March 2024

Environmental Impact Assessment

Report Volume 3

Proposed Extension to Scotshouse Quarry

Scotshouse Quarries Ltd.

Aghnaskew, Scotshouse, Co. Monaghan

MALONE O'REGAN

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NSAI Certified

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MALONE O'REGAN ENVIRONMENTAL

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Title: Environmental Impact Assessment Report Volume 3, Proposed Extension to Scotshouse Quarry, Scotshouse Quarries Ltd., Aghnaskew, Scotshouse, Co. Monaghan

Job Number: E2037

Prepared By: Ruth Crumpton **Signed:** R. C

Checked By: David Dwyer **Signed:**

Approved By: Kenneth Goodwin **Signed:**

Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
01	12/03/24	Report	Final	RC	DD	KG

Environmental Impact Assessment Report Volume 3

Proposed Extension to Scotshouse Quarry

Scotshouse Quarries Ltd.

Aghnaskew, Scotshouse, Co. Monaghan

APPENDICES

APPENDIX 3

Appendix 3-1: Letter of Consent from Current Landowners

APPENDIX 6

Appendix 6-1: Bat Survey at Scotshouse Quarry

Appendix 6-2: Designated Sites and Habitats Maps

APPENDIX 7

Appendix 7-1: Borehole Logs

APPENDIX 8

Appendix 8-1: Groundwater Monitoring Results

Appendix 8-2: Surface Water Historic (2016-19) and Recent (2022-23) Monitoring Results

Appendix 8-3: Slug Test Data

Appendix 8-4: Drawdown Data and Graphs

Appendix 8-5: Recovery Data and Graphs

Appendix 8-6: Water Framework Directive Report

Appendix 8-7: OPW Flood Report

APPENDIX 9

Appendix 9-1: Dusk Risk Assessment

APPENDIX 11

Appendix 11-1: Acoustics Glossary

Appendix 11-2: Acoustics Modelling Inputs and Outputs

Appendix 11-3: Noise Survey Reports

APPENDIX 12

Appendix 12-1: Photomontages of Viewpoint Reference Points

APPENDIX 13

Appendix 13-1: List of Recorded Monuments in Study Area

Appendix 13-2: Sites in the Study Area listed on the Sites and Monuments Record

Appendix 13-3: Archaeological and Cultural Heritage Materials Field Inspection

APPENDIX 14

Appendix 14-1: Traffic Count Data

Appendix 14-2: Scoping Document issued to Monaghan County Council Roads Department

Appendix 14-3: Junction 10 Outputs for L6280 Site Access

Appendix 3

APPENDIX 3-1

James Boylan & Mary Boylan
Drumeena,
Redhills,
Co. Cavan

Planning Department
Monaghan County Council,
Planning Office,
1 Dublin Street,
Co. Monaghan.

25th October 2022

Re: Planning Application for the extension to an existing quarry and all associated ancillary works at Aghnaskew & Lattacrossan, Scotshouse, Clones, Co. Monaghan

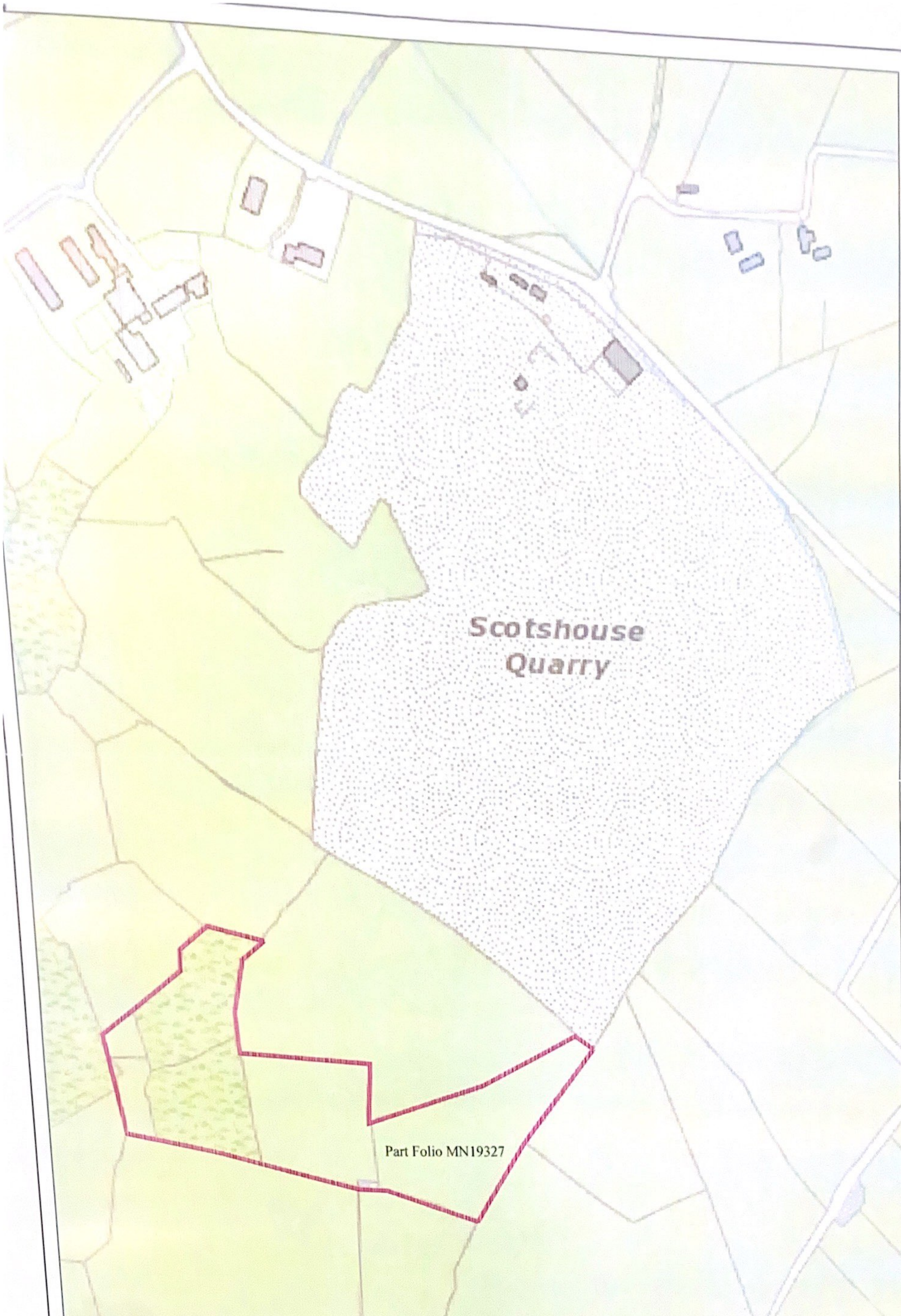
To whom it may concern,

We, James Boylan & Mary Boylan consent to a Planning Application lodged by Scotshouse Quarries Ltd. for the extension to an existing quarry and all associated ancillary works on our lands (Part Folio MN19327 – Map Attached) at Aghnaskew, Scotshouse, Clones, Co. Monaghan.

Signed:

James Boylan.

James Boylan & Mary Boylan



Planning Application for the Extension to an Existing Quarry by Scotshouse Quarries Ltd.

Signed: James Boylan Date: 2/11/22.

James Boylan & Mary Boylan

John Thomas Markey & Margaret Mary Markey
Scotshouse
Co Monaghan

Planning Department
Monaghan County Council,
Planning Office,
1 Dublin Street,
Co. Monaghan.

25th October 2022

Re: Planning Application for the extension to an existing quarry and all associate ancillary works at Aghnaskew & Lattacrossan, Scotshouse, Clones, Co. Monaghan

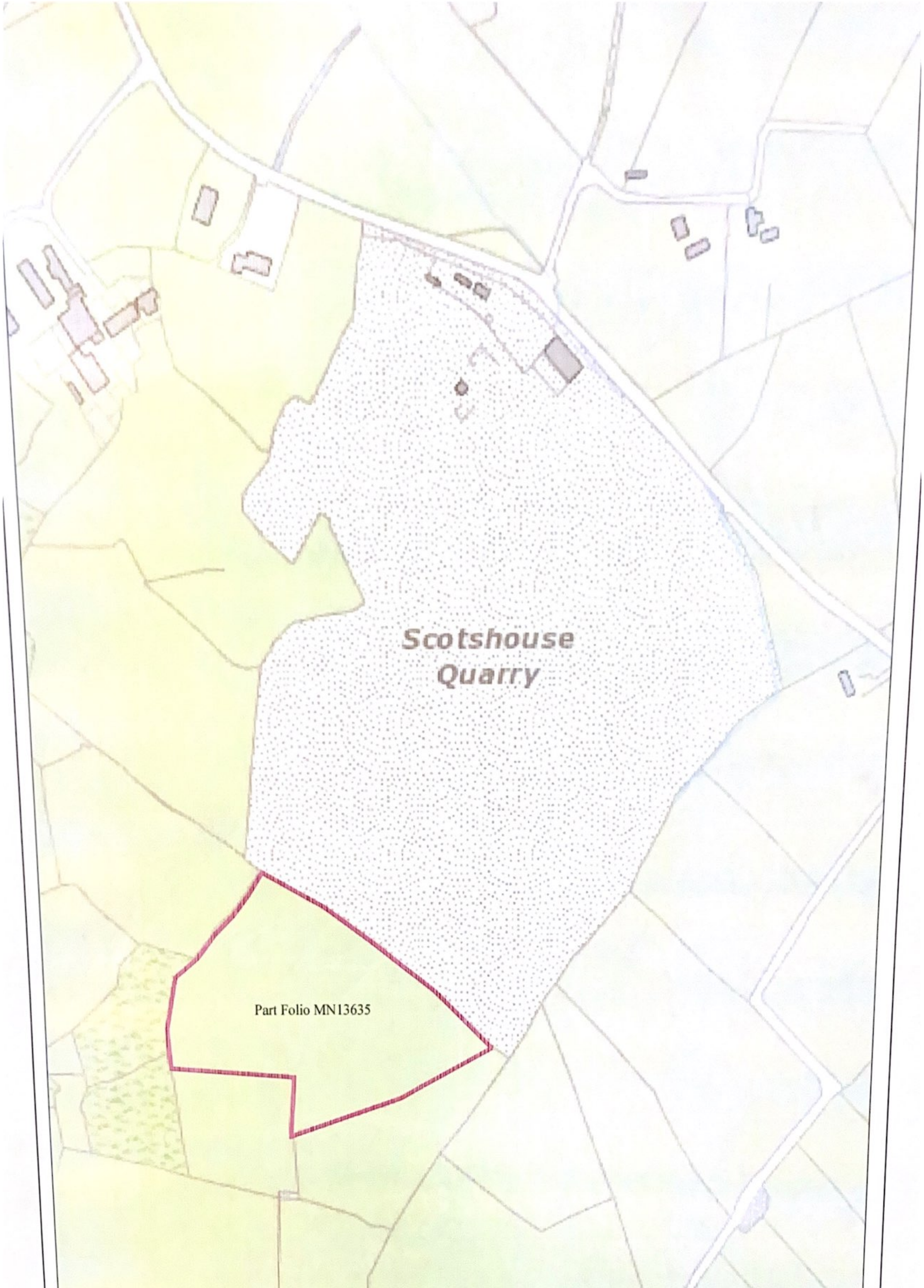
To whom it may concern,

We, John Thomas Markey & Margaret Mary Markey consent to a Planning Application lodged by Scotshouse Quarries Ltd. for the extension to an existing quarry and all associated ancillary works on our lands (Part Folio MN13635 – Map Attached) at Aghnaskew, Scotshouse, Clones, Co. Monaghan.

Signed:

John Markey Mary Markey

John Thomas Markey & Margaret Mary Markey



Planning Application for the Extension to an Existing Quarry by Scotshouse Quarries Ltd.

Signed: John Markey Date: 7/11/22

John Thomas Markey & Margaret Mary Markey

Mary Markey

Patrick Connolly & Pauline Connolly
Ballytrain,
Shantonagh,
Castleblayney,
Co. Monaghan

Planning Department
Monaghan County Council,
Planning Office,
1 Dublin Street,
Co. Monaghan.

25th October 2022

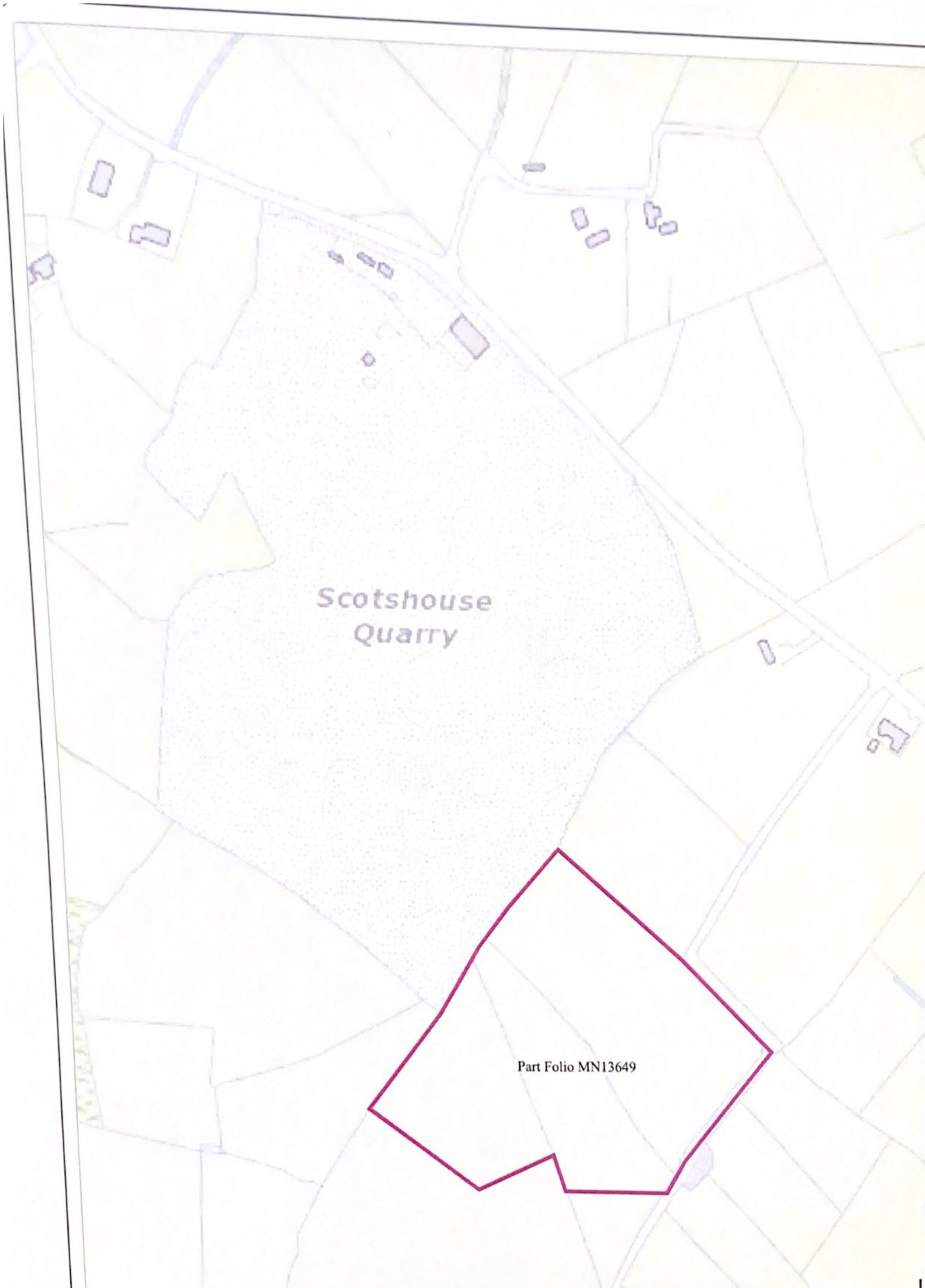
Re: Planning Application for the extension to an existing quarry and all associated ancillary works at Aghnaskew & Lattacrossan, Scotshouse, Clones, Co. Monaghan

To whom it may concern,

We, Patrick Connolly & Pauline Connolly consent to a Planning Application being lodged by Scotshouse Quarries Ltd. for the extension to an existing quarry and all associated ancillary works on our lands (Part Folio MN13649 – Map Attached) at Lattacrossan, Scotshouse, Clones, Co. Monaghan.

Signed:

Paddy Connolly
Pauline Connolly
Patrick Connolly & Pauline Connolly



Planning Application for the Extension to an Existing Quarry by Scotshouse Quarries Ltd.

Signed:

Patrick Connolly & Pauline Connolly

Date: 28/10/22.

Ronald Charles Soden
Lattycrusan,
Scotshouse,
Clones,
Co. Monaghan

Planning Department
Monaghan County Council,
Planning Office,
1 Dublin Street,
Co. Monaghan.

25th October 2022

Re: Planning Application for the extension to an existing quarry and all associated ancillary works at Aghnaskew & Lattacrossan, Scotshouse, Clones, Co. Monaghan

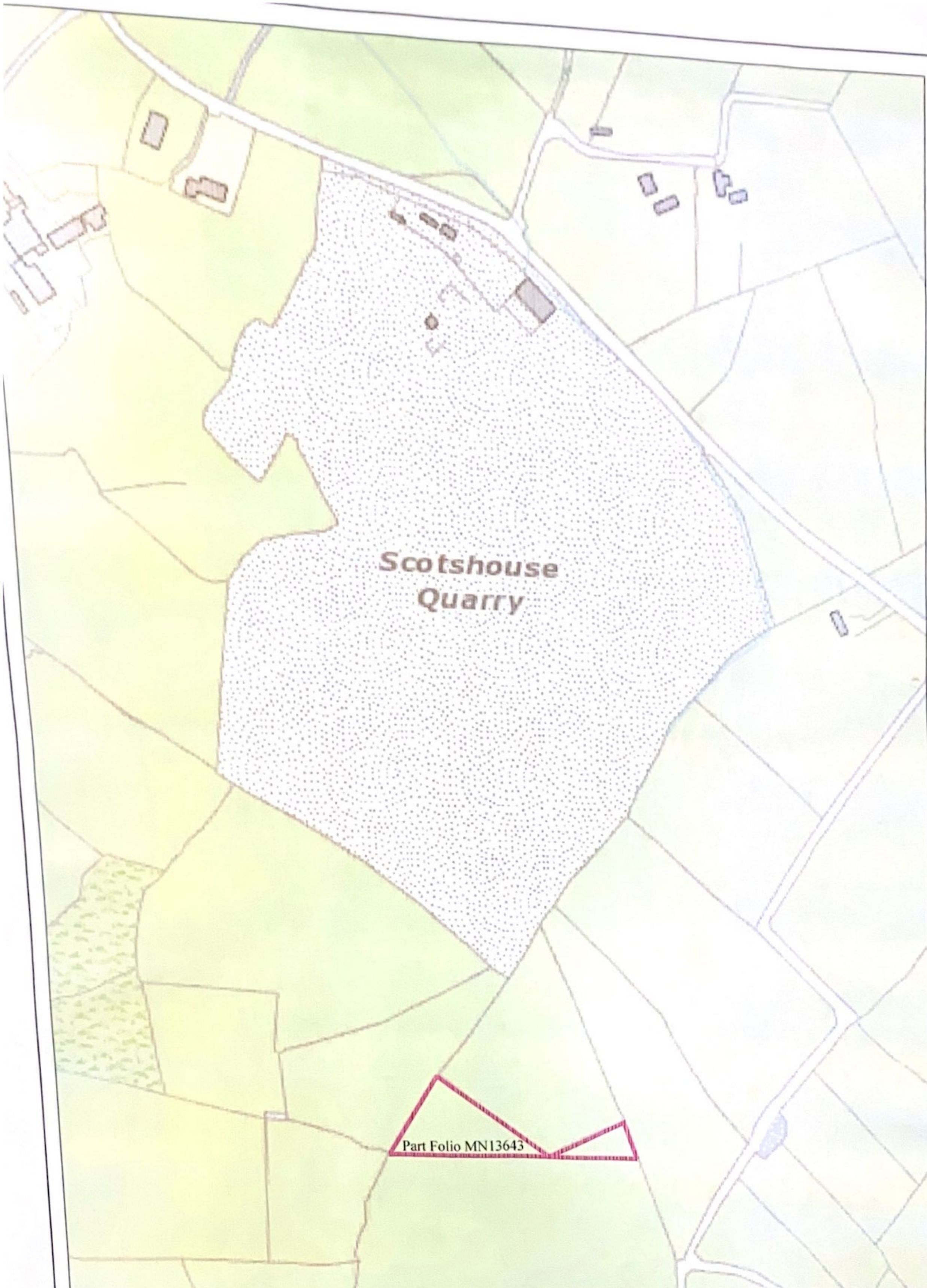
To whom it may concern,

I, Ronald Charles Soden consent to a Planning Application lodged by Scotshouse Quarries Ltd. for the extension to an existing quarry and all associated ancillary works on my lands (Part Folio MN13643 – Map Attached) at Lattacrossan, Scotshouse, Clones, Co. Monaghan.

Signed:

Ronald Soden

Ronald Charles Soden



Planning Application for the Extension to an Existing Quarry by Scotshouse Quarries Ltd.

Signed: Ronald Charles Soden Date: 5 - 11 - 2022

Ronald Charles Soden

APPENDIX 6

Appendix 6-1

Flynn Furney Environmental Consultants

Bat survey at Scotshouse Quarry, Aghnaskew Co. Monaghan

June 2023

Table of Contents

Table of Contents	Page
1. Introduction	2
2. Legislation and bats	4
3. Methodology	5
3.1 Desk study	5
3.2 Building assessment	5
3.3 Tree assessments	5
3.4 Site walkover – bat survey	5
4. Results	6
4.1 Desk Study	6
4.2 Building assessment	7
4.3 Tree assessments	8
4.4 Site walkovers – dusk bat surveys	8
5. Conclusion	10

1. Introduction

Flynn Furney Environmental Consultants undertook two dusk (evening) walkover bat surveys on lands adjacent to the operational Scotshouse Quarry at Aghnaskew, Scotshouse, Co. Monaghan on the 28th of May and 8th of June 2023. These walkover surveys were carried out to determine the level of bat activity and range of bat species using these primarily grassland fields that are located within the proposed quarry expansion zone (Figure 1). A number of trees and a derelict stone building on the site were also assessed for bat roost potential.

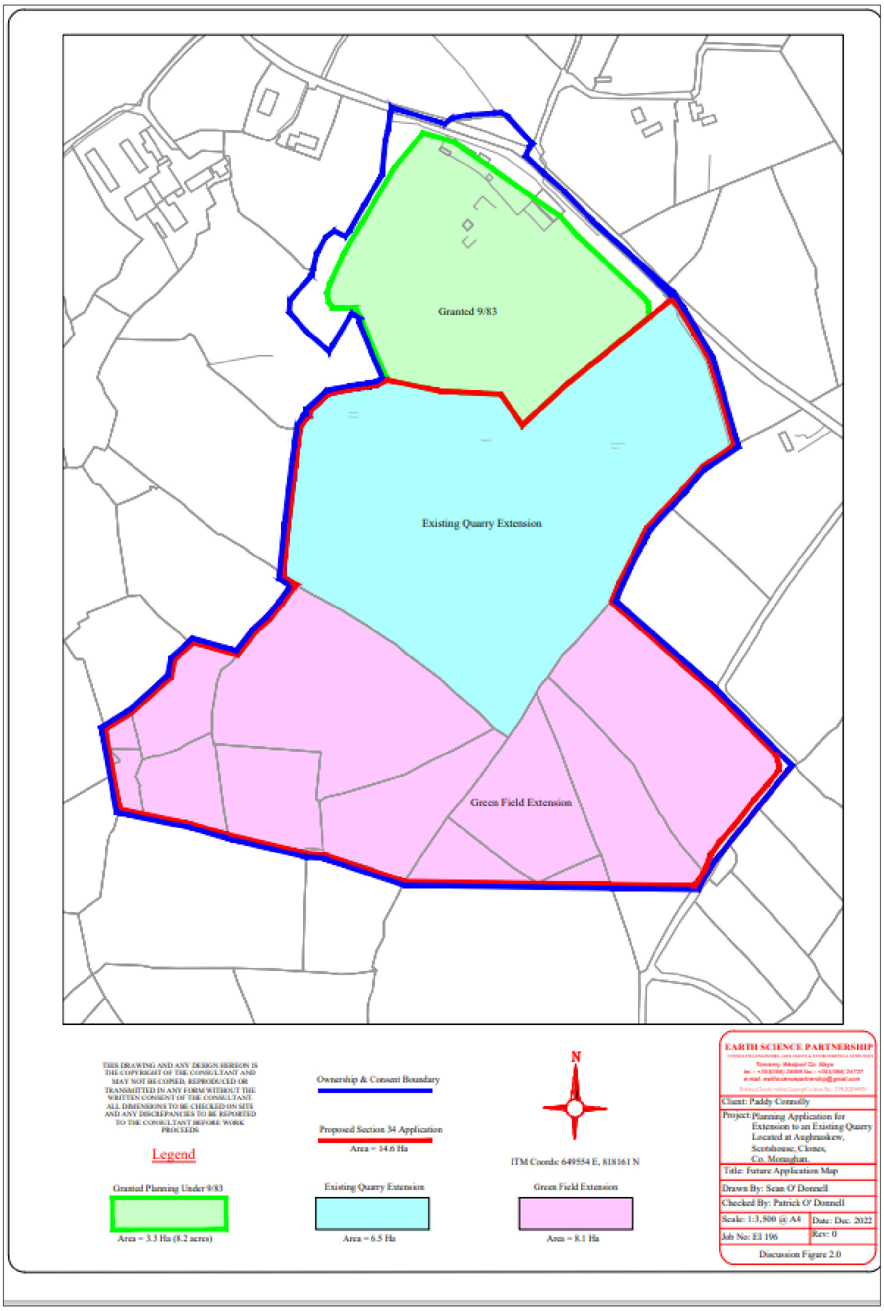


Figure 1. Site outline. The study area is shown in pink (labelled *Green Field Extension*)

The study site is located to the immediate south of the operational quarry and occupies an area of 8.1Ha. The site consists of managed grassland fields, areas of overgrown wet grassland and scrub with field boundaries demarcated with treelines, hedgerows and ditches (Figures 2, 3 & 4). The site is not within or immediately adjacent to any nationally or internationally designated sites for biodiversity, with the nearest such site being Drumcor Lough NHA, approximately 1.2km southwest of the site.

Figure 2. Recently mowed grassland field. View looking to the southeast.

Figure 3. Wet grassland and marsh in the centre of the study site. View looking to the southwest.

Figure 4. Typical treeline along the southern boundary of the study site.

2. Legislation and bats

All bat species are protected by law in Ireland at a national and European level. Nationally, the Wildlife Act 1976 (amended 2000) makes it an offence to wilfully interfere with, or destroy, the resting or breeding place for bats. All species of Irish bats are listed under Schedule 5 of the Wildlife Act (1976) making it an offence to:

- Intentionally kill, injure, or take a bat
- Possess or control any live or dead specimen or anything derived from a bat
- Wilfully interfere with any structure or place used for breeding or resting by a bat
- Wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose

The EU 'Habitats' Directive (92/43/EC; transposed into Irish law by S.I. No. 94 of 1997) provides legal protection for bats and their roosts at a European Union level. In addition, the Irish government are signatories of the 1979 Bonn 'Convention on the Conservation of Migratory Species of Wild Animals' and the 1982 Convention on the 'Conservation of European Wildlife and Natural Habitats'. Ireland must also fulfil commitments under the 1991 'Eurobats Agreement' for the conservation of bats in Europe. Under the EU Habitats Directive, lesser horseshoe bats are listed as an Annex II species (afforded special protection). All other Irish bat species are listed in Annex IV (general protection) of this directive.

Under existing legislation, the destruction, alteration or evacuation of a known bat roost requires the National Parks and Wildlife Service (NPWS) being notified before works can commence on or adjacent to a known bat roost. A derogation licence from NPWS must also be obtained prior to commencement of works.

3. Methodology

3.1 Desk study

The study site is located in tetrad H41Y (a tetrad being an area of $2km^2$). A search of bat records held on the National Biodiversity Datacentre's (NBDC) online portal[1] for this tetrad, was requested. Such information can identify bat species which may occur on the proposed development site or in the local area. It should be noted that an absence of records is likely to reflect an absence of survey data and cannot be taken as confirmation that bats in general or a particular species of bat is not present in the site or surrounding area.

3.2 Building assessment

A derelict stone farm building (possibly a former dwelling) is located in the southwestern corner of the study site, ITM 649253 817819. The assessment of this structure followed roost identification guidelines as per *'Bat Survey Guidelines: Traditional Farm Buildings Scheme,'* Aughney, T., Kelleher, C. & Mullen, D. (2008)[2]. The assessment involved searching for signs of bat presence such as droppings, discarded insect remains, urine staining and searching for suitable crevices and gaps in the structure's walls.

3.3 Tree assessments

There are a number of trees, particularly in the southwestern section of the site and around the derelict structure that were worthy of assessment for potential bat roost features (PRFs). The Tree Bat Roost Category Classification System (Collins, 2016) was used to assess these trees, see Table 1.

Table 1. *Tree Bat Roost Category Classification System (Collins, 2016).*

Tree Category	Description
1 (High)	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts
2 (Moderate)	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats;
3 (Low)	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features (PRFs) which may have limited potential to support bats;
4	Trees have no potential.

3.4 Site walkover – bat survey

Two dusk bat surveys were undertaken on the 28th of May and the 8th of June 2023. A handheld Echo Meter Touch Pro bat detector was used, with a Batbox Duet detector deployed as a backup device. Both surveys commenced 30 minutes before sunset; 21:15 on the 28th of May and at 21:28 on the 8th of June. Both surveys lasted approximately 2.5 hours.

[1] https://maps.biodiversityireland.ie/Map/Terrestrial/Dataset/128 Accessed May 25th, 2023.

[2] Aughney, T., Kelleher, C. & Mullen, D. (2008). Bat Survey Guidelines: Traditional Farm Buildings Scheme. The Heritage Council, Áras na hOidhreachta, Church Lane, Kilkenny.

Weather conditions on the evening of the 28th May were dry, calm and clear but notably cool for the time of year with temperatures ranging from +13°C at the start of the survey to +8°C upon completion. Whilst bats were active during this survey, and within the air temperatures parameters as per standard survey guidelines, it was decided to conduct a second survey on an evening with milder conditions to ensure that a more accurate assessment of bat activity on the site was made. The weather conditions during this second survey, carried out on the evening of 8th of June, were again dry, calm and clear with temperatures ranging from +16°C at the start of the survey to +12°C upon completion.

The transects walked on both evenings ensured adequate coverage of the site with an emphasis on the hedgerows and treelines along the site and internal field boundaries, the wet grassland, scrub areas and tree dominated area around the derelict structure as these are the features and habitats considered most likely to be used by commuting and foraging bats.

4. Results

4.1 Desk Study

The NBDC database search returned no records for tetrad H41Y, the tetrad within which the site is located. An online search was also made of adjacent tetrads with bat records located in tetrad H41Z. These records are listed in Table 2.

Table 2. *Bat records as per NBDC online portal for Tetrad H41Z*

Tetrad	Grid Reference (ITM)	Date	Survey dataset	Surveyor	Species recorded
H41Z	H485191	18/07/2007	National Bat Database of Ireland – Car based monitoring scheme.	D. McDonagh	Soprano pipistrelle *Pipistrellus pygmaeus*
	H485191	08/08/2007	National Bat Database of Ireland – Car based monitoring scheme.	D. McDonagh	Common pipistrelle *Pipistrellus pipistrellus sensu lato*

In addition, Bat Conservation Ireland's habitat suitability index[3], available to view on the NBDC online mapping portal, classifies tetrad H41Y, within which the study site is located, as having a moderate habitat suitability index for bats. A bat habitat suitability index score of 30.33 was assigned to this tetrad. The four bat species most likely to occur in tetrad H41Y, as per the habitat suitability index, are Leisler's bat *Nyctalus leisleri* (suitability score of 46), Common pipistrelle *Pipistrellus pipistrellus* (suitability score of 44) and Natterer's bat *Myotis Nattereri* (suitability score of 44) and Soprano pipistrelle *Pipistrellus pygmaeus* (suitability score of 43).

[3]Lundy, M.G., Aughney, T., Montgomery, W.I., & Roche, N. (2011) *Landscape conservation for Irish bats and specific roosting characteristics*. Bat Conservation Ireland. Accessed May 25th, 2023.

4.2 Building assessment

The stone building is in a derelict condition and offers few suitable features to support roosting bats (Figures 5, 6 & 7). No evidence of bat presence was noted, and the structure is considered to open, draughty and exposed to the elements to be suitable for significant bat usage. Some of the drier sections of the stone walls have crevices and gaps that could potentially be used by bats. The internal timber roof frame could provide perching opportunities for species such as brown long-eared bat *Plecotus auritus*. It is recommended that this structure is demolished under the supervision of an ecologist as a precautionary measure.

Figure 5. Rear view of the structure.

Figure 6. View of the front of the structure.

Figure 7. Internal roof timbers

4.3 Tree assessments

No trees were classified as Category 1 or 2, with some trees in the vicinity of the derelict structure and within treelines classified as Category 3 (low bat roost potential). An example is a sycamore tree located at ITM 649515 817783 (Figure 8). It is recommended that when these trees are to be felled, an ecologist is engaged to supervise these works. Selecting which trees require supervision during felling is at the discretion of the ecologist who will use their professional knowledge of bat roost features and potential in their decision making.

Figure 8. Sycamore tree with low roost potential at ITM 649515 817783

4.4 Site walkovers – dusk bat surveys

A total of four bat species were detected across both dusk surveys: Common pipistrelle, soprano pipistrelle, Leisler's bat and Nathusius' pipistrelle (*Pipistrellus nathusii*). The level of bat activity was notably higher during the dusk survey on the 8th of June when air temperatures were higher. Overall, bat activity on the site is not considered high with most activity concentrated in the area of trees around the derelict building and along the treelines and hedgerows close to the boundary with the existing quarry. An emergence survey of the derelict building recorded no bat emergence. Bat activity was low in the fields along the southern boundary of the study site, likely due to the more exposed nature of the landscape. Tables 3 & 4 provide details of detected bats during both surveys.

Table 3. Bats detected on the 28th of May 2023

Date	Grid reference (ITM)	Time	Species	Behaviour
28.05.2023	649299 817839	22.06	Soprano pipistrelle	Faint call detected
	649515 817783	22.30 – 22.35	Soprano pipistrelle	4 passes by sycamore tree
	649545 817839	22.37	Common pipistrelle	2 passes along hedgerow
	649553 817742	22.45	Soprano pipistrelle	2 passes along hedgerow
	649632 817938	23.17	Soprano pipistrelle	Faint call detected
	649732 817862	23.32	Leisler's bat	Faint call detected along roadway

Table 4. Bats detected on the 8th of June 2023

Date	Grid reference (ITM)	Time	Species	Behaviour
08.06.2023	649254 817834	22.03	Soprano pipistrelle	Two Individuals observed feeding at the trees by the derelict building. They remained at this location for at least five minutes.
	649297 817905	22.11	Soprano pipistrelle	1 pass detected along treeline
	649324 817832	22.20	Leisler's bat	Individual observed and detected flying high over the grass field. Feeding.
	649301 817774	22.26	Soprano pipistrelle	Individual observed and detected passing along treeline.
	649438 817743	22.31	Soprano pipistrelle	Faint pass detected.
	649435 817931	22.44	Leisler's bat	1 pass detected.
	64932 817894	22.53	Nathusius' pipistrelle	2 passes detected.
	649560 817841	22.59	Common pipistrelle	3 passes detected.
	649621 817852	23.08	Soprano pipistrelle	1 pass detected.
	649739 817784	23.16	Leisler's bat	Faint call detected
	649602 817903	23.24	Soprano pipistrelle	2 passes detected.
	649602	23.25	Leisler's bat	1 pass detected just after the passing of the soprano pipistrelle
	649694 817841	23.37	Leisler's bat	Strong call detected over the centre of recently cut grass field.

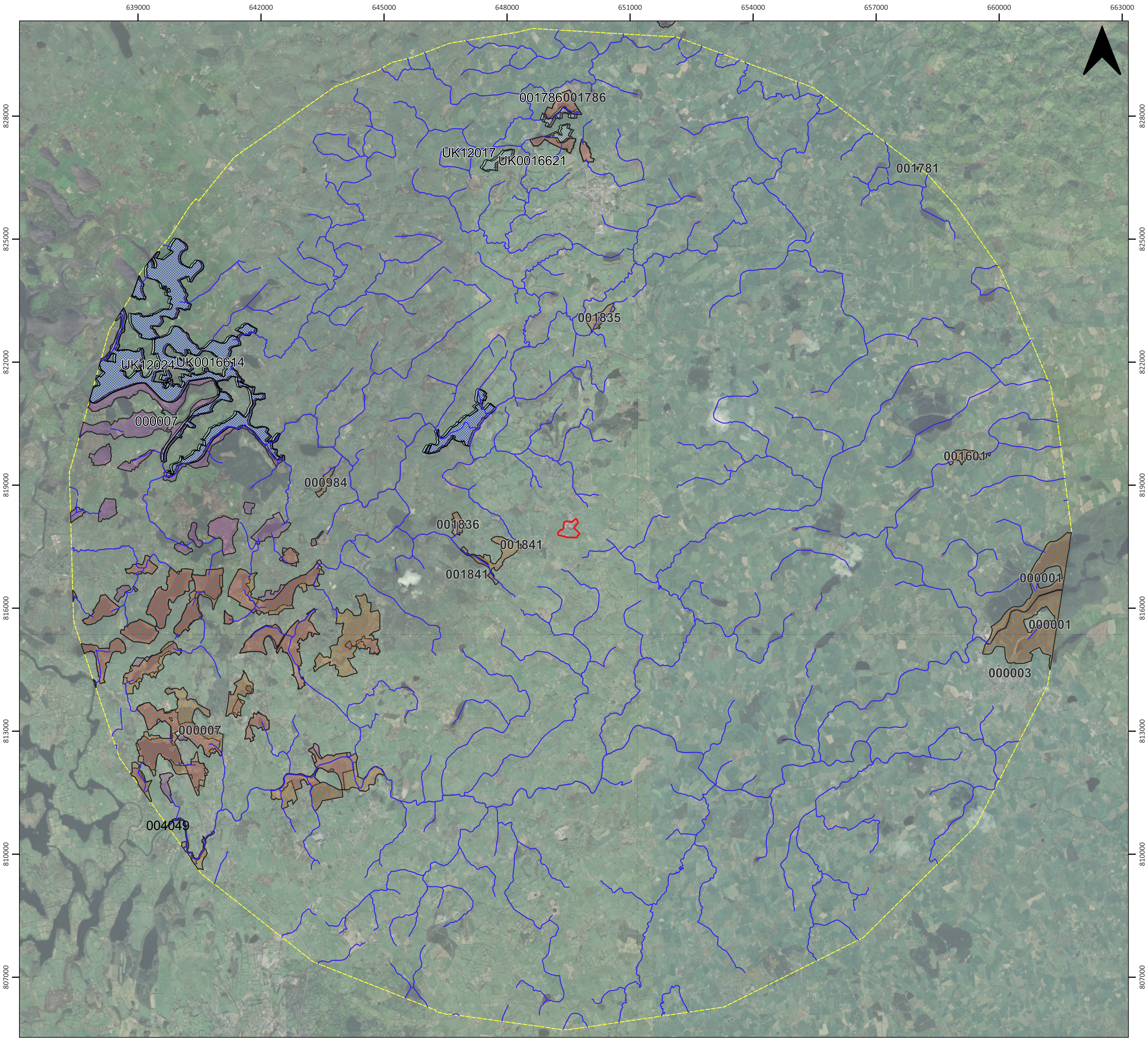
5. Conclusion

The site was assessed for bats at an appropriate time of year. Four species were recorded, three of which are widespread and commonly occurring species (Leisler bat, common pipistrelle and soprano pipistrelle). The detection of a Nathusius' pipistrelle is of note, although not unusual, considering that records for this species are more abundant in the north and northeast of Ireland (although this may be due to more focussed surveying efforts in these areas).

Overall, the study site is considered of low conservation value for bats. The loss of the green fields and internal field boundaries will result in the permanent loss of feeding area for bats. Considering the small scale of this land loss, the abundance of similar habitat in surrounding areas and the low number of bat activity on the site, this proposed quarry extension is predicted to have only a short-term small impact on the local bat population.

The derelict structure was not confirmed as hosting a roost and is classified as having only a low potential to do so. The majority of the trees within the site are classified as having negligible bat roost potential. Mitigation measures to protect bats include the supervision of the demolition of the building and felling of trees deemed to have a low bat roost potential. Boundary hedgerows and treelines should be retained and replanted as much as possible as these provide locally important commuting and feeding areas for bats and also benefit biodiversity in general.

APPENDIX 6-2



Scotshouse Quarry Extension

P0010190

Designated Sites

Legend

- Indicative Redline Boundary
- 12km Buffer
- SPA
- SAC
- Ramsar
- River Network
- pNHA

Notes

Basemap: © OpenStreetMap available under the Open Database License
Contains Ordnance Survey data © Crown copyright and database rights (2023). OS OpenData

Coordinate System: IRENET95 / Irish Transverse Mercator

0 3 6 km

0 1 2 NM

Scale:	Date:	Drawn by:	Checked by:	Approved by:
1:90146 @ A3	25/07/2023	MR	ET	ET

APEM Ltd
N.S.C. Campus
Mahon
Cork
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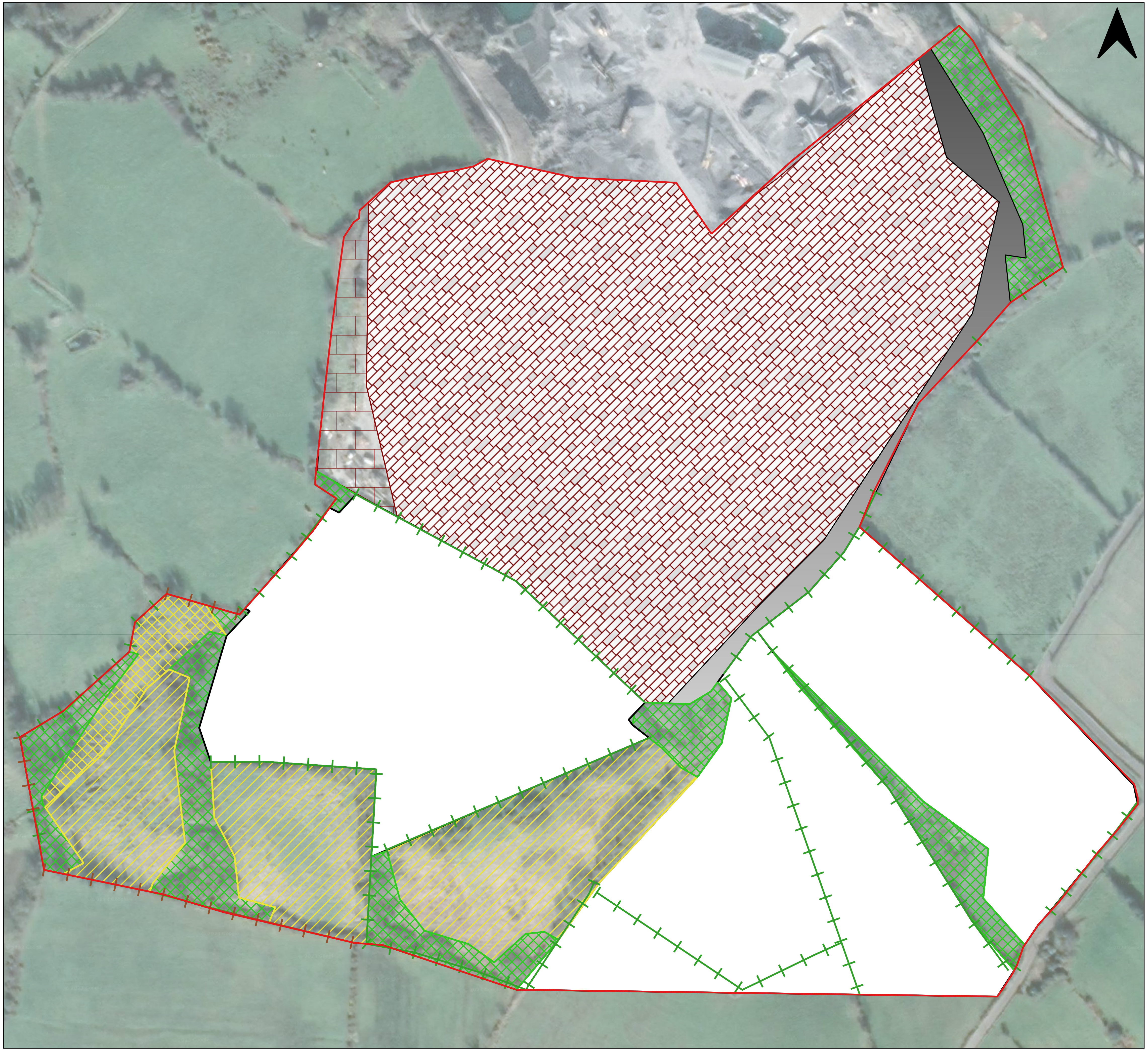
http://www.apemltd.com
+353 (0)21 230 7100

APEM

Figure 6.1

Figure Reference: P0010190



Scotshouse Quarry Extension

P0010190

Habitat Map

Legend

- Indicative Redline Boundary
- Hedgerow WL1
- Treeline WL2
- Hardstanding BL3
- Recolonising Bare Ground ED3
- Quarry ED4
- Agricultural Grassland GA1
- Dry meadown and grassy verge GS2
- Wet Grassland GS4
- Scrub WS1

Notes

Basemap: © OpenStreetMap available under the Open Database License
Contains Ordnance Survey data © Crown copyright and database rights (2023). OS OpenData

Coordinate System: IRENET95 / Irish Transverse Mercator

0 0.06 0.12 km

0 0.02 0.04 NM

Scale:	Date:	Drawn by:	Checked by:	Approved by:
1:1808 @ A3	06/07/2023	MR	ET	ET

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Figure 6-1

Figure Reference: P0010190

APPENDIX 7

APPENDIX 7-1

Petersen Drilling Services Ltd. on behalf of Scotshouse Quarries

Rotary Drilling Log

Keynetix

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details						Drilling Details				Standard Penetration Test											
		No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Hardcore Rock Fill MADE GROUND		RO		0.00	49.80		0000		100	grey											0.00	Dry
0.15	Medium strong laminated dark dark grey to blackish GREYWACKE frequent shale layers																						
13.00	Strong laminated dark grey GREYWACKE																						
18.00	Medium strong laminated dark grey GREYWACKE with frequent soft SHALE layers																						
39.50	Strong greenish grey GREYWACKE with occasional joints of Quartzsite																						

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0855			
Finish time (hhmm)	**Hole (m)**	**Water (m)**	**Casing (m)**
1700			

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
C	140.00	0.00	2.10					Sim. Casing			
RO	154.00	0.00	2.10				DTH Button Bit		115	Air	No
RO	120.00	2.10	49.80				DTH Button Bit			Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
0855		CAT Scanned: Yes
0855		Permit Completed: Yes
		DREM (21.00m - 21.50m): soft mudstone layer
		DREM (42.00m - 42.50m): minor fracture, change in flush to brown

SPT I.D. Number	PD1	**Calibration Date**	01/02/2021
SPT Rod Type	2 3/8 Regular	**SPT Energy Ratio**	0.00
Drilling Crew Details			**CSCS No**
Support Operative	John Whyte		
Lead Driller	Stephan Petersen		
Site category	Green		
Project Engineer	Nuria Manzanas		
Lead Driller's signature			

Project Title

Scotshouse Quarries

Weather	Variable	**Project No**	44/22
Date	08/11/2022	**Day**	Tuesday
Rig type	**Knebel HY79**	**Borehole Number**	
Inclination	**Orientation**	GW 1	
Sheet	1 of 1	**Completed**	Y

AGS

Produced by KeyLogbook

Petersen Drilling Services Ltd. on behalf of **Scotshouse Quarries** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Rock fill grey MADE GROUND		RO		0.00	45.50		0000		100	grey											0.00	0.00
0.50	Weak weathered laminated grey GREYWACKE																						
1.30	Medium strong laminated grey GREYWACKE with frequent soft mudstone layers																						
41.50	Very weak soft dark grey MUDSTONE																						

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
1000			
Finish time (hhmm)	**Hole (m)**	**Water (m)**	**Casing (m)**
1200			

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
C	140.00	0.00	2.00					Sim. Casing			
RO	154.00	0.00	2.00				DTH Button Bit		115	Air	No
RO	120.00	2.00	45.50				DTH Button Bit			Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
0800	1.50	1.50	Medium	0.00	0.00	0.00	0.00	N/S
0900	42.00	2.00	Medium	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
1000		CAT Scanned: Yes
1000		Permit Completed: Yes
		DREM (29.00m - 30.00m): soft mudstone layer
0845	0030	Dayworks: Airlift development of well
		General; Borehole collapse at 42m due to highly unstable formation

SPT I.D. Number	PD1	**Calibration Date**	01/02/2021
SPT Rod Type	2 3/8 Regular	**SPT Energy Ratio**	0.00
Drilling Crew Details			**CSCS No**
Support Operative	John Whyte		
Lead Driller	Stephan Petersen		
Site category	Green		
Project Engineer	Nuria Manzanas		
Lead Driller's signature			

Project Title

Scotshouse Quarries

Weather	Variable	**Project No**	44/22
Date	14/11/2022	**Day**	Monday
Rig type	Knebel HY79	**Borehole Number**	
Inclination	**Orientation**		GW 2
Sheet	1 of 1	**Completed**	Y

AGS

Produced by KeyLogbook

Petersen Drilling Services Ltd. on behalf of Scotshouse Quarries

Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Soft to firm brown TOPSOIL		RO		0.00	82.00		0000		100	grey											0.00	Dry
0.15	Firm brown gravelly CLAY																						
0.60	Strong to Very strong greenish grey GREYWACKE																						
15.00	Medium strong to Weak black laminated MUDSTONE GREYWACKE occasional soft layers																						
20.80	Strong to Very strong greenish grey GREYWACKE with occasional soft layers and quartzite veins																						

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
1115			
Finish time (hhmm)	**Hole (m)**	**Water (m)**	**Casing (m)**
1710	82.00	Dry	2.10

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
C	140.00	0.00	2.10					Sim. Casing			
RO	154.00	0.00	2.10				DTH Button Bit		115	Air	No
RO	120.00	2.10	82.00				DTH Button Bit			Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
1010	0.60	0.60	Seepage	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
1115		CAT Scanned: Yes
1115		Permit Completed: Yes
		DREM (32.20m - 33.10m): soft mudstone layer
		DREM (59.00m - 60.50m): soft mudstone layer

SPT I.D. Number	PD1	**Calibration Date**	01/02/2021
SPT Rod Type	2 3/8 Regular	**SPT Energy Ratio**	0.00
Drilling Crew Details			**CSCS No**
Support Operative	John Whyte		
Lead Driller	Stephan Petersen		
Site category	Green		
Project Engineer	Nuria Manzanas		
Lead Driller's signature			

Project Title

Scotshouse Quarries

Weather	Fine	**Project No**	44/22
Date	15/11/2022	**Day**	Tuesday
Rig type	Knebel HY79	**Borehole Number**	
Inclination	**Orientation**		GW 3
Sheet	1 of 2	**Completed**	Y

Petersen Drilling Services Ltd. on behalf of **Scotshouse Quarries** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0815	82.00	0.00	2.10
Finish time (hhmm)	**Hole (m)**	**Water (m)**	**Casing (m)**
1440			

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
1120	0030	Dayworks: Airlift development of well

SPT I.D. Number	PD1	**Calibration Date**	01/02/2021
SPT Rod Type	2 3/8 Regular	**SPT Energy Ratio**	0.00
Drilling Crew Details			**CSCS No**
Support Operative	John Whyte		
Lead Driller	Stephan Petersen		
Site category	Green		
Project Engineer	Nuria Manzanas		
Lead Driller's signature			

Project Title

Scotshouse Quarries

Weather	Fine	**Project No**	44/22
Date	16/11/2022	**Day**	Wednesday
Rig type	Knebel HY79	**Borehole Number**	
Inclination		**Orientation**	GW 3
Sheet	2 of 2	**Completed**	Y

AGS

Produced by KeyLogbook

Petersen Drilling Services Ltd. on behalf of **Scotshouse Quarries** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/flush level (m)
0.00	Soft to firm brown clayey TOPSOIL		RO		0.00	10.00		0000		100	grey											0.00	0.00
0.15	Firm brown silty gravelly CLAY occasional cobble [BOULDER CLAY]																						
1.90	Extremely weak laminated greenish grey highly weathered shaley clayey GREYWACKE																						

Sample / Hole / Test Details; Drilling Details; Standard Penetration Test

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
1240			
Finish time (hhmm)	**Hole (m)**	**Water (m)**	**Casing (m)**
1750			

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
C	140.00	0.00	10.00					Sim. Casing			
RO	154.00	0.00	10.00				DTH Button Bit		115	Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
1450	5.50	5.50	Very Slow	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
1240		CAT Scanned: Yes
1240		Permit Completed: Yes

SPT I.D. Number	PD1	**Calibration Date**	01/02/2021
SPT Rod Type	2 3/8 Regular	**SPT Energy Ratio**	0.00
Drilling Crew Details			**CSCS No**
Support Operative	John Whyte		
Lead Driller	Stephan Petersen		
Site category	Green		
Project Engineer	Nuria Manzanas		
Lead Driller's signature			

Project Title

Scotshouse Quarries

Weather	Variable	**Project No**	44/22
Date	10/11/2022	**Day**	Thursday
Rig type	**Knebel HY79**	**Borehole Number**	
Inclination		**Orientation**	GW 4
Sheet	1 of 1	**Completed**	Y

AGS

Produced by KeyLogbook

Petersen Drilling Services Ltd. on behalf of Scotshouse Quarries — Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Soft to firm brown clayey TOPSOIL		RO		0.00	79.00		0000		100	grey											0.00	0.00
0.15	Firm brown silty gravell CLAY occasional cobble [BOULDER CLAY]																						
1.90	Extremely weak laminated greenish grey highly weathered shaley clayey GREYWACKE																						
10.70	Medium strong laminated grey GREYWACKE occasional soft fractured layers																						
37.50	Weak laminated black SHALE MUDSTONE																						
42.00	Medium strong to Strong laminated dark to black GREYWACKE occasional soft layers																						

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
1035			
Finish time (hhmm)	**Hole (m)**	**Water (m)**	**Casing (m)**
1715	79.00	0.00	12.70

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
C	140.00	0.00	12.70					Sim. Casing			
RO	154.00	0.00	12.70				DTH Button Bit		115	Air	No
RO	120.00	12.70	79.00				DTH Button Bit			Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
1020	6.50	6.50	Medium	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
1035		CAT Scanned: Yes
1035		Permit Completed: Yes

SPT I.D. Number	PD1	Calibration Date	01/02/2021
SPT Rod Type	2 3/8 Regular	SPT Energy Ratio	0.00
Drilling Crew Details		CSCS No	
Support Operative	John Whyte		
Lead Driller	Stephan Petersen		
Site category	Green		
Project Engineer	Nuria Manzanas		
Lead Driller's signature			

Project Title

Scotshouse Quarries

Weather	Variable	Project No	44/22
Date	09/11/2022	Day	Wednesday
Rig type	Knebel HY79	Borehole Number	
Inclination	Orientation	GW 5	
Sheet	1 of 2	Completed	Y

AGS

Produced by KeyLogbook

Petersen Drilling Services Ltd. on behalf of **Scotshouse Quarries** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0810	79.00	0.00	12.70
Finish time (hhmm)	**Hole (m)**	**Water (m)**	**Casing (m)**
1355			

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks

SPT I.D. Number	PD1	**Calibration Date**	01/02/2021
SPT Rod Type	2 3/8 Regular	**SPT Energy Ratio**	0.00
Drilling Crew Details			**CSCS No**
Support Operative	John Whyte		
Lead Driller	Stephan Petersen		
Site category	Green		
Project Engineer	Nuria Manzanas		
Lead Driller's signature			

Project Title

Scotshouse Quarries

Weather	Variable	**Project No**	44/22
Date	10/11/2022	**Day**	Thursday
Rig type	**Knebel HY79**	**Borehole Number**	
Inclination		**Orientation**	GW 5
Sheet	2 of 2	**Completed**	Y

AGS

Produced by KeyLogbook

Petersen Drilling Services Ltd. on behalf of Scotshouse Quarries

Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Liner Dia (mm)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Rock Fill MADE GROUND		RO		0.00	51.00		0000		100	grey											0.00	0.00
0.60	Strong dark grey GREYWACKE with frequent laminated black SHALE layers																						

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
1240			
Finish time (hhmm)	**Hole (m)**	**Water (m)**	**Casing (m)**
1400			

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Casing Type	Bit serial No	Flush	Polymer
C	140.00	0.00	2.00					Sim. Casing			
RO	154.00	0.00	2.00				DTH Button Bit		115	Air	No
RO	120.00	2.00	51.00				DTH Button Bit			Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
0855	0.60	0.60	Fast	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
1240		CAT Scanned: Yes
1240		Permit Completed: Yes
1030	0200	Dayworks: Airlift development of all remaining wells
		DREM (41.50m - 44.00m): soft mudstone layer

SPT I.D. Number	PD1	**Calibration Date**	01/02/2021
SPT Rod Type	2 3/8 Regular	**SPT Energy Ratio**	0.00
Drilling Crew Details			**CSCS No**
Support Operative	John Whyte		
Lead Driller	Stephan Petersen		
Site category	Green		
Project Engineer	Nuria Manzanas		
Lead Driller's signature			

Project Title

Scotshouse Quarries

Weather	Variable	**Project No**	44/22
Date	16/11/2022	**Day**	Wednesday
Rig type	Knebel HY79	**Borehole Number**	
Inclination	**Orientation**	GW 6	
Sheet	1 of 1	**Completed**	Y

AGS

Produced by KeyLogbook

BOREHOLE LOG

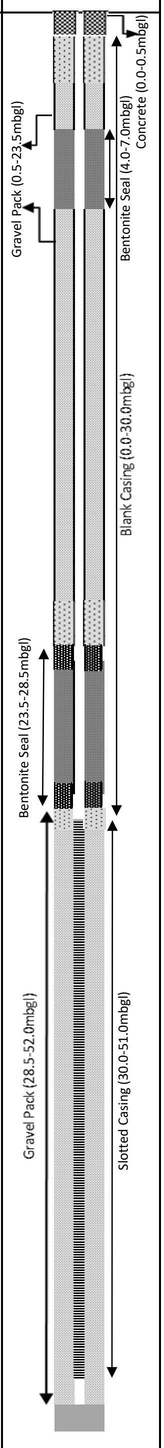
MALONE O'REGAN ENVIRONMENTAL
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

Project Number: E2037 - Scotshouse Quarries	**Client:** Paddy Connolly
Project Title: Proposed Extension to Scotshouse Quarry	**Site Location:** Scotshouse, Co. Monaghan.

BOREHOLE NO: GWB

SUBSURFACE CONDITIONS | **SAMPLE** | **INSTALLATION DETAILS**

Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	Depth (mbgl)	PID (ppm)
0		Soft to firm brown silty gravelly CLAY				
1		Weak to Medium strong greenish grey weathered GREYWACKE				
2						
3						
4						
5						
6		Medium strong to strong grey GREYWACKE with ocassional soft layers				
7						
8						
9						
10						
11						
12		Weak dark clay shaley GREYWACKE frequent very soft mudstone layers				
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35		Medium strong to strong grey GREYWACKE with ocassional soft layers				
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						
51			At 52mbgl - EOH			
52						
53						
54						



Drill Date: 23/01/2023 & 24/01/2023
Drill Method: Rotary Drilling
Drilled By: Petersen Dilling Services Ltd.

Reference Datum: Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: **Level:**

Logged By: EG
Checked By: NM

Revision: Final **Page:** 1 of 1

DISCLAIMER: This log is for environmental purposes only.

BOREHOLE LOG

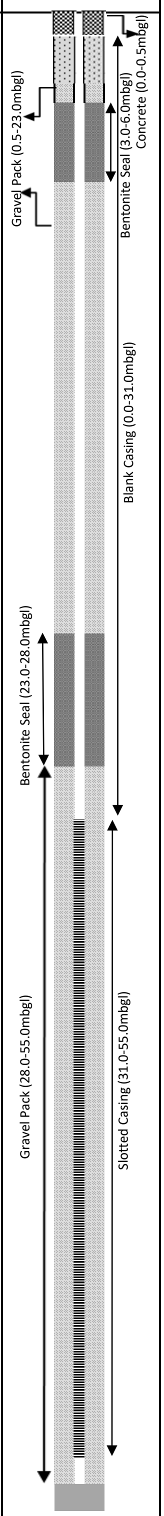
MALONE O'REGAN ENVIRONMENTAL
Ground Floor - Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y

Project Number: E2037 - Scotshouse Quarries
Client: Paddy Connolly
Project Title: Proposed Extension to Scotshouse Quarry
Site Location: Scotshouse, Co. Monaghan.
BOREHOLE NO: GWD

SUBSURFACE CONDITIONS

Depth (mbgl)	SYMBOL	DESCRIPTION	COMMENTS	WATER (mbgl)	SAMPLE Depth (mbgl)	SAMPLE PID (ppm)
0		Brown TOPSOIL Firm orangish brown gravelly CLAY				
1		Weak greenish grey weathered GREYWACKE with frequent soft layers				
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15		Medium strong greenish grey GREYWACKE with frequent soft layers				
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35		Strong to very strong greenish grey GREYWACKE				
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						
51						
52						
53						
54			At 55mbgl - EOH			
55						
56						

INSTALLATION DETAILS



Drill Date: 24/01/2023 & 25/01/2023
Drill Method: Rotary Drilling
Drilled By: Petersen Dilling Services Ltd.

Reference Datum: Elevation: 0
Easting: 0
Northing: 0

Water Strike:
Strike: **Level:**

Logged By: EG
Checked By: NM

Revision: Final **Page:** 1 of 1

DISCLAIMER: This log is for environmental purposes only.

