed in **Section 5.0**. The currently proposed locations of these excavations are shown in **Figure 7**.

Table 3: Excavation Details and Groundwater Interception Determination

Excavation	Width (m)	Total Length (m)	Max Open Trench Length (m)	Depth (m bgl)	Groundwater Penetrated?
Earthing Cables	0.3	2,450	702	0.3	Yes
DC String Cables	0.3 – 0.5	3,901	270	0.65 – 0.75	Yes
DC Main Cables	1.0	7,573	1,746	0.75	Yes
MV Cables	0.5 – 1.6	8,166	800	1.0	Yes

Figure 7: Location of cabling across the Project Site.

5.0 Groundwater Dewatering Assessment

As outlined in **Section 4.0**, all of the trenches may encounter groundwater due to the shallow nature of the groundwater on site. The potential effects of the dewatering on groundwater levels, groundwater users, surface water bodies and wetlands are discussed below.

5.1 Potential Effects on Groundwater Levels

SLR completed an assessment of groundwater drawdown to assess the potential effects of dewatering on the surrounding groundwater levels from all of the excavations. The drawdown assessment was estimated using the long narrow trench Ratio 10+ – unconfined groundwater methodology outlined in GHD (2024).

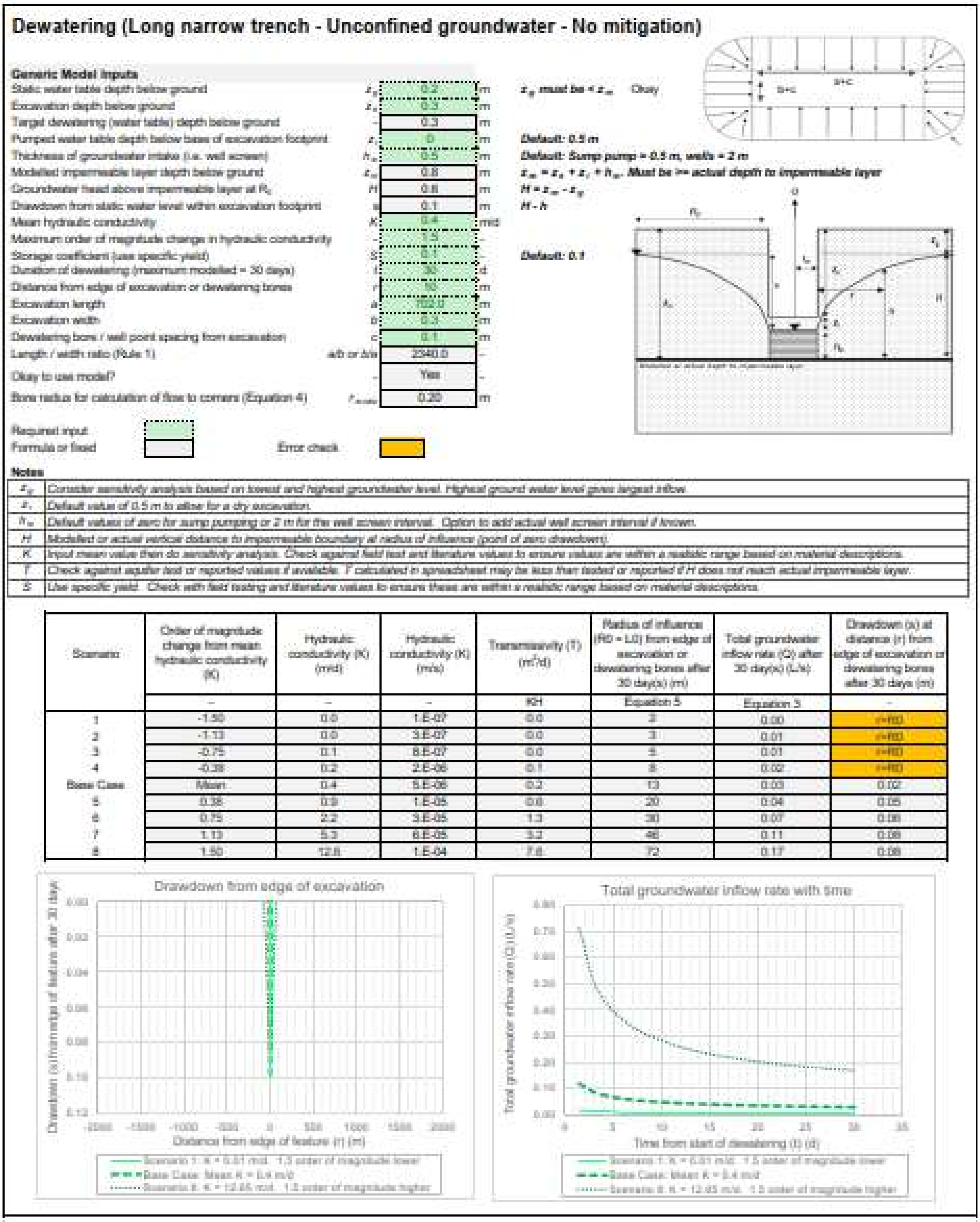
The analysis was undertaken using conservative parameters and assumptions including:

- The depth and width of the excavations used the deepest and widest estimates of the excavations as outlined in **Table 3**.
- The excavations are assumed to be open for a maximum of 30 days (maximum modelled time allowed using this method) with the assumption that the effects would reach steady state by 30 days.
- A range of hydraulic conductivities consistent with the permeability outlined in GHD (2024) and outlined in **Section 3.2**.
- A groundwater table of 0.2 m below existing ground surface based on the depth to groundwater on the property.

