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December 20th, 2023

Environmental Licensing Programme
Office of Environmental Sustainability
Environmental Protection Agency
Johnstown Castle
Co Wexford

Our ref: **1135-17**
Re: Dawn Meats Ireland Unlimited Company
Greenhills, Beauparc, Navan, Co Meath.
IE Licence Reg. No. P0811-02
Request for Technical Amendment

Dear Sir/Madam,

Dawn Meats Ireland UC request a Technical Amendment (TA) to Industrial Emissions Licence Reg. No. P0811-02 for their site at Greenhills, Beauparc, Navan, Co Meath under Section 96(1) of the Environmental Protection Agency Acts, 1992 (as amended).

The request for Technical Amendment arises from Dawn Meats intention to utilise lands at the site within company ownership for drip irrigation of treated wastewater as an alternative to tankering for offsite treatment and disposal at an Uisce Eireann WWTP.

Background

The proposal relates to a change in the treatment of process wastewater on site. The sources of process effluent are:

- Wastewater from process wash down
- Truck wash
- Wash system for blood pipework and storage tank.
- Yard wash down (Dirty area)

Raw process effluent is collected daily via a network of process drains and passes through a Meva screen, collection sump and a drum screen before storage within in a 3,750 m^3 HDPE lined and covered lagoon.

This lagoons provide balancing of the process effluent and also provide contingency effluent and firewater holding capacity.

From the first lagoon wastewater is pumped to a DAF unit where a chemical flocculant is added. Liquid from the DAF unit is then pumped to a second Lagoon (3750m^3). Wastewater from the second lagoon is tankered off site to Drogheda WWTP under License.

Sludge from the DAF unit is removed from site for Landspreading under the site Nutrient Management Plan (NMP) as part of the site License.

Anfield House
Baldonnell Bus. Park
Dublin 22
D22 N2N4

2 Osborne Promeneade
Warrenpoint
Newry
Co. Down,
BT34 3NQ

Proposal

Dawn Meats intend to amend the management of wastewater on site to allow for treatment and disposal on site, thereby removing the requirement to tanker wastewater off-site and reliance on third party treatment.

Under the proposed arrangement, treated wastewater will be pumped to a sub-surface Irrigation system, which is an effluent disposal technique designed to disperse effluent at a low application rate over a large area of suitable land. Details of the proposed system together with a Hydrological Risk Assessment and Site Characterisation report is appended to this document as Attachment B.

The licensee therefore requests the inclusion of an updated Schedule B.2 within the licence in order to accommodate the proposed drip irrigation system.

Proposed New Schedule B.2 Emissions to Water/Ground

Emission Point Reference No.:	Wi	
Name of Receiving Ground:	Drip Irrigation Lands	
Location of Monitoring Point	Final treated effluent chamber	
Volume to be Emitted:	Maximum in any one day	250 m^3
	Maximum in any one hour:	15 m^3

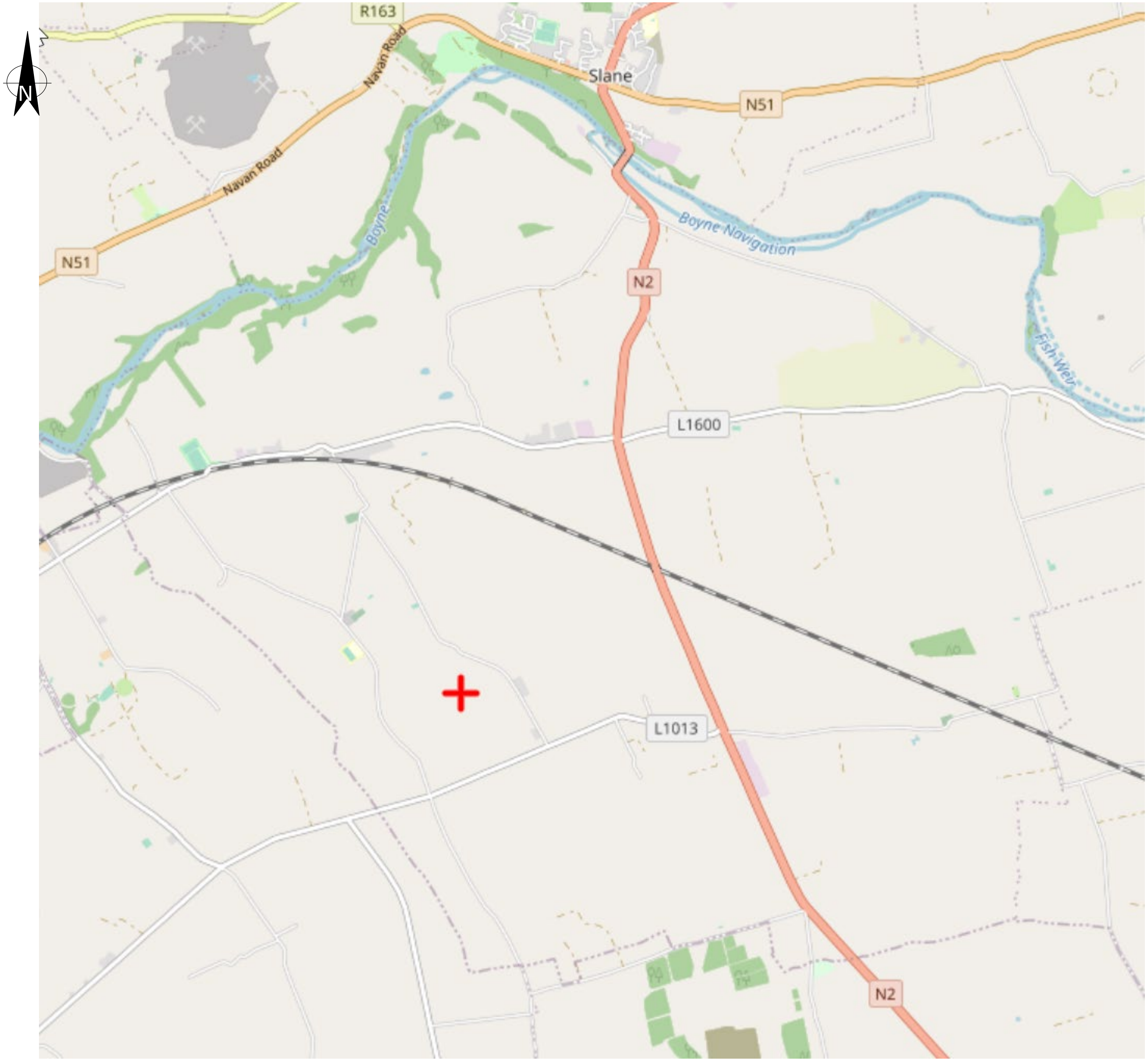
Parameter	Emission Limit Value
Temperature	25^{0}C (max)
pH	6-9
Toxicity	5 TU
	mg/l
BOD	20
COD	125
Total Suspended Solids	15
Total Nitrogen	15
Ammonia	1
Total Phosphorous	2
Orthophosphate	1
Oils, Fats & Greases	5

I trust that the above information is adequate to enable a proper assessment of our request and please do not hesitate to contact me should you require any further information in respect of the above.

Yours sincerely,

Peadar O'Loughlin
Managing Director

Attachment A
Drawings



Legend

Site Location

MEHS
ENVIRONMENT, HEALTH & SAFETY

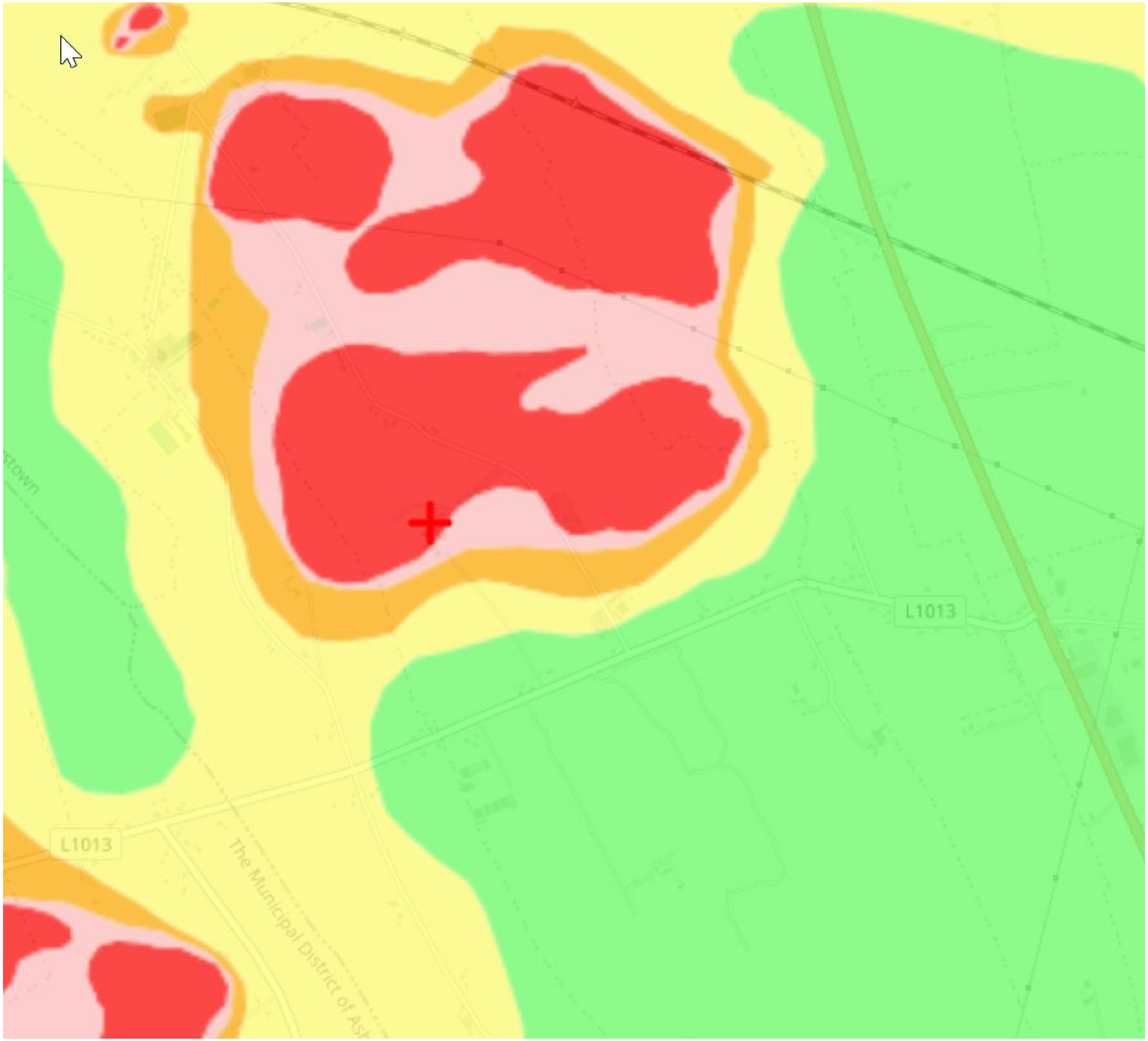
Client	Dawn Slane
Title	Mapping
Scale. NTS	Project No. P023 88
Figure No. Figure 1	Rev. A

Legend

Site Location

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane		
Title	Mapping		
Scale.	NTS	Project No.	P023 88
Figure No.	Figure 3	Rev.	A

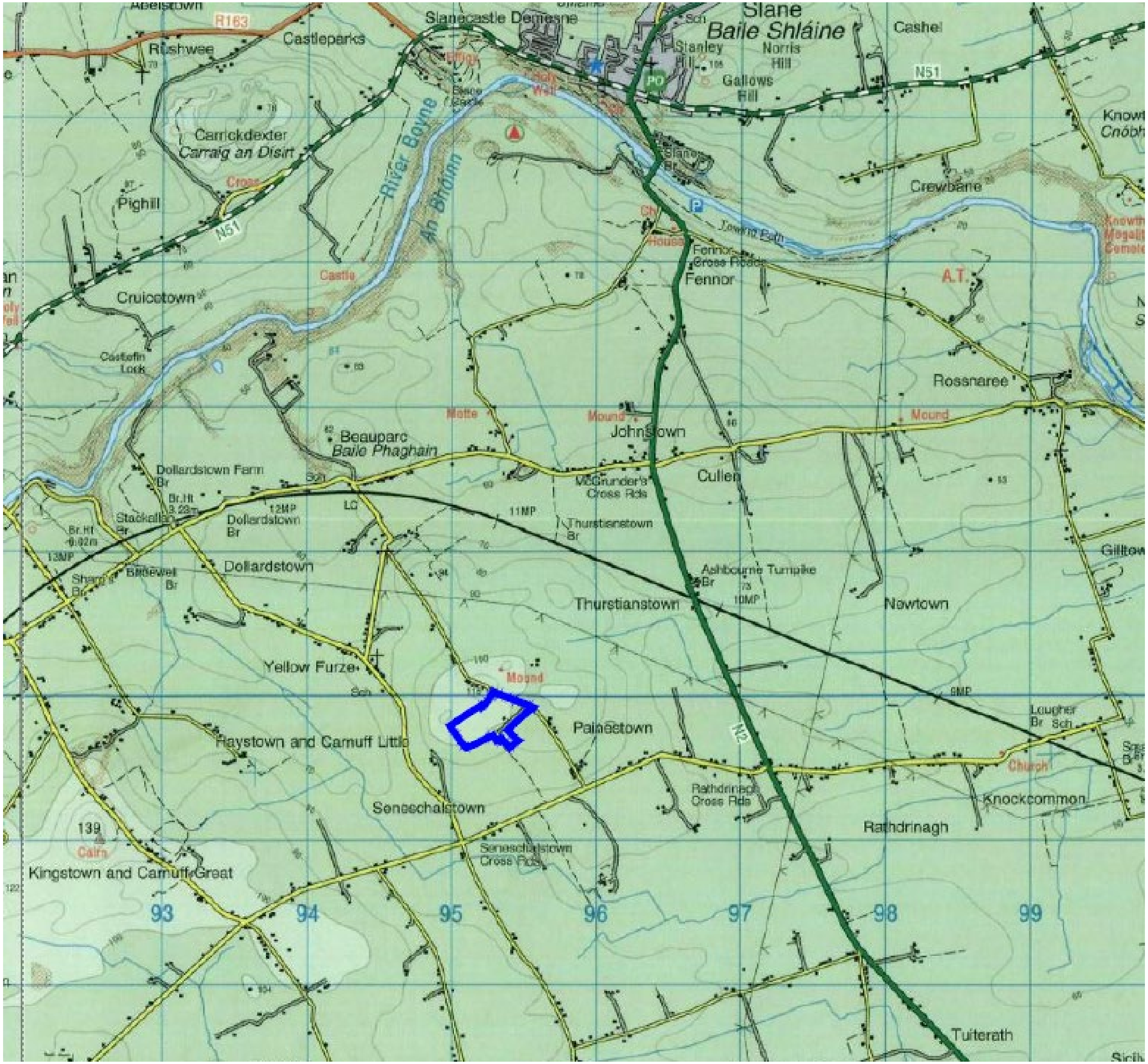


Legend

Site Location

ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Groundwater Vulnerability
Scale. NTS	Project No. P023 88
Figure No. Figure 2.5	Rev. A

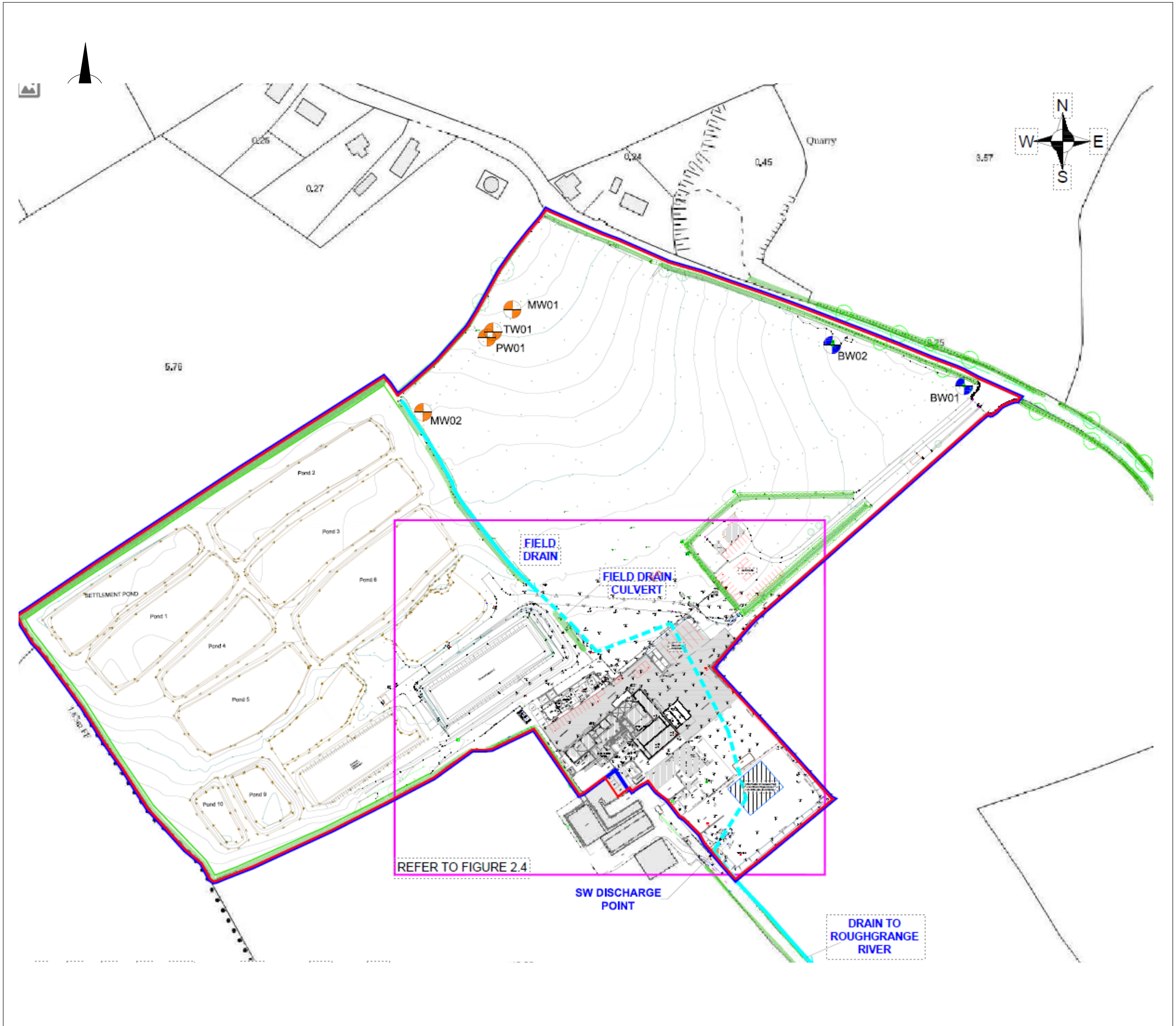


Legend

DUNBIA (SLANE)
LAND OWNERSHIP (C. 11.5 HA)

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane		
Title	Groundwater Vulnerability		
Scale.	NTS	Project No.	P023 88
Figure No.	Figure 2.2	Rev.	A

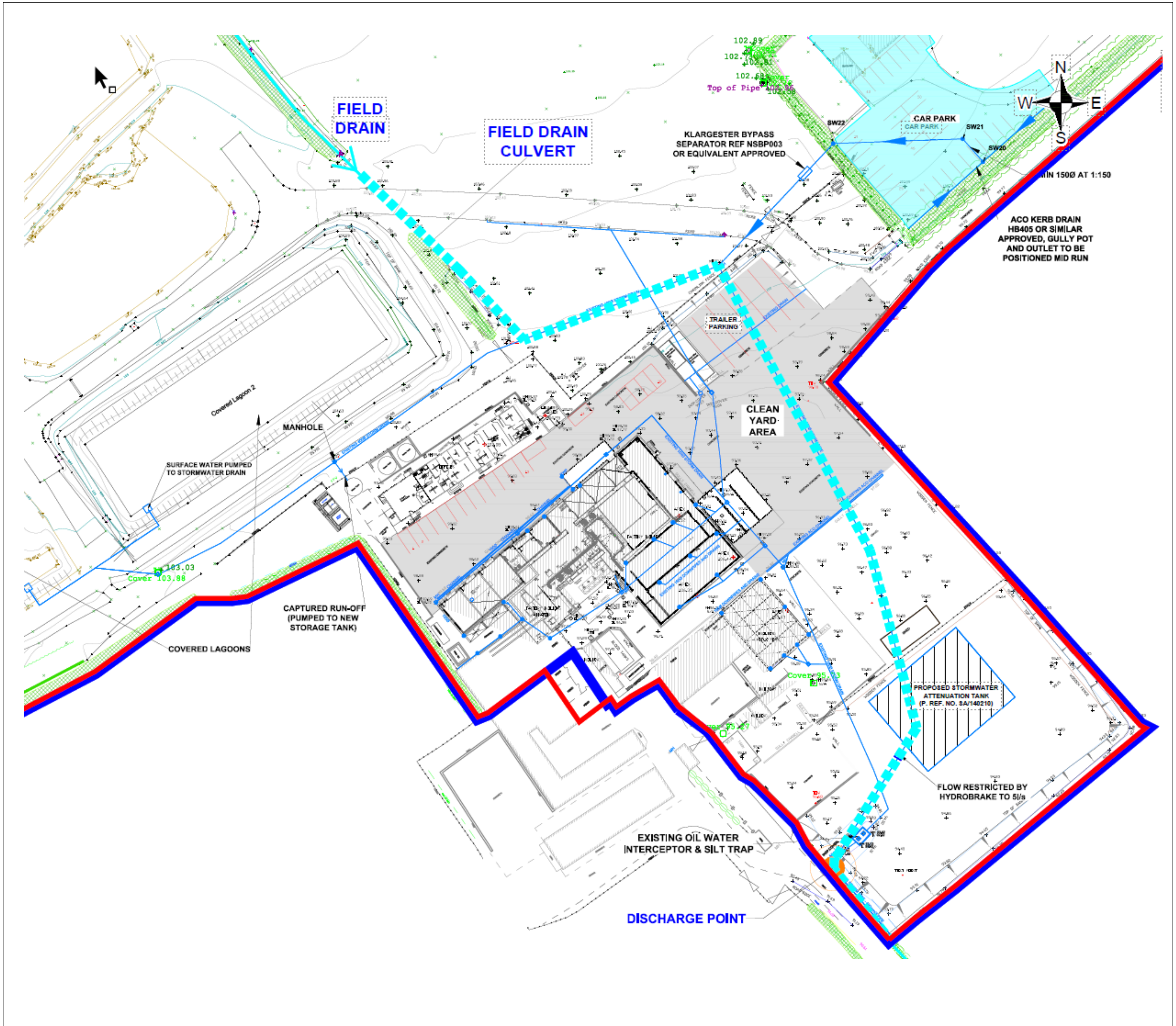


Legend

- DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)
- PLANNING APPLICATION AREA (C. 11.5 HA)
- FIELD DRAINAGE □ STORMWATER DRAIN
- BW02 — E□ISTING SUPPLY WELLS (BW01 □ BW02)
- MW01 — TEST AND MONITORING WELLS (2014)

MEHS ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Site layout
Scale. NTS	Project No. P023 88
Figure No. Figure 2.2	Rev. A

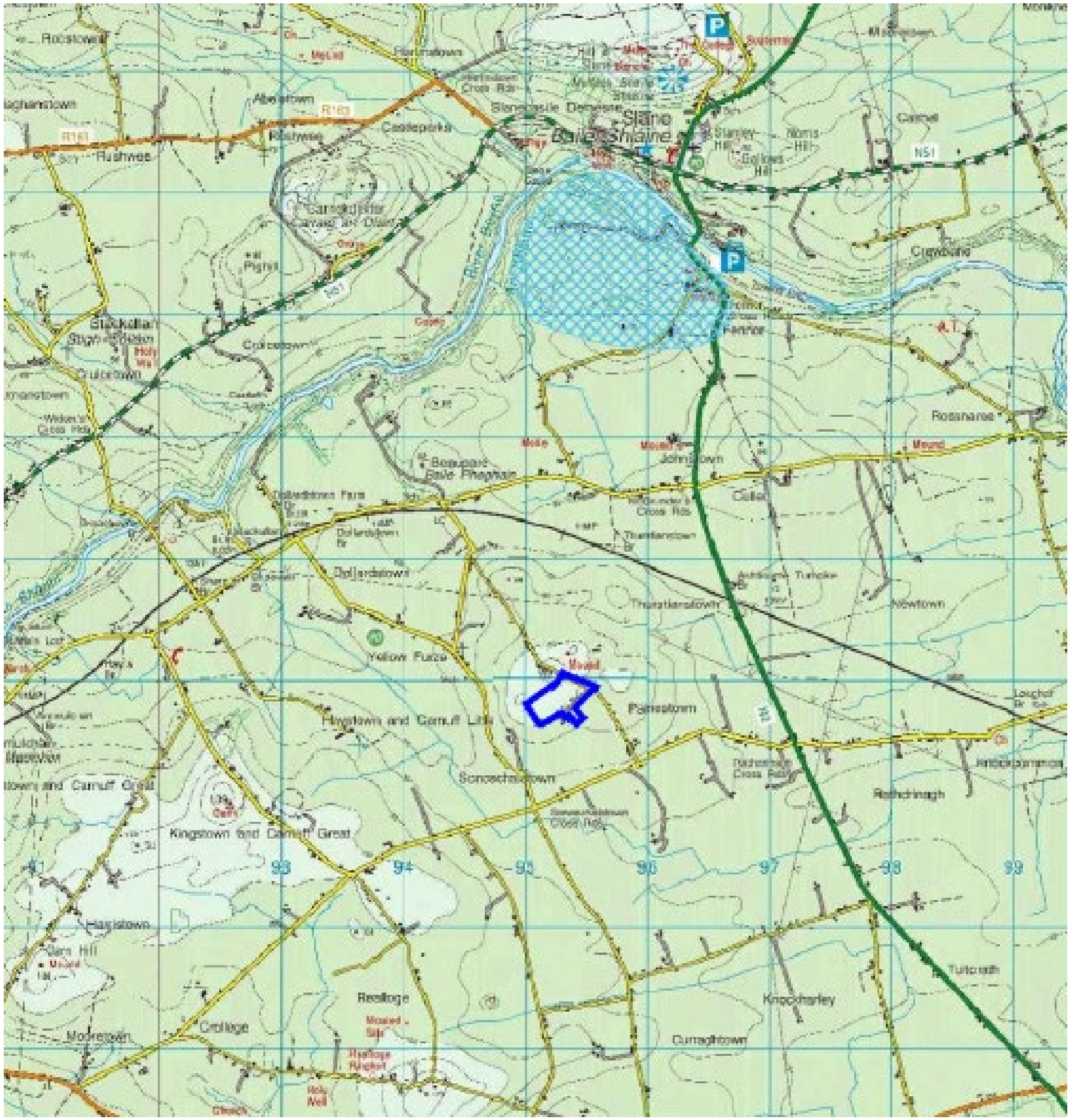


Legend

- DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)
- PLANNING APPLICATION AREA (C. 11.5 HA)
- FIELD DRAINAGE □ STORMWATER DRAIN
- SURFACE WATER DRAINAGE INFRASTRUCTURE

MEHS ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Detailed Site Layout
Scale. NTS	Project No. P023 88
Figure No. Figure 2.3	Rev. A



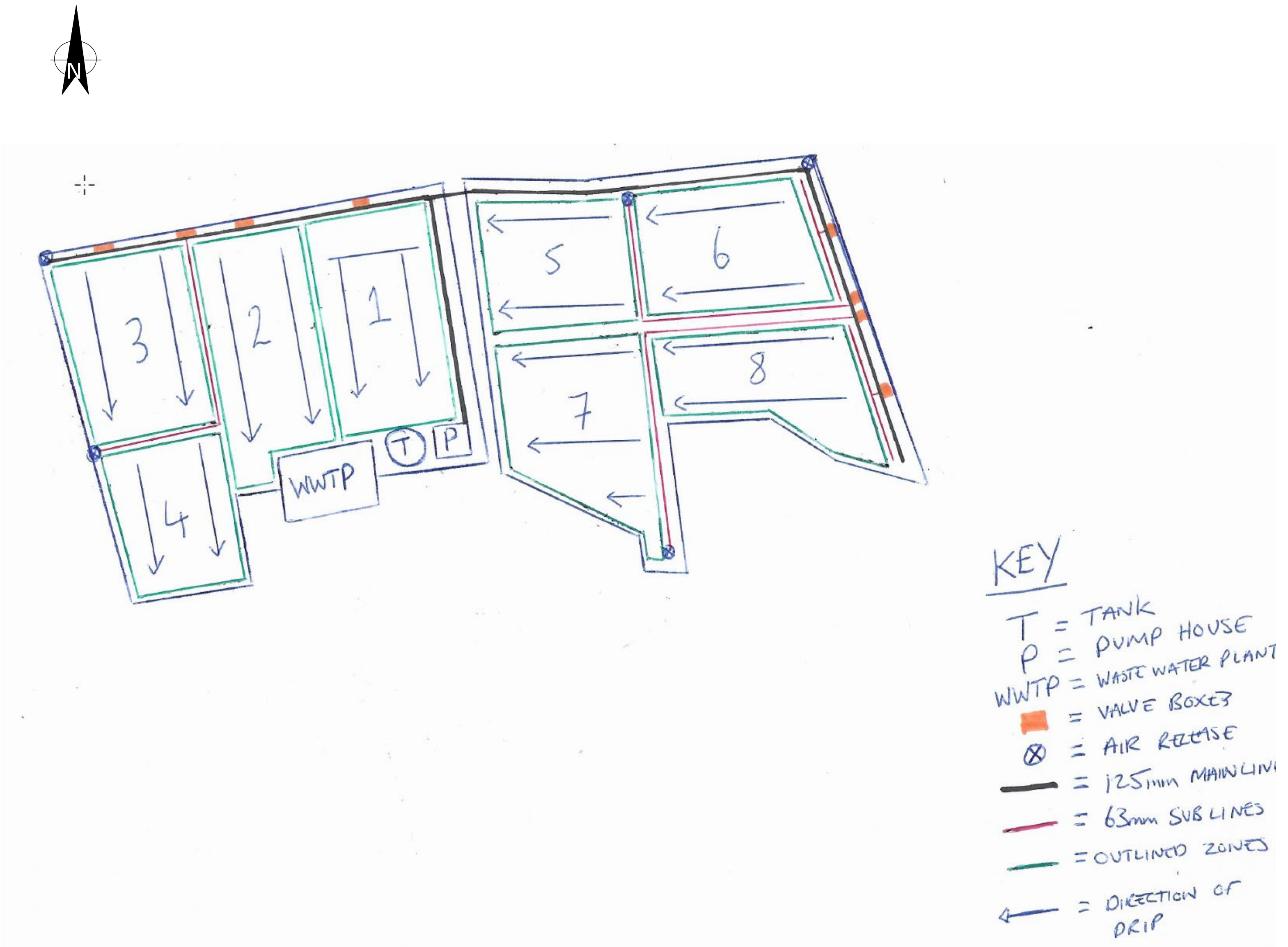
Legend

DUNBIA (SLANE)
LAND OWNERSHIP (C. 11.5 HA)

SLANE WELL SOURCE
PROTECTION ZONE

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	SOURCE PROTECTION ZONE MAP
Scale. NTS	Project No. P023 88
Figure No. Figure 2.4	Rev. A



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DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)

SLANE WELL SOURCE PROTECTION ZONE

MEHS ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Irrigation Zones
Scale. NTS	Project No. P023 88
Figure No. Figure 4	Rev. A

Attachment B

HYDROLOGICAL & HYDROGEOLOGICAL QUALITATIVE RISK ASSESSMENT

HYDROLOGICAL & HYDROGEOLOGICAL QUALITATIVE RISK ASSESSMENT FOR SUB-SURFACE IRRIGATION SYSTEM AT DAWN MEATS - SLANE GREENHILLS, BEAUPARC, CO. MEATH, C15 CF38

Technical Report Prepared For

Michelle McCarty

Technical Report Prepared By

Trevor Montgomery
EHS Consultant &

Our Reference

TM/23/88R01

Date of Issue

10th November 2023

Document History

Document Reference		Original Issue Date	
TM/23/088/R01		10 Nov 2023	
Revision Level	Revision Date	Description	Sections Affected

Record of Approval

Details	Written by	Approved by
Signature		
Name	Trevor Montgomery	Guy Meredith
Title	EHS Consultant & Director	Engineer
Date	10 Nov 2023	10 Nov 2023

Table of Contents

1.0 INTRODUCTION

1.1 Site Location & Hydrological Setting

Dunbia (Slane) is an existing cattle slaughtering installation located approximately 4.5 km south of Slane, Co. Meath. It is part of the Dawn Group.