APPENDIX 8

APPENDIX 8-1

		Sample Identity	Groundwater Standards		GW2	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
Field Measured Parameters						
pH	pH Units		-	≥6.5 and ≤9.5	7.27	7.5
Temperature	°C		-	25	9.37	7.24
Dissolved Oxygen	mg/l				11.11	7.43
Dissolved Oxygen	%		-	NAC	96.97	56.56
Electrical Conductivity (EC)	µS/cm		800[1] - 1875[3]	1000	981.41	459.06
Oxidation/Reduction Potential (ORP)	mV				48.2	80
Colour	~		-	NAC	Grey	Cloudy
Sheen	~				No	No
Observations	~				s.s	No s.s
Odour	~				No	No
Taste	~				-	-
Turbidity	~				-	-
Indicators, Inorganics and Nutrients						
Chloride	mg/l		24[1] - 187.5[3]	30	27.7	11.2
Nitrate as NO3	mg/l		37.5[3,4]	25	<0.2	<0.2
Nitrite as NO2	mg/l		0.375[4]	0.1	<0.02	<0.02
Total Ammonium (mg N/l)	mg N/l		0.065[2] - 0.175[4]	0.15	0.06	0.03
Total Cyanide	mg/l		0.0375	0.01	<0.01	<0.01
Sulphate	mg/l		187.5[4]	200	**219.2**	37.4
Orthophosphate	mg/l		-	0.03	<0.06	<0.06
Total Organic Carbon (TOC)	mg/l		-	NAC	<2	<2
Total Organic Nitrogen (TON)	mg/l		-	NAC	1.9	0.8
Alkalinity	mg/l		-	NAC	179	806
Bicarbonate	mg/l		-	NAC	<1	<1
Carbonate	mg/l		-	NAC	179	806
Hardness (as $CaCO_3$)	mg/l		-	200	**279**	196
Total Dissolved Solids (TDS)	mg/l		-	1000	541	280
Fluoride	mg/l		-	1	<0.3	<0.3
Silica			-	NAC	9.9	14.1
Metals						
Dissolved Aluminium	µg/l		150[4]	-	<20	<20
Dissolved Arsenic	µg/l		7.5[4]	-	<2.5	<2.5
Dissolved Barium	µg/l		-	-	32	41
Dissolved Boron	µg/l		750	-	53	34
Dissolved Cadmium	µg/l		3.75	-	<0.5	<0.5
Dissolved Calcium	mg/l		-	-	78.4	49
Total Dissolved Chromium	µg/l		37.5[4]	-	<1.5	<1.5
Dissolved Copper	µg/l		1500	-	<7	<7
Total Iron	µg/l		-	200	<20	<20
Dissolved Lead	µg/l		7.5[4]	-	<5	<5
Dissolved Magnesium	mg/l		-	-	19.7	17.4
Dissolved Manganese	µg/l				52	10
Dissolved Mercury	µg/l		0.75[4]	-	<1	<1
Dissolved Nickel	µg/l		15	-	3	3
Dissolved Potassium	mg/l				6.2	2.5
Dissolved Selenium	µg/l		-	-	<3	<3
Dissolved Sodium	mg/l		150	-	58.9	21.5
Dissolved Zinc	µg/l		75[4]	-	9	<3
Total Uranium	µg/l		-	9	<5	
MTBE	ug/l	<5	10[4]	30	<0.1	<0.1
Benzene	ug/l	<5	0.75[4]	1	<0.5	<0.5
Toluene	ug/l	<5	525[4]	10	<5	<5
Ethylbenzene	ug/l	<5	-	10	<1	<1
m/p-Xylene	ug/l	<5	-	10	<2	<2
o-Xylene	ug/l	<5	-	10	<1	<1
Total Xylenes	ug/l			10	<3	<3

		Sample Identity	Groundwater Standards		GW2	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
Total Petroleum Hydrocarbons (TPH-CWG)						
Aliphatics						
>C5-C6	µg/l	<10	-	-	<10	<10
>C6-C8	µg/l	<10	-	-	<10	<10
>C8-C10	µg/l	<10	-	-	<10	<10
>C10-C12	µg/l	<5	-	-	<5	<5
>C12-C16	µg/l	<10	-	-	<10	<10
>C16-C21	µg/l	<10	-	-	<10	<10
>C21-C35	µg/l	<10	-	-	<10	<10
>C35-C44	µg/l	<10	-	-	<10	<10
Total aliphatics C5-44	µg/l	<10	-	-	<10	<10
Aromatics						
>C5-EC7	µg/l	<10	-	-	<10	<10
>EC7-EC8	µg/l	<10	-	-	<10	<10
>EC8-EC10	µg/l	<10	-	-	<10	<10
>EC10-EC12	µg/l	<5	-	-	<5	<5
>EC12-EC16	µg/l	<10	-	-	<10	<10
>EC16-EC21	µg/l	<10	-	-	<10	<10
>EC21-EC35	µg/l	<10	-	-	<10	<10
>EC35-EC44	µg/l	<10	-	-	<10	<10
Total aromatics C5-44	µg/l	<10	-	-	<10	<10
Total aliphatics and aromatics(C5-44)	µg/l	<10	7.5[4,23]	10	<10	<10
Semi-Volatile Organic Compounds (SVOC's)						
Phenols						
2-Chlorophenol	ug/l	-	-	200	<1	<1
2-Methylphenol	ug/l	-	-	0.5	<0.5	<0.5
2-Nitrophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l	-	-	0.5	<1	<1
2,4,5-Trichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	-	-	200	<1	<1
4-Chloro-3-methylphenol	ug/l	-	-	0.5	<0.5	<0.5
4-Methylphenol	ug/l	-	-	0.5	<1	<1
4-Nitrophenol	ug/l	-	-	0.5	<10	<10
Pentachlorophenol	ug/l	-	-	2	<1	<1
Phenol	ug/l	-			<1	<1

		Sample Identity	Groundwater Standards		GW2	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
PAHs	ug/l					
2-Chloronaphthalene	ug/l				<1	<1
2-Methylnaphthalene	ug/l				<1	<1
Naphthalene	ug/l		-	1	<1	<1
Acenaphthylene	ug/l		-	0.1	<0.5	<0.5
Acenaphthene	ug/l		-	0.1	<1	<1
Fluorene	ug/l		-	0.1	<0.5	<0.5
Phenanthrene	ug/l		-	0.1	<0.5	<0.5
Anthracene	ug/l		-	10000	<0.5	<0.5
Fluoranthene	ug/l		-	1	<0.5	<0.5
Pyrene	ug/l		-	0.1	<0.5	<0.5
Benzo(a)anthracene	ug/l		-	0.1	<0.5	<0.5
Chrysene	ug/l		-	0.1	<0.5	<0.5
Benzo(bk)fluoranthene	ug/l		-	0.5 / 0.05	<1	<1
Benzo(a)pyrene	ug/l		0.0075[4]	0.01	<1	<1
Indeno(123cd)pyrene	ug/l		-	0.05	<1	<1
Dibenzo(ah)anthracene	ug/l		-	0.1	<0.5	<0.5
Benzo(ghi)perylene	ug/l		-	0.05	<0.5	<0.5
Phthalates						
Bis/Di (2-ethylhexyl) phthalate	ug/l		6	8	<5	<5
Butylbenzyl phthalate	ug/l		-	-	<1	<1
Di-n-butyl phthalate	ug/l		-	2	<1.5	<1.5
Di-n-Octyl phthalate	ug/l		-	5	<1	<1
Diethyl phthalate	ug/l		-	5	<1	<1
Dimethyl phthalate	ug/l		-	5	<1	<1
Additional SVOCs						
SVOC TICs (trace organics)	µg/l		-	-		
1,2-Dichlorobenzene	µg/l		-	10	<1	<1
1,2,4-Trichlorobenzene	µg/l		-	0.4	<1	<1
1,3-Dichlorobenzene	µg/l		-	-	<1	<1
1,4-Dichlorobenzene	µg/l		-	-	<1	<1
2-Nitroaniline	µg/l		-	-	<1	<1
2,4-Dinitrotoluene	µg/l		-	-	<0.5	<0.5
2,6-Dinitrotoluene	µg/l		-	-	<1	<1
3-Nitroaniline	µg/l		-	-	<1	<1
4-Bromodiphenylether (4-Bromophenylpl	µg/l		-	-	<1	<1
4-Chloroaniline	µg/l		-	-	<1	<1
4-Chlorodiphenylether (4-Chlorophenylpl	µg/l		-	-	<1	<1
4-Nitroaniline	µg/l		-	-	<0.5	<0.5
Azobenzene	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethoxy)methane	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethyl)ether	µg/l		-	-	<1	<1
Carbazole	µg/l		-	-	<0.5	<0.5
Dibenzofuran	µg/l		-	-	<0.5	<0.5
Hexachlorobenzene	µg/l		-	0.03	<1	<1
Hexachlorobutadiene	µg/l		-	0.1	<1	<1
Hexachlorocyclopentadiene	µg/l		-	-	<1	<1
Hexachloroethane	µg/l		-	-	<1	<1
Isophorone	µg/l		-	-	<0.5	<0.5
N-nitrosodi-n-propylamine	µg/l		-	-	<0.5	<0.5
Nitrobenzene	µg/l		-	10	<1	<1

Sample Identity			Groundwater Standards		GW2	
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
Sample Date					05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
VOCs						
Dichlorodifluoromethane	µg/l		-	-	<2	<2
Methyl Tertiary Butyl Ether	µg/l		-	-	<0.1	<0.1
Chloromethane	µg/l		-	-	<3	<3
Vinyl Chloride	µg/l		0.375[4]	-	<0.1	<0.1
Bromomethane	µg/l		-	-	<1	<1
Chloroethane	µg/l		-	-	<3	<3
Trichlorofluoromethane	µg/l		-	-	<3	<3
1,1-Dichloroethene	µg/l		-	-	<3	<3
Dichloromethane	µg/l		15[4]	0.04	<3	<3
trans-1-2-Dichloroethene	µg/l		-	-	<3	<3
1,1-Dichloroethane	µg/l		-	-	<3	<3
cis-1-2-Dichloroethene	µg/l		-	-	<3	<3
2,2-Dichloropropane	µg/l		-	-	<1	<1
Bromochloromethane	µg/l		-	-	<2	<2
Chloroform	µg/l		-	12	<2	<2
1,1,1-Trichloroethane	µg/l		-	500	<2	<2
1,1-Dichloropropene	µg/l		-	-	<3	<3
Carbon-tetrachloride/Tetrachloromethan	µg/l		-	2	<2	<2
1,2-Dichloroethane	µg/l		2.25[4]	3	<2	<2
Benzene	µg/l		0.75[4]	-	<0.5	<0.5
Trichloroethene	µg/l		7.5[4]	10	<3	<3
1,2-Dichloropropane	µg/l		-	-	<2	<2
Dibromomethane	µg/l		-	-	<3	<3
Bromodichloromethane	µg/l		-	-	<2	<2
cis-1-3-Dichloropropene	µg/l		-	-	<2	<2
Toluene	µg/l		525[4]	10	<5	<5
trans-1-3-Dichloropropene	µg/l		-	-	<2	<2
1,1,2-Trichloroethane	µg/l		-	-	<2	<2
Tetrachloroethene	µg/l		7.5[4]	10	<3	<3
1,3-Dichloropropane	µg/l		-	-	<2	<2
Dibromochloromethane	µg/l		-	-	<2	<2
1,2-Dibromoethane	µg/l		-	-	<2	<2
Chlorobenzene	µg/l		-	1	<2	<2
1,1,1,2-Tetrachloroethane	µg/l		-	-	<2	<2
Ethylbenzene	µg/l		-	10	<1	<1
p/m-Xylene	µg/l		-	10	<2	<2
o-Xylene	µg/l		-	10	<1	<1
Styrene	µg/l		-	-	<2	<2
Bromoform	µg/l		-	-	<2	<2
Isopropylbenzene	µg/l		-	-	<3	<3
1,1,2,2-Tetrachloroethane	µg/l		-	-	<4	<4
Bromobenzene	µg/l		-	-	<2	<2
1,2,3-Trichloropropane	µg/l		-	-	<3	<3
Propylbenzene	µg/l		-	-	<3	<3
2-Chlorotoluene	µg/l		-	-	<3	<3
1,3,5-Trimethylbenzene	µg/l		-	-	<3	<3
4-Chlorotoluene	µg/l		-	-	<3	<3
tert-Butylbenzene	µg/l		-	-	<3	<3
1,2,4-Trimethylbenzene	µg/l		-	-	<3	<3
sec-Butylbenzene	µg/l		-	-	<3	<3
4-Isopropyltoluene	µg/l		-	-	<3	<3
1,3-Dichlorobenzene	µg/l		-	-	<3	<3
1,4-Dichlorobenzene	µg/l		-	-	<3	<3
n-Butylbenzene	µg/l		-	-	<3	<3
1,2-Dichlorobenzene	µg/l		-	10	<3	<3
1,2-Dibromo-3-chloropropane	µg/l		-	-	<2	<2
1,2,4-Trichlorobenzene	µg/l		-	0.4	<3	<3
Hexachlorobutadiene	µg/l		-	0.1	<3	<3
Naphthalene	ug/l		-	1	<2	<2
1,2,3-Trichlorobenzene	µg/l		-	0.4	<3	<3

		Sample Identity	Groundwater Standards		GW2	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
PCBS						
Total PCBs	µg/l			0.01	<0.2	
Pesticides						
Organochlorine Pesticides						
Aldrin	µg/l		-	0.01	<0.01	
Alpha-HCH	µg/l		-	0.1	<0.01	
Beta-HCH	µg/l		-	0.1	<0.01	
Chlorothalonil	µg/l		-	0.1	<2.50	
cis-Chlordane	µg/l		-	0.1	<0.01	
Delta-HCH	µg/l		-	0.1	<0.01	
Dieldrin	µg/l		-	0.01	<0.01	
Endosulphan I (alpha endosulphan)	µg/l		-	0.1	<0.01	
Endosulphan II (beta endosulphan)	µg/l		-	0.1	<0.01	
Endosulphan sulphate	µg/l		-	0.1	<0.01	
Endrin	µg/l			0.1	<0.01	
Gamma-HCH/Lindane	µg/l		-	0.1	<0.01	
Heptachlor	µg/l		-	0.1	<0.01	
Heptachlor Epoxide	µg/l		-	0.1	<0.01	
Hexachlorobenzene/Benzene Hexachlor	µg/l		-	0.03	<0.01	
Isodrin	µg/l		-	0.1	<0.01	
o,p'-DDE (2,4'-DDE)	µg/l		-	0.1	<0.01	
o,p'-DDT (2,4'-DDT)	µg/l		-	0.1	<0.01	
o,p'-Methoxychlor	µg/l		-	0.1	<0.01	
o,p'-TDE (Mitotane, Lysodren, Clodithan	µg/l		-	0.1	<0.01	
p,p'-DDE (4,4'-DDE)	µg/l		-	0.1	<0.01	
p,p'-DDT (Clofenotane, 4,4'-DDT)	µg/l		-	0.1	<0.01	
p,p'-Methoxychlor	µg/l		-	0.1	<0.01	
p,p'-TDE (Rhothane, Dilene, 4,4'-DDD)	µg/l		-	0.1	<0.01	
Pendimethalin	µg/l		-	0.1	<0.01	
Permethrin I (cis-Permethrin)	µg/l		-	Limit for total below	<0.01	
Permethrin II (trans-Permethrin)	µg/l		-		<0.01	
Quintozene (PCNB)	µg/l		-	0.1	<0.01	
Tecnazene	µg/l		-	0.1	<0.01	
Telodrin (Isobezan)	µg/l		-	0.1	<0.01	
trans-Chlordane	µg/l		-	0.1	<0.01	
Triadimefon	µg/l		-	0.1	<0.01	
Triallate	µg/l		-	0.1	<0.01	
Trifluralin	µg/l		-	0.1	<0.01	
Organophosphorus Pesticides						
Azinphos ethyl	µg/l		-	0.1	<0.01	
Azinphos methyl	µg/l		-	0.1	<0.01	
Carbophenothion	µg/l		-	0.1	<0.01	
Chlorfenvinphos	µg/l		-	5	<0.01	
Chlorpyrifos	µg/l		-	90	<0.01	
Chlorpyrifos-methyl	µg/l		-	0.1	<0.01	
Diazinon	µg/l		-	0.1	<0.01	
Dichlorvos	µg/l		-	0.001	<0.01	
Disulfoton	µg/l		-	0.1	<0.01	
Dimethoate	µg/l		-	0.1	<0.01	
Ethion (Diethion)	µg/l		-	0.1	<0.01	
Ethyl Parathion (Parathion)	µg/l		-	0.1	<0.01	
Etrimphos	µg/l		-	0.1	<0.01	
Fenitrothion	µg/l		-	0.1	<0.01	
Fenthion	µg/l		-	0.1	<0.01	
Malathion	µg/l		-	0.01	<0.01	
Methyl Parathion	µg/l		-	0.1	<0.01	
Mevinphos	µg/l		-	0.1	<0.01	
Phosalone (Benzophosphate)	µg/l		-	0.1	<0.01	
Pirimiphos Methyl	µg/l		-	0.1	<0.01	
Propetamphos	µg/l		-	0.1	<0.01	
Triazophos (Hostathion, Methoxone)	µg/l		-	0.1	<0.01	

Parameters	Unit	MDL	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	GW3
Sample Identity			**Groundwater Standards**		**GW3**
Laboratory Report No.					**23/512**
Sample Date					**11/01/2023**
Field Measured Parameters					
pH	pH Units		-	≥6.5 and ≤9.5	6.82
Temperature	°C		-	25	8.42
Dissolved Oxygen	mg/l				4.94
Dissolved Oxygen	%		-	NAC	41.14
Electrical Conductivity (EC)	μS/cm		800[1] - 1875[3]	1000	575.11
Oxidation/Reduction Potential (ORP)	mV				82.7
Colour	~		-	NAC	Grey-Cloudy
Sheen	~				No
Observations	~				No s.s
Odour	~				No
Taste	~				
Turbidity	~				
Indicators, Inorganics and Nutrients					
Chloride	mg/l		24[1] - 187.5[3]	30	22.4
Nitrate as NO3	mg/l		37.5[3,4]	25	<0.2
Nitrite as NO2	mg/l		0.375[4]	0.1	<0.02
Total Ammonium (mg N/l)	mg N/l		0.065[2] - 0.175[4]	0.15	0.05
Total Cyanide	mg/l		0.0375	0.01	<0.01
Sulphate	mg/l		187.5[4]	200	74.1
Orthophosphate	mg/l		-	0.03	<0.06
Total Organic Carbon (TOC)	mg/l		-	NAC	<4
Total Organic Nitrogen (TON)	mg/l		-	NAC	1.1
Alkalinity	mg/l		-	NAC	241
Bicarbonate	mg/l		-	NAC	<1
Carbonate	mg/l		-	NAC	241
Hardness (as $CaCO_3$)	mg/l		-	200	199
Total Dissolved Solids (TDS)	mg/l		-	1000	372
Fluoride	mg/l		-	1	<0.3
Silica			-	NAC	6.9
Metals					
Dissolved Aluminium	μg/l		150[4]	-	<20
Dissolved Arsenic	μg/l		7.5[4]	-	<2.5
Dissolved Barium	μg/l		-	-	101
Dissolved Boron	μg/l		750	-	84
Dissolved Cadmium	μg/l		3.75	-	<0.5
Dissolved Calcium	mg/l		-	-	47.3
Total Dissolved Chromium	μg/l		37.5[4]	-	<1.5
Dissolved Copper	μg/l		1500	-	<7
Total Iron	μg/l		-	200	<20
Dissolved Lead	μg/l		7.5[4]	-	<5
Dissolved Magnesium	mg/l		-	-	19.3
Dissolved Manganese	μg/l				5
Dissolved Mercury	μg/l		0.75[4]	-	<1
Dissolved Nickel	μg/l		15	-	2
Dissolved Potassium	mg/l				4.8
Dissolved Selenium	μg/l		-	-	<3
Dissolved Sodium	mg/l		150	-	54.3
Dissolved Zinc	μg/l		75[4]	-	4
Total Uranium	μg/l		-	9	
MTBE	ug/l	<5	10[4]	30	<0.1
Benzene	ug/l	<5	0.75[4]	1	<0.5
Toluene	ug/l	<5	525[4]	10	<5
Ethylbenzene	ug/l	<5	-	10	<1
m/p-Xylene	ug/l	<5	-	10	<2
o-Xylene	ug/l	<5	-	10	<1
Total Xylenes	ug/l			10	<3

		Sample Identity	Groundwater Standards		GW3
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/512
		Sample Date			11/01/2023
Parameters	**Unit**	**MDL**			
Total Petroleum Hydrocarbons (TPH-CWG)					
Aliphatics					
>C5-C6	µg/l	<10	-	-	<10
>C6-C8	µg/l	<10	-	-	<10
>C8-C10	µg/l	<10	-	-	<10
>C10-C12	µg/l	<5	-	-	<5
>C12-C16	µg/l	<10	-	-	<10
>C16-C21	µg/l	<10	-	-	<10
>C21-C35	µg/l	<10	-	-	<10
>C35-C44	µg/l	<10	-	-	<10
Total aliphatics C5-44	µg/l	<10	-	-	<10
Aromatics					
>C5-EC7	µg/l	<10	-	-	<10
>EC7-EC8	µg/l	<10	-	-	<10
>EC8-EC10	µg/l	<10	-	-	<10
>EC10-EC12	µg/l	<5	-	-	<5
>EC12-EC16	µg/l	<10	-	-	<10
>EC16-EC21	µg/l	<10	-	-	<10
>EC21-EC35	µg/l	<10	-	-	<10
>EC35-EC44	µg/l	<10	-	-	<10
Total aromatics C5-44	µg/l	<10	-	-	<10
Total aliphatics and aromatics(C5-44)	µg/l	<10	7.5[4,23]	10	<10
Semi-Volatile Organic Compounds (SVOC's)					
Phenols					
2-Chlorophenol	ug/l	-	-	200	<1
2-Methylphenol	ug/l	-	-	0.5	<0.5
2-Nitrophenol	ug/l	-	-	0.5	<0.5
2,4-Dichlorophenol	ug/l	-	-	0.5	<0.5
2,4-Dimethylphenol	ug/l	-	-	0.5	<1
2,4,5-Trichlorophenol	ug/l	-	-	0.5	<0.5
2,4,6-Trichlorophenol	ug/l	-	-	200	<1
4-Chloro-3-methylphenol	ug/l	-	-	0.5	<0.5
4-Methylphenol	ug/l	-	-	0.5	<1
4-Nitrophenol	ug/l	-	-	0.5	<10
Pentachlorophenol	ug/l	-	-	2	<1
Phenol	ug/l	-			<1

			Sample Identity	Groundwater Standards		GW3
			Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/512
			Sample Date			11/01/2023
Parameters	**Unit**	**MDL**				
PAHs	ug/l					
2-Chloronaphthalene	ug/l					<1
2-Methylnaphthalene	ug/l					<1
Naphthalene	ug/l			-	1	<1
Acenaphthylene	ug/l			-	0.1	<0.5
Acenaphthene	ug/l			-	0.1	<1
Fluorene	ug/l			-	0.1	<0.5
Phenanthrene	ug/l			-	0.1	<0.5
Anthracene	ug/l			-	10000	<0.5
Fluoranthene	ug/l			-	1	<0.5
Pyrene	ug/l			-	0.1	<0.5
Benzo(a)anthracene	ug/l			-	0.1	<0.5
Chrysene	ug/l			-	0.1	<0.5
Benzo(bk)fluoranthene	ug/l			-	0.5 / 0.05	<1
Benzo(a)pyrene	ug/l			0.0075[4]	0.01	<1
Indeno(123cd)pyrene	ug/l			-	0.05	<1
Dibenzo(ah)anthracene	ug/l			-	0.1	<0.5
Benzo(ghi)perylene	ug/l			-	0.05	<0.5
Phthalates						
Bis/Di (2-ethylhexyl) phthalate	ug/l			6	8	<5
Butylbenzyl phthalate	ug/l			-	-	<1
Di-n-butyl phthalate	ug/l			-	2	<1.5
Di-n-Octyl phthalate	ug/l			-	5	<1
Diethyl phthalate	ug/l			-	5	<1
Dimethyl phthalate	ug/l			-	5	<1
Additional SVOCs						
SVOC TICs (trace organics)	µg/l			-	-	
1,2-Dichlorobenzene	µg/l			-	10	<1
1,2,4-Trichlorobenzene	µg/l			-	0.4	<1
1,3-Dichlorobenzene	µg/l			-	-	<1
1,4-Dichlorobenzene	µg/l			-	-	<1
2-Nitroaniline	µg/l			-	-	<1
2,4-Dinitrotoluene	µg/l			-	-	<0.5
2,6-Dinitrotoluene	µg/l			-	-	<1
3-Nitroaniline	µg/l			-	-	<1
4-Bromodiphenylether (4-Bromophenylpl	µg/l			-	-	<1
4-Chloroaniline	µg/l			-	-	<1
4-Chlorodiphenylether (4-Chlorophenylpl	µg/l			-	-	<1
4-Nitroaniline	µg/l			-	-	<0.5
Azobenzene	µg/l			-	-	<0.5
Bis(2-chloroethoxy)methane	µg/l			-	-	<0.5
Bis(2-chloroethyl)ether	µg/l			-	-	<1
Carbazole	µg/l			-	-	<0.5
Dibenzofuran	µg/l			-	-	<0.5
Hexachlorobenzene	µg/l			-	0.03	<1
Hexachlorobutadiene	µg/l			-	0.1	<1
Hexachlorocyclopentadiene	µg/l			-	-	<1
Hexachloroethane	µg/l			-	-	<1
Isophorone	µg/l			-	-	<0.5
N-nitrosodi-n-propylamine	µg/l			-	-	<0.5
Nitrobenzene	µg/l			-	10	<1

Sample Identity			Groundwater Standards		GW3
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/512
Sample Date					11/01/2023
Parameters	Unit	MDL			
VOCs					
Dichlorodifluoromethane	µg/l		-	-	<2
Methyl Tertiary Butyl Ether	µg/l		-	-	<0.1
Chloromethane	µg/l		-	-	<3
Vinyl Chloride	µg/l		0.375[4]	-	<0.1
Bromomethane	µg/l		-	-	<1
Chloroethane	µg/l		-	-	<3
Trichlorofluoromethane	µg/l		-	-	<3
1,1-Dichloroethene	µg/l		-	-	<3
Dichloromethane	µg/l		15[4]	0.04	<3
trans-1-2-Dichloroethene	µg/l		-	-	<3
1,1-Dichloroethane	µg/l		-	-	<3
cis-1-2-Dichloroethene	µg/l		-	-	<3
2,2-Dichloropropane	µg/l		-	-	<1
Bromochloromethane	µg/l		-	-	<2
Chloroform	µg/l		-	12	<2
1,1,1-Trichloroethane	µg/l		-	500	<2
1,1-Dichloropropene	µg/l		-	-	<3
Carbon-tetrachloride/Tetrachloromethane	µg/l		-	2	<2
1,2-Dichloroethane	µg/l		2.25[4]	3	<2
Benzene	µg/l		0.75[4]	-	<0.5
Trichloroethene	µg/l		7.5[4]	10	<3
1,2-Dichloropropane	µg/l		-	-	<2
Dibromomethane	µg/l		-	-	<3
Bromodichloromethane	µg/l		-	-	<2
cis-1-3-Dichloropropene	µg/l		-	-	<2
Toluene	µg/l		525[4]	10	<5
trans-1-3-Dichloropropene	µg/l		-	-	<2
1,1,2-Trichloroethane	µg/l		-	-	<2
Tetrachloroethene	µg/l		7.5[4]	10	<3
1,3-Dichloropropane	µg/l		-	-	<2
Dibromochloromethane	µg/l		-	-	<2
1,2-Dibromoethane	µg/l		-	-	<2
Chlorobenzene	µg/l		-	1	<2
1,1,1,2-Tetrachloroethane	µg/l		-	-	<2
Ethylbenzene	µg/l		-	10	<1
p/m-Xylene	µg/l		-	10	<2
o-Xylene	µg/l		-	10	<1
Styrene	µg/l		-	-	<2
Bromoform	µg/l		-	-	<2
Isopropylbenzene	µg/l		-	-	<3
1,1,2,2-Tetrachloroethane	µg/l		-	-	<4
Bromobenzene	µg/l		-	-	<2
1,2,3-Trichloropropane	µg/l		-	-	<3
Propylbenzene	µg/l		-	-	<3
2-Chlorotoluene	µg/l		-	-	<3
1,3,5-Trimethylbenzene	µg/l		-	-	<3
4-Chlorotoluene	µg/l		-	-	<3
tert-Butylbenzene	µg/l		-	-	<3
1,2,4-Trimethylbenzene	µg/l		-	-	<3
sec-Butylbenzene	µg/l		-	-	<3
4-Isopropyltoluene	µg/l		-	-	<3
1,3-Dichlorobenzene	µg/l		-	-	<3
1,4-Dichlorobenzene	µg/l		-	-	<3
n-Butylbenzene	µg/l		-	-	<3
1,2-Dichlorobenzene	µg/l		-	10	<3
1,2-Dibromo-3-chloropropane	µg/l		-	-	<2
1,2,4-Trichlorobenzene	µg/l		-	0.4	<3
Hexachlorobutadiene	µg/l		-	0.1	<3
Naphthalene	ug/l		-	1	<2
1,2,3-Trichlorobenzene	µg/l		-	0.4	<3

Sample Identity			Groundwater Standards		GW3
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/512
Sample Date					11/01/2023
Parameters	**Unit**	**MDL**			
PCBS					
Total PCBs	µg/l			0.01	
Pesticides					
Organochlorine Pesticides					
Aldrin	µg/l		-	0.01	
Alpha-HCH	µg/l		-	0.1	
Beta-HCH	µg/l		-	0.1	
Chlorothalonil	µg/l		-	0.1	
cis-Chlordane	µg/l		-	0.1	
Delta-HCH	µg/l		-	0.1	
Dieldrin	µg/l		-	0.01	
Endosulphan I (alpha endosulphan)	µg/l		-	0.1	
Endosulphan II (beta endosulphan)	µg/l		-	0.1	
Endosulphan sulphate	µg/l		-	0.1	
Endrin	µg/l			0.1	
Gamma-HCH/Lindane	µg/l		-	0.1	
Heptachlor	µg/l		-	0.1	
Heptachlor Epoxide	µg/l		-	0.1	
Hexachlorobenzene/Benzene Hexachlor	µg/l		-	0.03	
Isodrin	µg/l		-	0.1	
o,p'-DDE (2,4'-DDE)	µg/l		-	0.1	
o,p'-DDT (2,4'-DDT)	µg/l		-	0.1	
o,p'-Methoxychlor	µg/l		-	0.1	
o,p'-TDE (Mitotane, Lysodren, Clodithan	µg/l		-	0.1	
p,p'-DDE (4,4'-DDE)	µg/l		-	0.1	
p,p'-DDT (Clofenotane, 4,4'-DDT)	µg/l		-	0.1	
p,p'-Methoxychlor	µg/l		-	0.1	
p,p'-TDE (Rhothane, Dilene, 4,4'-DDD)	µg/l		-	0.1	
Pendimethalin	µg/l		-	0.1	
Permethrin I (cis-Permethrin)	µg/l		-	Limit for total below	
Permethrin II (trans-Permethrin)	µg/l		-		
Quintozene (PCNB)	µg/l		-	0.1	
Tecnazene	µg/l		-	0.1	
Telodrin (Isobezan)	µg/l		-	0.1	
trans-Chlordane	µg/l		-	0.1	
Triadimefon	µg/l		-	0.1	
Triallate	µg/l		-	0.1	
Trifluralin	µg/l		-	0.1	
Organophosphorus Pesticides					
Azinphos ethyl	µg/l		-	0.1	
Azinphos methyl	µg/l		-	0.1	
Carbophenothion	µg/l		-	0.1	
Chlorfenvinphos	µg/l		-	5	
Chlorpyrifos	µg/l		-	90	
Chlorpyrifos-methyl	µg/l		-	0.1	
Diazinon	µg/l		-	0.1	
Dichlorvos	µg/l		-	0.001	
Disulfoton	µg/l		-	0.1	
Dimethoate	µg/l		-	0.1	
Ethion (Diethion)	µg/l		-	0.1	
Ethyl Parathion (Parathion)	µg/l		-	0.1	
Etrimphos	µg/l		-	0.1	
Fenitrothion	µg/l		-	0.1	
Fenthion	µg/l		-	0.1	
Malathion	µg/l		-	0.01	
Methyl Parathion	µg/l		-	0.1	
Mevinphos	µg/l		-	0.1	
Phosalone (Benzophosphate)	µg/l		-	0.1	
Pirimiphos Methyl	µg/l		-	0.1	
Propetamphos	µg/l		-	0.1	
Triazophos (Hostathion, Methoxone)	µg/l		-	0.1	

		Sample Identity	Groundwater Standards		GW4	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
Field Measured Parameters						
pH	pH Units		-	≥6.5 and ≤9.5	7.57	6.76
Temperature	°C		-	25	8.96	7.51
Dissolved Oxygen	mg/l				2.93	6.55
Dissolved Oxygen	%		-	NAC	25.39	52.11
Electrical Conductivity (EC)	μS/cm		800[1] - 1875[3]	1000	413.71	402.5
Oxidation/Reduction Potential (ORP)	mV				-60.1	113.3
Colour	~		-	NAC	Grey	Cloudy
Sheen	~				No	No
Observations	~				No s.s.	No s.s.
Odour	~				No	No
Taste	~				-	-
Turbidity	~				-	-
Indicators, Inorganics and Nutrients						
Chloride	mg/l		24[1] - 187.5[3]	30	6.2	6.2
Nitrate as NO3	mg/l		37.5[3,4]	25	<0.2	<0.2
Nitrite as NO2	mg/l		0.375[4]	0.1	<0.02	<0.02
Total Ammonium (mg N/l)	mg N/l		0.065[2] - 0.175[4]	0.15	**0.08**	**0.07**
Total Cyanide	mg/l		0.0375	0.01	<0.01	<0.01
Sulphate	mg/l		187.5[4]	200	8.7	8.3
Orthophosphate	mg/l		-	0.03	<0.06	<0.06
Total Organic Carbon (TOC)	mg/l		-	NAC	<2	<2
Total Organic Nitrogen (TON)	mg/l		-	NAC	1.8	0.7
Alkalinity	mg/l		-	NAC	357	236
Bicarbonate	mg/l		-	NAC	<1	<1
Carbonate	mg/l		-	NAC	357	236
Hardness (as $CaCO_3$)	mg/l		-	200	192	190
Total Dissolved Solids (TDS)	mg/l		-	1000	497	391
Fluoride	mg/l		-	1	<0.3	<0.3
Silica			-	NAC	13.5	11.5
Metals						
Dissolved Aluminium	μg/l		150[4]	-	<20	<20
Dissolved Arsenic	μg/l		7.5[4]	-	<2.5	<2.5
Dissolved Barium	μg/l		-	-	418	358
Dissolved Boron	μg/l		750	-	18	15
Dissolved Cadmium	μg/l		3.75	-	<0.5	<0.5
Dissolved Calcium	mg/l		-	-	56.3	54
Total Dissolved Chromium	μg/l		37.5[4]	-	<1.5	<1.5
Dissolved Copper	μg/l		1500	-	<7	<7
Total Iron	μg/l		-	200	<20	<20
Dissolved Lead	μg/l		7.5[4]	-	<5	<5
Dissolved Magnesium	mg/l		-	-	12.2	13.1
Dissolved Manganese	μg/l				141	140
Dissolved Mercury	μg/l		0.75[4]	-	<1	<1
Dissolved Nickel	μg/l		15	-	<2	<2
Dissolved Potassium	mg/l				1.2	1.2
Dissolved Selenium	μg/l		-	-	<3	<3
Dissolved Sodium	mg/l		150	-	13.4	14.4
Dissolved Zinc	μg/l		75[4]	-	5	4
Total Uranium	μg/l		-	9	<5	
MTBE	ug/l	<5	10[4]	30	<0.1	<0.1
Benzene	ug/l	<5	0.75[4]	1	<0.5	<0.5
Toluene	ug/l	<5	525[4]	10	<5	<5
Ethylbenzene	ug/l	<5	-	10	<1	<1
m/p-Xylene	ug/l	<5	-	10	<2	<2
o-Xylene	ug/l	<5	-	10	<1	<1
Total Xylenes	ug/l			10	<3	<3

		Sample Identity	Groundwater Standards		GW4	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
Total Petroleum Hydrocarbons (TPH-CWG)						
Aliphatics						
>C5-C6	µg/l	<10	-	-	<10	<10
>C6-C8	µg/l	<10	-	-	<10	<10
>C8-C10	µg/l	<10	-	-	<10	<10
>C10-C12	µg/l	<5	-	-	<5	<5
>C12-C16	µg/l	<10	-	-	<10	<10
>C16-C21	µg/l	<10	-	-	<10	<10
>C21-C35	µg/l	<10	-	-	<10	<10
>C35-C44	µg/l	<10	-	-	<10	<10
Total aliphatics C5-44	µg/l	<10	-	-	<10	<10
Aromatics						
>C5-EC7	µg/l	<10	-	-	<10	<10
>EC7-EC8	µg/l	<10	-	-	<10	<10
>EC8-EC10	µg/l	<10	-	-	<10	<10
>EC10-EC12	µg/l	<5	-	-	<5	<5
>EC12-EC16	µg/l	<10	-	-	<10	<10
>EC16-EC21	µg/l	<10	-	-	<10	<10
>EC21-EC35	µg/l	<10	-	-	<10	<10
>EC35-EC44	µg/l	<10	-	-	<10	<10
Total aromatics C5-44	µg/l	<10	-	-	<10	<10
Total aliphatics and aromatics(C5-44)	µg/l	<10	7.5[4,23]	10	<10	<10
Semi-Volatile Organic Compounds (SVOC's)						
Phenols						
2-Chlorophenol	ug/l	-	-	200	<1	<1
2-Methylphenol	ug/l	-	-	0.5	<0.5	<0.5
2-Nitrophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l	-	-	0.5	<1	<1
2,4,5-Trichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	-	-	200	<1	<1
4-Chloro-3-methylphenol	ug/l	-	-	0.5	<0.5	<0.5
4-Methylphenol	ug/l	-	-	0.5	<1	<1
4-Nitrophenol	ug/l	-	-	0.5	<10	<10
Pentachlorophenol	ug/l	-	-	2	<1	<1
Phenol	ug/l	-			<1	<1

		Sample Identity	Groundwater Standards		GW4	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
PAHs	ug/l					
2-Chloronaphthalene	ug/l				<1	<1
2-Methylnaphthalene	ug/l				<1	<1
Naphthalene	ug/l		-	1	<1	<1
Acenaphthylene	ug/l		-	0.1	<0.5	<0.5
Acenaphthene	ug/l		-	0.1	<1	<1
Fluorene	ug/l		-	0.1	<0.5	<0.5
Phenanthrene	ug/l		-	0.1	<0.5	<0.5
Anthracene	ug/l		-	10000	<0.5	<0.5
Fluoranthene	ug/l		-	1	<0.5	<0.5
Pyrene	ug/l		-	0.1	<0.5	<0.5
Benzo(a)anthracene	ug/l		-	0.1	<0.5	<0.5
Chrysene	ug/l		-	0.1	<0.5	<0.5
Benzo(bk)fluoranthene	ug/l		-	0.5 / 0.05	<1	<1
Benzo(a)pyrene	ug/l		0.0075[4]	0.01	<1	<1
Indeno(123cd)pyrene	ug/l		-	0.05	<1	<1
Dibenzo(ah)anthracene	ug/l		-	0.1	<0.5	<0.5
Benzo(ghi)perylene	ug/l		-	0.05	<0.5	<0.5
Phthalates						
Bis/Di (2-ethylhexyl) phthalate	ug/l		6	8	<5	<5
Butylbenzyl phthalate	ug/l		-	-	<1	<1
Di-n-butyl phthalate	ug/l		-	2	<1.5	<1.5
Di-n-Octyl phthalate	ug/l		-	5	<1	<1
Diethyl phthalate	ug/l		-	5	<1	<1
Dimethyl phthalate	ug/l		-	5	<1	<1
Additional SVOCs						
SVOC TICs (trace organics)	µg/l		-	-		
1,2-Dichlorobenzene	µg/l		-	10	<1	<1
1,2,4-Trichlorobenzene	µg/l		-	0.4	<1	<1
1,3-Dichlorobenzene	µg/l		-	-	<1	<1
1,4-Dichlorobenzene	µg/l		-	-	<1	<1
2-Nitroaniline	µg/l		-	-	<1	<1
2,4-Dinitrotoluene	µg/l		-	-	<0.5	<0.5
2,6-Dinitrotoluene	µg/l		-	-	<1	<1
3-Nitroaniline	µg/l		-	-	<1	<1
4-Bromodiphenylether (4-Bromophenylpl	µg/l		-	-	<1	<1
4-Chloroaniline	µg/l		-	-	<1	<1
4-Chlorodiphenylether (4-Chlorophenylpl	µg/l		-	-	<1	<1
4-Nitroaniline	µg/l		-	-	<0.5	<0.5
Azobenzene	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethoxy)methane	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethyl)ether	µg/l		-	-	<1	<1
Carbazole	µg/l		-	-	<0.5	<0.5
Dibenzofuran	µg/l		-	-	<0.5	<0.5
Hexachlorobenzene	µg/l		-	0.03	<1	<1
Hexachlorobutadiene	µg/l		-	0.1	<1	<1
Hexachlorocyclopentadiene	µg/l		-	-	<1	<1
Hexachloroethane	µg/l		-	-	<1	<1
Isophorone	µg/l		-	-	<0.5	<0.5
N-nitrosodi-n-propylamine	µg/l		-	-	<0.5	<0.5
Nitrobenzene	µg/l		-	10	<1	<1

		Sample Identity	**Groundwater Standards**		**GW4**	
		Laboratory Report No.	**Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)**	**EPA Interim Guideline Value (IGV) for Groundwater**	**22/20240**	**23/512**
		Sample Date			**05/12/2022**	**11/01/2023**
Parameters	**Unit**	**MDL**				
VOCs						
Dichlorodifluoromethane	µg/l		-	-	<2	<2
Methyl Tertiary Butyl Ether	µg/l		-	-	<0.1	<0.1
Chloromethane	µg/l		-	-	<3	<3
Vinyl Chloride	µg/l		0.375[4]	-	<0.1	<0.1
Bromomethane	µg/l		-	-	<1	<1
Chloroethane	µg/l		-	-	<3	<3
Trichlorofluoromethane	µg/l		-	-	<3	<3
1,1-Dichloroethene	µg/l		-	-	<3	<3
Dichloromethane	µg/l		15[4]	0.04	<3	<3
trans-1-2-Dichloroethene	µg/l		-	-	<3	<3
1,1-Dichloroethane	µg/l		-	-	<3	<3
cis-1-2-Dichloroethene	µg/l		-	-	<3	<3
2,2-Dichloropropane	µg/l		-	-	<1	<1
Bromochloromethane	µg/l		-	-	<2	<2
Chloroform	µg/l		-	12	<2	<2
1,1,1-Trichloroethane	µg/l		-	500	<2	<2
1,1-Dichloropropene	µg/l		-	-	<3	<3
Carbon-tetrachloride/Tetrachloromethan	µg/l		-	2	<2	<2
1,2-Dichloroethane	µg/l		2.25[4]	3	<2	<2
Benzene	µg/l		0.75[4]	-	<0.5	<0.5
Trichloroethene	µg/l		7.5[4]	10	<3	<3
1,2-Dichloropropane	µg/l		-	-	<2	<2
Dibromomethane	µg/l		-	-	<3	<3
Bromodichloromethane	µg/l		-	-	<2	<2
cis-1-3-Dichloropropene	µg/l		-	-	<2	<2
Toluene	µg/l		525[4]	10	<5	<5
trans-1-3-Dichloropropene	µg/l		-	-	<2	<2
1,1,2-Trichloroethane	µg/l		-	-	<2	<2
Tetrachloroethene	µg/l		7.5[4]	10	<3	<3
1,3-Dichloropropane	µg/l		-	-	<2	<2
Dibromochloromethane	µg/l		-	-	<2	<2
1,2-Dibromoethane	µg/l		-	-	<2	<2
Chlorobenzene	µg/l		-	1	<2	<2
1,1,1,2-Tetrachloroethane	µg/l		-	-	<2	<2
Ethylbenzene	µg/l		-	10	<1	<1
p/m-Xylene	µg/l		-	10	<2	<2
o-Xylene	µg/l		-	10	<1	<1
Styrene	µg/l		-	-	<2	<2
Bromoform	µg/l		-	-	<2	<2
Isopropylbenzene	µg/l		-	-	<3	<3
1,1,2,2-Tetrachloroethane	µg/l		-	-	<4	<4
Bromobenzene	µg/l		-	-	<2	<2
1,2,3-Trichloropropane	µg/l		-	-	<3	<3
Propylbenzene	µg/l		-	-	<3	<3
2-Chlorotoluene	µg/l		-	-	<3	<3
1,3,5-Trimethylbenzene	µg/l		-	-	<3	<3
4-Chlorotoluene	µg/l		-	-	<3	<3
tert-Butylbenzene	µg/l		-	-	<3	<3
1,2,4-Trimethylbenzene	µg/l		-	-	<3	<3
sec-Butylbenzene	µg/l		-	-	<3	<3
4-Isopropyltoluene	µg/l		-	-	<3	<3
1,3-Dichlorobenzene	µg/l		-	-	<3	<3
1,4-Dichlorobenzene	µg/l		-	-	<3	<3
n-Butylbenzene	µg/l		-	-	<3	<3
1,2-Dichlorobenzene	µg/l		-	10	<3	<3
1,2-Dibromo-3-chloropropane	µg/l		-	-	<2	<2
1,2,4-Trichlorobenzene	µg/l		-	0.4	<3	<3
Hexachlorobutadiene	µg/l		-	0.1	<3	<3
Naphthalene	ug/l		-	1	<2	<2
1,2,3-Trichlorobenzene	µg/l		-	0.4	<3	<3

Sample Identity			Groundwater Standards		GW4	
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
Sample Date					05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
PCBS						
Total PCBs	µg/l			0.01	<0.2	
Pesticides						
Organochlorine Pesticides						
Aldrin	µg/l		-	0.01	<0.01	
Alpha-HCH	µg/l		-	0.1	<0.01	
Beta-HCH	µg/l		-	0.1	<0.01	
Chlorothalonil	µg/l		-	0.1	<2.50	
cis-Chlordane	µg/l		-	0.1	<0.01	
Delta-HCH	µg/l		-	0.1	<0.01	
Dieldrin	µg/l		-	0.01	<0.01	
Endosulphan I (alpha endosulphan)	µg/l		-	0.1	<0.01	
Endosulphan II (beta endosulphan)	µg/l		-	0.1	<0.01	
Endosulphan sulphate	µg/l		-	0.1	<0.01	
Endrin	µg/l			0.1	<0.01	
Gamma-HCH/Lindane	µg/l		-	0.1	<0.01	
Heptachlor	µg/l		-	0.1	<0.01	
Heptachlor Epoxide	µg/l		-	0.1	<0.01	
Hexachlorobenzene/Benzene Hexachlor	µg/l		-	0.03	<0.01	
Isodrin	µg/l		-	0.1	<0.01	
o,p'-DDE (2,4'-DDE)	µg/l		-	0.1	<0.01	
o,p'-DDT (2,4'-DDT)	µg/l		-	0.1	<0.01	
o,p'-Methoxychlor	µg/l		-	0.1	<0.01	
o,p'-TDE (Mitotane, Lysodren, Clodithan	µg/l		-	0.1	<0.01	
p,p'-DDE (4,4'-DDE)	µg/l		-	0.1	<0.01	
p,p'-DDT (Clofenotane, 4,4'-DDT)	µg/l		-	0.1	<0.01	
p,p'-Methoxychlor	µg/l		-	0.1	<0.01	
p,p'-TDE (Rhothane, Dilene, 4,4'-DDD)	µg/l		-	0.1	<0.01	
Pendimethalin	µg/l		-	0.1	<0.01	
Permethrin I (cis-Permethrin)	µg/l		-	Limit for total below	<0.01	
Permethrin II (trans-Permethrin)	µg/l		-		<0.01	
Quintozene (PCNB)	µg/l		-	0.1	<0.01	
Tecnazene	µg/l		-	0.1	<0.01	
Telodrin (Isobezan)	µg/l		-	0.1	<0.01	
trans-Chlordane	µg/l		-	0.1	<0.01	
Triadimefon	µg/l		-	0.1	<0.01	
Triallate	µg/l		-	0.1	<0.01	
Trifluralin	µg/l		-	0.1	<0.01	
Organophosphorus Pesticides						
Azinphos ethyl	µg/l		-	0.1	<0.01	
Azinphos methyl	µg/l		-	0.1	<0.01	
Carbophenothion	µg/l		-	0.1	<0.01	
Chlorfenvinphos	µg/l		-	5	<0.01	
Chlorpyrifos	µg/l		-	90	<0.01	
Chlorpyrifos-methyl	µg/l		-	0.1	<0.01	
Diazinon	µg/l		-	0.1	<0.01	
Dichlorvos	µg/l		-	0.001	<0.01	
Disulfoton	µg/l		-	0.1	<0.01	
Dimethoate	µg/l		-	0.1	<0.01	
Ethion (Diethion)	µg/l		-	0.1	<0.01	
Ethyl Parathion (Parathion)	µg/l		-	0.1	<0.01	
Etrimphos	µg/l		-	0.1	<0.01	
Fenitrothion	µg/l		-	0.1	<0.01	
Fenthion	µg/l		-	0.1	<0.01	
Malathion	µg/l		-	0.01	<0.01	
Methyl Parathion	µg/l		-	0.1	<0.01	
Mevinphos	µg/l		-	0.1	<0.01	
Phosalone (Benzophosphate)	µg/l		-	0.1	<0.01	
Pirimiphos Methyl	µg/l		-	0.1	<0.01	
Propetamphos	µg/l		-	0.1	<0.01	
Triazophos (Hostathion, Methoxone)	µg/l		-	0.1	<0.01	

		Sample Identity	Groundwater Standards		GW5	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
Field Measured Parameters						
pH	pH Units		-	≥6.5 and ≤9.5	7.56	7.35
Temperature	°C		-	25	9.23	8.23
Dissolved Oxygen	mg/l				3.27	2.9
Dissolved Oxygen	%		-	NAC	28.19	25.43
Electrical Conductivity (EC)	µS/cm		800[1] - 1875[3]	1000	314.25	425.13
Oxidation/Reduction Potential (ORP)	mV				66.2	89.7
Colour	~		-	NAC	Clear	Clear
Sheen	~				No	No
Observations	~				Few s.s	No s.s
Odour	~				No	No
Taste	~				-	-
Turbidity	~				-	-
Indicators, Inorganics and Nutrients						
Chloride	mg/l		24[1] - 187.5[3]	30	10	9.8
Nitrate as NO3	mg/l		37.5[3,4]	25	<0.2	<0.2
Nitrite as NO2	mg/l		0.375[4]	0.1	<0.02	<0.02
Total Ammonium (mg N/l)	mg N/l		0.065[2] - 0.175[4]	0.15	<0.03	<0.03
Total Cyanide	mg/l		0.0375	0.01	<0.01	<0.01
Sulphate	mg/l		187.5[4]	200	32	41.1
Orthophosphate	mg/l		-	0.03	<0.06	<0.06
Total Organic Carbon (TOC)	mg/l		-	NAC	<2	<2
Total Organic Nitrogen (TON)	mg/l		-	NAC	<0.5	<0.5
Alkalinity	mg/l		-	NAC	181	194
Bicarbonate	mg/l		-	NAC	<1	<1
Carbonate	mg/l		-	NAC	181	194
Hardness (as $CaCO_3$)	mg/l		-	200	190	188
Total Dissolved Solids (TDS)	mg/l		-	1000	262	257
Fluoride	mg/l		-	1	<0.3	<0.3
Silica			-	NAC	13.9	12.2
Metals						
Dissolved Aluminium	µg/l		150[4]	-	<20	<20
Dissolved Arsenic	µg/l		7.5[4]	-	<2.5	4.6
Dissolved Barium	µg/l		-	-	58	59
Dissolved Boron	µg/l		750	-	37	36
Dissolved Cadmium	µg/l		3.75	-	<0.5	<0.5
Dissolved Calcium	mg/l		-	-	44.1	41.5
Total Dissolved Chromium	µg/l		37.5[4]	-	<1.5	<1.5
Dissolved Copper	µg/l		1500	-	<7	<7
Total Iron	µg/l		-	200	<20	<20
Dissolved Lead	µg/l		7.5[4]	-	<5	<5
Dissolved Magnesium	mg/l		-	-	19.1	20.1
Dissolved Manganese	µg/l				38	47
Dissolved Mercury	µg/l		0.75[4]	-	<1	<1
Dissolved Nickel	µg/l		15	-	<2	<2
Dissolved Potassium	mg/l				1.8	1.7
Dissolved Selenium	µg/l		-	-	<3	<3
Dissolved Sodium	mg/l		150	-	23.6	24.1
Dissolved Zinc	µg/l		75[4]	-	4	<3
Total Uranium	µg/l		-	9	<5	
MTBE	ug/l	<5	10[4]	30	<0.1	<0.1
Benzene	ug/l	<5	0.75[4]	1	<0.5	<0.5
Toluene	ug/l	<5	525[4]	10	<5	<5
Ethylbenzene	ug/l	<5	-	10	<1	<1
m/p-Xylene	ug/l	<5	-	10	<2	<2
o-Xylene	ug/l	<5	-	10	<1	<1
Total Xylenes	ug/l			10	<3	<3

		Sample Identity	Groundwater Standards		GW5	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
Total Petroleum Hydrocarbons (TPH-CWG)						
Aliphatics						
>C5-C6	µg/l	<10	-	-	<10	<10
>C6-C8	µg/l	<10	-	-	<10	<10
>C8-C10	µg/l	<10	-	-	<10	<10
>C10-C12	µg/l	<5	-	-	<5	<5
>C12-C16	µg/l	<10	-	-	<10	<10
>C16-C21	µg/l	<10	-	-	<10	<10
>C21-C35	µg/l	<10	-	-	<10	<10
>C35-C44	µg/l	<10	-	-	<10	<10
Total aliphatics C5-44	µg/l	<10	-	-	<10	<10
Aromatics						
>C5-EC7	µg/l	<10	-	-	<10	<10
>EC7-EC8	µg/l	<10	-	-	<10	<10
>EC8-EC10	µg/l	<10	-	-	<10	<10
>EC10-EC12	µg/l	<5	-	-	<5	<5
>EC12-EC16	µg/l	<10	-	-	<10	<10
>EC16-EC21	µg/l	<10	-	-	<10	<10
>EC21-EC35	µg/l	<10	-	-	<10	<10
>EC35-EC44	µg/l	<10	-	-	<10	<10
Total aromatics C5-44	µg/l	<10	-	-	<10	<10
Total aliphatics and aromatics(C5-44)	µg/l	<10	7.5[4,23]	10	<10	<10
Semi-Volatile Organic Compounds (SVOC's)						
Phenols						
2-Chlorophenol	ug/l	-	-	200	<1	<1
2-Methylphenol	ug/l	-	-	0.5	<0.5	<0.5
2-Nitrophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l	-	-	0.5	<1	<1
2,4,5-Trichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	-	-	200	<1	<1
4-Chloro-3-methylphenol	ug/l	-	-	0.5	<0.5	<0.5
4-Methylphenol	ug/l	-	-	0.5	<1	<1
4-Nitrophenol	ug/l	-	-	0.5	<10	<10
Pentachlorophenol	ug/l	-	-	2	<1	<1
Phenol	ug/l	-			<1	<1

		Sample Identity	Groundwater Standards		GW5	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	Unit	MDL				
PAHs	ug/l					
2-Chloronaphthalene	ug/l				<1	<1
2-Methylnaphthalene	ug/l				<1	<1
Naphthalene	ug/l		-	1	<1	<1
Acenaphthylene	ug/l		-	0.1	<0.5	<0.5
Acenaphthene	ug/l		-	0.1	<1	<1
Fluorene	ug/l		-	0.1	<0.5	<0.5
Phenanthrene	ug/l		-	0.1	<0.5	<0.5
Anthracene	ug/l		-	10000	<0.5	<0.5
Fluoranthene	ug/l		-	1	<0.5	<0.5
Pyrene	ug/l		-	0.1	<0.5	<0.5
Benzo(a)anthracene	ug/l		-	0.1	<0.5	<0.5
Chrysene	ug/l		-	0.1	<0.5	<0.5
Benzo(bk)fluoranthene	ug/l		-	0.5 / 0.05	<1	<1
Benzo(a)pyrene	ug/l		0.0075[4]	0.01	<1	<1
Indeno(123cd)pyrene	ug/l		-	0.05	<1	<1
Dibenzo(ah)anthracene	ug/l		-	0.1	<0.5	<0.5
Benzo(ghi)perylene	ug/l		-	0.05	<0.5	<0.5
Phthalates						
Bis/Di (2-ethylhexyl) phthalate	ug/l		6	8	<5	<5
Butylbenzyl phthalate	ug/l		-	-	<1	<1
Di-n-butyl phthalate	ug/l		-	2	<1.5	<1.5
Di-n-Octyl phthalate	ug/l		-	5	<1	<1
Diethyl phthalate	ug/l		-	5	<1	<1
Dimethyl phthalate	ug/l		-	5	<1	<1
Additional SVOCs						
SVOC TICs (trace organics)	µg/l		-	-		
1,2-Dichlorobenzene	µg/l		-	10	<1	<1
1,2,4-Trichlorobenzene	µg/l		-	0.4	<1	<1
1,3-Dichlorobenzene	µg/l		-	-	<1	<1
1,4-Dichlorobenzene	µg/l		-	-	<1	<1
2-Nitroaniline	µg/l		-	-	<1	<1
2,4-Dinitrotoluene	µg/l		-	-	<0.5	<0.5
2,6-Dinitrotoluene	µg/l		-	-	<1	<1
3-Nitroaniline	µg/l		-	-	<1	<1
4-Bromodiphenylether (4-Bromophenylpl	µg/l		-	-	<1	<1
4-Chloroaniline	µg/l		-	-	<1	<1
4-Chlorodiphenylether (4-Chlorophenylpl	µg/l		-	-	<1	<1
4-Nitroaniline	µg/l		-	-	<0.5	<0.5
Azobenzene	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethoxy)methane	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethyl)ether	µg/l		-	-	<1	<1
Carbazole	µg/l		-	-	<0.5	<0.5
Dibenzofuran	µg/l		-	-	<0.5	<0.5
Hexachlorobenzene	µg/l		-	0.03	<1	<1
Hexachlorobutadiene	µg/l		-	0.1	<1	<1
Hexachlorocyclopentadiene	µg/l		-	-	<1	<1
Hexachloroethane	µg/l		-	-	<1	<1
Isophorone	µg/l		-	-	<0.5	<0.5
N-nitrosodi-n-propylamine	µg/l		-	-	<0.5	<0.5
Nitrobenzene	µg/l		-	10	<1	<1

Sample Identity			Groundwater Standards		GW5	
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
Sample Date					05/12/2022	11/01/2023
Parameters	Unit	MDL				
VOCs						
Dichlorodifluoromethane	µg/l		-	-	<2	<2
Methyl Tertiary Butyl Ether	µg/l		-	-	<0.1	<0.1
Chloromethane	µg/l		-	-	<3	<3
Vinyl Chloride	µg/l		0.375[4]	-	<0.1	<0.1
Bromomethane	µg/l		-	-	<1	<1
Chloroethane	µg/l		-	-	<3	<3
Trichlorofluoromethane	µg/l		-	-	<3	<3
1,1-Dichloroethene	µg/l		-	-	<3	<3
Dichloromethane	µg/l		15[4]	0.04	<3	<3
trans-1-2-Dichloroethene	µg/l		-	-	<3	<3
1,1-Dichloroethane	µg/l		-	-	<3	<3
cis-1-2-Dichloroethene	µg/l		-	-	<3	<3
2,2-Dichloropropane	µg/l		-	-	<1	<1
Bromochloromethane	µg/l		-	-	<2	<2
Chloroform	µg/l		-	12	<2	<2
1,1,1-Trichloroethane	µg/l		-	500	<2	<2
1,1-Dichloropropene	µg/l		-	-	<3	<3
Carbon-tetrachloride/Tetrachlorometham	µg/l		-	2	<2	<2
1,2-Dichloroethane	µg/l		2.25[4]	3	<2	<2
Benzene	µg/l		0.75[4]	-	<0.5	<0.5
Trichloroethene	µg/l		7.5[4]	10	<3	<3
1,2-Dichloropropane	µg/l		-	-	<2	<2
Dibromomethane	µg/l		-	-	<3	<3
Bromodichloromethane	µg/l		-	-	<2	<2
cis-1-3-Dichloropropene	µg/l		-	-	<2	<2
Toluene	µg/l		525[4]	10	<5	<5
trans-1-3-Dichloropropene	µg/l		-	-	<2	<2
1,1,2-Trichloroethane	µg/l		-	-	<2	<2
Tetrachloroethene	µg/l		7.5[4]	10	<3	<3
1,3-Dichloropropane	µg/l		-	-	<2	<2
Dibromochloromethane	µg/l		-	-	<2	<2
1,2-Dibromoethane	µg/l		-	-	<2	<2
Chlorobenzene	µg/l		-	1	<2	<2
1,1,1,2-Tetrachloroethane	µg/l		-	-	<2	<2
Ethylbenzene	µg/l		-	10	<1	<1
p/m-Xylene	µg/l		-	10	<2	<2
o-Xylene	µg/l		-	10	<1	<1
Styrene	µg/l		-	-	<2	<2
Bromoform	µg/l		-	-	<2	<2
Isopropylbenzene	µg/l		-	-	<3	<3
1,1,2,2-Tetrachloroethane	µg/l		-	-	<4	<4
Bromobenzene	µg/l		-	-	<2	<2
1,2,3-Trichloropropane	µg/l		-	-	<3	<3
Propylbenzene	µg/l		-	-	<3	<3
2-Chlorotoluene	µg/l		-	-	<3	<3
1,3,5-Trimethylbenzene	µg/l		-	-	<3	<3
4-Chlorotoluene	µg/l		-	-	<3	<3
tert-Butylbenzene	µg/l		-	-	<3	<3
1,2,4-Trimethylbenzene	µg/l		-	-	<3	<3
sec-Butylbenzene	µg/l		-	-	<3	<3
4-Isopropyltoluene	µg/l		-	-	<3	<3
1,3-Dichlorobenzene	µg/l		-	-	<3	<3
1,4-Dichlorobenzene	µg/l		-	-	<3	<3
n-Butylbenzene	µg/l		-	-	<3	<3
1,2-Dichlorobenzene	µg/l		-	10	<3	<3
1,2-Dibromo-3-chloropropane	µg/l		-	-	<2	<2
1,2,4-Trichlorobenzene	µg/l		-	0.4	<3	<3
Hexachlorobutadiene	µg/l		-	0.1	<3	<3
Naphthalene	ug/l		-	1	<2	<2
1,2,3-Trichlorobenzene	µg/l		-	0.4	<3	<3

Sample Identity			Groundwater Standards		GW5	
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
Sample Date					05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
PCBS						
Total PCBs	µg/l			0.01	<0.2	
Pesticides						
Organochlorine Pesticides						
Aldrin	µg/l		-	0.01	<0.01	
Alpha-HCH	µg/l		-	0.1	<0.01	
Beta-HCH	µg/l		-	0.1	<0.01	
Chlorothalonil	µg/l		-	0.1	<2.50	
cis-Chlordane	µg/l		-	0.1	<0.01	
Delta-HCH	µg/l		-	0.1	<0.01	
Dieldrin	µg/l		-	0.01	<0.01	
Endosulphan I (alpha endosulphan)	µg/l		-	0.1	<0.01	
Endosulphan II (beta endosulphan)	µg/l		-	0.1	<0.01	
Endosulphan sulphate	µg/l		-	0.1	<0.01	
Endrin	µg/l			0.1	<0.01	
Gamma-HCH/Lindane	µg/l		-	0.1	<0.01	
Heptachlor	µg/l		-	0.1	<0.01	
Heptachlor Epoxide	µg/l		-	0.1	<0.01	
Hexachlorobenzene/Benzene Hexachlor	µg/l		-	0.03	<0.01	
Isodrin	µg/l		-	0.1	<0.01	
o,p'-DDE (2,4'-DDE)	µg/l		-	0.1	<0.01	
o,p'-DDT (2,4'-DDT)	µg/l		-	0.1	<0.01	
o,p'-Methoxychlor	µg/l		-	0.1	<0.01	
o,p'-TDE (Mitotane, Lysodren, Clodithan	µg/l		-	0.1	<0.01	
p,p'-DDE (4,4'-DDE)	µg/l		-	0.1	<0.01	
p,p'-DDT (Clofenotane, 4,4'-DDT)	µg/l		-	0.1	<0.01	
p,p'-Methoxychlor	µg/l		-	0.1	<0.01	
p,p'-TDE (Rhothane, Dilene, 4,4'-DDD)	µg/l		-	0.1	<0.01	
Pendimethalin	µg/l		-	0.1	<0.01	
Permethrin I (cis-Permethrin)	µg/l		-	Limit for total below	<0.01	
Permethrin II (trans-Permethrin)	µg/l		-		<0.01	
Quintozene (PCNB)	µg/l		-	0.1	<0.01	
Tecnazene	µg/l		-	0.1	<0.01	
Telodrin (Isobezan)	µg/l		-	0.1	<0.01	
trans-Chlordane	µg/l		-	0.1	<0.01	
Triadimefon	µg/l		-	0.1	<0.01	
Triallate	µg/l		-	0.1	<0.01	
Trifluralin	µg/l		-	0.1	<0.01	
Organophosphorus Pesticides						
Azinphos ethyl	µg/l		-	0.1	<0.01	
Azinphos methyl	µg/l		-	0.1	<0.01	
Carbophenothion	µg/l		-	0.1	<0.01	
Chlorfenvinphos	µg/l		-	5	<0.01	
Chlorpyrifos	µg/l		-	90	<0.01	
Chlorpyrifos-methyl	µg/l		-	0.1	<0.01	
Diazinon	µg/l		-	0.1	<0.01	
Dichlorvos	µg/l		-	0.001	<0.01	
Disulfoton	µg/l		-	0.1	<0.01	
Dimethoate	µg/l		-	0.1	<0.01	
Ethion (Diethion)	µg/l		-	0.1	<0.01	
Ethyl Parathion (Parathion)	µg/l		-	0.1	<0.01	
Etrimphos	µg/l		-	0.1	<0.01	
Fenitrothion	µg/l		-	0.1	<0.01	
Fenthion	µg/l		-	0.1	<0.01	
Malathion	µg/l		-	0.01	<0.01	
Methyl Parathion	µg/l		-	0.1	<0.01	
Mevinphos	µg/l		-	0.1	<0.01	
Phosalone (Benzophosphate)	µg/l		-	0.1	<0.01	
Pirimiphos Methyl	µg/l		-	0.1	<0.01	
Propetamphos	µg/l		-	0.1	<0.01	
Triazophos (Hostathion, Methoxone)	µg/l		-	0.1	<0.01	