Figures 8 to **11** outlines the calculated drawdown from the excavations, with the following results:

- **Figure 8** shows that based on a conservative hydraulic conductivity of 12.6 m/day, the maximum drawdown at the earthing cable excavations would be 0.08 m at a distance of 10 m from the excavation, reducing to 0.0 m at a distance of 68 m. The total groundwater inflow rate after 30 days is calculated to be 0.17 L/s (14.7 m^3/day) assuming a total open trench length is 702 m.
- **Figure 9** outlines the calculated maximum drawdown from the DC String cable excavations based on a conservative hydraulic conductivity of 12.6 m/day, maximum depth of 0.75 m and maximum width of 0.5 m. The maximum drawdown would be 0.47 m at a distance of 10 m from the excavations, reducing to 0.0 m at a distance of 94 m. The total groundwater inflow rate after 30 days is calculated to be 0.42 L/s (36 m^3/day) assuming a total open trench length is 270 m.
- **Figure 10** outlines the calculated maximum drawdown from the DC Main Cables excavations based on a conservative hydraulic conductivity of 12.6 m/day, maximum depth of 0.75 m and maximum width of 1.0 m. The maximum drawdown would be 0.47 m at a distance of 10 m from the excavations, reducing to 0.0 m at a distance of 94 m. The total groundwater inflow rate after 30 days is calculated to be 2.36 L/s (204 m^3/day) assuming a total open trench length is 1,746 m.
- **Figure 11** shows the calculated maximum drawdown from the MV Cable excavations based on a conservative hydraulic conductivity of 12.6 m/day, maximum depth of 1.0 m and maximum width of 1.6 m. The maximum drawdown would be 0.68 m at a distance of 10 m from the excavations, reducing to 0.0 m at a distance of 105 m. The total groundwater inflow rate after 30 days is calculated to be 1.73 L/s (149 m^3/day) assuming a total open trench length is 800 m.

These assessments are considered to be conservative, particularly given the estimated proposed length of cabling to be open at one time. In addition, groundwater is proposed to be discharged to land which will allow the water to infiltrate into the ground and reduce the magnitude of effects.



Dewatering (Long narrow trench - Unconfined groundwater - No mitigation)

Generic Model Inputs

Static water table depth below ground	z_g	0.2	m	z_g must be < z_m Okay
Excavation depth below ground	z_e	0.3	m	
Target dewatering (water table) depth below ground	-	0.3	m	
Pumped water table depth below base of excavation footprint	z_i	0	m	Default: 0.5 m
Thickness of groundwater intake (i.e. well screen)	h_w	0.5	m	Default: Sump pump = 0.5 m, wells = 2 m
Modelled impermeable layer depth below ground	z_m	0.8	m	$z_m = z_e + z_i + h_w$. Must be >= actual depth to impermeable layer
Groundwater head above impermeable layer at R_0	H	0.6	m	$H = z_m - z_g$
Drawdown from static water level within excavation footprint	s	0.1	m	H - h
Mean hydraulic conductivity	K	0.4	m/d	
Maximum order of magnitude change in hydraulic conductivity	-	1.5	-	
Storage coefficient (use specific yield)	S	0.1	-	Default: 0.1
Duration of dewatering (maximum modelled = 30 days)	t	30	d	
Distance from edge of excavation or dewatering bores	r	10	m	
Excavation length	a	702.0	m	
Excavation width	b	0.3	m	
Dewatering bore / well point spacing from excavation	c	0.1	m	
Length / width ratio (Rule 1)	a/b or b/a	2340.0	-	
Okay to use model?	-	Yes	-	
Bore radius for calculation of flow to corners (Equation 4)	$r_{e,calc}$	0.20	m	

Required input
Formula or fixed
Error check

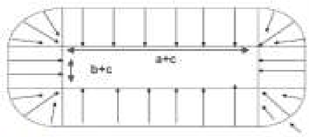
Notes

z_g	Consider sensitivity analysis based on lowest and highest groundwater level. Highest ground water level gives largest inflow.
z_i	Default value of 0.5 m to allow for a dry excavation.
h_w	Default values of zero for sump pumping or 2 m for the well screen interval. Option to add actual well screen interval if known.
H	Modelled or actual vertical distance to impermeable boundary at radius of influence (point of zero drawdown).
K	Input mean value then do sensitivity analysis. Check against field test and literature values to ensure values are within a realistic range based on material descriptions.
T	Check against aquifer test or reported values if available. T calculated in spreadsheet may be less than tested or reported if H does not reach actual impermeable layer.
S	Use specific yield. Check with field testing and literature values to ensure these are within a realistic range based on material descriptions.

Scenario	Order of magnitude change from mean hydraulic conductivity (K)	Hydraulic conductivity (K) (m/d)	Hydraulic conductivity (K) (m/s)	Transmissivity (T) (m^2/d)	Radius of influence (R0 + L0) from edge of excavation or dewatering bores after 30 day(s) (m)	Total groundwater inflow rate (Q) after 30 day(s) (L/s)	Drawdown (s) at distance (r) from edge of excavation or dewatering bores after 30 days (m)
	-	-	-	KH	Equation 5	Equation 3	-
1	-1.50	0.0	1.E-07	0.0	2	0.00	r>R0
2	-1.13	0.0	3.E-07	0.0	3	0.01	r>R0
3	-0.75	0.1	8.E-07	0.0	5	0.01	r>R0
4	-0.38	0.2	2.E-06	0.1	8	0.02	r>R0
Base Case	Mean	0.4	5.E-06	0.2	13	0.03	0.02
5	0.38	0.9	1.E-05	0.6	20	0.04	0.05
6	0.75	2.2	3.E-05	1.3	30	0.07	0.08
7	1.13	5.3	6.E-05	3.2	46	0.11	0.08
8	1.50	12.6	1.E-04	7.6	72	0.17	0.08

