



**HYDROGEOLOGICAL RISK ASSESSMENT FOR
A PROPOSED DEVELOPMENT
BEAUPARC
COUNTY MEATH**

Prepared For: -

Panda Waste Service
Rathdrinagh
Beauparc
Co. Meath

Prepared By: -

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1 INTRODUCTION

O' Callaghan Moran & Associates (OCM) was requested by Panda Waste Services Ltd (Panda) to undertake a hydrogeological assessment at the site of a proposed extension to its Materials Recovery Facility (MRF) at Beauparc, Navan, Co Meath. The objective of the assessment was to establish if the natural ground conditions would allow storm water from paved areas to percolate to ground through a suitably designed drainage system.

1.1 Background

Panda submitted an application for planning permission to Meath County Council in June 2009 for the extension of its existing Materials Recovery Facility comprising the construction of a new building to accommodate additional recycling activities. The application relates to the development of a new building to accommodate a processing system comprising dry fermentation and composting that will treat the existing organic waste stream accepted at the facility and divert it from landfill.

On the 4th August 2009 the Council requested further information in relation to the application. One of the requests required soakaway design calculations for the proposal to direct rainfall runoff from paved areas (approximately 5,000m² area) to a soakaway at the south eastern section of the site.

(ii) For proposed soakway, applicant shall submit full details and calculations together with soil permeability test rates and depth measurement from bottom of proposed soakway to winter water table level.

1.2 Assessment

OCM's assessment comprised a desk study review of the local area geology and hydrogeology database, an area reconnaissance, and a site investigation comprising trial pit excavation and permeability testing.

Rainwater run-off the paved yards will discharge to a soakaway via an oil interceptor. The BRE 365 design for the soakaway has been calculated for a 1:100 year storm event. Rain water run-off from the building roof will be kept separate from yard run-off. The roof water will be directed to an existing above ground water storage tank, which has a capacity of 660m³.

2 SITE LOCATION

2.1 Site Location & Surrounds

The facility is located in Rathdrinagh, Beuparc, Navan, County Meath. It is in the townland of Rathdrinagh, at National Grid Reference: E2973 N2689. The site is located on the N2 approximately 4km south of Slane, County Meath. The River Boyne flows in an easterly direction approximately 3km north east of the site.

The facility is bordered to the west by the N2 Dublin to Monaghan Road and to the north by a third class road, the Knockcommon Road. Surrounding activity is predominantly agriculture, however there are some commercial units adjacent the site to the west. There are nine residential dwellings with 0.5km on the Knockcommon Road and thirteen residences within 0.5km along the N2 and a third class road on the western side of the N2, Senchelstown Road.

2.2 Topography & Surface Water Drainage

The proposed extension area encompasses 3.2 hectares (ha) and adjoins the eastern boundary of the existing MRF. It is part of a larger farm holding and is currently used as pasture.

It slopes from north to south, falling from an elevation of approximately 60.5 m Ordnance Datum (OD), along the northern boundary, to 55.5 mOD along a drain at the southern boundary.

The site is in the catchment of the River Boyne, located approximately 3km to the north east of the site.

2.3 Land Use

The lands are currently used for animal grazing.

3 GEOLOGY AND HYDROGEOLOGY

Information on the local geology and hydrogeology was obtained from the bedrock geology maps, published by the Geological Survey of Ireland (GSI), the construction logs for two onsite groundwater wells and current site investigations undertaken at the site.

3.1 Bedrock Geology

The bedrock geology is shown on Figure 3.1. The site is underlain by the Balrickard Formation. It is described by the GSI as coarse sandstone, shale. It is bounded to the north and south by the Donore Formation which is shale, sandstone and limestone. To the east is the Walshestown Formation which is described as shale, sandstone and limestone. The Loughshinny Formation (dark micrite & calcarenite, shale), Platin Formation (crinoidal peloidal grainstone-packstone) and the Donore Formation are to the west.

The groundwater well logs indicate bedrock and water strikes at 10-12m below ground. The type of bedrock is not specified in one of the borehole logs and is described as limestone in the other. From the gravels observed by OCM during the site investigation it is considered likely that the bedrock is a shale as described by the GSI.

3.2 Subsoil (Quaternary) Geology

The trial pitting from the investigations undertaken as part of this assessment indicate a brown clay to approximately 1m which is underlain by a grey/black clay. A trial pit was excavated to 3.1m and bedrock was not encountered. Groundwater was also not encountered in any of the trial pits. The groundwater well information indicates that the subsoils are at least 10-12m deep.

The soil maps prepared by Teagasc indicates that the subsoil type is till derived from Namurian Shales and Sandstones (TNSSs) and the site investigation confirmed this.