The site comprises of lairage (animal holding) areas, processing buildings, chills, open yard areas, effluent storage, weighbridge, ancillary services and temporary porta-cabin offices. An unlined constructed wetland (approximately 4.5 hectares) was previously used to treat effluent/wash water arising at the installation. The wetland was decommissioned in 2015 and two lined covered effluent storage lagoons have been installed.

A new Wastewater Treatment Plant has been designed and installed by Glanua Industrial Ltd and due to be commissioned in Q1 2024. The site current operation is the primary effluent is discharged into the primary effluent lagoon and the treated via a DAF to remove solids and fats. The DAF effluent is stored in the effluent lagoon prior to transportation off-site for treatment.

The assessment conducted as part of this report and supporting work is to examine the 2 fields on the north of the site for sub-surface irrigation of the treated effluent from the WWTP.

Figure 1-1 below shows a summary of these locations.

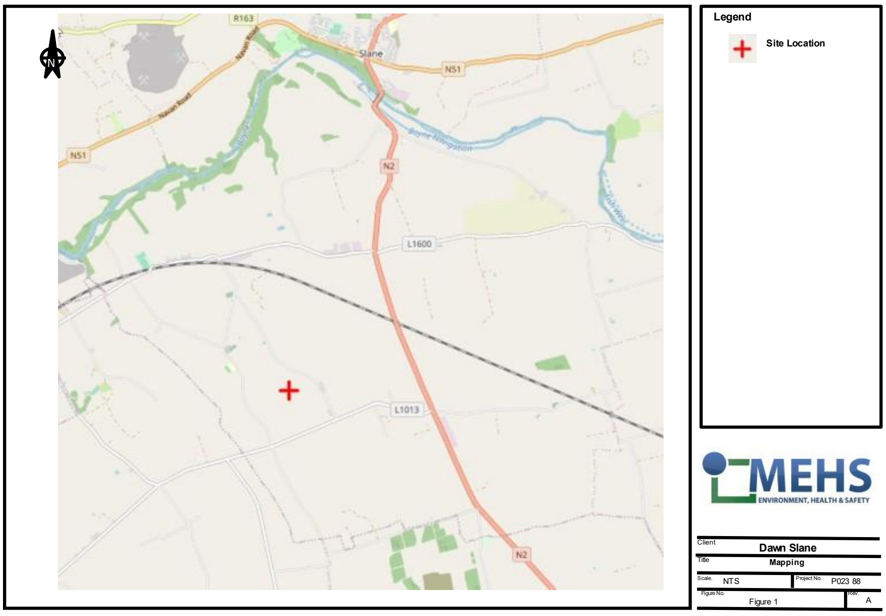

Figure 1.1 Site Location (Grid Reference N953001, 696990)

Due to a possible lack of assimilative capacity with the site for direct discharge. All options to disperse the effluent generated on site were examined which included:

- Piping the effluent to the River Boyle
- Increase the flow of surface water on-site by pumping groundwater
- Constructed wetland
- Discharge to sewer
- Transportation to off-site Wastewater Treatment Plant
- Surface irrigation.
- Sub-surface irrigation

Following extensive review by the Client, consultants and the EPA it was decided that sub-surface irrigation was the most sustainable option for the future of Dawn Slane.

The Dawn Slane facility is located in a rural area of Co. Meath and closest village is Yellow Furze to the south, it is north of Kentstown, south of Slane and east of Navan. The N2 Derry to Dublin Road runs approximately 2 km to the east of the site. The Cattle processing plant is occupied mainly by buildings, internal roadways Wastewater Treatment Plant and vehicle parking. The wastewater treatment plant is located on the north of the site and the effluent is pump to it from the main effluent sump. To the south, east, north and west of the site are areas of pasture with low density rural ribbon development.

The sub-surface irrigation system is proposed for the fields on the north of the site and is gently sloping from north to south in profile. To the northeast and west is agriculture land and to the south is the Dawn Site. There is a drainage stream to the north of field 1 and then between fields 1 and 2. which flows under the site, which is discharge at Surface Water Monitoring Point 1.

1.1 Objective of Report

The scope of this desk top review is to assess the potential for any likely significant impacts on receiving waters during construction or post development of the Sub-surface Irrigation System. The assessment considers the likely impact on water body status in the absence of taking account of any measures intended to avoid or reduce harmful effects of the proposed project (i.e., mitigation measures).

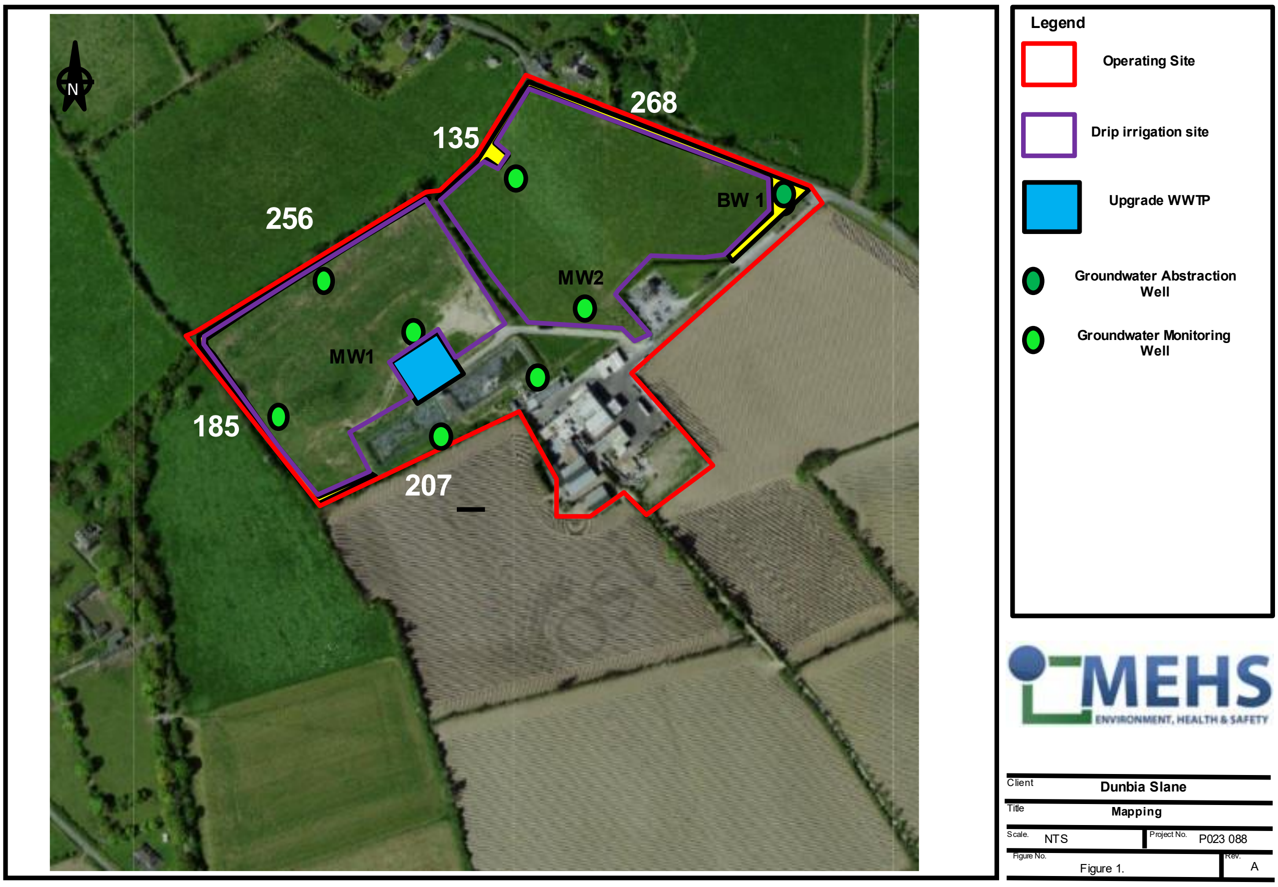

Figure 1.2 Site Location and location of Sub-surface Irrigation system.

In particular, this review considers the likely impact of construction run-off and industrial effluent from the Dawn Slane on water quality and overall waterbody status within stream to River Boyne and Natura 2000 sites. The assessment relies on information regarding construction and design provided in the following report.

This report is prepared by *Trevor Montgomery* (BSc, Post Grad Evn). Trevor is an environmental consultant with over 25 years' experience in water resource management and impact assessment. He has a Degree and Post Graduate Diploma in Environmental Science and has provided services on water related environmental and planning issues to both public and private sector bodies. He is qualified as a *competent person* as recognised by the EPA in relation to contaminated land assessment (IGI Register of competent persons, www.igi.ie). Trevor's specialist area of expertise is water resource management, hydrological assessment, wastewater treatment and environmental impact assessment.

1.2 Description of Drainage

There is no direct discharge to an open stream/river proposed as part of this development.

The nearest surface water receptor is the Roughgrange River (IE_EA_07R030640) which to the south west of the site (refer Figure 1.1 above). The area is part of the Roughgrange River River catchment and River Boyne. There is no direct hydraulic linkage between the proposed development and these water bodies.

The sub-surface Irrigation system is an effluent disposal technique designed to disperse effluent at a low application rate over a large area. The system is plough into the ground at centres between 400 mm apart. The smaller the centres the more disperse the effluent application.

It is planned to install a pore water monitoring well and surface water monitoring points as shown in Figure 1.4

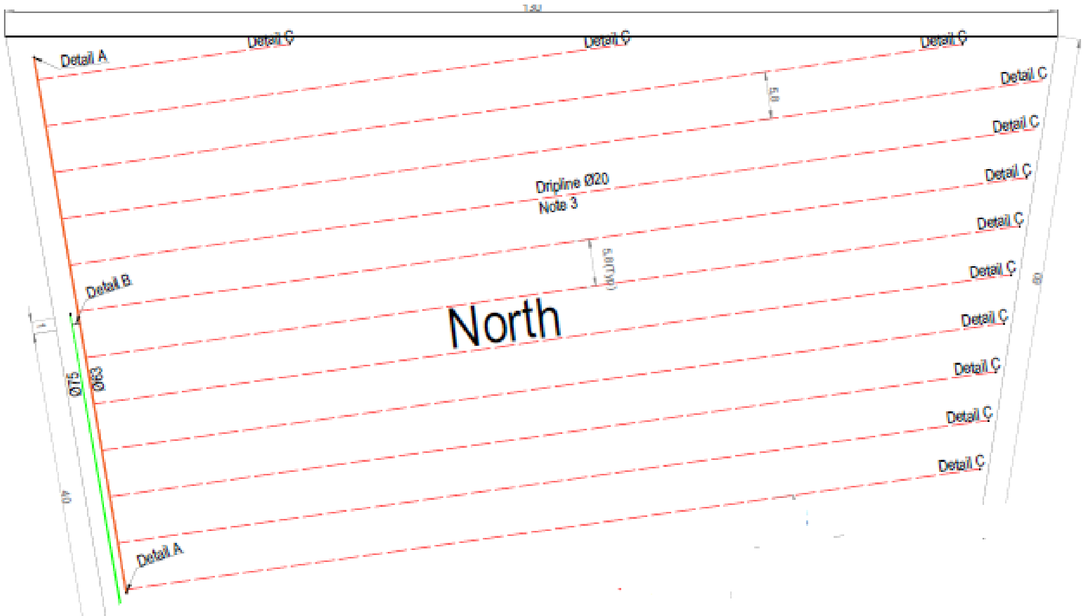

Figure 1.3 Layout of Pilot System in Plot 1.

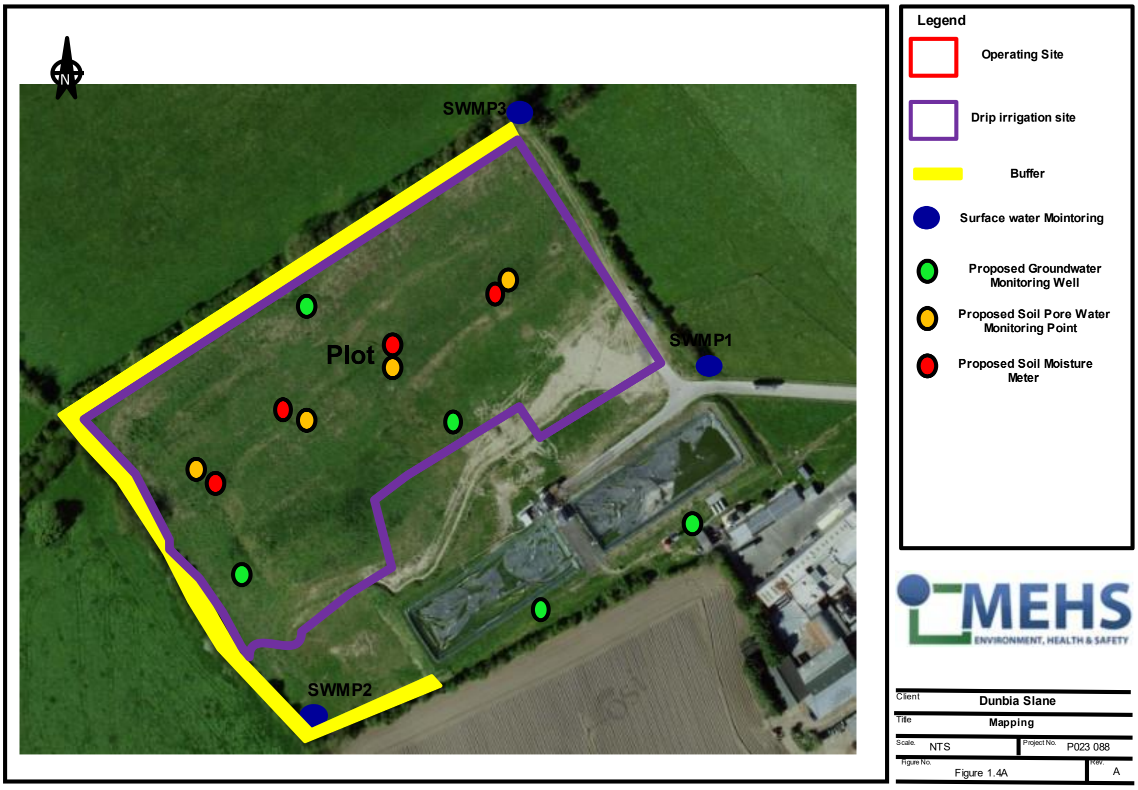

Figure 1.4A Monitoring Points for Surface, Ground and Pore Water

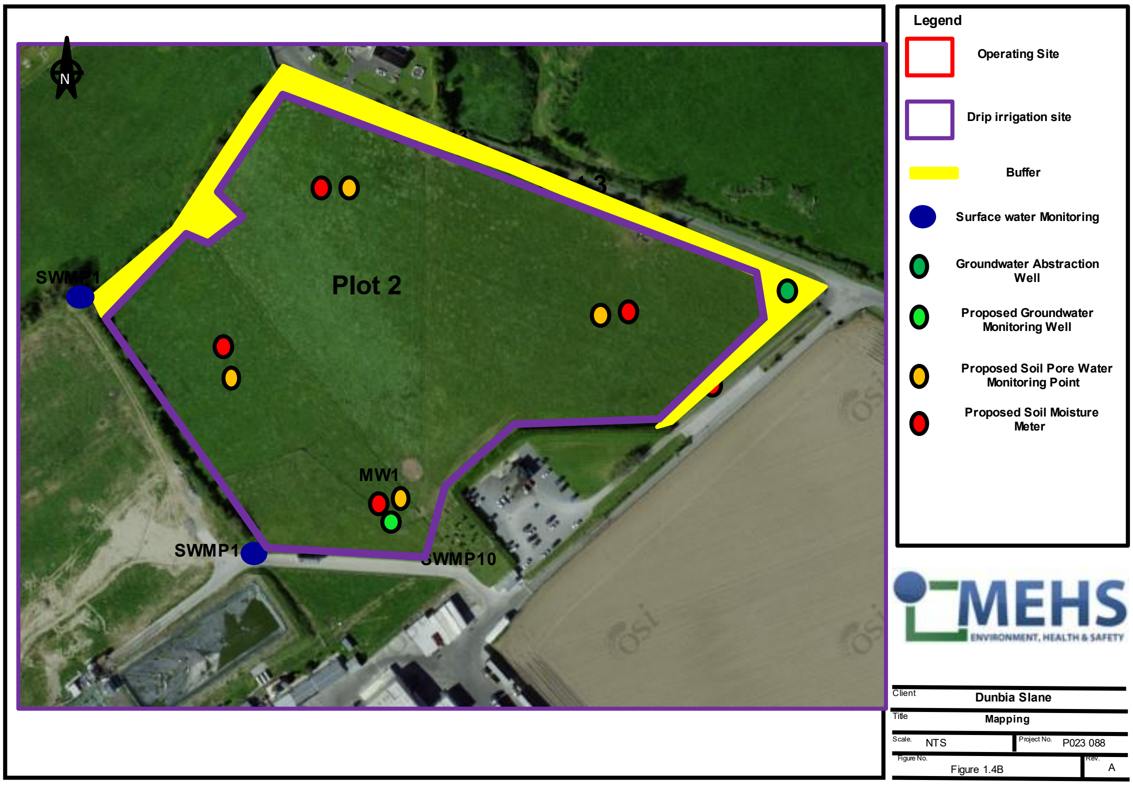

Figure 1.4B Monitoring Points for Surface, Ground and Pore Water

The proposal for the sub-surface irrigation system is to install a number of monitoring wells, soil pore water wells and surface water monitoring points to ensure complete monitoring of all strata which the sub-surface irrigation system could have an impact on.

In addition, soil water level continuous monitors will be installed to ensure no ponding occurs during the application of the treated effluent.

2.0 ASSESSMENT OF BASELINE WATER QUALITY, RIVER FLOW AND WATER BODY STATUS

A reliable Conceptual Site Model (CSM) requires an understanding of the existing hydrological and hydrogeological setting. This is described below for the proposed development site and surrounding hydrological and hydrogeological environs.

2.1 Hydrological Catchment Description

The site is located in the Boyne River Basin District, within the River Boyne WFD catchment. According to the EPA GIS map viewer, a number of water bodies occur in close proximity to the subject site. The closest water body is Roughgrange River which is located on the south 700 metres from the proposed irrigation site. Other water bodies include River Boyne c.2.9 km north and River Nanny c.4.9 km south. The most predominant and widely known water body feature of the region is River Boyne, situated c.2.9 km north of the subject site. Groundwater flow at the site is predicted to be towards the southeast.

The National Parks and Wildlife Service's online map viewer was consulted, and two designated sites were identified within 15km of the subject property, which are listed below:

- River Boyne and River Blackwater SAC Site Code 002299) c. 2.9 km North.
- River Boyne and River Blackwater SPA (004232) c 2.9 km North.

The proposed development site lies within the Boyle River Catchment. The Environmental Protection Agency (EPA, 2019) on-line mapping presents the available water quality status information for water bodies in Ireland. The River Boyne has an WFD status of '*Good*'. Monitoring data from the EPA of the River Boyne demonstrates that the water quality within the River Boyne is in compliance with

Schedule 5 of the European Communities Environmental Objectives (Surface Water) Regulations 2009 (S.I. No. 272 of 2009).

2.2 Aquifer Description & Superficial Deposits

According to the Geological Survey of Ireland (GSI) data viewer, topsoil underlying the subject site is classified as made ground, the topsoil type underlying the agricultural grasslands bordering the site is described as carboniferous limestone and shales from the Loughshinny Formation, with a small area of Namurian shales from the Donore Formation occurring around the eastern site boundary. The subsoil is classified as till derived from Limestone till (Carboniferous).

The ground investigation undertaken in September 2023 involved the excavation of 11 No. trial pits in plots 1 & 2. Geological Survey of Ireland (GSI) and published on the Environmental Protection Agency (EPA) website (www.epa.ie) indicates that rock occurs at or close to the surface at the Painestown facility and that subsoils are therefore thin, or absent. However, recent investigations indicate that the underlying subsoils, described as sandy gravelly clay (glacial till / boulder clay), occur to depths of between 2m and 3m deep at the application site. The trial pits varied in depth from 1.3m to 3.5m, with topsoil varying in depth from 0.6 m to 3.1 m. The topsoil was described as light brow and sandy clay. Each of the trial pits encountered stiff light brown to brown gravelly silty clay with angular fragments and cobbles. Some trial pits terminated on bedrock, described as black and brown shane.

2.2.1 Source Protection Zones and Wells

The GSI data viewer indicates that the subject site is not located within a source protection zone and there are no source protection zones within 5km.

There are two existing abstraction wells (BW01 and BW02) at the site which currently meet the water supply requirements of the Dunbia plant, the locations of which are shown on Figure 2-2 and 2-3. There are a number of private wells serving residential properties along the public road (Windmill Road) immediately to the east of the site recorded on the GSI well database, refer to Figure 2-4. The are no abstraction wells in the immediate vicinity of the application site recorded in the EPA Abstraction Register.

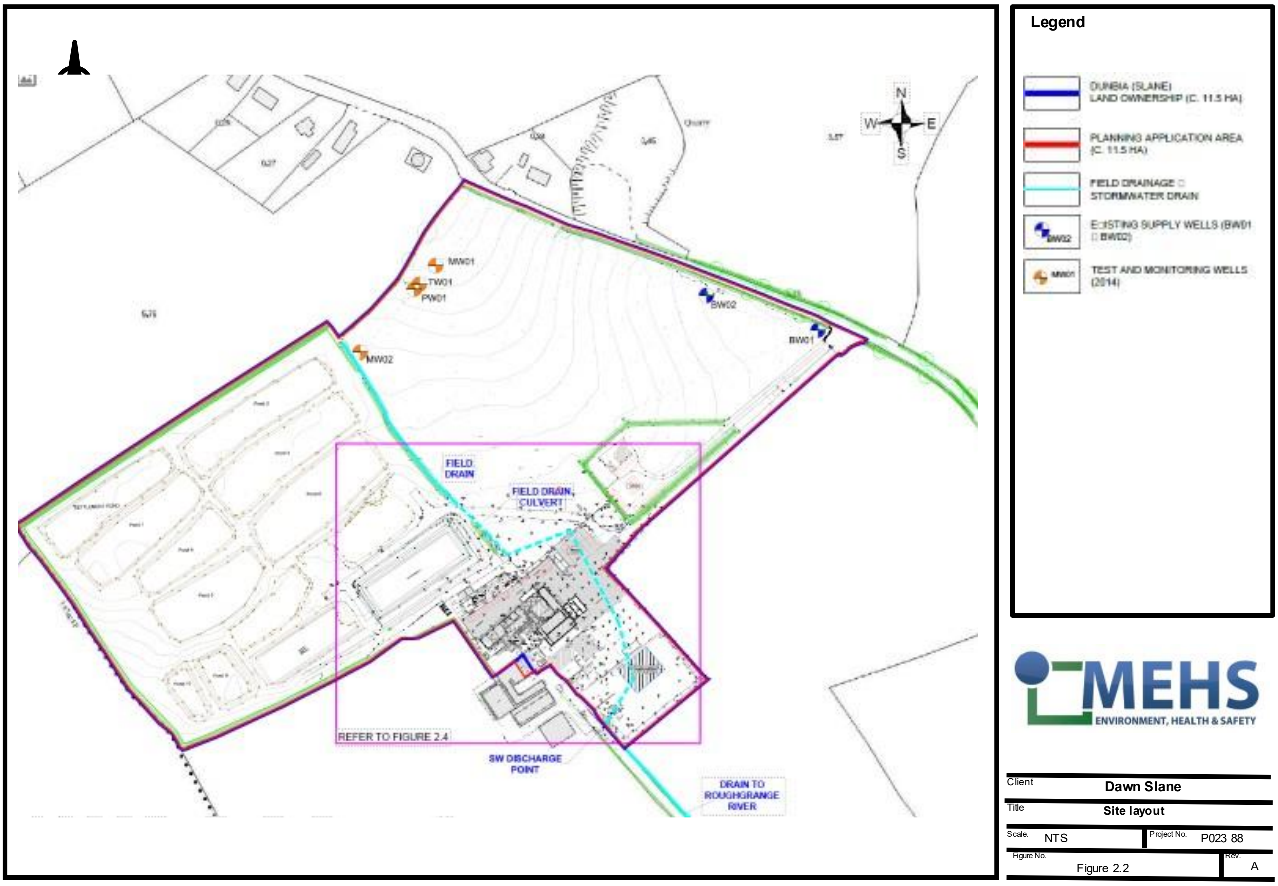

Figure 2-2 Site Layout

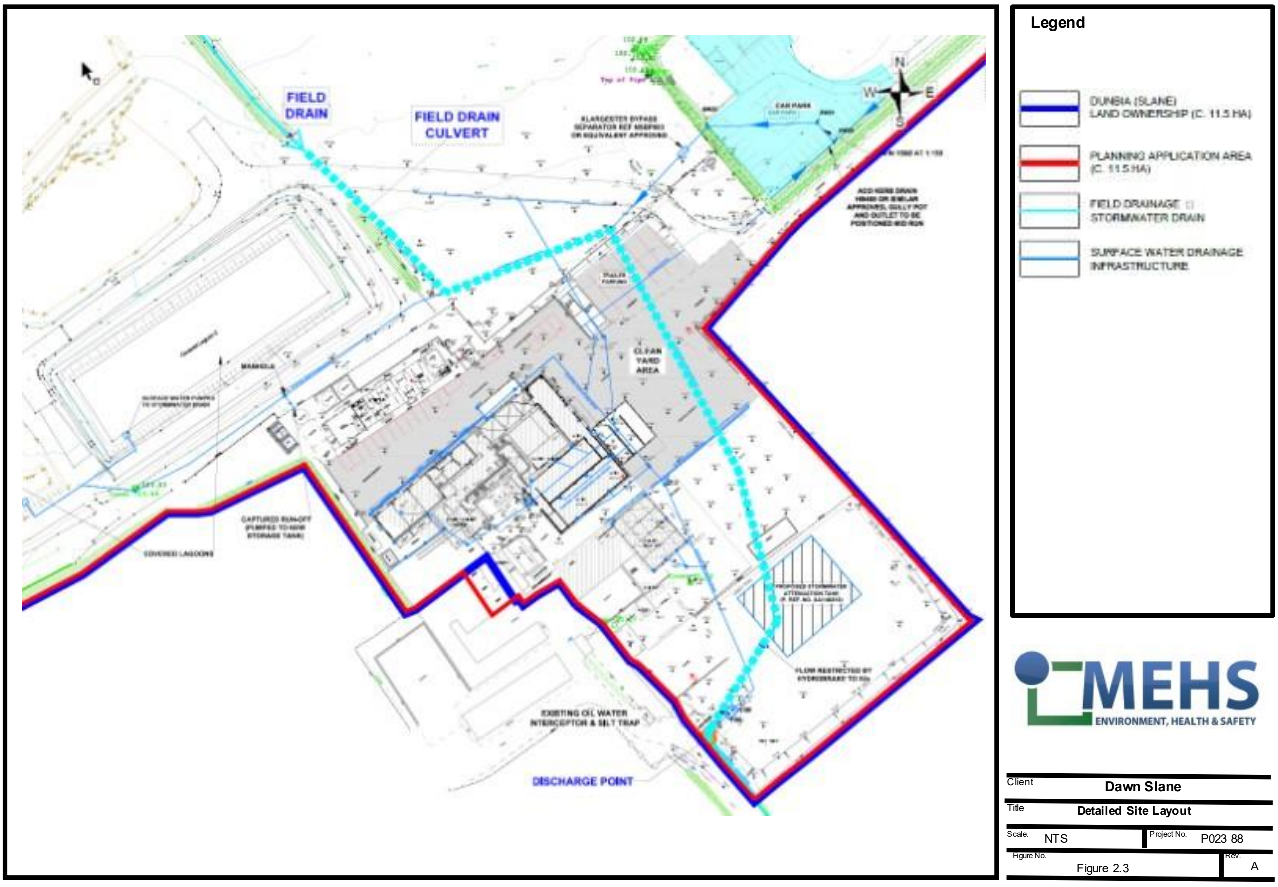

Figure 2-3 Detailed Site Layout

The application site is not located within any abstraction Source Protection Zone (SPZ) identified or delineated by the GSI or EPA. However, the eastern edge of the site may be within the supply zone for the wells serving the properties to the east of the site, although the extent of these supply zones is likely to be limited.

There is an identified SPZ close to the River Boyne at Slane, approximately 3km to the north of the site, see Figure 2-4. The application site is not located within this identified SPZ, nor is it up-hydraulic gradient of the SPZ.