Figure 8: Calculated distance drawdown from proposed earthing cabling excavations at Hinuera Solar Farm Site

Dewatering (Long narrow trench - Unconfined groundwater - No mitigation)



Generic Model Inputs

Static water table depth below ground	z_g	0.2	m
Excavation depth below ground	z_e	0.75	m
Target dewatering (water table) depth below ground	-	0.75	m
Pumped water table depth below base of excavation footprint	z_i	0	m
Thickness of groundwater intake (i.e. well screen)	h_w	0.5	m
Modelled impermeable layer depth below ground	z_m	1.25	m
Groundwater head above impermeable layer at R_0	H	1.05	m
Drawdown from static water level within excavation footprint	s	0.55	m
Mean hydraulic conductivity	K	0.4	m/d
Maximum order of magnitude change in hydraulic conductivity	-	1.5	-
Storage coefficient (use specific yield)	S	0.1	-
Duration of dewatering (maximum modelled = 30 days)	t	30	d
Distance from edge of excavation or dewatering bores	r	10	m
Excavation length	a	270.0	m
Excavation width	b	0.5	m
Dewatering bore / well point spacing from excavation	c	0.1	m
Length / width ratio (Rule 1)	a/b or b/a	540.0	-
Okay to use model?	-	Yes	-
Bore radius for calculation of flow to corners (Equation 4)	$r_{e\text{-}calc}$	0.30	m

z_g must be < z_m Okay

Default: 0.5 m

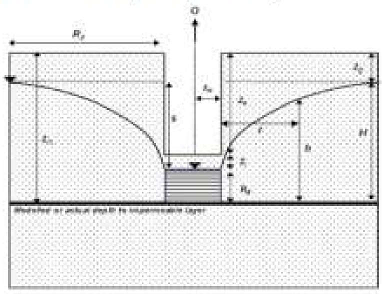
Default: Sump pump = 0.5 m, wells = 2 m

$z_m = z_e + z_i + h_w$. Must be >= actual depth to impermeable layer

$H = z_m - z_g$

$H - h$

Default: 0.1

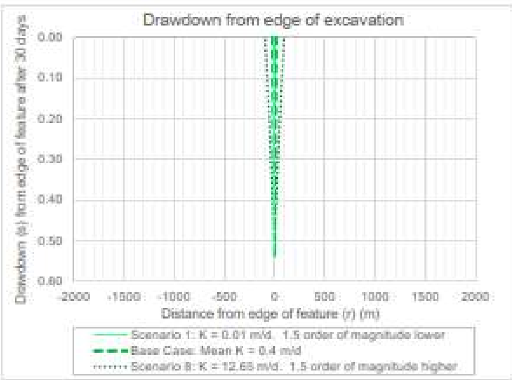


Required input
Formula or fixed
Error check

Notes

z_g	*Consider sensitivity analysis based on lowest and highest groundwater level. Highest ground water level gives largest inflow.*
z_i	*Default value of 0.5 m to allow for a dry excavation.*
h_w	*Default values of zero for sump pumping or 2 m for the well screen interval. Option to add actual well screen interval if known.*
H	*Modelled or actual vertical distance to impermeable boundary at radius of influence (point of zero drawdown).*
K	*Input mean value then do sensitivity analysis. Check against field test and literature values to ensure values are within a realistic range based on material descriptions.*
T	*Check against aquifer test or reported values if available. T calculated in spreadsheet may be less than tested or reported if H does not reach actual impermeable layer.*
S	*Use specific yield. Check with field testing and literature values to ensure these are within a realistic range based on material descriptions.*

Scenario	Order of magnitude change from mean hydraulic conductivity (K)	Hydraulic conductivity (K) (m/d)	Hydraulic conductivity (K) (m/s)	Transmissivity (T) (m^2/d)	Radius of influence (R0 = L0) from edge of excavation or dewatering bores after 30 day(s) (m)	Total groundwater inflow rate (Q) after 30 day(s) (L/s)	Drawdown (s) at distance (r) from edge of excavation or dewatering bores after 30 days (m)
	-	-	-	KH	Equation 5	Equation 3	-
1	-1.50	0.0	1.E-07	0.0	3	0.01	r>R0
2	-1.13	0.0	3.E-07	0.0	5	0.02	r>R0
3	-0.75	0.1	8.E-07	0.1	7	0.03	r>R0
4	-0.38	0.2	2.E-06	0.2	11	0.04	0.04
Base Case	Mean	0.4	5.E-06	0.4	17	0.07	0.18
5	0.38	0.9	1.E-05	1.0	26	0.10	0.29
6	0.75	2.2	3.E-05	2.4	40	0.16	0.37
7	1.13	5.3	6.E-05	5.6	61	0.26	0.43
8	1.50	12.6	1.E-04	13.3	95	0.42	0.47



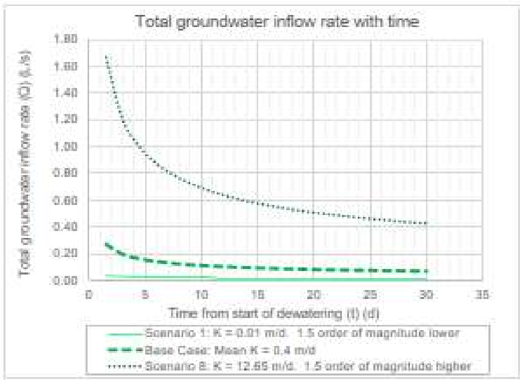
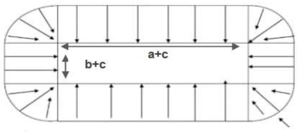