		Sample Identity	**Groundwater Standards**		**GW6**	
		Laboratory Report No.	**Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)**	**EPA Interim Guideline Value (IGV) for Groundwater**	**22/20240**	**23/512**
		Sample Date			**05/12/2022**	**11/01/2023**
Parameters	**Unit**	**MDL**				
Field Measured Parameters						
pH	pH Units		-	≥6.5 and ≤9.5	7.05	7.26
Temperature	°C		-	25	9.23	8.41
Dissolved Oxygen	mg/l				9.93	3.41
Dissolved Oxygen	%		-	NAC	86.54	29.85
Electrical Conductivity (EC)	µS/cm		800[1] - 1875[3]	1000	705.19	565.65
Oxidation/Reduction Potential (ORP)	mV				56.4	81.7
Colour	~		-	NAC	Brown	Brown
Sheen	~				No	No
Observations	~				s.s	No s.s
Odour	~				No	No
Taste	~				-	-
Turbidity	~				-	-
Indicators, Inorganics and Nutrients						
Chloride	mg/l		24[1] - 187.5[3]	30	6.3	6.8
Nitrate as NO3	mg/l		37.5[3,4]	25	0.9	4.1
Nitrite as NO2	mg/l		0.375[4]	0.1	<0.02	<0.02
Total Ammonium (mg N/l)	mg N/l		0.065[2] - 0.175[4]	0.15	0.05	**0.09**
Total Cyanide	mg/l		0.0375	0.01	<0.01	<0.01
Sulphate	mg/l		187.5[4]	200	**231.7**	175.1
Orthophosphate	mg/l		-	0.03	<0.06	<0.06
Total Organic Carbon (TOC)	mg/l		-	NAC	<2	<2
Total Organic Nitrogen (TON)	mg/l		-	NAC	1.1	7.5
Alkalinity	mg/l		-	NAC	104	110
Bicarbonate	mg/l		-	NAC	<1	<1
Carbonate	mg/l		-	NAC	104	110
Hardness (as $CaCO_3$)	mg/l		-	200	**325**	**272**
Total Dissolved Solids (TDS)	mg/l		-	1000	464	383
Fluoride	mg/l		-	1	<0.3	<0.3
Silica			-	NAC	13.7	11.5
Metals						
Dissolved Aluminium	µg/l		150[4]	-	<20	<20
Dissolved Arsenic	µg/l		7.5[4]	-	<2.5	<2.5
Dissolved Barium	µg/l		-	-	72	79
Dissolved Boron	µg/l		750	-	17	<12
Dissolved Cadmium	µg/l		3.75	-	<0.5	<0.5
Dissolved Calcium	mg/l		-	-	100.8	83.1
Total Dissolved Chromium	µg/l		37.5[4]	-	<1.5	<1.5
Dissolved Copper	µg/l		1500	-	<7	<7
Total Iron	µg/l		-	200	<20	<20
Dissolved Lead	µg/l		7.5[4]	-	<5	<5
Dissolved Magnesium	mg/l		-	-	17.4	15.4
Dissolved Manganese	µg/l				130	<2
Dissolved Mercury	µg/l		0.75[4]	-	<1	<1
Dissolved Nickel	µg/l		15	-	9	<2
Dissolved Potassium	mg/l				2.1	1.4
Dissolved Selenium	µg/l		-	-	<3	<3
Dissolved Sodium	mg/l		150	-	12.8	9.6
Dissolved Zinc	µg/l		75[4]	-	9	4
Total Uranium	µg/l		-	9	<5	
MTBE	ug/l	<5	10[4]	30	<0.1	<0.1
Benzene	ug/l	<5	0.75[4]	1	<0.5	<0.5
Toluene	ug/l	<5	525[4]	10	<5	<5
Ethylbenzene	ug/l	<5	-	10	<1	<1
m/p-Xylene	ug/l	<5	-	10	<2	<2
o-Xylene	ug/l	<5	-	10	<1	<1
Total Xylenes	ug/l			10	<3	<3

		Sample Identity	Groundwater Standards		GW6	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
Total Petroleum Hydrocarbons (TPH-CWG)						
Aliphatics						
>C5-C6	µg/l	<10	-	-	<10	<10
>C6-C8	µg/l	<10	-	-	<10	<10
>C8-C10	µg/l	<10	-	-	<10	<10
>C10-C12	µg/l	<5	-	-	<5	<5
>C12-C16	µg/l	<10	-	-	<10	<10
>C16-C21	µg/l	<10	-	-	<10	<10
>C21-C35	µg/l	<10	-	-	<10	<10
>C35-C44	µg/l	<10	-	-	<10	<10
Total aliphatics C5-44	µg/l	<10	-	-	<10	<10
Aromatics						
>C5-EC7	µg/l	<10	-	-	<10	<10
>EC7-EC8	µg/l	<10	-	-	<10	<10
>EC8-EC10	µg/l	<10	-	-	<10	<10
>EC10-EC12	µg/l	<5	-	-	<5	<5
>EC12-EC16	µg/l	<10	-	-	<10	<10
>EC16-EC21	µg/l	<10	-	-	<10	<10
>EC21-EC35	µg/l	<10	-	-	<10	<10
>EC35-EC44	µg/l	<10	-	-	<10	<10
Total aromatics C5-44	µg/l	<10	-	-	<10	<10
Total aliphatics and aromatics(C5-44)	µg/l	<10	7.5[4,23]	10	<10	<10
Semi-Volatile Organic Compounds (SVOC's)						
Phenols						
2-Chlorophenol	ug/l	-	-	200	<1	<1
2-Methylphenol	ug/l	-	-	0.5	<0.5	<0.5
2-Nitrophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l	-	-	0.5	<1	<1
2,4,5-Trichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	-	-	200	<1	<1
4-Chloro-3-methylphenol	ug/l	-	-	0.5	<0.5	<0.5
4-Methylphenol	ug/l	-	-	0.5	<1	<1
4-Nitrophenol	ug/l	-	-	0.5	<10	<10
Pentachlorophenol	ug/l	-	-	2	<1	<1
Phenol	ug/l	-			<1	<1

Sample Identity			Groundwater Standards		GW6	
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
Sample Date					05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
PAHs	ug/l					
2-Chloronaphthalene	ug/l				<1	<1
2-Methylnaphthalene	ug/l				<1	<1
Naphthalene	ug/l		-	1	<1	<1
Acenaphthylene	ug/l		-	0.1	<0.5	<0.5
Acenaphthene	ug/l		-	0.1	<1	<1
Fluorene	ug/l		-	0.1	<0.5	<0.5
Phenanthrene	ug/l		-	0.1	<0.5	<0.5
Anthracene	ug/l		-	10000	<0.5	<0.5
Fluoranthene	ug/l		-	1	<0.5	<0.5
Pyrene	ug/l		-	0.1	<0.5	<0.5
Benzo(a)anthracene	ug/l		-	0.1	<0.5	<0.5
Chrysene	ug/l		-	0.1	<0.5	<0.5
Benzo(bk)fluoranthene	ug/l		-	0.5 / 0.05	<1	<1
Benzo(a)pyrene	ug/l		0.0075[4]	0.01	<1	<1
Indeno(123cd)pyrene	ug/l		-	0.05	<1	<1
Dibenzo(ah)anthracene	ug/l		-	0.1	<0.5	<0.5
Benzo(ghi)perylene	ug/l		-	0.05	<0.5	<0.5
Phthalates						
Bis/Di (2-ethylhexyl) phthalate	ug/l		6	8	<5	<5
Butylbenzyl phthalate	ug/l		-	-	<1	<1
Di-n-butyl phthalate	ug/l		-	2	<1.5	<1.5
Di-n-Octyl phthalate	ug/l		-	5	<1	<1
Diethyl phthalate	ug/l		-	5	<1	<1
Dimethyl phthalate	ug/l		-	5	<1	<1
Additional SVOCs						
SVOC TICs (trace organics)	µg/l		-	-		
1,2-Dichlorobenzene	µg/l		-	10	<1	<1
1,2,4-Trichlorobenzene	µg/l		-	0.4	<1	<1
1,3-Dichlorobenzene	µg/l		-	-	<1	<1
1,4-Dichlorobenzene	µg/l		-	-	<1	<1
2-Nitroaniline	µg/l		-	-	<1	<1
2,4-Dinitrotoluene	µg/l		-	-	<0.5	<0.5
2,6-Dinitrotoluene	µg/l		-	-	<1	<1
3-Nitroaniline	µg/l		-	-	<1	<1
4-Bromodiphenylether (4-Bromophenylpl	µg/l		-	-	<1	<1
4-Chloroaniline	µg/l		-	-	<1	<1
4-Chlorodiphenylether (4-Chlorophenylpl	µg/l		-	-	<1	<1
4-Nitroaniline	µg/l		-	-	<0.5	<0.5
Azobenzene	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethoxy)methane	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethyl)ether	µg/l		-	-	<1	<1
Carbazole	µg/l		-	-	<0.5	<0.5
Dibenzofuran	µg/l		-	-	<0.5	<0.5
Hexachlorobenzene	µg/l		-	0.03	<1	<1
Hexachlorobutadiene	µg/l		-	0.1	<1	<1
Hexachlorocyclopentadiene	µg/l		-	-	<1	<1
Hexachloroethane	µg/l		-	-	<1	<1
Isophorone	µg/l		-	-	<0.5	<0.5
N-nitrosodi-n-propylamine	µg/l		-	-	<0.5	<0.5
Nitrobenzene	µg/l		-	10	<1	<1

		Sample Identity	Groundwater Standards		GW6	
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
		Sample Date			05/12/2022	11/01/2023
Parameters	**Unit**	**MDL**				
VOCs						
Dichlorodifluoromethane	µg/l		-	-	<2	<2
Methyl Tertiary Butyl Ether	µg/l		-	-	<0.1	<0.1
Chloromethane	µg/l		-	-	<3	<3
Vinyl Chloride	µg/l		0.375[4]	-	<0.1	<0.1
Bromomethane	µg/l		-	-	<1	<1
Chloroethane	µg/l		-	-	<3	<3
Trichlorofluoromethane	µg/l		-	-	<3	<3
1,1-Dichloroethene	µg/l		-	-	<3	<3
Dichloromethane	µg/l		15[4]	0.04	<3	<3
trans-1-2-Dichloroethene	µg/l		-	-	<3	<3
1,1-Dichloroethane	µg/l		-	-	<3	<3
cis-1-2-Dichloroethene	µg/l		-	-	<3	<3
2,2-Dichloropropane	µg/l		-	-	<1	<1
Bromochloromethane	µg/l		-	-	<2	<2
Chloroform	µg/l		-	12	<2	<2
1,1,1-Trichloroethane	µg/l		-	500	<2	<2
1,1-Dichloropropene	µg/l		-	-	<3	<3
Carbon-tetrachloride/Tetrachloromethan	µg/l		-	2	<2	<2
1,2-Dichloroethane	µg/l		2.25[4]	3	<2	<2
Benzene	µg/l		0.75[4]	-	<0.5	<0.5
Trichloroethene	µg/l		7.5[4]	10	<3	<3
1,2-Dichloropropane	µg/l		-	-	<2	<2
Dibromomethane	µg/l		-	-	<3	<3
Bromodichloromethane	µg/l		-	-	<2	<2
cis-1-3-Dichloropropene	µg/l		-	-	<2	<2
Toluene	µg/l		525[4]	10	<5	<5
trans-1-3-Dichloropropene	µg/l		-	-	<2	<2
1,1,2-Trichloroethane	µg/l		-	-	<2	<2
Tetrachloroethene	µg/l		7.5[4]	10	<3	<3
1,3-Dichloropropane	µg/l		-	-	<2	<2
Dibromochloromethane	µg/l		-	-	<2	<2
1,2-Dibromoethane	µg/l		-	-	<2	<2
Chlorobenzene	µg/l		-	1	<2	<2
1,1,1,2-Tetrachloroethane	µg/l		-	-	<2	<2
Ethylbenzene	µg/l		-	10	<1	<1
p/m-Xylene	µg/l		-	10	<2	<2
o-Xylene	µg/l		-	10	<1	<1
Styrene	µg/l		-	-	<2	<2
Bromoform	µg/l		-	-	<2	<2
Isopropylbenzene	µg/l		-	-	<3	<3
1,1,2,2-Tetrachloroethane	µg/l		-	-	<4	<4
Bromobenzene	µg/l		-	-	<2	<2
1,2,3-Trichloropropane	µg/l		-	-	<3	<3
Propylbenzene	µg/l		-	-	<3	<3
2-Chlorotoluene	µg/l		-	-	<3	<3
1,3,5-Trimethylbenzene	µg/l		-	-	<3	<3
4-Chlorotoluene	µg/l		-	-	<3	<3
tert-Butylbenzene	µg/l		-	-	<3	<3
1,2,4-Trimethylbenzene	µg/l		-	-	<3	<3
sec-Butylbenzene	µg/l		-	-	<3	<3
4-Isopropyltoluene	µg/l		-	-	<3	<3
1,3-Dichlorobenzene	µg/l		-	-	<3	<3
1,4-Dichlorobenzene	µg/l		-	-	<3	<3
n-Butylbenzene	µg/l		-	-	<3	<3
1,2-Dichlorobenzene	µg/l		-	10	<3	<3
1,2-Dibromo-3-chloropropane	µg/l		-	-	<2	<2
1,2,4-Trichlorobenzene	µg/l		-	0.4	<3	<3
Hexachlorobutadiene	µg/l		-	0.1	<3	<3
Naphthalene	ug/l		-	1	<2	<2
1,2,3-Trichlorobenzene	µg/l		-	0.4	<3	<3

Sample Identity			Groundwater Standards		GW6	
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	22/20240	23/512
Sample Date					05/12/2022	11/01/2023
Parameters	Unit	MDL				
PCBS						
Total PCBs	µg/l			0.01	<0.2	
Pesticides						
Organochlorine Pesticides						
Aldrin	µg/l		-	0.01	<0.03	
Alpha-HCH	µg/l		-	0.1	<0.03	
Beta-HCH	µg/l		-	0.1	<0.03	
Chlorothalonil	µg/l		-	0.1	<7.50	
cis-Chlordane	µg/l		-	0.1	<0.03	
Delta-HCH	µg/l		-	0.1	<0.03	
Dieldrin	µg/l		-	0.01	<0.03	
Endosulphan I (alpha endosulphan)	µg/l		-	0.1	<0.03	
Endosulphan II (beta endosulphan)	µg/l		-	0.1	<0.03	
Endosulphan sulphate	µg/l		-	0.1	<0.03	
Endrin	µg/l			0.1	<0.03	
Gamma-HCH/Lindane	µg/l		-	0.1	<0.03	
Heptachlor	µg/l		-	0.1	<0.03	
Heptachlor Epoxide	µg/l		-	0.1	<0.03	
Hexachlorobenzene/Benzene Hexachlor	µg/l		-	0.03	<0.03	
Isodrin	µg/l		-	0.1	<0.03	
o,p'-DDE (2,4'-DDE)	µg/l		-	0.1	<0.03	
o,p'-DDT (2,4'-DDT)	µg/l		-	0.1	<0.03	
o,p'-Methoxychlor	µg/l		-	0.1	<0.03	
o,p'-TDE (Mitotane, Lysodren, Clodithan	µg/l		-	0.1	<0.03	
p,p'-DDE (4,4'-DDE)	µg/l		-	0.1	<0.03	
p,p'-DDT (Clofenotane, 4,4'-DDT)	µg/l		-	0.1	<0.03	
p,p'-Methoxychlor	µg/l		-	0.1	<0.03	
p,p'-TDE (Rhothane, Dilene, 4,4'-DDD)	µg/l		-	0.1	<0.03	
Pendimethalin	µg/l		-	0.1	<0.03	
Permethrin I (cis-Permethrin)	µg/l		-	Limit for total below	<0.03	
Permethrin II (trans-Permethrin)	µg/l		-		<0.03	
Quintozene (PCNB)	µg/l		-	0.1	<0.03	
Tecnazene	µg/l		-	0.1	<0.03	
Telodrin (Isobezan)	µg/l		-	0.1	<0.03	
trans-Chlordane	µg/l		-	0.1	<0.03	
Triadimefon	µg/l		-	0.1	<0.03	
Triallate	µg/l		-	0.1	<0.03	
Trifluralin	µg/l		-	0.1	<0.03	
Organophosphorus Pesticides						
Azinphos ethyl	µg/l		-	0.1	<0.03	
Azinphos methyl	µg/l		-	0.1	<0.15	
Carbophenothion	µg/l		-	0.1	<0.03	
Chlorfenvinphos	µg/l		-	5	<0.03	
Chlorpyrifos	µg/l		-	90	<0.03	
Chlorpyrifos-methyl	µg/l		-	0.1	<0.03	
Diazinon	µg/l		-	0.1	<0.03	
Dichlorvos	µg/l		-	0.001	<0.03	
Disulfoton	µg/l		-	0.1	<0.03	
Dimethoate	µg/l		-	0.1	<0.03	
Ethion (Diethion)	µg/l		-	0.1	<0.03	
Ethyl Parathion (Parathion)	µg/l		-	0.1	<0.03	
Etrimphos	µg/l		-	0.1	<0.03	
Fenitrothion	µg/l		-	0.1	<0.03	
Fenthion	µg/l		-	0.1	<0.03	
Malathion	µg/l		-	0.01	<0.03	
Methyl Parathion	µg/l		-	0.1	<0.03	
Mevinphos	µg/l		-	0.1	<0.03	
Phosalone (Benzophosphate)	µg/l		-	0.1	<0.03	
Pirimiphos Methyl	µg/l		-	0.1	<0.03	
Propetamphos	µg/l		-	0.1	<0.03	
Triazophos (Hostathion, Methoxone)	µg/l		-	0.1	<0.03	

		Sample Identity	Groundwater Standards		GWB	GWD
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/2413	23/2413
		Sample Date			10/02/2023	14/02/2023
Parameters	**Unit**	**MDL**				
Field Measured Parameters						
pH	pH Units		-	≥6.5 and ≤9.5	7.67	7.58
Temperature	°C		-	25	10.36	6.38
Dissolved Oxygen	mg/l				2.66	10.82
Dissolved Oxygen	%		-	NAC	22.95	88.51
Electrical Conductivity (EC)	µS/cm		800[1] - 1875[3]	1000	647.73	608.55
Oxidation/Reduction Potential (ORP)	mV				63.7	62.4
Colour	~		-	NAC	-	Cloudy
Sheen	~				-	No sheen
Observations	~				-	No S.S.
Odour	~				-	No odour
Taste	~				-	-
Turbidity	~				-	-
Indicators, Inorganics and Nutrients						
Chloride	mg/l		24[1] - 187.5[3]	30	20.4	16.3
Nitrate as NO3	mg/l		37.5[3,4]	25	<0.2	<0.2
Nitrite as NO2	mg/l		0.375[4]	0.1	0.05	<0.02
Total Ammonium (mg N/l)	mg N/l		0.065[2] - 0.175[4]	0.15	**0.09**	0.03
Total Cyanide	mg/l		0.0375	0.01	<0.01	<0.01
Sulphate	mg/l		187.5[4]	200	83	41.7
Orthophosphate	mg/l		-	0.03	<0.06	<0.06
Total Organic Carbon (TOC)	mg/l		-	NAC	<2	<2
Total Organic Nitrogen (TON)	mg/l		-	NAC	<0.5	0.7
Alkalinity	mg/l		-	NAC	245	287
Bicarbonate	mg/l		-	NAC	245	287
Carbonate	mg/l		-	NAC	<1	<1
Hardness (as $CaCO_3$)	mg/l		-	200	119	**276**
Total Dissolved Solids (TDS)	mg/l		-	1000	456	370
Fluoride	mg/l		-	1	<0.3	<0.3
Silica			-	NAC	12.3	9.2
Metals						
Dissolved Aluminium	µg/l		150[4]	-	<20	<20
Dissolved Arsenic	µg/l		7.5[4]	-	<2.5	2.8
Dissolved Barium	µg/l		-	-	33	100
Dissolved Boron	µg/l		750	-	94	56
Dissolved Cadmium	µg/l		3.75	-	<0.5	<0.5
Dissolved Calcium	mg/l		-	-	29.4	62.7
Total Dissolved Chromium	µg/l		37.5[4]	-	<1.5	<1.5
Dissolved Copper	µg/l		1500	-	<7	<7
Total Iron	µg/l		-	200	<20	<20
Dissolved Lead	µg/l		7.5[4]	-	<5	<5
Dissolved Magnesium	mg/l		-	-	10.8	28.3
Dissolved Manganese	µg/l				44	131
Dissolved Mercury	µg/l		0.75[4]	-	<1	<1
Dissolved Nickel	µg/l		15	-	2	<2
Dissolved Potassium	mg/l				4.6	4.9
Dissolved Selenium	µg/l		-	-	11	<3
Dissolved Sodium	mg/l		150	-	90.4	27.1
Dissolved Zinc	µg/l		75[4]	-	<3	<3
Total Uranium	µg/l		-	9	<5	<5
MTBE	ug/l	<5	10[4]	30	<0.1	<0.1
Benzene	ug/l	<5	0.75[4]	1	<0.5	<0.5
Toluene	ug/l	<5	525[4]	10	<5	<5
Ethylbenzene	ug/l	<5	-	10	<1	<1
m/p-Xylene	ug/l	<5	-	10	<2	<2
o-Xylene	ug/l	<5	-	10	<1	<1
Total Xylenes	ug/l			10	<3	<3

		Sample Identity	Groundwater Standards		GWB	GWD
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/2413	23/2413
		Sample Date			10/02/2023	14/02/2023
Parameters	**Unit**	**MDL**				
Total Petroleum Hydrocarbons (TPH-CWG)						
Aliphatics						
>C5-C6	µg/l	<10	-	-	<10	<10
>C6-C8	µg/l	<10	-	-	<10	<10
>C8-C10	µg/l	<10	-	-	<10	<10
>C10-C12	µg/l	<5	-	-	<5	<5
>C12-C16	µg/l	<10	-	-	<10	<10
>C16-C21	µg/l	<10	-	-	<10	<10
>C21-C35	µg/l	<10	-	-	<10	<10
>C35-C44	µg/l	<10	-	-	<10	<10
Total aliphatics C5-44	µg/l	<10	-	-	<10	<10
Aromatics						
>C5-EC7	µg/l	<10	-	-	<10	<10
>EC7-EC8	µg/l	<10	-	-	<10	<10
>EC8-EC10	µg/l	<10	-	-	<10	<10
>EC10-EC12	µg/l	<5	-	-	<5	<5
>EC12-EC16	µg/l	<10	-	-	<10	<10
>EC16-EC21	µg/l	<10	-	-	<10	<10
>EC21-EC35	µg/l	<10	-	-	<10	210
>EC35-EC44	µg/l	<10	-	-	<10	<10
Total aromatics C5-44	µg/l	<10	-	-	<10	210
Total aliphatics and aromatics(C5-44)	µg/l	<10	7.5[4,23]	10	<10	***210***
Semi-Volatile Organic Compounds (SVOC's)						
Phenols						
2-Chlorophenol	ug/l	-	-	200	<1	<1
2-Methylphenol	ug/l	-	-	0.5	<0.5	<0.5
2-Nitrophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l	-	-	0.5	<1	<1
2,4,5-Trichlorophenol	ug/l	-	-	0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	-	-	200	<1	<1
4-Chloro-3-methylphenol	ug/l	-	-	0.5	<0.5	<0.5
4-Methylphenol	ug/l	-	-	0.5	<1	<1
4-Nitrophenol	ug/l	-	-	0.5	<10	<10
Pentachlorophenol	ug/l	-	-	2	<1	<1
Phenol	ug/l	-			<1	<1

Sample Identity			Groundwater Standards		GWB	GWD
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/2413	23/2413
Sample Date					10/02/2023	14/02/2023
Parameters	Unit	MDL				
PAHs	ug/l					
2-Chloronaphthalene	ug/l				<1	<1
2-Methylnaphthalene	ug/l				<1	<1
Naphthalene	ug/l		-	1	<1	<1
Acenaphthylene	ug/l		-	0.1	<0.5	<0.5
Acenaphthene	ug/l		-	0.1	<1	<1
Fluorene	ug/l		-	0.1	<0.5	<0.5
Phenanthrene	ug/l		-	0.1	<0.5	<0.5
Anthracene	ug/l		-	10000	<0.5	<0.5
Fluoranthene	ug/l		-	1	<0.5	<0.5
Pyrene	ug/l		-	0.1	<0.5	<0.5
Benzo(a)anthracene	ug/l		-	0.1	<0.5	<0.5
Chrysene	ug/l		-	0.1	<0.5	<0.5
Benzo(bk)fluoranthene	ug/l		-	0.5 / 0.05	<1	<1
Benzo(a)pyrene	ug/l		0.0075[4]	0.01	<1	<1
Indeno(123cd)pyrene	ug/l		-	0.05	<1	<1
Dibenzo(ah)anthracene	ug/l		-	0.1	<0.5	<0.5
Benzo(ghi)perylene	ug/l		-	0.05	<0.5	<0.5
Phthalates						
Bis/Di (2-ethylhexyl) phthalate	ug/l		6	8	<5	<5
Butylbenzyl phthalate	ug/l		-	-	<1	<1
Di-n-butyl phthalate	ug/l		-	2	<1.5	<1.5
Di-n-Octyl phthalate	ug/l		-	5	<1	<1
Diethyl phthalate	ug/l		-	5	<1	<1
Dimethyl phthalate	ug/l		-	5	<1	<1
Additional SVOCs						
SVOC TICs (trace organics)	µg/l		-	-		
1,2-Dichlorobenzene	µg/l		-	10	<1	<1
1,2,4-Trichlorobenzene	µg/l		-	0.4	<1	<1
1,3-Dichlorobenzene	µg/l		-	-	<1	<1
1,4-Dichlorobenzene	µg/l		-	-	<1	<1
2-Nitroaniline	µg/l		-	-	<1	<1
2,4-Dinitrotoluene	µg/l		-	-	<0.5	<0.5
2,6-Dinitrotoluene	µg/l		-	-	<1	<1
3-Nitroaniline	µg/l		-	-	<1	<1
4-Bromodiphenylether (4-Bromophenylpl	µg/l		-	-	<1	<1
4-Chloroaniline	µg/l		-	-	<1	<1
4-Chlorodiphenylether (4-Chlorophenylpl	µg/l		-	-	<1	<1
4-Nitroaniline	µg/l		-	-	<0.5	<0.5
Azobenzene	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethoxy)methane	µg/l		-	-	<0.5	<0.5
Bis(2-chloroethyl)ether	µg/l		-	-	<1	<1
Carbazole	µg/l		-	-	<0.5	<0.5
Dibenzofuran	µg/l		-	-	<0.5	<0.5
Hexachlorobenzene	µg/l		-	0.03	<1	<1
Hexachlorobutadiene	µg/l		-	0.1	<1	<1
Hexachlorocyclopentadiene	µg/l		-	-	<1	<1
Hexachloroethane	µg/l		-	-	<1	<1
Isophorone	µg/l		-	-	<0.5	<0.5
N-nitrosodi-n-propylamine	µg/l		-	-	<0.5	<0.5
Nitrobenzene	µg/l		-	10	<1	<1

			Groundwater Standards			
Sample Identity					GWB	GWD
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/2413	23/2413
Sample Date					10/02/2023	14/02/2023
Parameters	**Unit**	**MDL**				
VOCs						
Dichlorodifluoromethane	µg/l		-	-	<2	<2
Methyl Tertiary Butyl Ether	µg/l		-	-	<0.1	<0.1
Chloromethane	µg/l		-	-	<3	<3
Vinyl Chloride	µg/l		0.375[4]	-	<0.1	<0.1
Bromomethane	µg/l		-	-	<1	<1
Chloroethane	µg/l		-	-	<3	<3
Trichlorofluoromethane	µg/l		-	-	<3	<3
1,1-Dichloroethene	µg/l		-	-	<3	<3
Dichloromethane	µg/l		15[4]	0.04	<3	<3
trans-1-2-Dichloroethene	µg/l		-	-	<3	<3
1,1-Dichloroethane	µg/l		-	-	<3	<3
cis-1-2-Dichloroethene	µg/l		-	-	<3	<3
2,2-Dichloropropane	µg/l		-	-	<1	<1
Bromochloromethane	µg/l		-	-	<2	<2
Chloroform	µg/l		-	12	<2	<2
1,1,1-Trichloroethane	µg/l		-	500	<2	<2
1,1-Dichloropropene	µg/l		-	-	<3	<3
Carbon-tetrachloride/Tetrachloromethan	µg/l		-	2	<2	<2
1,2-Dichloroethane	µg/l		2.25[4]	3	<2	<2
Benzene	µg/l		0.75[4]	-	<0.5	<0.5
Trichloroethene	µg/l		7.5[4]	10	<3	<3
1,2-Dichloropropane	µg/l		-	-	<2	<2
Dibromomethane	µg/l		-	-	<3	<3
Bromodichloromethane	µg/l		-	-	<2	<2
cis-1-3-Dichloropropene	µg/l		-	-	<2	<2
Toluene	µg/l		525[4]	10	<5	<5
trans-1-3-Dichloropropene	µg/l		-	-	<2	<2
1,1,2-Trichloroethane	µg/l		-	-	<2	<2
Tetrachloroethene	µg/l		7.5[4]	10	<3	<3
1,3-Dichloropropane	µg/l		-	-	<2	<2
Dibromochloromethane	µg/l		-	-	<2	<2
1,2-Dibromoethane	µg/l		-	-	<2	<2
Chlorobenzene	µg/l		-	1	<2	<2
1,1,1,2-Tetrachloroethane	µg/l		-	-	<2	<2
Ethylbenzene	µg/l		-	10	<1	<1
p/m-Xylene	µg/l		-	10	<2	<2
o-Xylene	µg/l		-	10	<1	<1
Styrene	µg/l		-	-	<2	<2
Bromoform	µg/l		-	-	<2	<2
Isopropylbenzene	µg/l		-	-	<3	<3
1,1,2,2-Tetrachloroethane	µg/l		-	-	<4	<4
Bromobenzene	µg/l		-	-	<2	<2
1,2,3-Trichloropropane	µg/l		-	-	<3	<3
Propylbenzene	µg/l		-	-	<3	<3
2-Chlorotoluene	µg/l		-	-	<3	<3
1,3,5-Trimethylbenzene	µg/l		-	-	<3	<3
4-Chlorotoluene	µg/l		-	-	<3	<3
tert-Butylbenzene	µg/l		-	-	<3	<3
1,2,4-Trimethylbenzene	µg/l		-	-	<3	<3
sec-Butylbenzene	µg/l		-	-	<3	<3
4-Isopropyltoluene	µg/l		-	-	<3	<3
1,3-Dichlorobenzene	µg/l		-	-	<3	<3
1,4-Dichlorobenzene	µg/l		-	-	<3	<3
n-Butylbenzene	µg/l		-	-	<3	<3
1,2-Dichlorobenzene	µg/l		-	10	<3	<3
1,2-Dibromo-3-chloropropane	µg/l		-	-	<2	<2
1,2,4-Trichlorobenzene	µg/l		-	0.4	<3	<3
Hexachlorobutadiene	µg/l		-	0.1	<3	<3
Naphthalene	ug/l		-	1	<2	<2
1,2,3-Trichlorobenzene	µg/l		-	0.4	<3	<3

		Sample Identity	Groundwater Standards		GWB	GWD
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/2413	23/2413
		Sample Date			10/02/2023	14/02/2023
Parameters	**Unit**	**MDL**				
PCBS						
Total PCBs	µg/l			0.01	<0.2	<0.2
Pesticides						
Organochlorine Pesticides						
Aldrin	µg/l		-	0.01	<0.01	<0.01
Alpha-HCH	µg/l		-	0.1	<0.01	<0.01
Beta-HCH	µg/l		-	0.1	<0.01	<0.01
Chlorothalonil	µg/l		-	0.1	<2.50	<2.50
cis-Chlordane	µg/l		-	0.1	<0.01	<0.01
Delta-HCH	µg/l		-	0.1	<0.01	<0.01
Dieldrin	µg/l		-	0.01	<0.01	<0.01
Endosulphan I (alpha endosulphan)	µg/l		-	0.1	<0.01	<0.01
Endosulphan II (beta endosulphan)	µg/l		-	0.1	<0.01	<0.01
Endosulphan sulphate	µg/l		-	0.1	<0.01	<0.01
Endrin	µg/l			0.1	<0.01	<0.01
Gamma-HCH/Lindane	µg/l		-	0.1	<0.01	<0.01
Heptachlor	µg/l		-	0.1	<0.01	<0.01
Heptachlor Epoxide	µg/l		-	0.1	<0.01	<0.01
Hexachlorobenzene/Benzene Hexachlor	µg/l		-	0.03	<0.01	<0.01
Isodrin	µg/l		-	0.1	<0.01	<0.01
o,p'-DDE (2,4'-DDE)	µg/l		-	0.1	<0.01	<0.01
o,p'-DDT (2,4'-DDT)	µg/l		-	0.1	<0.01	<0.01
o,p'-Methoxychlor	µg/l		-	0.1	<0.01	<0.01
o,p'-TDE (Mitotane, Lysodren, Clodithan	µg/l		-	0.1	<0.01	<0.01
p,p'-DDE (4,4'-DDE)	µg/l		-	0.1	<0.01	<0.01
p,p'-DDT (Clofenotane, 4,4'-DDT)	µg/l		-	0.1	<0.01	<0.01
p,p'-Methoxychlor	µg/l		-	0.1	<0.01	<0.01
p,p'-TDE (Rhothane, Dilene, 4,4'-DDD)	µg/l		-	0.1	<0.01	<0.01
Pendimethalin	µg/l		-	0.1	<0.01	<0.01
Permethrin I (cis-Permethrin)	µg/l		-	Limit for total below	<0.01	<0.01
Permethrin II (trans-Permethrin)	µg/l		-		<0.01	<0.01
Quintozene (PCNB)	µg/l		-	0.1	<0.01	<0.01
Tecnazene	µg/l		-	0.1	<0.01	<0.01
Telodrin (Isobezan)	µg/l		-	0.1	<0.01	<0.01
trans-Chlordane	µg/l		-	0.1	<0.01	<0.01
Triadimefon	µg/l		-	0.1	<0.01	<0.01
Triallate	µg/l		-	0.1	<0.01	<0.01
Trifluralin	µg/l		-	0.1	<0.01	<0.01
Organophosphorus Pesticides						
Azinphos ethyl	µg/l		-	0.1	<0.01	<0.01
Azinphos methyl	µg/l		-	0.1	<0.05	<0.05
Carbophenothion	µg/l		-	0.1	<0.01	<0.01
Chlorfenvinphos	µg/l		-	5	<0.01	<0.01
Chlorpyrifos	µg/l		-	90	<0.01	<0.01
Chlorpyrifos-methyl	µg/l		-	0.1	<0.01	<0.01
Diazinon	µg/l		-	0.1	<0.01	<0.01
Dichlorvos	µg/l		-	0.001	<0.01	<0.01
Disulfoton	µg/l		-	0.1	<0.01	<0.01
Dimethoate	µg/l		-	0.1	<0.01	<0.01
Ethion (Diethion)	µg/l		-	0.1	<0.01	<0.01
Ethyl Parathion (Parathion)	µg/l		-	0.1	<0.01	<0.01
Etrimphos	µg/l		-	0.1	<0.01	<0.01
Fenitrothion	µg/l		-	0.1	<0.01	<0.01
Fenthion	µg/l		-	0.1	<0.01	<0.01
Malathion	µg/l		-	0.01	<0.01	<0.01
Methyl Parathion	µg/l		-	0.1	<0.01	<0.01
Mevinphos	µg/l		-	0.1	<0.01	<0.01
Phosalone (Benzophosphate)	µg/l		-	0.1	<0.01	<0.01
Pirimiphos Methyl	µg/l		-	0.1	<0.01	<0.01
Propetamphos	µg/l		-	0.1	<0.01	<0.01
Triazophos (Hostathion, Methoxone)	µg/l		-	0.1	<0.01	<0.01

Parameters	Unit	MDL	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	External Well
		Sample Identity	Groundwater Standards		External Well
		Laboratory Report No.			23/1443
		Sample Date			25/01/2023
Field Measured Parameters					
pH	pH Units		-	≥6.5 and ≤9.5	-
Temperature	°C		-	25	-
Dissolved Oxygen	mg/l				-
Dissolved Oxygen	%		-	NAC	-
Electrical Conductivity (EC)	µS/cm		800[1] - 1875[3]	1000	-
Oxidation/Reduction Potential (ORP)	mV				-
Colour	~		-	NAC	-
Sheen	~				-
Observations	~				-
Odour	~				-
Taste	~				-
Turbidity	~				-
Indicators, Inorganics and Nutrients					
Chloride	mg/l		24[1] - 187.5[3]	30	9
Nitrate as NO3	mg/l		37.5[3,4]	25	<0.2
Nitrite as NO2	mg/l		0.375[4]	0.1	<0.02
Total Ammonium (mg N/l)	mg N/l		0.065[2] - 0.175[4]	0.15	<0.03
Total Cyanide	mg/l		0.0375	0.01	<0.01
Sulphate	mg/l		187.5[4]	200	59.8
Orthophosphate	mg/l		-	0.03	<0.06
Total Organic Carbon (TOC)	mg/l		-	NAC	<2
Total Organic Nitrogen (TON)	mg/l		-	NAC	<0.5
Alkalinity	mg/l		-	NAC	287
Bicarbonate	mg/l		-	NAC	287
Carbonate	mg/l		-	NAC	<1
Hardness (as $CaCO_3$)	mg/l		-	200	**315**
Total Dissolved Solids (TDS)	mg/l		-	1000	396
Fluoride	mg/l		-	1	<0.3
Silica			-	NAC	14.1
Metals					
Dissolved Aluminium	µg/l		150[4]	-	<20
Dissolved Arsenic	µg/l		7.5[4]	-	<2.5
Dissolved Barium	µg/l		-	-	205
Dissolved Boron	µg/l		750	-	29
Dissolved Cadmium	µg/l		3.75	-	<0.5
Dissolved Calcium	mg/l		-	-	87.6
Total Dissolved Chromium	µg/l		37.5[4]	-	<1.5
Dissolved Copper	µg/l		1500	-	<7
Total Iron	µg/l		-	200	<20
Dissolved Lead	µg/l		7.5[4]	-	<5
Dissolved Magnesium	mg/l		-	-	22.9
Dissolved Manganese	µg/l				74
Dissolved Mercury	µg/l		0.75[4]	-	<1
Dissolved Nickel	µg/l		15	-	5
Dissolved Potassium	mg/l				2.5
Dissolved Selenium	µg/l		-	-	<3
Dissolved Sodium	mg/l		150	-	13.5
Dissolved Zinc	µg/l		75[4]	-	15
Total Uranium	µg/l		-	9	<5
MTBE	ug/l	<5	10[4]	30	<0.1
Benzene	ug/l	<5	0.75[4]	1	<0.5
Toluene	ug/l	<5	525[4]	10	<5
Ethylbenzene	ug/l	<5	-	10	<1
m/p-Xylene	ug/l	<5	-	10	<2
o-Xylene	ug/l	<5	-	10	<1
Total Xylenes	ug/l			10	<3

		Sample Identity	Groundwater Standards		External Well
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/1443
		Sample Date			25/01/2023
Parameters	**Unit**	**MDL**			
Total Petroleum Hydrocarbons (TPH-CWG)					
Aliphatics					
>C5-C6	µg/l	<10	-	-	<10
>C6-C8	µg/l	<10	-	-	<10
>C8-C10	µg/l	<10	-	-	<10
>C10-C12	µg/l	<5	-	-	<5
>C12-C16	µg/l	<10	-	-	<10
>C16-C21	µg/l	<10	-	-	<10
>C21-C35	µg/l	<10	-	-	<10
>C35-C44	µg/l	<10	-	-	<10
Total aliphatics C5-44	µg/l	<10	-	-	<10
Aromatics					
>C5-EC7	µg/l	<10	-	-	<10
>EC7-EC8	µg/l	<10	-	-	<10
>EC8-EC10	µg/l	<10	-	-	<10
>EC10-EC12	µg/l	<5	-	-	<5
>EC12-EC16	µg/l	<10	-	-	<10
>EC16-EC21	µg/l	<10	-	-	<10
>EC21-EC35	µg/l	<10	-	-	<10
>EC35-EC44	µg/l	<10	-	-	<10
Total aromatics C5-44	µg/l	<10	-	-	<10
Total aliphatics and aromatics(C5-44)	µg/l	<10	7.5[4,23]	10	<10
Semi-Volatile Organic Compounds (SVOC's)					
Phenols					
2-Chlorophenol	ug/l	-	-	200	<1
2-Methylphenol	ug/l	-	-	0.5	<0.5
2-Nitrophenol	ug/l	-	-	0.5	<0.5
2,4-Dichlorophenol	ug/l	-	-	0.5	<0.5
2,4-Dimethylphenol	ug/l	-	-	0.5	<1
2,4,5-Trichlorophenol	ug/l	-	-	0.5	<0.5
2,4,6-Trichlorophenol	ug/l	-	-	200	<1
4-Chloro-3-methylphenol	ug/l	-	-	0.5	<0.5
4-Methylphenol	ug/l	-	-	0.5	<1
4-Nitrophenol	ug/l	-	-	0.5	<10
Pentachlorophenol	ug/l	-	-	2	<1
Phenol	ug/l	-			<1

		Sample Identity	Groundwater Standards		External Well
		Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/1443
		Sample Date			25/01/2023
Parameters	**Unit**	**MDL**			
PAHs	ug/l				
2-Chloronaphthalene	ug/l				<1
2-Methylnaphthalene	ug/l				<1
Naphthalene	ug/l		-	1	<1
Acenaphthylene	ug/l		-	0.1	<0.5
Acenaphthene	ug/l		-	0.1	<1
Fluorene	ug/l		-	0.1	<0.5
Phenanthrene	ug/l		-	0.1	<0.5
Anthracene	ug/l		-	10000	<0.5
Fluoranthene	ug/l		-	1	<0.5
Pyrene	ug/l		-	0.1	<0.5
Benzo(a)anthracene	ug/l		-	0.1	<0.5
Chrysene	ug/l		-	0.1	<0.5
Benzo(bk)fluoranthene	ug/l		-	0.5 / 0.05	<1
Benzo(a)pyrene	ug/l		0.0075[4]	0.01	<1
Indeno(123cd)pyrene	ug/l		-	0.05	<1
Dibenzo(ah)anthracene	ug/l		-	0.1	<0.5
Benzo(ghi)perylene	ug/l		-	0.05	<0.5
Phthalates					
Bis/Di (2-ethylhexyl) phthalate	ug/l		6	8	<5
Butylbenzyl phthalate	ug/l		-	-	<1
Di-n-butyl phthalate	ug/l		-	2	<1.5
Di-n-Octyl phthalate	ug/l		-	5	<1
Diethyl phthalate	ug/l		-	5	<1
Dimethyl phthalate	ug/l		-	5	<1
Additional SVOCs					
SVOC TICs (trace organics)	µg/l		-	-	
1,2-Dichlorobenzene	µg/l		-	10	<1
1,2,4-Trichlorobenzene	µg/l		-	0.4	<1
1,3-Dichlorobenzene	µg/l		-	-	<1
1,4-Dichlorobenzene	µg/l		-	-	<1
2-Nitroaniline	µg/l		-	-	<1
2,4-Dinitrotoluene	µg/l		-	-	<0.5
2,6-Dinitrotoluene	µg/l		-	-	<1
3-Nitroaniline	µg/l		-	-	<1
4-Bromodiphenylether (4-Bromophenylpl	µg/l		-	-	<1
4-Chloroaniline	µg/l		-	-	<1
4-Chlorodiphenylether (4-Chlorophenylpl	µg/l		-	-	<1
4-Nitroaniline	µg/l		-	-	<0.5
Azobenzene	µg/l		-	-	<0.5
Bis(2-chloroethoxy)methane	µg/l		-	-	<0.5
Bis(2-chloroethyl)ether	µg/l		-	-	<1
Carbazole	µg/l		-	-	<0.5
Dibenzofuran	µg/l		-	-	<0.5
Hexachlorobenzene	µg/l		-	0.03	<1
Hexachlorobutadiene	µg/l		-	0.1	<1
Hexachlorocyclopentadiene	µg/l		-	-	<1
Hexachloroethane	µg/l		-	-	<1
Isophorone	µg/l		-	-	<0.5
N-nitrosodi-n-propylamine	µg/l		-	-	<0.5
Nitrobenzene	µg/l		-	10	<1

			Groundwater Standards		
Sample Identity					External Well
Laboratory Report No.			Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/1443
Sample Date					25/01/2023
Parameters	**Unit**	**MDL**			
VOCs					
Dichlorodifluoromethane	µg/l		-	-	<2
Methyl Tertiary Butyl Ether	µg/l		-	-	<0.1
Chloromethane	µg/l		-	-	<3
Vinyl Chloride	µg/l		0.375[4]	-	<0.1
Bromomethane	µg/l		-	-	<1
Chloroethane	µg/l		-	-	<3
Trichlorofluoromethane	µg/l		-	-	<3
1,1-Dichloroethene	µg/l		-	-	<3
Dichloromethane	µg/l		15[4]	0.04	<3
trans-1-2-Dichloroethene	µg/l		-	-	<3
1,1-Dichloroethane	µg/l		-	-	<3
cis-1-2-Dichloroethene	µg/l		-	-	<3
2,2-Dichloropropane	µg/l		-	-	<1
Bromochloromethane	µg/l		-	-	<2
Chloroform	µg/l		-	12	<2
1,1,1-Trichloroethane	µg/l		-	500	<2
1,1-Dichloropropene	µg/l		-	-	<3
Carbon-tetrachloride/Tetrachloromethan	µg/l		-	2	<2
1,2-Dichloroethane	µg/l		2.25[4]	3	<2
Benzene	µg/l		0.75[4]	-	<0.5
Trichloroethene	µg/l		7.5[4]	10	<3
1,2-Dichloropropane	µg/l		-	-	<2
Dibromomethane	µg/l		-	-	<3
Bromodichloromethane	µg/l		-	-	<2
cis-1-3-Dichloropropene	µg/l		-	-	<2
Toluene	µg/l		525[4]	10	<5
trans-1-3-Dichloropropene	µg/l		-	-	<2
1,1,2-Trichloroethane	µg/l		-	-	<2
Tetrachloroethene	µg/l		7.5[4]	10	<3
1,3-Dichloropropane	µg/l		-	-	<2
Dibromochloromethane	µg/l		-	-	<2
1,2-Dibromoethane	µg/l		-	-	<2
Chlorobenzene	µg/l		-	1	<2
1,1,1,2-Tetrachloroethane	µg/l		-	-	<2
Ethylbenzene	µg/l		-	10	<1
p/m-Xylene	µg/l		-	10	<2
o-Xylene	µg/l		-	10	<1
Styrene	µg/l		-	-	<2
Bromoform	µg/l		-	-	<2
Isopropylbenzene	µg/l		-	-	<3
1,1,2,2-Tetrachloroethane	µg/l		-	-	<4
Bromobenzene	µg/l		-	-	<2
1,2,3-Trichloropropane	µg/l		-	-	<3
Propylbenzene	µg/l		-	-	<3
2-Chlorotoluene	µg/l		-	-	<3
1,3,5-Trimethylbenzene	µg/l		-	-	<3
4-Chlorotoluene	µg/l		-	-	<3
tert-Butylbenzene	µg/l		-	-	<3
1,2,4-Trimethylbenzene	µg/l		-	-	<3
sec-Butylbenzene	µg/l		-	-	<3
4-Isopropyltoluene	µg/l		-	-	<3
1,3-Dichlorobenzene	µg/l		-	-	<3
1,4-Dichlorobenzene	µg/l		-	-	<3
n-Butylbenzene	µg/l		-	-	<3
1,2-Dichlorobenzene	µg/l		-	10	<3
1,2-Dibromo-3-chloropropane	µg/l		-	-	<2
1,2,4-Trichlorobenzene	µg/l		-	0.4	<3
Hexachlorobutadiene	µg/l		-	0.1	<3
Naphthalene	ug/l		-	1	<2
1,2,3-Trichlorobenzene	µg/l		-	0.4	<3

			Sample Identity	Groundwater Standards		External Well
			Laboratory Report No.	Groundwater Regulations 2010 (S.I. No. 9 of 2010) as amended (S.I. No. 149 of 2012 and S.I. No. 366 of 2016)	EPA Interim Guideline Value (IGV) for Groundwater	23/1443
			Sample Date			25/01/2023
Parameters	Unit	MDL				
PCBS						
Total PCBs	µg/l				0.01	<0.2
Pesticides						
Organochlorine Pesticides						
Aldrin	µg/l			-	0.01	<0.01
Alpha-HCH	µg/l			-	0.1	<0.01
Beta-HCH	µg/l			-	0.1	<0.01
Chlorothalonil	µg/l			-	0.1	<2.50
cis-Chlordane	µg/l			-	0.1	<0.01
Delta-HCH	µg/l			-	0.1	<0.01
Dieldrin	µg/l			-	0.01	<0.01
Endosulphan I (alpha endosulphan)	µg/l			-	0.1	<0.01
Endosulphan II (beta endosulphan)	µg/l			-	0.1	<0.01
Endosulphan sulphate	µg/l			-	0.1	<0.01
Endrin	µg/l				0.1	<0.01
Gamma-HCH/Lindane	µg/l			-	0.1	<0.01
Heptachlor	µg/l			-	0.1	<0.01
Heptachlor Epoxide	µg/l			-	0.1	<0.01
Hexachlorobenzene/Benzene Hexachlor	µg/l			-	0.03	<0.01
Isodrin	µg/l			-	0.1	<0.01
o,p'-DDE (2,4'-DDE)	µg/l			-	0.1	<0.01
o,p'-DDT (2,4'-DDT)	µg/l			-	0.1	<0.01
o,p'-Methoxychlor	µg/l			-	0.1	<0.01
o,p'-TDE (Mitotane, Lysodren, Clodithan	µg/l			-	0.1	<0.01
p,p'-DDE (4,4'-DDE)	µg/l			-	0.1	<0.01
p,p'-DDT (Clofenotane, 4,4'-DDT)	µg/l			-	0.1	<0.01
p,p'-Methoxychlor	µg/l			-	0.1	<0.01
p,p'-TDE (Rhothane, Dilene, 4,4'-DDD)	µg/l			-	0.1	<0.01
Pendimethalin	µg/l			-	0.1	<0.01
Permethrin I (cis-Permethrin)	µg/l			-	Limit for total below	<0.01
Permethrin II (trans-Permethrin)	µg/l			-		<0.01
Quintozene (PCNB)	µg/l			-	0.1	<0.01
Tecnazene	µg/l			-	0.1	<0.01
Telodrin (Isobezan)	µg/l			-	0.1	<0.01
trans-Chlordane	µg/l			-	0.1	<0.01
Triadimefon	µg/l			-	0.1	<0.01
Triallate	µg/l			-	0.1	<0.01
Trifluralin	µg/l			-	0.1	<0.01
Organophosphorus Pesticides						
Azinphos ethyl	µg/l			-	0.1	<0.01
Azinphos methyl	µg/l			-	0.1	<0.05
Carbophenothion	µg/l			-	0.1	<0.01
Chlorfenvinphos	µg/l			-	5	<0.01
Chlorpyrifos	µg/l			-	90	<0.01
Chlorpyrifos-methyl	µg/l			-	0.1	<0.01
Diazinon	µg/l			-	0.1	<0.01
Dichlorvos	µg/l			-	0.001	<0.01
Disulfoton	µg/l			-	0.1	<0.01
Dimethoate	µg/l			-	0.1	<0.01
Ethion (Diethion)	µg/l			-	0.1	<0.01
Ethyl Parathion (Parathion)	µg/l			-	0.1	<0.01
Etrimphos	µg/l			-	0.1	<0.01
Fenitrothion	µg/l			-	0.1	<0.01
Fenthion	µg/l			-	0.1	<0.01
Malathion	µg/l			-	0.01	<0.01
Methyl Parathion	µg/l			-	0.1	<0.01
Mevinphos	µg/l			-	0.1	<0.01
Phosalone (Benzophosphate)	µg/l			-	0.1	<0.01
Pirimiphos Methyl	µg/l			-	0.1	<0.01
Propetamphos	µg/l			-	0.1	<0.01
Triazophos (Hostathion, Methoxone)	µg/l			-	0.1	<0.01

APPENDIX 8-2

Appendix 8-2
Project: E2037
Surface Water Monitoring

Table 1 : Results obtained from MCC for SW discharge

Parameter/Date	May-16	Oct-16	Jun-17	Sep-17	Sep-18	Nov-18	Jul-19	Nov-19	ELVs	SWACs
Flow									4	-
Temperature									25	less than 1.5 change before/after discharge
pH range	7.6	8.0	8.0	7.8	8.11	7.79	8.1	7.9	6 - 9	4.5 / 6 - 9
Parameters Limited by Discharge Licence (mg/l)	**May-16**	**Oct-16**	**Jun-17**	**Sep-17**	**Sep-18**	**Nov-18**	**Jul-19**	**Nov-19**	**ELVs**	**SWACs**
BOD5	<2	<2	<2	<2	<2	<2	3	<2	5	1.5 mean
Suspended Solids	9.0	12.0	4.0	**25.0**	13.0	**49.0**	**30.0**	**30.0**	20	-
Molybdate Reactive Phosphate (as P)	<0.01	<0.01	<0.01	<0.04	<0.04	<0.04	0.231	<0.01	0.3	0.035 mean
Total Ammonia (as N)	**0.75**	**0.92**	0.14	0.12	**0.53**	0.23	**1.06**	**1.06**	0.3	0.065 mean
Additional Sampled Parameters	**May-16**	**Oct-16**	**Jun-17**	**Sep-17**	**Sep-18**	**Nov-18**	**Jul-19**	**Nov-19**	**ELVs**	**SWACs**
COD (mg/l)	6.0	<5	8.0	8.0	<5	<5	<10	<10	-	-
Conductivity (uscm-1 @20C)	1715	1854	1939	1251	1761	1165	1509	1314	-	-
Nitrate (mg/l)	11.74	12.07	11.03	11.8	13.98	8.31	14.6	9.89	-	-

Appendix 8-2
Project: E2037
Surface Water Monitoring

Table 2: 2022/2023 Surface Water Monitoring Results

Parameter	Current Discharge Licence ELVs	SWACs	SW1											
			Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jul-23	Aug-23	Sep-23	Oct-23
Flow		-												
Temperature	**25**	1.5 change before/after discharge	13.3	6.9	4.8	6.4	9.2	9.1	9.3	15.4	16.4	16.1	13.2	10.2
pH range	**6 - 9**	4.5/6 - 9	8.01	7.96	8.03	7.43	7.94	7.74	7.74	7.72	7.64	7.89	7.54	7.61
	mg/l	**mg/l**	**mg/l**											
BOD5	**5**	1.5 mean	0.3	0.3	0.1	0.2	0.3	0.2	0.3	1.4	<0.1	<0.1	<0.1	<0.1
Suspended Solids	**20**	-	<5	<10	12	<5	5.8	<5	<5	<10	<10	<5	<10	<10
Molybdate Reactive Phosphate (as P)	**0.3**	0.035 mean	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Ammonia (as N)	**0.3**	0.065 mean	**0.74**	0.4	<0.1	0.1	<0.1	0.1	0.22	<0.1	<0.1	0.15	<0.1	<0.1
COD	**N/A**	-	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15
Nitrate	**N/A**	-	31	26	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphate	-	-				750	913							

SW1 - lagoon
SW2 - trade effluent discharge
SW3 - Aghnaskew upstream of discharge
SW4 - Aghnaskew downstream of discharge
SW5 - Aghnaskew upstream of wetland
wetland, before Dunsrim Lough

Appendix 8-2

Project: E2037

Surface Water Monitoring

Table 2: 2022/2023 Surface Water Monitoring Results

Parameter	Current Discharge Licence ELVs	SWACs	SW2											
			Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jul-23	Aug-23	Sep-23	Oct-23
Flow		-												
Temperature	**25**	1.5 change before/after discharge	12.4	6.4	5.5	7.5	9.6	9.9	8.8	13.9	15.6	17.3	13.2	-
pH range	**6 - 9**	4.5/6 - 9	7.67	7.95	7.96	7.73	7.84	7.49	7.64	7.47	7.59	7.72	7.32	-
	mg/l	**mg/l**	**mg/l**											
BOD5	**5**	1.5 mean	0.1	0.5	0.4	2.4	0.5	0.3	0.3	0.7	0.1	0.5	0.4	-
Suspended Solids	**20**	-	<5	15	**34**	<5	<5	**21**	**21**	<5	5.2	<5	16	-
Molybdate Reactive Phosphate (as P)	**0.3**	0.035 mean	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Total Ammonia (as N)	**0.3**	0.065 mean	**0.31**	**0.32**	0.18	0.11	<0.1	0.12	0.17	0.15	0.17	0.18	0.2	-
COD	**N/A**	-	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	-
Nitrate	**N/A**	-	17	7.2	3.8	4.8	1.8	3.8	1.7	2.2	5.6	6	7	-
Sulphate	-	-				877	900							

SW1 - lagoon
SW2 - trade effluent discharge
SW3 - Aghnaskew upstream of discharge
SW4 - Aghnaskew downstream of discharge
SW5 - Aghnaskew upstream of wetland
wetland, before Dunsrim Lough

Appendix 8-2
Project: E2037
Surface Water Monitoring

Table 2: 2022/2023 Surface Water Monitoring Results

Parameter	Current Discharge Licence ELVs	SWACs	SW3											
			Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jul-23	Aug-23	Sep-23	Oct-23
Flow		-												
Temperature	25	1.5 change before/after discharge	12.8	7.2	5.2	7.1	9.3	9.8	7.6	12.4	14.2	-	12.9	10.6
pH range	6 - 9	4.5/6 - 9	7.75	7.75	7.82	7.68	7.59	7.41	7.86	7.96	7.46	-	7.63	7.43
	mg/l	mg/l	mg/l											
BOD5	5	1.5 mean	0.6	1.1	0.4	0.9	0.6	0.6	0.3	**3.2**	0.6	-	1	0.6
Suspended Solids	20	-	<5	<10	<10	<5	<5	<5	<10	130	<10	-	12	<10
Molybdate Reactive Phosphate (as P)	0.3	0.035 mean	0.012	0.011	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.011	-	0.013	<0.01
Total Ammonia (as N)	0.3	0.065 mean	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	0.11	<0.1	-	<0.1	0.12
COD	N/A	-	20	15	<15	<15	<15	<15	<15	<15	23	-	15	18
Nitrate	N/A	-	1.3	3.5	2.6	2.8	1.2	2	0.64	0.99	0.54	-	0.51	0.54
Sulphate	-	-				21	<10							

SW1 - lagoon
SW2 - trade effluent discharge
SW3 - Aghnaskew upstream of discharge
SW4 - Aghnaskew downstream of discharge
SW5 - Aghnaskew upstream of wetland
wetland, before Dunsrim Lough

Appendix 8-2

Project: E2037

Surface Water Monitoring

Table 2: 2022/2023 Surface Water Monitoring Results

Parameter	Current Discharge Licence ELVs	SWACs	SW4									
			Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	Aug-23	Sep-23	Oct-23
Flow		-										
Temperature	**25**	1.5 change before/after discharge	12.4	6.8	5.3	7.5	9.8	9.7	8.9	16.1	13.3	10.7
pH range	**6 - 9**	4.5/6 - 9	7.59	7.54	7.97	7.67	7.6	7..3	7.5	7.62	7.27	7.49
	mg/l	**mg/l**	**mg/l**									
BOD5	**5**	1.5 mean	0.4	0.7	1.4	<6.0	0.7	0.3	0.4	0.7	2.8	0.8
Suspended Solids	**20**	-	<10	<10	10	<5	<5	16	10	<5	13	<10
Molybdate Reactive Phosphate (as P)	**0.3**	0.035 mean	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Ammonia (as N)	**0.3**	0.065 mean	0.12	0.2	0.15	<0.1	<0.1	0.12	0.15	0.15	0.15	0.11
COD	**N/A**	-	<15	<15	<15	<15	<15	<15	<15	<15	<15	16
Nitrate	**N/A**	-	12	5.7	3.4	4	1.5	3.2	1.2	6	7.1	0.83
Sulphate	-	-				491	613					

SW1 - lagoon
SW2 - trade effluent discharge
SW3 - Aghnaskew upstream of discharge
SW4 - Aghnaskew downstream of discharge
SW5 - Aghnaskew upstream of wetland
wetland, before Dunsrim Lough

Appendix 8-2
Project: E2037
Surface Water Monitoring

Table 2: 2022/2023 Surface Water Monitoring Results

Parameter	Current Discharge Licence ELVs	SWACs	SW5								
			Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jul-23	Aug-23	Sep-23	Oct-23
Flow		-									
Temperature	**25**	1.5 change before/after discharge	7.8	10.4	10.3	8.7	15.3	15.7	15.7	13.4	11
pH range	**6 - 9**	4.5/6 - 9	7.82	7.61	7.62	7.51	7.76	7.37	7.74	7.36	7.56
	mg/l	**mg/l**	**mg/l**								
BOD5	**5**	1.5 mean	1.9	0.5	0.6	0.3	0.9	0.8	1.1	2.9	0.6
Suspended Solids	**20**	-	<10	5.6	5.2	<10	<5	<5	<5	14	<10
Molybdate Reactive Phosphate (as P)	**0.3**	0.035 mean	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Ammonia (as N)	**0.3**	0.065 mean	<0.1	<0.1	<0.1	<0.1	0.11	0.14	0.14	0.12	<0.1
COD	**N/A**	-	<15	<15	<15	<15	61	<15	<15	<15	16
Nitrate	**N/A**	-	8.8	4.1	6.8	2.9	2	3.6	5.2	6.1	3.2
Sulphate	-	-	374	476							

SW1 - lagoon
SW2 - trade effluent discharge
SW3 - Aghnaskew upstream of discharge
SW4 - Aghnaskew downstream of discharge
SW5 - Aghnaskew upstream of wetland
wetland, before Dunsrim Lough

Appendix 8-2
Project: E2037
Surface Water Monitoring

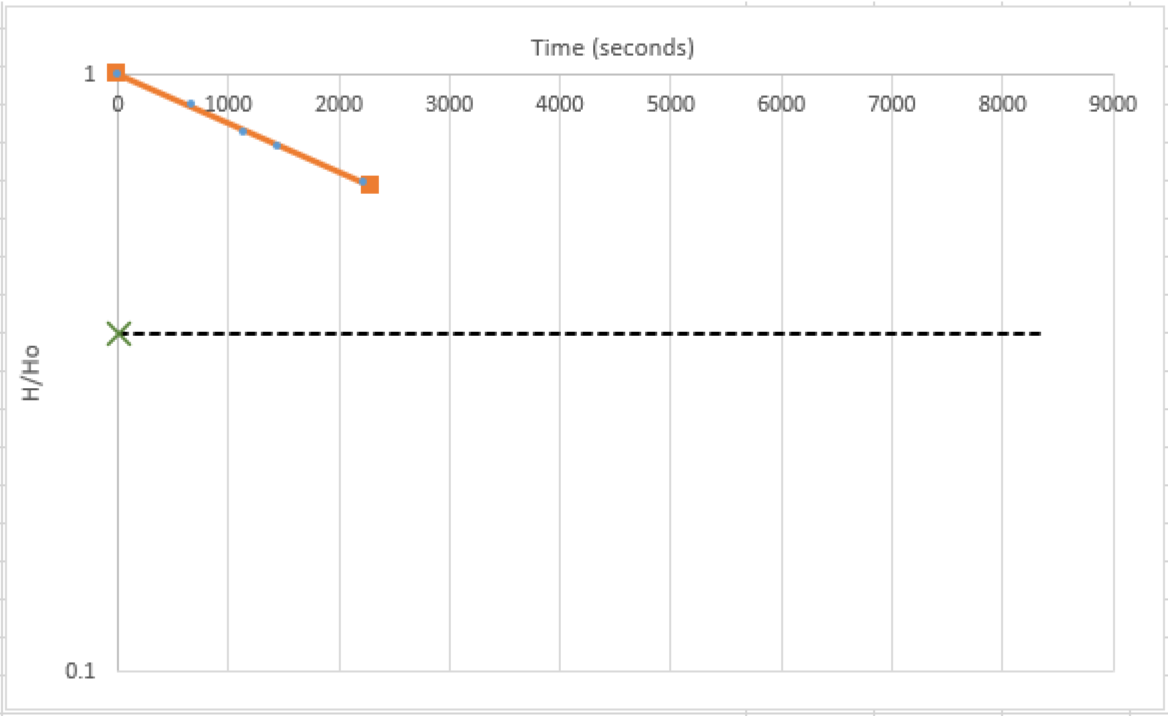
Table 2: 2022/2023 Surface Water Monitoring Results