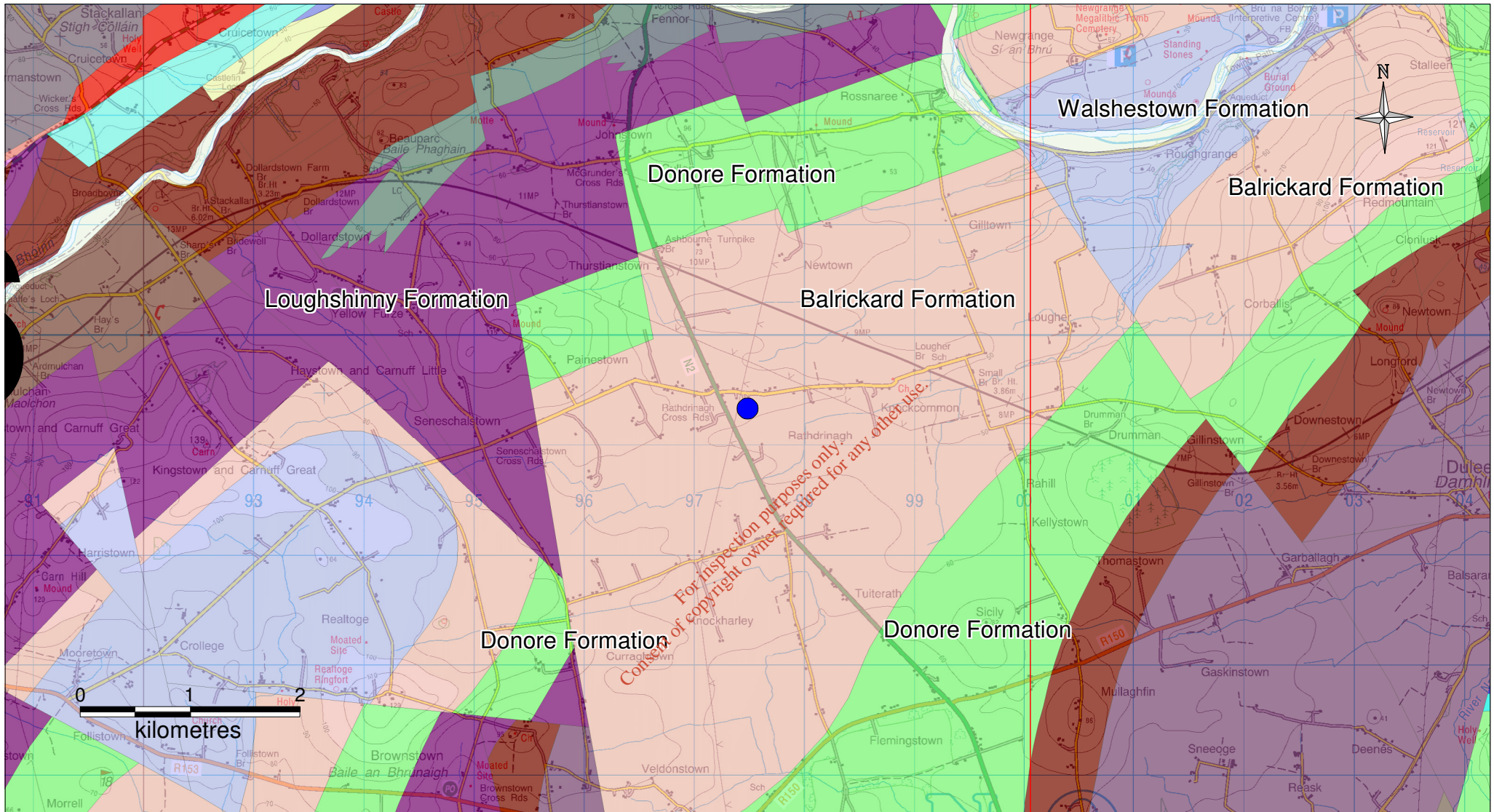
3.3 Aquifer Vulnerability

Vulnerability is defined by the GSI as the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. The GSI uses four groundwater vulnerability categories - extreme, high, moderate and low - for mapping purposes and in the assessment of risk to groundwaters.

The subsoils are the single most important natural feature influencing groundwater vulnerability. Groundwater is most at risk where the subsoils are either absent or thin and in areas of karstic limestone, where surface streams sink underground at swallow holes.

The Vulnerability map for Meath indicates that the vulnerability at the site is Low (Ref to Figure 3.2). The site specific information on subsoil thickness confirms that the Vulnerability is Low.