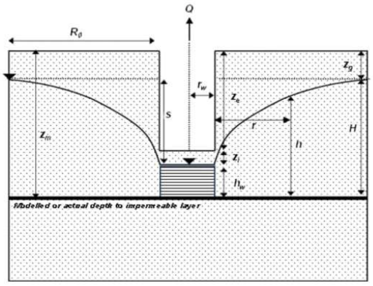
Figure 9: Calculated distance drawdown from proposed DC String cabling excavations at Hinuera Solar Farm Site

Dewatering (Long narrow trench - Unconfined groundwater - No mitigation)



Generic Model Inputs

Static water table depth below ground	z_g	0.2	m	***z_g* must be < *z_m*** Okay
Excavation depth below ground	z_e	0.75	m	
Target dewatering (water table) depth below ground	-	0.75	m	
Pumped water table depth below base of excavation footprint	z_i	0	m	***Default: 0.5 m***
Thickness of groundwater intake (i.e. well screen)	h_w	0.5	m	***Default: Sump pump = 0.5 m, wells = 2 m***
Modelled impermeable layer depth below ground	z_m	1.25	m	***$z_m = z_e + z_i + h_w$. Must be >= actual depth to impermeable layer***
Groundwater head above impermeable layer at R_0	H	1.05	m	***$H = z_m - z_g$***
Drawdown from static water level within excavation footprint	s	0.55	m	***H - h***
Mean hydraulic conductivity	K	0.4	m/d	
Maximum order of magnitude change in hydraulic conductivity	-	1.5	-	
Storage coefficient (use specific yield)	S	0.1	-	***Default: 0.1***
Duration of dewatering (maximum modelled = 30 days)	t	30	d	
Distance from edge of excavation or dewatering bores	r	10	m	
Excavation length	a	1746.0	m	
Excavation width	b	1.0	m	
Dewatering bore / well point spacing from excavation	c	0.1	m	
Length / width ratio (Rule 1)	a/b or b/a	1746.0	-	
Okay to use model?	-	Yes	-	
Bore radius for calculation of flow to corners (Equation 4)	$r_{w\text{-}calc}$	1.00	m	

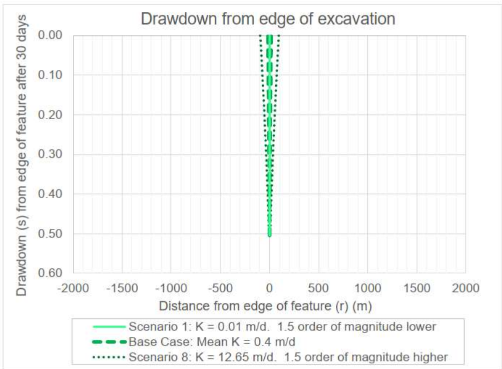


Required input
Formula or fixed
Error check

Notes

z_g	*Consider sensitivity analysis based on lowest and highest groundwater level. Highest ground water level gives largest inflow.*
z_i	*Default value of 0.5 m to allow for a dry excavation.*
h_w	*Default values of zero for sump pumping or 2 m for the well screen interval. Option to add actual well screen interval if known.*
H	*Modelled or actual vertical distance to impermeable boundary at radius of influence (point of zero drawdown).*
K	*Input mean value then do sensitivity analysis. Check against field test and literature values to ensure values are within a realistic range based on material descriptions.*
T	*Check against aquifer test or reported values if available. T calculated in spreadsheet may be less than tested or reported if H does not reach actual impermeable layer.*
S	*Use specific yield. Check with field testing and literature values to ensure these are within a realistic range based on material descriptions.*

Scenario	Order of magnitude change from mean hydraulic conductivity (K)	Hydraulic conductivity (K) (m/d)	Hydraulic conductivity (K) (m/s)	Transmissivity (T) (m^2/d)	Radius of influence (R0 = L0) from edge of excavation or dewatering bores after 30 day(s) (m)	Total groundwater inflow rate (Q) after 30 day(s) (L/s)	Drawdown (s) at distance (r) from edge of excavation or dewatering bores after 30 days (m)
	-	-	-	KH	Equation 5	Equation 3	-
1	-1.50	0.0	1.E-07	0.0	3	0.05	r>R0
2	-1.13	0.0	3.E-07	0.0	5	0.09	r>R0
3	-0.75	0.1	8.E-07	0.1	7	0.15	r>R0
4	-0.38	0.2	2.E-06	0.2	11	0.25	0.04
Base Case	Mean	0.4	5.E-06	0.4	17	0.39	0.18
5	0.38	0.9	1.E-05	1.0	26	0.62	0.29
6	0.75	2.2	3.E-05	2.4	40	0.97	0.37
7	1.13	5.3	6.E-05	5.6	61	1.51	0.43
8	1.50	12.6	1.E-04	13.3	95	2.36	0.47



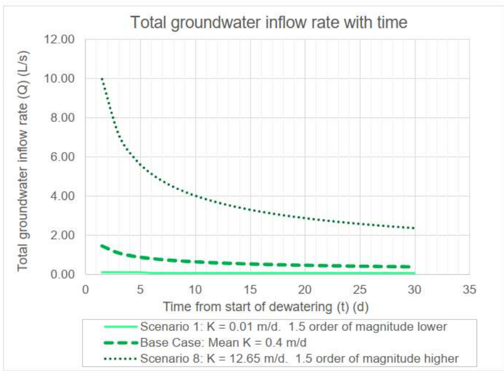
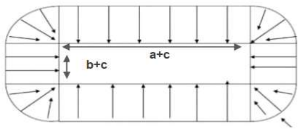