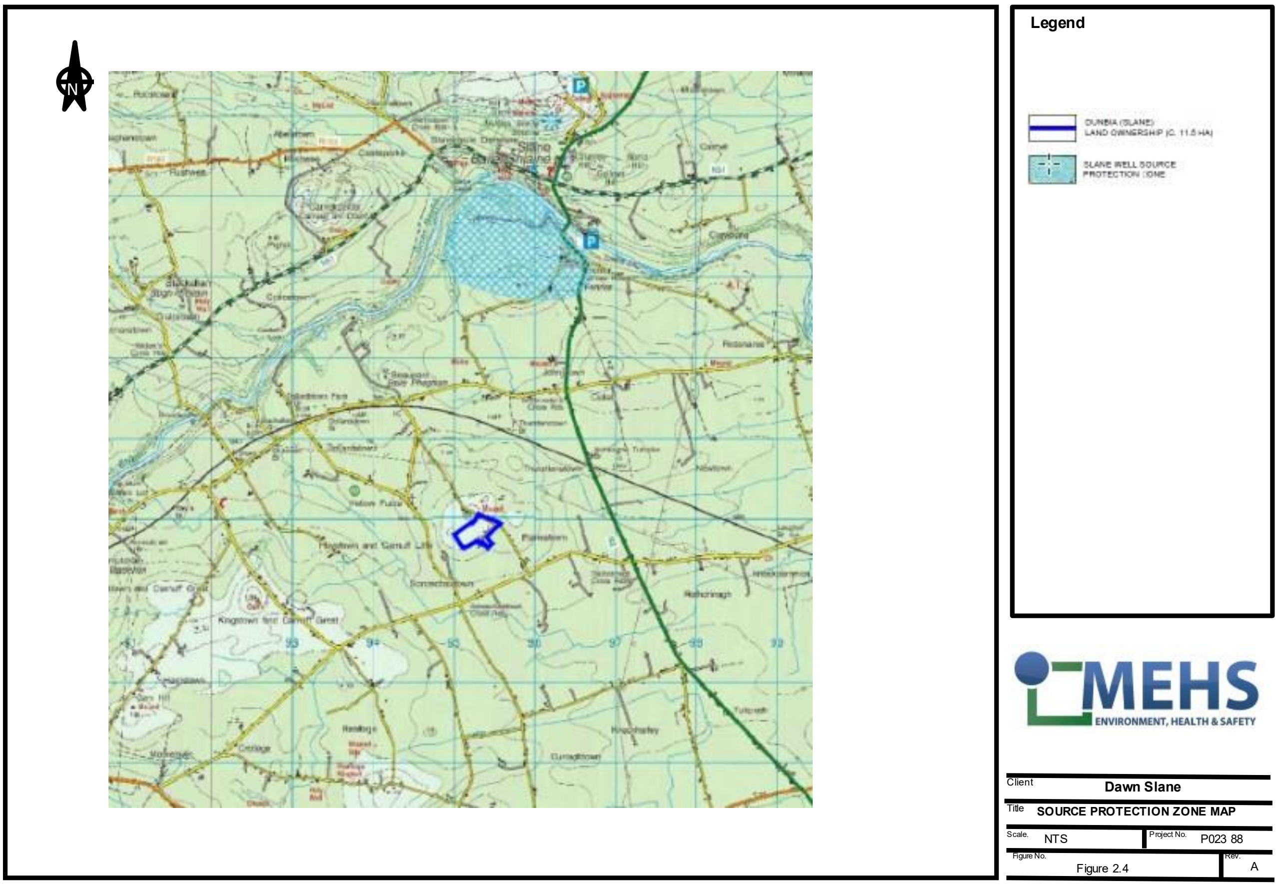

Figure 2.4 Source Protection Zone Map

The GSI also classifies the principal aquifer types in Ireland as:

- Lk - Locally Important Aquifer - Karstified
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only inLocal Zones
- Lm - Locally Important Aquifer - Bedrock which is Generally ModeratelyProductive

- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for LocalZones
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive
- Rkd - Regionally Important Aquifer (karstified diffuse)

The GSI national aquifer map of Ireland indicates the subject site is underlain with a locally Important Aquifer (Lm) - Bedrock which is Generally Moderately Productive.

2.2.2 Groundwater Vulnerability

Aquifer vulnerability is a term used to represent the intrinsic geological and hydrological characteristics that determine the ease with which groundwater may becontaminated generally by human activities. The GSI (2019) guidance presently classifies the bedrock aquifer vulnerability in the region of the subject site as '*Low*' which indicates a general overburden depth potential of >10m, indicating a natural protection of the aquifer by low permeability alluvial/glacial clays. The aquifer vulnerability class in the region of the site is presented as Insert 2.5 below.

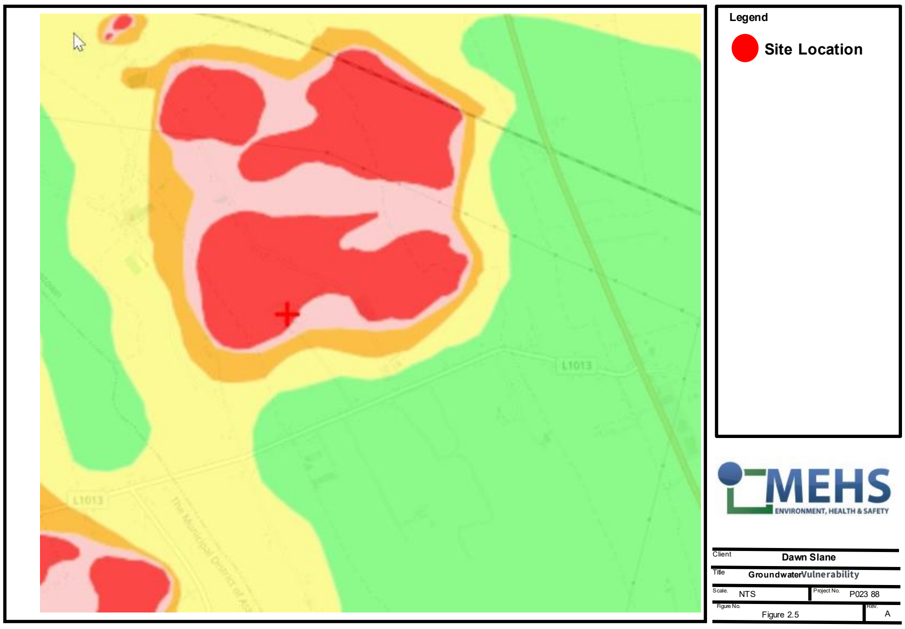

Figure 2.5 Aquifer Vulnerability (site location indicated, red dot)

On the basis of the 'High Vulnerability' classification the potential for any leakage of oil etc to ground to migrate horizontally or vertically to the underlying bedrock is considered to be relatively low.

3.0 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is developed based on a good understanding of the hydrological and hydrogeological environment, plausible sources of impact andknowledge of receptor requirements. This in turn allows possible

Source Pathway Receptor (S-P-R) linkages to be identified. If no S-P-R linkages are identified, then there is no risk to identified receptors.

3.1 Assessment of Plausible Sources

Potential sources during both the construction and operational phases are considered. For the purposes of undertaking the potential of any hydrological/ hydrogeological S-P-R linkages, all potential sources of contamination are considered *without taking account of* any measures intended to avoid or reduce harmful effects of the proposed project (mitigation measures) i.e., a worst-case scenario. Construction sources (short-term) and operational sources (long-term) areconsidered below.

Construction Phase

The following sources are considered plausible for the proposed construction site:

(i) Leakage may occur from construction site equipment. There will be no bulk fuel tank storage for re-fuelling the site. Fuel is delivered to site every few days and all plant is filled directly. There is no storage of fuel in general. At most, there may be some small amounts of fuel (less than 100L) stored in bunded containers for small plant such as consaws, compressors etc. As a worst-case scenario an unmitigated leak of 300 litres is considered. This would be a single short-term event.

(ii) Use of wet cement is a requirement during construction. Run-off water from recent cemented areas can result in highly alkaline water with high pH. As thiswould only occur during particular phases of work this is again considered asa single short-term event rather than an ongoing event.

(iii) Construction requires soil excavation and removal. Unmitigated run-off could contain a high concentration of suspended solids during earthworks. This could be considered an intermittent short-term event, i.e. if adequate mitigation measures were not incorporated in the Construction Management Plan (CMP). Removal of soil will also result in long term improvement in local water quality due to removal of historically contaminated soil.

Operational Phase

The following sources are considered plausible post construction:

(i) The proposed development will result in the installation of a sub-surface irrigation system. This system will allow treat effluent which has been filtered via a 120 micron filter.

(ii) The effluent is tested on a daily basis to ensure compliance with the Discharge License limits

(iii) The effluent will be applied at 3 litres per m^2 per day.

(iv) The use of soil water level meters will be used to ensure that ponding does not occur.

(v) The areas will be inspected daily to check for any ponding

(vi) Regular analysis of surface, groundwater and soil pore water will be carry out to ensure environmental strata are not affected.

(vii) The grass will be cut to maintain the driving range will remove from the plots and no fertiliser application or livestock.

3.2 Assessment of Pathways

The following pathways have been considered within this assessment with impact assessment presented in Section 3.4:

(i) Vertical migration to the underlying sandstone aquifer (LI) is minimised due to the recorded alluvial clays (Low Vulnerability) present at the site providing protection from any localised diesel/ fuel oil spills during either construction or operational phases. The site is underlain by (generally high permeability) limestone with poor connectivity of fractures, which the Geological Survey of Ireland classifies as a *locally Important (LI),*

(ii) There is no 'direct' hydrological or hydrogeological linkage for construction or operational run-off or any small hydrocarbon leaks from the site to the Roughgrange River or the River Boyne located farther down-gradient. However, an 'indirect pathway' doesexist through the offsite storm water network which ultimately discharges to Roughgrange River following treatment at via interceptors on-site.

3.3 Assessment of Receptors

The receptors considered in this assessment include the following:

(iii) Underlying sandstone bedrock aquifer;

(iv) Roughgrange River & River Boyne.

3.4 Assessment of Source Pathway Receptor Linkages

Table 3.1 below summarises the plausible pollutant linkages (S-P-R) considered as part of the assessment and a review of the assessed risk is also summarised below.

The clayey overburden thickness/ and a general lack of fracture connectivity associated with sandstone beneath the site will minimise the rate of off-site migrationfor any indirect discharges to ground at the site.

Should any silt-laden stormwater from construction manage to enter the public stormwater sewer i.e., without on-site mitigation, the suspended solids will naturally settle within the drainage pipes by the time the stormwater reaches any open water.

Standard mitigation e.g., use of a silt buster or similar to allow settlement of any silt laden stormwater during construction will be incorporated into the construction plan design to minimise any impacts on stormwater drains. In the event of a [theoretical] 300 litre [worst case scenario used] hydrocarbon leak fully discharging to the stormwater system during low flow conditions without mitigation (on-site interceptoror treatment), there is a low potential for some impact above water quality objectives as outlined in S.I. No. 272 of 2009/ Surface Water Amendment Regs SI No. 386 of 2015 in Roughgrange River prior to dilution. However, with the presence of an oil/ petrol interceptor, there is no likely impact above statutory thresholds. Based on the possible loading of any hazardous material during construction and operation there is subsequently no potential for impact on the Roughgrange River and River Boyne water quality status from an accidental discharge to stormwater drain.

Industrial effluent discharge will be discharge to the on-site wastewater treatment plant operated by Dawn Slane, collected in the sewer and treated at site WWTP at prior to the proposed sub-surface irrigation system. This WWTP is required to operate under an IE License to ground licence issued by the EPA and to meet environmental legislative requirements. The discharge of industrial effluent from the Dawn Slane to the WWTP and would not impact on the overall water quality within Roughgrange River and therefore would not have an impact on the current Water Body Status (as defined within the Water Framework Directive). This assessment is supported by hydrodynamic and chemical modelling within the Roughgrange River catchment including River Boyne which has shown that there is significant dilution for contaminants of concern (DIN and MRP).

The Boyne catchment is divided into 20 sub-catchments with 116 river waterbodies (which includes the Grand Canal Main Line (Boyne) & Royal Canal Main Line (Boyne) artificial waterbodies), 11 lakes, one transitional waterbody (Boyne Estuary), three coastal waterbodies (Boyne Estuary Plume Zone, Northwestern Irish Sea (HA 08) & Louth Coast (HA 06)) and 41 groundwater bodies (Figure 2).

Recent water quality assessment of River Boyne also shows that River Boyne on the whole, currently has the following:

- There is one waterbody achieving High Status,
- 64 achieving Good Status,

- 50 achieving Moderate Status and
- 29 at Poor Status.
- There are 28 waterbodies that do not have status assigned for Cycle 3.
- All waterbodies must achieve at least Good Ecological status.

The assessment has also considered the effect of cumulative events, such as release of sediment-laden water combined with a hydrocarbon leak on site. As there is adequate assimilation and dilution between the site and River Bann and the nearby SACs/ pNHAs, it is concluded that no perceptible impact on water quality would occur. It can also be concluded that the cumulative or in-combination effects of effluent arising from the proposed development with that of other developments discharging to WWTP will not be significant having regard to the size of the calculated discharge from the proposal.

Source-Pathway-Receptor

The conventional 'source-pathway-receptor' model for environmental management is useful when applying the risk concept to groundwater protection and vulnerability:

Source:

The source is the development and activity that pose a threat to groundwater. A key consideration in assessing the source is the type of contaminant, the contaminant loading, the potential hydraulic loading associated with the contaminant release, and potential the depth of release. The potential point of release of contaminants for effluent disposal activities such as sub-surface irrigation, 0.4 m below ground. The point of release is a critical reference point for groundwater vulnerability assessment and mapping.

Receptor:

The receptor is the water (groundwater & surface water) which must be protected. Wells and groundwater dependent ecosystems are obviously potential targets, but in the Irish Groundwater Protection Scheme the groundwater in the aquifer below a site is also a target in its own right. Vulnerability assessments relate to groundwater in the uppermost bedrock or sand & gravel aquifer below a site. This is a fundamental concept which underpins all the issues outlined here. Other targets that occur down-gradient of the site (e.g., wells) are important considerations in the overall risk assessment.

Pathway:

The pathway includes everything between the source and the receptor. It is from the point of release of contaminants through geological materials and layers to the groundwater (receptor). The pathway is determined by the groundwater vulnerability.

Table 3.1 Source – Pathway – Receptor pollutant linkages

Source	**Pathway**	**Receptor**	**Potential effect**	**Management controls**
Treated Effluent Discharge to sub-surface	Direct contact, ingestion and inhalation	Livestock	Toxic, hazardous to health	No livestock will be allowed on the irrigation plots.
	Uptake via plants and ingestion			
	Direct contact and ingestion	Humans (operator)	The effluent is not toxic, carcinogenic or hazardous to health	The effluent will be tested for chemical, biological and toxicity as required by the IE License
	Uptake via plants and ingestion of produce	Humans (bystanders)		
	Uptake via livestock and ingestion of silage	Humans (consumers)		
	Plant uptake	Crops	Reduction in crop yield and quality due to phytotoxicity, plant die-back, detrimental conditions to plant growth and so on	The silage will be tested to check digestibility and N, P & K analysis
	Leaching from soil to	Groundwater	Groundwater contamination –	As the application rate of 3 litres/m^2/day of is low and this will be spread out over 24 hours the risk of flooding is minimised.

	groundwater and vertical migration through the unsaturated zone		deterioration of quality, impact on potable water resource requiring treatment or closure of source of supply (borehole, well or spring)	The Trial Holes in the trial hole report (Attachment 1) shows the distance to bedrock is over 1.5 metres. The soil was a light brow sandy clay which was over 250 mm thick with a sub-soil of great than 1 metre. There were no pathways to ground water present within the trail hole. At Trial Holes the over burden was greater than 1.5 m this will further minimise the risk to groundwater.
				The irrigation plots vegetation cover will be used for silage production. No livestock will be allowed on the land and no fertiliser will be applied. The use of the land for cutting grass for collection will produce 9 tonne of grass per year (Attachment 2). On an Index 3 the Phosphorus requirement is 30 Kg/Ha/Year. If we assume that 25% of the Phosphorus required for Index 3 will be removed by Silage cutting in Index 4. We proposed that for the production of 9 tonne of grass per Ha (over 2 cuts) will remove at least 7.5 kgs of Phosphorus per year. In attachment 4 by Teagasc presentation "Phosphorus Loss Risk & Mitigation from Agricultural Landscapes" slide 7 shows that soils Index rating can be reduced. The existing soil mapping shows that the plot are between Index 2 and 4 over the next 3 to 5 years as part of the planned management strategy of sub-surface irrigation, no fertiliser or livestock and cut of grass the indexing of all plots will reduced.
				The Application of 3 litres/m2/day will result at the maximum volume of 10,095 litres per Ha. At a Total Phosphorus of 0.1 mg/l (0.0001 kg/m3) will result in 1.095 kgs of Phosphorus been applied per year. The cutting of grass will remove 7.5 kg of P/y/Ha, therefore a reduction of 6.405 kg of Phosphorus will take place per year per Hectare.
				The automated irrigation system will allow for controlled application of the treated effluent, and this prevent ponding via integrated soil water monitoring.
				In the event of ponding in an irrigation area, the effluent will be diverted to storage or Tankering off site.

				Presence of various monitoring equipment such as soil water level monitors, soil pore water wells, groundwater monitoring wells and surface water monitoring points will ensure that no negative impact on groundwater will occur.
				The daily inspection of the land to ensure that no leakage occurs on the system as part of the current license conditions. Logs of such inspections will be available for inspection by EPA, Meath CC & IFI.
				In grass will be cut short prior to installation of the drip feed system which will aid in the inspection of the system upon installation. The system will be pressurised in small sections to ensure the integrity of the system.
				A nutrient Management Plan will be complied each year as part of the License, and this will monitor the reduction in Phosphate as part of the no Fertiliser/Livestock and cutting of grass.
				The list of raw materials on-site, does not include any chemicals potentially presenting a risk to soils and the agricultural food chain and many include PTEs, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dioxins and furans, veterinary medicines and pesticides.

Source	Pathway	Receptor	Potential effect	Management controls
Treated Effluent Discharge to sub-surface	Surface run off and lateral migration within groundwater	Surface Water	Surface water contamination – deterioration of water quality, sediment loading	As the application rate of 3 litres/m2/day of is low and this will be spread out over 24 hours will minimise the risk to surface water.
				Presence of various monitoring equipment such as Soil water level monitors, Soil Pore water well, Groundwater Monitoring Well and Surface Water Monitoring Point will ensure that no negative impact on surface water will occur.
				The irrigation plots vegetation cover will be used for silage production. No livestock will be allowed on the land and no fertiliser will be applied. The use of the land for cutting of grass will produce 9 tonne of grass per year (Attachment 2). On Index 3 land, the Phosphorus requirement is 30 Kg/Ha/Year. If we assume that 25% of the Phosphorus required for Index 3 will be removed by Silage cutting in Index 4. We proposed that for the production of 9 tonne of grass per Ha will remove at least 7.5 kgs of Phosphorus per year. In attachment 4 by Teagasc presentation "Phosphorus Loss Risk & Mitigation from Agricultural Landscapes" slide 7 shows that soils Index rating can be reduced. The existing soil mapping shows that the plot is between Index 2 and 4 over the next 3 to 5 years as part of the planned management strategy of sub-surface irrigation, no fertiliser or livestock and cutting of grass the indexing of all plots will reduced.
				The daily inspection of the land to ensure that no leakage occurs on the system as part of the current license conditions. Logs of such inspections will be available for inspection by EPA, Meath CC & IFI.
				In all plots the grass will be cut short prior to installation of the drip feed system. This will aid in the inspection of the system upon installation. The system will be pressurised in small sections to ensure the integrity of the system.
				The automated irrigation system will allow for controlled application of the treated effluent, and this prevent ponding via integrated soil water monitoring.

				The application of 3 litres/m2/day will result at the maximum volume of 10,095 litres per Ha. At a Total Phosphorus of 0.1 mg/l (0.0001 kg/m3) in the treated effluent will result in 1.095 kgs of Phosphorus been applied per year per Hectare. The cutting of grass will remove 7.5 kg of P/y/Ha, therefore a reduction of 6.405 kg of Phosphorus will take place per Hectare.
				The automated irrigation system will allow for controlled application of the treated effluent, and this prevent ponding via integrated soil water monitoring.
				In the event of ponding in a irrigation area will be tankered off site for disposal
				A nutrient Management Plan will be complied each year as part of the License, and this will monitor the reduction in Phosphate as part of the no Fertiliser/Livestock and cutting grass twice per year.
				The list of raw materials on-site, does not include any chemicals potentially presenting a risk to soils and the agricultural food chain and many include PTEs, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dioxins and furans, veterinary medicines and pesticides.

Source	**Pathway**	**Receptor**	**Potential effect**	**Management controls**
Treated Effluent Discharge to sub-surface	Migration of effluent to adjacent sites, direct contact and uptake via soil vertebrate and invertebrate followed by transmission through the ecological food web	Ecological designation/ wildlife	Harm to protected sites and species through indirect contamination of sites adjacent to spreading area	The monitoring of Ground, Soil and Surface water will ensure that no migration of effluent takes place

4.0 CONCLUSIONS

A conceptual site model (CSM) has been prepared following a desk top review of the site and surrounding environs. Based on this CSM, plausible Source-Pathway-Receptor linkages have been assessed assuming an absence of any measures intended to avoid or reduce harmful effects of the proposed project (i.e. mitigation measures) in place at the proposed development site.

There is no 'direct' Source-Pathway linkage between the proposed development site and open water (Roughgrange River & River Boyne). It is concluded that there is also no impact from the additional discharge from the proposed development through the combined public [foul and stormwater] sewer network which could result in any change to the current water regime (water quality or quantity).

The proposal will be subject to a IE license from EPA to employ a number of irrigation plots, these will have grassland vegetation cover. No livestock will be allowed on the land and no fertiliser will be applied. The use of the land for grass will produce an estimate 9 tonne of silage per year (Attachment 2). On Index 3 land, the Phosphorus requirement is 30 Kg/Ha/Year and we have assumed for a conservative calculation that 25% of the Phosphorus required for Index 3 will be removed by grass cutting in Index 4. We proposed that for the production of 9 tonne of grass per Ha (over 2 cuts) will remove at least 7.5 kgs of Phosphorus per year. In attachment 4 by Teagasc presentation "Phosphorus Loss Risk & Mitigation from Agricultural Landscapes" slide 7 shows that soils Index rating can be reduced by no application of fertiliser or no livestock.

Finally, and in line with good practice, appropriate and effective mitigation measures have been included in the construction design, management of construction programme and during the operational phase of the proposed development. These specific measures will provide further protection to the receiving soil and water environments. However, the protection of downstream European sites is in no way reliant on these measures.

5.0 REFERENCES

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2019)

Attachments

Attachment 1 Soil Characterisation and Site Suitability Assessment of Proposed Drip Irrigation System, September 2023.

SOIL CHARACTERISATION AND SITE SUITABILITY ASSESSMENT REPORT OF PROPOSED DRIP IRRIGATION SYSTEM

DAWN MEATS – SLANE, GREENHILLS, BEAUPARC, CO. MEATH, C15 CF38

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FINAL

Project Title: Hydrogeological Assessment of Proposed Drip Irrigation System

Project No: **MEHS-23-89**

Status: FINAL

Client: DAWN MEATS – SLANE,
GREENHILLS,
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Issued By: **Montgomery EHS Ltd**

Document Production / Approval Record

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Unless otherwise stated in this Report, the assessments made assume that the site and facilities will continue to be used for their current purpose without significant change. The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested. Information obtained from third parties has not been independently verified by MEHS, unless otherwise stated in the Report.

Where assessments of works or costs required to reduce or mitigate any environmental liability identified in this Report are made, such assessments are based upon the information available at the time and may be subject to further investigations or information which may become available. It is therefore possible that cost estimates, where provided, may vary outside stated ranges. Where assessments of works or costs necessary to achieve compliance have been made these are based upon measures which, in MEHS's experience could normally benegotiated with the relevant authorities under present legislation and enforcement practice, assuming a pro-active and reasonable approach by site management.

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1 INTRODUCTION

1.1 General Introduction

This report presents a hydrogeological assessment of the proposed drip irrigation system at the Dawn Meats – Slane, Greenhills, Beauparc, Co. Meath, C15 CF38 (the site). The site location is shown in Figure 1. Dawn Meats – Slane is a Cattle Slaughtering site with all associated services.

Process effluent from the site is treated in an on-site wastewater treatment plant. Effluent from the wastewater treatment plant currently tankered to external wastewater treatment plants. The site has no waterbody close to the site with the assimilative capacity for dispersal of the effluent generated on-site, an alternative means of discharging treated process effluent from the facility is be required. Drip irrigation has been identified by MEHS on behalf of Dawn Meats – Slane as aviable solution.

The proposed drip irrigation system will be regarded by the EPA and some Local Authorities as an indirect discharge to groundwater. Under the Groundwater Regulations indirect discharges of effluent togroundwater are permitted provided they do not contain substances that are hazardousin groundwater, and provided there is no adverse impact on nearby receptors, such as groundwater abstraction wells or surface water courses that receive groundwater baseflow.

This hydrogeological assessment has been prepared with reference to the EPA's publication "*Guidance on the Authorisation of Discharges to Groundwater*" (version 1, December 2011 - hereafter referred to as 'EPA 2011'). The assessment takes into consideration available information on the local geology and hydrogeology of the site, as well as characteristics of the planned discharge.

1.2 Objectives

The primary objective of this hydrogeological assessment is to assess whether the discharge of treated process effluent from the proposed drip irrigation system will comply with the Groundwater Regulations[1]. The Groundwater Regulations aim to give effect to the measures needed to achieve the environmental objectives established for groundwater by the Water Framework Directive (WFD). Quoting from Regulation 2 of the Groundwater Regulations, the objectives of the WFD include the following:

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[1] European Communities Environmental Objectives (Groundwater) Regulations (S. I. No. 9 of 2010, as amended)

- prevent or limit the input of pollutants into groundwater and to prevent the deterioration of the status of all bodies of groundwater,
- protect, enhance and restore all bodies of groundwater and to ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status by not later than 22 December 2015,
- the reversal of any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order to progressively reduce pollution of groundwater.

1.3 Approach to Assessment

As outlined in EPA 2011, the assessment of a discharge to groundwater activity should be risk-based and focused on potential impacts on local receptors such as groundwater, surface water and users of these resources. The recommended approach is to follow a 'source-pathway-receptor' (SPR) model and to assess the potential impact of viable SPR linkages.

The main aspects that need to be considered in the assessment are:

- Source characterization – what are the constituents of potential concern (COPCs) in the discharge and what is the expected rate of discharge?
- Pathways analysis – what pathway will the treated effluent take following discharge? To what extent will the COPCs be expected to attenuate? Is there a potential pathway linking the source to a local receptor?
- Receptor identification – who or what could potentially be affected by the discharge?

1.4 Available Information

The hydrogeological assessment presented in this report has drawn on information on the environmental setting of the Emyvale area available from the Geological Survey of Ireland (GSI), the EPA and Ordnance Survey Ireland (OSI). In addition, the following information was provided by Castle Dragan:

- Data on treated effluent quality and flow rate;
- Results from a series of percolation tests completed within lands in the vicinity of the site in June 2023;
- Preliminary design information on the proposed drip irrigation system.

2 ENVIRONMENTAL SITE SETTING

2.1 Site Description

The Dawn Meats Slane is located in a rural area of Co. Meath on the southwest of Slane. The N2 Dublin to Derry runs approximately 2 km west to the eastern boundary of the site.

The cattle processing plant is occupied mainly by buildings, WWTP and internal roadways. Thewastewater treatment plant is located on the north side of the processing plant.

To the west, south, east, and north of the site are areas of pastureland. To the northeast is some residential dwellings.

The village of Slane is to the north and the village of yellow furze is located southwest of the site.

The site is on a gently sloping site with the level at the entrance level at 96 meters and the highest at the 111 m. The site of the proposed surface irrigation percolation area is relatively gently sloping from north to southeast with an average level of 105 metres above Ordnance Datum (m AOD).

2.2 Site Geology

2.2.1 Bedrock

According to the Geological Survey of Ireland (GSI) data viewer, topsoil underlying the subject site is classified as made ground, the topsoil type underlying the agricultural grasslands bordering the site is described as carboniferous limestone and shales from the Loughshinny Formation, with a small area of Namurian shales from the Donore Formation occurring around the eastern site boundary.

2.2.2 Overburden

GSI mapping indicates that subsoil is classified as till derived from sandy gravelly clay (glacial till / boulder clay).

Observations made during a programme of percolation testing completed during September 2023 confirmed that the predominant soil type across the pasture lands surrounding the site is sandy gravelly clay (glacial till / boulder clay) with some areas of clay soil also present.

2.3 Site Hydrogeology

According to the Geological Survey of Ireland (GSI) data viewer, topsoil underlying the subject site is classified as made ground, the topsoil type underlying the agricultural grasslands bordering the site is described as carboniferous limestone and shales from the Loughshinny Formation, with a small area of Namurian shales from the Donore Formation occurring around the eastern site boundary. The subsoil is classified as till derived from sandy gravelly clay (glacial till / boulder clay).

The GSI data viewer indicates that the subject site is not located within a source protection zone and there are no source protection zones within 5km.

There are two existing abstraction wells (BW01 and BW02) at the site which currently meet the water supply requirements of the Dunbia plant, the locations of which are shown on Figure 1 and 2. There are a number of private wells serving residential properties along the public road (Windmill Road) immediately to the east of the site recorded on the GSI well database, refer to Figure 3. The are 3 abstraction wells in the immediate vicinity of the application site recorded in the EPA Abstraction Register.

In a number of the excavation's groundwater was not observed, implying a depth to groundwater at these locations of greater than the depth of excavation of 2.6 – 3.1 m. These observations indicate that there may be non-continuous perched groundwater bodies within the soil.

2.4 Surface Water Features

The site is located in the Boyne River Basin District, within the River Boyne WFD catchment. According to the EPA GIS map viewer, a number of water bodies occur in close proximity to the subject site. The closest water body is Roughgrange River which is located on the south 700 metres from the proposed irrigation site. Other water bodies include River Boyne c.2.9 km north and River Nanny c.4.9 km south. The most predominant and widely known water body feature of the region is River Boyne, situated c.2.9 km north of the subject site. Groundwater flow at the site is predicted to be towards the southeast.

3 PROPOSED DRIP IRRIGATION SYSTEM

Dawn Meats – Slane is proposing to install a drip irrigation system within the two fields on the north of the processing site as a means of discharging treated effluent from the site. The reporton the percolation tests completed in September 2023 for Dawn Meats – Slane concluded that the soils underlying the pastureland where the tests were performed would be acceptable for a drip irrigation system, taking into consideration the depth to the water table, seasonal variations in the water table and the percolating quality of the soils.