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CLIENT
Panda Waste Services

TITLE
Bedrock Geology

Legend

● Site Location

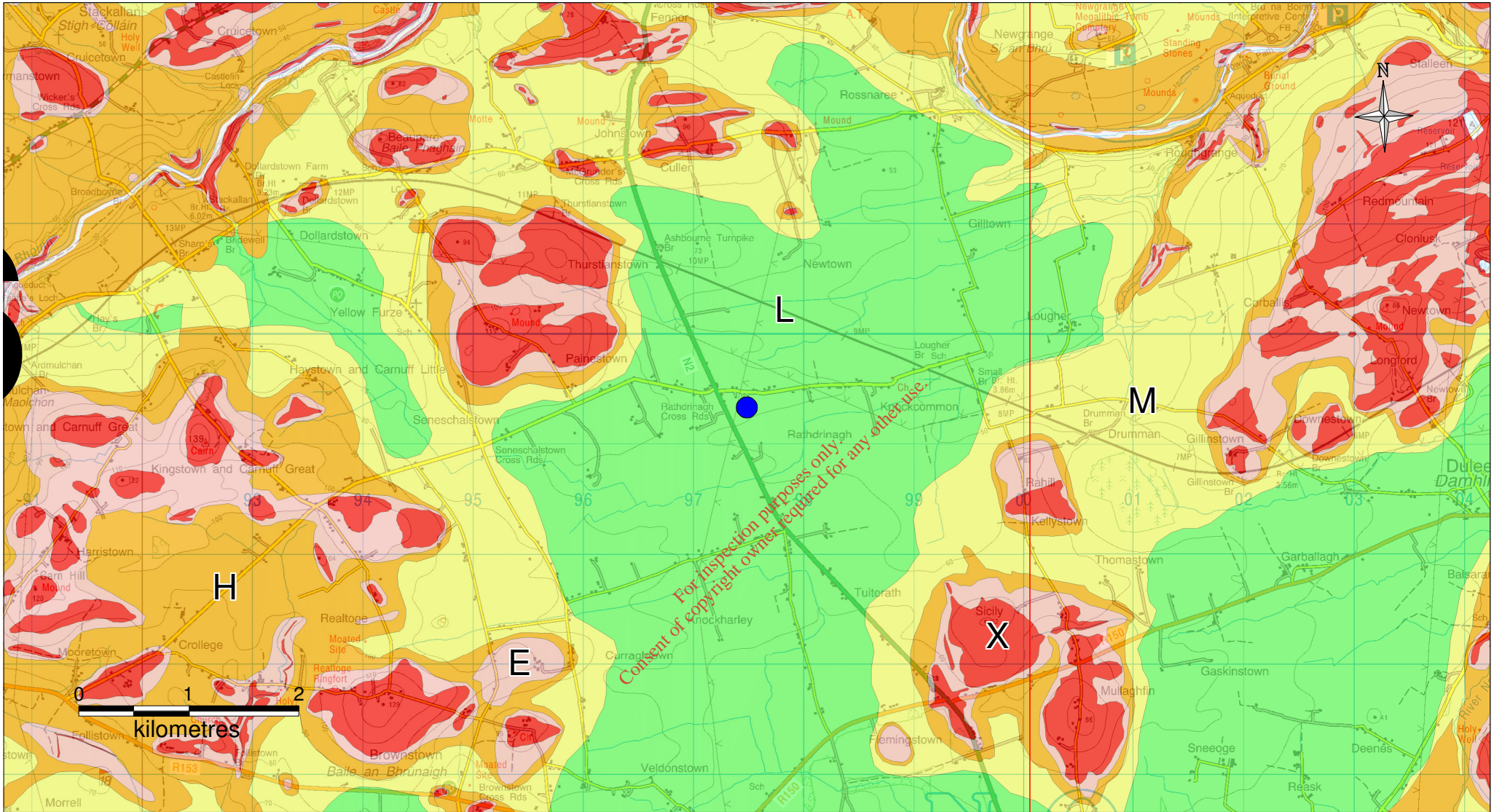
FIGURE No.