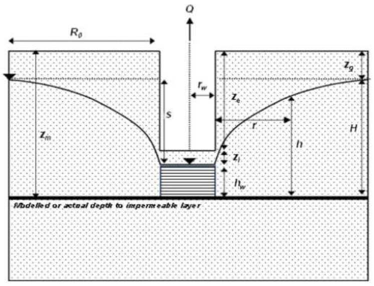
Figure 10: Calculated distance drawdown from proposed DC Main cabling excavations at Hinuera Solar Farm Site

Dewatering (Long narrow trench - Unconfined groundwater - No mitigation)



Generic Model Inputs

Static water table depth below ground	z_g	0.2	m	z_g must be < z_m Okay
Excavation depth below ground	z_e	1	m	
Target dewatering (water table) depth below ground	-	1	m	
Pumped water table depth below base of excavation footprint	z_i	0	m	*Default: 0.5 m*
Thickness of groundwater intake (i.e. well screen)	h_w	0.5	m	*Default: Sump pump = 0.5 m, wells = 2 m*
Modelled impermeable layer depth below ground	z_m	1.5	m	*$z_m = z_e + z_i + h_w$. Must be >= actual depth to impermeable layer*
Groundwater head above impermeable layer at R_0	H	1.3	m	*$H = z_m - z_g$*
Drawdown from static water level within excavation footprint	s	0.8	m	*$H - h$*
Mean hydraulic conductivity	K	0.4	m/d	
Maximum order of magnitude change in hydraulic conductivity	-	1.5	-	
Storage coefficient (use specific yield)	S	0.1	-	*Default: 0.1*
Duration of dewatering (maximum modelled = 30 days)	t	30	d	
Distance from edge of excavation or dewatering bores	r	10	m	
Excavation length	a	800.0	m	
Excavation width	b	1.6	m	
Dewatering bore / well point spacing from excavation	c	0.1	m	
Length / width ratio (Rule 1)	a/b or b/a	500.0	-	
Okay to use model?	-	Yes	-	
Bore radius for calculation of flow to corners (Equation 4)	$r_{w\text{-}calc}$	1.00	m	

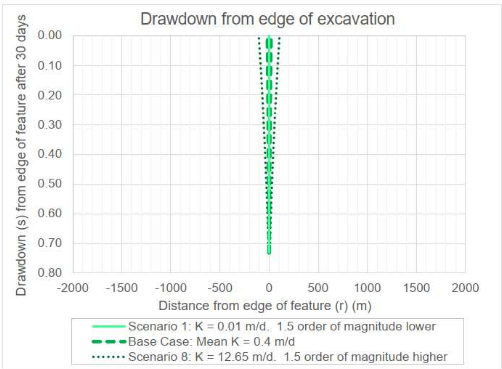


Required input
Formula or fixed
Error check

Notes

z_g	*Consider sensitivity analysis based on lowest and highest groundwater level. Highest ground water level gives largest inflow.*
z_i	*Default value of 0.5 m to allow for a dry excavation.*
h_w	*Default values of zero for sump pumping or 2 m for the well screen interval. Option to add actual well screen interval if known.*
H	*Modelled or actual vertical distance to impermeable boundary at radius of influence (point of zero drawdown).*
K	*Input mean value then do sensitivity analysis. Check against field test and literature values to ensure values are within a realistic range based on material descriptions.*
T	*Check against aquifer test or reported values if available. T calculated in spreadsheet may be less than tested or reported if H does not reach actual impermeable layer.*
S	*Use specific yield. Check with field testing and literature values to ensure these are within a realistic range based on material descriptions.*

Scenario	Order of magnitude change from mean hydraulic conductivity (K)	Hydraulic conductivity (K) (m/d)	Hydraulic conductivity (K) (m/s)	Transmissivity (T) (m^2/d)	Radius of influence (R0 = L0) from edge of excavation or dewatering bores after 30 day(s) (m)	Total groundwater inflow rate (Q) after 30 day(s) (L/s)	Drawdown (s) at distance (r) from edge of excavation or dewatering bores after 30 days (m)
	-	-	-	KH	Equation 5	Equation 3	-
1	-1.50	0.0	1.E-07	0.0	3	0.04	r>R0
2	-1.13	0.0	3.E-07	0.0	5	0.07	r>R0
3	-0.75	0.1	8.E-07	0.1	8	0.11	r>R0
4	-0.38	0.2	2.E-06	0.2	12	0.17	0.10
Base Case	Mean	0.4	5.E-06	0.5	19	0.28	0.29
5	0.38	0.9	1.E-05	1.2	29	0.44	0.43
6	0.75	2.2	3.E-05	2.9	44	0.69	0.54
7	1.13	5.3	6.E-05	6.9	68	1.09	0.62
8	1.50	12.6	1.E-04	16.4	105	1.73	0.68



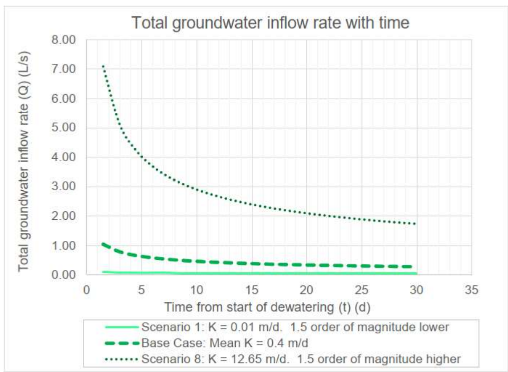


Figure 11: Calculated distance drawdown from proposed MV cabling excavations at Hinuera Solar Farm Site

5.2 Neighbouring Groundwater Users

Figure 6 shows the location of groundwater bores located in the vicinity of the Hinuera Solar Farm, with this data provided by the Wells Aotearoa New Zealand Database. Given the distance of the calculated drawdown from the proposed excavations (a maximum of 105 m), specific information from bores within 105 m of any of the cable excavations was reviewed.