Drip irrigation involves the controlled discharge of effluent into soil typically at a depth of 400 – 500mm below ground level via a network of pressurised pipes. The effluent is discharged into the soil via a series of "emitters" within the pipe wall, which enable the flow rate across the pipe network to be controlled and distributed evenly. The pipes are installed directly into the soil using a mole plough fitted to a standard agricultural tractor. No filter gravel is required around the pipes. The typical spacing between pipes is 400mm.

Drip irrigation systems are commonly used in situations where point source discharges to surface water are not possible due to the environmental sensitivity of the receiving streams. They are also commonly used at sites where conventional percolation systems are not appropriate due to the presence of low permeability soils or sloping ground.

Based on past experience from sites with similar soil type, the supplier of the drip irrigation system has recommended a preliminary application rate of 3 litres of treated effluent per square metre per day (3 litres/m^2/day). Currently 150 – 250 m^3 of treated effluent is generated at the site per day or 750 to 1250 m^3/week. At the proposed preliminary application rate of3 litres/m^2/day, the drip irrigation system will need to cover an area of approximately 7.0 hectares. However, the site is currently expanding and it is understood that site management wishes to install a drip irrigation system that is capable of discharging up to 200 m^3/day or 1400 m^3/week. At an application rate of 3 litres/m^2/day, the drip irrigation system willneed to cover an area of approximately 7.0 hectares.

The current concept put forward by the supplier of the drip irrigation system is to install a series of independent "drip-fields", each containing multiple zones of drip irrigation pipes of the order of 70,000 m^2 in area.

4 CONCEPTUAL SITE MODEL (CSM)

In this section, the proposed drip irrigation system is presented in the context of a Conceptual Site Model. The planned indirect discharge of treated effluent to groundwater is characterised in terms of hydraulic loading and contaminant loading. SPR linkages that potentially link the indirect discharge to local receptors are also considered.

A schematic representation of the CSM is illustrated in Figure 4.

4.1 Source Characterisation

The waste water treatment plant at the site is a biological plant that utilises activated sludge technology to reduce the organic content of the influent water. The treatment system has the following stages:

Primary treatment: This involves screening to remove gross solids, flow balancing and treatment by a Dissolved Air Floatation.

Secondary treatment: This stage comprises a Completely Mix Aeration system. The effluent passes through an initial anoxic contact tank where the effluent is mixed with activated sludge from the final stage of the process. The effluent then passes to the aerobic tank, where it is actively managed to optimise BOD removal. Retention time in the aerobic tank is 3 - 4 days. Waste sludge needs to be removed from the system on a daily basisin order to maintain treatment performance. The sludge that is removed is spread on designated land banks.

The effluent is then dosed with a flocculant before passing to a clarifier, where the solid biomass is allowed to settle from the treated effluent. The sludge is retained in the clarifier and the treated water discharges from the plant via a V-notch weir.

The flow rate of treated effluent discharging from the waste water treatment is typically in the range 160 - 230 m^3/day, with an average of approximately 200 m^3/day.

The discharge is not expected to contain substances that are considered hazardous in groundwater.

From the perspective of compliance with the Groundwater Regulations, the key parameters to consider in relation to the proposed indirect discharge are ammoniacal nitrogen (total ammonia) and MRP.

With regard to ammoniacal nitrogen, the GTV of 0.065 mg/l is applicable when considering potential impacts on surface water bodies from groundwater inputs, whereas the GTV of 0.175 mg/l is applicable when considering whether the ability of groundwater in a GWB to support human uses has been significantly impaired.

With regard to phosphorus, the GTV is for MRP rather than total phosphorus. The GTV for MRP of 0.035 mg/l is applicable when considering potential impacts on surface water bodies from groundwater inputs.

It is recognised that pathogenic micro-organisms may be present in the treated effluent. Although there is no applicable GTV for pathogens, the potential for pathogens to be present in the treated effluent has been considered in the assessment.

4.2 Migration Pathways

Treated effluent that enters the subsurface via the proposed drip irrigation system can be expected to follow one of two pathways:

- The treated effluent may be drawn into the root zone of plants growing in the topsoil and emitted as water vapour to the atmosphere via the process of transpiration;
- The proportion of the treated effluent that is not drawn into the root zone of the plants can be expected to migrate vertically down through the unsaturated zone soils to the water table, which based on available data lies close to the interface between the glacial till and the underlying bedrock.

Because each of the "drip-fields" is expected to be laterally extensive, the lateral migration of treated effluent within the shallow soils around the periphery of each drip-field is not expected to be significant in terms of volumetric flow; i.e. the predominant flow direction of the discharged water is expected to be downward.

Treated effluent migrating down through the glacial till is expected to discharge to the underlying limestone aquifer. The rate of migration can be expected to be relatively slow given the predominantly silty nature of the till; the travel time may be of the order of one year (based on a permeability of 0.01 m/day, porosity of 0.2 and thickness of overburden of 20m). Lateral flow of groundwater within the glacial till can be expectedto be limited, and for the purposes of this assessment has be ignored.

Once in the bedrock aquifer, indications from site measurements are that groundwater in the bedrock aquifer flows generally towards the south-east.

4.3 Potential Receptors

The bedrock aquifer underlying the site and the area down-gradient of the site is considered the key environmental receptor potentially at risk of impact from the drip irrigation system. Users of groundwater from the aquifer down-gradient of the site have also been considered potential receptors in the risk assessment.

The bedrock aquifer in the vicinity of the site has been classified by the GSI as "locally important".

It should be noted that the GSI's well records may not be complete, and it is possible there are private wells in the area south-east of the site that are not included in the GSI's records.

It is possible that the streams, Roughgrange River and River Boyne receives groundwater baseflow from the bedrock aquifer under the site; however, the contribution of groundwater from the site to the river is likely to be small relative to the flow rate in the river. As a result, the Roughgrange River & Boyne River is not considered to be at risk of impact from the drip irrigation system and it hasnot been considered a receptor in the risk assessment.

4.4 Potential Pollutant Linkages

A CSM for the site that incorporates the local geology and hydrogeology, and the indirect discharge to groundwater from the proposed drip irrigation system, is presented in cross section in Figure 4.

The potential pollutant linkages that have been considered in this assessment are as follows:

- Migration of effluent from the drip irrigation system via the glacial till to the bedrock aquifer. The focus of this potential pollutant linkage is on whether it is compliant with the Groundwater Regulations;
- Migration of effluent from the drip irrigation system via the glacial till to local groundwater abstraction wells. The are no wells on-site; however, there may be other wells that are noton the GSI's well database. The focus of this potential pollutant linkage is on thepotential impacts on water quality in abstraction wells located down-gradient ofthe site.

4.5 Appropriate Tier of Assessment

Section 4 of EPA 2011 recommends that a tiered approach be taken to the assessment of potential impacts on groundwater and other potential receptors.

The key risk factors associated with the drip irrigation are listed below:

- Groundwater vulnerability – the GSI classification is "low" with a localised area of "high" vulnerability in the north-east area of the site;
- Chemical load – the quality of the treated effluent is good and the key constituents of potential concern are non-hazardous in groundwater. The waste water treatment system consistently meets the ELVs specified in the IE licence;
- Chemical status of the GWB – currently "good";
- Hydraulic loading – the proposed hydraulic loading is relatively high for a drip irrigation system. The system is expected to cover several hectares of land due to the silty nature of the overburden in the vicinity of the site and the anticipated low application rate.

A key concern with the proposed drip irrigation system is considered to be the ability to reliably discharge the treated effluent into the ground without causing water logging or "break-out" at ground surface. With this risk factor in mind, and the scale of the proposed discharge, it is considered appropriate that a Tier 2 assessment is undertaken.

5 TIER 2 RISK ASSESSMENT

With reference to EPA 2011, the following aspects have been considered in the Tier 2 risk assessment:

- Infiltration capacity;
- Subsoil characterisation;
- Groundwater characterisation;
- Assessment of potential impacts.

5.1 Infiltration capacity

During the soil percolation tests undertaken in September 2023, groundwater wells installed with groundwater levels recorded in the 2 additional wells and 6 existing wells at depths ranging from 9.5 m to 11.1 m below ground level. In a number of the excavation's groundwater was not observed, implying a depth to groundwater at these locations of greater than the depth of excavation of 3.1 m. These observations indicate that there may be non-continuous perched groundwater bodies.

The percolation test results in terms of "P" value (i.e. the time it took for the water level in the trial holes to drop 100 mm) were varied. Approximately half of the P values were in the range 140 to 200, which is consistent with the soils observed at these locations. The remainder of the tests gave P valuesgreater than 200, indicating clay-dominated soil.

It is clearly important that the rate of input of treated effluent into the soil does not exceed the rate that groundwater is able to drain from the till into the underlying aquifer. If the rate of input of treated effluent is too high, there is potential forexcessive mounding of the water table to take place. This could potentially result in thewater table intersecting the ground surface, resulting in water logging or ponding. On areas of sloping ground, this could result in effluent migrating down-slope as uncontrolled run-off.

As such, establishing an optimal application rate for the drip irrigation system is important. This aspect needs to be considered in the detailed design of the system and during commissioning of the system. It should be noted that the optimal application rate can be expected to vary by area, depending on the permeability of the soil and on the depth to groundwater.

Additional permeability testing of soil in the areas that have already been assessed is not considered necessary; rather, it is considered appropriate that once each drip-field is established, they are monitored over a period using a range of application rates to assess their hydraulic performance. Based on the results of these trials an optimum application rate can be determined for each drip-field.

The preliminary application rate of 3 $l/m^2/day$ is expected to be conservative for the areas of land where P values of up to 30 were observed and it is likely in some areas a higher application rate will be sustainable. It is possible that in areas of more clayey soil an application rate less than 3 $l/m^2/day$ will be achievable.

It is recommended that the north-east area of the site is assessed for possibly inclusion in the overall drip irrigation system; this includes the area around the slurry storage lagoon, and the areas west and south of the lagoon. Indications from GSI mapping are that these areas may be underlain by gravelly soils, which can be expected to have significantly higher infiltration capacity than the silts and clays observed elsewhere.

Regardless of the application rate that can be achieved in each drip-field, the degree of groundwater mounding that occurs in response to the discharge of effluent also needs to be considered. This may be the controlling factor in terms of application rate, particularly in areas where the water table is relatively shallow.

With a view to monitoring the degree of mounding in the water table over time, it is recommended that a groundwater monitoring well is installed within each drip-field. These wells will provide useful information that can be used to assist with system optimisation during the initial period of operation, and to monitor the performance of the drip-fields on an ongoing basis.

5.2 Subsoil Characterisation

As outlined earlier, GSI mapping indicates that soil type under the pasture lands close to the site is predominantly stiff light brown to brown gravelly silty clay derived from the local bedrock. Observations made during the percolation tests confirmed that the predominant soil type across the pasture lands is light brown clay with some areas of gravelly soil clay also present.

5.3 Groundwater Characterisation

As outlined earlier the bedrock formations that underlie the site are classified by the GSI as "Locally Important aquifers – bedrock which is generally moderately productive (Lm)". The GSI has classified the vulnerability of these aquifers as "low" across most of the site and the surrounding pasture land, with localised areas of "moderate" or "high" vulnerability indicated close to the north-eastern site boundary.

There are 6 existing wells on-site and two new wells and the GSI does not contain any borehole logs.

The Geological Survey of Ireland (GSI) characterises the Trim groundwater body as follows:

- main aquifer lithology comprises Dinantian Upper Impure Limestones (Calp Limestones) which are typically impure limestones and limestones interbedded with calcareous shales; extremely heterogenous, with highly variable karsification and structural deformation (folded and faulted) throughout the area;
- a locally important aquifer ('Lm' aquifer classification) which is generally moderately productive, although it includes small areas of regionally important karstified aquifer (<5km2) dominated by diffuse flow (Rkd), and
- small generally unproductive areas (Pl) except for local zones (Ll);
- Slane Water Scheme, Co. Meath, pumping tests indicate a permeability range of

70m2/day to 200m2/day (PW1) and specific yield of 0.002 (Trial Well No. 2), representing unconfined aquifer conditions groundwater flows from the areas of high recharge in the uplands, where soils are thin, to the main surface water bodies overlying the aquifer (e.g. River Boyne); variable aquifer thickness, due to highly variable structural and

- weathering influences on the bedrock across the region;
- evidence of groundwater inflows from cavities 50m below ground level (at Summerhill and Enfield, Co Meath).

At the Dawn Meats – Slane site, the Glacial Till overlying the unconfined bedrock aquifer is up to 3m in thickness. There is no overlying sand and gravel aquifer. The bedrock aquifer characteristics are shown in Figure 4.

A review of the GSI karst database indicates that there are no identified karst landforms or features within 5 km of the application site.

5.4 Risks to Receptors

The vulnerability of the bedrock aquifer is classified as "high" by the GSI across all areas where the drip irrigation system is currently proposed. This reflects both the thickness of the overburden in the areas of interest, as well as the relatively low permeability of the soils of the area.

Added to this, the levels of key COPCs in the treated effluent discharging from the waste water treatment plant are not particularly high relative to those observed in the groundwater. For example, average concentrations of total ammonia appear to be similar to background levels in the bedrock aquifer.

Concentrations of key COPCs can be expected to attenuate as the effluent migrates down through the overburden, and an element of dilution can be expected as the effluent discharges from the overburden into the bedrock aquifer. The degree of attenuation that will be observed is difficult to estimate with any accuracy.

With regard to pathogens, the travel time for the treated effluent to migrate vertically down to the bedrock aquifer can be expected to be approximately one year (based on a permeability of 0.01 m/day, porosity of 0.2, and an overburden thickness of 20m). It is unlikely that pathogens present in the treated effluent as it discharges to the drip-fields will survive that long in the subsurface.

As outlined earlier, the risk to water quality in the surface waters down-gradient of the drip-fields is considered low.

6 GROUNDWATER COMPLIANCE MONITORING

The site's current IE licence includes the requirement to monitor groundwater quality in AGW01, AGW02 and AGW03 biannually. Monitoring of these three wells is considered adequate for the purposes of compliance monitoring of the current operations at the site.

Additional groundwater monitoring is considered necessary linked to operation of the proposed drip irrigation system. The aims of this monitoring would be as follows:

- To monitor the degree of groundwater mounding within the overburden in each drip-field and to use measurements from this monitoring to optimise application rates across each drip-field;
- To monitor groundwater quality in the overburden for key COPCs. The analytical suite should include total ammonia and indicator pathogens E. Coli, total coliforms and faecal coliforms.

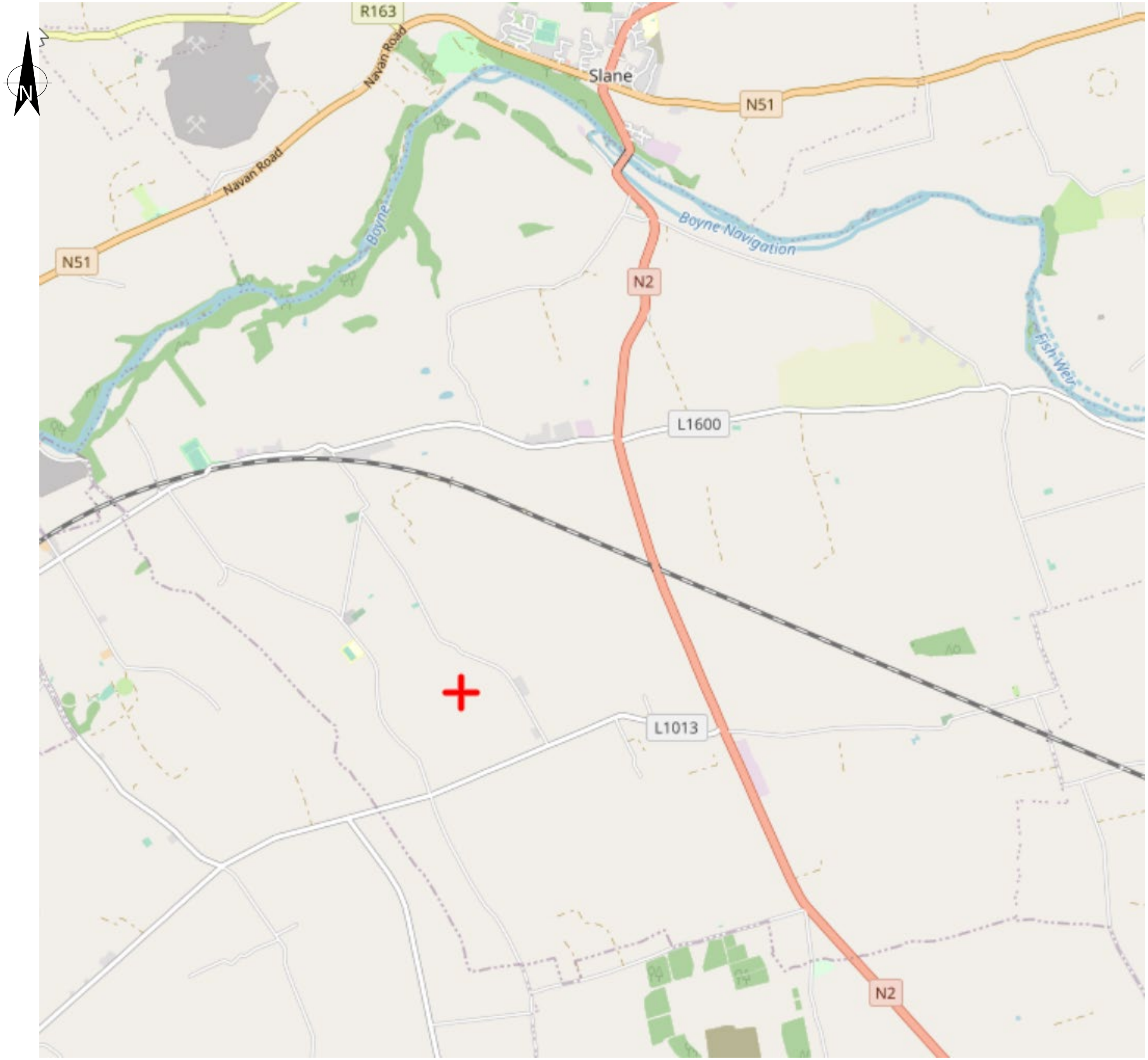
7 CONCLUSIONS

Based on the CSM presented herein, the following conclusions can be drawn:

- Any impact on the bedrock aquifer as a result of the proposed discharge in terms of increases in COPC concentrations is expected to be minor. Exceedance of GTVs for the key COPCs is not expected at any point within the aquifer;
- The discharge is not expected to have a significant impact on groundwater quality in the proposed groundwater well;
- The discharge is not expected to have an impact on local surface waters, provided application rates are monitored and controlled;

In summary, it is expected that the indirect discharge of effluent from the proposed drip irrigation system will be compliant with the Groundwater Regulations.

FIGURES



Legend

Site Location

MEHS
ENVIRONMENT, HEALTH & SAFETY

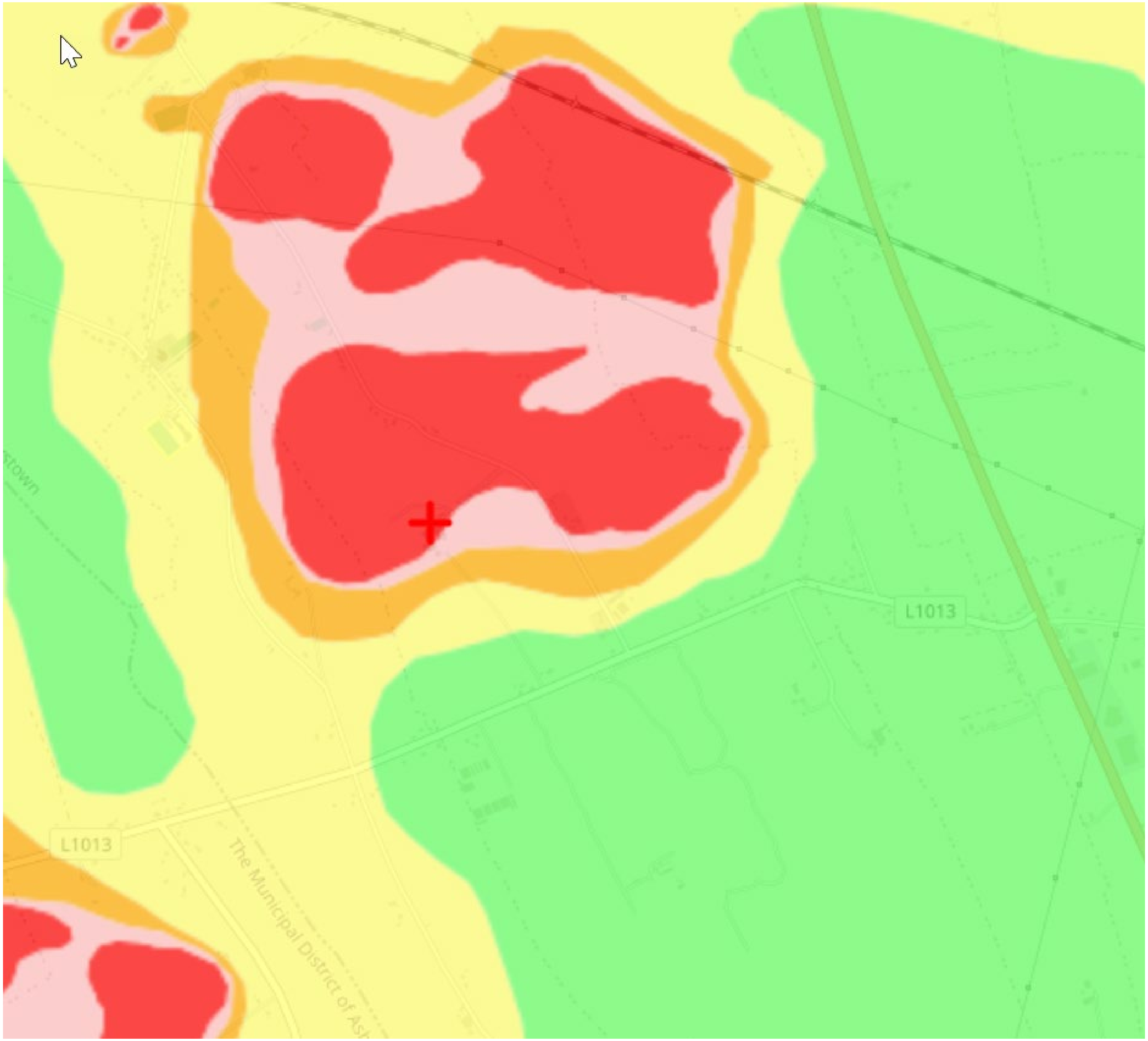
Client	Dawn Slane
Title	Mapping
Scale. NTS	Project No. P023 88
Figure No. Figure 1	Rev. A

Legend

Site Location

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Mapping
Scale. NTS	Project No. P023 88
Figure No. Figure 3	Rev. A

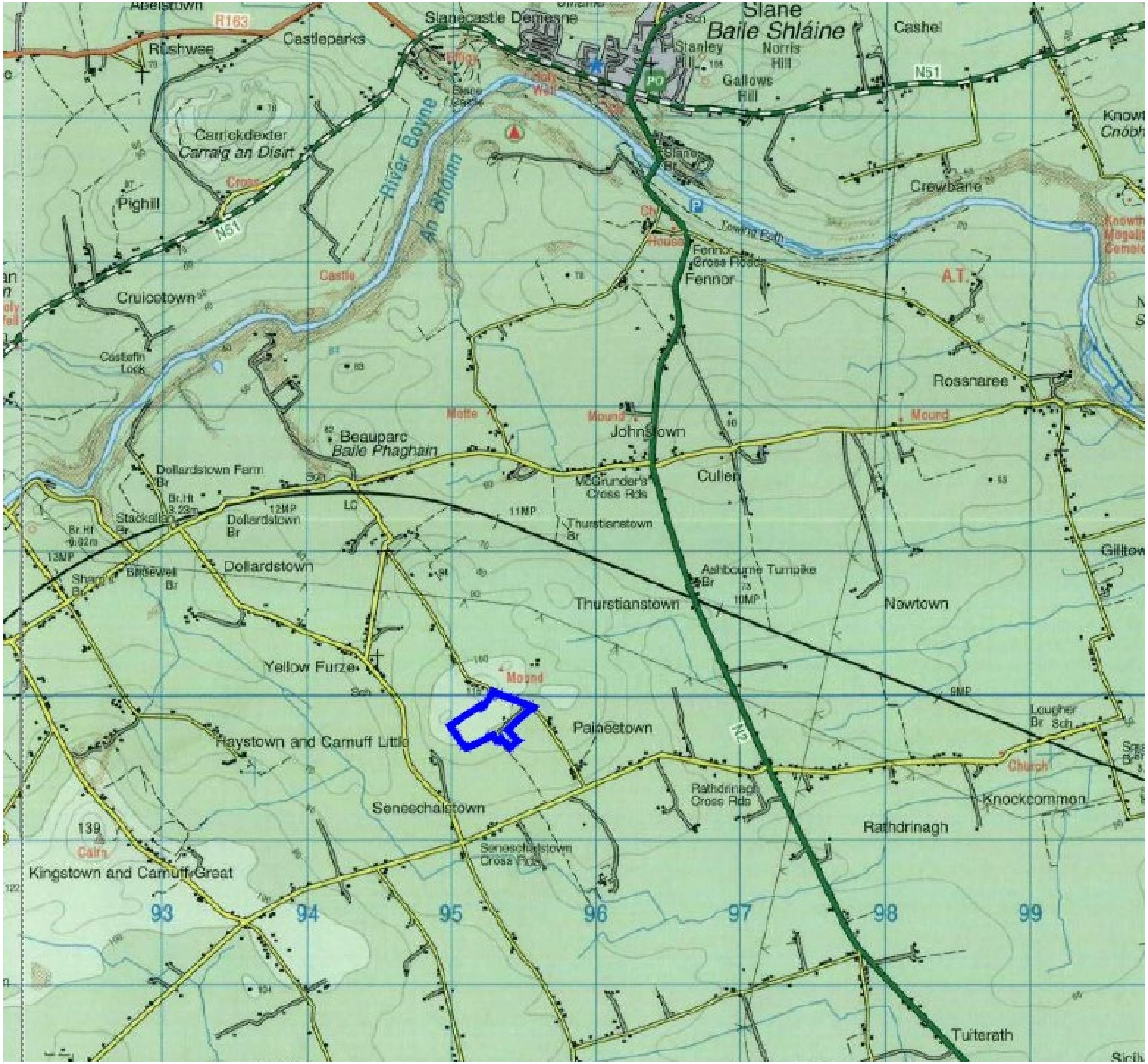


Legend

● Site Location

MEHS ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Groundwater Vulnerability
Scale. NTS	Project No. P023 88
Figure No. Figure 2.5	Rev. A

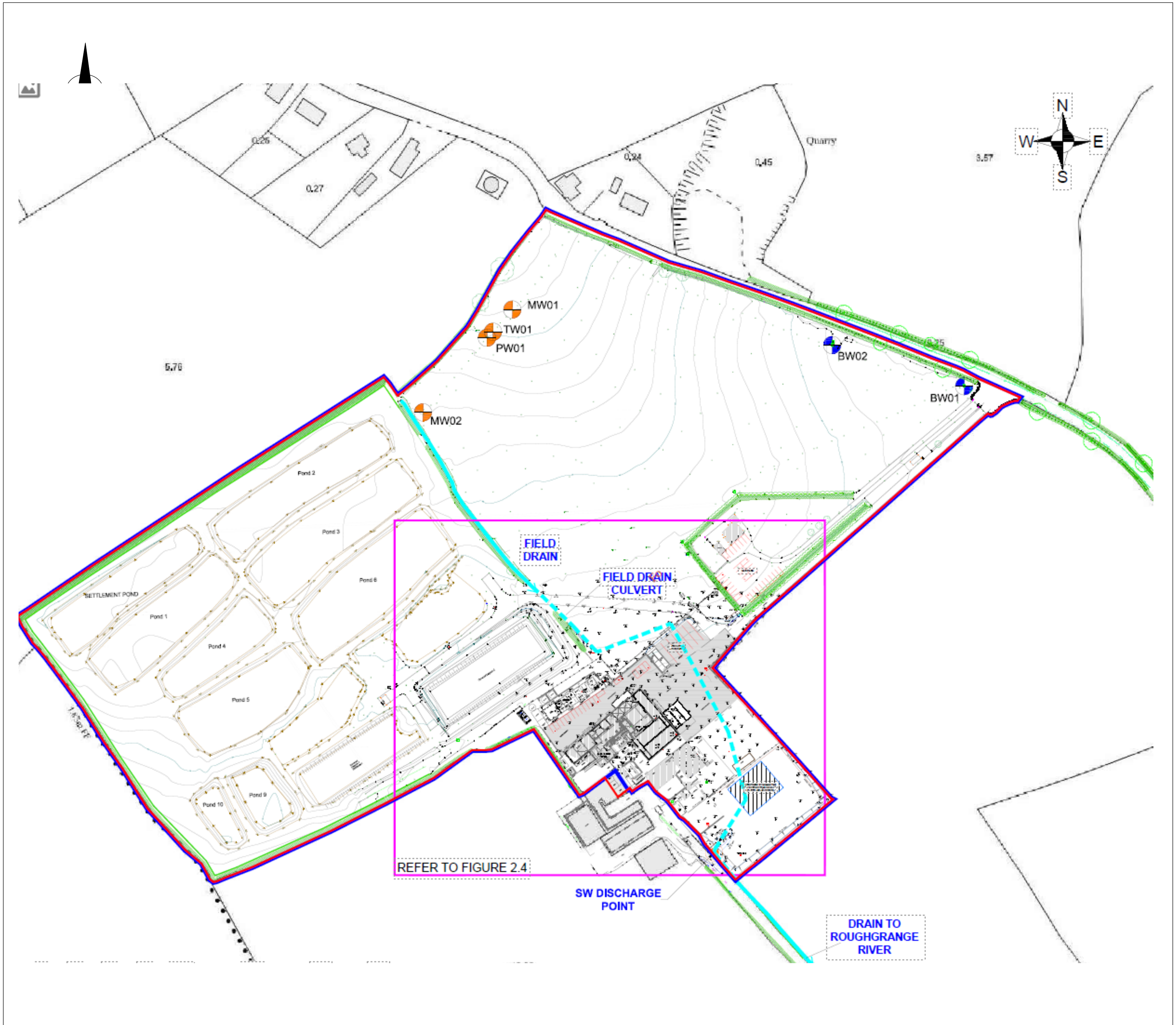


Legend

DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Groundwater Vulnerability
Scale. NTS	Project No. P023 88
Figure No. Figure 2.2	Rev. A