3.1

SCALE

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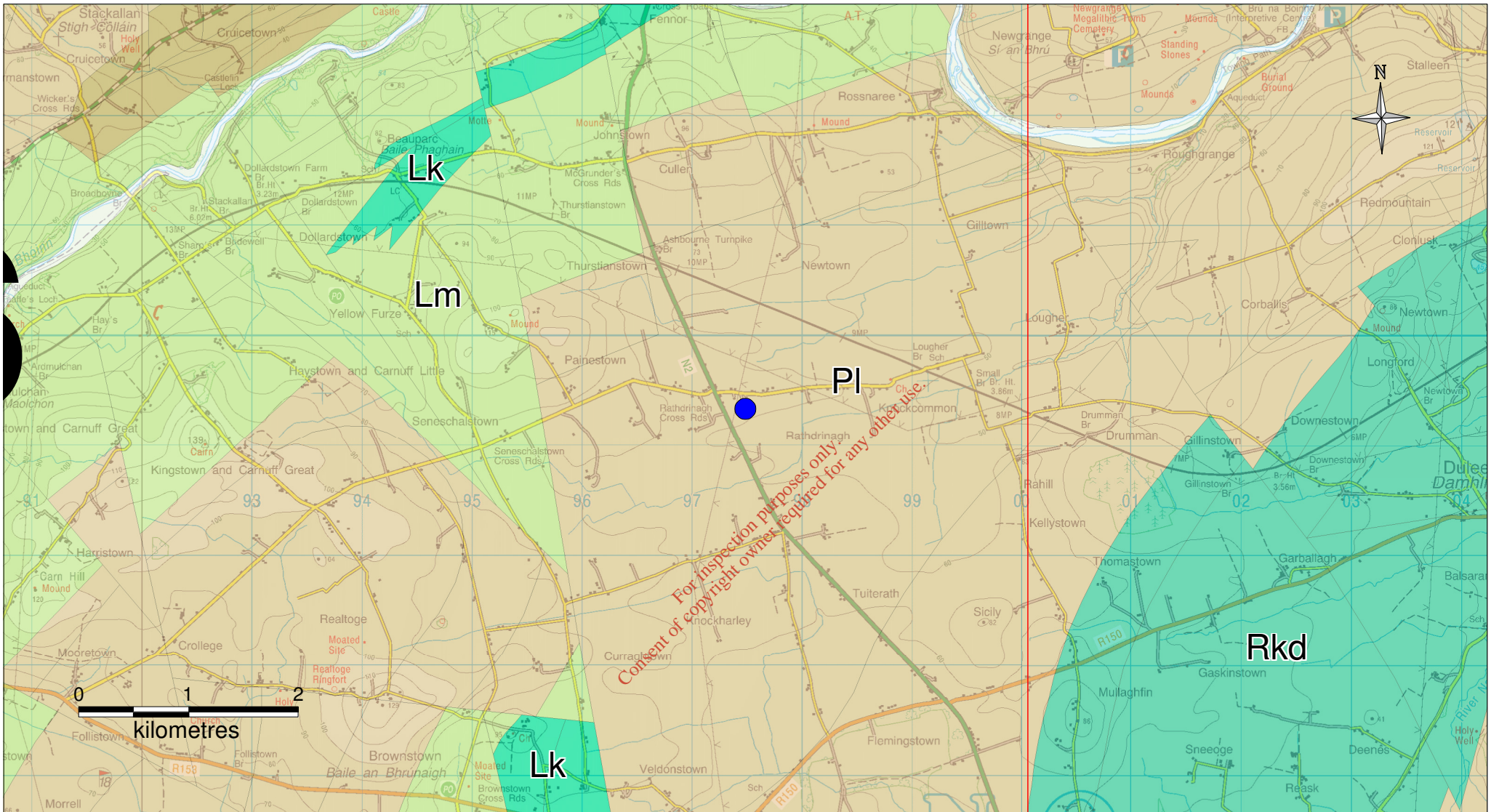


 <p>O' Callaghan Moran & Associates. Granary House, Rutland Street, Cork, Ireland. Tel. (021) 4321521 Fax. (021) 4321522 email : info@ocallaghanmoran.com</p>	<p>CLIENT Panda Waste Services</p>	<p>Legend ● Site Location</p>	<p>FIGURE No. 3.2</p>
<p>This drawing is the property of O'Callaghan Moran & Associates and shall not be used, reproduced or disclosed to anyone without the prior written permission of O'Callaghan Moran & Associates and shall be returned upon request.</p>	<p>TITLE Aquifer Vulnerability</p>		<p>SCALE 1:50,000</p>

3.4 Aquifer Characteristics

The aquifer map for the Navan area is shown in Figure 3.3. The Balrickard Formation, is classified by the GSI as a bedrock aquifer that is generally unproductive except for local zones(**PI**). The Donore and Walshestown Formations are also classified as PI. The Platin Formation, to the southwest, is considered a locally important Karstified bedrock aquifer (Lk) and the Loughshinny Formation is a bedrock aquifer that is generally moderately productive (Lm).