This review determined that other than the five groundwater bores located on the Project Site, all neighbouring bores are located greater than 105 m from the proposed excavation. As such, no groundwater bores outside of the Project Site will be affected by the dewatering for these excavations.

5.3 Potential Effects on Surface Water Bodies

As stated in **Section 4.3**, the closest water bodies on the property are the Mangawhero Stream and its tributary.

Figure 7 shows that the proposed excavations in the vicinity of the Mangawhero Stream are earth cable excavations with these located between 10 and 50 m from the stream. With regards to the tributary of the Mangawhero Stream, the closest proposed excavations are DC and Earth trenches in the northern portion of the site (located 10 m away at the closest point away) and the MV Trench (1 m wide) which is proposed to run along the tributary approximately 10 m away).

The effects of the proposed dewatering on the water race were calculated using the Theis Jenkins streamflow depletion calculation method. Once again, the calculations were based on the worst-case scenario of excavations and mean hydraulic conductivity and therefore the results are considered conservative. In addition, groundwater levels in the vicinity of the streams are likely to be lower than 0.2 m used in the assessment, as the surface water body channels will reduce the groundwater levels in the vicinity.

The inflows calculated in the drawdown assessment were used, with the results shown in **Figures 12**, **13**, and **14** for the earth cable, DC and earth cables and MV trench cable excavations, respectively.

The depletion in the Mangawhero Stream and its tributary as a result of the earth cables and DC and earth cable excavations will be 0 L/s after 30 days of dewatering. The depletion in the tributary of the Mangawhero Stream from the MV cable excavation would result in a stream depletion of 0.2 L/s after 30 days of dewatering.

It is considered that this low level of depletion would have a less than minor effect on the tributary considering the dewatering is temporary and, in most cases, the groundwater will be discharged back to land or potentially directly to the tributary if water quality allows allowing recharge to occur.

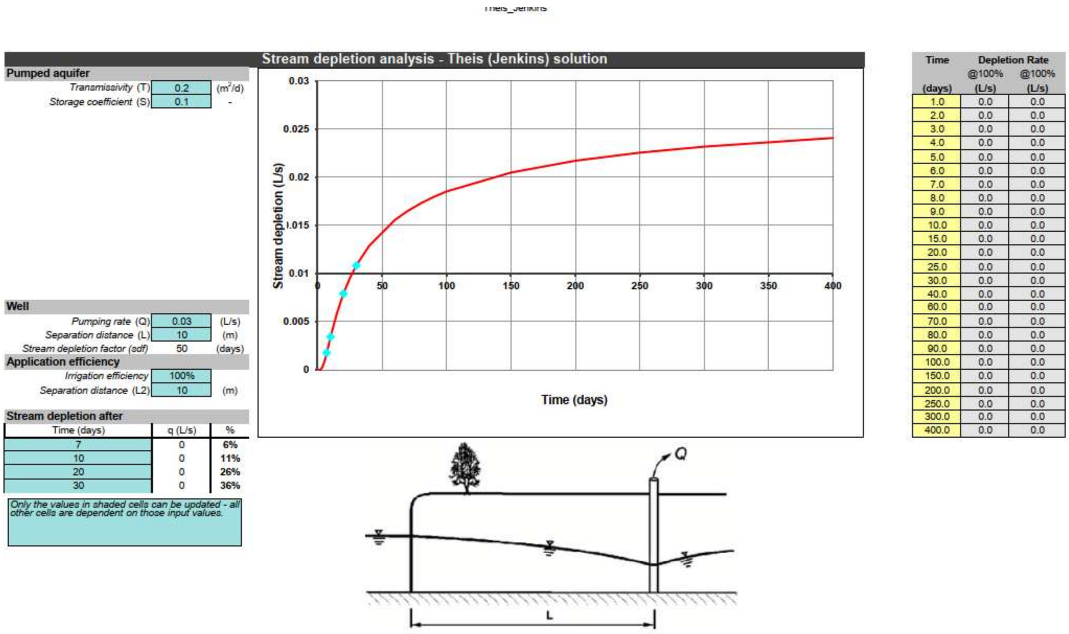


Figure 12: Mangawhero Stream Depletion from Earth Cable Excavations (10 m distance from stream)