Parameter	Current Discharge Licence ELVs	SWACs	SW6								
			Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jul-23	Aug-23	Sep-23	Oct-23
Flow		-									
Temperature	25	1.5 change before/after discharge	7.71	9.9	10.5	9.6	14.3	14.4	14.7	13.3	10.1
pH range	6 - 9	4.5/6 - 9	7.1	7.29	7.11	7.41	7.84	7.42	7.57	7.07	7.33
	mg/l	mg/l	mg/l								
BOD5	5	1.5 mean	1.2	1.7	0.9	**2.6**	**5.3**	**2**	<6.5	**2.1**	1.2
Suspended Solids	20	-	<5	<5	<5	16	14	<10	<10	<10	<10
Molybdate Reactive Phosphate (as P)	0.3	0.035 mean	0.058	0.088	0.054	0.079	0.12	0.1	0.2	0.15	0.089
Total Ammonia (as N)	0.3	0.065 mean	<0.1	0.11	0.1	0.12	0.22	<0.1	0.1	<0.1	<0.1
COD	N/A	-	19	20	20	28	27	47	31	32	24
Nitrate	N/A	-	5.3	2.9	3.7	1.9	0.69	1.7	<0.5	1.8	2.5
Sulphate	-	-	55	79							

SW1 - lagoon
SW2 - trade effluent discharge
SW3 - Aghnaskew upstream of discharge
SW4 - Aghnaskew downstream of discharge
SW5 - Aghnaskew upstream of wetland
wetland, before Dunsrim Lough

APPENDIX 8-3

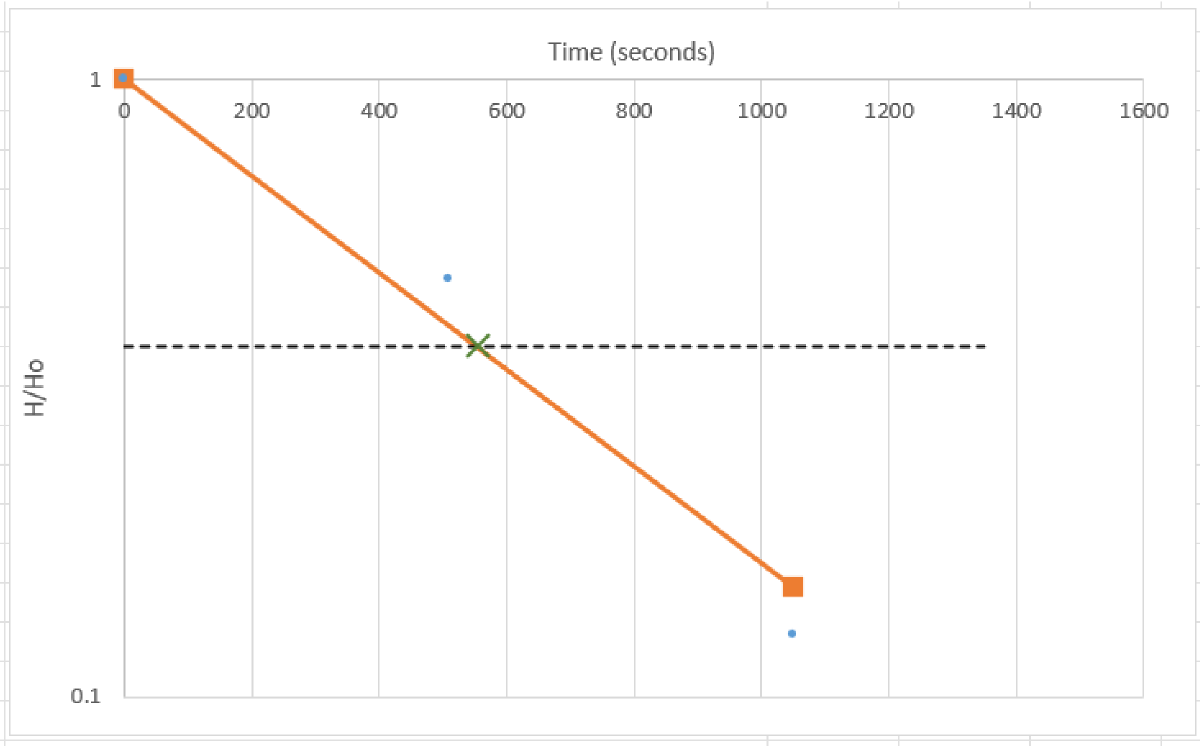
GW2 – Slug Test



Rest water level: 0mbtoci

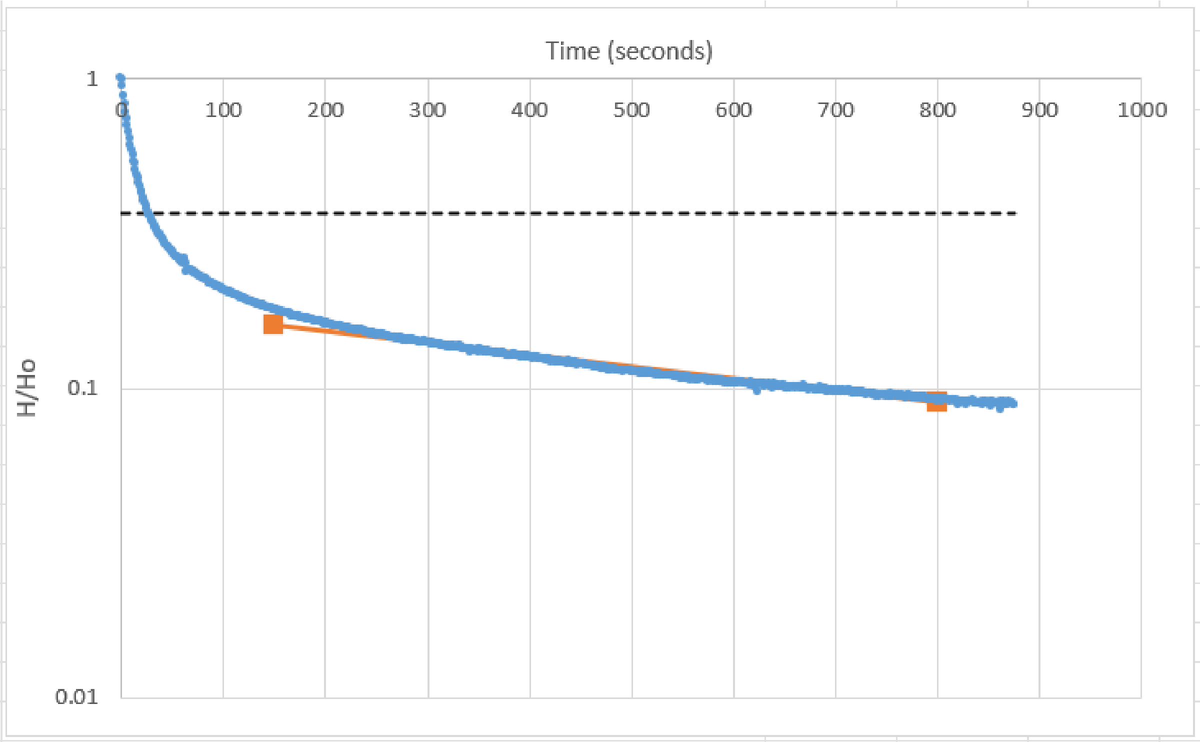
Time (seconds)	Water level (mbd)	H (m)	H/Ho
0	1.12	-1.12	1
660	1	-1	0.89285
1140	0.9	-0.9	0.80357
1440	0.85	-0.85	0.75892
2220	0.74	-0.74	0.66071
8340	0	0	0
Hydraulic conductivity	**K**	m/s	1.16E-08
		m/d	9.98E-04

GW3 – Slug Test



Rest water level:	6.82mbtoci		
Time (seconds)	Water level (mbd)	H (m)	H/Ho
0	8.25	-1.43	1
510	7.5	-0.68	0.475524
1050	7	-0.18	0.125874
1350	6.82	0	0
Hydraulic conductivity	**K**	m/s m/d	9.35E-08 8.08E-03

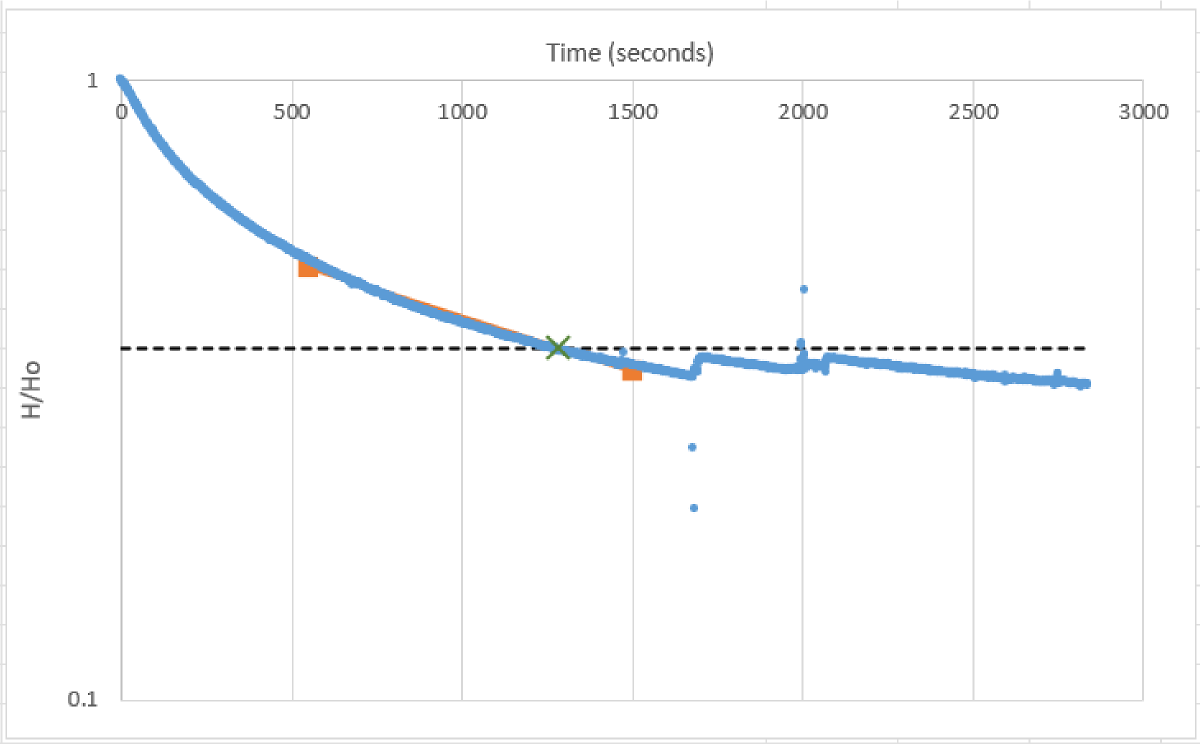
GW4 – Slug Test



Rest water level: 3.44 m below datum (mbd)

Time (seconds)	Water level (mbd)	H (m)	H/Ho
0	2.8671	0.5729	1
265	3.3562	0.0838	0.146273
410	3.3686	0.0714	0.124629
876	3.3897	0.0503	0.087799
Hydraulic conductivity	**K**	m/s m/d	1.80E-07 1.55E-02

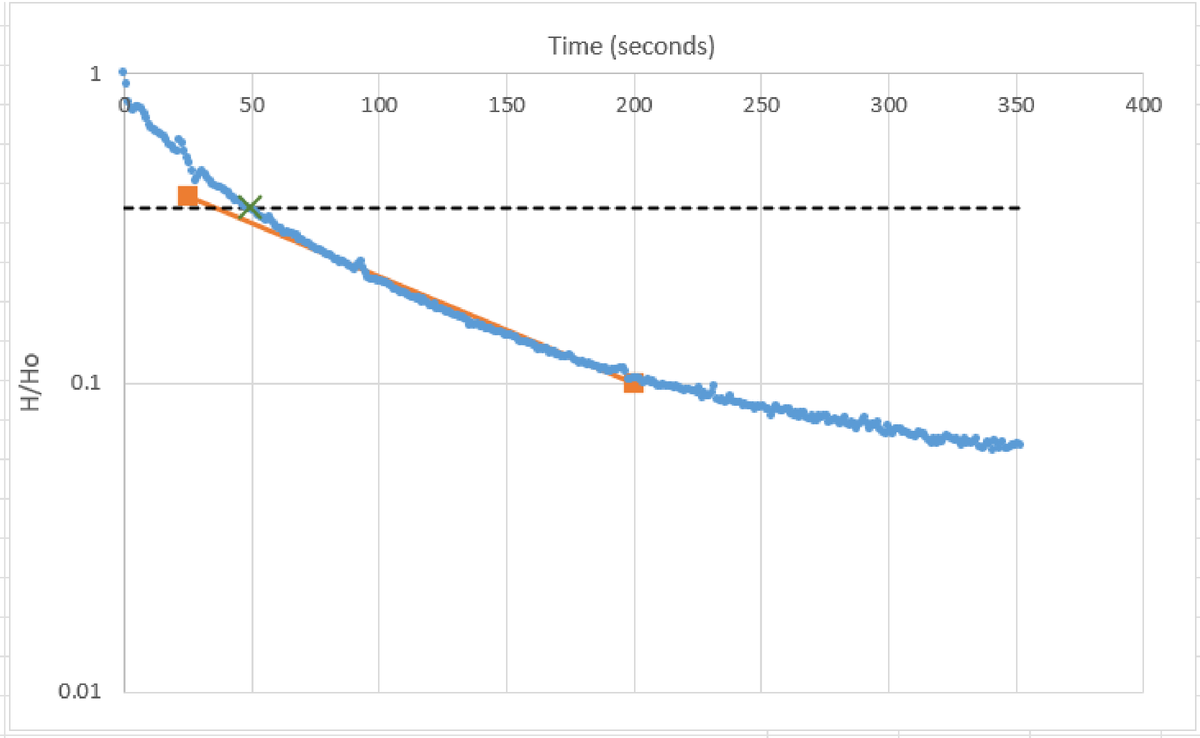
GW5 – Slug Test



Rest water level: 12.44 m below datum (mbd)

Time (seconds)	Water level (mbd)	H (m)	H/Ho
0	11.7867	0.6533	1
350	12.0499	0.3901	0.597122
900	12.1641	0.2759	0.422317
1500	12.2134	0.2266	0.346854
2838	12.2294	0.2106	0.322363
Hydraulic conductivity	**K**	m/s m/d	2.11E-08 1.83E-03

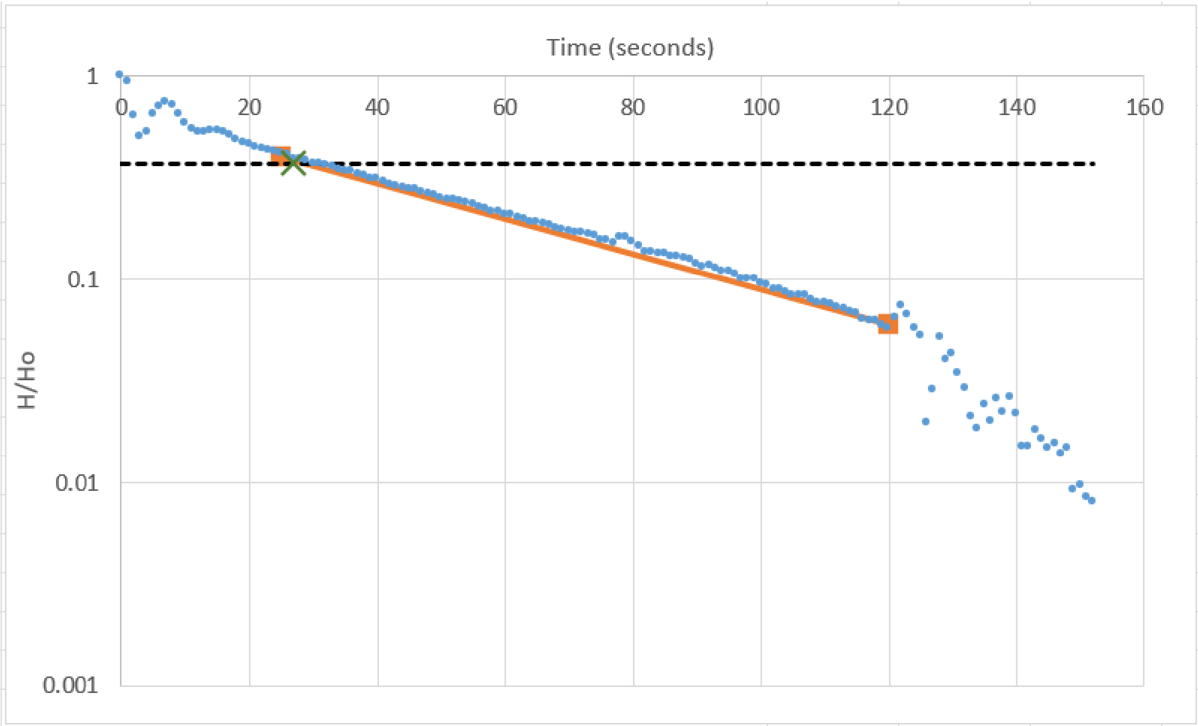
GW6 – Slug Test (First Test)



Rest water level: 14.8 m below datum (mbd)

Time (seconds)	Water level (mbd)	H (m)	H/Ho
0	14.5242	0.2758	1
100	14.7412	0.0588	0.213198
250	14.7772	0.0228	0.082669
352	14.7828	0.0172	0.062364
Hydraulic conductivity	**K**	m/s m/d	1.66E-06 1.44E-01

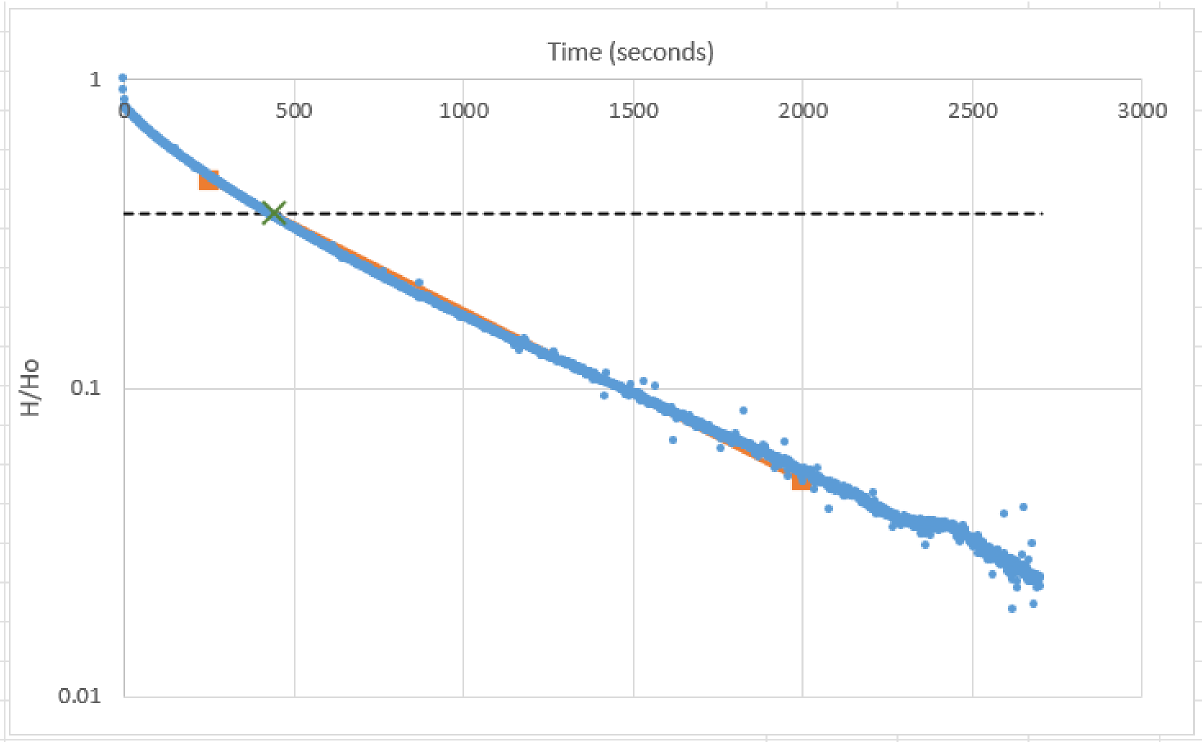
GW6 – Slug Test (Second Test)



Rest water level: 14.8 m below datum (mbd)

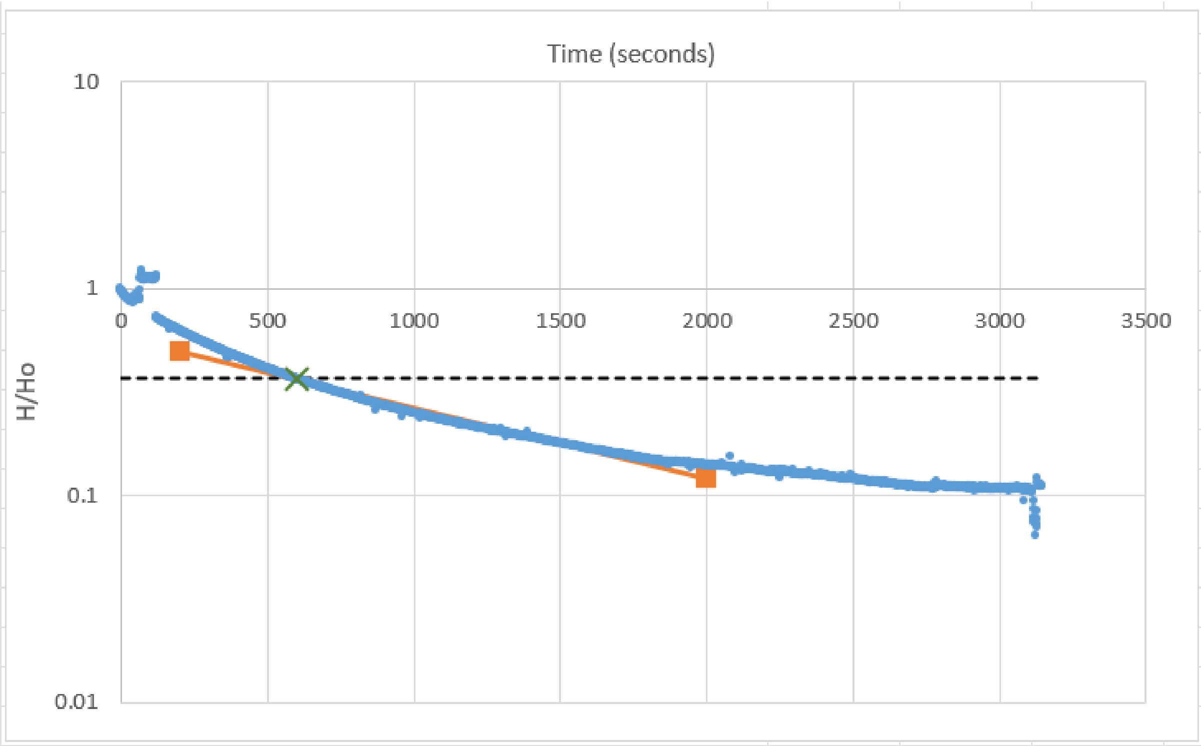
Time (seconds)	Water level (mbd)	H (m)	H/Ho
0	14.5622	0.2378	1
40	14.7255	0.0745	0.313288
75	14.7632	0.0368	0.154752
152	14.7981	0.0019	0.00799
Hydraulic conductivity	**K**	m/s m/d	4.19E-06 3.62E-01

GWB – Slug Test (First Test)



Rest water level:	12.08	m below datum (mbd)	
Time (seconds)	Water level (mbd)	H (m)	H/Ho
0	11.3853	0.6947	1
450	11.8329	0.2471	0.355693
900	11.9452	0.1348	0.194041
1500	12.0139	0.0661	0.095149
2703	12.0631	0.0169	0.024327
Hydraulic conductivity	**K**	m/s m/d	9.74E-08 8.42E-03

GWB – Slug Test (Second Test)



Rest water level: 12.08 m below datum (mbd)

Time (seconds)	Water level (mbd)	H (m)	H/Ho
0	11.4263	0.6537	1
350	11.7529	0.3271	0.500382
950	11.9105	0.1695	0.259293
1500	11.9637	0.1163	0.17791
2250	11.9955	0.0845	0.129264
3147	12.0084	0.0716	0.10953
Hydraulic conductivity	**K**	m/s m/d	6.03E-08 5.21E-03

APPENDIX 8-4

WELL ID: GW3 - Section A

Local ID: GW3
Date: #########
Time: 00:00

INPUT

Construction:	
Casing dia. (d_c)	0.14 Meter
Annulus dia. (d_w)	0.14 Meter
Screen Length (L)	39 Meter
Depths to:	
water level (DTW)	3.11 Meter
Top of Aquifer	3.11 Meter
Base of Aquifer	82 Meter
Annular Fill:	
across screen --	Gravel
above screen --	Bentonite
Aquifer Material --	Basalt
FLOW RATE	5 liters/min

COMPUTED

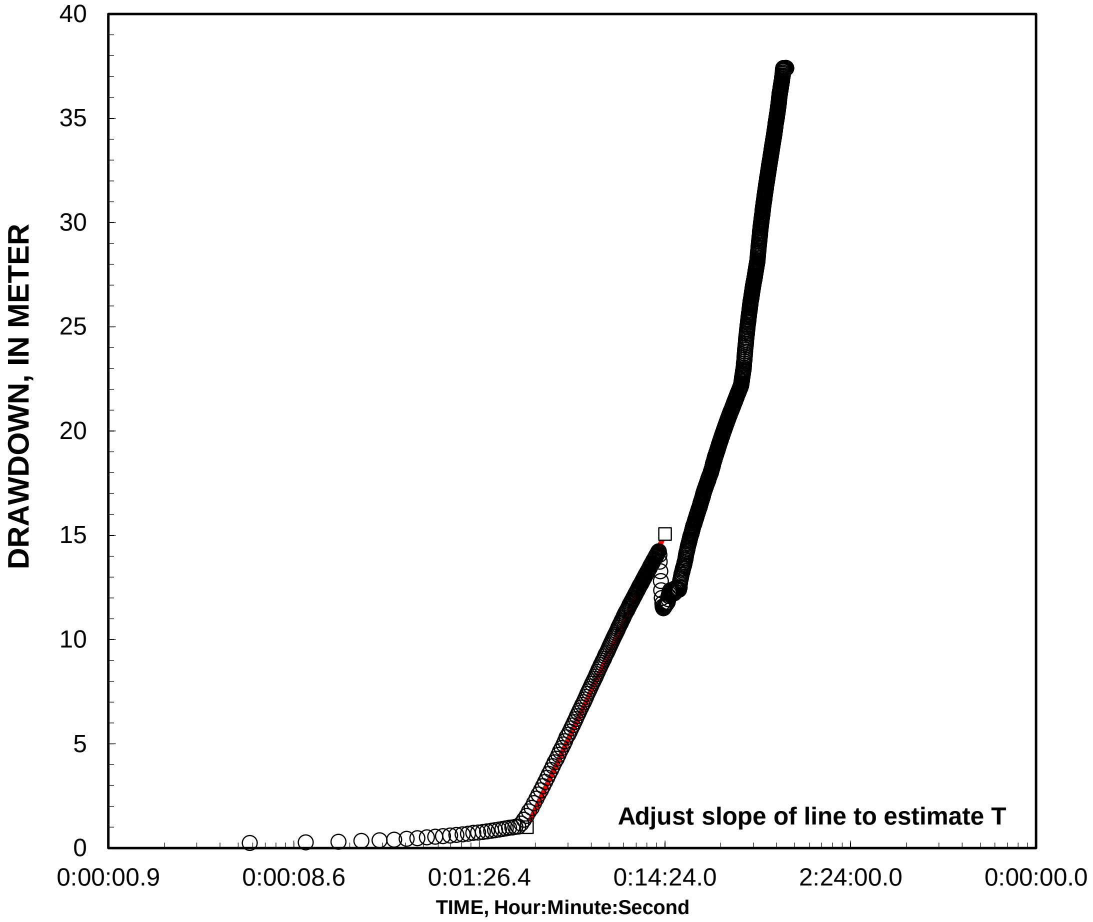
Aquifer thickness = 79 Meter

Slope = 5.754438 Meter/log10

Input is consistent.

K =	0.00089 Meter/Day
T =	0.07 Meter²/Day

K= 0.00089 is less than likely minimum of 0.00914 for Basalt



REMARKS:

Cooper-Jacob analysis of single-well aquifer test

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	43.54	51	1/0/00 0:29:10	23.79
2	1/0/00 0:00:35	43.09	52	1/0/00 0:29:45	23.57
3	1/0/00 0:01:10	42.87	53	1/0/00 0:30:20	23.35
4	1/0/00 0:01:45	42.67	54	1/0/00 0:30:55	23.14
5	1/0/00 0:02:20	42.50	55	1/0/00 0:31:30	22.95
6	1/0/00 0:02:55	41.16	56	1/0/00 0:32:05	22.76
7	1/0/00 0:03:30	39.79	57	1/0/00 0:32:40	22.58
8	1/0/00 0:04:05	38.57	58	1/0/00 0:33:15	22.41
9	1/0/00 0:04:40	37.49	59	1/0/00 0:33:50	22.23
10	1/0/00 0:05:15	36.53	60	1/0/00 0:34:25	22.06
11	1/0/00 0:05:50	35.66	61	1/0/00 0:35:00	21.90
12	1/0/00 0:06:25	34.87	62	1/0/00 0:35:35	21.73
13	1/0/00 0:07:00	34.15	63	1/0/00 0:36:10	21.57
14	1/0/00 0:07:35	33.49	64	1/0/00 0:36:45	21.42
15	1/0/00 0:08:10	32.88	65	1/0/00 0:37:20	21.13
16	1/0/00 0:08:45	32.33	66	1/0/00 0:37:55	20.72
17	1/0/00 0:09:20	31.85	67	1/0/00 0:38:30	20.20
18	1/0/00 0:09:55	31.40	68	1/0/00 0:39:05	19.53
19	1/0/00 0:10:30	30.99	69	1/0/00 0:39:40	18.94
20	1/0/00 0:11:05	30.59	70	1/0/00 0:40:15	18.42
21	1/0/00 0:11:40	30.23	71	1/0/00 0:40:50	17.97
22	1/0/00 0:12:15	29.88	72	#N/A	#N/A
23	1/0/00 0:12:50	29.56	73	#N/A	#N/A
24	1/0/00 0:13:25	29.47	74	#N/A	#N/A
25	1/0/00 0:14:00	31.95	75	#N/A	#N/A
26	1/0/00 0:14:35	31.84	76	#N/A	#N/A
27	1/0/00 0:15:10	31.34	77	#N/A	#N/A
28	1/0/00 0:15:45	31.22	78	#N/A	#N/A
29	1/0/00 0:16:20	31.11	79	#N/A	#N/A
30	1/0/00 0:16:55	31.12	80	#N/A	#N/A
31	1/0/00 0:17:30	30.60	81	#N/A	#N/A
32	1/0/00 0:18:05	30.08	82	#N/A	#N/A
33	1/0/00 0:18:40	29.53	83	#N/A	#N/A
34	1/0/00 0:19:15	28.99	84	#N/A	#N/A
35	1/0/00 0:19:50	28.54	85	#N/A	#N/A
36	1/0/00 0:20:25	28.15	86	#N/A	#N/A
37	1/0/00 0:21:00	27.79	87	#N/A	#N/A
38	1/0/00 0:21:35	27.47	88	#N/A	#N/A
39	1/0/00 0:22:10	27.13	89	#N/A	#N/A
40	1/0/00 0:22:45	26.78	90	#N/A	#N/A
41	1/0/00 0:23:20	26.48	91	#N/A	#N/A
42	1/0/00 0:23:55	26.19	92	#N/A	#N/A
43	1/0/00 0:24:30	25.91	93	#N/A	#N/A
44	1/0/00 0:25:05	25.66	94	#N/A	#N/A
45	1/0/00 0:25:40	25.41	95	#N/A	#N/A
46	1/0/00 0:26:15	25.08	96	#N/A	#N/A
47	1/0/00 0:26:50	24.77	97	#N/A	#N/A
48	1/0/00 0:27:25	24.52	98	#N/A	#N/A
49	1/0/00 0:28:00	24.27	99	#N/A	#N/A
50	1/0/00 0:28:35	24.02	100	#N/A	#N/A

WELL ID: GW3 - Section B

Local ID: GW3
Date:
Time: 00:00

Entry

INPUT

Construction:	
Casing dia. (d_c)	0.14 Meter
Annulus dia. (d_w)	0.14 Meter
Screen Length (L)	39 Meter
Depths to:	
water level (DTW)	3.11 Meter
Top of Aquifer	3.11 Meter
Base of Aquifer	82 Meter
Annular Fill:	
across screen --	Gravel
above screen --	Bentonite
Aquifer Material --	Basalt
FLOW RATE	2.75 liters/min

COMPUTED

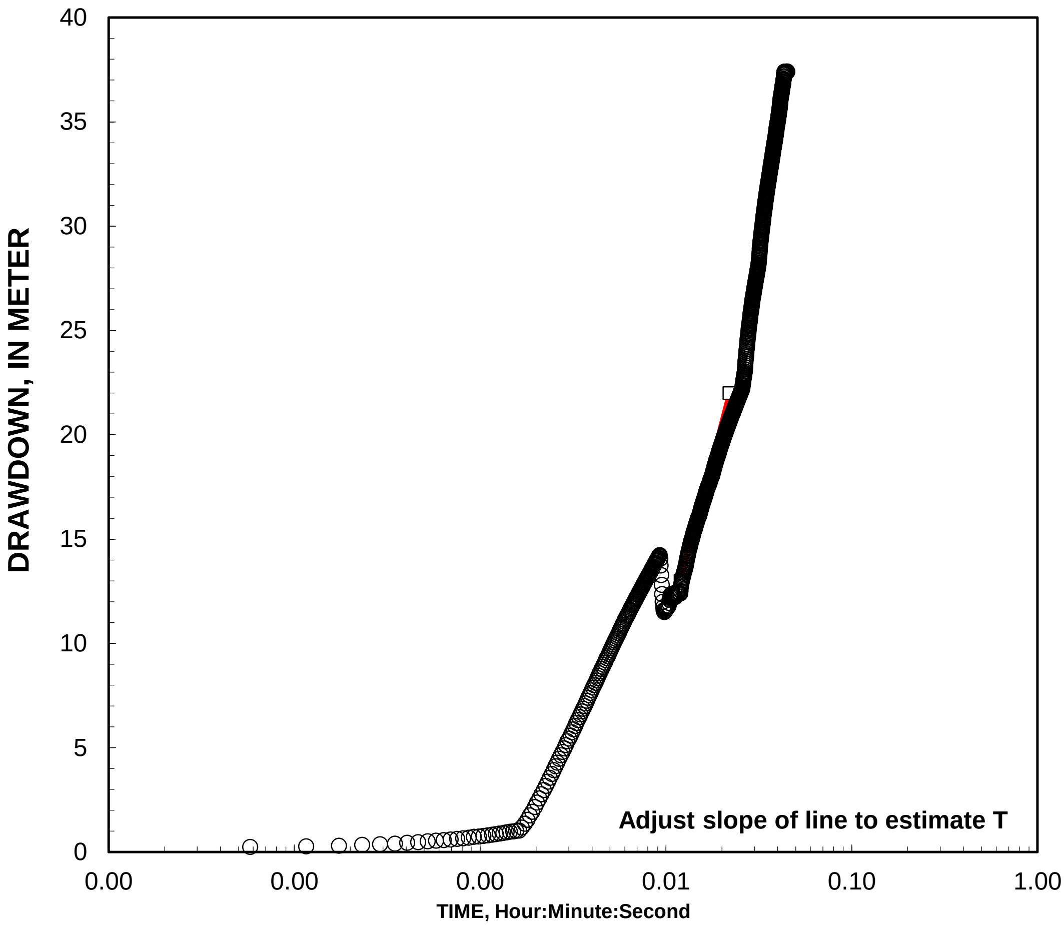
Aquifer thickness = 79 Meter

Slope = 10.42085 Meter/log10

Input is consistent.

K =	0.00027	Meter/Day
T =	0.021	Meter²/Day

K= 0.00027 is less than likely minimum of 0.00914 for Basalt



REMARKS:

Cooper-Jacob analysis of single-well aquifer test

Reduced Data

Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1/0/00 0:00:00	43.54	51	1/0/00 0:29:10	23.79
1/0/00 0:00:35	43.09	52	1/0/00 0:29:45	23.57
1/0/00 0:01:10	42.87	53	1/0/00 0:30:20	23.35
1/0/00 0:01:45	42.67	54	1/0/00 0:30:55	23.14
1/0/00 0:02:20	42.50	55	1/0/00 0:31:30	22.95
1/0/00 0:02:55	41.16	56	1/0/00 0:32:05	22.76
1/0/00 0:03:30	39.79	57	1/0/00 0:32:40	22.58
1/0/00 0:04:05	38.57	58	1/0/00 0:33:15	22.41
1/0/00 0:04:40	37.49	59	1/0/00 0:33:50	22.23
1/0/00 0:05:15	36.53	60	1/0/00 0:34:25	22.06
1/0/00 0:05:50	35.66	61	1/0/00 0:35:00	21.90
1/0/00 0:06:25	34.87	62	1/0/00 0:35:35	21.73
1/0/00 0:07:00	34.15	63	1/0/00 0:36:10	21.57
1/0/00 0:07:35	33.49	64	1/0/00 0:36:45	21.42
1/0/00 0:08:10	32.88	65	1/0/00 0:37:20	21.13
1/0/00 0:08:45	32.33	66	1/0/00 0:37:55	20.72
1/0/00 0:09:20	31.85	67	1/0/00 0:38:30	20.20
1/0/00 0:09:55	31.40	68	1/0/00 0:39:05	19.53
1/0/00 0:10:30	30.99	69	1/0/00 0:39:40	18.94
1/0/00 0:11:05	30.59	70	1/0/00 0:40:15	18.42
1/0/00 0:11:40	30.23	71	1/0/00 0:40:50	17.97
1/0/00 0:12:15	29.88	72	#N/A	#N/A
1/0/00 0:12:50	29.56	73	#N/A	#N/A
1/0/00 0:13:25	29.47	74	#N/A	#N/A
1/0/00 0:14:00	31.95	75	#N/A	#N/A
1/0/00 0:14:35	31.84	76	#N/A	#N/A
1/0/00 0:15:10	31.34	77	#N/A	#N/A
1/0/00 0:15:45	31.22	78	#N/A	#N/A
1/0/00 0:16:20	31.11	79	#N/A	#N/A
1/0/00 0:16:55	31.12	80	#N/A	#N/A
1/0/00 0:17:30	30.60	81	#N/A	#N/A
1/0/00 0:18:05	30.08	82	#N/A	#N/A
1/0/00 0:18:40	29.53	83	#N/A	#N/A
1/0/00 0:19:15	28.99	84	#N/A	#N/A
1/0/00 0:19:50	28.54	85	#N/A	#N/A
1/0/00 0:20:25	28.15	86	#N/A	#N/A
1/0/00 0:21:00	27.79	87	#N/A	#N/A
1/0/00 0:21:35	27.47	88	#N/A	#N/A
1/0/00 0:22:10	27.13	89	#N/A	#N/A
1/0/00 0:22:45	26.78	90	#N/A	#N/A
1/0/00 0:23:20	26.48	91	#N/A	#N/A
1/0/00 0:23:55	26.19	92	#N/A	#N/A
1/0/00 0:24:30	25.91	93	#N/A	#N/A
1/0/00 0:25:05	25.66	94	#N/A	#N/A
1/0/00 0:25:40	25.41	95	#N/A	#N/A
1/0/00 0:26:15	25.08	96	#N/A	#N/A
1/0/00 0:26:50	24.77	97	#N/A	#N/A
1/0/00 0:27:25	24.52	98	#N/A	#N/A
1/0/00 0:28:00	24.27	99	#N/A	#N/A
1/0/00 0:28:35	24.02	100	#N/A	#N/A

WELL ID: GW3 - Section C

Local ID: GW3
Date:
Time: 00:00

Entry

INPUT

Construction:		
Casing dia. (d_c)	0.14	Meter
Annulus dia. (d_w)	0.14	Meter
Screen Length (L)	39	Meter
Depths to:		
water level (DTW)	3.11	Meter
Top of Aquifer	3.11	Meter
Base of Aquifer	82	Meter
Annular Fill:		
across screen --	Gravel	
above screen --	Bentonite	
Aquifer Material --	Basalt	
FLOW RATE	3.03	liters/min

COMPUTED

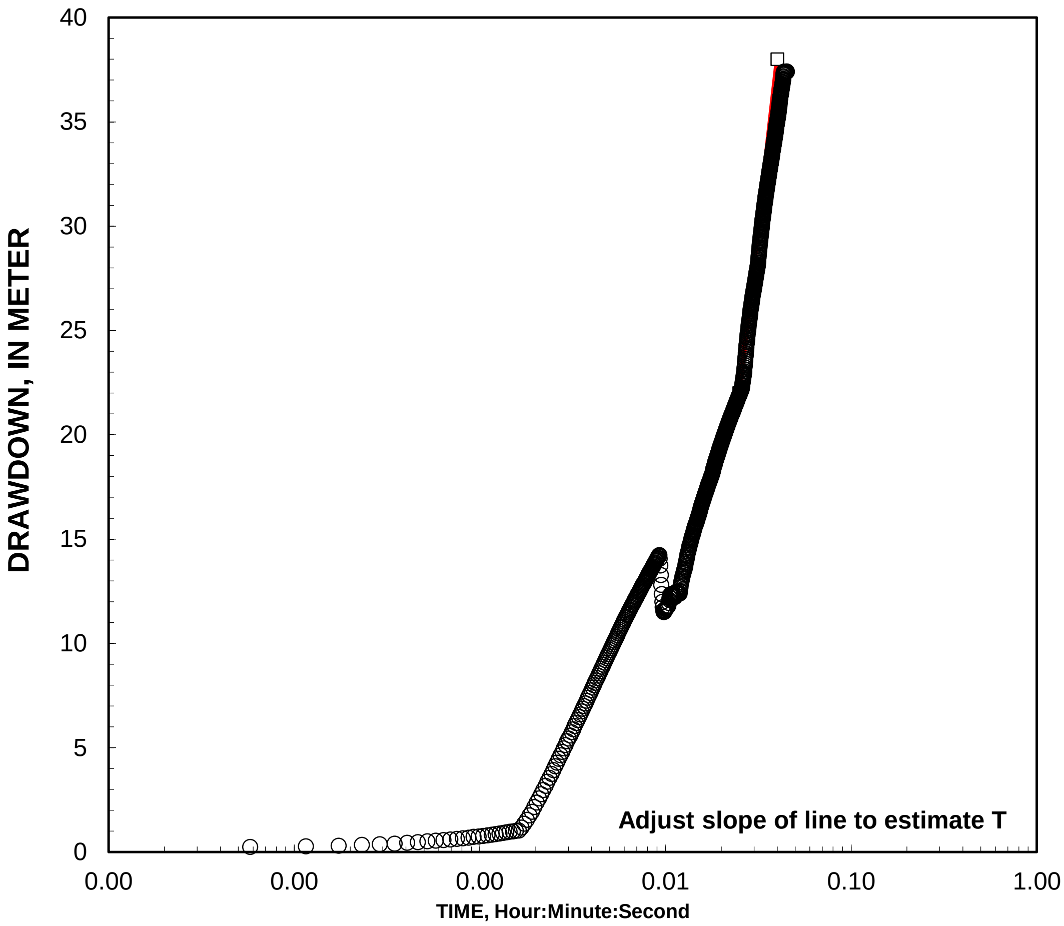
Aquifer thickness = 79 Meter

Slope = 23.89183 Meter/log10

Input is consistent.

K =	0.00013	Meter/Day
T =	0.01	Meter²/Day

K= 0.00013 is less than likely minimum of 0.00914 for Basalt



REMARKS:

Cooper-Jacob analysis of single-well aquifer test

Reduced Data

Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1/0/00 0:00:00	43.54	51	1/0/00 0:29:10	23.79
1/0/00 0:00:35	43.09	52	1/0/00 0:29:45	23.57
1/0/00 0:01:10	42.87	53	1/0/00 0:30:20	23.35
1/0/00 0:01:45	42.67	54	1/0/00 0:30:55	23.14
1/0/00 0:02:20	42.50	55	1/0/00 0:31:30	22.95
1/0/00 0:02:55	41.16	56	1/0/00 0:32:05	22.76
1/0/00 0:03:30	39.79	57	1/0/00 0:32:40	22.58
1/0/00 0:04:05	38.57	58	1/0/00 0:33:15	22.41
1/0/00 0:04:40	37.49	59	1/0/00 0:33:50	22.23
1/0/00 0:05:15	36.53	60	1/0/00 0:34:25	22.06
1/0/00 0:05:50	35.66	61	1/0/00 0:35:00	21.90
1/0/00 0:06:25	34.87	62	1/0/00 0:35:35	21.73
1/0/00 0:07:00	34.15	63	1/0/00 0:36:10	21.57
1/0/00 0:07:35	33.49	64	1/0/00 0:36:45	21.42
1/0/00 0:08:10	32.88	65	1/0/00 0:37:20	21.13
1/0/00 0:08:45	32.33	66	1/0/00 0:37:55	20.72
1/0/00 0:09:20	31.85	67	1/0/00 0:38:30	20.20
1/0/00 0:09:55	31.40	68	1/0/00 0:39:05	19.53
1/0/00 0:10:30	30.99	69	1/0/00 0:39:40	18.94
1/0/00 0:11:05	30.59	70	1/0/00 0:40:15	18.42
1/0/00 0:11:40	30.23	71	1/0/00 0:40:50	17.97
1/0/00 0:12:15	29.88	72	#N/A	#N/A
1/0/00 0:12:50	29.56	73	#N/A	#N/A
1/0/00 0:13:25	29.47	74	#N/A	#N/A
1/0/00 0:14:00	31.95	75	#N/A	#N/A
1/0/00 0:14:35	31.84	76	#N/A	#N/A
1/0/00 0:15:10	31.34	77	#N/A	#N/A
1/0/00 0:15:45	31.22	78	#N/A	#N/A
1/0/00 0:16:20	31.11	79	#N/A	#N/A
1/0/00 0:16:55	31.12	80	#N/A	#N/A
1/0/00 0:17:30	30.60	81	#N/A	#N/A
1/0/00 0:18:05	30.08	82	#N/A	#N/A
1/0/00 0:18:40	29.53	83	#N/A	#N/A
1/0/00 0:19:15	28.99	84	#N/A	#N/A
1/0/00 0:19:50	28.54	85	#N/A	#N/A
1/0/00 0:20:25	28.15	86	#N/A	#N/A
1/0/00 0:21:00	27.79	87	#N/A	#N/A
1/0/00 0:21:35	27.47	88	#N/A	#N/A
1/0/00 0:22:10	27.13	89	#N/A	#N/A
1/0/00 0:22:45	26.78	90	#N/A	#N/A
1/0/00 0:23:20	26.48	91	#N/A	#N/A
1/0/00 0:23:55	26.19	92	#N/A	#N/A
1/0/00 0:24:30	25.91	93	#N/A	#N/A
1/0/00 0:25:05	25.66	94	#N/A	#N/A
1/0/00 0:25:40	25.41	95	#N/A	#N/A
1/0/00 0:26:15	25.08	96	#N/A	#N/A
1/0/00 0:26:50	24.77	97	#N/A	#N/A
1/0/00 0:27:25	24.52	98	#N/A	#N/A
1/0/00 0:28:00	24.27	99	#N/A	#N/A
1/0/00 0:28:35	24.02	100	#N/A	#N/A

WELL ID: GW5 - Section B

Local ID: GW5
Date:
Time: 00:00

INPUT

Construction:	
Casing dia. (d_c)	0.14 Meter
Annulus dia. (d_w)	0.14 Meter
Screen Length (L)	30 Meter
Depths to:	
water level (DTW)	12.35 Meter
Top of Aquifer	12.35 Meter
Base of Aquifer	79 Meter
Annular Fill:	
across screen --	Gravel
above screen --	Bentonite
Aquifer Material --	Basalt
FLOW RATE	1.07 liters/min

COMPUTED

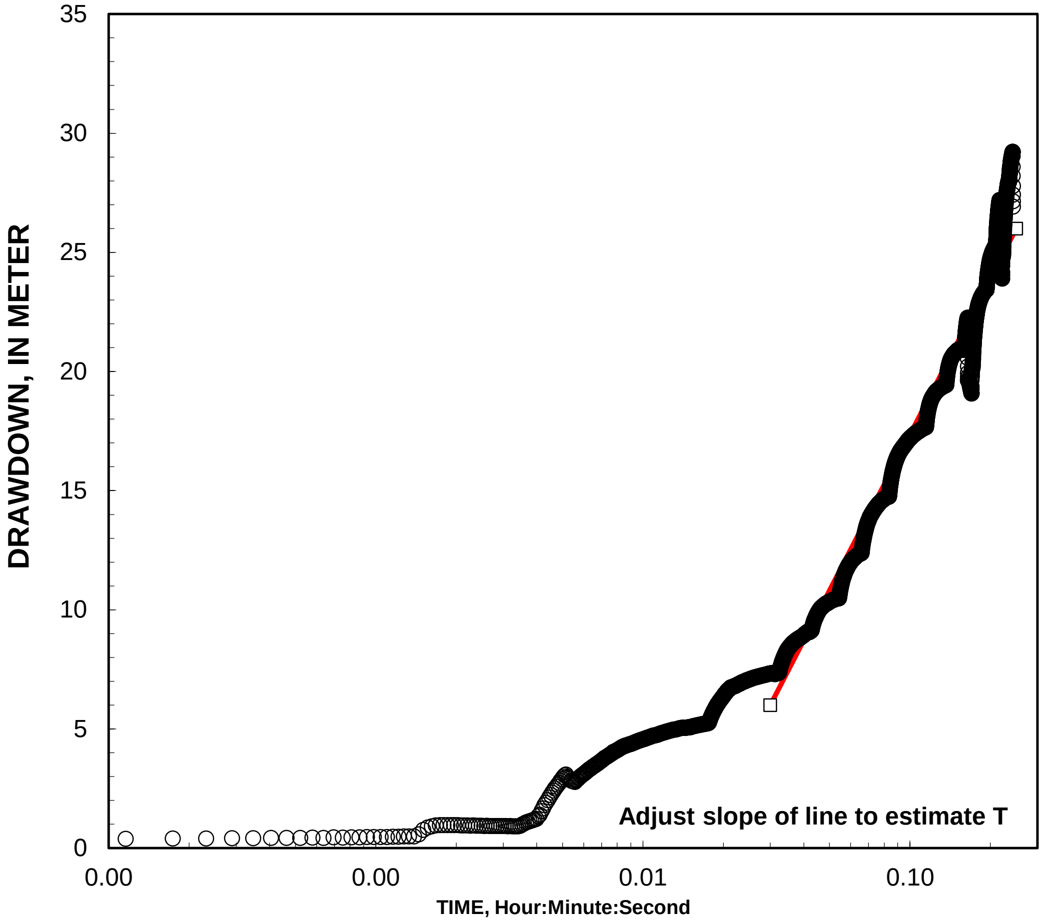
Aquifer thickness = 67 Meter

Slope = 6.620195 Meter/log10

Input is consistent.

K =	0.0002 Meter/Day
T =	0.013 Meter²/Day

K= 0.0002 is less than likely minimum of 0.00914 for Basalt



REMARKS: Cooper-Jacob analysis of single-well aquifer test

Relatively straight line in later data - line has been fitted to this

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	41.37	51	#N/A	#N/A
2	1/0/00 0:01:40	40.89	52	#N/A	#N/A
3	1/0/00 0:03:20	40.42	53	#N/A	#N/A
4	1/0/00 0:05:00	40.43	54	#N/A	#N/A
5	1/0/00 0:06:40	38.96	55	#N/A	#N/A
6	1/0/00 0:08:20	38.40	56	#N/A	#N/A
7	1/0/00 0:10:00	37.72	57	#N/A	#N/A
8	1/0/00 0:11:40	37.22	58	#N/A	#N/A
9	1/0/00 0:13:20	36.95	59	#N/A	#N/A
10	1/0/00 0:15:00	36.74	60	#N/A	#N/A
11	1/0/00 0:16:40	36.57	61	#N/A	#N/A
12	1/0/00 0:18:20	36.43	62	#N/A	#N/A
13	1/0/00 0:20:00	36.33	63	#N/A	#N/A
14	1/0/00 0:21:40	36.29	64	#N/A	#N/A
15	1/0/00 0:23:20	36.20	65	#N/A	#N/A
16	1/0/00 0:25:00	36.14	66	#N/A	#N/A
17	1/0/00 0:26:40	35.56	67	#N/A	#N/A
18	1/0/00 0:28:20	35.10	68	#N/A	#N/A
19	1/0/00 0:30:00	34.74	69	#N/A	#N/A
20	1/0/00 0:31:40	34.58	70	#N/A	#N/A
21	1/0/00 0:33:20	34.46	71	#N/A	#N/A
22	1/0/00 0:35:00	34.35	72	#N/A	#N/A
23	1/0/00 0:36:40	34.26	73	#N/A	#N/A
24	1/0/00 0:38:20	34.19	74	#N/A	#N/A
25	1/0/00 0:40:00	34.14	75	#N/A	#N/A
26	#N/A	#N/A	76	#N/A	#N/A
27	#N/A	#N/A	77	#N/A	#N/A
28	#N/A	#N/A	78	#N/A	#N/A
29	#N/A	#N/A	79	#N/A	#N/A
30	#N/A	#N/A	80	#N/A	#N/A
31	#N/A	#N/A	81	#N/A	#N/A
32	#N/A	#N/A	82	#N/A	#N/A
33	#N/A	#N/A	83	#N/A	#N/A
34	#N/A	#N/A	84	#N/A	#N/A
35	#N/A	#N/A	85	#N/A	#N/A
36	#N/A	#N/A	86	#N/A	#N/A
37	#N/A	#N/A	87	#N/A	#N/A
38	#N/A	#N/A	88	#N/A	#N/A
39	#N/A	#N/A	89	#N/A	#N/A
40	#N/A	#N/A	90	#N/A	#N/A
41	#N/A	#N/A	91	#N/A	#N/A
42	#N/A	#N/A	92	#N/A	#N/A
43	#N/A	#N/A	93	#N/A	#N/A
44	#N/A	#N/A	94	#N/A	#N/A
45	#N/A	#N/A	95	#N/A	#N/A
46	#N/A	#N/A	96	#N/A	#N/A
47	#N/A	#N/A	97	#N/A	#N/A
48	#N/A	#N/A	98	#N/A	#N/A
49	#N/A	#N/A	99	#N/A	#N/A
50	#N/A	#N/A	100	#N/A	#N/A

WELL ID: GW6 - Section C

Local ID: GW6
Date:
Time: 00:00

INPUT

Construction:	
Casing dia. (d_c)	0.14 Meter
Annulus dia. (d_w)	0.14 Meter
Screen Length (L)	6 Meter
Depths to:	
water level (DTW)	14.8 Meter
Top of Aquifer	14.8 Meter
Base of Aquifer	42 Meter
Annular Fill:	
across screen --	Gravel
above screen --	Bentonite
Aquifer Material --	Fractured Igneous anc
FLOW RATE	7.42 liters/min

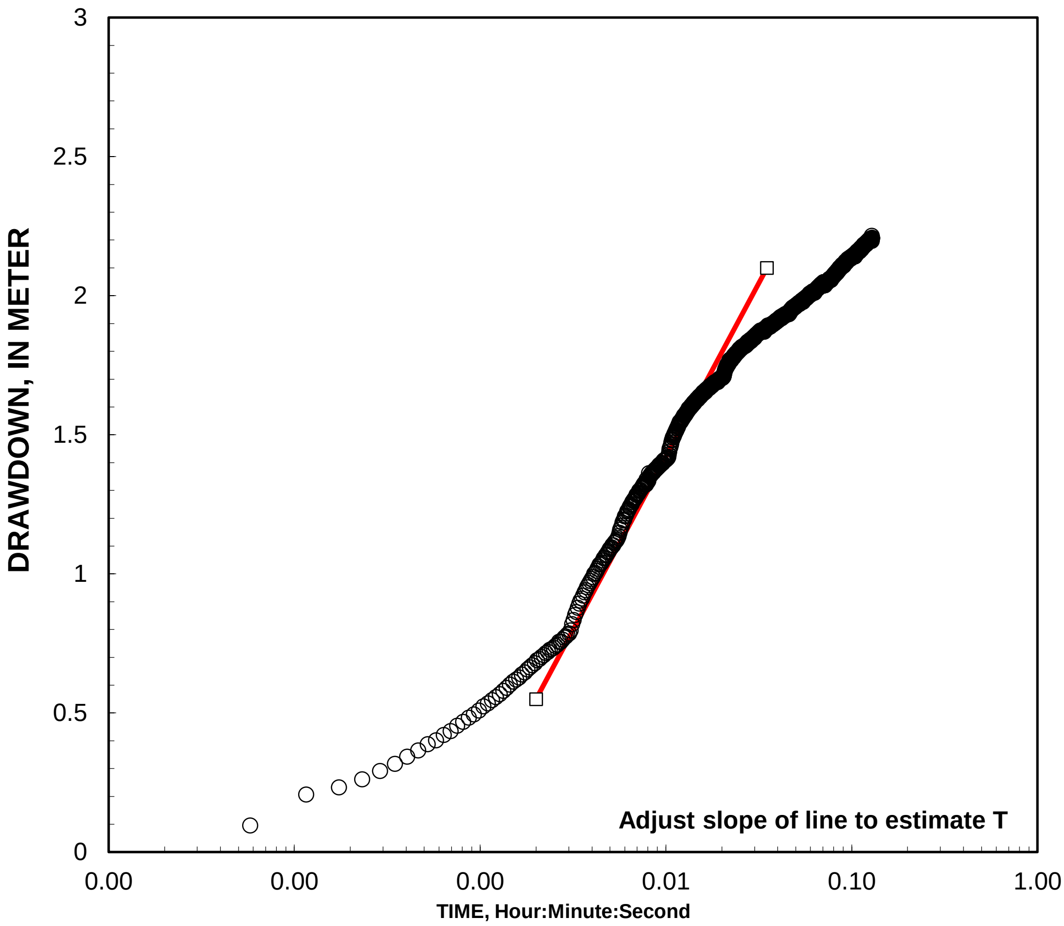
COMPUTED

Aquifer thickness = 27 Meter

Slope = 0.380069 Meter/log10

Input is consistent.

K =	0.058 Meter/Day
T =	1.6 Meter²/Day



REMARKS:

Cooper-Jacob analysis of single-well aquifer test

Average discharge rate calculated from the last pumping test without stopping to reful the generator

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	23.78	51	#N/A	#N/A
2	1/0/00 0:01:40	23.23	52	#N/A	#N/A
3	1/0/00 0:03:20	23.06	53	#N/A	#N/A
4	1/0/00 0:05:00	22.88	54	#N/A	#N/A
5	1/0/00 0:06:40	22.72	55	#N/A	#N/A
6	1/0/00 0:08:20	22.61	56	#N/A	#N/A
7	1/0/00 0:10:00	22.50	57	#N/A	#N/A
8	1/0/00 0:11:40	22.42	58	#N/A	#N/A
9	1/0/00 0:13:20	22.39	59	#N/A	#N/A
10	1/0/00 0:15:00	22.34	60	#N/A	#N/A
11	1/0/00 0:16:40	22.25	61	#N/A	#N/A
12	1/0/00 0:18:20	22.21	62	#N/A	#N/A
13	1/0/00 0:20:00	22.17	63	#N/A	#N/A
14	1/0/00 0:21:40	22.14	64	#N/A	#N/A
15	1/0/00 0:23:20	22.13	65	#N/A	#N/A
16	1/0/00 0:25:00	22.10	66	#N/A	#N/A
17	1/0/00 0:26:40	22.09	67	#N/A	#N/A
18	1/0/00 0:28:20	22.08	68	#N/A	#N/A
19	1/0/00 0:30:00	22.05	69	#N/A	#N/A
20	1/0/00 0:31:40	22.01	70	#N/A	#N/A
21	1/0/00 0:33:20	22.00	71	#N/A	#N/A
22	1/0/00 0:35:00	21.98	72	#N/A	#N/A
23	1/0/00 0:36:40	21.97	73	#N/A	#N/A
24	1/0/00 0:38:20	21.96	74	#N/A	#N/A
25	1/0/00 0:40:00	21.95	75	#N/A	#N/A
26	#N/A	#N/A	76	#N/A	#N/A
27	#N/A	#N/A	77	#N/A	#N/A
28	#N/A	#N/A	78	#N/A	#N/A
29	#N/A	#N/A	79	#N/A	#N/A
30	#N/A	#N/A	80	#N/A	#N/A
31	#N/A	#N/A	81	#N/A	#N/A
32	#N/A	#N/A	82	#N/A	#N/A
33	#N/A	#N/A	83	#N/A	#N/A
34	#N/A	#N/A	84	#N/A	#N/A
35	#N/A	#N/A	85	#N/A	#N/A
36	#N/A	#N/A	86	#N/A	#N/A
37	#N/A	#N/A	87	#N/A	#N/A
38	#N/A	#N/A	88	#N/A	#N/A
39	#N/A	#N/A	89	#N/A	#N/A
40	#N/A	#N/A	90	#N/A	#N/A
41	#N/A	#N/A	91	#N/A	#N/A
42	#N/A	#N/A	92	#N/A	#N/A
43	#N/A	#N/A	93	#N/A	#N/A
44	#N/A	#N/A	94	#N/A	#N/A
45	#N/A	#N/A	95	#N/A	#N/A
46	#N/A	#N/A	96	#N/A	#N/A
47	#N/A	#N/A	97	#N/A	#N/A
48	#N/A	#N/A	98	#N/A	#N/A
49	#N/A	#N/A	99	#N/A	#N/A
50	#N/A	#N/A	100	#N/A	#N/A

WELL ID: GWB

Local ID: GWB
Date:
Time: 00:00

INPUT

Construction:	
Casing dia. (d_c)	0.14 Meter
Annulus dia. (d_w)	0.14 Meter
Screen Length (L)	21 Meter
Depths to:	
water level (DTW)	13.14 Meter
Top of Aquifer	13.14 Meter
Base of Aquifer	51 Meter
Annular Fill:	
across screen --	Gravel
above screen --	Bentonite
Aquifer Material --	Fractured Igneous and
FLOW RATE	2.52 liters/min

COMPUTED

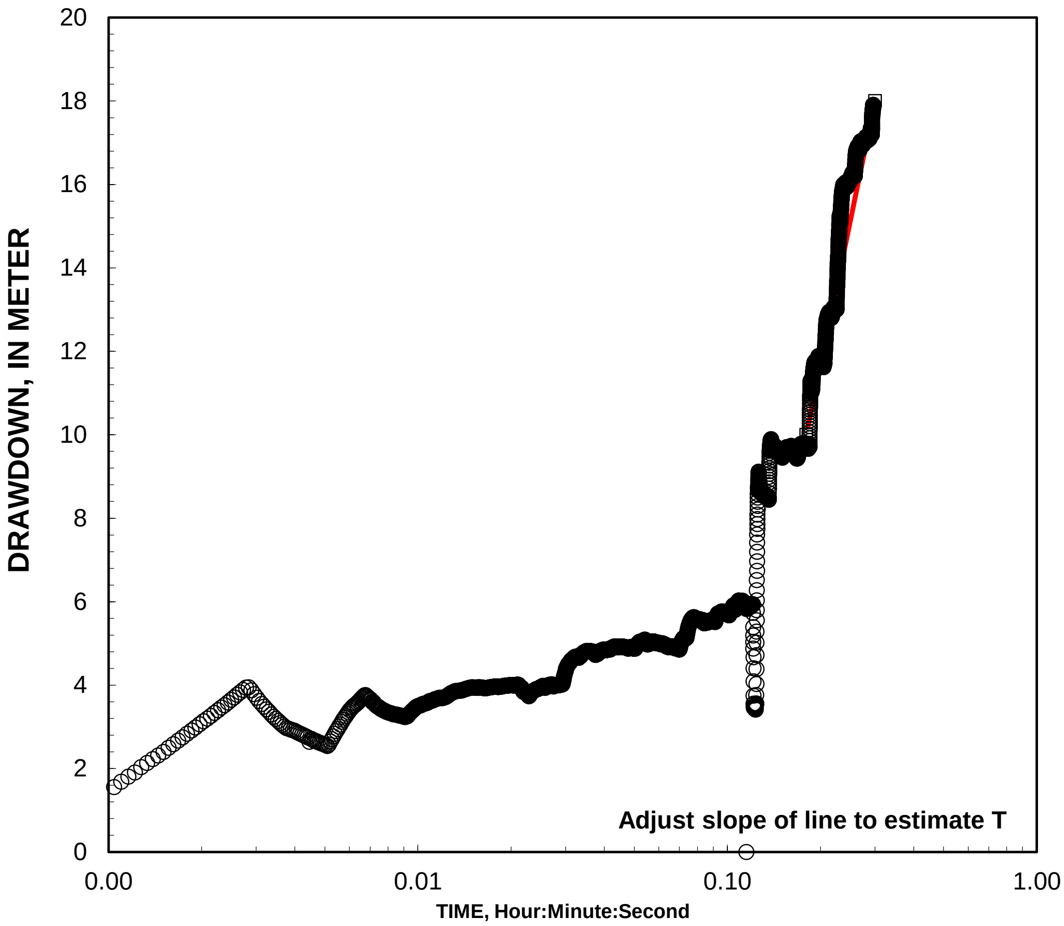
Aquifer thickness = 38 Meter

Slope = 10.99127 Meter/log10

Input is consistent.