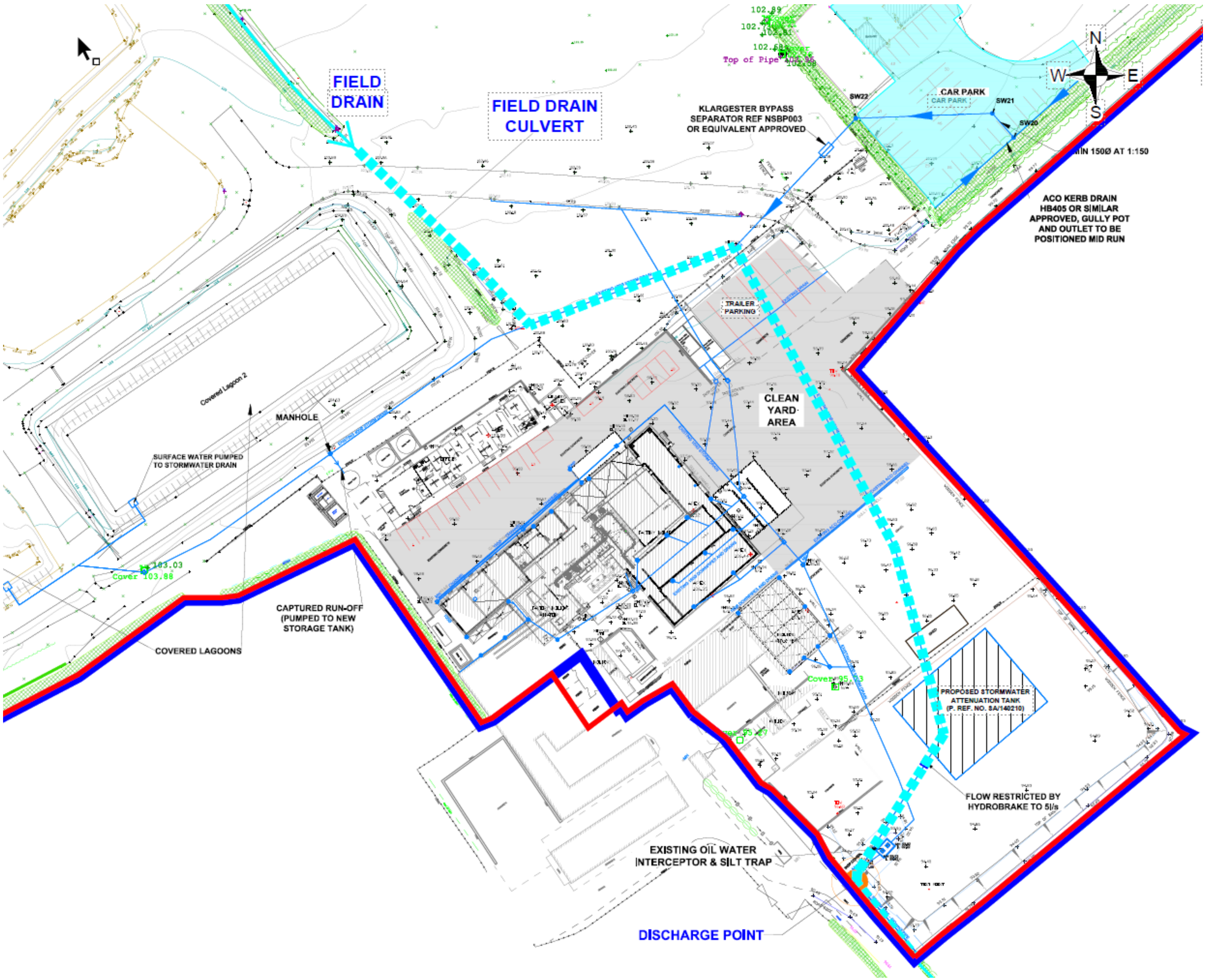


Legend

- DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)
- PLANNING APPLICATION AREA (C. 11.5 HA)
- FIELD DRAINAGE □ STORMWATER DRAIN
- E□ISTING SUPPLY WELLS (BW01 □ BW02)
- TEST AND MONITORING WELLS (2014)

MEHS ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Site layout
Scale. NTS	Project No. P023 88
Figure No. Figure 2.2	Rev. A

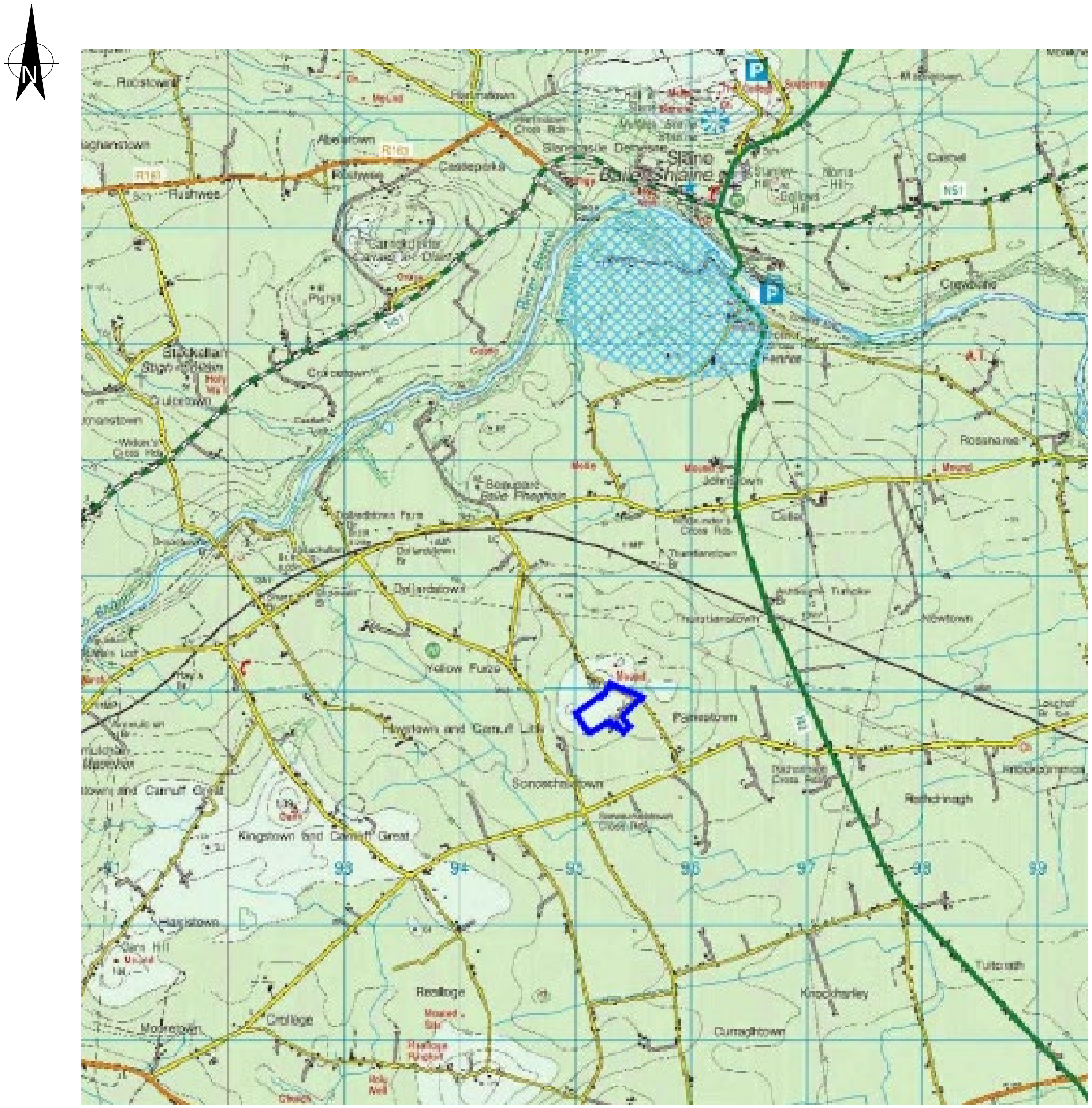


Legend

- DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)
- PLANNING APPLICATION AREA (C. 11.5 HA)
- FIELD DRAINAGE □ STORMWATER DRAIN
- SURFACE WATER DRAINAGE INFRASTRUCTURE

MEHS ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Detailed Site Layout
Scale: NTS	Project No. P023 88
Figure No. Figure 2.3	Rev. A



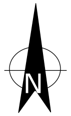
Legend

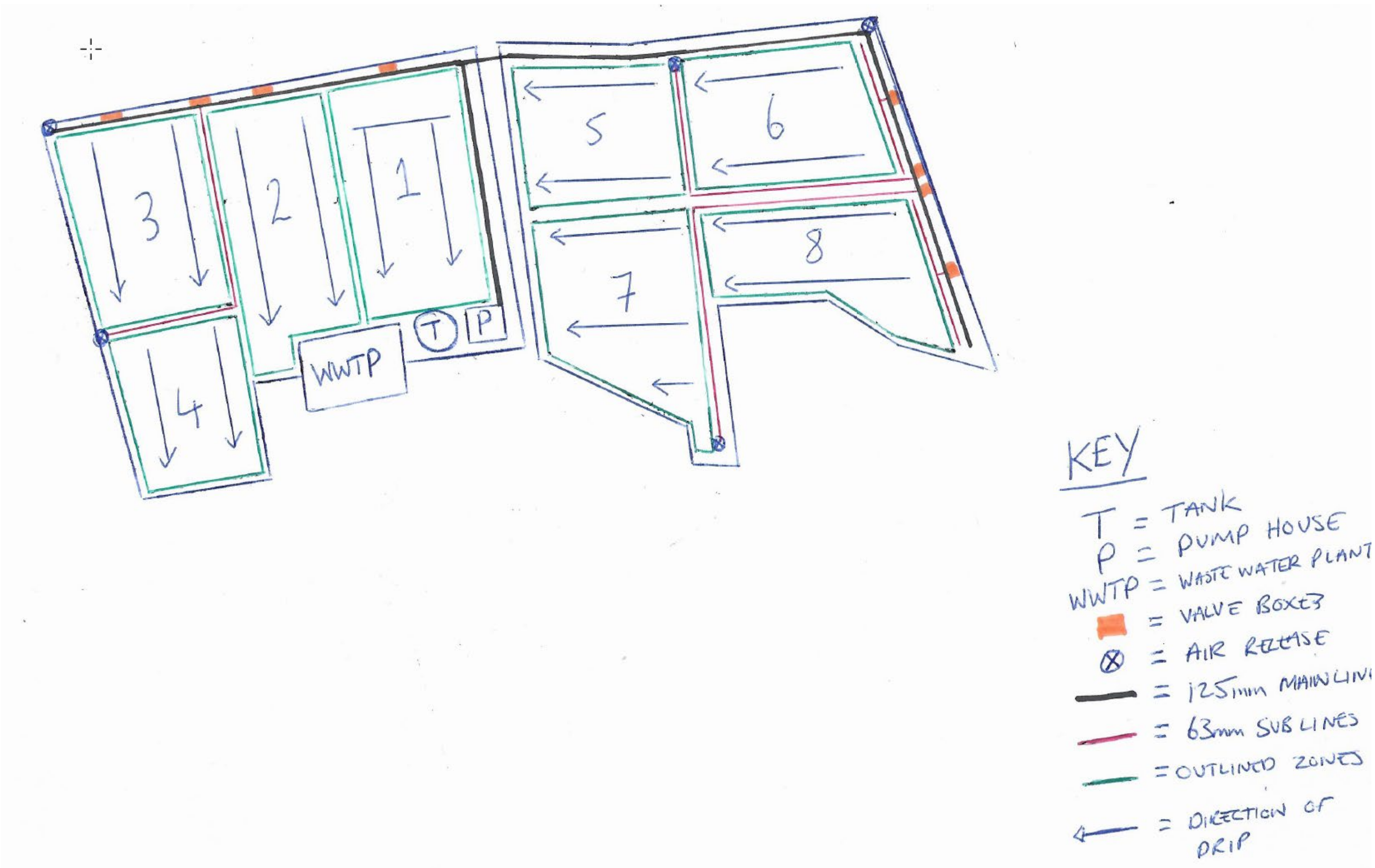
DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)

SLANE WELL SOURCE PROTECTION ZONE

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	SOURCE PROTECTION ZONE MAP
Scale. NTS	Project No. P023 88
Figure No. Figure 2.4	Rev. A





Legend

DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)

SLANE WELL SOURCE PROTECTION ZONE

ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Irrigation Zones
Scale. NTS	Project No. P023 88
Figure No. Figure 4	Rev. A

APPENDIX A
Report on Percolation Tests – September 2023

Reply to: Dawn Slane Our ref: RF
Your ref: Date: 15th Nov 2023

Dawn Meats – Slane
Greenhills,
Beauparc,
Co. Meath,
C15 CF38

Re:- Site Assessment for Proposed Drip Irrigation System at Dawn Meats – Slane

Dear Michelle McCarthy,

With reference to above-mentioned and prior discussions with Dawn Meats – Slane. I confirm that I attended on site to carry out site assessment study of the existing landsfor determination of suitability for dispersal of treated wastewater using a drip irrigation system andreport as follows:-

Scope of Works:

To determine the type and classification of soils/subsoils on site, the depth of soils/subsoils, and the depth to water table.

Purpose of Works:

To enable a decision on the suitability of the lands for dispersal of treated wastewater using a drip irrigation system.

Assessment Parameters:

It was decided following discussions with Joe Walsh of Ash Environmental Technologies to adapt measures outlined in the EPA Code of Practice Wastewater Treatment and Disposal Systems Serving Single Houses 2009, using the British Standard BS5930:1999 for soil classification and the Percolation Test procedure for the percolating properties of the soils.

Assessment Requirements:

Based on the parameters set, a three day period of assessment was required. It was agreed that I would attend on site on 19th to 21st September 2023 to carry out the assessment. We had advised that he would attend on site from the commencement of the assessment and that a suitable machine and sufficient water would be provided by MEHS to enable us to carry out the assessment.

Assessment Process:

It was decided, given the expanse and location of the lands identified for possible dispersal, to excavate a number of trial holes throughout the land at varying locations and field positions. It was also decided to excavate a Percolation Test Hole at each trial hole location.

Trial Holes:

A total of 11 trial holes were excavated throughout the lands, each to a depth of 2.7 to 3.1 m. The location points for the trial holes are marked as approximate on the attached site location map (Appendix A).Each of these trial holes were assessed as follows:-

(i) Soil layers/type/classification
(ii) Depth to water ingress when excavated
(iii) Depth to water table after 24 hours
(iv) Depth to water table after 48 hours
(v) Depth to bedrock

Trial hole assessment results are detailed individually and marked as trial holes 1 to 11 attached (Appendix A).

Percolation Test Holes:

A total of 11 percolation test holes were excavated throughout the lands, adjacent to each trial hole. The dimensions of each hole was 300mm x 300mm x 400mm deep. Each of these holes were pre-soaked twice on 19th September, 2023 at 10am and 4pm. In order to achieve an indication of any percolation qualities of the soils it was decided that pre-soaking would be carried out twice and the level of water remaining in the hole prior to testing on the 20th September 2023 would be recorded.

Percolation test hole results are detailed individually and marked as P-Test holes 1 to 2 attached (Appendix A).

General Findings:

My assessment concluded that there are very similar soils across the two fields. A common trend concluded that the soils generally are deep poorly drained soils with very little mottling evident suggesting a seasonally adjusting water table in only 2 of the 11 trial holes.

A good depth of soil was recorded above recorded water table levels, ranging from 2.6 to in excess of 3.1 m., and the predominant soil type recorded was silty in nature with sand and gravelcontent common.

Conclusion:

I would be of the opinion that such soils would be acceptable for a drip irrigation system, given the depth to water table, the seasonal nature of the water table, and the percolating quality of the soils. The use of drip irrigation in Ireland is relatively new and has tended thus far to be used as an option where percolating qualities are poor.

However, the low levels of water in trial holes after 48 hours and the complete absence in some, combined with the low loading rates envisaged in the region of 3 litres/m^2 would seem to indicate that sub-surface infiltration aided by horizontal movement in the upper soil horizons should be achieved. In addition, the removal of the build-up of vegetation from the existing drains in the lands so that surface water can move more freely, would assist the drainage of the lower lying areas.

Comment:

This report as is our normal practice is for the benefit of the addressee only and should not be relied upon in whole or in part by any third party without the consent of the undersigned.

Please do revert should you have any questions or require any further particulars.

Yours sincerely,

Trevor Montgomery
Montgomery EHS Ltd

Appendix A Report on Percolation Tests – September 2023

SITE CHARACTERISATION FORM
COMPLETING THE FORM

Note: This form requires the latest version of Adobe Acrobat Reader

and on PC's Windows 7 or later. Windows XP produces errors in calculations

Step 1:

Goto Menu Item **File, Save As** and save the file under a reference relating to the client or the planning application reference if available.

Clear Form

Use the **Clear Form** button to clear all information fields.

Notes:

All calculations in this form are automatic.

Where possible information is presented in the form of drop down selection lists to eliminate potential errors.

Variable elements are recorded by tick boxes. In all cases only one tick box should be activated.

All time record fields must be entered in twenty four hour format as follows: HH:MM

All date formats are DD-MM-YYYY.

All other data fields are in text entry format.

This form can be printed out fully populated for submission with related documents and for your files. It can also be submitted by email.

Section 3.2 In this section use an underline _____ across all six columns to indicate the depth at which changes in classification / characteristics occur.

Section 3.4 Lists supporting documentation required.

Section 4 Select the treatment systems suitable for this site and the discharge route.

Section 5 Indicate the system type that it is proposed to install.

Section 6 Provide details, as required, on the proposed treatment system.

APPENDIX A: SITE CHARACTERISATION FORM

File Reference:

1.0 GENERAL DETAILS (From planning application)

Prefix: First Name: Dawn Meats - Slane Surname:

Address: Greenhills, Beauparc, Co. Meath, C15 CF38

Site Location and Townland: Greenhills, Beauparc, Co. Meath, C15 CF38

Number of Bedrooms: Maximum Number of Residents: 4

Comments on population equivalent

Site is a cattle slaughtering plant which is EPA licensed site operating a wastewater treatment plant.

Proposed Water Supply:

Mains ☐ Private Well/Borehole ☑ Existing well on-site Group Well/Borehole ☐

2.0 GENERAL DETAILS (From planning application)

Soil Type, (Specify Type): Soil Association 38:
Grey Brown Podzolics (75%), Gleys (20%), Brown earths (5%)

Subsoil, (Specify Type): Silt/Clay

Bedrock Type: DUIL-Dinantian Upper Impure Limestone

Aquifer Category: Regionally Important Locally Important LI Poor

Vulnerability: Extreme ☐ High ☑ Moderate ☐ Low ☐

Groundwater Body: IE_EA_G_002 Status Good

Name of Public/Group Scheme Water Supply within 1 km: None

Source Protection Area: ZOC ☐ SI ☐ SO ☐ Groundwater Protection Response:

Presence of Significant Sites (Archaeological, Natural & Historical): None on-site

Past experience in the area: GENERALLY GOOD P AND T VALUES COMMON

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

Note: Only information available at the desk study stage should be used in this section.

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position: Plot 1 & Plot 2

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☐ Relatively Flat (<1:20) ☑

Slope Comment

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses:

Two fields on the North site of the Plant and entrance

Existing Land Use:

Improved grassland

Vegetation Indicators:

grass land

Groundwater Flow Direction: South easterly

Ground Condition:

Grass

Site Boundaries:

tree line, stream

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Roads:

Site is 0.2 km from Windmill Lane

Outcrops (Bedrock And/Or Subsoil):

None on the area of the irrigation system

Surface Water Ponding:

None

Lakes:

None

Beaches/Shellfish Areas:

N/A

Wetlands:

N/A

Karst Features:

None

Watercourses/Streams:*

There is a drainage ditch to the North of Plot 1 and then between Plot 1 & 2.

***Note and record** water level

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Drainage Ditches:*

As above

Springs:*

None

Wells:*

As per Figure

Comments:
(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

R1 = Acceptable subject to normal good practice. Site may be suitable for discharge to ground, if the minimum depths are met on the site and if there exists suitable percolation. As the soil type in the area is Grey Brown Podzolics (75% of the land area), and as the area is mapped as 'High' Vulnerability. Groundwater as a resource will be at risk if the minimum depths required are not achieved on the site, or if the percolation rate is too rapid. Older wells in the area may also be at risk, if the minimum separation distances are not adhered to. Groundwater and wells are therefore the main targets, following the desk study. Given the response and the aquifer type, the site is potentially suitable for a conventional septic tank system if the minimum depths required are met on the site, if the minimum separation distances can be met, and if the percolation rate is adequate.

***Note and record** water level

Trial Hole 1 Grid Reference N 95052 69729

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.1

Depth from ground surface to bedrock (m) (if present): 3.0

Depth from ground surface to water table (m) (if present): 2.7

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19-Sep-2023 09:00

Date and time of examination: 19-Sep-2023 09:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-3100mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m			GWT				
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 2 Grid Reference N 95034 69796

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 09:30

Date and time of examination: 19/09/2023 09:30

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads	Crumb	Low	Brown	No
0.6 m							
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 3 Grid Reference N 95085 69771

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.1

Depth from ground surface to bedrock (m) (if present): Not Present

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 09:45

Date and time of examination: 19/09/2023 09:45

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-3100mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 4 Grid Reference N 95114 69821

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 10:00

Date and time of examination: 19/09/2023 10:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads	Crumb	Low	Brown	No
0.6 m							
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

Trial Hole 5 Grid Reference N 95034 69796

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 10:30

Date and time of examination: 19/09/2023 10:30

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

Trial Hole 6 Grid Reference N 95149 69895

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 10:30

Date and time of examination: 19/09/2023 10:30

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

Trial Hole 7 Grid Reference N 95222 69914

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 11:00

Date and time of examination: 19/09/2023 11:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 8 Grid Reference N 95034 69796

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.1

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): 2.8

Depth of water ingress: 2.7

Rock type (if present): shales

Date and time of excavation: 19/09/2023 11:30

Date and time of examination: 19/09/2023 11:30

Depth of Surface and Subsurface Percolation Tests	
0.1 m	
0.2 m	
0.3 m	TA/P
0.4 m	
0.5 m	
0.6 m	
0.7 m	
0.8 m	
0.9 m	
1.0 m	
1.1 m	
1.2 m	
1.3 m	
1.4 m	
1.5 m	TA/P
1.6 m	
1.7 m	
1.8 m	
1.9 m	
2.0 m	
2.1 m	
2.2 m	
2.3 m	
2.4 m	
2.5 m	TA/P
2.6 m	
2.7 m	
2.8 m	
2.9 m	
3.0 m	
3.1 m	
3.2 m	
3.3 m	
3.4 m	
3.5 m	

Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
350 mm-3100mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads	Crumb	Low	Brown	No

GWT

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. (‘Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 9 Grid Reference N 95270 70003

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.0

Depth from ground surface to bedrock (m) (if present): 3.0

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 12:00

Date and time of examination: 19/09/2023 12:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-3000mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 10 Grid Reference N 95339 69964

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 12:30

Date and time of examination: 19/09/2023 12:30

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 11 Grid Reference N 95461 69917

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.1

Depth from ground surface to bedrock (m) (if present): Not Present

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 13:00

Date and time of examination: 19/09/2023 13:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-3100mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads	Crumb	Low	Brown	No
0.6 m							
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date	19-Sep-2023	19-Sep-2023	19-Sep-2023
	Time	10:00	10:00	10:00
2nd pre-soak start	Date	19-Sep-2023	19-Sep-2023	19-Sep-2023
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
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3.4 The following associated Maps, Drawings and Photographs should be appended to this site characterisation form.

1. Discovery Series 1:50,000 Map indicating overall drainage, groundwater flow direction and housing density in the area.
2. Supporting maps for vulnerability, aquifer classification, soil, subsoil, bedrock.
3. North point should always be included.
4. (a) Scaled sketch of site showing measurements to Trial Hole location and
   (b) Percolation Test Hole locations,
   (c) wells and
   (d) direction of groundwater flow (if known),
   (e) proposed house (incl. distances from boundaries)
   (f) adjacent houses,
   (g) watercourses,
   (h) significant sites
   (i) and other relevant features.
5. Site specific cross sectional drawing of the site and the proposed layout[1] should be submitted.
6. Photographs of the trial hole, test holes and site including landmarks (date and time referenced).
7. Pumped design must be designed by a suitably qualified person.

[1] The calculated percolation area or polishing filter area should be set out accurately on the site layout drawing in accordance with the code of practice's requirements.

4.0 CONCLUSION of SITE CHARACTERISATION

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Slope of proposed infiltration / treatment area: level ground

Are all minimum separation distances met? ✓

Depth of unsaturated soil and/or subsoil beneath invert of gravel (or drip tubing in the case of drip dispersal system)

Percolation test result: Surface: Sub-surface:

Not Suitable for Development ☐ **Suitable for Development** ✓

Identify all suitable options

1. Septic tank system (septic tank and percolation area) **(Chapter 7)**
2. Secondary Treatment System **(Chapters 8 and 9)** and soil polishing filter **(Section 10.1)**
3. Tertiary Treatment System and Infiltration / treatment area **(Section 10.2)** Yes

Discharge Route [1]

5.0 SELECTED DWWTS

Propose to install: Tertiary Treatment System and Infiltration /treatment area

and discharge to: Ground Water

Invert level of the trench/bed gravel or drip tubing (m) 0.50

Site Specific Conditions (e.g. special works, site improvement works testing etc.

Watewater treatment system as per design document with sub-surface irrigation system.

[1] A discharge of sewage effluent to "waters" (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.4.

6.0 TREATMENT SYSTEM DETAILS

SYSTEM TYPE: Septic Tank Systems (Chapter 7)

Tank Capacity (m^3): 50.00

Percolation Area		Mounded Percolation Area	
No. of Trenches		No. of Trenches	
Length of Trenches (m)		Length of Trenches (m)	
Invert Level (m)		Invert Level (m)	

SYSTEM TYPE: Secondary Treatment System (Chapters 8 and 9) and polishing filter (Section 10.1)

Secondary Treatment Systems receiving septic tank effluent (Chapter 8)

Media Type	Area (m^2)*	Depth of Filter	Invert Level
Sand/Soil			
Soil			
Constructed Wetland			
Other			

Packaged Secondary Treatment Systems receiving raw wastewater (Chapter 9)

Type:

Capacity PE:

Sizing of Primary Compartment: m^3

Polishing Filter*: (Section 10.1)

Surface Area (m^2)*:

Option 1 - Direct Discharge Surface area (m^2):

Option 2 - Pumped Discharge Surface area (m^2):

Option 3 - Gravity Discharge Trench length (m):

Option 4 - Low Pressure Pipe Distribution Trench length (m):

Option 5 - Drip Dispersal Surface area (m^2): 70,000.00

SYSTEM TYPE: Tertiary Treatment System and infiltration / treatment area (Section 10.2)

Identify purpose of tertiary treatment	Provide performance information demonstrating system will provide required treatment levels	Provide design information
Primary screening and balancing. Primary DAF Activated Sludge Clarification Tertiary automatic filtration Sub-Surface Irrigation System		

DISCHARGE ROUTE:

Groundwater		Hydraulic Loading Rate * ($l/m^2.d$)		Surface area (m^2)	70,000.00
Surface Water **		Discharge Rate (m^3/hr)	8.75		

* Hydraulic loading rate is determined by the percolation rate of subsoil

** Water Pollution Act discharge licence required

6.0 TREATMENT SYSTEM DETAILS

QUALITY ASSURANCE:

Installation & Commissioning

Installation of the wastewater treatment plant by Glanua Industrial
Installation of sub-surface irrigation by MEHS

On-going Maintenance

Glanua Industrial & MEHS

7.0 SITE ASSESSOR DETAILS

Company: Montgomery EHS Ltd

Prefix: Mr First Name: Trevor Surname: Montgomery

Address: Kantoher Business Park, Killeedy, Ballagh, Co. Limerick

Qualifications/Experience: BSc, Post Graduate, Dip Poll Ass & Control, Cert Envn Mon

Date of Report: 27-Sep-2023

Phone: 0872390421 E-mail trevor@mehs.ie

Indemnity Insurance Number: HU PI6 1827155 (34)

Signature: ____

Attachment 2 Making Silage, Padraig O'Kiely, Teagasc

Section 6

Making Silage

by **Padraig O'Kiely**

Introduction

Excellent silage will support animal performance over the winter and reduce concentrate costs. Choosing the right time to harvest the grass and minimising the loss of feed value are the key goals when making silage.

1. What is meant by digestibility?
2. How do I make high DMD silage?
3. What influence do grass varieties have?
4. How do I ensure good preservation?
5. How do I maximise yield per hectare?
6. How much silage does my herd need?

chapter 36

Making **Silage**

① What is meant by digestibility?

The higher the digestibility (DMD) of a grass silage, the more efficiently animals will use it and the greater the amount of milk or meat they will produce. Grasses with a lot of stem, seed-heads or dead vegetation are much less digestible than those with a greater proportion of leaf. The importance of highly digestible silage is greater when the price of concentrates is high.

② How do I make high DMD silage?

1. High yielding ryegrass crops are easier to manage, especially when varieties in the sward have similar heading dates; It's easier to identify exactly when to cut. Ryegrasses naturally have high levels of sugar and preserve easily.
2. Avoid old or dead herbage accumulating at the base of a crop as it can reduce digestibility by 5-6% units – this means that a crop that should have been 75% DMD would be 69-70% DMD instead.
3. Take full account of the mineral and slurry nitrogen applied for early grazing and silage because excess nitrogen can cause heavy-yielding crops to lodge in wet windy weather. The DMD of a normal crop of grass would be expected to decline by about 3 percentage points per week in late May/June (e.g. 78%-75%). A lodged crop lying under wet conditions can decline by up to 9 percentage points (e.g. 78%–69%) during the same week.
4. Monitor the silage fields from late April and book the contractor in time, monitoring weather forecasts. Intermediate-heading ryegrasses are at around 75% DMD when their first seed heads start to peep from the grass plants but geographical location, soil type, sward type and previous management will alter the optimum harvest date.
5. Control weeds such as docks - even leafy docks in silage only have a digestibility of around 65% DMD.

③ What influence do grass varieties have?

1. Late-heading ryegrasses can be harvested eight days later than intermediate-heading varieties, with both types of crops having similar yield and ensilability. The later heading crops will have slightly higher digestibility. There is more flexibility in harvest dates with the later heading crop as its rate of digestibility decline at this stage is slightly slower than for intermediate-heading ryegrasses.
2. Once the categories of ryegrass are identified, select varieties mainly on yield (spring, autumn and annual) and persistence. If independent information is available on grass digestibility or sugars, consider these after the above. Select grass varieties from the recommended list of varieties for Ireland produced by the Department of Agriculture, Food and the Marine.
3. If reseeding, invest the effort in seed-bed preparation, sowing, etc., that such a long-term investment warrants.