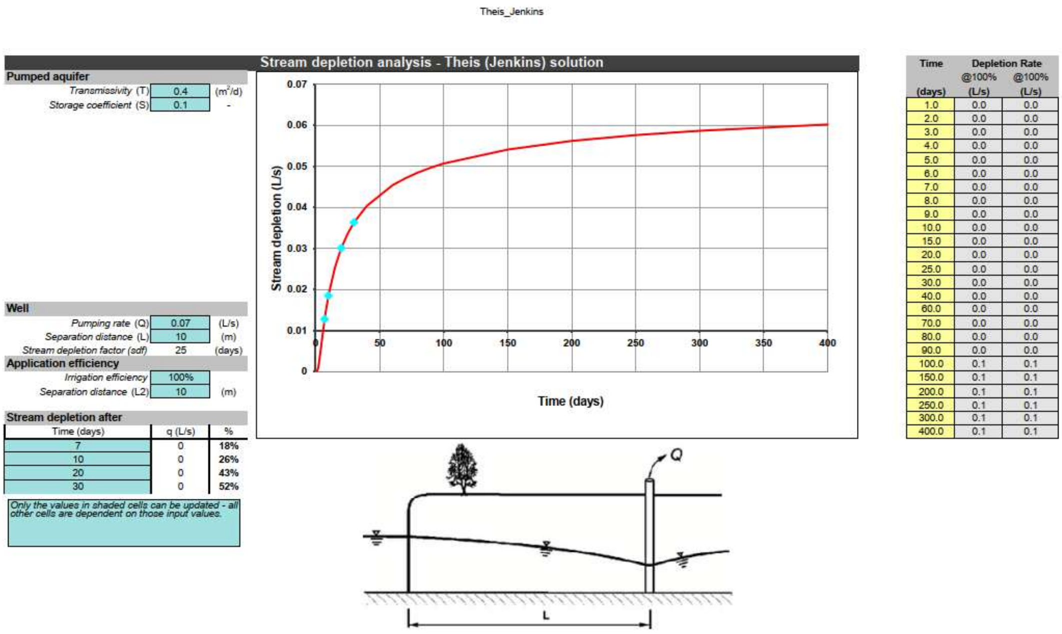


Figure 13: Mangawhero Tributary Depletion from DC and Earth Cable Excavations (10 m distance)

Theis_Jenkins

Pumped aquifer

Transmissivity (T)	0.5	(m^2/d)
Storage coefficient (S)	0.1	-

Well

Pumping rate (Q)	0.28	(L/s)
Separation distance (L)	10	(m)
Stream depletion factor (sdf)	20	(days)

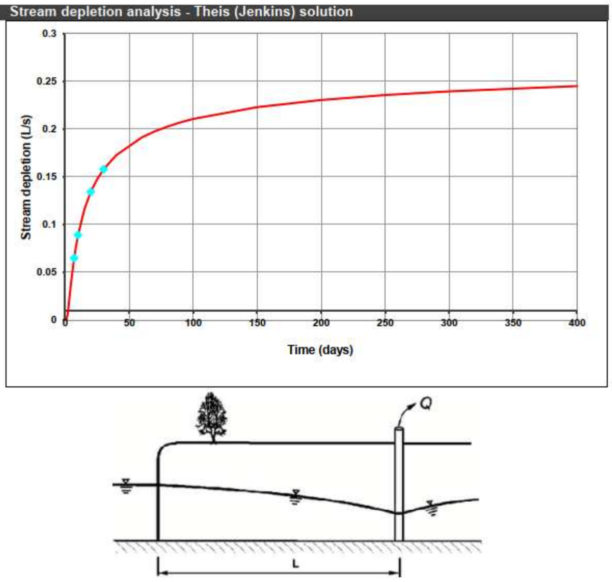
Application efficiency

Irrigation efficiency	100%	
Separation distance (L2)	10	(m)

Stream depletion after

Time (days)	q (L/s)	%
7	0	23%
10	0	32%
20	0	48%
30	0	56%

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



Time (days)	Depletion Rate @100% (L/s)	@100% (L/s)
1.0	0.0	0.0
2.0	0.0	0.0
3.0	0.0	0.0
4.0	0.0	0.0
5.0	0.0	0.0
6.0	0.1	0.1
7.0	0.1	0.1
8.0	0.1	0.1
9.0	0.1	0.1
10.0	0.1	0.1
15.0	0.1	0.1
20.0	0.1	0.1
25.0	0.1	0.1
30.0	0.2	0.2
40.0	0.2	0.2
60.0	0.2	0.2
70.0	0.2	0.2
80.0	0.2	0.2
90.0	0.2	0.2
100.0	0.2	0.2
150.0	0.2	0.2
200.0	0.2	0.2
250.0	0.2	0.2
300.0	0.2	0.2
400.0	0.2	0.2

Figure 14: Mangawhero Tributary Depletion from MV Trench Cable Excavations (10 m distance)

5.4 Potential Effects on Wetlands

Figure 7 shows that the earth cable excavations will be located approximately 10 m from the low value wetlands identified on the site. Based on the stream depletion assessment shown in Figure 13, dewatering of the shallow earth cable excavations will have a less than minor effect on the wetlands.

5.5 Potential Effects of Groundwater Discharge

Multiple options for discharging the dewatered groundwater are being proposed depending on the site-specific constraints. These are:

- Direct to Land - the discharge point must be a minimum of 20 m from a wetland area or waterway and selected to ensure the appropriate erosion and sediment control is in place, such that water does not cause erosion, run to water (either surface water or wetland) or leave the site. Measures to assist include, but are not limited to, small rock pad or sandbags to diffuse concentrated flow. Routine monitoring of the discharge site must be undertaken to ensure the discharge does not result in erosion, flooding or run off to water or neighbouring sites.
- Temporary Storage and Reuse - Water may be collected and re-used on site for non-potable purposes. This could include use in a water cart for purposes of dust control. Any water collected and stored for this purpose would either be clean water, or require filtration or chemical treatment to ensure sediment is removed prior to reuse.
- Controlled Discharge Solutions - Temporary containment and controlled discharge may be utilised, particularly when conditions mean discharge direct to land would result in unacceptable ponding or off-site effects. Potential controlled discharge

solutions could include decanting earth bunds, turkey nests, sediment retention ponds, sediment dewatering bags or chemical treatment. An example of this would be the controlled discharge, following treatment, into one the farm drains located across the property. Recommended consent conditions are proposed for consent (**see Section 6.0**) in the event that this discharge option is selected by the contractor.