K =	0.00049 Meter/Day
T =	0.018 Meter²/Day

0.00049 is less than likely minimum of 0.0152 for Fractured Igneous and Metamorphic I



REMARKS:

Cooper-Jacob analysis of single-well aquifer test

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	20.07	51	#N/A	#N/A
2	1/0/00 0:01:40	18.26	52	#N/A	#N/A
3	1/0/00 0:03:20	16.61	53	#N/A	#N/A
4	1/0/00 0:05:00	16.88	54	#N/A	#N/A
5	1/0/00 0:06:40	17.40	55	#N/A	#N/A
6	1/0/00 0:08:20	16.85	56	#N/A	#N/A
7	1/0/00 0:10:00	16.38	57	#N/A	#N/A
8	1/0/00 0:11:40	16.73	58	#N/A	#N/A
9	1/0/00 0:13:20	16.80	59	#N/A	#N/A
10	1/0/00 0:15:00	16.52	60	#N/A	#N/A
11	1/0/00 0:16:40	16.39	61	#N/A	#N/A
12	1/0/00 0:18:20	16.27	62	#N/A	#N/A
13	1/0/00 0:20:00	16.19	63	#N/A	#N/A
14	1/0/00 0:21:40	16.12	64	#N/A	#N/A
15	1/0/00 0:23:20	16.13	65	#N/A	#N/A
16	1/0/00 0:25:00	16.11	66	#N/A	#N/A
17	1/0/00 0:26:40	16.10	67	#N/A	#N/A
18	1/0/00 0:28:20	16.07	68	#N/A	#N/A
19	1/0/00 0:30:00	16.06	69	#N/A	#N/A
20	1/0/00 0:31:40	16.23	70	#N/A	#N/A
21	1/0/00 0:33:20	16.26	71	#N/A	#N/A
22	1/0/00 0:35:00	16.16	72	#N/A	#N/A
23	1/0/00 0:36:40	16.10	73	#N/A	#N/A
24	1/0/00 0:38:20	16.06	74	#N/A	#N/A
25	1/0/00 0:40:00	16.07	75	#N/A	#N/A
26	#N/A	#N/A	76	#N/A	#N/A
27	#N/A	#N/A	77	#N/A	#N/A
28	#N/A	#N/A	78	#N/A	#N/A
29	#N/A	#N/A	79	#N/A	#N/A
30	#N/A	#N/A	80	#N/A	#N/A
31	#N/A	#N/A	81	#N/A	#N/A
32	#N/A	#N/A	82	#N/A	#N/A
33	#N/A	#N/A	83	#N/A	#N/A
34	#N/A	#N/A	84	#N/A	#N/A
35	#N/A	#N/A	85	#N/A	#N/A
36	#N/A	#N/A	86	#N/A	#N/A
37	#N/A	#N/A	87	#N/A	#N/A
38	#N/A	#N/A	88	#N/A	#N/A
39	#N/A	#N/A	89	#N/A	#N/A
40	#N/A	#N/A	90	#N/A	#N/A
41	#N/A	#N/A	91	#N/A	#N/A
42	#N/A	#N/A	92	#N/A	#N/A
43	#N/A	#N/A	93	#N/A	#N/A
44	#N/A	#N/A	94	#N/A	#N/A
45	#N/A	#N/A	95	#N/A	#N/A
46	#N/A	#N/A	96	#N/A	#N/A
47	#N/A	#N/A	97	#N/A	#N/A
48	#N/A	#N/A	98	#N/A	#N/A
49	#N/A	#N/A	99	#N/A	#N/A
50	#N/A	#N/A	100	#N/A	#N/A

APPENDIX 8-5

WELL ID: GW3-Recovery

Local ID: GW3
Date:
Time: 00:00

INPUT

Construction:	
Casing dia. (d_c)	0.14 Meter
Annulus dia. (d_w)	0.14 Meter
Screen Length (L)	39 Meter
Depths to:	
water level (DTW)	3.11 Meter
Top of Aquifer	3.11 Meter
Base of Aquifer	82 Meter
Annular Fill:	
across screen --	Gravel
above screen --	Bentonite
Aquifer Material --	Basalt
FLOW RATE	3.6 liters/min

COMPUTED

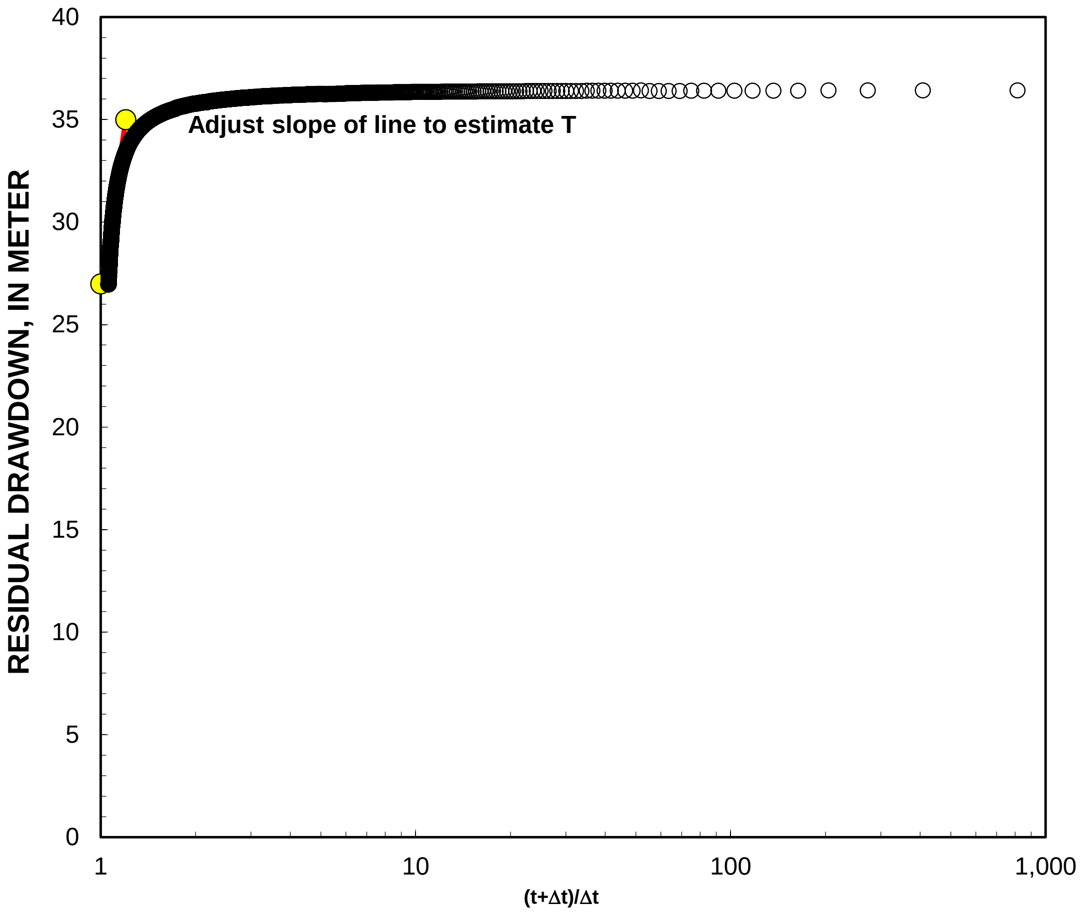
Aquifer thickness = 79 Meter

Slope = 30.79517 Meter/log10

Input is consistent.

K = 0.00012 Meter/Day
T = 0.0094 Meter²/Day

K= 0.00012 is less than likely minimum of 0.00914 for Basalt



REMARKS: Cooper-Jacob recovery analysis of single-well aquifer test

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	43.54	51	#N/A	#N/A
2	1/0/00 1:09:25	7.12	52	#N/A	#N/A
3	1/0/00 1:11:05	7.15	53	#N/A	#N/A
4	1/0/00 1:12:45	7.16	54	#N/A	#N/A
5	1/0/00 1:14:25	7.18	55	#N/A	#N/A
6	1/0/00 1:16:05	7.20	56	#N/A	#N/A
7	1/0/00 1:17:45	7.21	57	#N/A	#N/A
8	1/0/00 1:19:25	7.23	58	#N/A	#N/A
9	1/0/00 1:21:05	7.25	59	#N/A	#N/A
10	1/0/00 1:22:45	7.28	60	#N/A	#N/A
11	1/0/00 1:24:25	7.28	61	#N/A	#N/A
12	1/0/00 1:26:05	7.30	62	#N/A	#N/A
13	1/0/00 1:27:45	7.31	63	#N/A	#N/A
14	1/0/00 1:29:25	7.33	64	#N/A	#N/A
15	1/0/00 1:31:05	7.35	65	#N/A	#N/A
16	1/0/00 1:32:45	7.36	66	#N/A	#N/A
17	1/0/00 1:34:25	7.37	67	#N/A	#N/A
18	1/0/00 1:36:05	7.39	68	#N/A	#N/A
19	1/0/00 1:37:45	7.41	69	#N/A	#N/A
20	1/0/00 1:39:25	7.42	70	#N/A	#N/A
21	1/0/00 1:41:05	7.44	71	#N/A	#N/A
22	1/0/00 1:42:45	7.45	72	#N/A	#N/A
23	1/0/00 1:44:25	7.47	73	#N/A	#N/A
24	1/0/00 1:46:05	7.49	74	#N/A	#N/A
25	1/0/00 1:47:45	7.50	75	#N/A	#N/A
26	#N/A	#N/A	76	#N/A	#N/A
27	#N/A	#N/A	77	#N/A	#N/A
28	#N/A	#N/A	78	#N/A	#N/A
29	#N/A	#N/A	79	#N/A	#N/A
30	#N/A	#N/A	80	#N/A	#N/A
31	#N/A	#N/A	81	#N/A	#N/A
32	#N/A	#N/A	82	#N/A	#N/A
33	#N/A	#N/A	83	#N/A	#N/A
34	#N/A	#N/A	84	#N/A	#N/A
35	#N/A	#N/A	85	#N/A	#N/A
36	#N/A	#N/A	86	#N/A	#N/A
37	#N/A	#N/A	87	#N/A	#N/A
38	#N/A	#N/A	88	#N/A	#N/A
39	#N/A	#N/A	89	#N/A	#N/A
40	#N/A	#N/A	90	#N/A	#N/A
41	#N/A	#N/A	91	#N/A	#N/A
42	#N/A	#N/A	92	#N/A	#N/A
43	#N/A	#N/A	93	#N/A	#N/A
44	#N/A	#N/A	94	#N/A	#N/A
45	#N/A	#N/A	95	#N/A	#N/A
46	#N/A	#N/A	96	#N/A	#N/A
47	#N/A	#N/A	97	#N/A	#N/A
48	#N/A	#N/A	98	#N/A	#N/A
49	#N/A	#N/A	99	#N/A	#N/A
50	#N/A	#N/A	100	#N/A	#N/A

WELL ID: GW4 - Test C-Recovery

Local ID: GW4 - Test C Recovery
Date:
Time: 00:00

INPUT

Construction:		
Casing dia. (d_c)	0.14	Meter
Annulus dia. (d_w)	0.14	Meter
Screen Length (L)	6	Meter
Depths to:		
water level (DTW)	3.24	Meter
Top of Aquifer	3.24	Meter
Base of Aquifer	10	Meter
Annular Fill:		
across screen --	Gravel	
above screen --	Bentonite	
Aquifer Material --	Fractured Igneous and	
FLOW RATE	0.34	liters/min

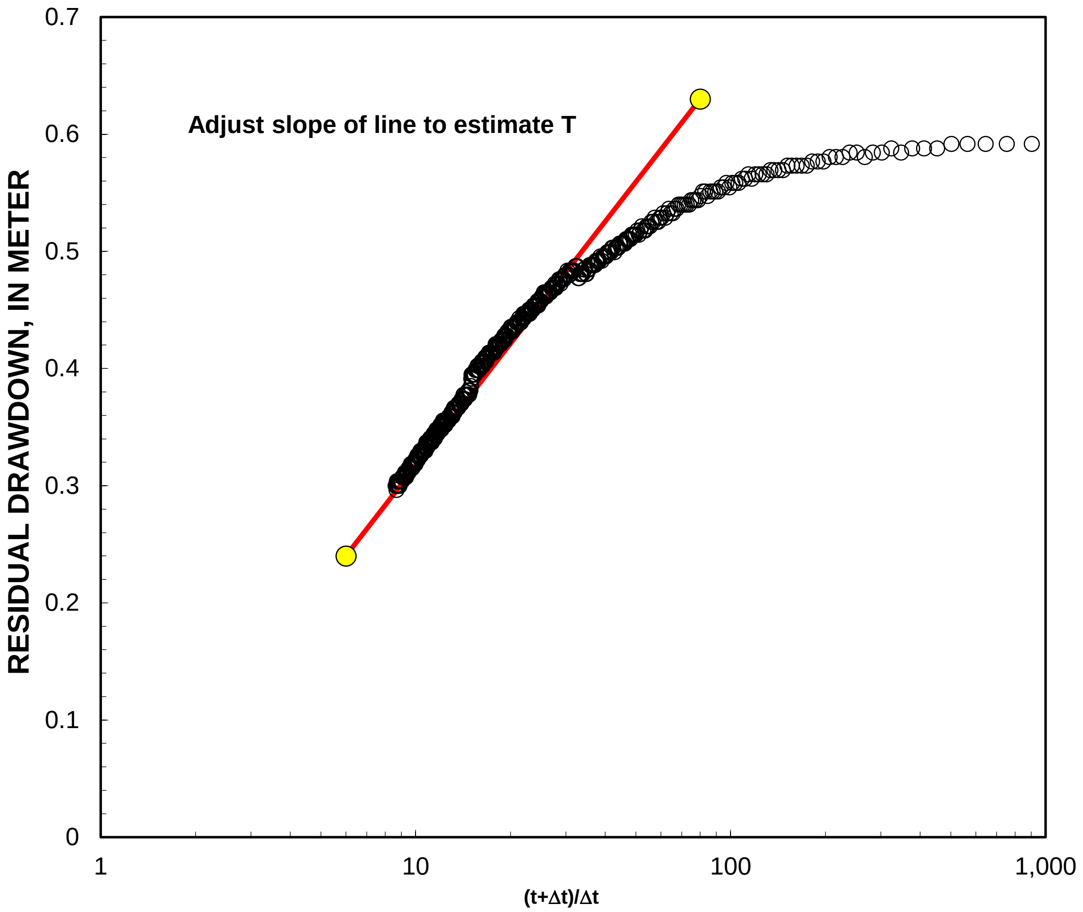
COMPUTED

Aquifer thickness = 6.8 Meter

Slope = 0.10567 Meter/log10

Input is consistent.

K =	0.038	Meter/Day
T =	0.26	Meter²/Day



REMARKS: Cooper-Jacob recovery analysis of single-well aquifer test

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	5.23	51	#N/A	#N/A
2	1/0/00 6:17:40	4.65	52	#N/A	#N/A
3	1/0/00 6:19:20	4.67	53	#N/A	#N/A
4	1/0/00 6:21:00	4.69	54	#N/A	#N/A
5	1/0/00 6:22:40	4.71	55	#N/A	#N/A
6	1/0/00 6:24:20	4.72	56	#N/A	#N/A
7	1/0/00 6:26:00	4.74	57	#N/A	#N/A
8	1/0/00 6:27:40	4.75	58	#N/A	#N/A
9	1/0/00 6:29:20	4.75	59	#N/A	#N/A
10	1/0/00 6:31:00	4.77	60	#N/A	#N/A
11	1/0/00 6:32:40	4.78	61	#N/A	#N/A
12	1/0/00 6:34:20	4.79	62	#N/A	#N/A
13	1/0/00 6:36:00	4.80	63	#N/A	#N/A
14	1/0/00 6:37:40	4.81	64	#N/A	#N/A
15	1/0/00 6:39:20	4.82	65	#N/A	#N/A
16	1/0/00 6:41:00	4.83	66	#N/A	#N/A
17	1/0/00 6:42:40	4.84	67	#N/A	#N/A
18	1/0/00 6:44:20	4.86	68	#N/A	#N/A
19	1/0/00 6:46:00	4.86	69	#N/A	#N/A
20	1/0/00 6:47:40	4.87	70	#N/A	#N/A
21	1/0/00 6:49:20	4.87	71	#N/A	#N/A
22	1/0/00 6:51:00	4.88	72	#N/A	#N/A
23	1/0/00 6:52:40	4.89	73	#N/A	#N/A
24	1/0/00 6:54:20	4.90	74	#N/A	#N/A
25	1/0/00 6:56:00	4.90	75	#N/A	#N/A
26	#N/A	#N/A	76	#N/A	#N/A
27	#N/A	#N/A	77	#N/A	#N/A
28	#N/A	#N/A	78	#N/A	#N/A
29	#N/A	#N/A	79	#N/A	#N/A
30	#N/A	#N/A	80	#N/A	#N/A
31	#N/A	#N/A	81	#N/A	#N/A
32	#N/A	#N/A	82	#N/A	#N/A
33	#N/A	#N/A	83	#N/A	#N/A
34	#N/A	#N/A	84	#N/A	#N/A
35	#N/A	#N/A	85	#N/A	#N/A
36	#N/A	#N/A	86	#N/A	#N/A
37	#N/A	#N/A	87	#N/A	#N/A
38	#N/A	#N/A	88	#N/A	#N/A
39	#N/A	#N/A	89	#N/A	#N/A
40	#N/A	#N/A	90	#N/A	#N/A
41	#N/A	#N/A	91	#N/A	#N/A
42	#N/A	#N/A	92	#N/A	#N/A
43	#N/A	#N/A	93	#N/A	#N/A
44	#N/A	#N/A	94	#N/A	#N/A
45	#N/A	#N/A	95	#N/A	#N/A
46	#N/A	#N/A	96	#N/A	#N/A
47	#N/A	#N/A	97	#N/A	#N/A
48	#N/A	#N/A	98	#N/A	#N/A
49	#N/A	#N/A	99	#N/A	#N/A
50	#N/A	#N/A	100	#N/A	#N/A

WELL ID: GW5 - Recovery

Local ID: GW5 - Recovery
Date:
Time: 00:00

INPUT

Construction:		
Casing dia. (d_c)	0.14	Meter
Annulus dia. (d_w)	0.14	Meter
Screen Length (L)	30	Meter
Depths to:		
water level (DTW)	12.35	Meter
Top of Aquifer	12.35	Meter
Base of Aquifer	79	Meter
Annular Fill:		
across screen --	Gravel	
above screen --	Bentonite	
Aquifer Material --	Basalt	
FLOW RATE	1.07	liters/min

COMPUTED

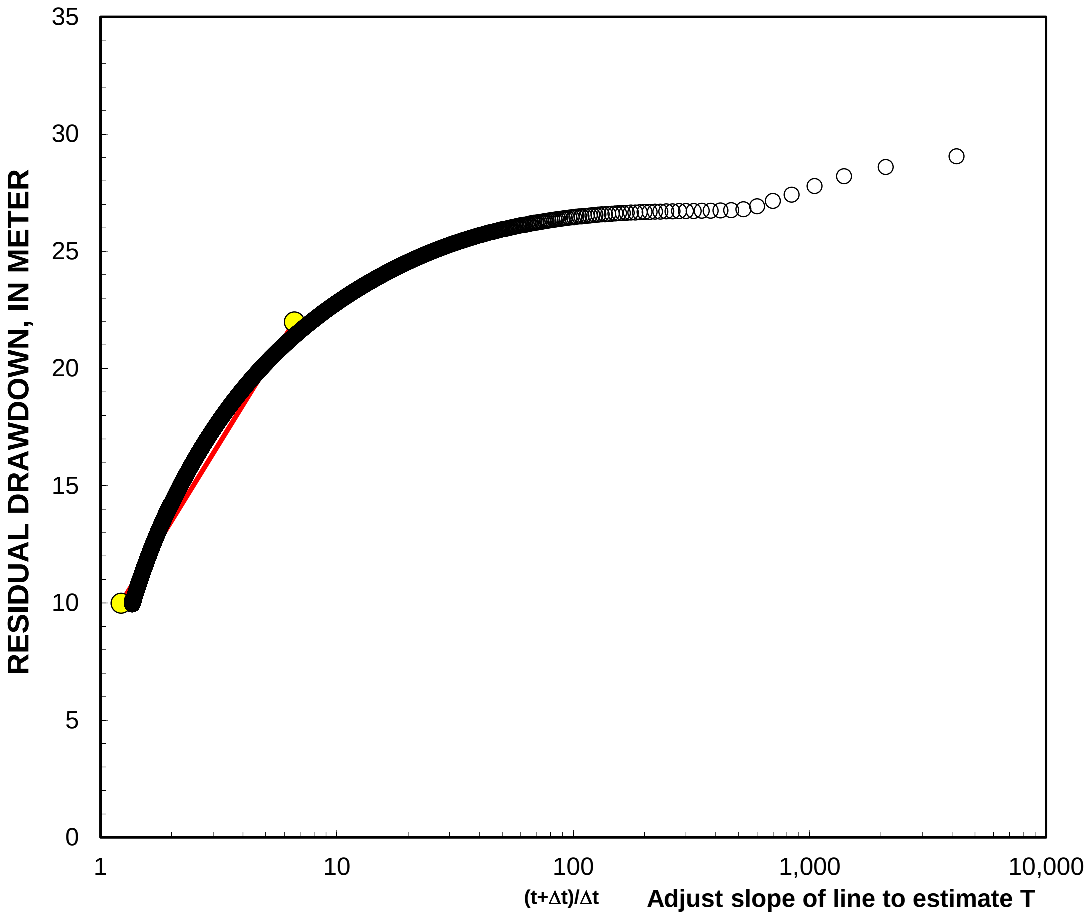
Aquifer thickness = 67 Meter

Slope = 4.988652 Meter/log10

Input is consistent.

K = 0.00026 Meter/Day
T = 0.017 Meter²/Day

K= 0.00026 is less than likely minimum of 0.00914 for Basalt



REMARKS: Cooper-Jacob recovery analysis of single-well aquifer test

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	41.37	51	#N/A	#N/A
2	7/29/57 0:00:00	14.68	52	#N/A	#N/A
3	11/6/57 0:00:00	14.88	53	#N/A	#N/A
4	2/14/58 0:00:00	15.12	54	#N/A	#N/A
5	5/25/58 0:00:00	15.36	55	#N/A	#N/A
6	9/2/58 0:00:00	15.60	56	#N/A	#N/A
7	12/11/58 0:00:00	15.82	57	#N/A	#N/A
8	3/21/59 0:00:00	16.04	58	#N/A	#N/A
9	6/29/59 0:00:00	16.24	59	#N/A	#N/A
10	10/7/59 0:00:00	16.45	60	#N/A	#N/A
11	1/15/60 0:00:00	16.63	61	#N/A	#N/A
12	4/24/60 0:00:00	16.81	62	#N/A	#N/A
13	8/2/60 0:00:00	16.99	63	#N/A	#N/A
14	11/10/60 0:00:00	17.15	64	#N/A	#N/A
15	2/18/61 0:00:00	17.31	65	#N/A	#N/A
16	5/29/61 0:00:00	17.46	66	#N/A	#N/A
17	9/6/61 0:00:00	17.62	67	#N/A	#N/A
18	12/15/61 0:00:00	17.75	68	#N/A	#N/A
19	3/25/62 0:00:00	17.90	69	#N/A	#N/A
20	7/3/62 0:00:00	18.03	70	#N/A	#N/A
21	10/11/62 0:00:00	18.15	71	#N/A	#N/A
22	1/19/63 0:00:00	18.28	72	#N/A	#N/A
23	4/29/63 0:00:00	18.41	73	#N/A	#N/A
24	8/7/63 0:00:00	18.52	74	#N/A	#N/A
25	11/15/63 0:00:00	18.64	75	#N/A	#N/A
26	#N/A	#N/A	76	#N/A	#N/A
27	#N/A	#N/A	77	#N/A	#N/A
28	#N/A	#N/A	78	#N/A	#N/A
29	#N/A	#N/A	79	#N/A	#N/A
30	#N/A	#N/A	80	#N/A	#N/A
31	#N/A	#N/A	81	#N/A	#N/A
32	#N/A	#N/A	82	#N/A	#N/A
33	#N/A	#N/A	83	#N/A	#N/A
34	#N/A	#N/A	84	#N/A	#N/A
35	#N/A	#N/A	85	#N/A	#N/A
36	#N/A	#N/A	86	#N/A	#N/A
37	#N/A	#N/A	87	#N/A	#N/A
38	#N/A	#N/A	88	#N/A	#N/A
39	#N/A	#N/A	89	#N/A	#N/A
40	#N/A	#N/A	90	#N/A	#N/A
41	#N/A	#N/A	91	#N/A	#N/A
42	#N/A	#N/A	92	#N/A	#N/A
43	#N/A	#N/A	93	#N/A	#N/A
44	#N/A	#N/A	94	#N/A	#N/A
45	#N/A	#N/A	95	#N/A	#N/A
46	#N/A	#N/A	96	#N/A	#N/A
47	#N/A	#N/A	97	#N/A	#N/A
48	#N/A	#N/A	98	#N/A	#N/A
49	#N/A	#N/A	99	#N/A	#N/A
50	#N/A	#N/A	100	#N/A	#N/A

WELL ID: GW6 - Recovery

Local ID: GW6 - Recovery
Date: #########
Time: 00:00

INPUT

Construction:		
Casing dia. (d_c)	0.14	Meter
Annulus dia. (d_w)	0.14	Meter
Screen Length (L)	6	Meter
Depths to:		
water level (DTW)	14.8	Meter
Top of Aquifer	14.8	Meter
Base of Aquifer	42	Meter
Annular Fill:		
across screen --	Gravel	
above screen --	Bentonite	
Aquifer Material --	Fractured Igneous and	
FLOW RATE	7.42	liters/min

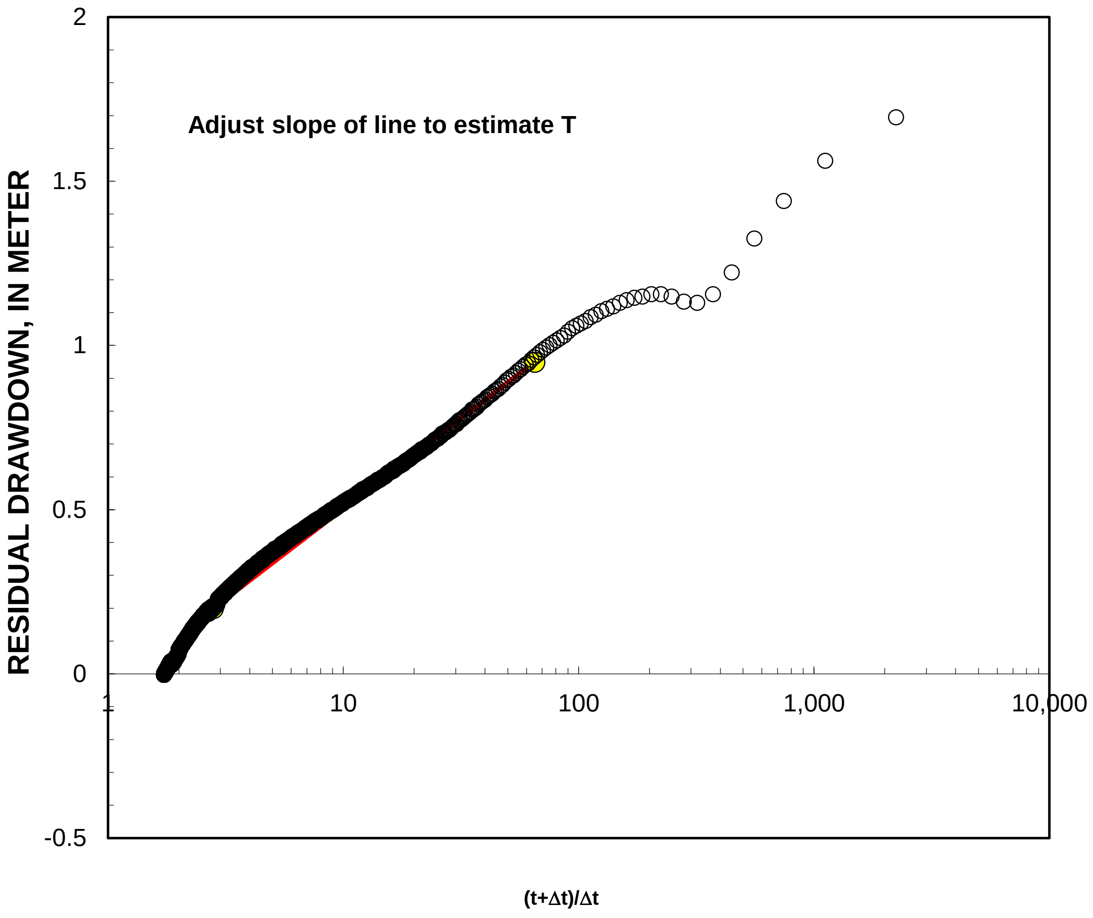
COMPUTED

Aquifer thickness = 27 Meter

Slope = 0.16738 Meter/log10

Input is consistent.

K =	0.13	Meter/Day
T =	3.6	Meter²/Day



REMARKS: Cooper-Jacob recovery analysis of single-well aquifer test

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	23.78	51	#N/A	#N/A
2	1/0/00 3:07:10	22.69	52	#N/A	#N/A
3	1/0/00 3:08:50	22.84	53	#N/A	#N/A
4	1/0/00 3:10:30	22.95	54	#N/A	#N/A
5	1/0/00 3:12:10	23.03	55	#N/A	#N/A
6	1/0/00 3:13:50	23.08	56	#N/A	#N/A
7	1/0/00 3:15:30	23.12	57	#N/A	#N/A
8	1/0/00 3:17:10	23.15	58	#N/A	#N/A
9	1/0/00 3:18:50	23.18	59	#N/A	#N/A
10	1/0/00 3:20:30	23.20	60	#N/A	#N/A
11	1/0/00 3:22:10	23.22	61	#N/A	#N/A
12	1/0/00 3:23:50	23.24	62	#N/A	#N/A
13	1/0/00 3:25:30	23.25	63	#N/A	#N/A
14	1/0/00 3:27:10	23.27	64	#N/A	#N/A
15	1/0/00 3:28:50	23.28	65	#N/A	#N/A
16	1/0/00 3:30:30	23.29	66	#N/A	#N/A
17	1/0/00 3:32:10	23.31	67	#N/A	#N/A
18	1/0/00 3:33:50	23.31	68	#N/A	#N/A
19	1/0/00 3:35:30	23.32	69	#N/A	#N/A
20	1/0/00 3:37:10	23.34	70	#N/A	#N/A
21	1/0/00 3:38:50	23.35	71	#N/A	#N/A
22	1/0/00 3:40:30	23.35	72	#N/A	#N/A
23	1/0/00 3:42:10	23.37	73	#N/A	#N/A
24	1/0/00 3:43:50	23.37	74	#N/A	#N/A
25	1/0/00 3:45:30	23.38	75	#N/A	#N/A
26	#N/A	#N/A	76	#N/A	#N/A
27	#N/A	#N/A	77	#N/A	#N/A
28	#N/A	#N/A	78	#N/A	#N/A
29	#N/A	#N/A	79	#N/A	#N/A
30	#N/A	#N/A	80	#N/A	#N/A
31	#N/A	#N/A	81	#N/A	#N/A
32	#N/A	#N/A	82	#N/A	#N/A
33	#N/A	#N/A	83	#N/A	#N/A
34	#N/A	#N/A	84	#N/A	#N/A
35	#N/A	#N/A	85	#N/A	#N/A
36	#N/A	#N/A	86	#N/A	#N/A
37	#N/A	#N/A	87	#N/A	#N/A
38	#N/A	#N/A	88	#N/A	#N/A
39	#N/A	#N/A	89	#N/A	#N/A
40	#N/A	#N/A	90	#N/A	#N/A
41	#N/A	#N/A	91	#N/A	#N/A
42	#N/A	#N/A	92	#N/A	#N/A
43	#N/A	#N/A	93	#N/A	#N/A
44	#N/A	#N/A	94	#N/A	#N/A
45	#N/A	#N/A	95	#N/A	#N/A
46	#N/A	#N/A	96	#N/A	#N/A
47	#N/A	#N/A	97	#N/A	#N/A
48	#N/A	#N/A	98	#N/A	#N/A
49	#N/A	#N/A	99	#N/A	#N/A
50	#N/A	#N/A	100	#N/A	#N/A

WELL ID: GWB-Recovery

Local ID: GWB
Date:
Time: 00:00

INPUT

Construction:		
Casing dia. (d_c)	0.14	Meter
Annulus dia. (d_w)	0.14	Meter
Screen Length (L)	21	Meter
Depths to:		
water level (DTW)	13.14	Meter
Top of Aquifer	13.14	Meter
Base of Aquifer	51	Meter
Annular Fill:		
across screen --	Gravel	
above screen --	Bentonite	
Aquifer Material --	Basalt	
FLOW RATE	1.81	liters/min

COMPUTED

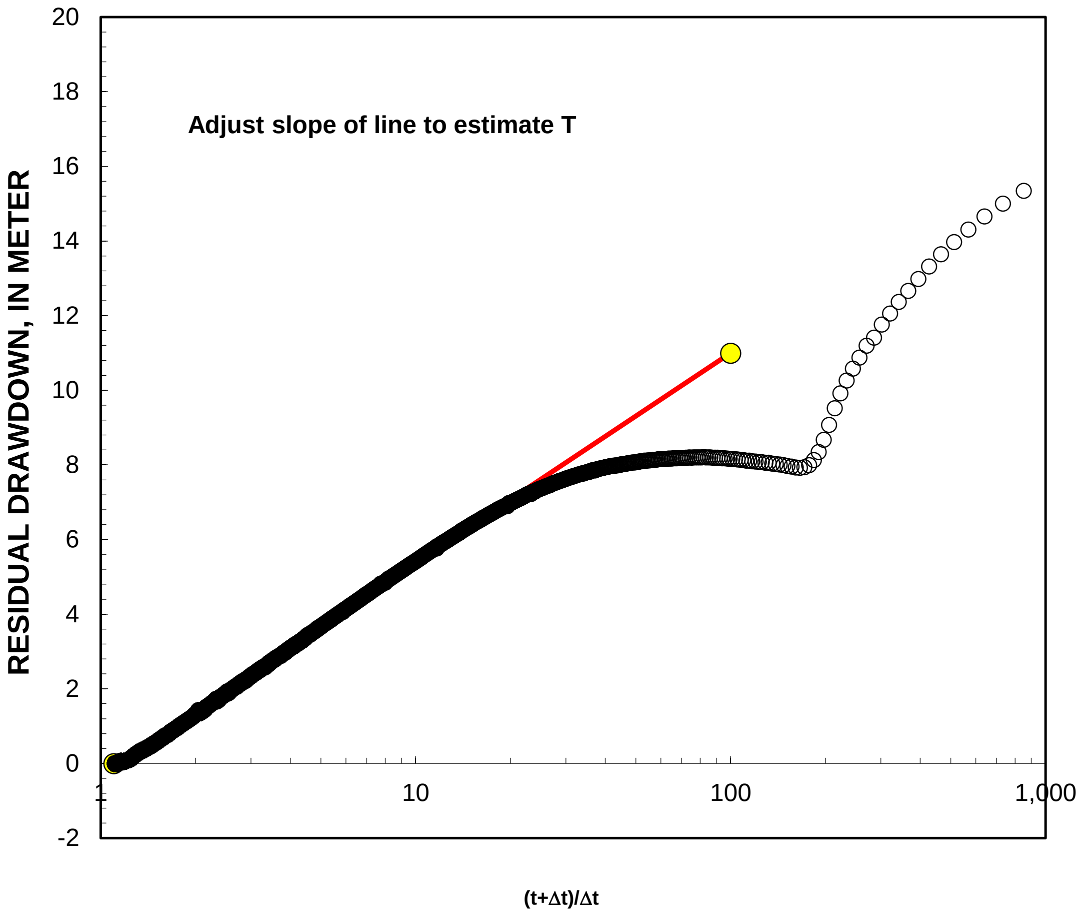
Aquifer thickness = 38 Meter

Slope = 1.711829 Meter/log10

Input is consistent.

K =	0.0022	Meter/Day
T =	0.085	Meter²/Day

K= 0.0022 is less than likely minimum of 0.00914 for Basalt



REMARKS: Cooper-Jacob recovery analysis of single-well aquifer test

Reduced Data

Entry	Time, Date Hr:Min:Sec	Water Level Meter	Entry	Time, Date Hr:Min:Sec	Water Level Meter
1	1/0/00 0:00:00	20.36	51	#N/A	#N/A
2	1/0/00 7:07:45	9.16	52	#N/A	#N/A
3	1/0/00 7:09:25	12.30	53	#N/A	#N/A
4	1/0/00 7:11:05	12.16	54	#N/A	#N/A
5	1/0/00 7:12:45	12.18	55	#N/A	#N/A
6	1/0/00 7:14:25	12.25	56	#N/A	#N/A
7	1/0/00 7:16:05	12.36	57	#N/A	#N/A
8	1/0/00 7:17:45	12.47	58	#N/A	#N/A
9	1/0/00 7:19:25	12.61	59	#N/A	#N/A
10	1/0/00 7:21:05	12.74	60	#N/A	#N/A
11	1/0/00 7:22:45	12.89	61	#N/A	#N/A
12	1/0/00 7:24:25	13.03	62	#N/A	#N/A
13	1/0/00 7:26:05	13.17	63	#N/A	#N/A
14	1/0/00 7:27:45	13.31	64	#N/A	#N/A
15	1/0/00 7:29:25	13.44	65	#N/A	#N/A
16	1/0/00 7:31:05	13.57	66	#N/A	#N/A
17	1/0/00 7:32:45	13.70	67	#N/A	#N/A
18	1/0/00 7:34:25	13.82	68	#N/A	#N/A
19	1/0/00 7:36:05	13.93	69	#N/A	#N/A
20	1/0/00 7:37:45	14.04	70	#N/A	#N/A
21	1/0/00 7:39:25	14.16	71	#N/A	#N/A
22	1/0/00 7:41:05	14.26	72	#N/A	#N/A
23	1/0/00 7:42:45	14.37	73	#N/A	#N/A
24	1/0/00 7:44:25	14.45	74	#N/A	#N/A
25	1/0/00 7:46:05	14.54	75	#N/A	#N/A
26	#N/A	#N/A	76	#N/A	#N/A
27	#N/A	#N/A	77	#N/A	#N/A
28	#N/A	#N/A	78	#N/A	#N/A
29	#N/A	#N/A	79	#N/A	#N/A
30	#N/A	#N/A	80	#N/A	#N/A
31	#N/A	#N/A	81	#N/A	#N/A
32	#N/A	#N/A	82	#N/A	#N/A
33	#N/A	#N/A	83	#N/A	#N/A
34	#N/A	#N/A	84	#N/A	#N/A
35	#N/A	#N/A	85	#N/A	#N/A
36	#N/A	#N/A	86	#N/A	#N/A
37	#N/A	#N/A	87	#N/A	#N/A
38	#N/A	#N/A	88	#N/A	#N/A
39	#N/A	#N/A	89	#N/A	#N/A
40	#N/A	#N/A	90	#N/A	#N/A
41	#N/A	#N/A	91	#N/A	#N/A
42	#N/A	#N/A	92	#N/A	#N/A
43	#N/A	#N/A	93	#N/A	#N/A
44	#N/A	#N/A	94	#N/A	#N/A
45	#N/A	#N/A	95	#N/A	#N/A
46	#N/A	#N/A	96	#N/A	#N/A
47	#N/A	#N/A	97	#N/A	#N/A
48	#N/A	#N/A	98	#N/A	#N/A
49	#N/A	#N/A	99	#N/A	#N/A
50	#N/A	#N/A	100	#N/A	#N/A

APPENDIX 8-6

March 2024

Water Framework Directive

Assessment Report

Proposed Extension to Scotshouse Quarry

Scotshouse Quarries Ltd.

Aghnaskew, Scotshouse, Co. Monaghan

MALONE O'REGAN ENVIRONMENTAL

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Water Framework Directive Assessment Report

Proposed Extension to Scotshouse Quarry

Scotshouse Quarries Ltd.

Aghnaskew, Scotshouse, Co. Monaghan

Contents

1 INTRODUCTION 1
1.1 Background 1
1.2 Regulatory Context Overview 2
1.2.1 EU Legislation - Water Framework Directive 2
1.2.2 National Policy 4
1.3 Assessment Criteria 5
1.3.1 Surface Water Quality Assessment 5
1.3.2 Groundwater Quality Assessment 5
2 METHODOLOGY AND SCOPE 6
3 SITE CONTEXT AND STUDY AREA 9
3.1 Existing Development 9
3.1.1 Foul Drainage 10
3.1.2 Stormwater Drainage 10
3.1.3 Discharge License 10
3.1.4 Surface Water Monitoring 11
3.1.5 Groundwater Monitoring 13
3.1.6 Current Mitigation Measures 13
3.2 Proposed Development 14
3.2.1 Construction Phase 16
3.2.2 Operational Phase 16
3.2.3 Restoration Phase 20
3.2.4 Drainage and Dewatering 20
3.2.5 Restoration and Aftercare 20
4 STUDY AREA SCREENING 21
4.1 Surface Water 21

4.2 Groundwater ... 24
4.3 Protected Sites ... 25
4.4 Flood Risk Assessment (FRA) ... 29
4.5 Water Pressures ... 30
4.6 Cumulative Impacts from other Facilities/Developments ... 31
4.7 Screening ... 33
5 IMPACT ASSESSMENT ... 36
5.1 GORTNANA_010 ... 36
5.2 FINN (MONAGHAN)_050 ... 37
5.3 Cavan GWB ... 38
5.4 Clones GWB ... 39
5.5 Mitigation of Impact ... 40
5.5.1 Mitigation Measures ... 40
5.5.2 Potential Impacts ... 41
6 CONCLUSIONS ... 41
7 REFERENCES ... 43

FIGURES

Figure 1-1: Site Location ... 1
Figure 2-1: WFD Screening Assessment ... 7
Figure 2-2: Article 4(7) Screening Assessment ... 8
Figure 3-1: Scotshouse Quarry Infrastructure ... 9
Figure 3-2: Discharge Licence Drainage ... 11
Figure 3-3: Breakdown of Site into Zones ... 15
Figure 3-4: Current Land-holdings of Land within Quarry Extension Boundary ... 15
Figure 3-5: Proposed Phasing Plan, Showing Upper and Lower Elevation Phases ... 19
Figure 4-1: Surface Waterbodies ... 21
Figure 4-2: Groundwater Bodies ... 24
Figure 4-3: Protected Sites ... 25
Figure 4-4: IEL Locations ... 32
Figure 4-5: Groundwater Boreholes ... 33

TABLES

Table 3-1: Discharge Licence Limits 10
Table 4-1: Surface Waterbodies within 5km of Site 22
Table 4-2: Groundwater Waterbodies within 5km of Site 24
Table 4-3: Protected Sites within 15km of Site 26
Table 4-4: EPA Water Pressures on Subcatchment Finn[Monaghan]_SC_020 Surface Waterbodies 5km from Site 30
Table 4-5: EPA Water Pressures on Groundwater Waterbodies 5km from Site 31
Table 4-6: EPA Licensed Facilities within 5km of the Proposed Development 31
Table 4-7: Available Groundwater Well Information 32
Table 4-8: Screening Table 34
Table 5-1: GORTNANA_010 Impact Assessment 36
Table 5-2: FINN (MONAGHAN)_050 Impact Assessment 37
Table 5-3: Cavan GWB Impact Assessment 38
Table 5-4: Clones GWB Impact Assessment 39
Table 5-5: Predicted Status Changes 41

1 INTRODUCTION

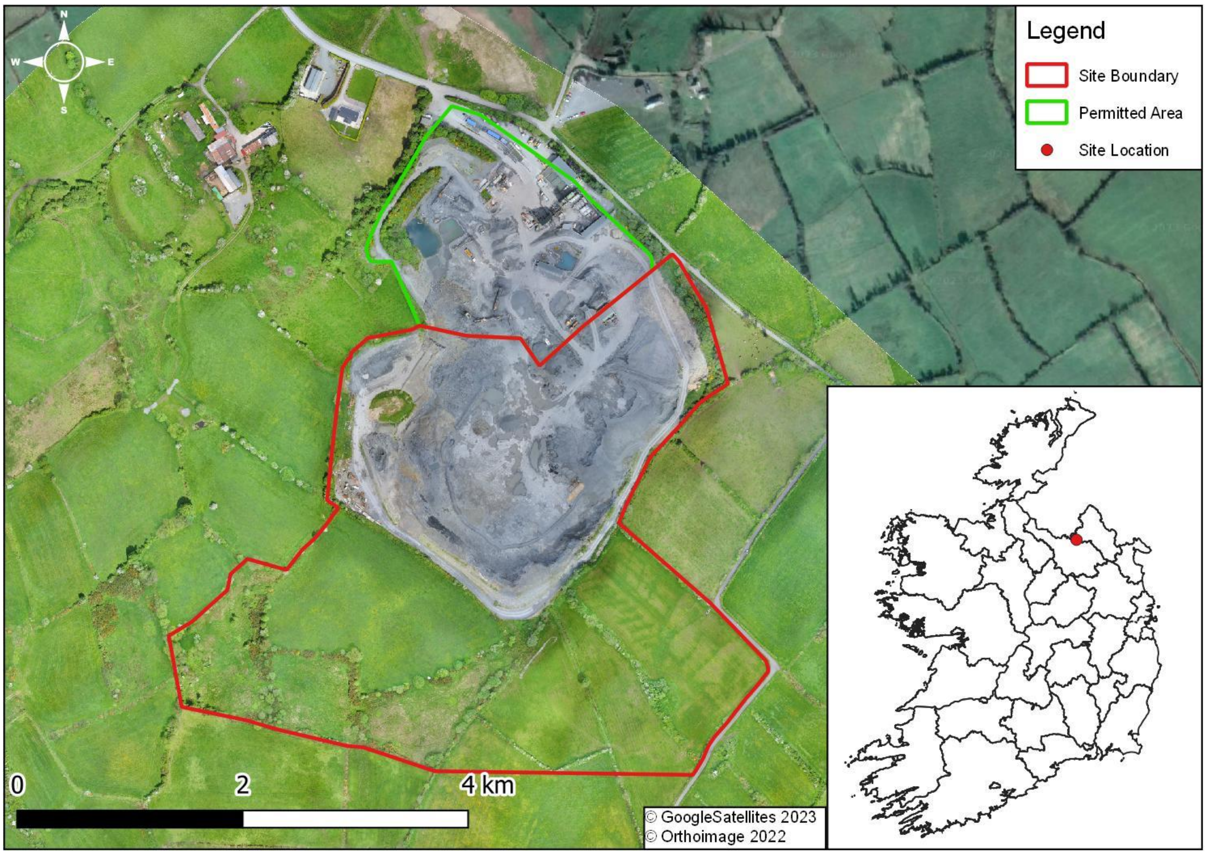
1.1 Background

Malone O'Regan Environmental (MOR) was commissioned by Scotshouse Quarries Ltd. (the Applicant) to undertake a Water Framework Directive Assessment in support of a planning application by the Applicant to An Bord Pleanála (ABP) under Section 37L of the Planning and Development Act 2000 (as amended) for the proposed extension of Scotshouse Quarry. An application for Substitute Consent under Section 177E of the Planning and Development Act 2000 (as amended) to regularise a 5.6-hectare (ha) area of land within the Applicant's landholding is currently under consideration with ABP (ABP case reference 316144-23). It is the intention of the Applicant for this application to be considered in conjunction with the Substitute Consent application in accordance with Section 37L of the Planning and Development Act 2000 (as amended). Please see the main Environmental Impact Assessment Report (EIAR) for further details.

The aim of this Assessment is to ascertain whether the project has the potential to impact waterbodies in such a way as to result in a deterioration in that waterbody's status under the Water Framework Directive. If such impacts are found to be possible, then mitigation must be put in place.

The location of the Site is shown in Figure 1-1 below.

Figure 1-1: Site Location



1.2 Regulatory Context Overview

1.2.1 EU Legislation - Water Framework Directive

The Water Framework Directive (WFD) (2000/60/EC) [1], as amended by Directives 2008/105/EC and 2013/39/EU, requires EU Member States to protect and improve water quality. It applies to all surface waters (defined as inland waters, both standing and flowing and includes rivers, lakes, reservoirs, streams and canals), groundwater, transitional (estuarine) and coastal waters. This includes both natural and “artificial and heavily modified bodies of water” (‘artificial’ is defined in Article 2(8) as ‘a body of surface water created by human activity’ and ‘heavily modified’ is defined in Article 2(9) as ‘a body of surface water which as a result of physical alternations by human activity is substantially changed in character’.).

The long-term aim of the Directive is for all ground and surface waters within the EU to achieve ‘good’ status (see section 1.4 below). The WFD was given legal status in Ireland via the European Communities (Water Policy) Regulations 2003 (S.I. 722/2003), as amended.

Article 1 sets out that the purpose of the Directive is to establish a framework which *“prevents further deterioration and protects and enhances the status of aquatic ecosystems”*, *“promotes sustainable water use”* and *“aims at enhanced protection and improvement of the aquatic environment* inter alia *through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of priority hazardous substances”*.

Article 3 of the Directive states that:

“1. Member States shall identify the individual river basins lying within their national territory and, for the purposes of this Directive, shall assign them to individual river basin districts. Small river basins may be combined with larger river basins or joined with neighbouring small basins to form individual river basin districts where appropriate. Where groundwaters do not fully follow a particular river basin, they shall be identified and assigned to the nearest or most appropriate river basin district. Coastal waters shall be identified and assigned to the nearest or most appropriate river basin district or districts.

3. Member States shall ensure that a river basin covering the territory of more than one Member State is assigned to an international river basin district. At the request of the Member States involved, the Commission shall act to facilitate the assigning to such international river basin districts.

4. Member States shall ensure that the requirements of this Directive for the achievement of the environmental objectives established under Article 4, and in particular all programmes of measures are coordinated for the whole of the river basin district. For international river basin districts the Member States concerned shall together ensure this coordination and may, for this purpose, use existing structures stemming from international agreements. At the request of the Member States involved, the Commission shall act to facilitate the establishment of the programmes of measures.

5. Where a river basin district extends beyond the territory of the Community, the Member State or Member States concerned shall endeavour to establish appropriate coordination with the relevant non-Member States, with the aim of achieving the objectives of this Directive throughout the river basin district. Member States shall ensure the application of the rules of this Directive within their territory.”

Article 4 of the Directive sets out environmental objectives. In relation to surface water, Article 4(1)(a) states that:

> *"(i) Member States shall implement the necessary measures to prevent the deterioration of the status of all bodies of surface water…*
>
> *(ii) Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status at the latest 15 years after the date of entry into force of this Directive…*
>
> *(iii) Member States shall protect, enhance and restore all artificial and heavily modified bodies of water with the aim of achieving good ecological potential and good surface water chemical status at the latest 15 years after the date of entry into force of this Directive…"*

Article 4(1)(b) places the same obligation to prevent deterioration in relation to groundwater and in addition places an obligation to:

> *"protect, enhance and restore all bodies of groundwater, ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status at the latest 15 years after the date of entry into force of this Directive…"*

Article 4(7) states that Member States will not be in breach of the Directive when failure to achieve good groundwater/ecological status/ecological potential is the result of new modifications to the physical characteristics of a surface water body/alterations to the level of a groundwater body, or failure to prevent deterioration from 'high' to 'good' status is the result of new sustainable human development activities **and:**

- all practicable steps are taken to mitigate the adverse impact;
- the reasons for the modifications/alterations are set out in the river basin management plan;
- the reasons for the modifications/alternations are of over-riding public interest/the benefits of achieving good status are outweighed by the benefits of the modifications/alterations; and,
- the benefits of the medications/alternations cannot for reasons of technical feasibility or disproportionate cost be achieved by other means which are a significantly better environmental option.

Article 5(1) requires that each Member State:

> *"ensure that for each river basin district or for the portion of an international river basin district falling within its territory:*
>
> > *an analysis of its characteristics*
> >
> > *a review of the impact of human activity on the status of surface waters and on groundwater and*
> >
> > *an economic analysis of water use*
>
> *is undertaken according to the technical specifications set out in Annexes II and III and that it is completed at the latest four years after the date of entry into force of this Directive."*

Article 6 of the WFD requires Member States to create and maintain registers of all those areas within a river basin district which have been designated as requiring special protection for their groundwater, surface water, habitats or dependant species. The register is required to include all water bodies identified in Article 7(1) and all waters listed in Annex IV.

Article 7(1) requires Member States to identify within each river basin:

> *"all bodies of water used for the abstraction of water intended for human consumption providing more than 10m3 a day as an average or serving more than 50 persons and those bodies of water intended for such future use.*
>
> *Member States shall monitor, in accordance with Annex V, those bodies of water which according to Annex V provide more than 100m3 a day as an average."*

Annex IV lists the relevant protected areas as:

i. *"Areas designated for the abstraction of water intended for human consumption under Article 7;*
ii. *areas designated for the protection of economically significant aquatic species;*
iii. *bodies of water designated as recreational waters, including areas designated as bathing waters under Directive 76/160/EEC[1];*
iv. *nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC[2] and areas designated as sensitive areas under Directive 91/271/EEC[3] and*
v. *areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under Directive 92/43/EEC[4] and Directive 79/409/EEC[5]."*

Article 11 requires each Member State to establish a "programme of measures" to achieve the objectives set out in Article 4.

1.2.2 National Policy

Since 2010, the Government of Ireland has created River Basin Management Plans (RBMPs) which operate on a renewing six-year cycle. The purpose of these RBMPs is to set targets to address water quality issues including the protection, improvement and sustainable management of the water environment, in line with the WFD. The first WFD cycle ran from 2009-2015, and the second cycle operated from 2016-2021. The current (third) cycle will run from 2022-2027. A Draft plan was published in September 2021, with public consultation on this Draft closing on 31st March 2022 but a final plan has yet to be published [2].

The first cycle of RBMPs (2010-2015) were developed separately but in close co-operation with the relevant authorities in Northern Ireland and as a result all the water environments in Ireland plus those shared with Northern Ireland were assessed in unison. The second cycle (2016-2021) [3] plans for Ireland and Northern Ireland were produced under differing timelines, although coordination still occurred in terms of the implementation of the plans. Coordination is ongoing during the development and implementation of the third cycle (2022-2027).

In order to manage the specific cross-border WFD issues that existed prior to the withdrawal of the United Kingdom from the EU, the Draft 2022-2027 RBMP sets out four River Basin Districts (RBDs) across the island of Ireland. The Ireland RBD comprises the majority of the Republic of Ireland, with two cross-border/international districts (the Northwestern RBD and the Neagh Bann RBD) covering parts of the Republic of Ireland and Northern Ireland [2]. The Northeastern RBD lies fully within Northern Ireland.

---

[1] The Bathing Water Directive
[2] The Nitrates Directive
[3] The Urban Wastewater Treatment Directive
[4] The Habitats Directive
[5] The Birds Directive

Both jurisdictions carry full responsibility for ensuring implementation of all WFD measures in their national territory, including any part of an International River Basin District that lies within their national territory. Following the 2016 referendum in the UK on EU withdrawal, the Second River Basin Management Plan (2016-2021) included provision for the North South Water Framework Directive Coordination Group to over-see the management of shared water bodies [3].

1.3 Assessment Criteria

1.3.1 Surface Water Quality Assessment

Under the WFD [1], surface water bodies are defined as either:

- Rivers;
- Lakes;
- Transitional waters;
- Coastal waters,
- Artificial surface water bodies; and,
- Heavily modified surface water bodies.

Each natural surface water body is assessed on its ecological status and its chemical status. Ecological status is assessed based on the following categories, with each category receiving a rating of, “High,” “Good,” “Moderate,” “Poor” or “Bad”:

- Biological quality (aquatic flora and fauna);
- Physico-chemical quality (temperature, oxygenation, nutrient conditions) and,
- Hydromorphological quality (waterflow, sediment composition and movement, riverbank structure etc).

The over-all ecological status is based on the lowest of the three individual ratings.

In the case of artificial and heavily modified waters, ecological potential status is assessed similarly to ecological status above but is rated as “Maximum,” “Good,” “Moderate,” “Poor” or “Bad ecological potential” instead. In general terms, ‘maximum ecological potential’ means that the water body is as close as possible to a comparable surface water body, with the only differences being those directly attributed to artificial or modified nature of the water body.

Chemical status is given one of two ratings: ‘Good’ or ‘Failing to Achieve Good.’ For an assessment of ‘Good,’ no substance listed in the S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended) [4] may be found in concentrations above the relevant EQS limits.

The over-all chemical status of a waterbody is determined by the lowest status found to apply.

1.3.2 Groundwater Quality Assessment

Groundwater is awarded either “Good” or “Poor” status. Groundwater is assessed based on its chemical and quantitative status.

Good chemical status of a groundwater body requires the entry of hazardous substances and saline intrusion into the groundwater to be prevented, and the presence of other pollutants to be below the limits within S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended) [5]. Concentrations of pollutants must also not be of such a concentration as to impact the ecological or chemical status of associated surface waters or to damage linked terrestrial ecosystems.

Quantitative status is assessed based on whether or not the available groundwater resource is being reduced by the long-term rate of annual abstraction and is rated as “Good” or “Poor.”

2 METHODOLOGY AND SCOPE

In order to assist in the implementation of the WFD, EU member states, alongside Norway and the European Commission, developed a “Common Implementation Strategy” (CIS) in May 2001. This CIS was designed to provide coherent and comprehensible guidelines aimed at achieving the aims of WFD.

Figure 4 of the CIS Guidance Document 36 – “Exemptions to the Environmental Objectives according to Article 4(7)” [6] provides an outline of an approach to WFD Assessments. This, reproduced in Figure 2-1 below, breaks the assessment down into the following sequential steps:

- Screening for Potential Effects - Determine whether the Project could have any direct or indirect effect on the different quality elements relevant to the WFD;
- Scoping of Further Investigations - Outline the information required to determine the significance of any effect on the relevant quality elements; and,
- Data Collection and Assessment - Assess whether any effect could cause deterioration or compromise the status/potential status of a water body.

If the project is determined to compromise or deteriorate the status/potential status of a waterbody then a “Article 4(7) Test” is required. The project can only be authorised if the conditions as outlined under Article 4(7) a) to d) (shown in Chapter 1.3.1) are fulfilled. If the conditions are not fulfilled the project cannot be authorised according to the WFD. Assessment under Article 4(7) is summarised in Figure 6 of CIS Guidance Document 36, reproduced as Figure 2-2 below.

If no impacts are identified, then no Article 4(7) assessment is required, and the project may be authorised according to the WFD.

Figure 2-1: WFD Screening Assessment

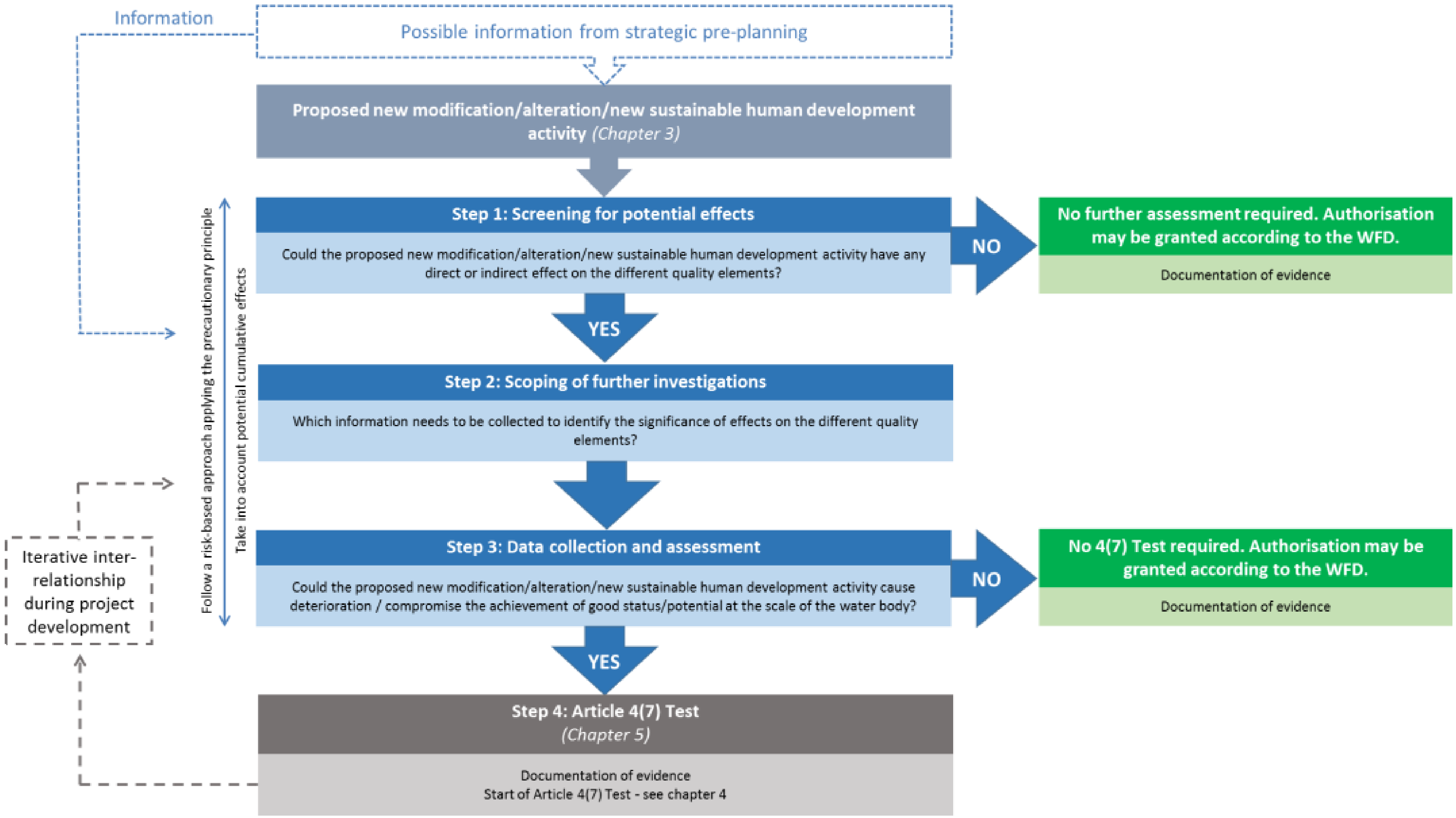
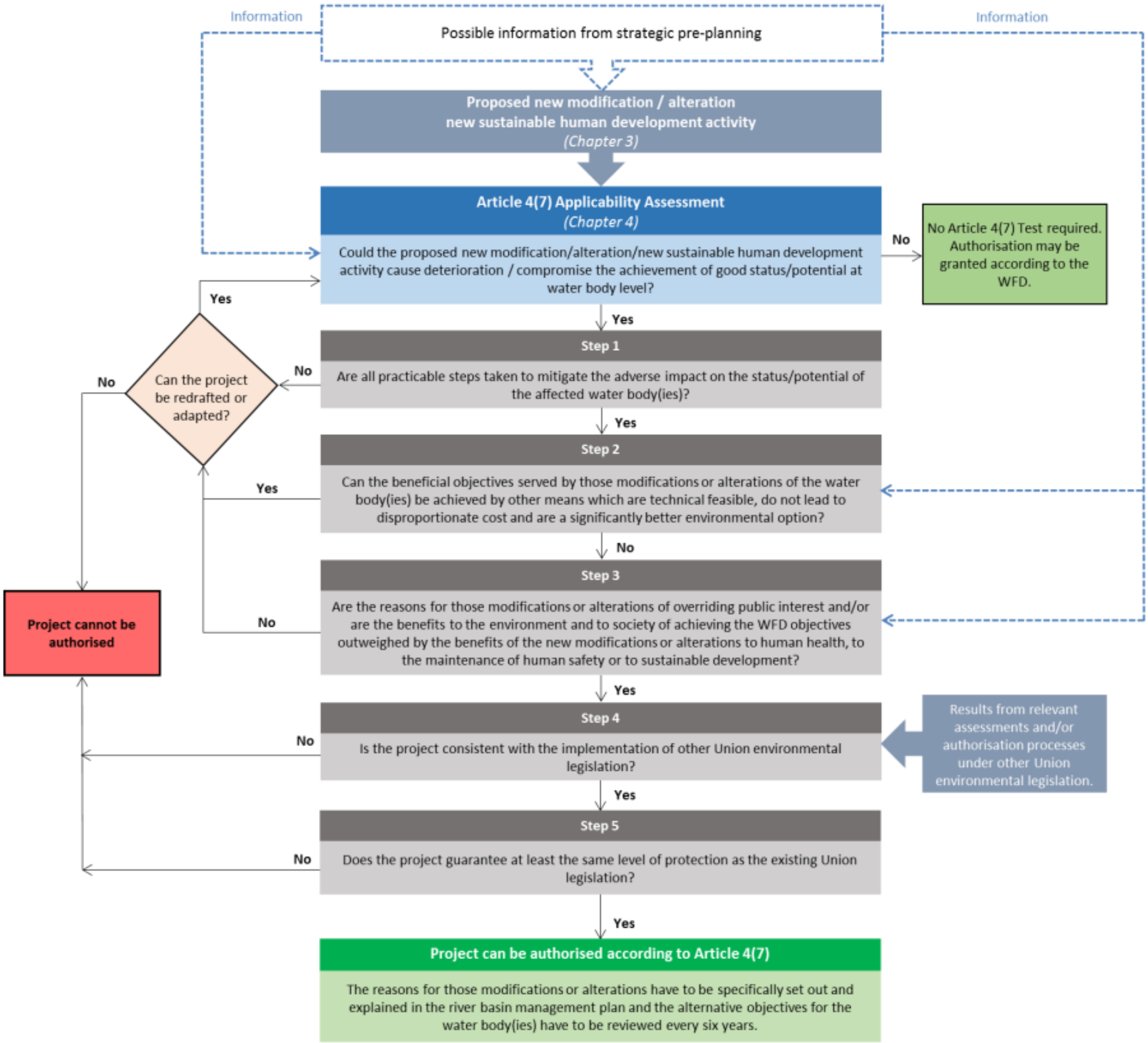


Figure 2-2: Article 4(7) Screening Assessment



3 SITE CONTEXT AND STUDY AREA

3.1 Existing Development

The existing Scotshouse Quarry has known pre-1963 origins and was registered under S261 as quarry QY1. It lies immediately on the southwest side of the L6280, ca. 700m south of the junction between the L6280 and the R212. North of the Site, the R212 joins the N54 at Clones (8km from the Site), providing access to Monaghan Town to the northeast and Cavan to the southwest. South of the existing Scotshouse Quarry, ca. 6km away, the L6280 connects to the L2023 which runs east to Cootehill and connects to numerous regional roads.