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CLIENT
Panda Waste Services

Legend
 ● Site Location

FIGURE No.
3.3

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TITLE
Bedrock Aquifer

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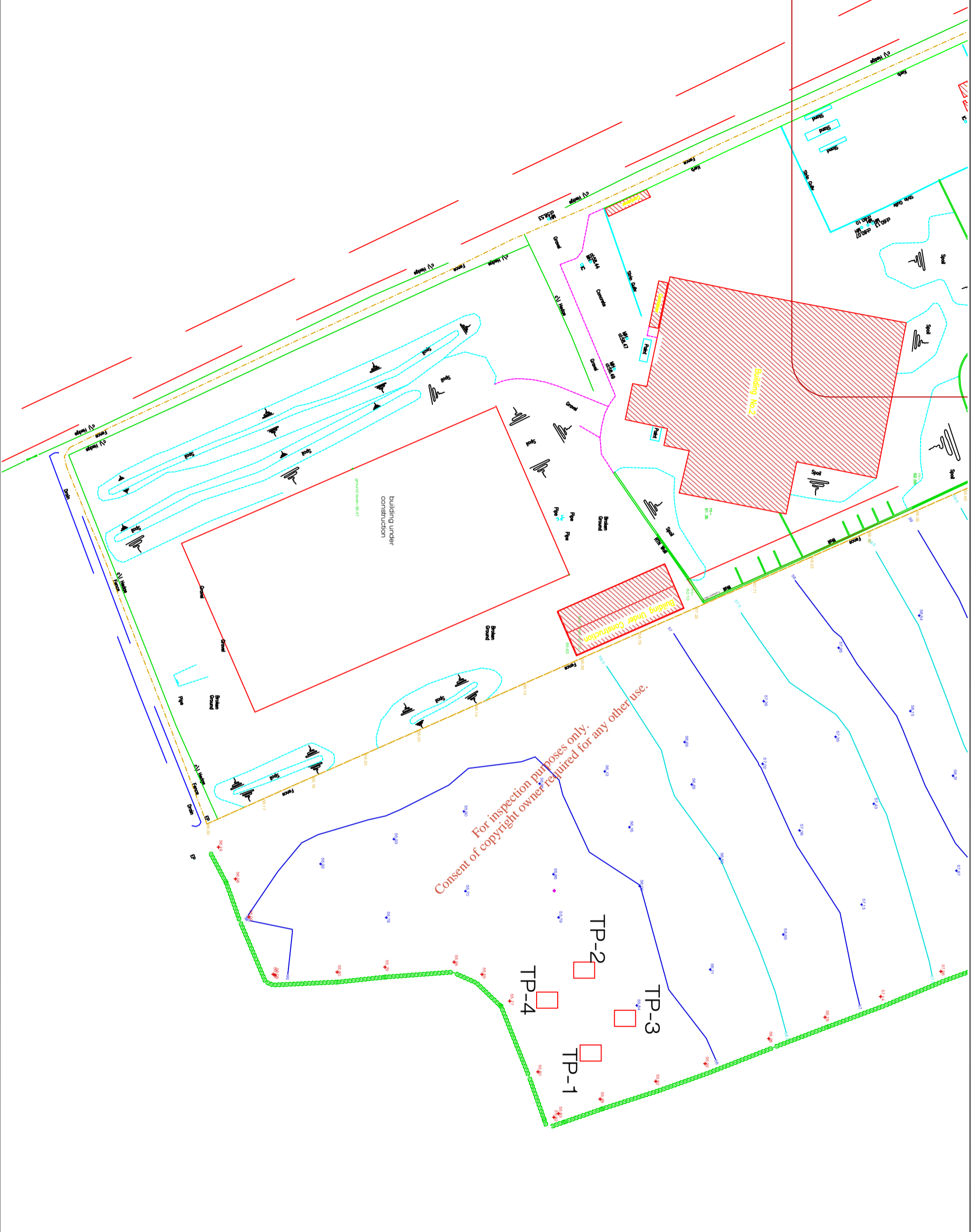
4 SITE INVESTIGATION

OCM undertook the site investigations on the 13th August 2009. OCM inspected the location of the proposed soakaway area on the original design layout. Drainage had been proposed for a green area to be located in the south east portion of the site. OCM excavated four trial pits in the vicinity of the soakaway. The trial pit locations are shown on Figure 4.1. The trial pit logs & Photos are presented in Appendix 1.

4.1 Trial Pits

TP1 and TP-2 were excavated to a depth of 2.1 and 3.2m respectively to assess the nature and thickness of the subsoils and to establish the approximate location of the winter water table. This can be interpreted from observations of mottling of the subsoil layer, which occurs as the subsoil dries out as water table levels drop during the drier summer period. Two additional trial pits (TP-3 and TP-4) were excavated to 1.5m and 0.8m below ground level for the purposes of percolation testing.

In general the trial pits indicate a dry well draining top soil layer approximately 25 cm thick. The subsoils were consistent in each of the trial pits and comprised brown clay with occasional gravel to 1.1m below ground with lenses of yellow clay at approximately 0.7m below ground level. This was underlain by a stiff grey/black clay with shale gravels. No inflows of water were observed in any of the trial pits. Bedrock was not encountered in any of the trial pits and there was no evidence of the winter water table. It is therefore assumed that the winter water table level is at least greater than 1.5m below ground level.