④ How do I ensure good preservation?

Poorly preserved silage could lose up to 5% units of DMD and have low intake characteristics. Therefore:

1. Only attempt to wilt a crop if it will be genuinely drying while on the ground. A successfully wilted crop will preserve properly.
2. If using an additive, ensure the full rate of an appropriate product is applied evenly.
3. Harvest the grass free of contamination by dirt.
4. Fill the silo quickly and seal perfectly (or wrap bale perfectly) in order to achieve the air-free conditions that are necessary for good preservation and to prevent mould growth.
5. Ensure any effluent can quickly escape from the silo and is safely collected.

Pit management

1. Seal grass carefully beneath 2 sheets of black 0.125mm polythene.
2. Cover completely with a layer of car tyres, placed edge-to-edge. Seal the edges with a layer of sandbags, silt, etc.
3. As the silage sinks in the silo during the following week or two, check the plastic seal to ensure air is not getting.
4. Inspect the plastic cover frequently and immediately repair any damage.

Manage the silage appropriately during feedout to prevent heating losses, as any such losses will reduce silage digestibility.

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5 How do I maximise yield per hectare?

1. Minimise soil compaction during silage making, slurry and fertilizer spreading, grazing, etc.

2. Ensure appropriate soil P, K, and pH levels. Soil test each field once every four years.

3. Apply a total of 125 kg N/ha from the combined input of inorganic fertilizer (e.g. CAN, urea, etc.) and slurry.

    - If rolling the silage fields in spring, complete the job before the grass starts to elongate, as late rolling can crush the stems and impair growth.

    - Decide on the amount of silage needed and the land required to deliver it. It is wise to have a modest surplus of silage in reserve.

4. Apply a total of 100kg N/ha from a combined input of inorganic fertilizer and slurry for second cut silage.

Table1. Grass[1] yield and digestibility

Harvest date	1 May	8 May	15 May	22 May	29 May	5 June	12 June	19 June	26 June	3 July
Yield (t DM/ha)	2.92	3.99	4.98	5.96	6.79	7.82	8.48	8.93	9.50	9.83
DMD%	79.9	77.9	77.5	76.6	74.6	69.2	67.9	64.3	63.5	58.2

[1]Silage yields and digestibilities (DMD) will be lower than these values

6 How much silage does my herd need?

This will depend on:

- Number of cows.
- Length of winter.

100 cows x 150 days x 10kg DM = 150t dry matter

At a yield of 5t/ha for first cut, this will require the equivalent of 30ha of first cut silage. Second cut yield will typically be 80% of first cut yield.

Estimated monthly feed requirements for various stock categories

	tonnes fresh weight/month
Dairy Cows	1.65
In-calf heifers/550-660 kg store	1.35
200-250 kg weanling	0.7
400-450 kg store	1.25

Attachment 3 Fertiliser Advice for Grass Establishment, Mark Plunkett, Johnstown Castle, Research Center, April, 2020

Fertiliser Advice for Grass Establishment

Mark Plunkett, Johnstown Castle, Research Center, April, 2020

Soil Testing

Soil sample fields in advance of reseeding – where establishing grass seeds by ploughing take the soil sample from the ploughed soil to get a better indication of the soils fertility status and future fertiliser applications. Establish soil P & K levels and apply suitable fertilisers / manures before or during soil cultivations. Check soil pH and apply lime as recommended on the soil test report.

Lime

Reseeding time offers a perfect opportunity to correct soil pH and apply lime. Apply lime to the seedbed and incorporate into the top 10cm of soil. This will provide the ideal conditions for fast and even seed establishment. Where soil magnesium levels are low (<50pppm) apply magnesium limestone to correct soil Mg levels.

*Optimum Soil pH for Mineral Soils **	
Grass	6.3 – 6.5
Clover	6.5 – 7.0
*Peat's - Lime to a pH 5.5 – 5.8	

Phosphorus (P) & Potassium (K)

Soil P and K are an essential at reseeding time. P and K are required for rapid root and tiller development during the early stages of establishment (1st 3-6 weeks). In addition P & K is required to ensure the longevity of rye grasses in the sward over time. Aim to maintain soils at ***Soil Index* 3** for maximum production and persistency of clovers & rye grasses. Apply P & K fertiliser as per soil test report and incorporate into the seedbed at sowing time (see table below). Insufficient soil P & K will result in poor establishment of rye grasses / clovers and the benefits of reseeding will be lost. *Additional P allowance of 15kg P/ha is available at index 1, 2 & 3 for reseeds as per Nitrates.*

P & K Advice (kg/ha)

Soil Index	***1***	***2***	***3***	***4***
P	***60***	***40***	***30***	***0***
K	***110***	***75***	***50***	***30***

Suitable fertilisers include 0-10-20,10-10-20, etc.

Nitrogen

Sufficient N is one of the essentials in aiding good grass establishment. Grass seeds have a low N requirement during the early stages of establishment. Too much N will encourage weed growth and competition for new grass seedlings.

Apply approx. 30kg N/ha at sowing time to maximize grass growth. Apply 30 to 40kg N/ha 6 to 8 weeks after reseeding.

N for grass est. without cover crop (kg/ha)		
Index	**Grass Only**	**Grass/legume**
1	40 - 75	60
2	40 - 75	50
3	40 -75	40
4	40 - 75	40

Undersown crops apply 40kgN/ha after cereal harvest. Reseeds following long-term tillage will benefit from additional N in the first 3 years.

Manure & Slurry – Available N, P & K

Manure Type	**N**	**P**	**K**
	Kg/m³		
Cattle slurry	1.0	0.5	3.5
Pig slurry	2.1	0.8	2.0
kg/tonne			
FYM	1.4	0.6	5.4
Broiler litter	14	3	16
SMC	1.6	0.8	6.9
** LESS Application- band spreader / Trailing shoe*			

Organic Manure–Good Source of N, P & K

Apply organic manures to build soil fertility status where required (Index 1 & 2). It is best to apply low N organic manures (Cattle slurry/FYM /SMC) & incorporate to reduce N loss. Organic manures applied to P & K index 1 & 2 soils, availability reduced to 50 & 90%, respectively Supply remaining 50% of P as chemical fertiliser.

Make sure that manures are applied evenly and well incorporated at sowing time. This will reduce problems during establishment especially in a min – till system.

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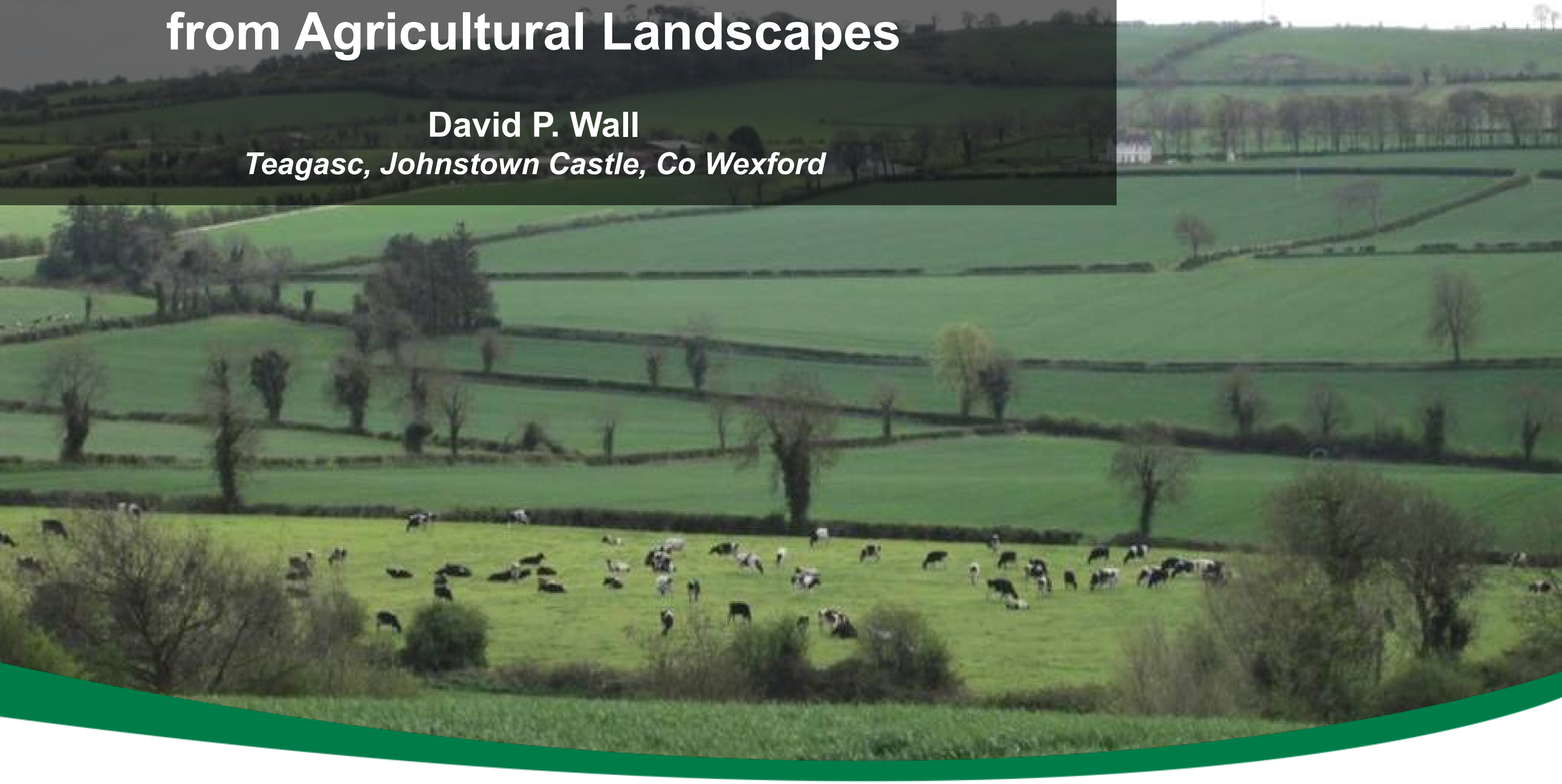
Attachment 4 Phosphorus Loss Risk & Mitigation from Agricultural Landscapes. David P. Wall, Teagasc, Johnstown Castle, Co Wexford

Phosphorus Loss Risk & Mitigation from Agricultural Landscapes

David P. Wall
Teagasc, Johnstown Castle, Co Wexford



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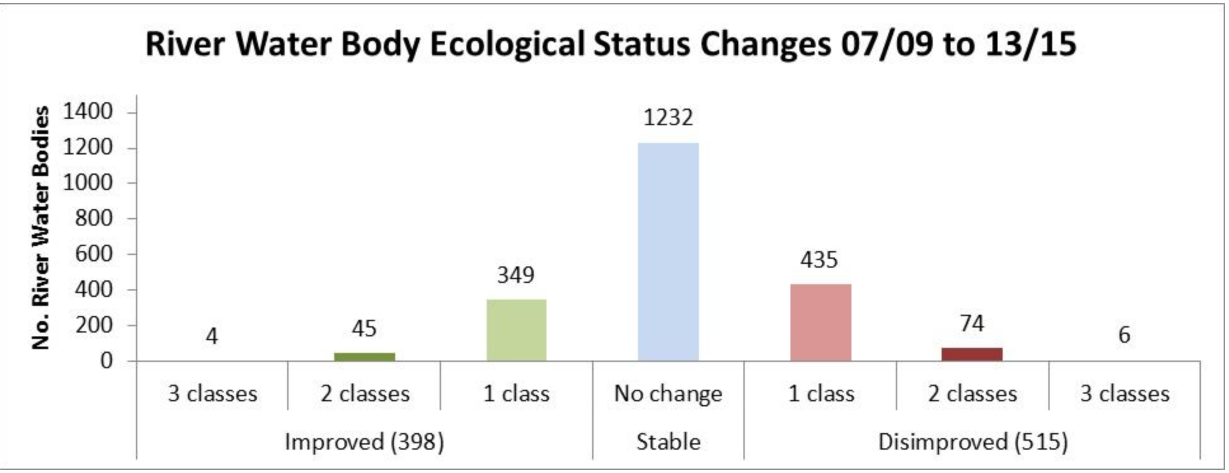
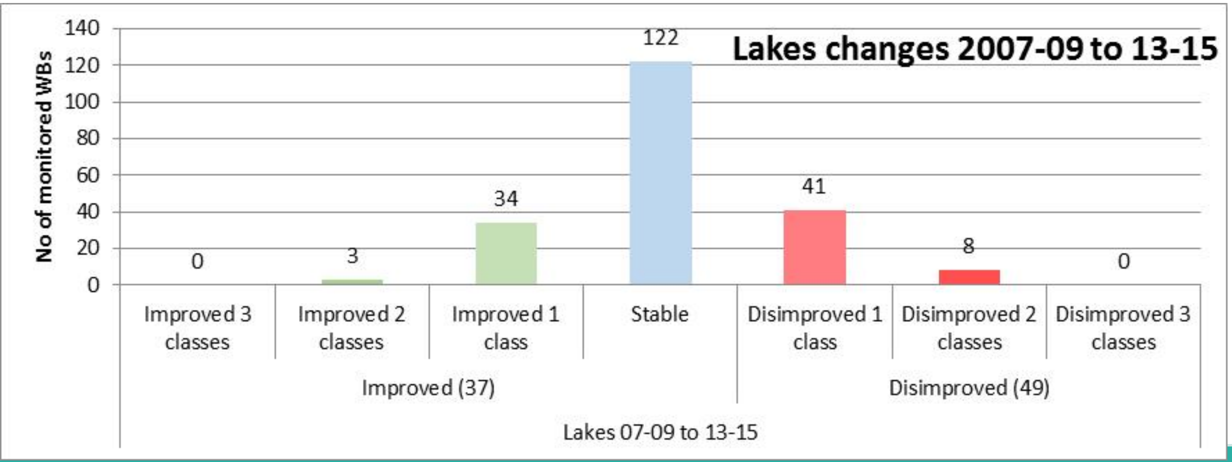
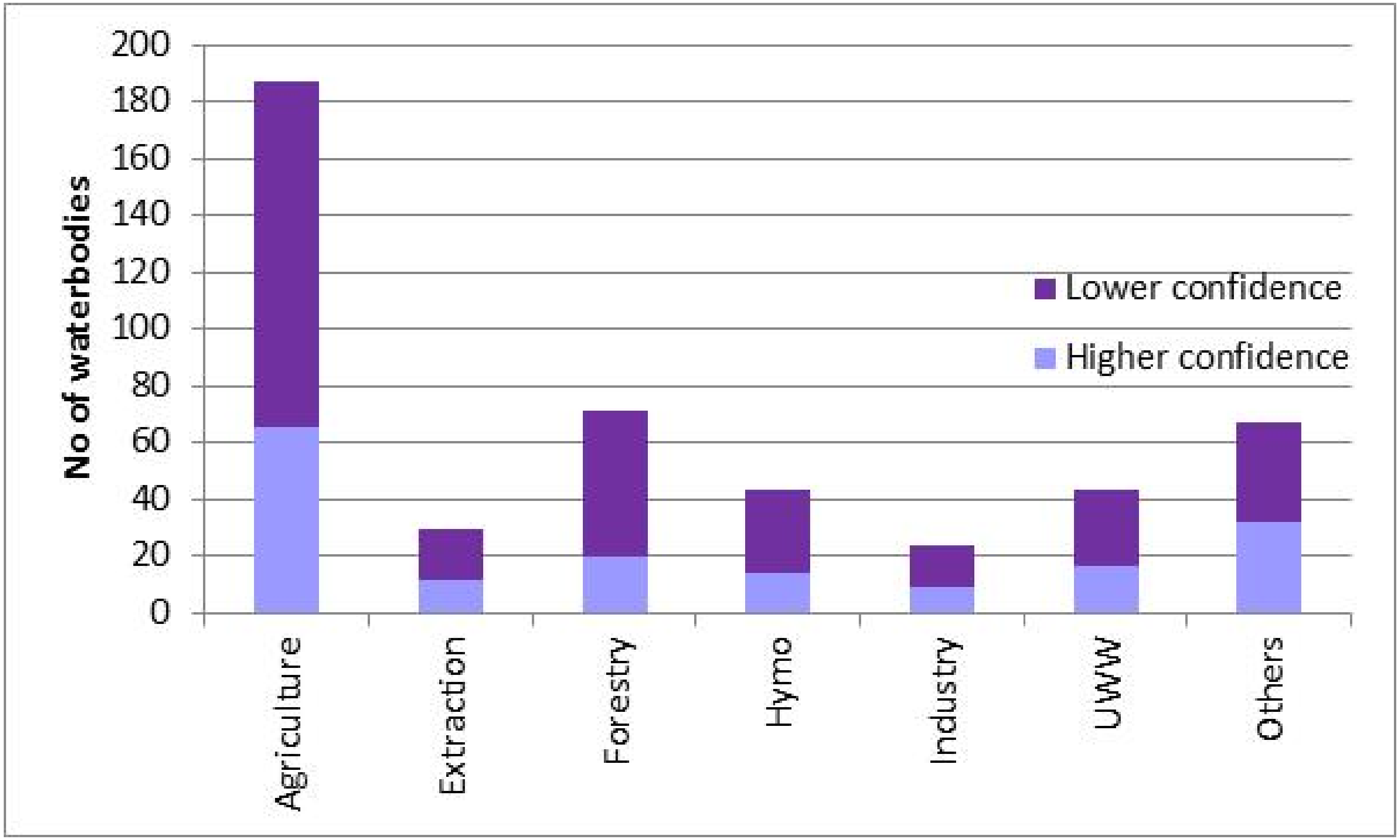
WB status changes 07/09 to 13/15





- Little net change between 2007 and 2015
- But **515** waterbodies have **disimproved**. These have been offset by 400 that have improved.
- Not an artefact of the monitoring programme. Real changes.
- What can we learn from this?

Significant pressures in the 511 deteriorated river WBs



Phosphorus loss

- Issue – Water Quality
  - A relatively small quantity of P loss can cause negative environmental effect in surface water bodies (rivers & freshwater lakes)
  - Phosphorus: source of diffuse pollution from agricultural landscapes

- Main Pathways of P loss:
  - **>>**Runoff from soil surface to drainage ditches, streams & lakes
  - < Leaching to drainage systems or to groundwater

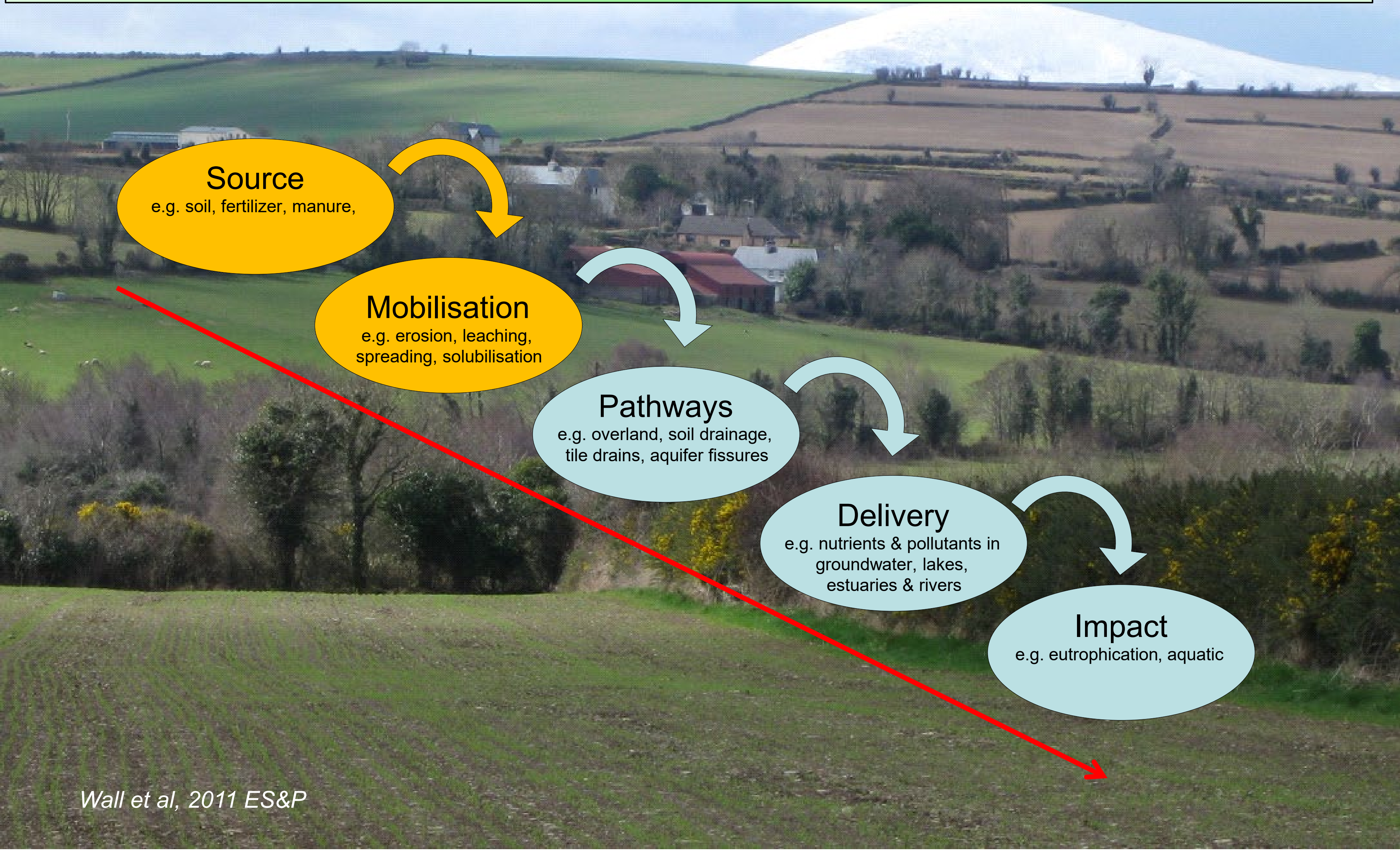
- Soil type and chemistry informs the potential for P loss by each pathway





Phosphorus management to reduce P loss

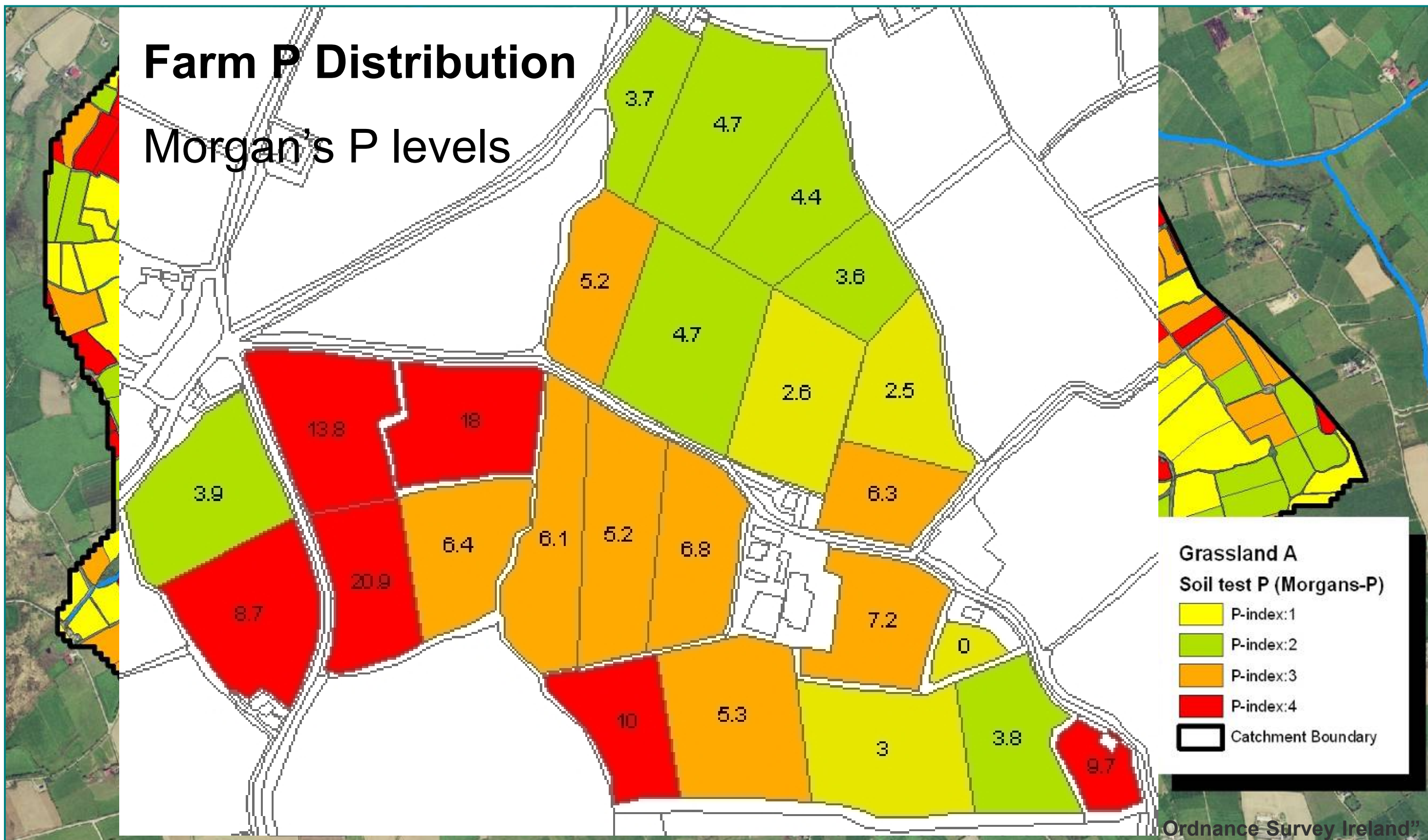
Nitrates Directive Aim: To reduce soils with excessive soil P levels and minimise the potential for P loss to water bodies



Soil P Index 4 soils – higher P risk loss risk potential!

Field-by-field soil testing

- Soil testing for P required (5 ha area every 4 years(
  - Derogation holdings (> 170 kg/ha org N)
  - Holdings using higher P build-up allowances (Table 13B - SI 605 of 2017)
- Assume P index 3 (replacement) on non-soil sampled holdings



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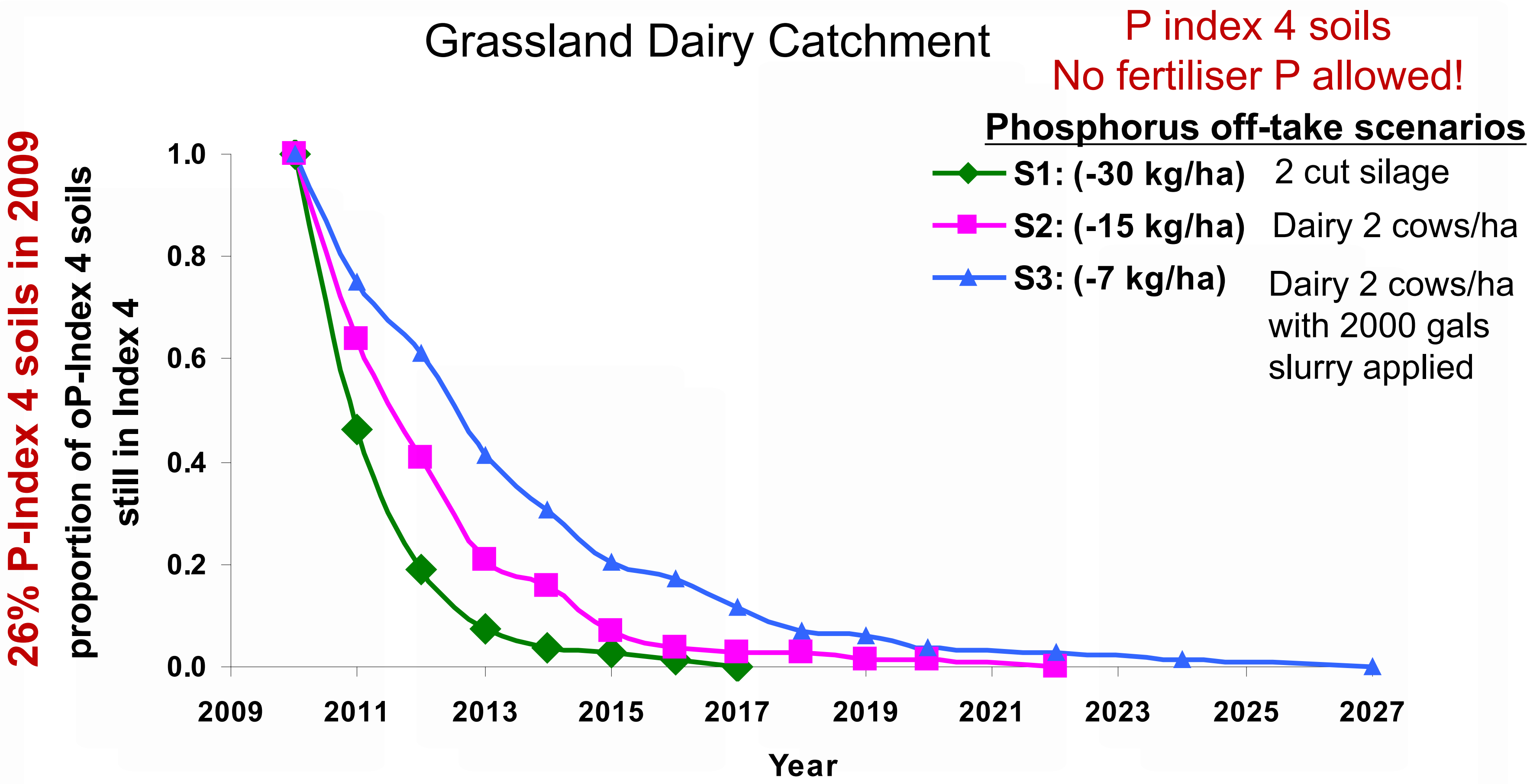
Soil P Decline is linked with P offtake

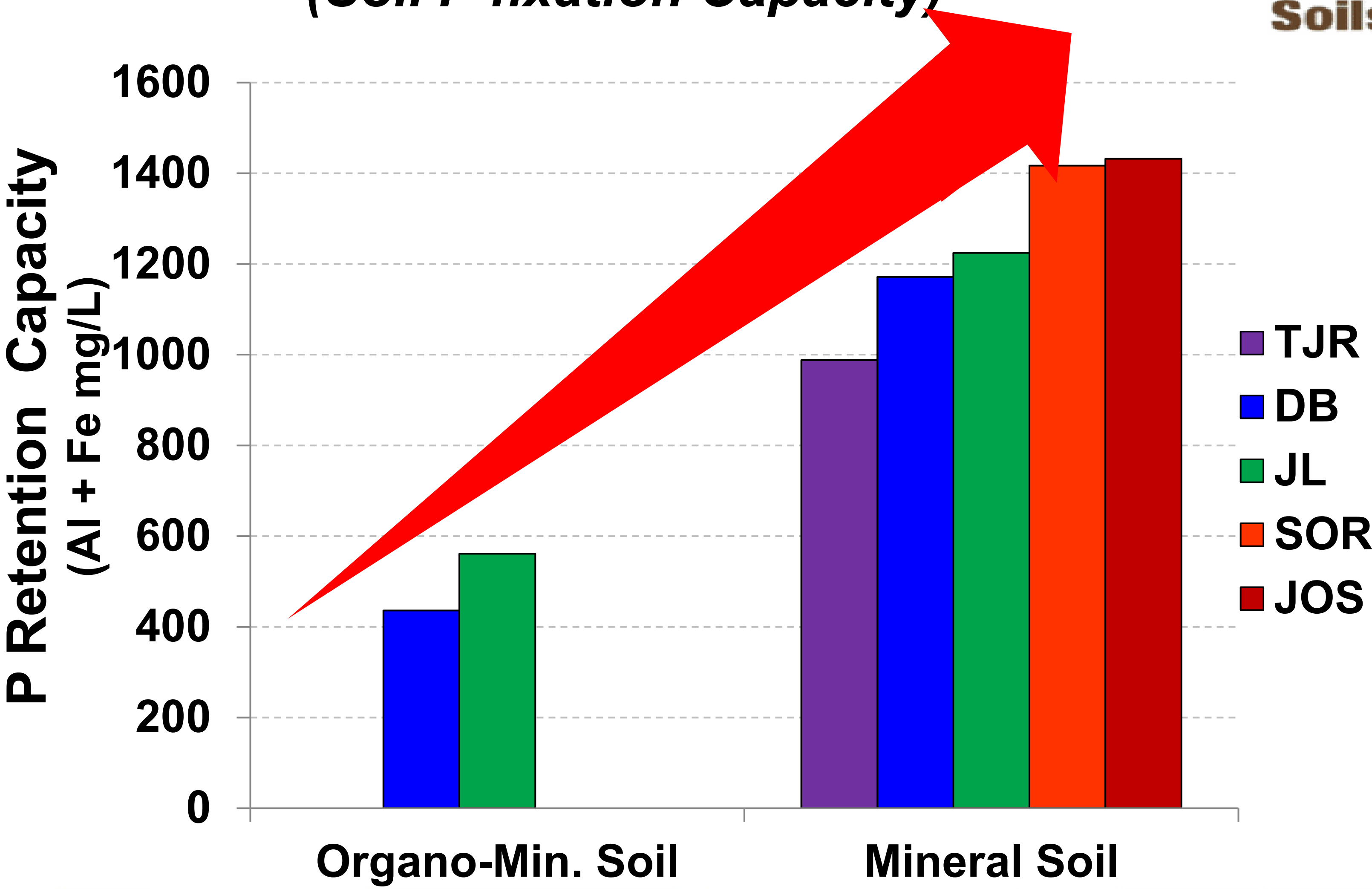
How quickly would soil P decline under different off-take levels?