The existing Scotshouse Quarry includes the following established components/infrastructure:

- ESB substation;
- Site office;
- Vehicle parking;
- Staff welfare facilities;
- Weighbridge;
- Wheel wash;
- Associated settlement ponds;
- Crushing/screening plant; and,
- Hot-mixed macadam plant.

The layout of this infrastructure can be seen in Figure 3-1 below.

Figure 3-1: Scotshouse Quarry Infrastructure

The wheel wash, located on the access road between the quarry floor and the access gate onto the L6280, consists of a 9.3m x 3.7m concrete-lined depression supplied by intercepted run-off stormwater from the quarry sides and extraction floor. During prolonged periods of dry weather, it can be topped-up from the mains water supply. Maintenance in the form of the removal of accumulated silt is routinely carried out by use of an excavator.

Fuel is stored within a purpose-built bunded tank inside a covered garage. All quarry-owned HGVs and all on-site mobile plant and equipment are refuelled on the concrete plinth next to the fuel garage. Refuelling is carried out by trained personnel, with suitable drip trays and easy access to emergency spill kits. Storm drainage from the refuelling plinth feeds into the settlement tanks located next to the quarry offices.

Oils and other maintenance liquids are stored in suitable bunded/double-skinned/drip-tray containers, on hard-standing and secured in the main site garage close to the access gate. Any oil or lubricant changes or routine servicing of wheeled or tracked plant is undertaken within suitable garage facilitates. The Proposed Development will rely on the existing procedures and policies in relation to fuel/oil storage, and as such, no refuelling or storage will occur within the Site.

3.1.1 Foul Drainage

Welfare foul water from the site office and canteen is discharged via gravity-fed pipe to a septic tank located opposite the site office. Further hygiene facilities are provided in a portable toilet located just inside the quarry access gate onto the public road. Both the porta-loo and the septic tank are emptied on an as-needed basis by licensed contractors and disposed of at a suitably licensed off-site facility.

3.1.2 Stormwater Drainage

The quarry floor has a shallow gradient which slopes towards the quarry access gate. Run-off from the quarry floor to the north of the Proposed Development currently drains overland via informal channels and large puddles. This run-off is intercepted either by the wheel-wash or by the yard interceptor drain at the quarry access gate. The drain is 20m x0.7m and is ca.0.1m deep below a removable metal grate. This discharges into an open channel at the eastern end and flows via a 150mm pipe into the settlement tanks (see section 3.6.3 below).

3.1.3 Discharge License

The Site was granted a trade effluent discharge licence by MCC (WP26/15) following the granting of planning ref 14/124. This permits the discharge of trade effluent from:

- Mineral washing;
- Washing out of vehicles;
- Wheel washing; and,
- Run-off from yard areas.

The limits for this discharge are set out in Table 3-1 below:

Table 3-1: Discharge Licence Limits

Parameter	Emission Limit Value (ELV)	
Temperature	25 ^{o}C	
pH	6-9	
	mg/l	**kg/day**
BOD_5	5	0.6
Suspended Solids	20	2.4
Molybdate Reactive Phosphate (as P)	0.3	0.036

Total Ammonia (as N)	0.3	0.036
	l/s	**m^3/day**
Max Volume	4	360

The existing quarry discharges account for approximately 25-30% of the permitted volume of water allowed to be discharged from the Site based on the licence limits. The trade effluent is collected and held within a concrete-lined pit containing four (4No.) linked settlement tanks. This is located close to the northeastern boundary fence. The tanks have a combined surface area of ca.230m^2 and are divided by interior walls. Water enters the first tank at the north-west end and discharges via the final tank at the south-east via a hydrocarbon class interceptor. From the interceptor, the effluent flows via a buried 150mm pipe to the open roadside drain to the exterior of the Site fence. The drain flows to the northwest, being culverted under the L2780, and flows through neighbouring agricultural land before discharging to a wetland area downstream of Dunsrim Lough. See Figure 3-2 below.

Figure 3-2: Discharge Licence Drainage

3.1.4 Surface Water Monitoring

Surface water monitoring of the current discharge and surrounding surface waters occurred between October 2022 and October 2023. Twelve (No.12) monitoring events were carried out for surface water for a monthly basis during this period. Sampling took place at six (No. 6) locations – SW1 sampled the settlement lagoons, SW2 sampled the discharge point, SW3 sampled the drainage ditch upstream from the discharge point, SW4 sampled the drainage ditch downstream of the discharge, SW5 sampled the drainage ditch before the wetlands adjacent to Dunsrim Lough (after January 2023) and SW6 sampled the water flowing from the wetlands adjacent to Dunsrim Lough (after January 2023).

Three (No.3) exceedances of the suspended solids ELV (20mg/l) was noted at SW2 during the December 2022 (34mg/l), March 2023 (21mg/l) and April 2023 (21mg/l) monitoring events. Two (No. 2) exceedances of the total ammonia (as N) ELV (0.3mg/l) were recorded during monitoring in 2022 at SW2 in October 2022 (0.31mg/l) and in November 2022 (0.32mg/l). All discharges (SW2) exceeded surface water acceptance criteria (SWACs) for “Good” quality total ammonia as N (≤0.065mg/l N annual mean), excluding the February 2023 monitoring event (<0.1mg/l N) and the October 2023 event (where no sample was taken), with concentrations ranging between <0.1 - 0.32mg/l N.

When comparing drainage ditch measurements (SW3 – SW6) taken in 2022 and 2023 to S.I. No.272/2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended), the surface water body directly downstream of the discharge (SW4) exceeds the SWAC for “Good” quality total ammonia as N (≤0.065mg/l N annual mean) during all 2022 monitoring events and the March – October 2023 monitoring events, with concentrations ranging between <0.1 - 0.2mg/l N. Upstream (SW3) shows exceedance of the SWAC for total ammonia as N during the April, May and October 2023 monitoring events. Downstream of SW3, SW5 shows three (No.3) exceedances above the SWAC for total ammonia as N during the May 2023 (0.11mg/l N), July 2023 (0.14mg/l N) and September 2023 (0.12mg/l N) monitoring events. Further downstream, SW6 shows five (No. 5) exceedances of the SWAC for total ammonia as N during the February – May 2023 and the August 2023 monitoring events. Elevated suspended solid concentrations at SW2 map consistently onto the detection of suspended solids at SW4 downstream. However, during a single event of 130mg/l suspended solid concentrations upstream (SW3) of the discharge location during the May 2023 monitoring event no suspended solids were detected at SW4.

The average of the BOD measurements between October 2022 and October 2023 (2.25mg/l) at SW6 exceeds the SWAC for BOD (1.5mg/l annual average). Additionally, there are exceedances of the SWAC for molybdate reactive phosphate (as P) (≤0.035mg/l P annual mean) at SW6 during all monitoring events at that location (January – May 2023) (0.054 – 0.15mg/l P range). These exceedances are likely unrelated to onsite activities as no exceedances of BOD or molybdate reactive phosphate (as P) occur within or around the discharge.

The discharge from the Site is made up of storm water carrying overflow from the mineral crushing plant, vehicle and wheel washings and general run-off from the Site. The suspended solids from the Site are sourced from sediment and other material carried in this run-off and can be sourced actively (washings) and passively (run-off) from Site activities. The Site may be acting as a pathway for agricultural land run-off from Zone B and other adjoining agricultural lands, which may be contributing to ammonia within surface water discharges, given the offsite ammonia source identified from groundwater monitoring (see Section 3.1.5). Additionally, residues of explosives from onsite blasting entering run-off and washings to reach the discharge are likely contributing to ammonia in the discharge. However, as noted from monitoring data for SW3, there are elevations above SWAC limits for ammonia and elevations in suspended solids within waters in the drainage network upstream of the discharge, indicating that the Site is not the sole contributor for these elevations locally.

Whilst the elevated concentration of suspended solids and total ammonia of the discharge can be correlated to concentrations directly downstream of the discharge at SW4, elevated concentrations at the discharge do not directly correspond to concentrations above the SWAC limits further downstream at SW5 and SW6 in all cases. As such, the negative effect of current Site activities is localised, temporary and not significant, with the transport and the wetland attenuating effects before they enter surface waters at Dunsrim Lough.

3.1.5 Groundwater Monitoring

Groundwater monitoring onsite occurred between December 2022 and February 2023. Groundwater level measurements taken during the monitoring events indicate a groundwater gradient (flow direction) from southeast to northwest across the Site, with wells GW2 and GW6 being within Zone A (the current quarry pit) and the other groundwater wells being within Zone B (the proposed extension lands). Therefore, any exceedances noted in the Zone B wells GW4, GWB and GWD are not associated with quarry activities, instead reflecting external pressures on groundwater quality or local aquifer characteristics.

Five (No.5) exceedances of GAC limits were detected during the 5th December 2022 monitoring event; total ammonium as N (0.065mg N/l) at GW4 (0.08mg N/l), sulphate (187.5mg/l) at GW2 (219.2mg/l) and GW6 (231.7mg/l) and hardness (as CaCO3) (200mg/l) at GW2 (279mg/l) and GW6 (325mg/l). No exceedances of the GAC limits were detected for GW5 during this monitoring event.

Three (No.3) exceedances of GAC limits were detected during the 11th January 2023 monitoring event; total ammonium as N (0.065mg N/l) at GW4 (0.07mg N/l) and GW6 (0.09mg N/l) and hardness (as CaCO3) (200mg/l) at GW6 (272mg/l). No exceedances of the GAC limits were detected for GW2, GW3 and GW5 during this monitoring event.

One (No.1) exceedance of GAC limits were detected during the 10th February 2023 monitoring event; total ammonium as N (0.065mg N/l) at GWB (0.09mg N/l). No other exceedances of the GAC limits were detected for GWB during this monitoring event.

Two (No.2) exceedances of GAC limits were detected during the 14th February 2023 monitoring event; hardness (as CaCO3) (200mg/l) at GWD (276mg/l) and total aliphatics and aromatics (C5-44) (7.5µg/l) at GWD (210µg/l). No other exceedances of the GAC limits were detected for GWD during this monitoring event.

In addition to the sampling of onsite wells, a groundwater sample was taken from a private well located north of the site on 25th January 2023. This sample showed one (1 No.) exceedance of GAC limits for hardness (as CaCO3) (200mg/l), with a concentration of 315mg/l. No other exceedances of the GAC limits were detected.

The noted exceedances in total ammonium as N occurred only once within the quarry but three times in the upgradient wells, indicating that these elevations in ammonia are not associated with quarry activities, however related to a potential offsite source. Exceedances in water hardness are reported in both Zone A and B wells, along with the private/external well north of the Site, indicating the elevated water hardness are local characteristic of the groundwater or be associated with other, upgradient pressures. Additionally, high water hardness (“hard” water) is not considered to cause human health risks.

Given the location of the hydrocarbon detection in groundwater, the current Site activities likely did not result in the observed total aliphatics and aromatics (C5-44) exceedance at GWD. The only exceedances observed within Zone A not noted in Zone B or outside the Site are the sulphate exceedances noted in both Zone A wells (GW2 and GW6), indicating it is associated with onsite activity. The most likely source of sulphate onsite is dissolution or leaching of sulphate from minerals within crushed rock and dust generated onsite. However, this exceedance only occurred once during the monitoring period and so is not a consistent pressure on groundwater. Therefore, it likely has a brief to temporary, not significant negative effect on local groundwater as it is impacting groundwater quality, though not in a persistent manner.

3.1.6 Current Mitigation Measures

The original planning permission (ref 83/09) set out conditions which included requirements for the:

- Suppression of dust;
- Limits on noise levels;
- Prohibition of surface water flow onto the public road;
- Storage of topsoil against future site restoration, and; and,
- Planting of native trees/retention of hedges to act as a screen.

At the time of writing, there were no complaints or enforcement notices brought against Scotshouse Quarry in relation to compliance with the aforementioned conditions.

3.2 Proposed Development

The Proposed Development incorporates an area of ca.14.6ha, extending the registered quarry QY1 in a southerly direction. This consists of:

- Zone A – covers 6.5 ha. area of land previously exposed to extraction activities, including that area for which substitute consent has been applied; and,
- Zone B – covers 8.1 ha. area of land to the south of the existing excavated area which is currently and previously used for pasture.

Zone A are lands owned by the Applicant, and which have been subject to historic quarrying. Ground levels are variable within this zone, depending upon the number of historic blasting conducted. It is proposed to initially reduce all of Zone A to a common floor level, prior to developing this zone deeper by 1 bench to reach the desired depth of ca. 90mOD.

Zone B constitutes agricultural land, which will involve the purchase of land from three neighbouring land-holders and the inclusion of land to the immediate south-east of the Substitute Consent Area already held by the Connolly family. The wider locality is dominated by agricultural land use. Land levels within these agricultural fields gradually rises from the boundary with Zone A (ca. 130mOD) to the high point in the south (ca. 146-150mOD). There is a derelict stone farm building present in the southwestern portion of Zone B2. It is estimated that up to 3 benches will be formed in Zone B to bring this land down to the desired quarry floor level of ca. 90mOD.

The zoning of the Proposed Development in relation to extraction phases is shown in Figure 3-3 below. Figure 3-4 displays the relevant land ownership boundaries.

Figure 3-3: Breakdown of Site into Zones

Figure 3-4: Current Land-holdings of Land within Quarry Extension Boundary

The extension is to allow the company to continue to extract at their current rate of up to 350,000 tonnes per annum. The proposed operations onsite will emulate the existing/previous excavation and processing operations within Scotshouse Quarry.

The Proposed Development will not increase employment but will retain vital jobs in the locality. It is not proposed to introduce new facilities such as a canteen, office or washroom as these facilities are already in place within the existing quarry. The Proposed Development seeks to extract the land within the Site to a level of 90mOD.

3.2.1 Construction Phase

The Construction Phase relates to the preparation of the agricultural fields located in the south of the Site for rock extraction activities. The works will include the:

- Removal of overburden;
- Removal of a derelict stone building (only in Zone B2);
- Creation of soil embankments and berms along the new Site boundaries;
- Creation of a haul road between all operational areas of the Site;
- Planting of the embankment; and,
- Installation of security fencing to prevent unauthorised access to the Site during the Operational Phase.

Plant required at this phase will primarily consist of a bulldozer and excavator. This phase will result in an exposed rock outcropping which is suitably prepared for extraction through blasting. The construction phase (site preparation) will be completed over a 6-month period cumulatively, split over two phases at the request of landowners. The construction phase will not be completed sequentially with the operational phase.

3.2.2 Operational Phase

The Proposed Development will operate in a similar manner to the existing Scotshouse Quarry. The operational face will be developed in a phased manner, using industry standard drilling and blasting techniques to release the rock from the quarry benches.

The extraction area will maintain a minimum buffer with adjoining lands of ca. 9m to provide an area of minimal disturbance around the Site. This extraction buffer will be used for the siting of the berm and security fencing. The berm will be constructed from overburden stripped as part of the preparation works in the extension lands. The berm will be ca. 4m wide and 2m high and will be planted with native tree species to aid screening and provide features which may offer biodiversity enhancement. The berm will be constructed along the periphery of the extraction area.

Rock will be prepared for processing into aggregate and other products by programmes of controlled intermittent blasting. This requires the selected area of rock face to be readied by a drilling rig, installation of explosives by a competent blast specialist, detonation, which breaks/shatters a given portion of rock face. During and after a blasting event, the area is closed to personnel for safety purposes. Once the area has been deemed safe, the blasted rock can be processed. This processing represents the main activity of the quarry.

Processing will consist of the primary crushing and screening by mobile plant near the blast area followed by transportation, either directly to market or to the main processing plant within the existing Scotshouse Quarry to the north of the Site. This requires the use of various plant such as tracked excavators, rubber tyred loading shovels and a variety of crushers and screeners. Crushed and screened aggregate will be stockpiled onsite prior to removal from the quarry or use in the macadam manufacturing operation within Scotshouse Quarry.

The Proposed Development will seek to provide the raw material for aggregate chippings for use in surface dressing and macadam, along with different grades of crushed stone and customer-tailored aggregates.

The following mobile equipment will be used during the Operational Phase of the Proposed Development:

- One (1) x Volvo 300 excavator
- One (1) x Sandvik QJ341 Jaw Primary Crusher
- One (1) x Roco 1600 Scalping Screen
- One (1) to Two (2) x Roco tracked conveyer/stacker
- One (1) x Volvo L180 Wheel Loader

The Operational Phase will be divided into 8 phases and will result in the existing ground level across Zones A and B being extracted down to 90mOD. Figure 3-5 below presents the phasing scheme for the upper and lower elevations, which is described below.

During the operation, the phasing design will include for a low point on the Site to be maintained. This will act as a sump to hold water which may be encountered from water ingress such as storm events or groundwater faults. The water held within this sump will be pumped off at a controlled rate suitable to comply with the existing discharge licence for the Site.

Phase 1

The first phase will commence in Zone A, where the applicant will extract the remaining rock deposits in the north-western portion of the Site. Extraction activities within this phase will reduce the existing ground level from ca.130mOD at its highest point to ca.105mOD. This phase will run concurrently with Phase 2.

Phase 2

While extraction activities are occurring within Phase 1, the applicant will commence site preparation works (Construction Phase) in Zone B1 of the extension lands (i.e., the land currently owned by Connolly and Soden). Once these lands have been prepared, extraction activities associated with Phase 2 can commence.

Extraction activities associated with this phase will reduce the existing ground level from ca.140mOD at its highest point to ca.120mOD. Aggregates will be transported back to the existing quarry for further processing via the existing haul route on the eastern periphery of the Site. However, as the ground level is reduced new temporary haul routes will be constructed to main connectivity with the existing quarry infrastructure. This phase will run partly in concurrence with Phase 3 and 4.

Phase 3

Phase 3 will seek to extract the remaining deposits from ca. 115mOD at its highest point to ca. 105mOD in the eastern portion of Zone A. This phase will run in partial concurrence with Phase 2 and 4.

Phase 4

Phase 4 will seek to extract deposits within the central and eastern portion of Zone A from 105mOD to 90mOD. These deposits associated with this phase extend beneath those in Phase 3 and as such will be accessible following their removal. This phase will run in partial concurrence with Phase 3 and 5.

This phase will provide a sump for water storage. This will aid the Applicant’s ability to avoid water leaving the Site at a greater rate than permitted via the discharge licence as this void will act as large sump, requiring water to be pumped from it thereby altering the current gravity fed arrangement. Prior to this phase, the Applicant will ensure there will always be a low point in the quarry (i.e. below 100mOD).

Phase 5 & Phase 6

While extraction activities are occurring within Phase 5, the applicant will commence site preparation works (Construction Phase) in Zone B2 of the extension lands (i.e., the land currently owned by Markey and Boylan). These lands will be accessed via the existing access track along the western periphery of the Site. During the preparation of Phase 6 lands, extraction activities associated with phase 5 will be on-going. Extraction activities associated with this phase will reduce the existing ground level from ca. 120mOD at its highest point to ca. 90mOD within Phase 5.

Following preparation works in Phase 5, extraction activities will commence in Phase 6. Extraction activities associated with Phase 6 will reduce the existing ground level from ca.140mOD at its highest point to ca.120mOD in Zone B1. Both Phase 5 and Phase 6 will be completed concurrently, providing an opportunity for summer/winter benches pending water levels at the Site.

Phase 7

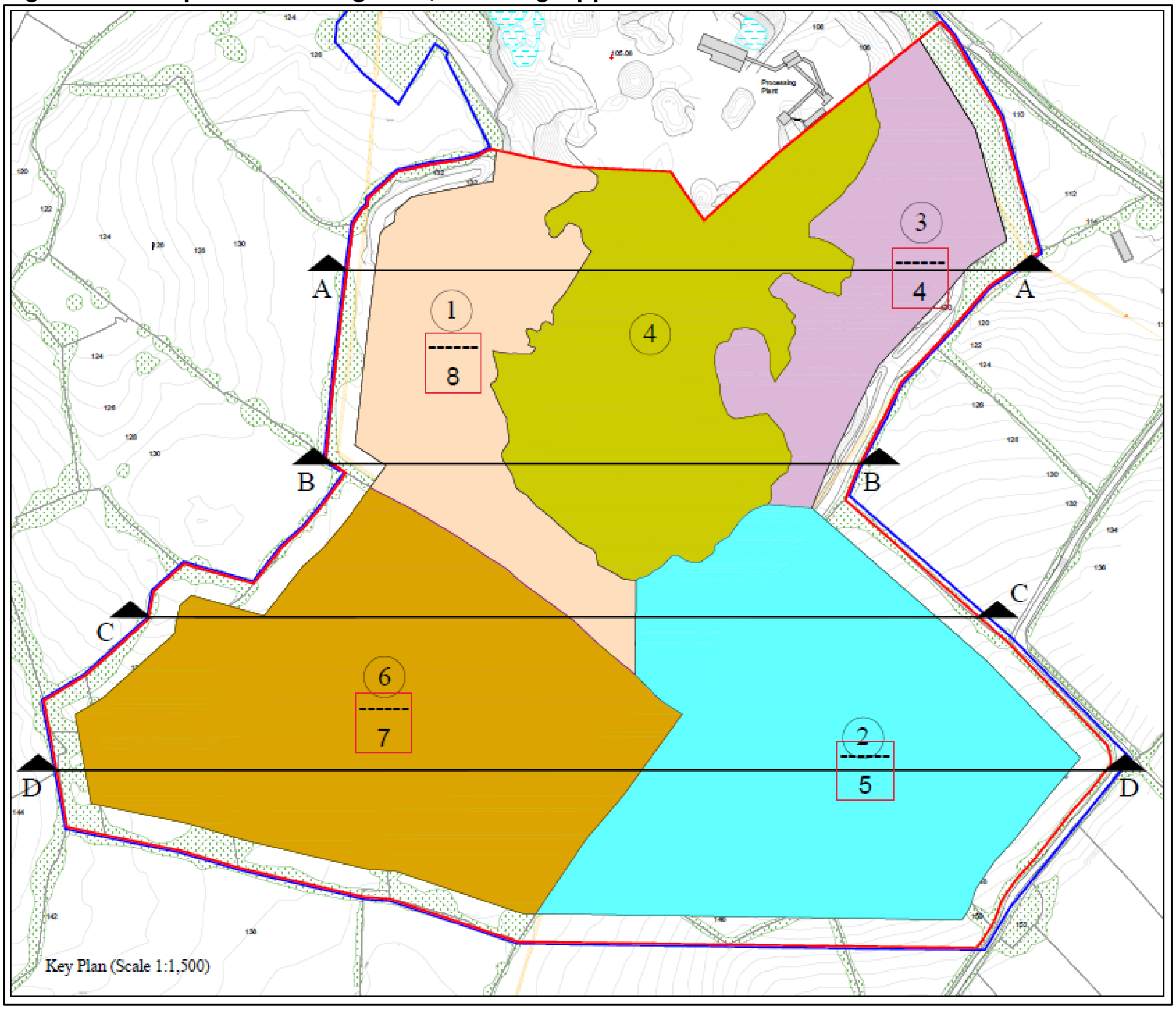
Phase 7 will seek to extract the remaining deposits in Zone B1 from 105mOD to ca.90mOD. The latter stages of Phase 7 will be concurrent with the earlier stages of Phase 8.

Phase 8

This phase will seek to extract the remaining deposits in the western portion of Zone A from 105mOD its highest point to ca.90mOD. This will be the last phase of operations associated with the Proposed Development.

Each of these stages will be completed in a distinct manner over the course of the operational life of the Proposed Development. Nevertheless, the activities associated with each stage will be relatively consistent.

Figure 3-5: Proposed Phasing Plan, Showing Upper and Lower Elevation Phases



3.2.3 Restoration Phase

Upon the completion of extraction activities, the Site will be made safe and left in a state which may enable a biodiverse habitat to develop. The resultant ground level across Zone A and B will be below the water table – the estimated groundwater level is 104-105mOD. As such, groundwater will be allowed to recharge and form a water body across the Site. Given the low conductivity of the rock in the Site, it will take many years for inundation to former levels to occur. This represents a departure from the rehabilitation plan previously submitted to the competent authority for Zone A. As submitted under the Substitute Consent application, this is necessitated by the deepening of the Quarry.

The Rehabilitation Phase will include Site closure and the key deliverable will be the provision of an extended water body with improved boundary landscaping to facilitate and encourage aquatic bird species. Additional bird and bat boxes will be erected around the periphery of the Site.

The boundary embankments, which will be well established with ca. 30 years of development, will be left in-situ to provide a visual screen for these species from the surrounding landscape. At this stage, all plant and equipment will be removed from the Site. A ramp will be created from the exit haul route with additional aggregate as needed into the future water body, which will allow safe egress from the final water level.

3.2.4 Drainage and Dewatering

As the Proposed Development extends ground level below the current level of 105mOD it will be necessary to commence pumping water to the existing lagoons for use in onsite processes as gravity will no longer provide a suitable means of drainage. The Proposed Development will seek to utilise the existing discharge licence to remove groundwater/surface water encountered during the operational phase of the Proposed Development, that is excess to processing requirements. The dewatering will be completed using a submersible pump at a rate which will ensure the discharge limit of $360m^3$/day will not be exceeded at any time. The proposed operational activities will be phased in a manner which will ensure there will be a sump available to hold excess water to ensure discharge remains compliant with the licence. The sump will also act as a settlement pond, allowing any solids to settle out.

As there is no change to staffing numbers arising from the Proposed Development, there will be no change to foul drainage.

3.2.5 Restoration and Aftercare

No part of Scotshouse Quarry has undergone any restoration at the time of writing (March 2024). A full Restoration Plan forms part of this EIAR and is supplied with this planning permission. The restoration will be carried out in accordance with then-current best practice guidelines and in compliance with relevant legislation. It is envisaged that the Restoration Plan will take 18 months to complete, with a suitable subsequent period of monitoring.

4 STUDY AREA SCREENING

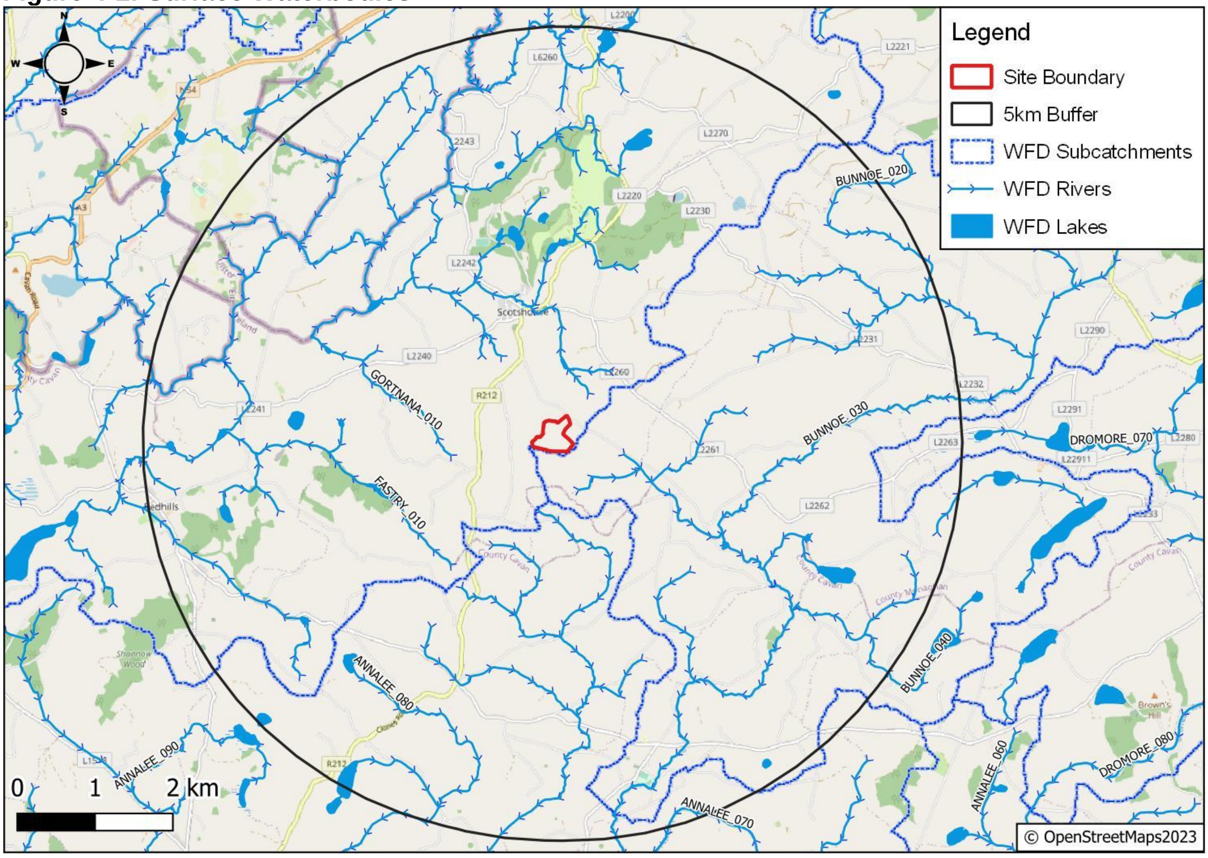
For the purposes of this screening assessment, information available on or through the EPA maps [7] was utilised throughout. Specific data on the quality status of waterbodies was gathered from datasets available on catchments.ie [8].

4.1 Surface Water

Surface water bodies were screened to a radius of 5km from the Site boundary. Impacts from the Proposed Development are unlikely to extend beyond this distance, given the size and nature of the development.

Figure 4-1 below shows all the surface waterbodies and subcatchment boundaries within 5km of the Site. The closest EPA surface waterbody is the GORTNANA_010, located ca.400m northeast of the Site. The Site discharges into local drainage ditches that connect to the GORTNANA_010 waterbody at Dunsrim Lough – a small lough that forms part of the GORTNANA_010 waterbody.

Figure 4-1: Surface Waterbodies



All surface waterbodies with 5km are located in the WFD “Erne” River catchment, with the Proposed Development located fully within the Finn[Monaghan]_SC_020 subcatchment and with the Bunnoe_SC_010 and Annalee_SC_030 subcatchments to the east and south respectively. Details of waterbodies within 5km of the Site, obtained from catchments.ie [8] datasets, are presented in Table 4-1 below. Waterbodies upstream of the Discharge or located within a separate subcatchment are screened out of the Assessment as they will not experience any impact from the proposed activities.

Table 4-1: Surface Waterbodies within 5km of Site

Name	EPA Code	Type	Area / Length	Status (2016 – 2021)			Risk
				Ecological	Physio-Chemical	Hydro-morphological	
Subcatchment - Finn[Monaghan]_SC_020							
GORTNANA_010	IE_NW_36G750800	River	16.43km	Moderate (Note - Low Confidence)	-	-	At Risk
FINN (MONAGHAN)_050	UKGBNI1NW363604080	River	45.53km	Poor (Invertebrate Status)	-	-	At Risk
Lackey River_010	UKGBNI1NW363604066	River	81.10km	Moderate	-	-	At Risk
Corconnelly	IE_NW_36_192	Lake	0.05km^2	High	Moderate	Moderate	At Risk
FASTRY_010	IE_NW_36M620820	River	9.51km	Moderate (Note - Low Confidence)	-	-	In Review
MAY HILL_010	IE_NW_36M620820	River	14.40km	Moderate (Note - Low Confidence)	-	-	In Review
Subcatchment - Bunnoe_SC_010							
BUNNOE_020	IE_NW_36B050400	River	15.43km	Moderate	-	-	At Risk
BUNNOE_030	IE_NW_36B050500	River	11.86km	Good	Good	-	In Review

Name	**EPA Code**	**Type**	**Area / Length**	**Status (2016 – 2021)**			**Risk**
				Ecological	**Physio-Chemical**	**Hydro-morphological**	
Killynenagh	IE_NW_36_409	Lake	$0.06km^2$	Moderate	-	-	In Review
BUNNOE_040	IE_NW_36B050700	River	15.34km	Good	-	-	In Review
Subcatchment - Annalee_SC_030							
ANNALEE_080	IE_NW_36A021000	River	62.23km	Good	-	-	Not At Risk
ANNALEE_070	IE_NW_36A020900	River	11.26km	Good	Good	-	In Review

4.2 Groundwater

Groundwater bodies (GWB) were screened to a radius of 5km from the Site boundary. Impacts from the Proposed Development are unlikely to extend beyond this distance, given the size and nature of the development. Figure 4-2 below shows all the groundwater waterbodies (GWB) within 5km of the Site, with details of groundwater waterbodies are presented in Table 4-2 below.

Figure 4-2: Groundwater Bodies

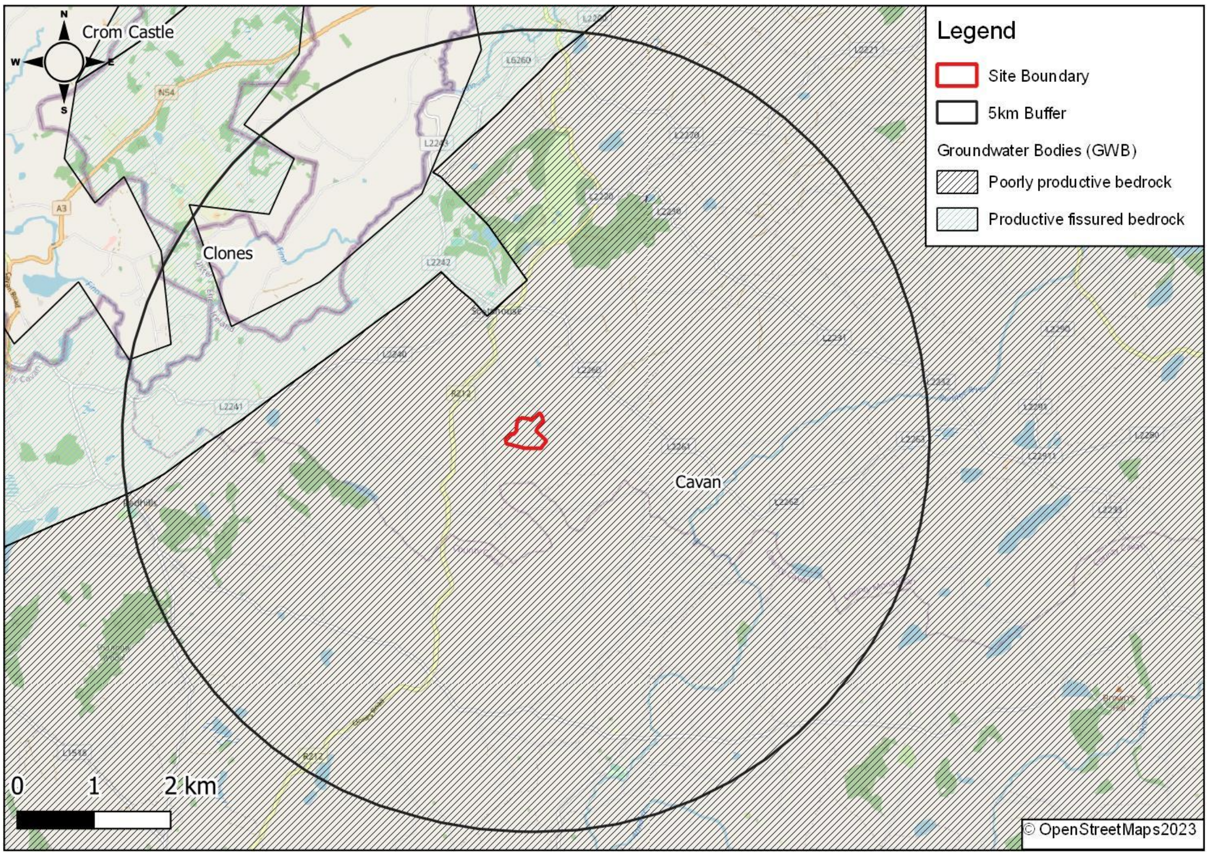


Table 4-2: Groundwater Waterbodies within 5km of Site

Name	EPA Code	Type	Area (km^2)	Status		Risk
				Quantitative	Chemical	
Cavan	IE_NW_G_061	Poorly productive bedrock	*	Good	Good	Not at Risk
Clones**	IEGBNI_NW_G_063	Productive fissured bedrock	*	Good	Good	At Risk

**These GWBs cross the NI border and are defined differently in NI. As a result, an area cannot be constrained for these GWBs.*

*** The EPA maps do not extend into NI. As such the Clones GWB terminates at the border. The unlabelled area of GWB within 5km of the Site is considered to be a section of the Clones GWB that extends into NI.*

Although the Proposed Development does not include planned abstraction, there will be extraction to below the groundwater level. As such, there is an increased vulnerability to contamination of groundwater as more groundwater is exposed onsite. As such, there may be mitigation required during Site activities to limit potential releases to groundwater during the operation of the quarry. This vulnerability increase is limited to the Site area and will persist following remediation onsite, as no infilling of the quarry pit will occur.

There is a pathway for transport of contamination to enter the “At Risk” Clones GWB via groundwater flow, which could degrade the water quality of the already pressured (see Section 4.5) GWB. Therefore, the Clones GWB should be screened in for further assessment. Given the direct hydrogeological link between the Site and the Cavan GWB, it also should be screened in for further assessment.

4.3 Protected Sites

Within 15km of the Site, there are 16 No. Protected Sites (see Figure 4-3 and Table 4-3 below). As acknowledged in the Office of the Planning Regulator guidelines – “Appropriate Assessment Screening for Development Management” [9], few projects have a zone of influence this large. However, the identification of European sites within 15km has become commonplace as the starting point for the screening process.

Only Protected Sites with a hydrological connection to the Proposed Development are screened into the assessment. Only the Lough Oughter and Associated Loughs SAC is hydrologically connected to the Site at Lough Sarah, located approximately 14.6km downstream of the discharge point. The connection exists for a small number of Lough located in the northern region of the SAC. Given the scale of the Proposed Development and the proposed maximum discharge of 360m^3/day (in compliance with discharge licence) any potential negative impacts to the SAC as a result of the Proposed Development will be imperceptible or not significant.

No Natural Heritage Areas (NHAs) were noted to be within 15km of the Site.

Figure 4-3: Protected Sites

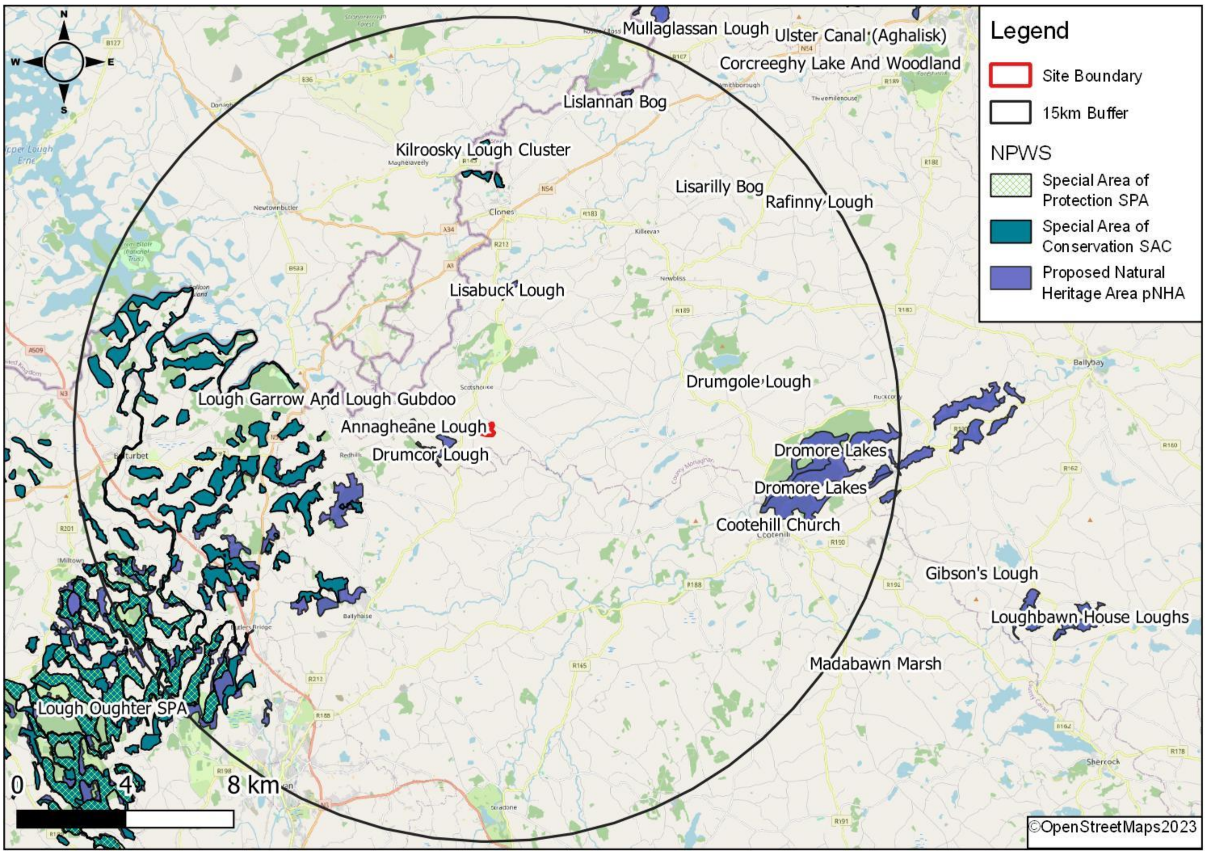


Table 4-3: Protected Sites within 15km of Site

Name	Site Code	Hydro Connection	Qualifying Interest
Special Protection Areas (SPAs)			
Lough Ougher SPA	004049	None	Great Crested Grebe (Podiceps cristatus) Whooper Swan (Cygnus cygnus) Wigeon (Anas penelope) Wetland and Waterbirds
Special Areas of Conservation (SACs)			
Lough Oughter And Associated Loughs SAC*	000007	Downstream – ca. 14.3km downstream of discharge	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation Bog woodland Lutra lutra (Otter)
Kilroosky Lough Cluster SAC	001786	None	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. Calcareous fens with Cladium mariscus and species of the Caricion davallianae Alkaline fens Austropotamobius pallipes (White-clawed Crayfish)
Proposed Natural Heritage Areas (pNHAs)			
Lisabuck Lough	001835	None	Attention was originally drawn to this lake because of the presence of Slender Tufted-sedge (Carex acuta) which is of restricted occurrence in Ireland. However, it is also a good site representative of the swarm of small lakes characteristic of the drumlin belt in Co. Monaghan which together represent a substantial wetland asset. Floristic gradients from open water to adjacent dry grasslands are well developed and included within the designated area.
Kilroosky Lough Cluster	001786	None	See SAC
Lislannan Bog	001840	None	When surveyed in 1983, this site was identified as being important as it was the only area of acid scraw and bog vegetation in the calcareous part of the Finn/Lacky catchment. The bog

Name	Site Code	Hydro Connection	Qualifying Interest
			also appeared to be drying out at this time however, to the extent that peat cutting, scrub clearance and reclamation were possible. A critical re-examination of the site may be required in the future.
Lisarilly Bog	001781	None	Some of the bog has been cut for peat, however it is mostly undisturbed. It retains considerable interest because it is the only reasonably intact example of raised bog development in the Finn-Lackey Catchment area.
Rafinny Lough	001606	None	This is the most interesting of the upland oligotrophic lakes found to date in Monaghan. It is unusually species rich for an upland lake and the flora exhibits a strong northern element. The floating mat vegetation is very well developed and provides an excellent example of a successional sequence typical in small water bodies.
Drumgole Lough	001601	None	The lake is not of outstanding ecological interest however it is one of the more attractive lakes in this area of south Monaghan. The development of large reed-bed areas around the lake edges is also of considerable interest and is a feature lacking in most of the other lakes in the locality.
Dromore Lakes	000001	None	The main interest of the site lies in its wintering waterfowl population. The site supports nationally important numbers of Whooper Swan and Wigeon.
Cootehill Church	000003	None	This site is recommended as a NHA due to the presence of a nursery colony of Natterer's Bats (Myotis nattereri) using the loft and bell tower of the church.
Drumkeen House Woodland	000980	None	Though not extensive woodland, and not natural in character the lack of woodlands in the locality, any deciduous woodland tract of a reasonable size and maturity is of local importance. It has a small lake that, although not in itself significant amongst the many other inter-drumlin lakes and wetlands found nearby, does add diversity to the pNHA.
Lough Oughter And Associated Loughs	000007	None	See SAC
Drumcor Lough	001841	None	This lake was identified as being of scientific importance in a lake survey of the Finn-Lacky catchment in 1983 because the water was of comparatively high quality facilitating a notable diversity of aquatic communities, and because it showed a good development of lakeside wetland communities, especially marsh dominated by small sedge (Carex spp.) species.

Name	Site Code	Hydro Connection	Qualifying Interest
Annagheane Lough	001836	None	Annaghaewe Lough is a very interesting lake mainly because of the high number of different habitat types occurring within a very small area. It also possesses an interesting sequence of vegetation zonation from reed swamp to birch woodland on cutaway, which is rarely encountered in the county.
Lough Garrow And Lough Gubdoo	000984	None	These lakes are a good example of low nutrient, high calcium lakes. This type of lake is unusual, with susceptibility to damage by nutrient enrichment from intensive agriculture in their catchment. The adjacent unimproved calcareous grassland also increases the value of this site.

4.4 Flood Risk Assessment (FRA)

The OPW's Catchment Flood Risk Assessment and Management (CFRAM) maps [10], Flood Hazard Mapping, along with historical mapping (i.e. 6" and 25" base maps) were reviewed to assess flood risk in the area of the Site.

CFRAM mapping has been completed for the Site and shows that the Site is not located within any fluvial or pluvial flood zones. There is no identification of areas that are "prone to flooding" on the available historical 6" or 25" (inch) within the Site boundary [10].

No flood events or recurring flood incidents were identified at the Site or in its vicinity from the OPW's Flood Hazard Mapping (see Appendix 8-7 of the main EIAR for a copy of the Past Flood Event Local Area Summary Report for the Site). The closest mapped flood events are located to the north and southeast of the Site, the majority of which are recurring in nature. The closest of these recurring flood events is 2.76km southeast of the Site, resulting from the Mill Race and River overflowing after heavy rain.

The area up to 2km surrounding the Site is not located within any predicted flood extents or areas at elevated risk of flood for both current and predicted future scenarios on the OPW datasets. This applies for pluvial, fluvial and groundwater flooding. Currently, discharges range from 34-123m^3/day, with an average rate of 89m^3/day measured. Given the minimal flood risk within the vicinity and downstream of the discharge it is not considered that proposed increases to discharge volume from Site will contribute to surface water flooding offsite.

However, the Site area itself is to be extracted below the groundwater table and as such natural intrusion and flooding of groundwater will occur, which will be allowed to collect, along with any run-off or rainfall, in sumps formed from low points onsite produced during extraction. Water from these sumps will be pumped offsite through the surface water discharge at rates compliant with the limits of the discharge licence. This pumping will be phased dependent with the project design creating sump low points in extraction zones for each phase, and pumping occurring when necessary, during changes in extraction area/phase and in order to prevent the sump overflowing from water input. Based on the data presented in Table 8-4 of the EIAR, there is limited seasonality in the groundwater levels across the Site area, with slight drops in summer elevations. As such this phased design may help reduce the amount of operations within the limited seasonal groundwater elevations onsite.

In the instance of a storm event, the areas within the Site below the groundwater table will be prone to inundation. This is the result of the stormwater elevating the groundwater profile onsite and stormwater becoming trapped within areas below the groundwater table as a result of the exposure of the groundwater table. The current design phasing leaves low points not currently under extraction as sumps for groundwater and storm inputs to be retained to prevent a breach of discharge limits in the licence.

Based on the categorisation of storms by Met Eireann [11], rainfall associated with a "Status Red Storm" is "greater than 80mm in 24hrs or less". Using this as a model storm event, the volume of stormwater entering the Site and existing quarry, and thus accumulating in any sumps for discharge, can be estimated. Additionally, using a High-End Future Scenario from the OPW [12], rainfall increases of 30% can be used to model a worse-case-scenario accounting for climate change. Therefore, a worst-case model storm would input greater than 104mm of rainfall in 24hrs or less over an area of 17.9ha (the area of Scotshouse Quarry, including the extension lands), or 179,000m^2. This equates to a minimum of 18,616m^3/day of stormwater directly entering the Site, which is a net input of 18,256m^3/day, when a maximum discharge of 360m^3/day is considered. The minimum sump height during any given phase of the development is 15m, hence, to accommodate the minimum storm inputs in a worst-case scenario and a sump of 1241m^2 is required with no discharge and a sump of 1217m^2 is required with discharge. Accounting for predicted maximum groundwater inputs of 50m^3/day from pumping tests, this necessary minimum area is 1244m^2 with no discharge and 1220m^2 is required with discharge. This calculation is based on a number of assumptions:

- Storm inputs relate directly to the rainfall onto the Site area and do not account for inputs from increased offsite runoff or groundwater entering the site as a result of the storm;
- The storm inputs cease after 24hrs at the stated rate;
- There is no water loss to groundwater transport, evaporation, etc.; and,
- The minimum capacity assumes that the sump area is empty before the storm inputs.

The calculated minimum areas equate to approximately 0.7% of the area of Scotshouse Quarry, including the extension lands. Given the area of the Site, and the phases to be implemented it is estimated that there will be sufficient space to withhold water from a storm event/groundwater intrusion.

Based on this information it can be concluded that the Proposed Development will not contribute to surface water flooding, however the Proposed Development will be naturally prone to groundwater flooding due to extraction below the groundwater table, with this flooding worsening during storm events. The Applicant will maintain sumps across the operational phase to ensure this flooding is concentrated in a desired area and pumped off at rate to maintain compliance with existing discharge limits.

4.5 Water Pressures

The EPA has identified significant pressures for waterbodies that are “At Risk” of not meeting their water quality objectives under the WFD. Significant pressures are those pressures which need to be addressed in order to improve water quality. From the data presented on the EPA maps, there are no significant water pressures within 5km of the Site for surface waters in the Annalee_SC_030 Subcatchment (to the south of the Site). However, multiple such pressures exist for the other surface water bodies and groundwater bodies within 5km of the Site. The key local surface water pressure is Agricultural, which is experienced by four out of the six surface waterbodies reviewed. Only the Clones GWB is marked as being under water pressures, specifically Agricultural and Domestic Wastewater pressures. Therefore, agricultural pressures are the main water pressure on local waterbodies within the vicinity of the Site.

Table 4-4, Table 4-5 and Table 4-6 below summarises these pressures.

Table 4-4: EPA Water Pressures on Subcatchment Finn[Monaghan]_SC_020 Surface Waterbodies 5km from Site

Pressure/ Waterbody	Abstraction	Agricultural	Urban Run-off
GORTNANA_010*			√
FINN(MONAGHAN)_050*		√	
LACKEY_RIVER_010		√	√
FASTRY_010		√	
MAYHILL_010		√	
CORCONNELLY	√		
BUNNOE_030	√		

Pressure/ Waterbody	Abstraction	Agricultural	Urban Run-off
BUNNOE_040	√		

Note: * waterbodies are downstream of the discharge location

Table 4-5: EPA Water Pressures on Groundwater Waterbodies 5km from Site

Pressure / Waterbody	Agricultural	Domestic Wastewater
Cavan		
Clones	√	√

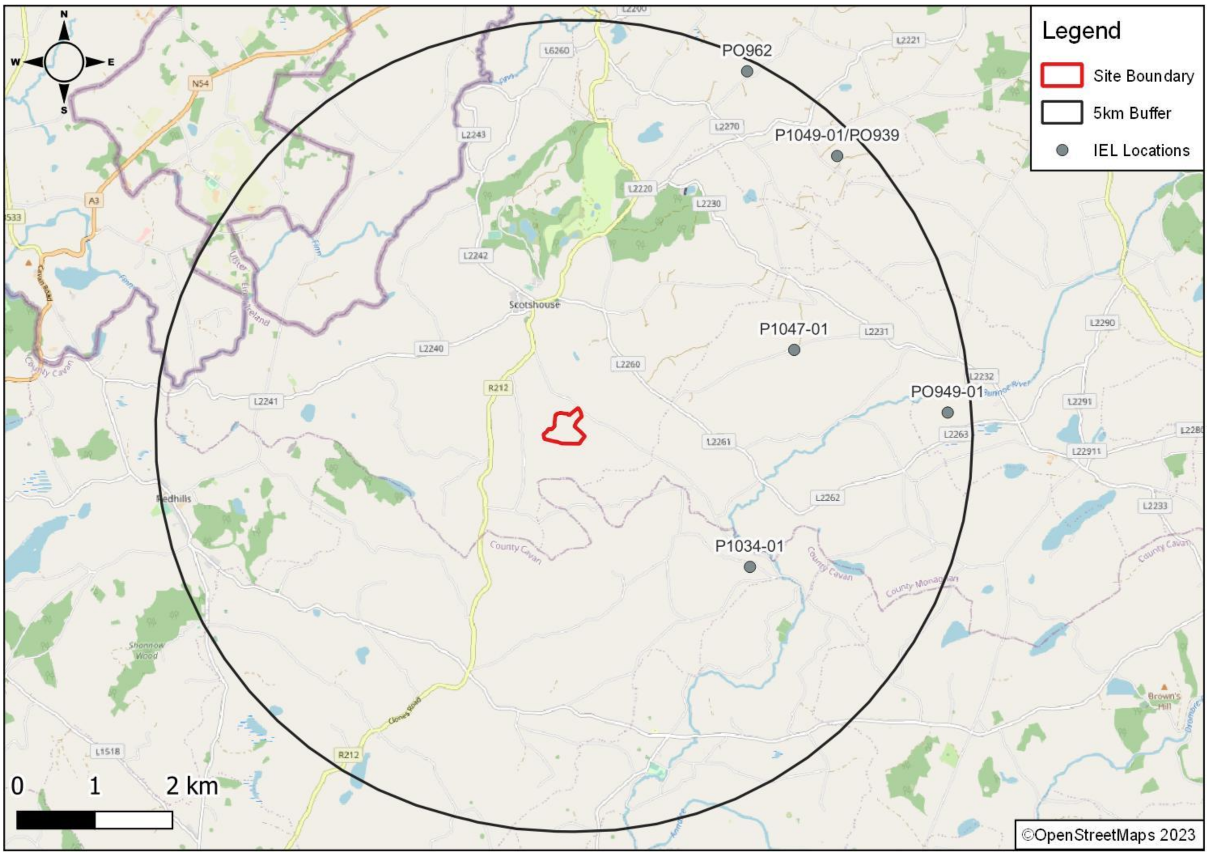
4.6 Cumulative Impacts from other Facilities/Developments

Based on EPA maps, there are six EPA licensed facilities within 5km of the Proposed Development, as shown in Table 4-6 and Figure 4-4 below:

Table 4-6: EPA Licensed Facilities within 5km of the Proposed Development

License ID	License Type	Distance from Site	Grid Reference (Irish Grid)	Activity Class	Relevant Licensed Emissions / Controls	License Status
P0962	IEL	4.75km NE	251822 322446	6.1 – Intensive Agriculture	No water emissions Stormwater discharge and onsite manure/ fertiliser controls licensed	Surrendered
P0939	IEL	4.67km NE	253015 321506	6.1 – Intensive Agriculture	Application withdrawn	Other
P1049	IEL	4.67km NE	253015 321506	6.1 – Intensive Agriculture	No water emissions Ammonia reduction controls in place Stormwater discharge and onsite manure/ fertiliser controls licensed	Licensed
P1047	IEL	2.88km E	252537 318918	6.1 – Intensive Agriculture	No water emissions Ammonia reduction measures licensed Stormwater discharge and onsite manure/ fertiliser controls licensed	Licensed
P0949	IEL	4.68km E	254494 318120	6.1 – Intensive Agriculture	No water emissions Stormwater discharge and onsite manure/ fertiliser controls licensed	Licensed
P1034	IEL	2.71km SE	251960 316130	6.1 – Intensive Agriculture	No water emissions Stormwater discharge and onsite manure/ fertiliser controls licensed	Licensed

Figure 4-4: IEL Locations



No IEL location is licensed for discharge to water, but numerous measures for control of nitrogen/ammonia entering waterbodies are noted. However, none of the listed IEL locations are within the same subcatchment as the Proposed Development and as such no cumulative/in-combination impacts are predicted to occur.

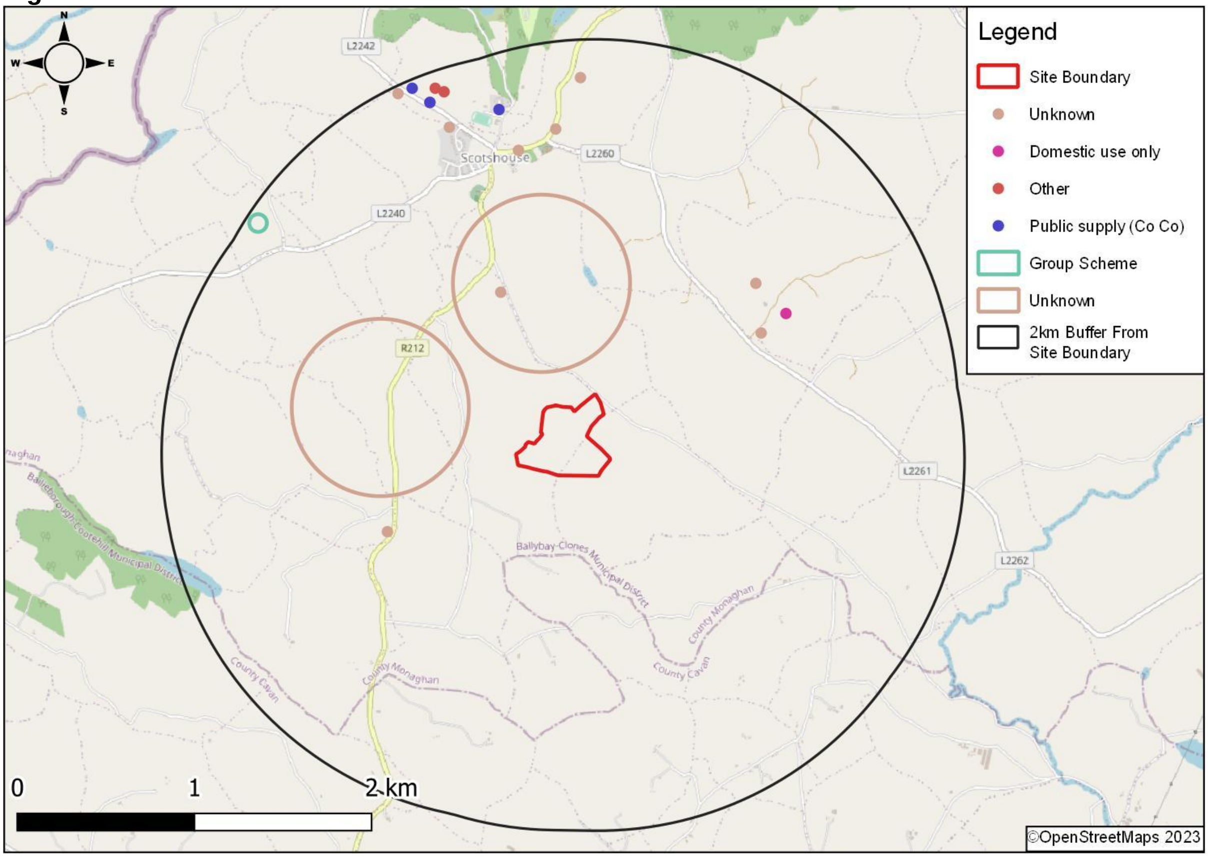
From the GIS database, there are nineteen groundwater boreholes within a 2km vicinity of the Site, as shown in Table 4-7 and Figure 4-5 below:

Table 4-7: Available Groundwater Well Information

Borehole ID	Centre Distance from Site	Grid Reference (Irish Grid)	Well Type	Total Depth (m)	Townland	Yield (m^3d)
2331SEW001	1.68km NW	248920 319680	Dug well	3	Aghnahola	34.6
2331SEW002	1.96km NW	248630 319870	Borehole	14	Cavanreagh	34.6
2331SEW004	0.70km NW	249210 318750	Dug well	3	Aghnaskew	34.6
2331SEW005	1.46km N	249310 319550	Borehole	20	Killyfargy	-
2331SEW012	1.12km NE	250650 318800	Dug well	5	Cavan	17.3
2331SEW013	1.00km NE	250680 318520	Dug well	6	Cavaney	8.6
2331SEW014	1.86km N	249660 319960	Spring	-	Killyfargy	25.9
2331SEW015	1.56km N	249520 319670	Dug well	4	Killyfargy	25.9
2331SEW019	1.04km SW	248570 317400	Unknown	18	Skerrick West	25.9
2331SEW030	0.65km N	249440 318800	Dug well	3.7	Dunsrim	21.8
2331SEW034	0.74km W	248530 318100	Dug well	3.7	Corrackan	38.2

Borehole ID	Centre Distance from Site	Grid Reference (Irish Grid)	Well Type	Total Depth (m)	Townland	Yield (m^3d)
2331SEW039	1.92km NW	247840 319140	Borehole	91.4	Drumaveale	218
2331SEW040	1.87km NW	248890 319880	Borehole	3.2	Cavanreagh	-
2331SEW041	1.90km NW	248840 319900	Borehole	3.2	Cavanreagh	-
2331SEW042	1.84km NW	248810 319820	Borehole	10.5	Cavanreagh	-
2331SEW047	1.18km NE	250820 318630	Borehole	158.5	Cavan	3.3
2331SEW048	1.95km NW	248710 319900	Borehole	67	Cavanreagh	1000
2331SEW049	1.70km N	249200 319780	Borehole	67	Cavanreagh	350
2331SEW050	1.84km NW	248810 319820	Borehole	70	Cavanreagh	1221

Figure 4-5: Groundwater Boreholes



Given the lack of onsite groundwater abstraction, cumulative/in-combination impacts on groundwater as a result of abstraction are not predicted to occur.