The potential effect on the water quality within the farm drain from the proposed discharge is considered to be less than minor given the small volume of water calculated to be discharged during the dewatering process, water quality treatment will occur prior to the discharge occurring and any potential effects of erosion due to the discharge will be managed through the site Erosion and Sediment Control Plan (ESCP).

By having multiple options for groundwater discharge will allow the contractors to determine the best method to reduce the level of effect on the discharge to the surrounding environment.

6.0 Recommended Consent Conditions

The following consent conditions are proposed for the dewatering component of the project given the level of effect determined in this assessment:

Limits

- The daily take volume authorised by this consent must not exceed 149 cubic metres per day.

With regards to the disposal of the groundwater discharge if the discharge occurs directly to land or to a nearby farm drain then this activity should be included in the Erosion and Sediment Control Plan (ESCP) prepared for the Project Site.

Regards,

GHolmes

Gillian Holmes
Principal Hydrogeologist

Review: Tim Baker, Principal Hydrogeologist

References

CMW (2025). Geotechnical Investigation Report, Hinuera Solar Farm, 4775 State Highway 29, Matamata. Report prepared for Harmony Energy NZ Limited #06. Dated 6 November 2025. Job No: HAM2025-0095AB.

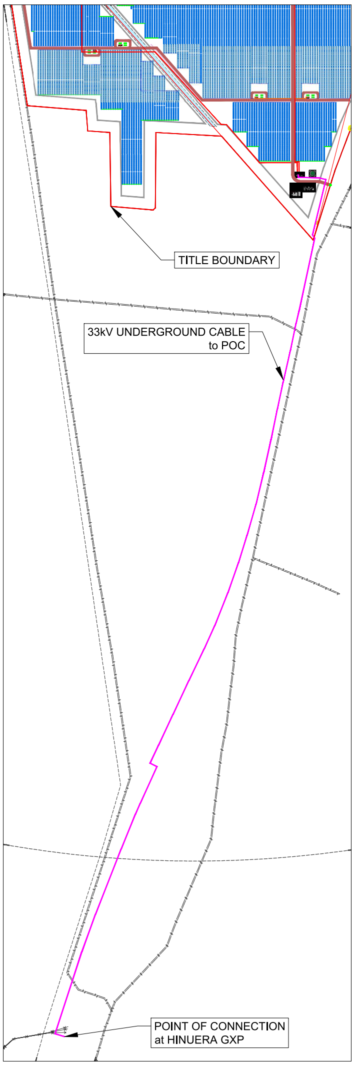
Hadfield J. (2001). Waikato. *In* Groundwaters of New Zealand, M. R. Rosen and P.A. White (*eds*). New Zealand Hydrological Society Inc., Wellington. P315-326.

SLR (2025). Draft Ecological Impact Assessment, Harmony Hinuera Solar Farm. Report prepared for Harmony Energy NZ #6 Limited. Dated 20 November 2025.

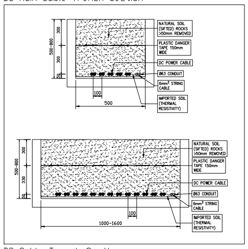
Appendix A Infrastructure and and Cable Layout (concept only)

SLR

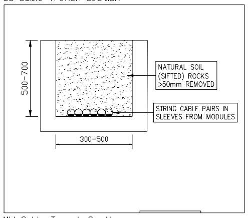
Project Site Map - NTS



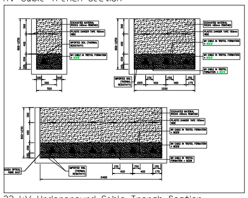
DC Main Cable Trench Section



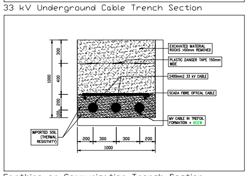
DC Cable Trench Section



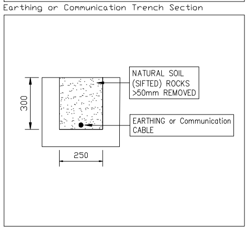
MV Cable Trench Section



33 kV Underground Cable Trench Section



Earthing or Communication Trench Section



Legend	
	PV Module
	Lot Boundary
	Earthing Cable
	DC String/Main Cable 0.5m Trench
	DC Main Cable 1.0m Trench
	33kV MV Main Cable 0.8m Trench
	33kV MV Main Cable 1.2m Trench
	33kV MV Main Cable 1.6m Trench
	Construction Access
	Internal Road
	Water Tank
	Inverter Station
	BESS

N

System Specifications	
PV_{DC} Size	+100 MWp
PV_{AC} Size (MEC)	70 MW
Module Specifications	
Type	Topcon N-TYPE
Quantity	170,000
PV_{STC}	625W
Inverter Specifications	
Type	Sungrow SG 3400
Quantity	~30
AC_{CAP}	~103 MVA
Mounting Gear Specifications	
Type	Tracking System or Fixed Tilt
Quantity	TBC
Pitch	TBC
Connection Specifications	
Point of Connection	Hinuera Powerco
Connection Voltage	33 kV

Notes

-4,681m of Earthing and Comms trenching

-12,028m of DC Main trenching

-9,088m of MV Main trenching

Rev.	Date	Description of changes	By
R0	26-02-26	Concept Trenching	RDP

Revisions

HARMONY ENERGY

Auckland
New Zealand

Project Title
HINEURA TRACKING

Drawing Title
SITE TRENCHING

Drawing No.	Rev No.
MST-02.00	R0

Drafted By	Designed By	Checked By	Approved Date
DJ	RDP	RDP	

Paper Size	Scale	Units	Sheet No.
A2	NTS	M	1 of 1

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