NOTES

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CLIENT			
PANDA			
TITLE			
TRIAL PIT LOCATIONS BEAUPARC			
SCALE		DRAWING No.	
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REV.		A	
A		20.08.09	
REV		DATE	
DESCRIPTION		LW SM APP	
DRN		CHKD APP	

4.2 Percolation Tests

OCM conducted two percolation tests in TP3 and TP4 in accordance with British Research Establishment (BRE 365) Soakaway Design Guidance. The results are presented in Appendix 2.

4.2.1 Results

TP-3 had trial pit dimensions 3m x 1.2m x 1.3m deep. The pit was filled to within 0.2 m of the top of the pit, and the drop in water level was observed. The water level dropped approximately 6cm in TP-3 in one hour. The water level in TP-3 dropped 90 cm in 16 hours. The permeability for this area was calculated at 6.42^{-7} m/s.

TP-4 had trial pit dimensions 1.5m x 0.8m x 0.7m deep. The pit was filled to within 0.05 m of the top of the pit, and the drop in water level was observed. The water level dropped approximately 7.5cm in TP-4 in one hour. The water level in TP-4 dropped 43 cm in 8 hours. The permeability for this area was calculated at 5.93^{-7} m/s.

This permeability indicates that the soils are suitable for percolation of the stormwater from the paved area of the extension.

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5 HYDROGEOLOGICAL RISK ASSESSMENT OF PROPOSED SUSTAINABLE URBAN DRAINAGE SYSTEM (SUDS)

It is likely that the water table level mirrors the topography and falls to the south toward the low point on site where the ground level is approximately 55.05mOD. It is likely that the water table in this area is at least 10 m below ground level. No water strikes were encountered in any of the trial pits excavated at the site.

Anecdotal evidence from the site owner indicates that this portion of the site does not flood in the winter period.

5.1 Groundwater Risk Assessment

In addition to ensuring the correct design of the soakaway the potential for infiltrating stormwater to impact on surface and/or groundwater must be considered. The standard risk assessment model of “source - pathway - receptor” is used as the framework.

- **Source:** The source is the stormwater which will enter the soakaway. The “first flush” of stormwater after a dry period can contain pollutants collected from surface e.g. oil from road surfaces and organic matter from gutters and drains. BRE guidance suggests the use of an oil water interceptor as part of the drainage system to mitigate the risk from hydrocarbon sources such as run-off from roads or vehicles. OCM understand that this will be incorporated in the design to mitigate potential impact on the underlying bedrock aquifer.
- **Pathway:** The pathway is the soakaway system and underlying subsoils. The design has been completed for a storm duration of 60minutes for a 1:100 year return period. There are at least 10m of subsoils beneath the site.
- **Receptor:** OCM assume that the design would include the discharge of stormwater to ground via a suitably designed percolation system(s). The Aquifer vulnerability is Low in the proposed percolation area. The water table level appears to be at least 10m below ground level in this area.

- The nearest watercourse is the surface water drain which runs along the southern boundary. Once the stormwater is allowed to percolate through the subsoil having come through an oil interceptor the travel time and dilution in the unsaturated zone should mitigate any risk to the water course. An ecological survey of the site has confirmed that the surface water drain does not support aquatic life and is not of significant ecological value.

5.2 Discharge of Stormwater to Ground.

The indicative size of the soakaway shown on the planning application drawing is approximately 300m². The percolation test results indicate a soakaway size of approximately 130m² will be sufficient to accommodate the surface water flows from the paved areas around the new extension (approximately 5,000m² area). The soakaway layout should be approximately 130m x 1m x 1.5m deep which can be accommodated in the proposed landscaped area to the south east of the site.

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6 CONCLUSIONS & RECOMMENDATIONS

6.1 Conclusions

OCM considers that a stormwater attenuation system, with a percolation area located in the southeast of the site, can be designed to accommodate the proposed development.

OCM estimate that the water table is located at least >3.1m below ground level in the south of the site. Anecdotal evidence from the site owner indicates that this portion of the site does not flood in the winter period. The available site investigation information on water table levels and soil drainage characteristics supports this observation.

In the proposed percolation area the Aquifer vulnerability is Low. OCM understand that all necessary measures (interceptor) will be incorporated in the design to ensure that the aquifer is not impacted by stormwater discharges.

The nearest watercourse is the surface water drain which is located at the southern boundary. Once the stormwater has percolated through the subsoil the travel time and dilution in the unsaturated zone should mitigate any risk to the water course.

6.2 Recommendations

OCM recommend that an oil water interceptor system be incorporated into the design to minimise the risk of hydrocarbon run-off from roads and vehicles entering the groundwater system.