4.7 Screening

Given the pressures and hydrological/hydrogeological connectivity of the waterbodies discussed above, waterbodies can be categorised into either requiring further assessment or not requiring further assessment. See Table 4-8 below.

Table 4-8: Screening Table

Name	**Quality Status (Overall)**	**Risk**	**Further Assessment?**	**Justification**
Surface Waterbody				
Subcatchment - Finn[Monaghan]_SC_020				
Downstream of Discharge				
GORTNANA_010	Moderate	At Risk	Yes	There is an indirect connection between the Proposed Development discharge point and the waterbody through local drainage ditches.
FINN (MONAGHAN)_050	Poor	At Risk	Yes	There is an indirect connection between the Proposed Development discharge point and the waterbody through the GORTNANA_010 waterbody.
Upstream of Discharge				
Lackey River_010	Moderate	At Risk	No	There is no direct hydrological connection between the Proposed Development and these waterbodies as they are upstream of the discharge impacted waters.
Corconnelly	Moderate	At Risk	No	
FASTRY_010	Moderate	In Review	No	
MAY HILL_010	Moderate	In Review	No	
Subcatchment - Bunnoe_SC_010				
BUNNOE_020	Moderate	At Risk	No	There is no direct hydrological connection between the Proposed Development and these waterbodies as they are present with separate subcatchments.
BUNNOE_030	Good	In Review	No	
Killynenagh	Moderate	In Review	No	

Name	Quality Status (Overall)	Risk	Further Assessment?	Justification
BUNNOE_040	Good	In Review	No	
Subcatchment - Annalee_SC_030				
ANNALEE_080	Good	Not at Risk	No	There is no direct hydrological connection between the Proposed Development and the waterbody as they are present with separate subcatchments.
ANNALEE_070	Good	In Review	No	
Groundwater Waterbody				
Cavan	Good	Not at Risk	Yes	There is a direct link between the Site and GWB - further assessment is required to determine any potential risk to groundwater quality status.
Clones	Good	At Risk	Yes	The GWB already experiences pressures from other sources and is close enough to the Site that groundwater flow could transport contamination to the GWB. As a result, cumulative and in combination impacts could degrade water quality.

5 IMPACT ASSESSMENT

5.1 GORTNANA_010

Table 5-1: GORTNANA_010 Impact Assessment

Receptor	Potential Impact from Site	Potential Impact of Proposed Development	Mitigation Required?
Hydromorphology quality	No	No works are proposed in or adjacent to the waterbodies or its bank. The proposed discharge rate to the river waterbody is expected to increase relative to current discharges as a result of dewatering onsite. However, the discharge rate will be constrained to remain in compliance with onsite discharge licence limits, through water retention in the onsite sumps. There is no predicted impact on river hydro-morphology, given the volumes involved and that the discharge is indirect, flowing through drainage ditches and wetland before joining the river waterbody.	No further assessment required.
Biological quality	Yes	No riverbed works or works along banks are proposed, so there will be no direct risk to habitats or species. The proposed changes to discharge rate could result in increased suspended solids or ammonia entering the watercourse via the offsite drainage, potentially impairing its biological/ecological quality. However, the change in land-use from agricultural to quarrying in Zone B of the Site will reduce ammonia from agricultural run-off entering the Site. The potential for increased suspended solid export remains unaffected by the change in land use and as such the Proposed Development could result in a slight negative effect on biological quality. The effects would be temporary, ceasing following the end of Site operations.	Mitigation measures required.
Physico-Chemical quality	Yes	The proposed changes to discharge rate could result in increased suspended solids or ammonia entering the watercourse via the offsite drainage, potentially impairing its biological/ecological quality. However, the change in land-use from agricultural to quarrying in Zone B of the Site will reduce ammonia from agricultural run-off entering the Site. However, there is a risk of spills from hydrocarbon contaminants such as oils or fuel, which would result in significant long-term impacts on GORTNANA_010. This potential risk would persist until the Site ceases operation, but proper mitigation would reduce the risk posed to waterbody chemical status to an acceptable level.	Mitigation measures required.

5.2 FINN (MONAGHAN)_050

Table 5-2: FINN (MONAGHAN)_050 Impact Assessment

Receptor	Potential Impact from Site	Potential Impact of Proposed Development	Mitigation Required?
Hydromorphology quality	No	No works are proposed in or adjacent to the waterbodies or its bank. Though the proposed discharge rate is expected to increase relative to current discharges, there is no predicted impact on river hydro-morphology given the volumes involved and the downstream distance between the waterbody and discharge point.	No further assessment required.
Biological quality	No	No riverbed works or works along banks are proposed, so there will be no direct risk to habitats or species. The FINN (MONAGHAN)_050 waterbody is approximately 5km downstream of the discharge point. Given this distance and the maximum volume of allowed discharge (360m^3 based on the discharge license), it is likely that the concentrations of potential pollutants transported from the discharge, through the GORTNANA_010 waterbody, to the FINN (MONAGHAN)_050 waterbody would result in an imperceptible negative impact on biological quality.	No further assessment required.
Physico-Chemical quality	Yes	The FINN (MONAGHAN)_050 waterbody is approximately 5km downstream of the discharge point. Given this distance and the maximum volume of allowed discharge (360m^3 based on the discharge license), it is likely that the concentrations of potential pollutants transported from the discharge, through the GORTNANA_010 waterbody, to the FINN (MONAGHAN)_050 waterbody would result in an imperceptible negative impact on physico-chemical quality. An exception to this is the potential spill of hydrocarbon contaminants such as oils orfuels, which, following downstream transport, would result in moderate to significant medium-term impacts on FINN (MONAGHAN)_050. This potential risk would persist until the Site ceases operation, but proper mitigation would reduce the risk posed to waterbody chemical status to an acceptable level. There will be no long-term change to general chemical quality elements as a result of the Proposed Development.	Mitigation measures required.

5.3 Cavan GWB

Table 5-3: Cavan GWB Impact Assessment

Receptor	Potential Impact from Site	Potential Impact of Proposed Development	Mitigation Required?
Quantitative quality	No	No abstraction works are proposed as part of the Proposed Development. Therefore, no quantitative impacts are predicted to occur.	No further assessment required.
Chemical quality	Yes	The Proposed Development includes the extraction of bedrock below the water table. This will result in an increase in groundwater vulnerability for the Cavan GWB, providing a direct pathway for contamination to enter the GWB. The potential release of hydrocarbons or explosive residues utilised during the operation of the Proposed Development would result in a significant negative impact on groundwater in the locality. This potential risk would persist until the Site ceases operation, but proper mitigation would reduce the risk posed to waterbody chemical status to an acceptable level. Occasional sulphate concentration increases above EQS limits associated with current Site activities would continue under the Proposed Development, however given the magnitude of the exceedances, brief to temporary lifespan of the effects and non-consistent occurrence of the exceedances the overall effects on the Cavan GWB quality status are not significant. Additionally, these effects are unlikely to reduce the groundwater status the Cavan GWB is considered “not at risk,” indicating a lack of other pressures that could result in cumulative or in-combination effects lowering its quality status. The potential for elevated sulphate concentrations will cease following the closure of the Site. Following the restoration onsite, the increased groundwater vulnerability will remain as the quarry pit will remain below groundwater levels and as such will leave an exposed groundwater body at the surface. Design measures including vegetated screening berms and security fencing will limit access and run-off from surrounding lands, limiting the potential for contamination to an acceptable level.	Mitigation measures required.

5.4 Clones GWB

Table 5-4: Clones GWB Impact Assessment

Receptor	Potential Impact from Site	Potential Impact of Proposed Development	Mitigation Required?
Quantitative quality	No	No abstraction works are proposed as part of the Proposed Development. Therefore, no quantitative impacts are predicted to occur.	No further assessment required.
Chemical quality	Yes	No direct link between the Proposed Development and Clones GWB is present. Transport of contamination via groundwater flow in the Cavan GWB is required to influence the Clones GWB. Therefore, mitigation in place onsite to prevent the potential contamination of the Cavan GWB by onsite operations will prevent the degrading of the chemical quality status of the Clones GWB.	Mitigation measures required.

5.5 Mitigation of Impact

5.5.1 Mitigation Measures

The potential impacts identified in waterbodies screened into the impact assessment are predominantly associated with operational activities as part of the Proposed Development. The potential operational impact sources for identified were;

- Suspended sediment discharge to surface waters from sumps/lagoons, attached to the onsite drainage system, causing potential detriment to water quality.
- Oil Spill/Oil leaking from bulk container to ground / surface water or oil/fuel spill during refuelling operations, causing significant damage to the aquatic environment.
- Explosive residues entering groundwater or surface water, degrading the chemical status of affected waters.

Mitigation to reduce the potential impact to an acceptable level is described in the sections below;

- All plant and HGV will be refuelled on a concrete plinth in the existing Scotshouse Quarry. This plinth flows into settlement tanks before reaching the interceptor prior to discharge;
- Items of plant unsuitable for travelling to the refuelling area (dry screening plant), will be refuelled utilising adequately sized and positioned drip trays, outside of areas of the quarry below the groundwater table;
- Spill kits will be available adjacent to all refuelling and fuel storage operations;
- Fuel will be stored in a double skin tank in the existing quarry and will be appropriately bunded. No fuel will be stored within the Site;
- Fuels, lubricants and hydraulic fluids for screening equipment used on the Site will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best practice codes. These will be stored at the existing quarry;
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the Site for disposal or recycling;
- Drip trays will be used under plant which has the potential for hydrocarbon or chemical leakage when located on permeable ground;
- Any spillage of fuels, lubricants, hydraulic oils or other chemicals will be immediately contained, and the contaminated soil removed from the Site and disposed of in accordance with relevant legislation;
- It is recommended that items of plant will not be left within sumps or water retention areas within the quarry overnight or periods before forecasted storm events;
- Ensure blasting practice minimises the risk of occurrence of nitrate/ammonia residues by proper blast design and implementation, appropriate disposal of any excess explosives, and selection of the appropriate type of explosives;
- Water to be discharged will be collected in existing settlement ponds and onsite sumps before discharge to allow solids to settle out and reduce the suspended solids within the discharging waters; and,
- It is recommended that a penstock valve and flow monitor be installed at the existing discharge point. The penstock valve would be an emergency measure capable of shutting off flow from the discharge point if discharge flow limits were to be exceeded.

Additionally, the phased design approach for extraction within the Proposed Development contributes to mitigation for water effects, by allowing the low points not being extracted from in each phase of operation to act as sumps for onsite water retention. This allows for:

- Additional sediment settlement, which removes suspended solids from the water column, limiting any increases in suspended solid entering the drainage network from increased discharge volume; and,
- Increased capacity for the retention of onsite water in the case of storm events, preventing a breach of licence limits and limiting any contributions to potential flooding at offsite surface waters linked to discharge from the Site.

A permanent impact of the Proposed Development is an increase to the groundwater vulnerability across the Site, following Site closure. Measures taken during the Restoration phase will limit the risk associated with this increased vulnerability:

- The retention and vegetation of onsite screening berms will limit the run-off from surrounding lands into the groundwater within the quarry pit; and,
- The retention of security fencing constructed as part of the Proposed Development for safety purposed will limit unauthorised access to the Site.

5.5.2 Potential Impacts

Table 5-5 below provides a summary of the predicted status changes associated with the Proposed Development, with and without mitigation.

Table 5-5: Predicted Status Changes

Name	**EPA Code**	**Current Status**	**Current Risk**	**Potential Status Change**	
				Unmitigated	**Mitigated**
Surface Water Waterbody					
GORTNANA_010	IE_NW_36G750800	Moderate (Note - Low Confidence)	At Risk	Poor	Moderate
FINN (MONAGHAN)_050	UKGBNI1NW363604080	Poor (Invertebrate Status)	At Risk	Poor	Poor
Groundwater Waterbody					
Cavan	IE_NW_G_061	Good	Not at Risk	Good	Good
Clones	IEGBNI_NW_G_063	Good	At Risk	Good	Good

It should be noted that whilst predictions for Cavan GWB and Clones GWB show no status change, this is the result of the large scale of the GWBs relative to the Site. On a local scale, groundwater quality is predicted to be impaired without mitigation.

6 CONCLUSIONS

The Proposed Development is the extension of an existing greywacke quarry to agricultural lands south of Scotshouse Quarry. Potential impacts to surface waters are associated with a discharge point, that discharges into a local drainage network. Discharge volumes may potentially increase as part of operations at the Proposed Development, however, will remain within the existing discharge licence (WP26/15) limit of 360m^3/day.

The status of GORTNANA_010 is moderate, and “at risk”, and the FINN (MONAGHAN)_050 is poor, and “at risk”. With mitigation in place, increased discharge from the Proposed

Development should remain compliant with discharge limits and as such will not cause the status to deteriorate further or to compromise the ability of the receiving waters to achieve good status. Any potential threats to that status come from sources external to the Site, that may or may not be licensed, with the EPA identifying “urban run-off” pressures on the GORTNANA_010 waterbody and “agricultural” pressures on the FINN (MONAGHAN)_050 waterbody. The operation of the Proposed Development will not jeopardise the achievement of good surface water quality status or of good ecological potential for any connected surface water body or the achievement of good surface water chemical status.

The Proposed Development will not result in a deterioration of groundwater in the vicinity of the Site, given the size of the Cavan GWB relative to the area of increased groundwater vulnerability, the “not at risk” status of the Cavan GWB and the mitigation proposed to manage onsite risks to groundwater quality. As such the Cavan GWB expected to remain of “Good” quality and “Not at Risk.” The Clones GWB is not expected to be impacted by the Proposed Development.

Only the Lough Oughter and Associated Loughs SAC is hydrologically connected to the Site, located approximately 14.6km downstream of the licensed discharge point. Given the scale of the Proposed Development and the maximum proposed discharge of 360m^3/day, any potential negative impacts to the SAC as a result of the Proposed Development will be imperceptible or not significant.

As such, the Proposed Development will not cause a deterioration in the status of all surface and groundwater bodies assessed. The Proposed Development does not obstruct surface water bodies from achieving “Good” chemical or ecological quality status. The Proposed Development does not obstruct groundwater bodies from achieving “Good” chemical or quantitative quality status. Therefore, the Proposed Development will not compromise the objectives and requirements of the WFD within the local area and within the river basin district.

7 REFERENCES

[1] European Commission, “Water Framework Directive,” European Commission, 2000.

[2] Government of Ireland, “Draft River Basin Management Plan for Ireland 2022 - 2027,” GoI, Dublin, 2021.

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[7] EPA, “EPA Maps,” June 2023. [Online]. Available: https://gis.epa.ie/EPAMaps/. [Accessed June 2023].

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[10] OPW, “National Flood Hazard Mapping,” Office of Public Works, 2020. [Online]. Available: http://www.floodmaps.ie/View/Default.aspx.

[11] Met Éireann, “Met Éireann Warning System Explained,” Met Éireann, [Online]. Available: https://www.met.ie/met-eireann-warning-system-explained. [Accessed 01 09 2023].

[12] Office of the Planning Regulator, “Environmental Impact Assessment Screening - Practice Note PN02,” OPR, Dublin, 2021.

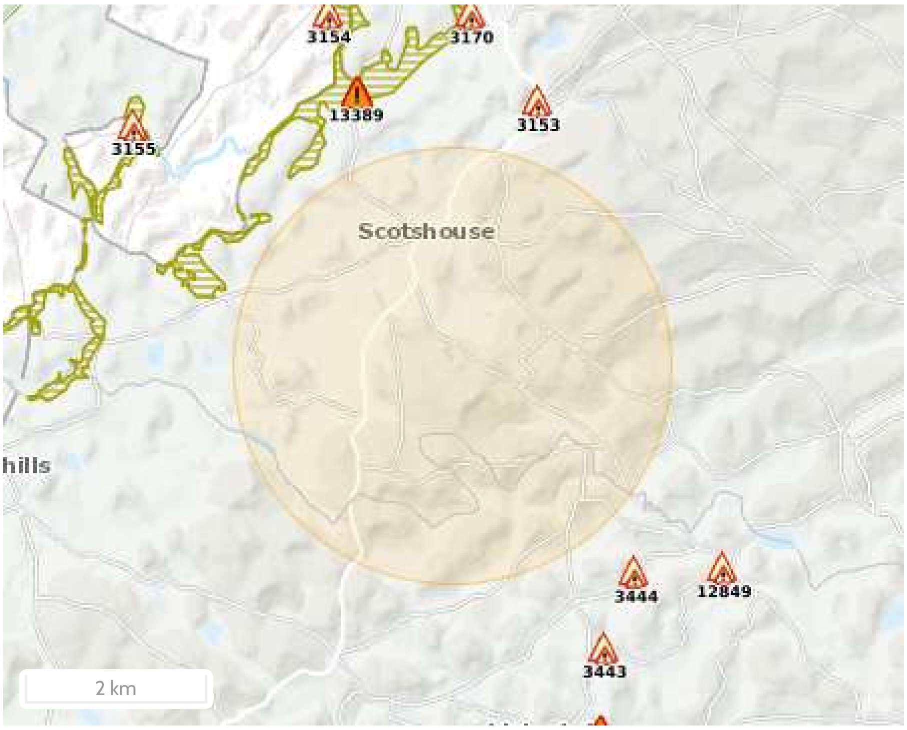
APPENDIX 8-7

Past Flood Event Local Area Summary Report

Report Produced: **15/3/2023 12:00**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "**Website**"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

0 Results

Name (Flood_ID)	Start Date	Event Location

APPENDIX 9

Appendix 9-1

Appendix 9-1
Mineral Dust Risk Assessment
Scotshouse Quarries Ltd
Aghnaskew, Scotshouse, Co. Monaghan

Contents

1 DISAMENTIY DUST RISK ASSESSMENT....................................1
1.1 Identification of Sensitive Receptors....................................1
1.2 Determining the Residual Source of Emissions....................................1
1.3 Estimation of the Pathway Effectiveness....................................4
1.4 Estimation of the Dust Impact Risk and Effects....................................5
2 REFERENCES....................................6

FIGURES

Figure 1-1: Site Preparation/ Restoration 2
Figure 1-2:Mineral Extraction 2
Figure 1-3: Materials Handling 2
Figure 1-4: Onsite Transportation 3
Figure 1-5:Mineral Processing 3
Figure 1-6: Stockpiles/Exposed Surfaces....................................3
Figure 1-7:Offsite Transportation 4

TABLES

Table 1-1: Categorisation of Frequency of Potentially Dust Winds 4
Table 1-2:Categorisation of Receptor Distance from Source....................................4
Table 1-3: Classification of the Pathway Effectiveness....................................5
Table 1-4: Estimation of Dust Impact Risks....................................5
Table 1-5: Descriptors for magnitude of Dust Effects 5

1 DISAMENTIY DUST RISK ASSESSMENT

The IAQM Guidance aims to provide advice on robust and consistent good-practice approaches that can be used to assess the operational phase dust impacts from quarry activities. [1]

1.1 Identification of Sensitive Receptors

For the sensitivity of people and their property to dust soiling, the IAQM recommends the use of professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies. The following classification was used to define a receptor with High, Medium or Low sensitivity to dust soiling:

High Sensitive Receptor

- Users can reasonably expect enjoyment of a high level of amenity; or
- The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.

Indicative examples of a high sensitivity receptor included dwellings, medium and long term carparks and car showrooms.

Medium Sensitive Receptor:

- Users would expect a to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or,
- The appearance, aesthetics or value of their property could be diminished by soiling; or,
- The people or property would not reasonably be expected a to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.

Indicative examples include parks, and places of work.

Low Sensitivity Receptor

- The enjoyment of amenity would not reasonably be expected ; or,
- There is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or,
- There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.

Indicative examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short term car parks and roads.

1.2 Determining the Residual Source of Emissions

The following examples show the residual source emissions for a number of activities, illustrating the factors that may be considered when determining the potential impact.

Figure 1-1: Site Preparation/ Restoration

LARGE	SMALL
Large working area	Small working area
High bunds	Low bunds
High volume of material movement	Low volume of material movement
High no. heavy plant	Low no. heavy plant
Minimal seeding/sealing of bund surface	Bunds seeded/sealed immediately
Material of high dust potential	Material of low dust potential

An example of a large potential dust magnitude from site preparation/restoration may include factors such as a working area >10ha, bunds >8 m in height, >100,000 m^3 material movement, >10 heavy plant simultaneously active, bunds un-seeded, fine grained and friable material. Conversely, a small potential dust magnitude may include a site with a working area <2.5ha, bunds <4m in height, <20,000 m^3 material movement, <5 heavy plant simultaneously active, all bunds seeded, material with a high moisture content.

Figure 1-2:Mineral Extraction

LARGE	SMALL
Large working area	Small working area
High energy extraction methods	Low energy extraction methods
Material of high dust potential	Material of low dust
Potential high extraction rate	Low extraction rate

An example of a large potential dust magnitude from mineral extraction may include a working area >100 ha, drilling and blasting frequently used, dusty mineral of small particle size and/or low moisture content, 1,000,000 tpa extraction rate. A small potential magnitude may include working area <20 ha, hydraulic excavator, coarse material and/or high moisture content, <200,000 tpa extraction rate.

Figure 1-3: Materials Handling

LARGE	SMALL
High no. heavy plant	Low no. heavy plant
Unconsolidated/bare surface	Hard standing surface
Activities close to site boundary	Activities within quarry void
Material of high dust potential	Material of low dust potential

An example of a large potential dust magnitude from materials handling may include factors such as >10 loading plant within 50m of a site boundary, transferring material of a high dust potential and/or low moisture content on dry, poorly surfaced ground. Conversely, a small potential dust magnitude may include <5 plant, more than 100 m of a site boundary, within the quarry void or clean hardstanding, transferring material of low dust potential and/or high moisture content.

Figure 1-4: Onsite Transportation

LARGE	SMALL
Use of unconsolidated haul roads	Use of conveyors
Unpaved haul roads	Paved haul roads
Road surface of high dust potential	Road surface of low dust potential
High no. HDV movements	Low no. HDV movements
High total length of haul roads	Low total length of haul roads
Uncontrolled vehicle speed	Controlled (low) vehicle speed

An example of a large potential dust magnitude from on-site transportation could include >250 movements in any one day on unpaved surfaces of potentially dusty material. A small potential magnitude may include the employment of covered conveyors used for the majority of the on-site transportation of material, <100 movements of vehicles per day, with surface materials of compacted aggregate, <500 m in length and a maximum speed of 15 mph.

Figure 1-5:Mineral Processing

LARGE	SMALL
Raw material of high dust potential	Raw material of low dust potential
End product of high dust potential	End product of low dust potential
Complex or combination of processes	Single process
High volume material processed	Low volume material processed

An example of a large potential dust magnitude from mineral processing may include factors such as a mobile crusher and screener with concrete batching plant on-site, processing >1,000,000 tpa of material with a high dust potential and/or low moisture content e.g. hard rock. Conversely, a small potential dust magnitude may include a site with a fixed screening plant with effective design in dust control, processing <200,000 tpa of material with a low dust potential and/or high moisture content e.g. wet sand and gravel.

Figure 1-6: Stockpiles/Exposed Surfaces

LARGE	SMALL
Long term stockpile	Short term stockpile
Frequent material transfers	Infrequent material transfers
Material of high dust potential	Material of low dust potential
Ground surface unconsolidated/un-kept	Ground surface hardstanding/clean
Stockpiles close to site boundary	Stockpiles well within quarry void
Large areas of exposed surfaces	Small areas of exposed surfaces
High wind speeds/low dust threshold	Low wind speeds/high dust threshold

An example of a large potential dust magnitude from stockpiles and exposed surfaces could include a stockpile with a total exposed area >10 ha in an area exposed to high wind speeds located <50 m of the site boundary. Daily transfer of material with a high dust potential and/or low moisture content. Stockpile duration >12 months and quarry production >1,000,000 tpa. A small potential magnitude may include stockpile duration of <1 month with a total area <2.5 ha in an area of low wind speeds, located >100 m from the site boundary. Weekly transfers of material with a low dust potential and/or high moisture content. Quarry production <200,000 tpa.

Figure 1-7:Offsite Transportation

LARGE	SMALL
High No. HDV Movements	Low No. HDV Movements
Unconsolidated Access Road	Paved Access Road
Limited/No Vehicle Cleaning Facilities	Extensive Vehicle Cleaning Facilities
Small Length of Access Road	Large Length of Access Road

An example of a large potential dust magnitude from off-site transportation could include total HDV >200 movements in any one day on unsurfaced site access road <20 m in length with no HDV cleaning facilities. No road sweeper available. A small potential magnitude may include <25 HDV movements per day, paved surfaced site access road >50 m in length, with effective HDV cleaning facilities and procedures, the employment of an effective road sweeper.

1.3 Estimation of the Pathway Effectiveness

The site-specific factors considered to determine the Effectiveness of the Pathway were distance and direction of receptors relative to prevailing wind directions. Receptors were identified within 400m of the dust emission source. Table 1-1 shows the categorisation of the frequency of potentially dust winds, based on the meteorological data from a nearby weather station.

Table 1-1: Categorisation of Frequency of Potentially Dust Winds

Frequency Category	Criteria
Infrequent	Frequency of winds (>5 m/s) from the direction of the dust source on dry days are less than 5%
Moderately Frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 5% and 12%
Frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 12% and 20%
Very Frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are greater than 20%

Table 1-2 below shows the categorisation of receptors, based on their distance to the dust emission source.

Table 1-2:Categorisation of Receptor Distance from Source

Distance Category	Criteria
Distant	Receptor is between 200m and 400m from the dust source
Intermediate	Receptor is between 100m and 200m from the dust source
Close	Receptor is less than 100m from the dust source

Table 1-3 below shows the determination of the Pathway Effectiveness based on the frequency of potentially dusty winds and the distance of the receptor from the dust emission source.

Table 1-3: Classification of the Pathway Effectiveness

Receptor Distance Category	Frequency of Potentially Dusty Winds			
	Infrequent	**Moderately Frequent**	**Frequent**	**Very Frequent**
Close	Ineffective	Moderately Effective	Highly Effective	Highly Effective
Intermediate	Ineffective	Moderately Effective	Moderately Effective	Highly Effective
Distant	Ineffective	Ineffective	Moderately Effective	Moderately Effective

1.4 Estimation of the Dust Impact Risk and Effects

Table 1-4 shows the estimation of the Dust Impact Risk based on the Residual Source of Emission and Pathway Effectiveness classifications

Table 1-4: Estimation of Dust Impact Risks

Pathway Effectiveness	Residual Source Emission		
	Small	**Medium**	**Large**
Highly Effective Pathway	Low Risk	Medium Risk	High Risk
Moderate Effective Pathway	Negligible Risk	Low Risk	Medium Risk
Ineffective Pathway	Negligible Risk	Negligible Risk	Low Risk

Table 1-5 below dhows the estimate of the likely magnitude of Disamenity Effects based on the receptor sensitivity and the risk of dust impacts.

Table 1-5: Descriptors for magnitude of Dust Effects

Receptor Distance Category	Receptor Sensitivity		
	Low	**Medium**	**High**
High Risk	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium Risk	Negligible effect	Slight Adverse Effect	Moderate Adverse Effect
Low Risk	Negligible effect	Negligible effect	Slight Adverse Effect
Negligible Risk	Negligible effect	Negligible effect	Negligible effect

2 REFERENCES

[1] IAQM, “Guidance on the Assessment of Mineral Dust Impacts for Planning,” Institute of Air Quality Management, London, 2016.

APPENDIX 11

APPENDIX 11-1

Glossary of Acoustic Terminology

Abbreviation / Descriptor	Description
A Weighted	A time weighting given to noise values to amend the values to suit the human ear response to the various frequency components of the sound.
Acoustic environment	Sound from all sound sources as modified by the environment (BS ISO 12913-1:2013).
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far. *Note: The ambient sound comprises the residual sound and the specific sound when present.*
Ambient sound level, $L_a = L_{Aeq,\ T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T. *Note: the ambient sound level is a measure of the residual sound and the specific sound when present.*
Background sound level, $L_{A90,\ T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
dB (decibel)	A relative unit of measurements, based on a logarithmic scale to describe the ratio between the measured level and a reference or threshold level of 0dB. Unless otherwise stated 0dB within this report is $2x10^{-5}$ pascals (Pa).
Day	A 24 hour period from midnight to midnight.
Daytime	A 12 hour period between 07:00 – 19:00 hours, as per NG4
Evening-Time	A 4 hour period between 19:00 – 23:00 hours, as per NG4
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,\ T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T=t_2-t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given the following equation: $L_{Aeq,T} = 10\lg_{10}\left\{(1/T)\int_{t_1}^{t_2}[p_A(t)^2/p_0^2]dt\right\}$ where: p_0 is the reference sound pressure (20 μPa); and $p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t *Note: The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.*
$L_{AN,T}$	The Fast interval, A-Weighted noise level in the for the 'N' percentile of the sampling interval 'T'.
$L_{A10,T}$	The A-Weighted noise level for the 10%ile of the sampling interval 'T', typically utilised to represent peak noise events such as intermittent passing traffic.
$L_{A90,T}$	The A-Weighted noise level in the lower 90 percentile of the sampling interval 'T', excludes intermittent features typical of traffic. See also background sound level.
$L_{A95,T}$	The A-Weighted noise level for the 95%ile of the sampling interval 'T'. Representative of steady noise events at a monitoring location.

$L_{Aeq,T}$	The equivalent continuous sound level, used to describe the fluctuating noise in terms of a single noise level over the same sampling time period (T). Also see ambient sound.
L_{den}	Day-evening-night equivalent level, calculated as: $$Lden = 10Log\frac{1}{24}\left(12*10\frac{Lday}{10}+4*10\frac{Levening+5}{10}+8*10\frac{Lnight+10}{10}\right)$$ Where the L_{day}, $L_{evening}$ and L_{night} are as defined in ISO1996-2:1987, and for the duration of 12 hours, 4 hours and 8 hours respectively, are A-weighted long term Leq sound level.
L_{day}	Day equivalent level. A-weighted Leq sound level measured over the 12 hour period from 07:00 hours to 19:00 hours.
$L_{evening}$	Evening equivalent level. A-weighted Leq sound level measured during the evening period of 19:00 hours to 23:00 hours.
L_{Amax}	The maximum RMS A-Weighted sound pressure level occurring within a specified time period.
L_{night}	Night equivalent level. A-weighted Leq sound level measured during the night period of 23:00 hours to 07:00 hours.
Measurement time interval, T_m	total time over which measurements are taken. *Note: This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.*
Rating level, $L_{Ar, Tr}$	specific sound level plus any adjustment for the characteristic features of the sound.
Reference time interval, T_r	specified interval over which the specific sound level is determined. *Note: This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h*
Residual sound	ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level, L_r = $L_{Aeq,T}$	equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.
Specific sound level, L_s = $L_{Aeq,Tr}$	equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.
Specific sound source	sound source being assessed.
Night-Time	An 8 hour period between 23:00 – 07:00 hours, as per NG4
Noise Ambient	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far. Also see ambient sound.
Noise Background	The steady existing noise level present without contribution from any intermittent sources, The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, 'T' ($L_{AF90,T}$). Also see background sound level, $L_{A90, T}$.
Noise Specific	The sound arising from the source under investigation, disregarding all external and residual sources. Also see specific sound source.
NSR	Noise Sensitive Receptor - an identified dwelling, amenity area, recreational zone or other such place where a change in noise may result in a nuisance impact.
RMS	Root Mean Squared, mathematical method to account for swells and troughs within wave forms, such as sound.

Sound Power Level (L_W)	The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m2. Utilised to express the intensity at source of a noise emission.
Sound Pressure Level (L_P)	Fluctuations in air pressure caused by the passage of a sound wave. The measurement of sound/noise through the use of a sound level meter, is a representation of these fluctuations in air pressure as they pass the instrument microphone.
Time Weighting	One of the averaging time for noise monitoring instrumentation: F – Fast, instrument samples every 125 milliseconds; S – Slow, instrument samples every 1 second; I – Impulsive, instrument samples every 35 milliseconds.

Note:

Unless otherwise stated all broadband noise values are A-weighted with a fast response.

Where 0dB is referenced it refers to the threshold of hearing – $2x10^{-5}$Pa.

All 1/3 octave values are unweighted/linear. (z-weighted on the Bruel and Kjaer software)

APPENDIX 11-2

Model: 230706 - EIAR model
EIAR June 2023 - Initial model 060123
Group: (main group)
Listing of: Moving source, for method Industrial noise - LimA - BS 5228

Name	Desc.	ISO H	ISO Terr.	HDef.	Weighting	Flow(D)	Flow(E)	Flow(N)	Avg.speed	Lw 63	Lw 125	Lw 250	Lw 500	Lw 1k	Lw 2k
Wheeled L	Wheeled loader	0.75	--	Relative to Objects	A	10	--	--	10	86.80	94.90	95.40	99.80	103.00	101.20
Wheeled L	Wheeled loader	0.75	129.00	Relative to Objects	A	10	--	--	10	86.80	94.90	95.40	99.80	103.00	101.20
Wheeled L	Wheeled loader	0.75	--	Relative to Objects	A	10	--	--	10	86.80	94.90	95.40	99.80	103.00	101.20
Wheeled L	Wheeled loader	0.75	129.00	Relative to Objects	A	10	--	--	10	86.80	94.90	95.40	99.80	103.00	101.20

Model: 230706 - EIAR model
EIAR June 2023 - Initial model 060123
Group: (main group)
Listing of: Moving source, for method Industrial noise - LimA - BS 5228

Name	Lw 4k	Lw 8k	Red 63	Red 125	Red 250	Red 500	Red 1k	Red 2k	Red 4k	Red 8k
Wheeled L	101.00	87.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wheeled L	101.00	87.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wheeled L	101.00	87.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wheeled L	101.00	87.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Model: 230706 - EIAR model
EIAR June 2023 - Initial model 060123
Group: (main group)
Listing of: Point sources, for method Industrial noise - LimA - BS 5228

Name	Desc.	Height	Terrain L	HDef.	Ca(D)	Ca(E)	Ca(N)	Weighting	Lw 63	Lw 125	Lw 250	Lw 500	Lw 1k	Lw 2k
C.9.11	Tracked excavator with breaker	2.00	105.33	Relative	0.00	--	--	A	92.80	100.90	104.40	113.80	115.00	116.20
C.9.14	Semi mobile crusher	2.00	105.37	Relative	0.00	--	--	A	92.80	102.90	107.40	111.80	113.00	112.20
C.9.07	Wheeled Loader	1.00	105.41	Relative	0.00	--	--	A	89.80	99.90	106.40	109.80	114.00	112.20
C.2.34	Tipper lorry	0.75	105.50	Relative	0.00	--	--	A	74.80	89.90	97.40	102.80	102.00	102.20
C.2.34	Tipper lorry#2	0.75	105.49	Relative	0.00	--	--	A	74.80	89.90	97.40	102.80	102.00	102.20
Crusher		1.50	129.00	Relative to Objects	0.00	--	--	A	94.80	97.90	98.40	105.80	103.00	100.20
Tracked Co	Tracked conveyor ROCO	1.50	129.00	Relative to Objects	0.00	--	--	A	65.00	77.00	82.00	88.00	88.00	84.00
Excavator	Volvo EX300E	2.10	129.00	Relative	0.00	0.00	0.00	A	78.80	96.90	89.40	97.80	98.00	97.20
Scalp Scr	Scalping Screen ROCO	1.50	129.00	Relative to Objects	0.00	--	--	A	87.00	90.00	91.00	95.00	95.00	93.00
Scalp Scr	Scalping Screen ROCO	1.50	129.00	Relative to Objects	0.00	--	--	A	87.00	90.00	91.00	95.00	95.00	93.00
Crusher		1.50	129.00	Relative to Objects	0.00	--	--	A	94.80	97.90	98.40	105.80	103.00	100.20
Tracked Co	Tracked conveyor ROCO	1.50	129.00	Relative to Objects	0.00	--	--	A	65.00	77.00	82.00	88.00	88.00	84.00
Excavator	Volvo EX300E	2.10	129.00	Relative	0.00	0.00	0.00	A	78.80	96.90	89.40	97.80	98.00	97.20
Scalp Scr	Scalping Screen ROCO	1.50	116.50	Relative to Objects	0.00	--	--	A	87.00	90.00	91.00	95.00	95.00	93.00
Crusher		1.50	116.50	Relative to Objects	0.00	--	--	A	94.80	97.90	98.40	105.80	103.00	100.20
Tracked Co	Tracked conveyor ROCO	1.50	116.50	Relative to Objects	0.00	--	--	A	65.00	77.00	82.00	88.00	88.00	84.00
Excavator	Volvo EX300E	2.10	116.50	Relative	0.00	0.00	0.00	A	78.80	96.90	89.40	97.80	98.00	97.20
Scalp Scr	Scalping Screen ROCO	1.50	129.00	Relative to Objects	0.00	--	--	A	87.00	90.00	91.00	95.00	95.00	93.00
Crusher		1.50	129.00	Relative to Objects	0.00	--	--	A	94.80	97.90	98.40	105.80	103.00	100.20
Tracked Co	Tracked conveyor ROCO	1.50	129.00	Relative to Objects	0.00	--	--	A	65.00	77.00	82.00	88.00	88.00	84.00
Excavator	Volvo EX300E	2.10	129.00	Relative	0.00	0.00	0.00	A	78.80	96.90	89.40	97.80	98.00	97.20

Model: 230706 - EIAR model
EIAR June 2023 - Initial model 060123
Group: (main group)
Listing of: Point sources, for method Industrial noise - LimA - BS 5228

Name	Lw 4k	Lw 8k	Red 63	Red 125	Red 250	Red 500	Red 1k	Red 2k	Red 4k	Red 8k
C.9.11	113.00	106.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C.9.14	107.00	94.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C.9.07	106.00	96.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C.2.34	97.00	92.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C.2.34	97.00	92.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crusher	95.00	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tracked Co	85.00	76.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	92.00	83.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scalp Scr	90.00	81.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scalp Scr	90.00	81.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crusher	95.00	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tracked Co	85.00	76.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	92.00	83.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scalp Scr	90.00	81.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crusher	95.00	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tracked Co	85.00	76.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	92.00	83.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scalp Scr	90.00	81.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crusher	95.00	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tracked Co	85.00	76.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	92.00	83.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Model: 230706 - EIAR model
EIAR June 2023 - Initial model 060123
Group: (main group)
Listing of: Receivers, for method Industrial noise - LimA - BS 5228

Name	Desc.	Terrain L	HDef.	Height A	Height B	Height C	Height D	Height E	Height F	Façade
Rx01		101.86	Relative	1.50	4.00	--	--	--	--	No
Rx02		100.56	Relative	1.50	4.00	--	--	--	--	No
Rx03		124.46	Relative	1.50	4.00	--	--	--	--	No
Rx04		128.60	Relative	1.50	4.00	--	--	--	--	No
Rx10		114.98	Relative	1.50	4.00	--	--	--	--	No
Rx05		154.71	Relative	1.50	4.00	--	--	--	--	No
Rx08		127.66	Relative	1.50	4.00	--	--	--	--	No
Rx09		115.76	Relative	1.50	4.00	--	--	--	--	No
Rx11		117.78	Relative	1.50	4.00	--	--	--	--	No
Rx12		105.80	Relative	1.50	4.00	--	--	--	--	No
Rx06		115.41	Relative	1.50	4.00	--	--	--	--	No
Rx07		112.79	Relative	1.50	4.00	--	--	--	--	No

APPENDIX 11-3

Analysing
Testing
Consulting
Calibrating

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TEST REPORT 244496

Client:
Scotshouse Quarries Ltd.
Scotshouse
Monaghan
Co. Monaghan

BHP Ref No.: 22/12/3870
Order No.:
Date Received: 27th October, 19th December & 20th December 2022
Date Tested: 27th October, 19th December & 20th December 2022
Test Specification: Noise Monitoring

FAO: Paddy Connolly

Item: ***Noise survey at noise sensitive locations at the Scotshouse Quarries Ltd. site located at Scotshouse, Monaghan, Co.Monaghan.***

For and on behalf of BHP Ltd.

Dervla Purcell
Date Issued: 3rd January 2023
Supplement to report No. N/A

Contents

1.0 Scope

2.0 Survey Approach

3.0 Date of survey

4.0 Results
   4.1 Noise levels and sampling notes

5.0 Interpretation of results
   5.1 Noise Levels

6.0 Conclusions

Appendix A: Map showing noise monitoring locations

Appendix B: Photographs indicating noise monitoring locations

1.0 Scope of survey

At the request of Scotshouse Quarries Ltd., BHP undertook noise monitoring at their operation in Scotshouse, Co.Monaghan. The purpose of this survey was to provide Scotshouse Quarries Ltd with the noise data and analysis required as part of their planning requirements.

This report deals with 8 nominated noise monitoring locations at the operation in Scotshouse, Co.Monaghan.

2.0 Survey approach

Two sound level meters (SLM's) were used in the survey, a Cirrus 171C type 1 (serial number G068852) and a Cirrus 831C type 1 (serial number D20874FF). The SLM's were calibrated at the start of the survey with a CRL 515 calibrator (serial number 74767). The same calibrator was used to check the SLM at the end of the survey, to inspect the microphone drift.

Monitoring and the interpretation of acquired data are to the following standards:

- International Standard (ISO 1996-1: 2003E) Acoustics – Description, measurement and assessment of Environmental Noise. Part 1. Basic quantities and assessment procedures.
- International Standard (ISO 1996-2: 2007E) Acoustics – Description, measurement and assessment of Environmental Noise. Part 2. Determination of environmental noise levels.
- British Standard: BS 7445 Part 3: 1991 (ISO 1996-3: 1987) Description and measurement of Environmental Noise. Part 3. Guide to application to noise limits.

60-minute daytime levels were measured at eight locations. The locations were labelled as NM1, NM2, NM3, NSL1, NSL2, NSL3, NSL4 and NSL5 and are identified on the map included in Appendix A.

Appendix B contains photographs of the noise monitoring equipment at the monitoring points.

3.0 Date of survey

The survey was carried out on the 27th October, 19th December and 20th December 2022 for the daytime monitoring.

4.0 Results

4.1 Noise levels:

Levels are presented on the following pages.

Daytime Measurements- Noise Locations- Scotshouse Quarry, Monaghan, Co. Monaghan.
27 October 2022.
Weather Conditions; Clear, Dry, Wind 4-5 m/s SE, 14° C.
19 December 2022.
Weather Conditions; Mostly Cloudy, Wet, Wind 4-5 m/s S, 5° C.
20 December 2022.
Weather Conditions; Partly Cloudy, Wet, Wind 8-9 m/s S, 6° C.

Location	Sampling Period	Duration	LAeqt dB	LA10 dB	LA90 dB	LAMAX dB	Impulsive/ Tonal	Notes
NM1	09:32-10:32 20/12/22	60 mins	47	53	40	84	No	Quarry activity audible from this location. Asphalt plant could be heard in the distance at 48-53dBA consistently through testing. Truck passed noise monitoring point during testing. This was the noise associated with the LAmax.
NM2	13:57-14:57 27/10/22	60 mins	55	60	57	67	No	Asphalt plant could be heard during the start of testing (20mins) operating at 58-63dBA. When not running, mobile plant was heard on site at 45-53dBA. Trucks entering and exiting the quarry was audible at 45-50dBA occasionally.
NM3	14:07-15:07 27/10/22	60 mins	54	57	37	72	No	Asphalt plant was audible during the start of testing (10mins) at 50-55dBA. When not running, mobile plant and trucks moving on site was heard at 42-47dBA.
NSL1	15:50-16:50 19/12/22	60 mins	55	59	40	68	No	Asphalt plant audible at 53-58dBA almost consistently through testing. Infrequent traffic passing on local road heard faintly in the background.

NSL2	14:31-15:31 19/12/22	60 mins	51	51	43	81	No	Asphalt plant audible 45-53dBA for second half of testing. Occasional passing traffic on local road was audible and associated with the LAmax of 81dBA.
NSL3	09:22-10:22 20/12/22	60 mins	51	53	42	75	No	Quarry activity not audible from this location. Dog barking is associated with the LAmax of 75dBA regularly during testing. Cattle in nearly sheds could be heard at 65-45dBA occasionally.
NSL4	16:08-17:08 19/12/22	60 mins	50	54	36	73	No	Quarry activity not audible from this location. Nearby tractor was audible intermittently during testing at 45-53dBA. One bus passed audible at up to 73dBA. Occasional passing traffic on local road heard at 55-65dBA.
NSL5	14:22-15:22 19/12/22	60 mins	52	54	40	72	No	Asphalt plant audible at 45-52dBA for the second half of testing. Cars passing on local road were audible at 45-55dBA and an occasional truck passing at up to 72dBA.

5.0 Interpretation of results

5.1 Noise levels;

The noise limits for the Scotshouse Quarries Ltd. operation in Scotshouse Co.Monaghan are as follows:

Daytime Limit L_{Aeq}55dBA

5.1.1 Day-time levels :

As can be seen in section 4.1, L_{Aeq} levels at all monitoring locations are equal to or less than the daytime limit of 55dBA.

6.0 Conclusions

The noise contribution made by the Scotshouse Quarries Ltd. operation did not exceed the daytime limit of 55dBA.

There was no evidence of tonal or impulsive qualities to the recorded noise from the quarry at the nominated locations.

Appendix A

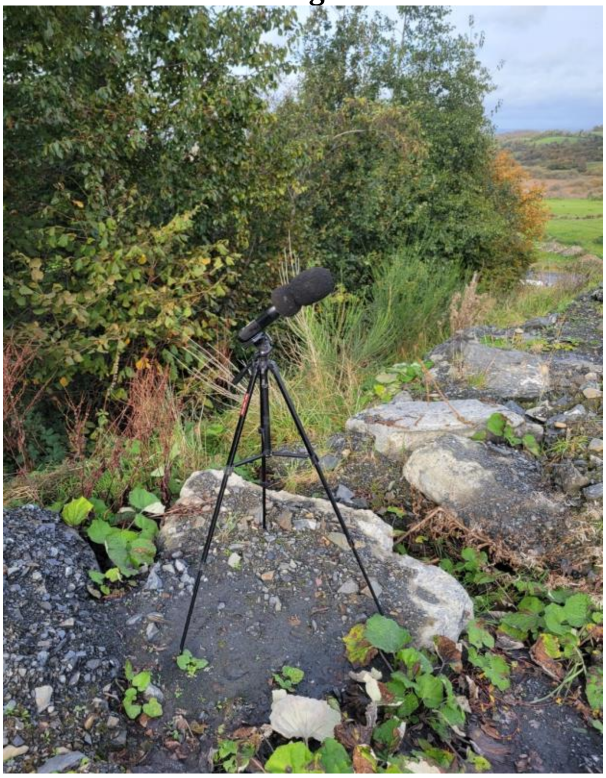
Site map showing noise monitoring locations

Appendix B

Photographs of noise monitoring locations

Noise monitoring location NM1

Noise monitoring location NM2



Noise monitoring location NM3

Noise monitoring location NSL1

Noise monitoring location NSL2

Noise monitoring location NSL3

Noise monitoring location NSL4

Noise monitoring location NSL5

Analysing
Testing
Consulting
Calibrating

BHP
New Road
Thomondgate
Limerick
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Fax + 353 61 455447
E Mail
dervlapurcell@bhp.ie

TEST REPORT 246892

Client:

Scotshouse Quarries Ltd.
Scotshouse
Monaghan
Co. Monaghan

BHP Ref No.: 23/02/0345
Order No.:
Date Received: 23rd January 2023
Date Tested: 23rd January 2023
Test Specification: Noise Monitoring

FAO: Paddy Connolly

Item: Noise survey at noise sensitive locations at the Scotshouse Quarries Ltd. site located at Scotshouse, Monaghan, Co. Monaghan.

For and on behalf of BHP Ltd.

Dervla Purcell
Date Issued: 17th February 2023
Supplement to report No. N/A

Contents

1.0 Scope

2.0 Survey Approach

3.0 Date of survey

4.0 Results
    4.1 Noise levels and sampling notes

5.0 Interpretation of results
    5.1 Noise Levels

6.0 Conclusions

Appendix A: Map showing noise monitoring locations

Appendix B: Photographs indicating noise monitoring locations

1.0 Scope of survey

At the request of Scotshouse Quarries Ltd., BHP undertook noise monitoring at their operation in Scotshouse, Co.Monaghan. The purpose of this survey was to provide Scotshouse Quarries Ltd with the noise data and analysis required as part of their planning requirements.

This report deals with 6 nominated noise monitoring locations at the operation in Scotshouse, Co.Monaghan.

2.0 Survey approach

Two sound level meters (SLM's) were used in the survey, a Cirrus 171C type 1 (serial number G068852) and a Cirrus 831C type 1 (serial number D20874FF). The SLM's were calibrated at the start of the survey with a CRL 515 calibrator (serial number 74767). The same calibrator was used to check the SLM at the end of the survey, to inspect the microphone drift.

Monitoring and the interpretation of acquired data are to the following standards:

- International Standard (ISO 1996-1: 2003E) Acoustics – Description, measurement and assessment of Environmental Noise. Part 1. Basic quantities and assessment procedures.
- International Standard (ISO 1996-2: 2007E) Acoustics – Description, measurement and assessment of Environmental Noise. Part 2. Determination of environmental noise levels.
- British Standard: BS 7445 Part 3: 1991 (ISO 1996-3: 1987) Description and measurement of Environmental Noise. Part 3. Guide to application to noise limits.

60-minute daytime levels were measured at six locations. The locations were labelled as NM1, NM2, NM3, NSL1, NSL2 and NSL5 and are identified on the map included in Appendix A.

Appendix B contains photographs of the noise monitoring equipment at the monitoring points.

3.0 Date of survey

The survey was carried out on the 23rd January 2023 for the daytime monitoring.

4.0 Results

4.1 Noise levels:

Levels are presented on the following pages.

Daytime Measurements- Noise Locations- Scotshouse Quarry, Monaghan, Co. Monaghan.
23 January 2023.
Weather Conditions; Mostly Cloudy, Dry, Calm, 8° C.

Location	Sampling Period	Duration	LAeqt dB	LA10 dB	LA90 dB	LAMAX dB	Impulsive/ Tonal	Notes
NM1	17:28-18:28	60 mins	47	52	27	60	No	No quarry activity audible from this location during testing. Tractor working in nearby off site field. This is the noise associated with the maximum. Birdsong consistently during testing at 45-50dBA.
NM2	15:07-16:07	60 mins	43	45	31	69	No	Mobile plant was heard on site at 40-50dBA. Trucks entering and exiting the quarry was audible at 45-50dBA occasionally.
NM3	15:03-16:03	60 mins	41	44	30	73	No	Mobile plant and trucks moving on site was heard at 42-47dBA regularly during testing.
NSL1	17:22-18:22	60 mins	36	38	25	57	No	Infrequent traffic passing on local road heard faintly in the background. Dog barking from nearby house and was associated with the maximum. No quarry noise audible.
NSL2	16:18-17:18	60 mins	38	43	28	69	No	Occasional passing traffic on local road was audible. Car entered the driveway of the house and was associated with the maximum levels heard. Mobile plant audible faintly in the distance. Distant tractor operating was heard at 35-40dBA occasionally.

NSL5	16:15-17:15	60 mins	46	52	28	67	No	Cars passing on local road were audible at 45-55dBA and an occasional truck passing at up to 67dBA. Mobile plant audible faintly in the distance. Farm related noise such as cattle and sheds banging audible from the site next door to this location.

5.0 Interpretation of results

5.1 Noise levels;

The noise limits for the Scotshouse Quarries Ltd. operation in Scotshouse Co. Monaghan are as follows:

Daytime Limit L_{Aeq}55dBA

5.1.1 Day-time levels:

As can be seen in section 4.1, L_{Aeq} levels at all monitoring locations are less than the daytime limit of 55dBA.

6.0 Conclusions

The noise contribution made by the Scotshouse Quarries Ltd. operation did not exceed the daytime limit of 55dBA.

There was no evidence of tonal or impulsive qualities to the recorded noise from the quarry at the nominated locations.

Appendix A

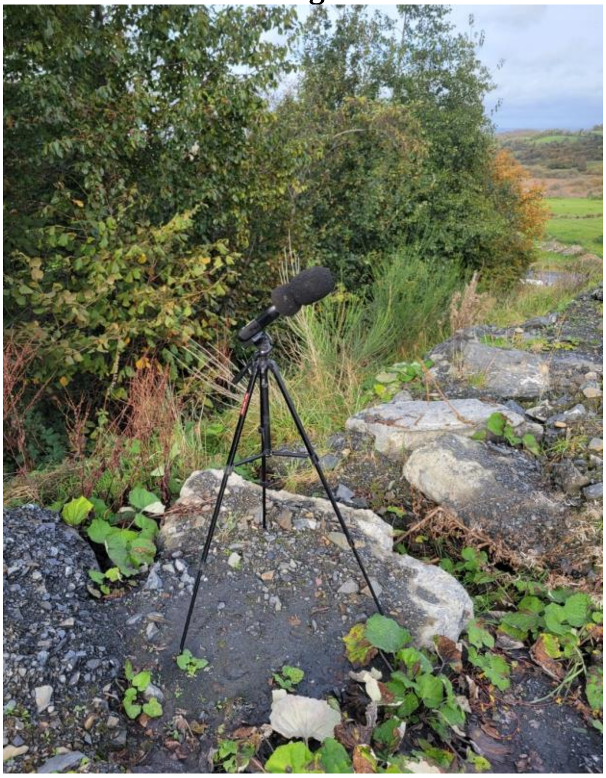
Site map showing noise monitoring locations.

Appendix B

Photographs of noise monitoring locations

Noise monitoring location NM1

Noise monitoring location NM2



Noise monitoring location NM3

Noise monitoring location NSL1

Noise monitoring location NSL2

Noise monitoring location NSL5

APPENDIX 12

APPENDIX 12-1

Scotshouse Quarry Extension

LVIA Photomontages

This book contains imagery for the viewpoints chosen for the LVIA study

August 2023

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INDEX

Viewpoint 1 - Existing View
NB - There is no Montage View as the proposed development is not visible from this viewpoint

Viewpoint 2 - Existing View + Montage View

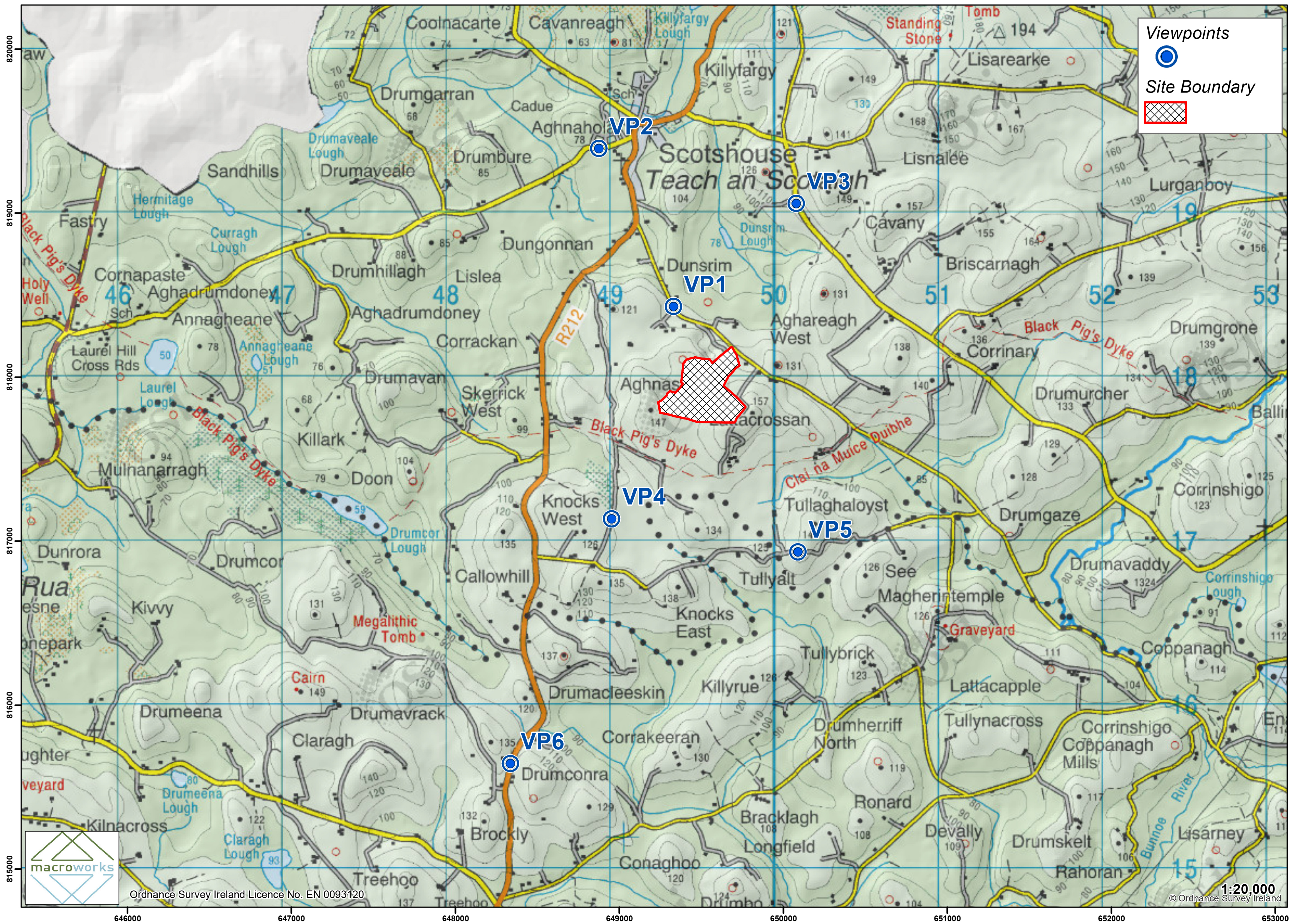
Viewpoint 3 - Existing View + Montage View

Viewpoint 4 - Existing View + Montage View

Viewpoint 5 - Existing View + Montage View

Viewpoint 6 - Existing View + Montage View

LVIA viewpoints selected for the Scotshouse Quarry Extension project



Existing View

Please Note: There is no Montage View for this viewpoint as the proposed development is completely screened by existing vegetation and/or terrain.

These are 80° panoramic montages captured and presented in accordance with the guidance set by the British Landscape Institute 2011 - Advice Note 01/11.

To view these panoramas on a flat surface one must move from left to right along its length whilst maintaining a perpendicular viewing direction and the specified correct viewing distance of 30cm. To see this entire panoramic scene in reality would necessitate turning one's head through 40°.

Easting (ITM):	649328	Lens:	50mm / Full Frame Sensor	Date:	06/01/2023
Northing (ITM):	818430	Camera:	Canon 1-D Mark II digital SLR	Time:	11:30
Direction of View 146°	E of Grid North	Camera Height:	1.7m Above Ground Level		
Angle of View:	80°				

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Scotshouse Quarry Extension

Imagery depicting the view towards the site (Existing and Montage)

These are 80° panoramic montages captured and presented in accordance with the guidance set by the British Landscape Institute 2011 - Advice Note 01/11.

To view these panoramas on a flat surface one must move from left to right along its length whilst maintaining a perpendicular viewing direction and the specified correct viewing distance of 30cm. To see this entire panoramic scene in reality would necessitate turning one's head through 40°.

Easting (ITM): 648873	Lens:	50mm / Full Frame Sensor	Date:	06/01/2023
Northing (ITM): 819392	Camera:	Canon 1-D Mark II digital SLR	Time:	11:46
Direction of View 161° E of Grid North	Camera Height:	1.7m Above Ground Level		
Angle of View: 80°				

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Imagery depicting the view towards the site (Existing and Montage)

Local road northeast of site VP3

These are 80° panoramic montages captured and presented in accordance with the guidance set by the British Landscape Institute 2011 - Advice Note 01/11.

To view these panoramas on a flat surface one must move from left to right along its length whilst maintaining a perpendicular viewing direction and the specified correct viewing distance of 30cm. To see this entire panoramic scene in reality would necessitate turning one's head through 40°.

Easting (ITM):	650078	Lens:	50mm / Full Frame Sensor	Date:	06/01/2023
Northing (ITM):	819058	Camera:	Canon 1-D Mark II digital SLR	Time:	11:58
Direction of View 154° W of Grid North		Camera Height:	1.7m Above Ground Level		
Angle of View:	80°				

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These are 80° panoramic montages captured and presented in accordance with the guidance set by the British Landscape Institute 2011 - Advice Note 01/11.

To view these panoramas on a flat surface one must move from left to right along its length whilst maintaining a perpendicular viewing direction and the specified correct viewing distance of 30cm. To see this entire panoramic scene in reality would necessitate turning one's head through 40°.

Easting (ITM):	648952	Lens:	50mm / Full Frame Sensor	Date:	06/01/2023
Northing (ITM):	817135	Camera:	Canon 1-D Mark II digital SLR	Time:	12:29
Direction of View	42° E of Grid North	Camera Height:	1.7m Above Ground Level		
Angle of View:	80°				

Scotshouse Quarry Extension

Imagery depicting the view towards the site (Existing and Montage)

Local road southeast of site VP5

These are 80° panoramic montages captured and presented in accordance with the guidance set by the British Landscape Institute 2011 - Advice Note 01/11.

To view these panoramas on a flat surface one must move from left to right along its length whilst maintaining a perpendicular viewing direction and the specified correct viewing distance of 30cm. To see this entire panoramic scene in reality would necessitate turning one's head through 40°.

Easting (ITM):	650089	Lens:	50mm / Full Frame Sensor	Date:	06/01/2023
Northing (ITM):	816934	Camera:	Canon 1-D Mark II digital SLR	Time:	12:41
Direction of View	44° W of Grid North	Camera Height:	1.7m Above Ground Level		
Angle of View:	80°				

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Scotshouse Quarry Extension

Imagery depicting the view towards the site (Existing and Montage) R212 southwest of site VP6

These are 80° panoramic montages captured and presented in accordance with the guidance set by the British Landscape Institute 2011 - Advice Note 01/11.

To view these panoramas on a flat surface one must move from left to right along its length whilst maintaining a perpendicular viewing direction and the specified correct viewing distance of 30cm. To see this entire panoramic scene in reality would necessitate turning one's head through 40°.

Easting (ITM):	648334	Lens:	50mm / Full Frame Sensor	Date:	06/01/2023
Northing (ITM):	815644	Camera:	Canon 1-D Mark II digital SLR	Time:	12:55
Direction of View	31° E of Grid North	Camera Height:	1.7m Above Ground Level		
Angle of View:	80°				

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APPENDIX 13

APPENDIX 13-1

RECORDED MONUMENTS IN THE STUDY AREA

MO016-015---- Lisnalee Ringfort – rath
Situated on top of a drumlin. This rath is depicted on McCrea's map of County Monaghan (1793). It is a raised, circular, grass and scrub-covered area (diam. 44m E-W; 42m N-S) defined by a slight but overgrown earthen bank (at W: Wth c. 3m; int. H 0.15m; ext. H 1.15m) and traces of an outer fosse (Wth c. 1.5m) that has been re-cut as a drain with an outer bank N-E. The original entrance is not identified and the perimeter is slightly truncated by a NE-SW field bank E-S.

MO021-005---- Sherrick West Cairn - unclassified
Situated on a rise with rock outcrop at the bottom of a S-facing slope. This was described in the 1940s as 'a small mound of stones about 8 feet across and not more than 2 high (c. 2.45m; c. 0.6m), bounded by a kerb of rather large stones. Towards the north side of the mound stands a quarried block with rather sharp edges, 3' x 1' 8" x 4' 6" high (c. 0.9m; c. 0.5m; c. 1.35m).

MO021-006---- Aghnaskew Ringfort – rath
Situated on a shelf on a N-facing slope. It is not depicted as a rath on any map but it was described c. 1940 as a subcircular area (dims c. 35m E-W; c. 33m N-S) defined by a stony bank (Wth c. 1m; H c. 0.6m) and hedge E-S-W with no visible fosse (SMR file).

MO021-007---- Dunsrim Ringfort – cashel
Located on a rise on a NE-facing slope, with the headwaters of a small SE-NW stream c. 50m to the SW. It is depicted only on the 1907 edition of the OS 6-inch map as a D-shaped enclosure defined by field walls. This is an oval grass-covered area (dims 28.5m N-S; 22.5m E-W) defined by a grass-covered stone spread (Wth c. 4m; int. H c. 0.2m; ext. H 1.2-1.5m) but no facing stones are identified. The original entrance is not recognised, but the perimeter is slightly clipped by a NW-SE field wall at SW.