Wall et al., 2013

Soils have different P Retention Capacity

(Soil P fixation Capacity)



Wall, D.P., Johnstown Castle, January 2018

How much P fertiliser does it take to build-up soil fertility levels?

Irish studies showing the soil test P response to build-up P applications		
Reference Studies Conducted across a range of soils	**Land Use type**	**P build-up required to achieve 1mg/L STP**
Culleton et al. 2001 Long term Cowlands, Johnstown Castle	Grassland (grazing – beef)	59 kg/ha P for Index 1
Sheil *et al.,* 2016, Long term P fertiliser study	Grassland (simulated grazing)	56kg/ha P for Index 1 40 kg/ha for Index 2
Wall *et al.,* 2017, Heavy soils study (5 dairy farms)	Grassland (grazing – dairy)	76 kg/ha at P Index 1 50 kg /ha at P Index 2

P fertiliser allowances under new Build up P rates

- P index 1 soils : 50 kg /ha P build–up allowance
- P index 2 soils : 30 kg /ha P build–up allowance

How quickly: ~4 years to build up one soil P Index (3 ppm)

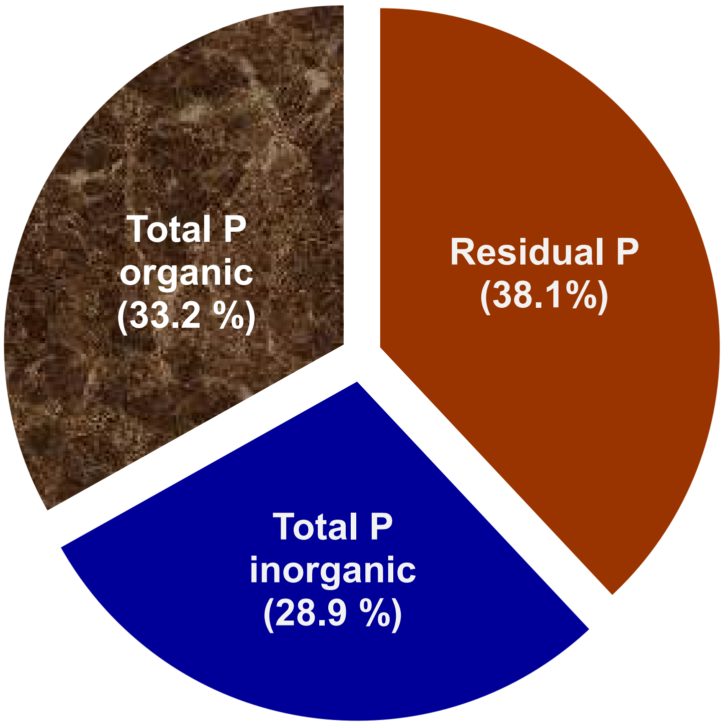
Wall, D.P., Johnstown Castle, January 2018

Phosphorus pools in Grassland soils

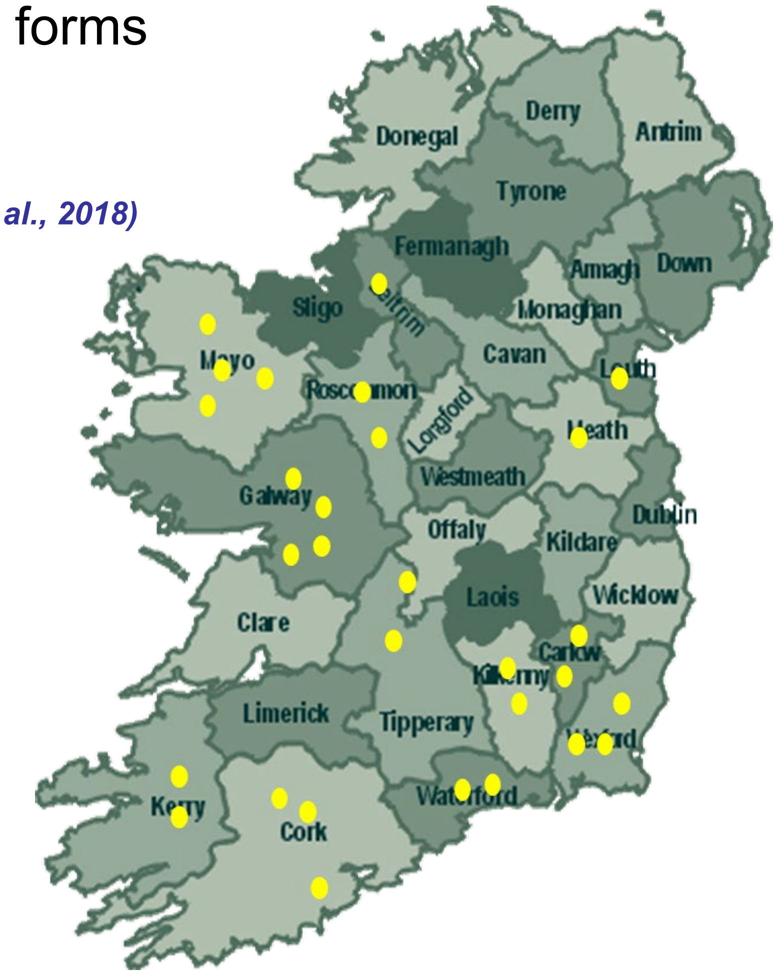
Typically there is up to 1 tonne of total P per ha in grassland soils

Majority of soil P is stored in no available forms

- Phosphorus pools in Irish soils



(Graca et al., 2018)



Total P inorganic= Sum individual P inorganic pools
Total P organic = Sum individual P organic pools

- Composite soil samples (0-10 cm)

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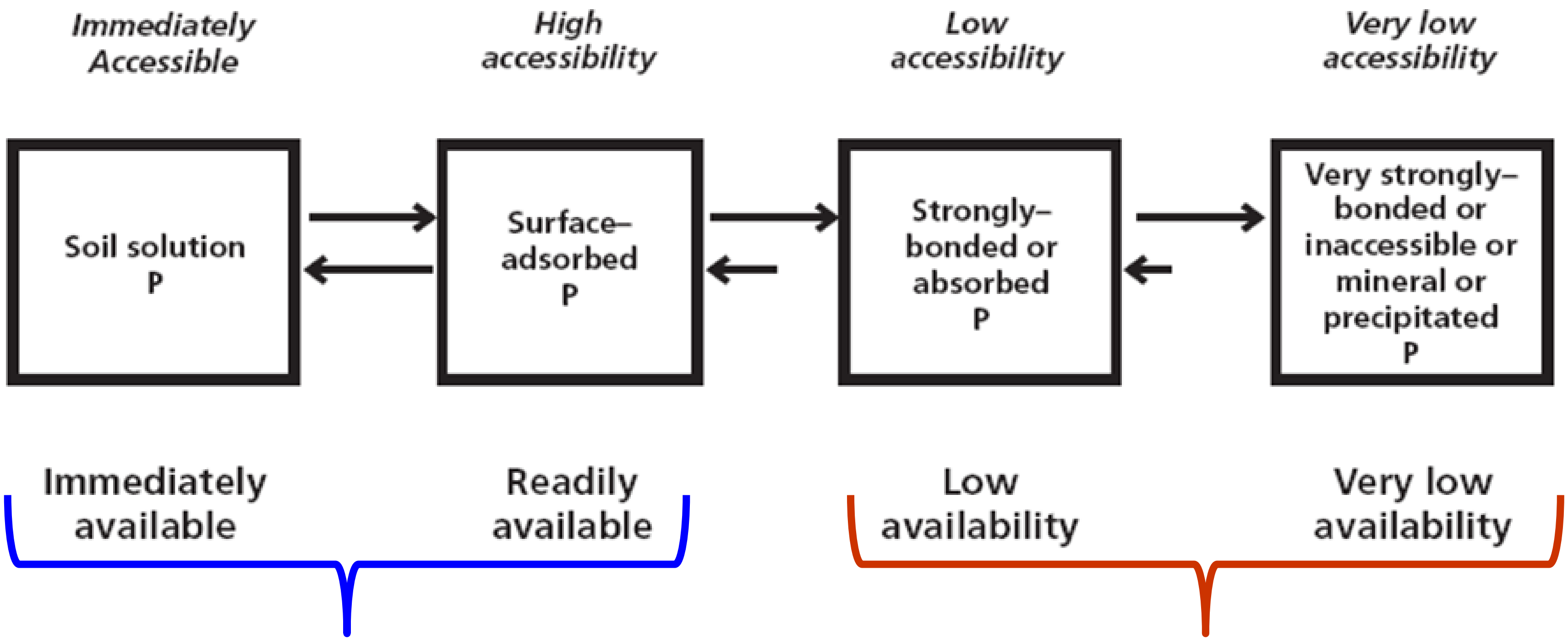
Soil Phosphorus pools: Mineral Soils

Inorganic

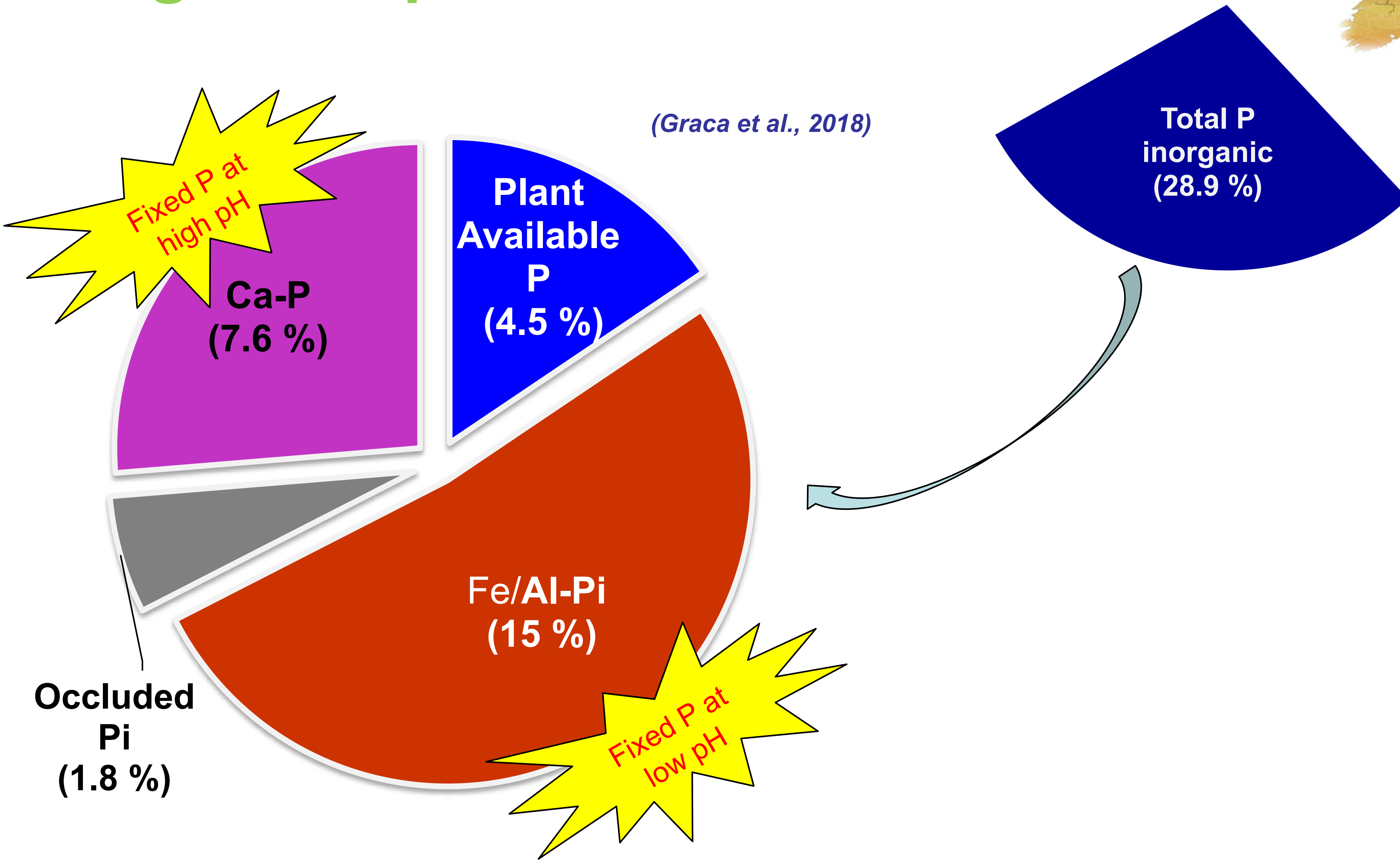


Water soluble & potentially plant available

Soil P which is not directly water soluble

Syers, Johnston & Curtin, 2008

Inorganic P pools in Grassland soils



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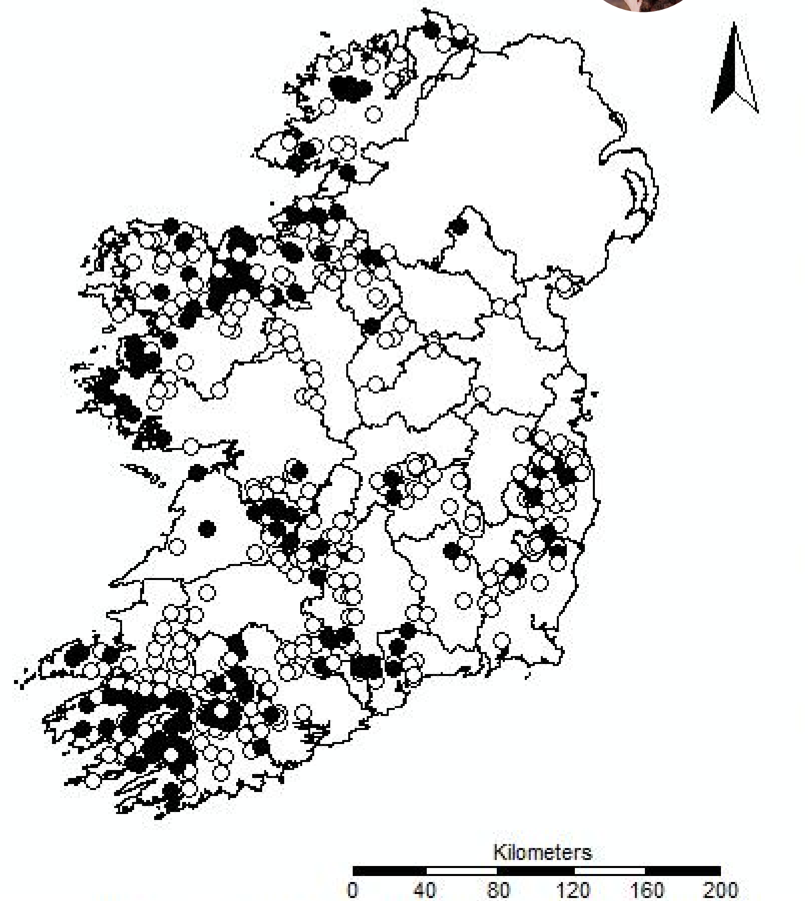
High Organic Matter Soils (>20% OM)

Water Framework Directive

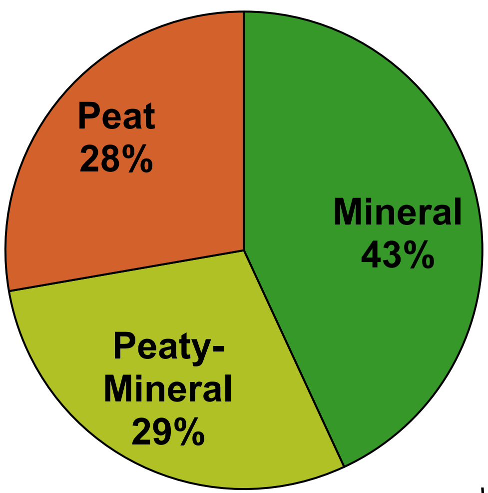
Issue: Steady decline in the number of high status water bodies in Ireland.

Highest rates of WQ decline along the western seaboard, in upland areas

Predominant soils in High status sites are peats and other organic matter-rich soils



Soil types in High Status Catchments



(Daly et al., 2017)

EPA Water Quality Monitoring

- High Status rivers (black dots).
- Sites that varied their status (white dots).

Period 2001-2012

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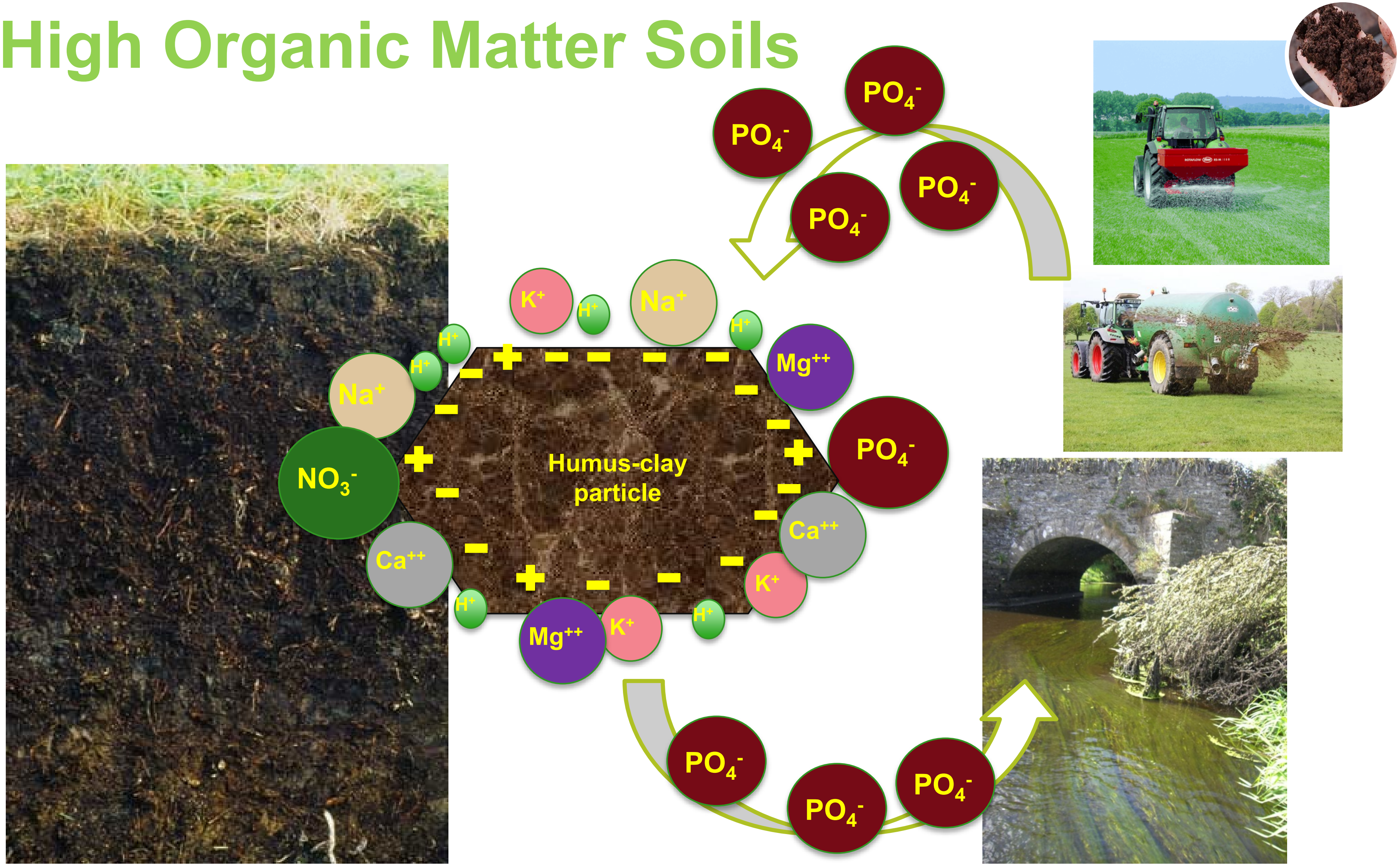
High Organic Matter Soils



Poor P retention capacities in organic matter rich soils !

Maintenace P fertiliser only – No P build-up

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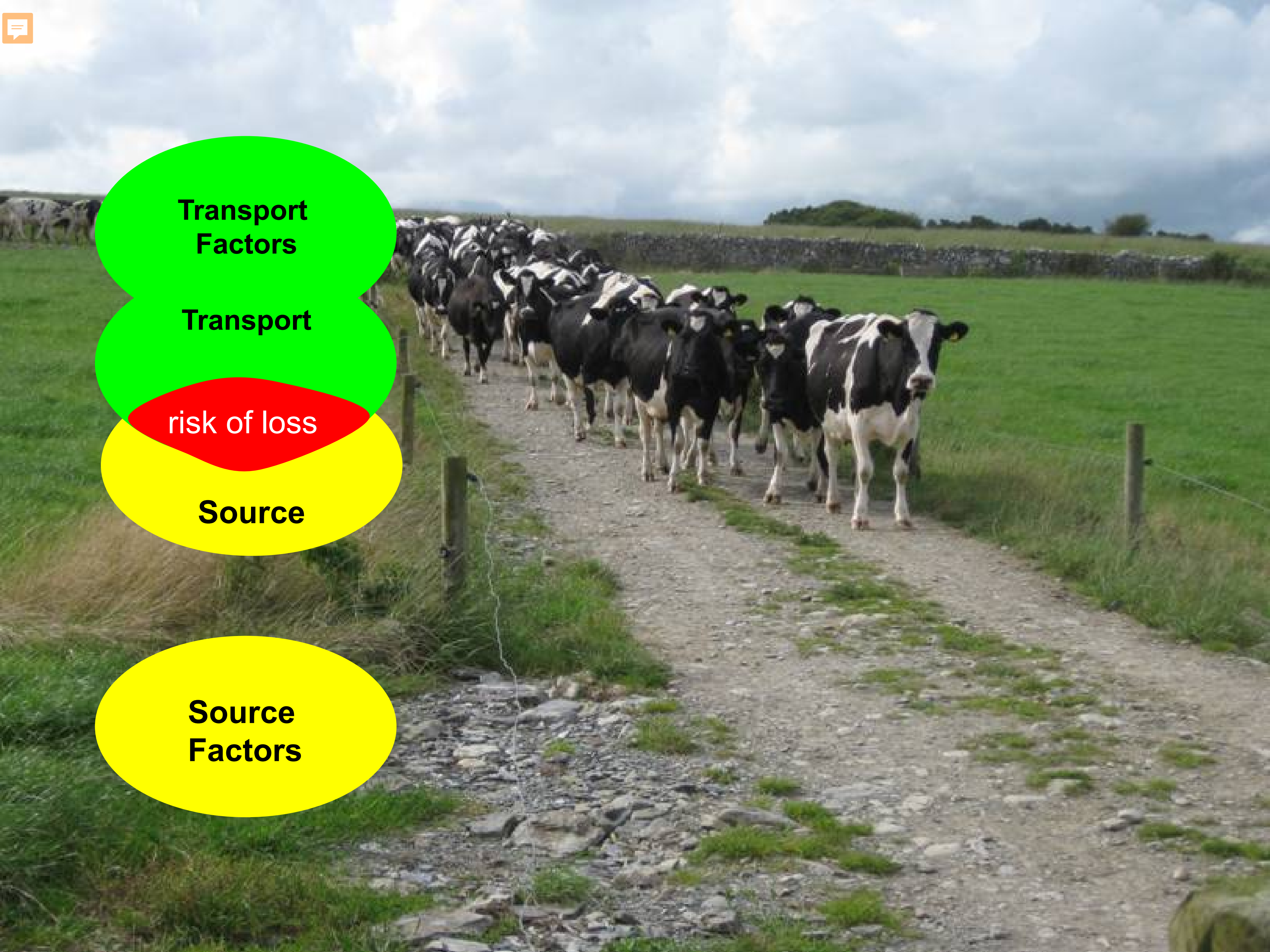
Transport Factors
Transport
risk of loss
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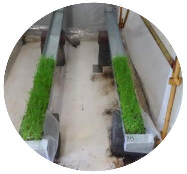
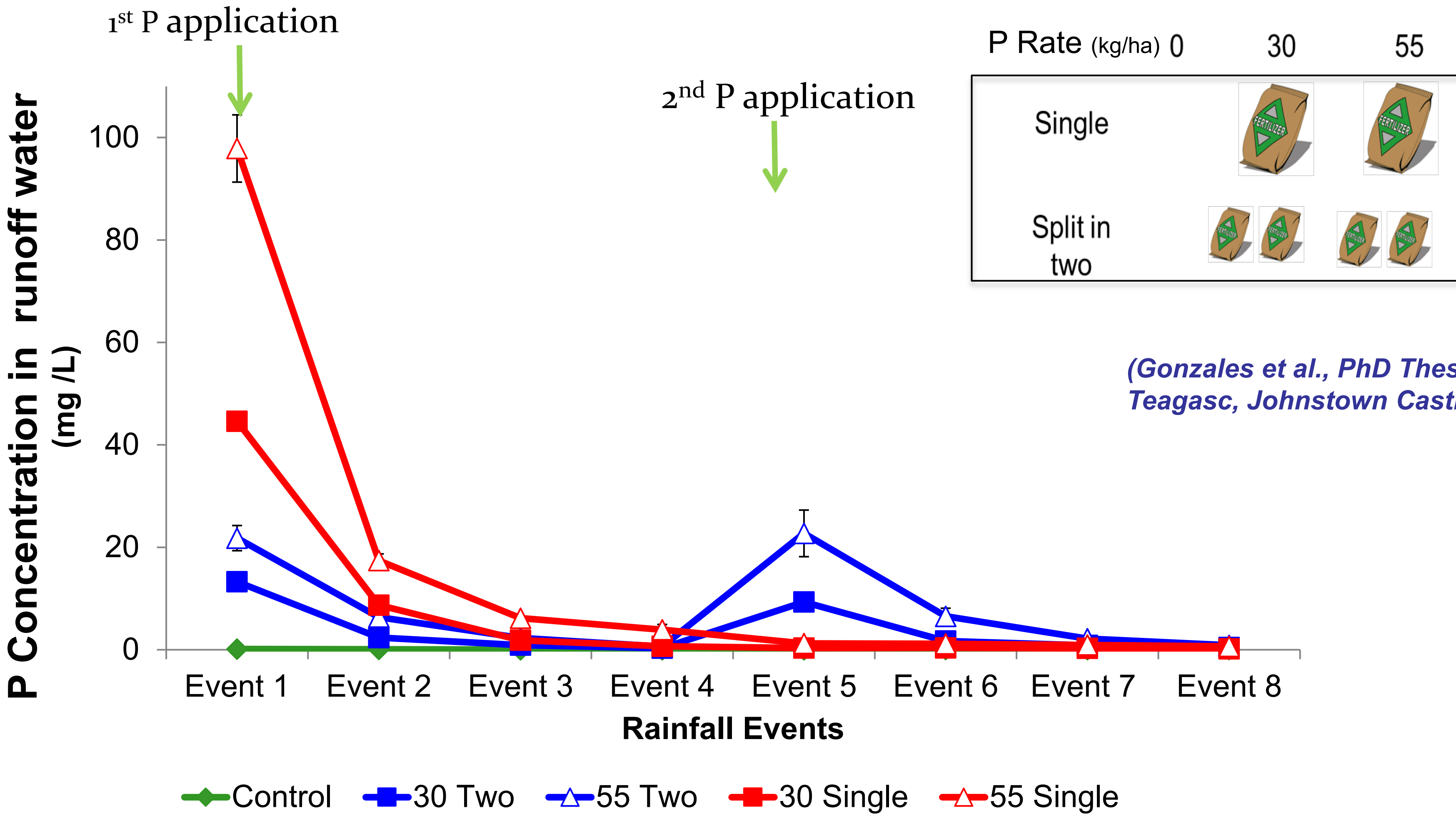