APPENDIX 1

Trial Pits Logs & Photos

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TRIAL PIT LOG


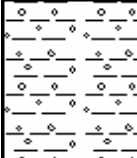

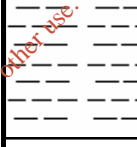
CONTRACT: PANDA

TRIAL PIT NO: TP-1

LOCATION: Beuparc, Co Meath

DATE: 13/08/2009.

METHOD OF EXCAVATION: Track Mounted Excavator

DESCRIPTION	BOREHOLE DEPTH (m)	SYMBOLIC LOG	SAMPLE TYPE	DEPTH (m)/ Reading (ppm)
Topsoil	Metres (m)			
Firm brown Clay with very occasional gravels.	0.5m			
Stiff yellow Clay with occasional gravels	1.0m			
Very stiff grey/black Clay with gravels Angular shale gravels	1.5m			
Trial Pit Terminated	2.0m			
	2.5m			
	3.0m			
<p>Comments: Pit walls stable to completion. No groundwater encountered.</p>				

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TRIAL PIT LOG



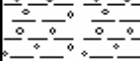
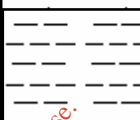


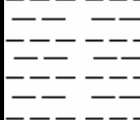
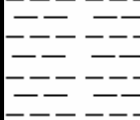
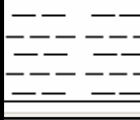
CONTRACT: PANDA

TRIAL PIT NO: TP-2

LOCATION: Beuparc, Co Meath

DATE: 13/08/2009.

METHOD OF EXCAVATION: Track Mounted Excavator

DESCRIPTION	BOREHOLE DEPTH (m)	SYMBOLIC LOG	SAMPLE TYPE	DEPTH (m)/ Reading (ppm)
Topsoil	Metres (m)			
Firm brown Clay with very occasional gravels.	0.5m			
Firm yellow/brown CLAY with occasional gravels				
Stiff grey/black Clay with gravels Angular shale gravels	1.0m			
	1.5m			
	2.0m			
	2.5m			
	3.0m			
Trial Pit Terminated	3.5m			
Comments: Pit walls stable to completion. No groundwater encountered.				

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TRIAL PIT LOG


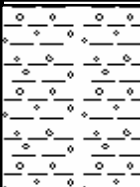



CONTRACT: PANDA

TRIAL PIT NO: TP-3

LOCATION: Beauparc, Co Meath

DATE: 13/08/2009.

METHOD OF EXCAVATION: Track Mounted Excavator

DESCRIPTION	BOREHOLE DEPTH (m)	SYMBOLIC LOG	SAMPLE TYPE	DEPTH (m)/ Reading (ppm)
Topsoil	Metres (m)			
Firm brown Clay with very occasional gravels.	0.5m			
Stiff yellow Clay with occasional gravels	1.0m			
Very stiff grey/black Clay with gravels Angular shale gravels	1.5m			
Trial Pit Terminated	2.0m			
	2.5m			
	3.0m			
Comments: Pit walls stable to completion. No groundwater encountered.				

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TRIAL PIT LOG

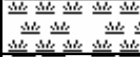
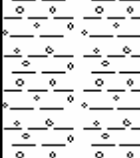
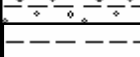
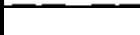

CONTRACT: PANDA

TRIAL PIT NO: TP-4

LOCATION: Beuparc, Co Meath

DATE: 13/08/2009.

METHOD OF EXCAVATION: Track Mounted Excavator

DESCRIPTION	BOREHOLE DEPTH (m)	SYMBOLIC LOG	SAMPLE TYPE	DEPTH (m)/ Reading (ppm)
Topsoil	Metres (m) 0.5m 1.0m 1.5m 2.0m			
Firm brown Clay with occasional gravel.				
Firm yellow/brown Clay.				
Stiff grey/black Clay with angular shale gravels				
Trial Pit Terminated				
<p>Comments: Pit walls stable to completion. No groundwater encountered.</p>				

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TP1 – Panda, Beuparc, Co Meath



TP2 – Panda, Beauparc, Co Meath



BRE Test Location – Panda, Beauparc, Co Meath.



BRE Test – TP4. Panda, Beuparc, Co Meath

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APPENDIX 2

Percolation Test Results

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Soakway Design

		SOAKWAY	SOAKWAY
Parameter		TP-3	TP-4
Input Parameter	Storm Duration (mins)	60	60
	A (m ²)	5000	5000
	R (m)	0.033	0.033
Calculated Parameter	I (m ³)	165	165
	Soil Perm (m/s)	6.42E-06	5.93E-06
	Duration (s)	3600	3600
	Soakway L (m)	155	130
	Soakaway W (m)	0.75	1
	Soakaway Depth (m)	1.5	1.5
	Soakaway Volume (m ³)	174.375	195
	Free Volume	0.95	0.95
	As50 (m ³)	233.625	196.5
	O (m ³)	5.40	4.20
	I - O	160	161
	Soakaway capacity (m ³)	166	185
	ts50 (hrs)	15.3	22.1