MO021-008---- Lattacrossan Ringfort – rath
Situated on a rise which is on a NE-facing slope and overlooking a col with a hill rising to the NE. This rath is the more northerly of two at Lattacrossan represented on McCrea's Map of County Monaghan (1793), and it is also depicted on the 1834 and 1907 editions of the OS 6-inch map. This is an oval and domed grass-covered area (dims 38m NNW-SSE; 32.3m ENE-WSW) defined by a scarp (Wth 1.5m; H 1m at N to 3m at SE) that is incorporated into an overgrown field bank and hedge SE-W-NW. There is no visible fosse and the original entrance is not identified. The perimeter is damaged by quarrying SSE-SSW.

MO021-009---- Aghareagh West Ringfort – rath
Located on a N-S drumlin ridge. This is a circular grass-covered area (diam. 42.5m N-S; 38.5m E-W) defined by an earthen bank (Wth c. 3m; int. H 0.6m; ext. H c. 2-2.5m) NNW-NE that is largely reduced to a scarp (at E: H 1.8m) and hedge. The remains of an outer fosse (Wth of base c. 1.5m) SW-N-SE has been deepened (ext. D c. 0.7m) NNW-NNE. The original entrance is probably the large gap (Wth at base 2.3m) at S.

MO021-010---- Lattacrossan Ringfort – rath
Circular area (c. 25.7m NE-SW; 27.5m NW-SE) surrounded by earthen bank with external fosse. No visible trace of original entrance.

MO021-011---- Aghareagh West, Aghnaskew, Annagheane, Cornapaste, Corrackan, Corrinary, Corrinshigo, Drumavan, Drumgrone, Fastry Or Racreeghan, Killark, Lattacrossan, Skerrick West Linear earthwork

The Black Pig's Dyke is a name that is generally applied to a number of linear earthworks in the south Ulster and north Connaught regions by the map-makers. They form discontinuous sections extending mostly through drumlin country from Donegal Bay in the west almost as far as Dundalk Bay in the east. Other names are the 'Worm's Ditch' or the 'Worm's Cast', and in Co. Cavan the 'Duncla'. Similar earthworks, like the Dane's Cast and the Dorsey in Co. Armagh, could be part of the same phenomenon. Linear earthworks have been regarded as providing border defence, but their entire length could hardly have been defended, and it might be more reasonable to suggest that they were constructed to control access points and to hinder cattle raiding [1]. Linear earthworks can date from the Late Bronze Age up to the high medieval period, but the Black Pig's Dyke dates mainly to the Iron Age (c. 500BC-c. 500 AD). It has recently been studied in detail [2], and an article on the Monaghan section is published [3].

In Co. Monaghan, apart from two short sections (MO025-044----; MO025-046----) at the E edge of the county close to the Armagh boundary, one long section extends E from a NE-SW section of the Finn river, south of Scotshouse, at the most western point of the county. From the river at Cornapaste – Corr na Péiste, the hill or hollow of the worm – it runs SE through Annagheane and Killark connecting Laurel Lough and Drumcor Lough. From the E end of Drumcor it turns NE (L c. 670m), rising up Doon Hill in Drumavan, before resuming a meandering eastward course through Skerrick West and Corrackan to Aghernaskew. The section to Aghernaskew is poorly preserved and represented as a dotted line on the 1907 edition of the OS 6-inch map. Eastwards from Aghernaskew it survives in generally good condition through the townlands of Lattacrossan, Aghareagh West, and Corrinary where it takes another turn to the N (L c. 300m) before curving eastwards through Drumurcher where it doesn't survive visibly and connects with a small pot lake meering with Drumgrone, on the E side of which it crosses the NE-SW Bunoe River and comes to an end (total L c. 6.8km).

The earthwork was usually positioned in the valleys and hollows between drumlins, and where it is on a slope it is generally S-facing. Where it survives intact it consists of two banks with associated fosses on the up-slope side or a bank with fosses on either side. Where two banks are present the northern is invariably the stronger. Modern investigations of this earthwork began with an excavation of a NE-SW portion at Aghareagh West in 1982 [4], which provides a good sample of its original appearance [4] [5]. Before excavation and from the NW it consisted of a fosse (Wth of top 7m; ext. D c. 1m), the wide N bank (Wth of base c. 7m; H over NW c. 3m; H over SE c. 3m) separated by a rounded fosse (Wth of top c. 8.5-9m) from the SE bank (Wth of base 4.5m; H over NW and SE c. 1.2-1.4mm), and the earthworks have a total width of c. 24m. A palisade trench (Wth 0.5m; D 0.9m) that had been burnt was found outside the NW fosse. No artefacts were recovered from the excavation, but samples of carbon from the palisade trench produced a revised C14 date of 310 cal. BC to cal. AD 140 [2]. A gradiometer survey (19R0233) of the fields to the NW and SE of Walsh's excavation recorded intimations of numerous pits and possible enclosures [6].

Archaeological testing (98E0245) uncovered an area of brushwood just S of the line of the earthwork at the W edge Cornapaste townland [7], but further testing (05E0657) S of its line in the same area produced no related material [8]. However, archaeological testing (05E0915) adjacent to a section at the E end of Lattacrossan townland on the N side of the earthwork produced evidence of a palisade in a layer of burnt clay running parallel with the earthwork which was preserved in situ [9]. A remote sensing survey conducted at Corrinary as part of the regional study confirmed the form of the linear earthwork as a double ditch feature with evidence of a burnt palisade trench outside the N ditch [10]. As confirmation of these features, a limited test excavation (05E0915) at Lattacrossan recorded a spread of burnt clay running parallel with a NE-SW section of the linear earthwork on the NW side [9].

A section of this monument, in the townland of Annagheane, is subject to a preservation order made under the National Monuments Acts 1930 to 2014 (PO no. 4/1990).

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[8] O'Hara, "Archaeolohical Assessment, Cornapaste, Co Monaghan Licence 05E06557," (Not published), Archaeological Consultancy Services, 2005.

[9] R. Meenan, "Lattacrossan Vicinity of Black Pig's Dyke," in *Excavations 2005: Summary accounts of archaeological excavations in Ireland*, Bray, Wordwell, 2008, p. 313.

[10] H. Gimson, "Investigations into a section of the Black Pig's Dyke (MO021-011----), Corrinary, Co Monaghan, Licence 14R0117," (Not published), Kilkenny Archaeology, 2014.

APPENDIX 13-2

SITES IN THE SITES AND MONUMENTS RECORD IN THE STUDY AREA

MO021-013---- Knocks West Mass-rock
Located at a break in slope on a S-facing slope and on the E side of a NNE-SSW field bank. In the 1960s the landowner and a local priest built a concrete wall around the mass-rock, which is still present creating a bay (dims 1.05m NE-SW; 0.7m NW-SE; H 0.7m) open to the SE and with the stump of an iron cross still present, but the mass rock is no longer present.

APPENDIX 13-3

November 2022 Field Inspection for Archaeological or Cultural Heritage Materials

Plate 1: Aerial view of site showing numbered sections

12.1 Area 1

Hexagonal-shaped area of hummocky west sloping damp pasture, enclosed by banks with hedgerow and trees. There was no visible indication of any significant archaeological or cultural heritage material at ground level.

Plate 2: Area 1 (looking northwest)

12.2 Area 2

Irregular-shaped area of hummocky rough pasture, enclosed by banks overgrown with gorse, brambles and some trees. Structure 8 is in the west part of this area (see main EIAR, chapter

13, Figures 13-6 to 13-8). There was no visible indication of any significant archaeological or cultural heritage material at ground level.

Plate 3: Area 2 (looking northwest)

12.3 Area 3

Rhomboid-shaped area of undulating rough pasture, enclosed by banks overgrown with gorse and brambles with some trees. There was no visible indication of any significant archaeological or cultural heritage material at ground level.

Plate 4: Area 3 (looking southeast)

12.4 Area 4

Pentagonal-shaped area of south-west sloping rough pasture, enclosed by banks overgrown with gorse, brambles with some trees. There was no visible indication of any significant archaeological or cultural heritage material at ground level.

Plate 5: Area 4 (looking southwest)

12.5 Area 5

Rhomboid-shaped area of north sloping pasture, enclosed by banks with hedgerow and some trees. There was no visible indication of any significant archaeological or cultural heritage material at ground level.

Plate 6: Area 5 looking north

12.6 Area 6

Roughly triangular-shaped area of north-east sloping pasture, enclosed by banks with hedgerow and some trees. There was no visible indication of any significant archaeological or cultural heritage material at ground level.

Plate 7: Area 6 looking north

12.7 Area 7

Quadrilateral-shaped area of north-east sloping pasture, enclosed by banks with hedgerow and some trees. Structure 9 was in the south-west part of this area (see main EIAR, Chapter

13, Figure 13-9). There was no visible indication of any significant archaeological or cultural heritage material at ground level.

Plate 8: Area 7 looking north

12.8 Area 8

The northern part of a field of north sloping pasture, enclosed by banks with hedgerow and some trees. There was no visible indication of any significant archaeological or cultural heritage material at ground level.

Plate 9: Area 8 looking north-west

APPENDIX 14

APPENDIX 14-1

Traffic Calculations for Scotshouse Quarry, Co. Monaghan

Site 1 - L6280/ Quarry Access

AM Peak (07:45 - 08:45)

Seasonally Adjusted 2022

Route	A	HGV	B	HGV	C	HGV
A	0	0	3	1	5	0
B	0	0	0	0	0	5
C	2	0	2	1	0	0

2023 ***Year of Opening***

Monaghan	***LGV***	***HGV***
2016 - 2030 index	*1.0115*	*1.0252*
Years	*1*	*1*
Central Growth Factor	***1.0115***	***1.0252***

Route	A	HGV	B	HGV	C	HGV
A	0	0	3	1	5	0
B	0	0	0	0	0	5
C	2	0	2	1	0	0

2028 ***(5 Years after Opening)***

Monagha	***LGV***	***HGV***
2016-2030 index	*1.0115*	*1.0252*
Years	*6*	*6*
Central Growth Factor	***1.0710***	***1.1611***

Route	A	HGV	B	HGV	C	HGV
A	0	0	3	1	6	0
B	0	0	0	0	0	6
C	2	0	2	1	0	0

2038 ***(15 Years after Opening)***

Monagha	***LGV***	***HGV***
2016-2030 index	*1.0115*	*1.0252*
Years	*8*	*8*
Central Growth Factor	***1.0958***	***1.2203***

Monagha	***LGV***	***HGV***
2030-2040 index	*1.0047*	*1.0112*
Years	*8*	*8*
Central Growth Factor	***1.0382***	***1.0932***

Combined Factors	***1.1377***	***1.3340***

Route	A	HGV	B	HGV	C	HGV
A	0	0	4	1	6	0
B	0	0	0	0	0	7
C	2	0	2	1	0	0

AM PEAK GENERATED TRAFFIC

Site 1 - L6280/ Quarry Access

WITH DEVELOPMENT

Generated Traffic

Route	A	HGV	B	HGV	C	HGV
A	0	0	12	4	0	0
B	0	0	0	0	0	8
C	0	0	8	4	0	0

Year of Opening

Route	A	HGV	B	HGV	C	HGV
A	0	0	15	5	5	0
B	0	0	0	0	0	13
C	2	0	10	5	0	0

(5 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	15	5	6	0
B	0	0	0	0	0	14
C	2	0	10	5	0	0

(15 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	16	5	6	0
B	0	0	0	0	0	15
C	2	0	10	5	0	0

Traffic Calculations for Scotshouse Quarry, Co. Monaghan

Site 1 - L6280/ Quarry Access

PM Peak (16:45 - 17:45)

Seasonally Adjusted 2022

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	0	5	0
B	1	0	0	0	1	2
C	5	1	0	0	0	0

2023 ***Year of Opening***

Monaghan	***LGV***	***HGV***
2016 - 2030 index	*1.0115*	*1.0252*
Years	*1*	*1*
Central Growth Factor	***1.0115***	***1.0252***

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	0	5	0
B	1	0	0	0	1	2
C	5	1	0	0	0	0

2028 ***(5 Years after Opening)***

Monagha	***LGV***	***HGV***
2016-2030 index	*1.0115*	*1.0252*
Years	*6*	*6*
Central Growth Factor	***1.0710***	***1.1611***

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	0	6	0
B	1	0	0	0	1	2
C	6	1	0	0	0	0

2038 ***(15 Years after Opening)***

Monagha	***LGV***	***HGV***
2016-2030 index	*1.0115*	*1.0252*
Years	*8*	*8*
Central Growth Factor	***1.0958***	***1.2203***

Monagha	***LGV***	***HGV***
2030-2040 index	*1.0047*	*1.0112*
Years	*8*	*8*
Central Growth Factor	***1.0382***	***1.0932***

Combined Factors	***1.1377***	***1.3340***

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	0	6	0
B	1	0	0	0	1	3
C	6	1	0	0	0	0

AM PEAK GENERATED TRAFFIC

Site 1 - L6280/ Quarry Access

WITH DEVELOPMENT

Generated Traffic

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	4	0	0
B	10	0	0	0	10	8
C	0	0	0	4	0	0

Year of Opening

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	4	5	0
B	11	0	0	0	11	10
C	5	1	0	4	0	0

(5 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	4	6	0
B	11	0	0	0	11	11
C	6	1	0	4	0	0

(15 Years after Opening)

Route	A	HGV	B	HGV	C	HGV
A	0	0	0	4	6	0
B	11	0	0	0	11	11
C	6	1	0	4	0	0

APPENDIX 14-2

JACOBS TOBIN
CONSULTING ENGINEERS

SCOPING STUDY FOR:	**11524 - Scotshouse Quarry - Substitute Consent (SC) and Planning Application**
CLIENT:	**Scotshouse Quarries**
LOCAL AUTHORITY	**Monaghan County Council**
SCOPING FORM SENT TO:	**Kevin West and Brian Braniff,** **Monaghan County Council**
SENT BY:	**Maria Rooney** **DATE:** **18-11-22**

Ref	Item	Requirements
1	Location, Size and nature of proposed description of proposal	Continued use of the substitute consent area together with a greenfield area which the quarry operator wants to extend the quarry into. A total area of 22.8Ha.
2	Is the development in line with National, County and Local Area Plan policy?	Yes
3	Description of existing uses of land	Varying agriculture use.
4	Does the development involve the relocation of an existing use?	No
5	What provisions are there for Pedestrians, Cyclists, Public Transport, Disabled access?	N/A
6	What is the carrying capacity of the existing transportation Networks?	TBC
7	What data sources, guidance is available?	Traffic Counts to be undertaken
8	Are traffic surveys of the existing conditions available or required?	NI
9	Potential trip / traffic generation from the site. Initial estimates can be obtained from available databases, from existing similar development in the locality, or from existing travel patterns if the development is relocating.	Trip generation and distribution to be determined from typical weighbridge data.
10	Are further traffic generation surveys required?	No
11	What are the targets for mode share and how are they achieved?	N/A
12	Are trip distribution and assignment models to be used?	Distribution based on existing distribution.
13	Are further traffic surveys required or can TRICS database be used to estimate trip rates?	Generated Traffic estimated from first principles.
14	What is the rate of traffic growth locally?	Central growth rate as per TII Project Appraisal Guidelines
15	When is the critical time period of assessment? i.e. consider the peak hour for development traffic and also the peak hour for the network – it may be necessary to	To be confirmed from Traffic Counts

Ref	Item	Requirements
	assess both periods if they are different. What are the assessment years?	
16	What are the assessment years?	Peak year of Construction
17	When will the site become fully operational? Are there significant phases to the project?	2023. No.
18	Are there ways to reduce car dependency? Is a mobility management plan and future travel plans required?	N/A
19	Will the site attract traffic from other adjacent sites?	No.
20	Are there any adjacent developments committed or proposed that will have significant trip / traffic implications?	TBC
21	What is the cumulative impact of the development within the area?	TBC
22	What will be the area of impact of the proposal, i.e. which adjacent local regional and National Road routes and junctions will be affected and require capacity calculations?	Existing access in L6280.
23	Is a new or modified highway access likely?	TBC
24	Details of any adjacent highway improvement proposals and, if necessary, any proposals distant from the site	TBC
25	Will adjacent links or junctions become overloaded or be impacted significantly? Is a new or modified road access likely?	TBC
26	What level of car parking provision is proposed?	N/A
27	What sightlines/ visibility splays are available at the proposed development accesses?	TBC
28	Do they comply with the requirements of the relevant standards, *TII DN-GEO-03060 Geometric Design of Junctions (priority junctions, direct accesses, roundabout, grade separated and compact separated junctions) & DMURS for Urban Areas*	TBC
29	Are there any road safety implications?	TBC
30	Is a Road Safety Impact assessment or Road Safety Audit required? Refer to TII standards.	N/A
31	What type of transport analysis is most suitable, i.e. what type of traffic modelling software is most appropriate to give the best	PICADY

Ref	Item	Requirements
	understanding of the potential impacts?	

APPENDIX 14-3

Junctions 10

PICADY 10 - Priority Intersection Module

Filename: 11524_ Junction Access.j10
Path: C:\Users\gabriela.iha\OneDrive - TOBIN Consulting Engineers\Documents\workingfiles\unionsquare.tobin.ie
Report generation date: 06/01/2023 11:46:10

»2022 Base Year, AM
»2022 Base Year, PM
»2023 Do Nothing-YoO, AM
»2023 Do Nothing-YoO, PM
»2023 Do Something-YoO, AM
»2023 Do Something-YoO, PM
»2028 Do Nothing YoO+5, AM
»2028 Do Nothing YoO+5, PM
»2028 Do Something YoO+5, AM
»2028 Do Something YoO+5, PM
»2038 Do Nothing YoO+15, AM
»2038 Do Nothing YoO+15, PM
»2038 Do Something YoO+15, AM
»2038 Do Something YoO+15, PM

Summary of junction performance

	AM				PM			
	Queue (Veh)	Delay (s)	RFC	Junction LOS	Queue (Veh)	Delay (s)	RFC	Junction LOS
	2022 Base Year							
Stream B-C	0.0	12.83	0.02	A	0.0	0.00	0.00	A
Stream B-A	0.0	0.00	0.00		0.0	0.00	0.00	
Stream C-AB	0.0	8.41	0.01		0.0	0.00	0.00	
	2023 Do Nothing-YoO							
Stream B-C	0.0	12.83	0.02	A	0.0	0.00	0.00	A
Stream B-A	0.0	0.00	0.00		0.0	0.00	0.00	

Stream C-AB	0.0	8.47	0.01		0.0	0.00	0.00	
	2023 Do Something-YoO							
Stream B-C	0.1	13.29	0.05	A	0.1	9.98	0.06	A
Stream B-A	0.0	0.00	0.00		0.0	8.53	0.03	
Stream C-AB	0.0	8.83	0.04		0.0	12.58	0.02	
	2028 Do Nothing YoO+5							
Stream B-C	0.0	12.89	0.02	A	0.0	10.71	0.01	A
Stream B-A	0.0	0.00	0.00		0.0	8.26	0.00	
Stream C-AB	0.0	8.55	0.01		0.0	0.00	0.00	
	2028 Do Something YoO+5							
Stream B-C	0.1	13.36	0.05	A	0.1	10.09	0.06	A
Stream B-A	0.0	0.00	0.00		0.0	8.54	0.03	
Stream C-AB	0.0	8.84	0.04		0.0	12.55	0.02	
	2038 Do Nothing YoO+15							
Stream B-C	0.0	12.94	0.03	A	0.0	10.84	0.01	A
Stream B-A	0.0	0.00	0.00		0.0	8.26	0.00	
Stream C-AB	0.0	8.70	0.01		0.0	0.00	0.00	
	2038 Do Something YoO+15							
Stream B-C	0.1	13.41	0.06	A	0.1	10.09	0.06	A
Stream B-A	0.0	0.00	0.00		0.0	8.54	0.03	
Stream C-AB	0.0	8.86	0.04		0.0	12.55	0.02	

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Junction LOS and Junction Delay are demand-weighted averages.

File summary

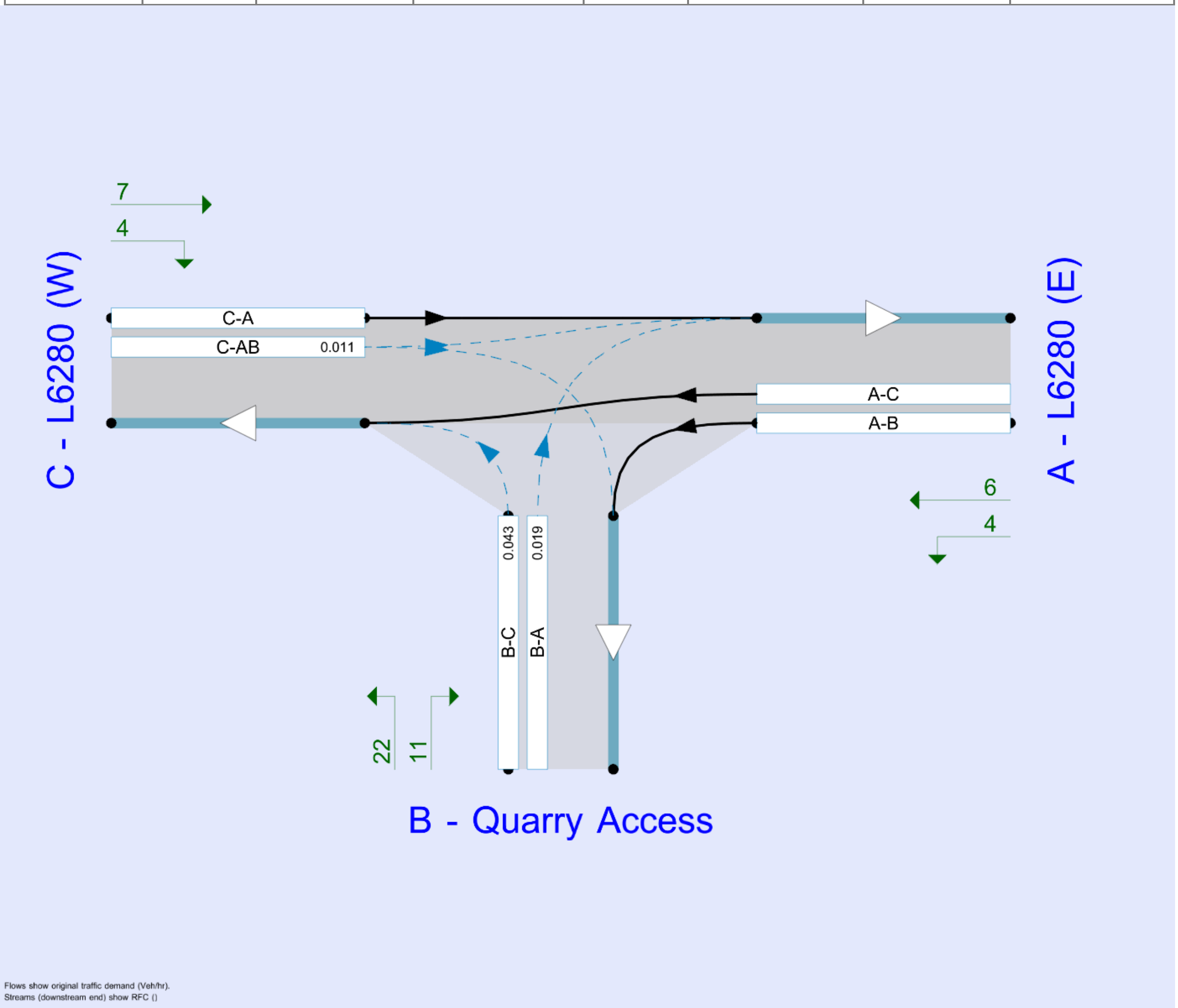
File Description

Title	Quarry Access
Location	
Site number	
Date	06/01/2023

Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	TOBIN\Gabriela.lha
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed	Show lane queues	Show all PICADY	Calculate residual capacity	RFC Threshold	Average Delay	Queue threshold (PCU)	Use iterations	Max number of iterations

		queueing delay	in feet / metres	stream intercepts			threshold (s)		with HCM roundabouts	for roundabouts
5.75	✓					0.85	36.00	20.00		500

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2022 Base Year	AM	ONE HOUR	07:30	09:00	15	✓
D2	2022 Base Year	PM	ONE HOUR	16:30	18:00	15	✓
D3	2023 Do Nothing-YoO	AM	ONE HOUR	07:30	09:00	15	✓
D4	2023 Do Nothing-YoO	PM	ONE HOUR	16:30	18:00	15	✓
D5	2023 Do Something-YoO	AM	ONE HOUR	07:30	09:00	15	✓
D6	2023 Do Something-YoO	PM	ONE HOUR	16:30	18:00	15	✓
D7	2028 Do Nothing YoO+5	AM	ONE HOUR	07:30	09:00	15	✓
D8	2028 Do Nothing YoO+5	PM	ONE HOUR	16:30	18:00	15	✓
D9	2028 Do Something YoO+5	AM	ONE HOUR	07:30	09:00	15	✓
D10	2028 Do Something YoO+5	PM	ONE HOUR	16:30	18:00	15	✓
D11	2038 Do Nothing YoO+15	AM	ONE HOUR	07:30	09:00	15	✓
D12	2038 Do Nothing YoO+15	PM	ONE HOUR	16:30	18:00	15	✓
D13	2038 Do Something YoO+15	AM	ONE HOUR	07:30	09:00	15	✓
D14	2038 Do Something YoO+15	PM	ONE HOUR	16:30	18:00	15	✓

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2022 Base Year, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		6.23	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.23	A

Arms

Arms

Arm	Name	Description	Arm type
A	L6280 (E)		Major
B	Quarry Access		Minor
C	L6280 (W)		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right-turn storage	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C - L6280 (W)	5.50			0.0	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane Width (Left) (m)	Lane Width (Right) (m)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	Two lanes	2.20	2.20	0	0

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	440	0.082	0.207	0.130	0.295
B-C	574	0.090	0.227	-	-
C-B	574	0.227	0.227	-	-

The slopes and intercepts shown above include custom intercept adjustments only.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically

D1	2022 Base Year	AM	ONE HOUR	07:30	09:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	9	100.000
B - Quarry Access		ONE HOUR	✓	5	100.000
C - L6280 (W)		ONE HOUR	✓	5	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	**B - Quarry Access**	**C - L6280 (W)**
From	**A - L6280 (E)**	0	4	5
	B - Quarry Access	0	0	5
	C - L6280 (W)	2	3	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - L6280 (E)	**B - Quarry Access**	**C - L6280 (W)**
From	**A - L6280 (E)**	0	25	0
	B - Quarry Access	0	0	100
	C - L6280 (W)	0	33	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.02	12.83	0.0	0.5	B	5	7
B-A	0.00	0.00	0.0	~1	A	0	0
C-AB	0.01	8.41	0.0	0.5	A	3	4

C-A						2	3
A-B						4	6
A-C						5	7

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	286	0.013	4	0.0	0.0	12.734	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	2	0.57	431	0.005	2	0.0	0.0	8.388	A
C-A	1	0.37			1				
A-B	3	0.75			3				
A-C	4	0.94			4				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	286	0.016	4	0.0	0.0	12.775	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	3	0.68	431	0.006	3	0.0	0.0	8.398	A
C-A	2	0.45			2				
A-B	4	1			4				
A-C	4	1			4				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	6	1	286	0.019	5	0.0	0.0	12.828	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	3	1	431	0.008	3	0.0	0.0	8.411	A
C-A	2	0.55			2				
A-B	4	1			4				
A-C	6	1			6				

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	6	1	286	0.019	6	0.0	0.0	12.828	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	3	1	431	0.008	3	0.0	0.0	8.411	A
C-A	2	0.55			2				
A-B	4	1			4				
A-C	6	1			6				

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	286	0.016	5	0.0	0.0	12.776	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	3	0.68	431	0.006	3	0.0	0.0	8.396	A
C-A	2	0.45			2				
A-B	4	1			4				
A-C	4	1			4				

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	286	0.013	4	0.0	0.0	12.740	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	2	0.57	431	0.005	2	0.0	0.0	8.387	A
C-A	1	0.37			1				
A-B	3	0.75			3				
A-C	4	0.94			4				

Queue Variation Results for each time segment

07:30 - 07:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

07:45 - 08:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.02	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.01	0.25	0.45	0.48			N/A	N/A

08:00 - 08:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:15 - 08:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:30 - 08:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:45 - 09:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

2022 Base Year, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.

Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.00	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.00	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2022 Base Year	PM	ONE HOUR	16:30	18:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	5	100.000
B - Quarry Access		ONE HOUR	✓	4	100.000
C - L6280 (W)		ONE HOUR	✓	6	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	0	5
	B - Quarry Access	1	0	3
	C - L6280 (W)	6	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	0	0
	B - Quarry Access	0	0	67
	C - L6280 (W)	17	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.00	0.00	0.0	~1	A	0	0
B-A	0.00	0.00	0.0	~1	A	0	0
C-AB	0.00	0.00	0.0	~1	A	0	0
C-A						6	8
A-B						0	0
A-C						5	7

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	438	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	4	0.94			4				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service

B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	438	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	4	1			4				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	7	2			7				
A-B	0	0			0				
A-C	6	1			6				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	7	2			7				
A-B	0	0			0				
A-C	6	1			6				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	438	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	4	1			4				

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	438	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	4	0.94			4				

Queue Variation Results for each time segment

16:30 - 16:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

16:45 - 17:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:00 - 17:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:15 - 17:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:30 - 17:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:45 - 18:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

2023 Do Nothing-YoO, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		6.24	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.24	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D3	2023 Do Nothing-YoO	AM	ONE HOUR	07:30	09:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)

✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	9	100.000
B - Quarry Access		ONE HOUR	✓	5	100.000
C - L6280 (W)		ONE HOUR	✓	5	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	4	5
	B - Quarry Access	0	0	5
	C - L6280 (W)	2	3	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	25	0
	B - Quarry Access	0	0	100
	C - L6280 (W)	0	34	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.02	12.83	0.0	0.5	B	5	7
B-A	0.00	0.00	0.0	~1	A	0	0
C-AB	0.01	8.47	0.0	0.5	A	3	4
C-A						2	3
A-B						4	6

A-C						5	7

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	286	0.013	4	0.0	0.0	12.734	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	2	0.57	428	0.005	2	0.0	0.0	8.451	A
C-A	1	0.37			1				
A-B	3	0.75			3				
A-C	4	0.94			4				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	286	0.016	4	0.0	0.0	12.775	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	3	0.68	428	0.006	3	0.0	0.0	8.461	A
C-A	2	0.45			2				
A-B	4	1			4				
A-C	4	1			4				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	6	1	286	0.019	5	0.0	0.0	12.828	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	3	1	428	0.008	3	0.0	0.0	8.474	A
C-A	2	0.55			2				
A-B	4	1			4				
A-C	6	1			6				

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service

B-C	6	1	286	0.019	6	0.0	0.0	12.828	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	3	1	428	0.008	3	0.0	0.0	8.475	A
C-A	2	0.55			2				
A-B	4	1			4				
A-C	6	1			6				

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	286	0.016	5	0.0	0.0	12.776	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	3	0.68	428	0.006	3	0.0	0.0	8.461	A
C-A	2	0.45			2				
A-B	4	1			4				
A-C	4	1			4				

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	286	0.013	4	0.0	0.0	12.740	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	2	0.57	428	0.005	2	0.0	0.0	8.450	A
C-A	1	0.37			1				
A-B	3	0.75			3				
A-C	4	0.94			4				

Queue Variation Results for each time segment

07:30 - 07:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

07:45 - 08:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.02	0.02	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.01	0.25	0.45	0.48			N/A	N/A

08:00 - 08:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:15 - 08:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:30 - 08:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:45 - 09:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

2023 Do Nothing-YoO, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.

Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		0.00	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	0.00	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D4	2023 Do Nothing-YoO	PM	ONE HOUR	16:30	18:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	5	100.000
B - Quarry Access		ONE HOUR	✓	4	100.000
C - L6280 (W)		ONE HOUR	✓	6	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	0	5
	B - Quarry Access	1	0	3
	C - L6280 (W)	6	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	0	0
	B - Quarry Access	0	0	67
	C - L6280 (W)	17	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.00	0.00	0.0	~1	A	0	0
B-A	0.00	0.00	0.0	~1	A	0	0
C-AB	0.00	0.00	0.0	~1	A	0	0
C-A						6	8
A-B						0	0
A-C						5	7

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	438	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	4	0.94			4				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A

B-A	0	0	438	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	4	1			4				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	7	2			7				
A-B	0	0			0				
A-C	6	1			6				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	7	2			7				
A-B	0	0			0				
A-C	6	1			6				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	438	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	4	1			4				

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	0	0	343	0.000	0	0.0	0.0	0.000	A
B-A	0	0	438	0.000	0	0.0	0.0	0.000	A
C-AB	0	0	528	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	4	0.94			4				

Queue Variation Results for each time segment

16:30 - 16:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

16:45 - 17:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:00 - 17:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:15 - 17:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:30 - 17:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:45 - 18:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.00	0.00	0.00	0.00	0.00			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

2023 Do Something-YoO, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		6.70	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.70	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D5	2023 Do Something-YoO	AM	ONE HOUR	07:30	09:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)

✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	25	100.000
B - Quarry Access		ONE HOUR	✓	13	100.000
C - L6280 (W)		ONE HOUR	✓	17	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
From		**A - L6280 (E)**	**B - Quarry Access**	**C - L6280 (W)**
	A - L6280 (E)	0	20	5
	B - Quarry Access	0	0	13
	C - L6280 (W)	2	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
From		**A - L6280 (E)**	**B - Quarry Access**	**C - L6280 (W)**
	A - L6280 (E)	0	25	0
	B - Quarry Access	0	0	100
	C - L6280 (W)	0	34	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.05	13.29	0.1	0.5	B	12	18
B-A	0.00	0.00	0.0	~1	A	0	0
C-AB	0.04	8.83	0.0	0.5	A	14	21
C-A						2	3
A-B						18	28

A-C						5	7

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	286	0.034	10	0.0	0.0	13.033	B
B-A	0	0	433	0.000	0	0.0	0.0	0.000	A
C-AB	11	3	426	0.027	11	0.0	0.0	8.685	A
C-A	1	0.37			1				
A-B	15	4			15				
A-C	4	0.94			4				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	285	0.041	12	0.0	0.0	13.146	B
B-A	0	0	431	0.000	0	0.0	0.0	0.000	A
C-AB	14	3	425	0.032	14	0.0	0.0	8.746	A
C-A	2	0.44			2				
A-B	18	4			18				
A-C	4	1			4				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	14	4	285	0.050	14	0.0	0.1	13.290	B
B-A	0	0	429	0.000	0	0.0	0.0	0.000	A
C-AB	17	4	424	0.039	17	0.0	0.0	8.828	A
C-A	2	0.53			2				
A-B	22	6			22				
A-C	6	1			6				

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service

B-C	14	4	285	0.050	14	0.1	0.1	13.292	B
B-A	0	0	429	0.000	0	0.0	0.0	0.000	A
C-AB	17	4	424	0.039	17	0.0	0.0	8.827	A
C-A	2	0.53			2				
A-B	22	6			22				
A-C	6	1			6				

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	12	3	285	0.041	12	0.1	0.0	13.152	B
B-A	0	0	431	0.000	0	0.0	0.0	0.000	A
C-AB	14	3	425	0.032	14	0.0	0.0	8.747	A
C-A	2	0.44			2				
A-B	18	4			18				
A-C	4	1			4				

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	10	2	286	0.034	10	0.0	0.0	13.051	B
B-A	0	0	433	0.000	0	0.0	0.0	0.000	A
C-AB	11	3	426	0.027	11	0.0	0.0	8.690	A
C-A	1	0.37			1				
A-B	15	4			15				
A-C	4	0.94			4				

Queue Variation Results for each time segment

07:30 - 07:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.03	0.00	0.00	0.03	0.03			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.00	0.00	0.03	0.03			N/A	N/A

07:45 - 08:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.04	0.03	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.03	0.25	0.45	0.48			N/A	N/A

08:00 - 08:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.05	0.03	0.26	0.46	0.49			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.04	0.03	0.25	0.46	0.48			N/A	N/A

08:15 - 08:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.05	0.00	0.00	0.05	0.05			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.04	0.00	0.00	0.04	0.04			N/A	N/A

08:30 - 08:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.00	0.00	0.03	0.03			N/A	N/A

08:45 - 09:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.00	0.00	0.03	0.03			N/A	N/A

2023 Do Something-YoO, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.

Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		7.22	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.22	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D6	2023 Do Something-YoO	PM	ONE HOUR	16:30	18:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	9	100.000
B - Quarry Access		ONE HOUR	✓	32	100.000
C - L6280 (W)		ONE HOUR	✓	10	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	4	5
	B - Quarry Access	11	0	21
	C - L6280 (W)	6	4	0

Vehicle Mix

Heavy Vehicle Percentages

	To			
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	100	0
	B - Quarry Access	0	0	48
	C - L6280 (W)	17	100	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.06	9.98	0.1	0.5	A	19	29
B-A	0.03	8.53	0.0	0.5	A	10	15
C-AB	0.02	12.58	0.0	0.5	B	4	6
C-A						5	8
A-B						4	6
A-C						5	7

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	16	4	385	0.041	16	0.0	0.0	9.742	A
B-A	8	2	436	0.019	8	0.0	0.0	8.417	A
C-AB	3	1	290	0.011	3	0.0	0.0	12.562	B
C-A	4	1			4				
A-B	3	1			3				
A-C	4	0.94			4				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	19	5	384	0.049	19	0.0	0.1	9.844	A

B-A	10	2	435	0.023	10	0.0	0.0	8.466	A
C-AB	4	1	290	0.013	4	0.0	0.0	12.576	B
C-A	5	1			5				
A-B	4	1			4				
A-C	4	1			4				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	23	6	384	0.060	23	0.1	0.1	9.981	A
B-A	12	3	434	0.028	12	0.0	0.0	8.531	A
C-AB	5	1	291	0.016	4	0.0	0.0	12.585	B
C-A	7	2			7				
A-B	4	1			4				
A-C	6	1			6				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	23	6	384	0.060	23	0.1	0.1	9.983	A
B-A	12	3	434	0.028	12	0.0	0.0	8.531	A
C-AB	5	1	291	0.016	5	0.0	0.0	12.577	B
C-A	7	2			7				
A-B	4	1			4				
A-C	6	1			6				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	19	5	384	0.049	19	0.1	0.1	9.849	A
B-A	10	2	435	0.023	10	0.0	0.0	8.467	A
C-AB	4	1	290	0.013	4	0.0	0.0	12.559	B
C-A	5	1			5				
A-B	4	1			4				
A-C	4	1			4				

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	16	4	385	0.041	16	0.1	0.0	9.754	A
B-A	8	2	436	0.019	8	0.0	0.0	8.420	A
C-AB	3	1	290	0.011	3	0.0	0.0	12.558	B
C-A	4	1			4				
A-B	3	1			3				
A-C	4	0.94			4				

Queue Variation Results for each time segment

16:30 - 16:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

16:45 - 17:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.05	0.03	0.25	0.45	0.48			N/A	N/A
B-A	0.02	0.02	0.25	0.45	0.48			N/A	N/A
C-AB	0.01	0.01	0.25	0.45	0.48			N/A	N/A

17:00 - 17:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.06	0.03	0.26	0.47	0.49			N/A	N/A
B-A	0.03	0.00	0.00	0.03	0.03			N/A	N/A
C-AB	0.02	0.00	0.00	0.02	0.02			N/A	N/A

17:15 - 17:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.06	0.00	0.00	0.06	0.06			N/A	N/A
B-A	0.03	0.00	0.00	0.03	0.03			N/A	N/A
C-AB	0.02	0.00	0.00	0.02	0.02			N/A	N/A

17:30 - 17:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.05	0.00	0.00	0.05	0.05			N/A	N/A
B-A	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

17:45 - 18:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

2028 Do Nothing YoO+5, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		6.23	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.23	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D7	2028 Do Nothing YoO+5	AM	ONE HOUR	07:30	09:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)

✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	11	100.000
B - Quarry Access		ONE HOUR	✓	6	100.000
C - L6280 (W)		ONE HOUR	✓	5	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
From		**A - L6280 (E)**	**B - Quarry Access**	**C - L6280 (W)**
	A - L6280 (E)	0	5	6
	B - Quarry Access	0	0	6
	C - L6280 (W)	2	3	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
From		**A - L6280 (E)**	**B - Quarry Access**	**C - L6280 (W)**
	A - L6280 (E)	0	27	0
	B - Quarry Access	0	0	100
	C - L6280 (W)	0	35	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.02	12.89	0.0	0.5	B	6	8
B-A	0.00	0.00	0.0	~1	A	0	0
C-AB	0.01	8.55	0.0	0.5	A	3	4
C-A						2	3
A-B						5	7

A-C						6	8

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	5	1	286	0.016	4	0.0	0.0	12.772	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	2	0.57	425	0.005	2	0.0	0.0	8.520	A
C-A	1	0.37			1				
A-B	4	1			4				
A-C	5	1			5				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	5	1	286	0.019	5	0.0	0.0	12.823	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	3	0.68	425	0.006	3	0.0	0.0	8.532	A
C-A	2	0.45			2				
A-B	4	1			4				
A-C	5	1			5				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	7	2	286	0.023	7	0.0	0.0	12.888	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	3	1	425	0.008	3	0.0	0.0	8.546	A
C-A	2	0.55			2				
A-B	6	1			6				
A-C	7	2			7				

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service

B-C	7	2	286	0.023	7	0.0	0.0	12.888	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	3	1	425	0.008	3	0.0	0.0	8.545	A
C-A	2	0.55			2				
A-B	6	1			6				
A-C	7	2			7				

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	5	1	286	0.019	5	0.0	0.0	12.827	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	3	0.68	425	0.006	3	0.0	0.0	8.530	A
C-A	2	0.45			2				
A-B	4	1			4				
A-C	5	1			5				

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	5	1	286	0.016	5	0.0	0.0	12.780	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	2	0.57	425	0.005	2	0.0	0.0	8.521	A
C-A	1	0.37			1				
A-B	4	1			4				
A-C	5	1			5				

Queue Variation Results for each time segment

07:30 - 07:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

07:45 - 08:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.02	0.02	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.01	0.25	0.45	0.48			N/A	N/A

08:00 - 08:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:15 - 08:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:30 - 08:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:45 - 09:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

2028 Do Nothing YoO+5, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.

Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		3.65	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.65	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D8	2028 Do Nothing YoO+5	PM	ONE HOUR	16:30	18:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	6	100.000
B - Quarry Access		ONE HOUR	✓	5	100.000
C - L6280 (W)		ONE HOUR	✓	7	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	0	6
	B - Quarry Access	1	0	4
	C - L6280 (W)	7	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	0	0
	B - Quarry Access	0	0	68
	C - L6280 (W)	18	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.01	10.71	0.0	0.5	B	4	6
B-A	0.00	8.26	0.0	0.5	A	0.92	1
C-AB	0.00	0.00	0.0	~1	A	0	0
C-A						6	10
A-B						0	0
A-C						6	8

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	3	1	341	0.009	3	0.0	0.0	10.652	B
B-A	0.75	0.19	438	0.002	0.75	0.0	0.0	8.236	A
C-AB	0	0	526	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	5	1			5				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	341	0.011	4	0.0	0.0	10.677	B

B-A	0.90	0.22	437	0.002	0.90	0.0	0.0	8.245	A
C-AB	0	0	525	0.000	0	0.0	0.0	0.000	A
C-A	6	2			6				
A-B	0	0			0				
A-C	5	1			5				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	341	0.013	4	0.0	0.0	10.709	B
B-A	1	0.28	437	0.003	1	0.0	0.0	8.257	A
C-AB	0	0	525	0.000	0	0.0	0.0	0.000	A
C-A	8	2			8				
A-B	0	0			0				
A-C	7	2			7				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	341	0.013	4	0.0	0.0	10.709	B
B-A	1	0.28	437	0.003	1	0.0	0.0	8.257	A
C-AB	0	0	525	0.000	0	0.0	0.0	0.000	A
C-A	8	2			8				
A-B	0	0			0				
A-C	7	2			7				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	341	0.011	4	0.0	0.0	10.680	B
B-A	0.90	0.22	437	0.002	0.90	0.0	0.0	8.246	A
C-AB	0	0	525	0.000	0	0.0	0.0	0.000	A
C-A	6	2			6				
A-B	0	0			0				
A-C	5	1			5				

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	3	1	341	0.009	3	0.0	0.0	10.654	B
B-A	0.75	0.19	438	0.002	0.75	0.0	0.0	8.236	A
C-AB	0	0	526	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	5	1			5				

Queue Variation Results for each time segment

16:30 - 16:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

16:45 - 17:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.01	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.25	0.45	0.48			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:00 - 17:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:15 - 17:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:30 - 17:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:45 - 18:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

2028 Do Something YoO+5, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		6.69	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.69	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D9	2028 Do Something YoO+5	AM	ONE HOUR	07:30	09:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)

✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	27	100.000
B - Quarry Access		ONE HOUR	✓	14	100.000
C - L6280 (W)		ONE HOUR	✓	17	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
From		**A - L6280 (E)**	**B - Quarry Access**	**C - L6280 (W)**
	A - L6280 (E)	0	21	6
	B - Quarry Access	0	0	14
	C - L6280 (W)	2	15	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
From		**A - L6280 (E)**	**B - Quarry Access**	**C - L6280 (W)**
	A - L6280 (E)	0	26	0
	B - Quarry Access	0	0	100
	C - L6280 (W)	0	34	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.05	13.36	0.1	0.5	B	13	19
B-A	0.00	0.00	0.0	~1	A	0	0
C-AB	0.04	8.84	0.0	0.5	A	14	21
C-A						2	3
A-B						19	29

A-C						6	8

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	286	0.037	10	0.0	0.0	13.075	B
B-A	0	0	432	0.000	0	0.0	0.0	0.000	A
C-AB	11	3	425	0.027	11	0.0	0.0	8.691	A
C-A	1	0.37			1				
A-B	16	4			16				
A-C	5	1			5				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	285	0.044	13	0.0	0.0	13.197	B
B-A	0	0	431	0.000	0	0.0	0.0	0.000	A
C-AB	14	3	425	0.032	14	0.0	0.0	8.754	A
C-A	2	0.44			2				
A-B	19	5			19				
A-C	5	1			5				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	15	4	285	0.054	15	0.0	0.1	13.354	B
B-A	0	0	429	0.000	0	0.0	0.0	0.000	A
C-AB	17	4	424	0.039	17	0.0	0.0	8.838	A
C-A	2	0.53			2				
A-B	23	6			23				
A-C	7	2			7				

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	15	4	285	0.054	15	0.1	0.1	13.356	B
B-A	0	0	429	0.000	0	0.0	0.0	0.000	A
C-AB	17	4	424	0.039	17	0.0	0.0	8.837	A
C-A	2	0.53			2				
A-B	23	6			23				
A-C	7	2			7				

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	285	0.044	13	0.1	0.0	13.206	B
B-A	0	0	431	0.000	0	0.0	0.0	0.000	A
C-AB	14	3	425	0.032	14	0.0	0.0	8.755	A
C-A	2	0.43			2				
A-B	19	5			19				
A-C	5	1			5				

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	286	0.037	11	0.0	0.0	13.094	B
B-A	0	0	432	0.000	0	0.0	0.0	0.000	A
C-AB	11	3	425	0.027	11	0.0	0.0	8.696	A
C-A	1	0.37			1				
A-B	16	4			16				
A-C	5	1			5				

Queue Variation Results for each time segment

07:30 - 07:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.00	0.00	0.03	0.03			N/A	N/A

07:45 - 08:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.05	0.03	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.03	0.25	0.45	0.48			N/A	N/A

08:00 - 08:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.06	0.03	0.26	0.46	0.49			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.04	0.03	0.25	0.46	0.48			N/A	N/A

08:15 - 08:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.06	0.00	0.00	0.06	0.06			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.04	0.00	0.00	0.04	0.04			N/A	N/A

08:30 - 08:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.05	0.00	0.00	0.05	0.05			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.00	0.00	0.03	0.03			N/A	N/A

08:45 - 09:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.00	0.00	0.03	0.03			N/A	N/A

2028 Do Something YoO+5, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.

Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		7.11	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.11	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D10	2028 Do Something YoO+5	PM	ONE HOUR	16:30	18:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	10	100.000
B - Quarry Access		ONE HOUR	✓	33	100.000
C - L6280 (W)		ONE HOUR	✓	11	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	4	6
	B - Quarry Access	11	0	22
	C - L6280 (W)	7	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	100	0
	B - Quarry Access	0	0	49
	C - L6280 (W)	18	100	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.06	10.09	0.1	0.5	B	20	30
B-A	0.03	8.54	0.0	0.5	A	10	15
C-AB	0.02	12.55	0.0	0.5	B	4	6
C-A						6	10
A-B						4	6
A-C						6	8

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	4	382	0.043	16	0.0	0.0	9.834	A
B-A	8	2	436	0.019	8	0.0	0.0	8.423	A
C-AB	3	1	290	0.011	3	0.0	0.0	12.540	B
C-A	5	1			5				
A-B	3	1			3				
A-C	5	1			5				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	20	5	382	0.052	20	0.0	0.1	9.943	A

B-A	10	2	435	0.023	10	0.0	0.0	8.472	A
C-AB	4	1	291	0.013	4	0.0	0.0	12.550	B
C-A	6	2			6				
A-B	4	1			4				
A-C	5	1			5				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	24	6	381	0.064	24	0.1	0.1	10.088	B
B-A	12	3	434	0.028	12	0.0	0.0	8.539	A
C-AB	5	1	292	0.016	5	0.0	0.0	12.553	B
C-A	8	2			8				
A-B	4	1			4				
A-C	7	2			7				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	24	6	381	0.064	24	0.1	0.1	10.090	B
B-A	12	3	434	0.028	12	0.0	0.0	8.539	A
C-AB	5	1	292	0.016	5	0.0	0.0	12.544	B
C-A	8	2			8				
A-B	4	1			4				
A-C	7	2			7				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	20	5	382	0.052	20	0.1	0.1	9.949	A
B-A	10	2	435	0.023	10	0.0	0.0	8.475	A
C-AB	4	1	291	0.013	4	0.0	0.0	12.528	B
C-A	6	2			6				
A-B	4	1			4				
A-C	5	1			5				

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	4	382	0.043	17	0.1	0.0	9.846	A
B-A	8	2	436	0.019	8	0.0	0.0	8.426	A
C-AB	3	1	290	0.011	3	0.0	0.0	12.534	B
C-A	5	1			5				
A-B	3	1			3				
A-C	5	1			5				

Queue Variation Results for each time segment

16:30 - 16:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

16:45 - 17:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.05	0.03	0.25	0.45	0.48			N/A	N/A
B-A	0.02	0.02	0.25	0.45	0.48			N/A	N/A
C-AB	0.01	0.01	0.25	0.45	0.48			N/A	N/A

17:00 - 17:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.07	0.03	0.26	0.47	0.49			N/A	N/A
B-A	0.03	0.00	0.00	0.03	0.03			N/A	N/A
C-AB	0.02	0.00	0.00	0.02	0.02			N/A	N/A

17:15 - 17:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.07	0.00	0.00	0.07	0.07			N/A	N/A
B-A	0.03	0.00	0.00	0.03	0.03			N/A	N/A
C-AB	0.02	0.00	0.00	0.02	0.02			N/A	N/A

17:30 - 17:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.06	0.00	0.00	0.06	0.06			N/A	N/A
B-A	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

17:45 - 18:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.05	0.00	0.00	0.05	0.05			N/A	N/A
B-A	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

2038 Do Nothing YoO+15, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		6.76	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.76	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D11	2038 Do Nothing YoO+15	AM	ONE HOUR	07:30	09:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)

✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	11	100.000
B - Quarry Access		ONE HOUR	✓	7	100.000
C - L6280 (W)		ONE HOUR	✓	6	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	5	6
	B - Quarry Access	0	0	7
	C - L6280 (W)	2	4	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	28	0
	B - Quarry Access	0	0	100
	C - L6280 (W)	0	37	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.03	12.94	0.0	0.5	B	6	10
B-A	0.00	0.00	0.0	~1	A	0	0
C-AB	0.01	8.70	0.0	0.5	A	4	6
C-A						2	3
A-B						5	7

A-C						6	8

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	5	1	286	0.018	5	0.0	0.0	12.806	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	3	1	419	0.007	3	0.0	0.0	8.663	A
C-A	1	0.37			1				
A-B	4	1			4				
A-C	5	1			5				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	6	2	286	0.022	6	0.0	0.0	12.864	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	4	1	418	0.009	4	0.0	0.0	8.677	A
C-A	2	0.45			2				
A-B	4	1			4				
A-C	5	1			5				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	8	2	286	0.027	8	0.0	0.0	12.939	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	4	1	418	0.011	4	0.0	0.0	8.697	A
C-A	2	0.54			2				
A-B	6	1			6				
A-C	7	2			7				

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service

B-C	8	2	286	0.027	8	0.0	0.0	12.939	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	4	1	418	0.011	4	0.0	0.0	8.696	A
C-A	2	0.54			2				
A-B	6	1			6				
A-C	7	2			7				

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	6	2	286	0.022	6	0.0	0.0	12.866	B
B-A	0	0	436	0.000	0	0.0	0.0	0.000	A
C-AB	4	1	418	0.009	4	0.0	0.0	8.675	A
C-A	2	0.45			2				
A-B	4	1			4				
A-C	5	1			5				

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	5	1	286	0.018	5	0.0	0.0	12.812	B
B-A	0	0	437	0.000	0	0.0	0.0	0.000	A
C-AB	3	1	419	0.007	3	0.0	0.0	8.664	A
C-A	1	0.37			1				
A-B	4	1			4				
A-C	5	1			5				

Queue Variation Results for each time segment

07:30 - 07:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

07:45 - 08:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.02	0.02	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.01	0.25	0.45	0.48			N/A	N/A

08:00 - 08:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.03	0.00	0.00	0.03	0.03			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:15 - 08:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.03	0.00	0.00	0.03	0.03			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:30 - 08:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

08:45 - 09:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.02	0.00	0.00	0.02	0.02			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

2038 Do Nothing YoO+15, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.

Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		3.70	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.70	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D12	2038 Do Nothing YoO+15	PM	ONE HOUR	16:30	18:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	6	100.000
B - Quarry Access		ONE HOUR	✓	5	100.000
C - L6280 (W)		ONE HOUR	✓	7	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	0	6
	B - Quarry Access	1	0	4
	C - L6280 (W)	7	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	0	0
	B - Quarry Access	0	0	70
	C - L6280 (W)	19	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.01	10.84	0.0	0.5	B	4	6
B-A	0.00	8.26	0.0	0.5	A	0.92	1
C-AB	0.00	0.00	0.0	~1	A	0	0
C-A						6	10
A-B						0	0
A-C						6	8

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	3	1	337	0.009	3	0.0	0.0	10.780	B
B-A	0.75	0.19	438	0.002	0.75	0.0	0.0	8.236	A
C-AB	0	0	523	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	5	1			5				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	337	0.011	4	0.0	0.0	10.805	B

B-A	0.90	0.22	437	0.002	0.90	0.0	0.0	8.245	A
C-AB	0	0	523	0.000	0	0.0	0.0	0.000	A
C-A	6	2			6				
A-B	0	0			0				
A-C	5	1			5				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	337	0.013	4	0.0	0.0	10.838	B
B-A	1	0.28	437	0.003	1	0.0	0.0	8.258	A
C-AB	0	0	523	0.000	0	0.0	0.0	0.000	A
C-A	8	2			8				
A-B	0	0			0				
A-C	7	2			7				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	337	0.013	4	0.0	0.0	10.838	B
B-A	1	0.28	437	0.003	1	0.0	0.0	8.258	A
C-AB	0	0	523	0.000	0	0.0	0.0	0.000	A
C-A	8	2			8				
A-B	0	0			0				
A-C	7	2			7				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	4	1	337	0.011	4	0.0	0.0	10.808	B
B-A	0.90	0.22	437	0.002	0.90	0.0	0.0	8.247	A
C-AB	0	0	523	0.000	0	0.0	0.0	0.000	A
C-A	6	2			6				
A-B	0	0			0				
A-C	5	1			5				

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	3	1	337	0.009	3	0.0	0.0	10.784	B
B-A	0.75	0.19	438	0.002	0.75	0.0	0.0	8.237	A
C-AB	0	0	523	0.000	0	0.0	0.0	0.000	A
C-A	5	1			5				
A-B	0	0			0				
A-C	5	1			5				

Queue Variation Results for each time segment

16:30 - 16:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

16:45 - 17:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.01	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.25	0.45	0.48			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:00 - 17:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:15 - 17:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:30 - 17:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

17:45 - 18:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.01	0.00	0.00	0.01	0.01			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.00	0.00	0.00	0.00	0.00			N/A	N/A

2038 Do Something YoO+15, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		6.90	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.90	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D13	2038 Do Something YoO+15	AM	ONE HOUR	07:30	09:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)

✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	27	100.000
B - Quarry Access		ONE HOUR	✓	15	100.000
C - L6280 (W)		ONE HOUR	✓	18	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	21	6
	B - Quarry Access	0	0	15
	C - L6280 (W)	2	16	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	26	0
	B - Quarry Access	0	0	100
	C - L6280 (W)	0	34	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.06	13.41	0.1	0.5	B	14	21
B-A	0.00	0.00	0.0	~1	A	0	0
C-AB	0.04	8.86	0.0	0.5	A	15	22
C-A						2	3
A-B						19	29

A-C						6	8

Main Results for each time segment

07:30 - 07:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	286	0.040	11	0.0	0.0	13.112	B
B-A	0	0	432	0.000	0	0.0	0.0	0.000	A
C-AB	12	3	425	0.028	12	0.0	0.0	8.707	A
C-A	1	0.37			1				
A-B	16	4			16				
A-C	5	1			5				

07:45 - 08:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	285	0.047	13	0.0	0.0	13.240	B
B-A	0	0	431	0.000	0	0.0	0.0	0.000	A
C-AB	14	4	425	0.034	14	0.0	0.0	8.774	A
C-A	2	0.43			2				
A-B	19	5			19				
A-C	5	1			5				

08:00 - 08:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	4	285	0.058	16	0.0	0.1	13.409	B
B-A	0	0	429	0.000	0	0.0	0.0	0.000	A
C-AB	18	4	424	0.042	18	0.0	0.0	8.862	A
C-A	2	0.53			2				
A-B	23	6			23				
A-C	7	2			7				

08:15 - 08:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service

B-C	17	4	285	0.058	17	0.1	0.1	13.411	B
B-A	0	0	429	0.000	0	0.0	0.0	0.000	A
C-AB	18	4	424	0.042	18	0.0	0.0	8.861	A
C-A	2	0.53			2				
A-B	23	6			23				
A-C	7	2			7				

08:30 - 08:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	13	3	285	0.047	14	0.1	0.1	13.250	B
B-A	0	0	431	0.000	0	0.0	0.0	0.000	A
C-AB	14	4	425	0.034	14	0.0	0.0	8.775	A
C-A	2	0.43			2				
A-B	19	5			19				
A-C	5	1			5				

08:45 - 09:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	11	3	286	0.040	11	0.1	0.0	13.127	B
B-A	0	0	432	0.000	0	0.0	0.0	0.000	A
C-AB	12	3	425	0.028	12	0.0	0.0	8.711	A
C-A	1	0.37			1				
A-B	16	4			16				
A-C	5	1			5				

Queue Variation Results for each time segment

07:30 - 07:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.00	0.00	0.03	0.03			N/A	N/A

07:45 - 08:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.05	0.03	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.04	0.03	0.25	0.45	0.48			N/A	N/A

08:00 - 08:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.06	0.03	0.26	0.46	0.49			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.04	0.03	0.25	0.46	0.48			N/A	N/A

08:15 - 08:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.06	0.03	0.25	0.45	0.48			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.04	0.00	0.00	0.04	0.04			N/A	N/A

08:30 - 08:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.05	0.00	0.00	0.05	0.05			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.04	0.00	0.00	0.04	0.04			N/A	N/A

08:45 - 09:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.00	0.00	0.00	0.00	0.00			N/A	N/A
C-AB	0.03	0.00	0.00	0.03	0.03			N/A	N/A

2038 Do Something YoO+15, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm visibility to right	B - Quarry Access - Minor arm geometry	Visibility to right expected to have two components if the arm has two lanes, or two lanes in a flared section.
Warning	Major arm width	C - L6280 (W) - Major arm geometry	For two-way major roads, please interpret results with caution if the total major carriageway width is less than 6m.

Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		7.10	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.10	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D14	2038 Do Something YoO+15	PM	ONE HOUR	16:30	18:00	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
A - L6280 (E)		ONE HOUR	✓	10	100.000
B - Quarry Access		ONE HOUR	✓	33	100.000
C - L6280 (W)		ONE HOUR	✓	11	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
From	A - L6280 (E)	0	4	6
	B - Quarry Access	11	0	22
	C - L6280 (W)	7	4	0

Vehicle Mix

Heavy Vehicle Percentages

	To			
From		A - L6280 (E)	B - Quarry Access	C - L6280 (W)
	A - L6280 (E)	0	100	0
	B - Quarry Access	0	0	49
	C - L6280 (W)	19	100	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)
B-C	0.06	10.09	0.1	0.5	B	20	30
B-A	0.03	8.54	0.0	0.5	A	10	15
C-AB	0.02	12.55	0.0	0.5	B	4	6
C-A						6	10
A-B						4	6
A-C						6	8

Main Results for each time segment

16:30 - 16:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	4	382	0.043	16	0.0	0.0	9.834	A
B-A	8	2	436	0.019	8	0.0	0.0	8.423	A
C-AB	3	1	290	0.011	3	0.0	0.0	12.540	B
C-A	5	1			5				
A-B	3	1			3				
A-C	5	1			5				

16:45 - 17:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	20	5	382	0.052	20	0.0	0.1	9.943	A

B-A	10	2	435	0.023	10	0.0	0.0	8.473	A
C-AB	4	1	291	0.013	4	0.0	0.0	12.551	B
C-A	6	2			6				
A-B	4	1			4				
A-C	5	1			5				

17:00 - 17:15

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	24	6	381	0.064	24	0.1	0.1	10.088	B
B-A	12	3	434	0.028	12	0.0	0.0	8.539	A
C-AB	5	1	292	0.016	5	0.0	0.0	12.554	B
C-A	8	2			8				
A-B	4	1			4				
A-C	7	2			7				

17:15 - 17:30

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	24	6	381	0.064	24	0.1	0.1	10.090	B
B-A	12	3	434	0.028	12	0.0	0.0	8.539	A
C-AB	5	1	292	0.016	5	0.0	0.0	12.545	B
C-A	8	2			8				
A-B	4	1			4				
A-C	7	2			7				

17:30 - 17:45

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	20	5	382	0.052	20	0.1	0.1	9.949	A
B-A	10	2	435	0.023	10	0.0	0.0	8.475	A
C-AB	4	1	291	0.013	4	0.0	0.0	12.529	B
C-A	6	2			6				
A-B	4	1			4				
A-C	5	1			5				

17:45 - 18:00

Stream	Total Demand (Veh/hr)	Junction Arrivals (Veh)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	Unsignalised level of service
B-C	17	4	382	0.043	17	0.1	0.0	9.844	A
B-A	8	2	436	0.019	8	0.0	0.0	8.428	A
C-AB	3	1	290	0.011	3	0.0	0.0	12.532	B
C-A	5	1			5				
A-B	3	1			3				
A-C	5	1			5				

Queue Variation Results for each time segment

16:30 - 16:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.04	0.00	0.00	0.04	0.04			N/A	N/A
B-A	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

16:45 - 17:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.05	0.03	0.25	0.45	0.48			N/A	N/A
B-A	0.02	0.02	0.25	0.45	0.48			N/A	N/A
C-AB	0.01	0.01	0.25	0.45	0.48			N/A	N/A

17:00 - 17:15

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.07	0.03	0.26	0.47	0.49			N/A	N/A
B-A	0.03	0.00	0.00	0.03	0.03			N/A	N/A
C-AB	0.02	0.00	0.00	0.02	0.02			N/A	N/A

17:15 - 17:30

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.07	0.00	0.00	0.07	0.07			N/A	N/A
B-A	0.03	0.00	0.00	0.03	0.03			N/A	N/A
C-AB	0.02	0.00	0.00	0.02	0.02			N/A	N/A

17:30 - 17:45

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker

B-C	0.06	0.00	0.00	0.06	0.06			N/A	N/A
B-A	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A

17:45 - 18:00

Stream	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
B-C	0.05	0.00	0.00	0.05	0.05			N/A	N/A
B-A	0.02	0.00	0.00	0.02	0.02			N/A	N/A
C-AB	0.01	0.00	0.00	0.01	0.01			N/A	N/A