Use 0.95 for Wavin Aquacells

Must be greater than I - O
Must be less than 24

BRE 365

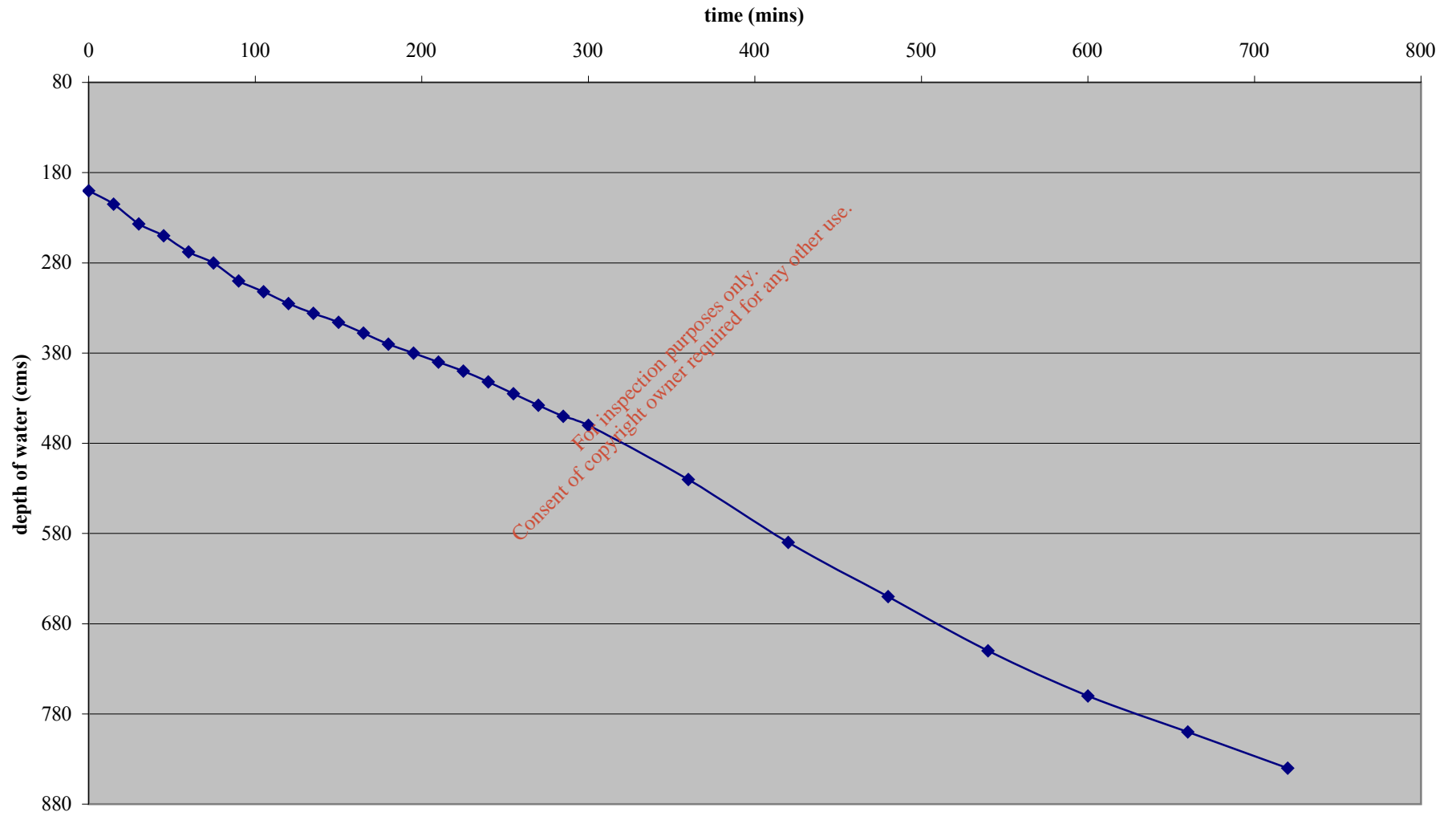
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Beauparc

Paramter	TP-3	TP-4
Width (m)	1.2	0.8
Length (m)	3	1.5
WC Depth (m)	1.3	0.7
Test Depth (m)	0.64	0.275
Time (min)	660	330
Volume (m ³)	2.304	0.33
Surface Area (m ²)	9.06	2.81
Infiltration Rate (m/s)	6.4218342E-06	5.9311981E-06
Infiltration Rate (m/d)	0.555	0.512

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Soakway Infiltration Test Data Panda Beauparc TP3



Soakway Infiltration Test Data Panda Beauparc TP4