High OM Soils:
Reducing P loss by Splitting P fertiliser applications

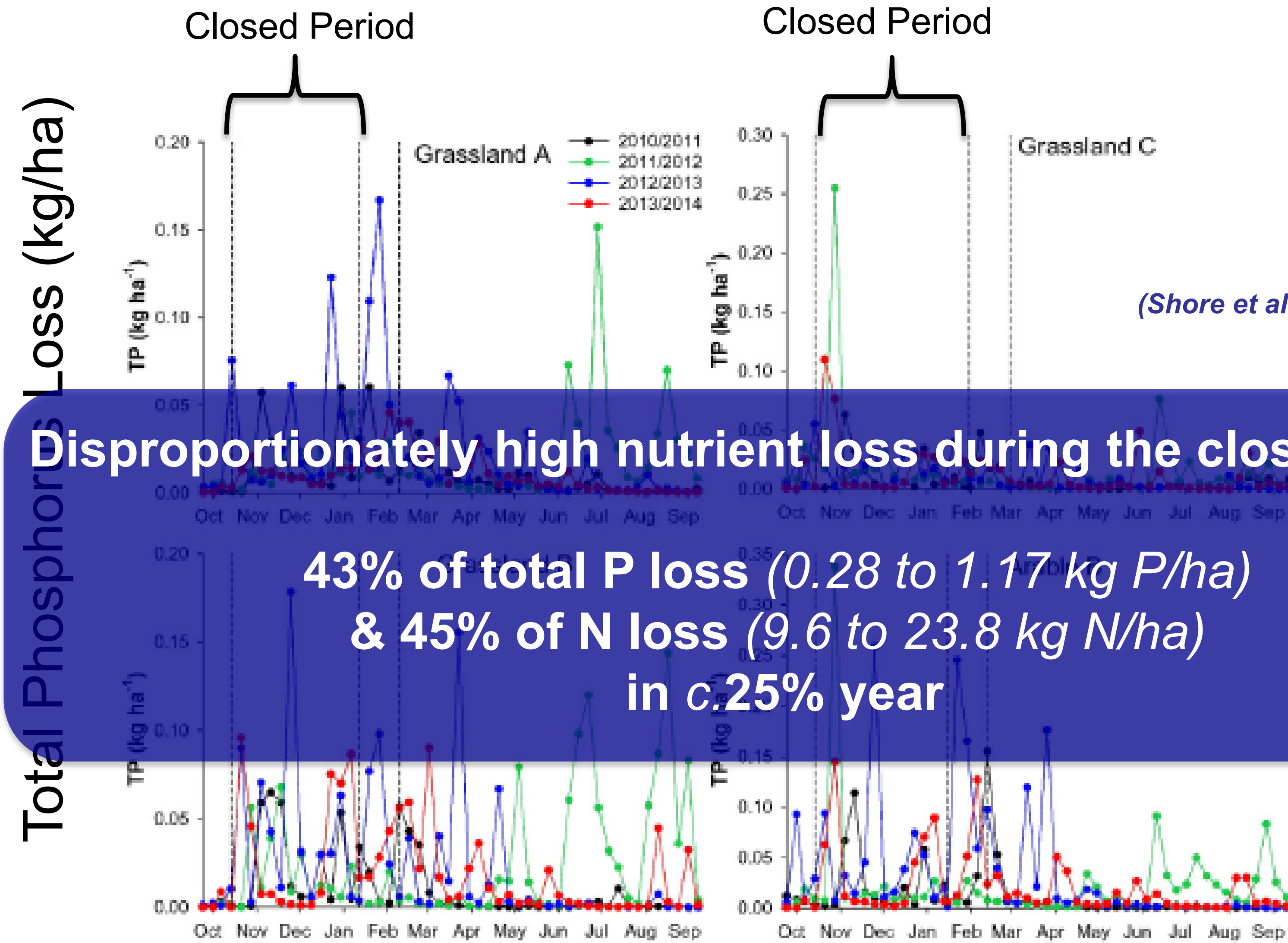


(Gonzales et al., PhD Thesis Teagasc, Johnstown Castle)

P losses proportional to the amount of P fertiliser applications

Higher overall P losses from single P applications than two applications

Potential P losses from river catchments



(Shore et al., STOTEN 2016)

Disproportionately high nutrient loss during the closed period

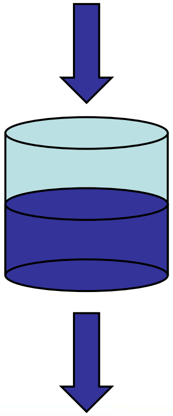
43% of total P loss *(0.28 to 1.17 kg P/ha)*
& 45% of N loss *(9.6 to 23.8 kg N/ha)*
in ***c.*** **25% year**

Effect of season on P leaching

Summer event (Jun 2012)
SMD = 31 mm
Rainfall = 25 mm
Stream flow = 2 mm
P loss = 1.6 g TRP/ha

Winter event (Nov 2012)
SMD = 0 mm
Rainfall = 29 mm
Stream flow = 20 mm
P loss = 6.5 g TRP/ha

25 mm



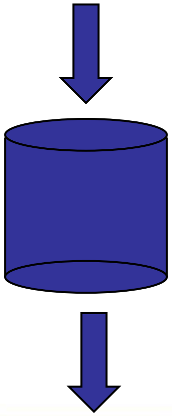
31 mm

2 mm

1.6 g TRP/ha

Four times higher P loss
in the winter event!

29 mm



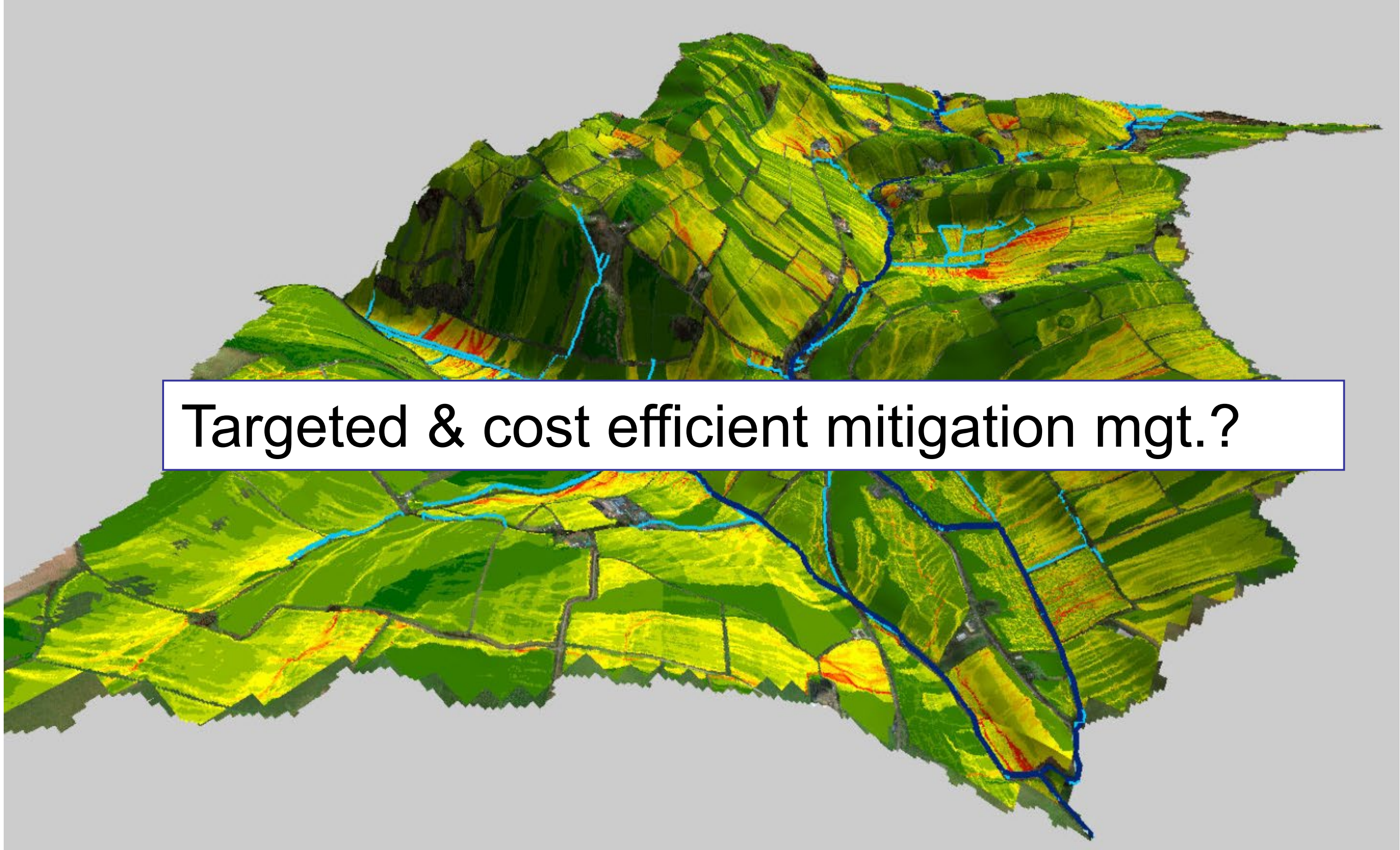
0 mm

20 mm

6.5 g TRP/ha

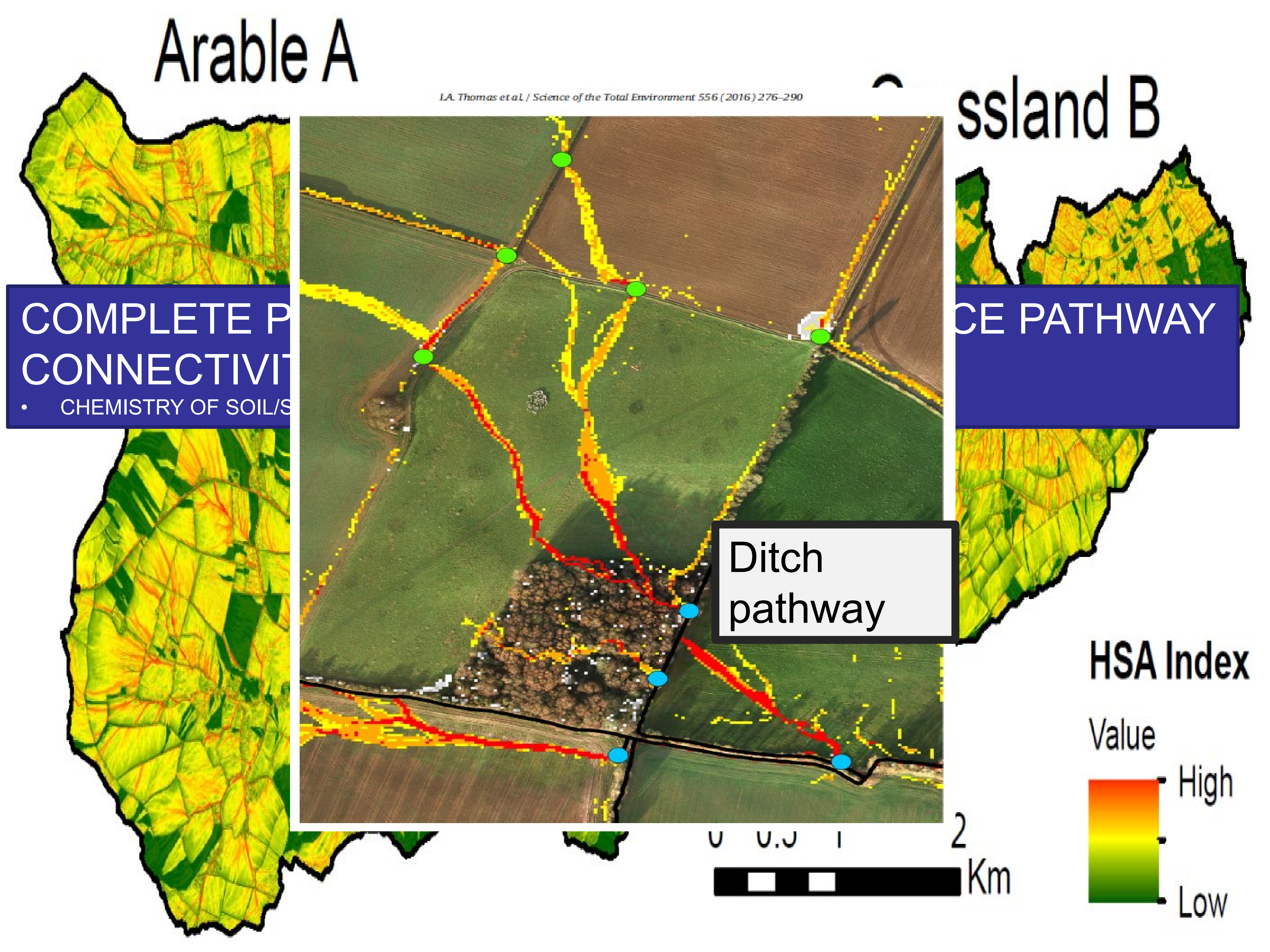
(Mellander et al., HP 2015)

Critical Source Areas (CSA's)



(Thomas et al., STOTEN 2016)

- Soil P concentration
- Erosion risk
- Mobilisation potential
- Hydrological Sensitive Areas (TWI, Soil drainage and flow sinks)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I.A. Thomas et al. / Science of the Total Environment 556 (2016) 276–290
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Thank you

Attachment C

SOIL CHARACTERISATION AND SITE SUITABILITY ASSESSMENT REPORT

SOIL CHARACTERISATION AND SITE SUITABILITY ASSESSMENT REPORT OF PROPOSED DRIP IRRIGATION SYSTEM

DAWN MEATS – SLANE, GREENHILLS, BEAUPARC, CO. MEATH, C15 CF38

Prepared for
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SLANE, GREENHILLS,
BEAUPARC, CO.
MEATH, C15 CF38

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V42 RY96

FINAL

Project Title: Hydrogeological Assessment of Proposed Drip Irrigation System

Project No: **MEHS-23-89**

Status: FINAL

Client: DAWN MEATS – SLANE,
GREENHILLS,
BEAUPARC,
CO. MEATH,
C15 CF38

Issued By: **Montgomery EHS Ltd**

Document Production / Approval Record

	Name	Signature	Date	Position
Prepared by	T Montgomery		10th Nov 23	EHS Consultant
Approved by	Guy Meredith		10th Nov 23	Site Lead

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Montgomery EHS Ltd (MEHS) has prepared this Report for the sole use of Dawn Meats - Slane in accordance with the Agreement under which our services were performed. No other warranty, express or implied, is made as to the professional advice included in this Report or any other services provided by us. This Report may not be relied upon by any other party without the prior and express written agreement of MEHS.

Unless otherwise stated in this Report, the assessments made assume that the site and facilities will continue to be used for their current purpose without significant change. The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested. Information obtained from third parties has not been independently verified by MEHS, unless otherwise stated in the Report.

Where assessments of works or costs required to reduce or mitigate any environmental liability identified in this Report are made, such assessments are based upon the information available at the time and may be subject to further investigations or information which may become available. It is therefore possible that cost estimates, where provided, may vary outside stated ranges. Where assessments of works or costs necessary to achieve compliance have been made these are based upon measures which, in MEHS's experience could normally benegotiated with the relevant authorities under present legislation and enforcement practice, assuming a pro-active and reasonable approach by site management.

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1 INTRODUCTION

1.1 General Introduction

This report presents a hydrogeological assessment of the proposed drip irrigation system at the Dawn Meats – Slane, Greenhills, Beauparc, Co. Meath, C15 CF38 (the site). The site location is shown in Figure 1. Dawn Meats – Slane is a Cattle Slaughtering site with all associated services.

Process effluent from the site is treated in an on-site wastewater treatment plant. Effluent from the wastewater treatment plant currently tankered to external wastewater treatment plants. The site has no waterbody close to the site with the assimilative capacity for dispersal of the effluent generated on-site, an alternative means of discharging treated process effluent from the facility is be required. Drip irrigation has been identified by MEHS on behalf of Dawn Meats – Slane as aviable solution.

The proposed drip irrigation system will be regarded by the EPA and some Local Authorities as an indirect discharge to groundwater. Under the Groundwater Regulations indirect discharges of effluent togroundwater are permitted provided they do not contain substances that are hazardousin groundwater, and provided there is no adverse impact on nearby receptors, such as groundwater abstraction wells or surface water courses that receive groundwater baseflow.

This hydrogeological assessment has been prepared with reference to the EPA's publication "*Guidance on the Authorisation of Discharges to Groundwater*" (version 1, December 2011 - hereafter referred to as 'EPA 2011'). The assessment takes into consideration available information on the local geology and hydrogeology of the site, as well as characteristics of the planned discharge.

1.2 Objectives

The primary objective of this hydrogeological assessment is to assess whether the discharge of treated process effluent from the proposed drip irrigation system will comply with the Groundwater Regulations[1]. The Groundwater Regulations aim to give effect to the measures needed to achieve the environmental objectives established for groundwater by the Water Framework Directive (WFD). Quoting from Regulation 2 of the Groundwater Regulations, the objectives of the WFD include the following:

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[1] European Communities Environmental Objectives (Groundwater) Regulations (S. I. No. 9 of 2010, as amended)

- prevent or limit the input of pollutants into groundwater and to prevent the deterioration of the status of all bodies of groundwater,
- protect, enhance and restore all bodies of groundwater and to ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status by not later than 22 December 2015,
- the reversal of any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order to progressively reduce pollution of groundwater.

1.3 Approach to Assessment

As outlined in EPA 2011, the assessment of a discharge to groundwater activity should be risk-based and focused on potential impacts on local receptors such as groundwater, surface water and users of these resources. The recommended approach is to follow a 'source-pathway-receptor' (SPR) model and to assess the potential impact of viable SPR linkages.

The main aspects that need to be considered in the assessment are:

- Source characterization – what are the constituents of potential concern (COPCs) in the discharge and what is the expected rate of discharge?
- Pathways analysis – what pathway will the treated effluent take following discharge? To what extent will the COPCs be expected to attenuate? Is there a potential pathway linking the source to a local receptor?
- Receptor identification – who or what could potentially be affected by the discharge?

1.4 Available Information

The hydrogeological assessment presented in this report has drawn on information on the environmental setting of the Emyvale area available from the Geological Survey of Ireland (GSI), the EPA and Ordnance Survey Ireland (OSI). In addition, the following information was provided by Castle Dragan:

- Data on treated effluent quality and flow rate;
- Results from a series of percolation tests completed within lands in the vicinity of the site in June 2023;
- Preliminary design information on the proposed drip irrigation system.

2 ENVIRONMENTAL SITE SETTING

2.1 Site Description

The Dawn Meats Slane is located in a rural area of Co. Meath on the southwest of Slane. The N2 Dublin to Derry runs approximately 2 km west to the eastern boundary of the site.

The cattle processing plant is occupied mainly by buildings, WWTP and internal roadways. Thewastewater treatment plant is located on the north side of the processing plant.

To the west, south, east, and north of the site are areas of pastureland. To the northeast is some residential dwellings.

The village of Slane is to the north and the village of yellow furze is located southwest of the site.

The site is on a gently sloping site with the level at the entrance level at 96 meters and the highest at the 111 m. The site of the proposed surface irrigation percolation area is relatively gently sloping from north to southeast with an average level of 105 metres above Ordnance Datum (m AOD).

2.2 Site Geology

2.2.1 Bedrock

According to the Geological Survey of Ireland (GSI) data viewer, topsoil underlying the subject site is classified as made ground, the topsoil type underlying the agricultural grasslands bordering the site is described as carboniferous limestone and shales from the Loughshinny Formation, with a small area of Namurian shales from the Donore Formation occurring around the eastern site boundary.

2.2.2 Overburden

GSI mapping indicates that subsoil is classified as till derived from sandy gravelly clay (glacial till / boulder clay).

Observations made during a programme of percolation testing completed during September 2023 confirmed that the predominant soil type across the pasture lands surrounding the site is sandy gravelly clay (glacial till / boulder clay) with some areas of clay soil also present.

2.3 Site Hydrogeology

According to the Geological Survey of Ireland (GSI) data viewer, topsoil underlying the subject site is classified as made ground, the topsoil type underlying the agricultural grasslands bordering the site is described as carboniferous limestone and shales from the Loughshinny Formation, with a small area of Namurian shales from the Donore Formation occurring around the eastern site boundary. The subsoil is classified as till derived from sandy gravelly clay (glacial till / boulder clay).

The GSI data viewer indicates that the subject site is not located within a source protection zone and there are no source protection zones within 5km.

There are two existing abstraction wells (BW01 and BW02) at the site which currently meet the water supply requirements of the Dunbia plant, the locations of which are shown on Figure 1 and 2. There are a number of private wells serving residential properties along the public road (Windmill Road) immediately to the east of the site recorded on the GSI well database, refer to Figure 3. The are 3 abstraction wells in the immediate vicinity of the application site recorded in the EPA Abstraction Register.

In a number of the excavation's groundwater was not observed, implying a depth to groundwater at these locations of greater than the depth of excavation of 2.6 – 3.1 m. These observations indicate that there may be non-continuous perched groundwater bodies within the soil.

2.4 Surface Water Features

The site is located in the Boyne River Basin District, within the River Boyne WFD catchment. According to the EPA GIS map viewer, a number of water bodies occur in close proximity to the subject site. The closest water body is Roughgrange River which is located on the south 700 metres from the proposed irrigation site. Other water bodies include River Boyne c.2.9 km north and River Nanny c.4.9 km south. The most predominant and widely known water body feature of the region is River Boyne, situated c.2.9 km north of the subject site. Groundwater flow at the site is predicted to be towards the southeast.

3 PROPOSED DRIP IRRIGATION SYSTEM

Dawn Meats – Slane is proposing to install a drip irrigation system within the two fields on the north of the processing site as a means of discharging treated effluent from the site. The reporton the percolation tests completed in September 2023 for Dawn Meats – Slane concluded that the soils underlying the pastureland where the tests were performed would be acceptable for a drip irrigation system, taking into consideration the depth to the water table, seasonal variations in the water table and the percolating quality of the soils.

Drip irrigation involves the controlled discharge of effluent into soil typically at a depth of 400 – 500mm below ground level via a network of pressurised pipes. The effluent is discharged into the soil via a series of "emitters" within the pipe wall, which enable the flow rate across the pipe network to be controlled and distributed evenly. The pipes are installed directly into the soil using a mole plough fitted to a standard agricultural tractor. No filter gravel is required around the pipes. The typical spacing between pipes is 400mm.

Drip irrigation systems are commonly used in situations where point source discharges to surface water are not possible due to the environmental sensitivity of the receiving streams. They are also commonly used at sites where conventional percolation systems are not appropriate due to the presence of low permeability soils or sloping ground.

Based on past experience from sites with similar soil type, the supplier of the drip irrigation system has recommended a preliminary application rate of 3 litres of treated effluent per square metre per day (3 litres/m^2/day). Currently 150 – 250 m^3 of treated effluent is generated at the site per day or 750 to 1250 m^3/week. At the proposed preliminary application rate of3 litres/m^2/day, the drip irrigation system will need to cover an area of approximately 7.0 hectares. However, the site is currently expanding and it is understood that site management wishes to install a drip irrigation system that is capable of discharging up to 200 m^3/day or 1400 m^3/week. At an application rate of 3 litres/m^2/day, the drip irrigation system willneed to cover an area of approximately 7.0 hectares.

The current concept put forward by the supplier of the drip irrigation system is to install a series of independent "drip-fields", each containing multiple zones of drip irrigation pipes of the order of 70,000 m^2 in area.

4 CONCEPTUAL SITE MODEL (CSM)

In this section, the proposed drip irrigation system is presented in the context of a Conceptual Site Model. The planned indirect discharge of treated effluent to groundwater is characterised in terms of hydraulic loading and contaminant loading. SPR linkages that potentially link the indirect discharge to local receptors are also considered.

A schematic representation of the CSM is illustrated in Figure 4.

4.1 Source Characterisation

The waste water treatment plant at the site is a biological plant that utilises activated sludge technology to reduce the organic content of the influent water. The treatment system has the following stages:

Primary treatment: This involves screening to remove gross solids, flow balancing and treatment by a Dissolved Air Floatation.

Secondary treatment: This stage comprises a Completely Mix Aeration system. The effluent passes through an initial anoxic contact tank where the effluent is mixed with activated sludge from the final stage of the process. The effluent then passes to the aerobic tank, where it is actively managed to optimise BOD removal. Retention time in the aerobic tank is 3 - 4 days. Waste sludge needs to be removed from the system on a daily basisin order to maintain treatment performance. The sludge that is removed is spread on designated land banks.

The effluent is then dosed with a flocculant before passing to a clarifier, where the solid biomass is allowed to settle from the treated effluent. The sludge is retained in the clarifier and the treated water discharges from the plant via a V-notch weir.

The flow rate of treated effluent discharging from the waste water treatment is typically in the range 160 - 230 m^3/day, with an average of approximately 200 m^3/day.

The discharge is not expected to contain substances that are considered hazardous in groundwater.

From the perspective of compliance with the Groundwater Regulations, the key parameters to consider in relation to the proposed indirect discharge are ammoniacal nitrogen (total ammonia) and MRP.

With regard to ammoniacal nitrogen, the GTV of 0.065 mg/l is applicable when considering potential impacts on surface water bodies from groundwater inputs, whereas the GTV of 0.175 mg/l is applicable when considering whether the ability of groundwater in a GWB to support human uses has been significantly impaired.

With regard to phosphorus, the GTV is for MRP rather than total phosphorus. The GTV for MRP of 0.035 mg/l is applicable when considering potential impacts on surface water bodies from groundwater inputs.

It is recognised that pathogenic micro-organisms may be present in the treated effluent. Although there is no applicable GTV for pathogens, the potential for pathogens to be present in the treated effluent has been considered in the assessment.

4.2 Migration Pathways

Treated effluent that enters the subsurface via the proposed drip irrigation system can be expected to follow one of two pathways:

- The treated effluent may be drawn into the root zone of plants growing in the topsoil and emitted as water vapour to the atmosphere via the process of transpiration;
- The proportion of the treated effluent that is not drawn into the root zone of the plants can be expected to migrate vertically down through the unsaturated zone soils to the water table, which based on available data lies close to the interface between the glacial till and the underlying bedrock.

Because each of the "drip-fields" is expected to be laterally extensive, the lateral migration of treated effluent within the shallow soils around the periphery of each drip-field is not expected to be significant in terms of volumetric flow; i.e. the predominant flow direction of the discharged water is expected to be downward.

Treated effluent migrating down through the glacial till is expected to discharge to the underlying limestone aquifer. The rate of migration can be expected to be relatively slow given the predominantly silty nature of the till; the travel time may be of the order of one year (based on a permeability of 0.01 m/day, porosity of 0.2 and thickness of overburden of 20m). Lateral flow of groundwater within the glacial till can be expectedto be limited, and for the purposes of this assessment has be ignored.

Once in the bedrock aquifer, indications from site measurements are that groundwater in the bedrock aquifer flows generally towards the south-east.

4.3 Potential Receptors

The bedrock aquifer underlying the site and the area down-gradient of the site is considered the key environmental receptor potentially at risk of impact from the drip irrigation system. Users of groundwater from the aquifer down-gradient of the site have also been considered potential receptors in the risk assessment.

The bedrock aquifer in the vicinity of the site has been classified by the GSI as "locally important".

It should be noted that the GSI's well records may not be complete, and it is possible there are private wells in the area south-east of the site that are not included in the GSI's records.

It is possible that the streams, Roughgrange River and River Boyne receives groundwater baseflow from the bedrock aquifer under the site; however, the contribution of groundwater from the site to the river is likely to be small relative to the flow rate in the river. As a result, the Roughgrange River & Boyne River is not considered to be at risk of impact from the drip irrigation system and it hasnot been considered a receptor in the risk assessment.

4.4 Potential Pollutant Linkages

A CSM for the site that incorporates the local geology and hydrogeology, and the indirect discharge to groundwater from the proposed drip irrigation system, is presented in cross section in Figure 4.

The potential pollutant linkages that have been considered in this assessment are as follows:

- Migration of effluent from the drip irrigation system via the glacial till to the bedrock aquifer. The focus of this potential pollutant linkage is on whether it is compliant with the Groundwater Regulations;
- Migration of effluent from the drip irrigation system via the glacial till to local groundwater abstraction wells. The are no wells on-site; however, there may be other wells that are noton the GSI's well database. The focus of this potential pollutant linkage is on thepotential impacts on water quality in abstraction wells located down-gradient ofthe site.

4.5 Appropriate Tier of Assessment

Section 4 of EPA 2011 recommends that a tiered approach be taken to the assessment of potential impacts on groundwater and other potential receptors.

The key risk factors associated with the drip irrigation are listed below:

- Groundwater vulnerability – the GSI classification is "low" with a localised area of "high" vulnerability in the north-east area of the site;
- Chemical load – the quality of the treated effluent is good and the key constituents of potential concern are non-hazardous in groundwater. The waste water treatment system consistently meets the ELVs specified in the IE licence;
- Chemical status of the GWB – currently "good";
- Hydraulic loading – the proposed hydraulic loading is relatively high for a drip irrigation system. The system is expected to cover several hectares of land due to the silty nature of the overburden in the vicinity of the site and the anticipated low application rate.

A key concern with the proposed drip irrigation system is considered to be the ability to reliably discharge the treated effluent into the ground without causing water logging or "break-out" at ground surface. With this risk factor in mind, and the scale of the proposed discharge, it is considered appropriate that a Tier 2 assessment is undertaken.

5 TIER 2 RISK ASSESSMENT

With reference to EPA 2011, the following aspects have been considered in the Tier 2 risk assessment:

- Infiltration capacity;
- Subsoil characterisation;
- Groundwater characterisation;
- Assessment of potential impacts.

5.1 Infiltration capacity

During the soil percolation tests undertaken in September 2023, groundwater wells installed with groundwater levels recorded in the 2 additional wells and 6 existing wells at depths ranging from 9.5 m to 11.1 m below ground level. In a number of the excavation's groundwater was not observed, implying a depth to groundwater at these locations of greater than the depth of excavation of 3.1 m. These observations indicate that there may be non-continuous perched groundwater bodies.

The percolation test results in terms of "P" value (i.e. the time it took for the water level in the trial holes to drop 100 mm) were varied. Approximately half of the P values were in the range 140 to 200, which is consistent with the soils observed at these locations. The remainder of the tests gave P valuesgreater than 200, indicating clay-dominated soil.

It is clearly important that the rate of input of treated effluent into the soil does not exceed the rate that groundwater is able to drain from the till into the underlying aquifer. If the rate of input of treated effluent is too high, there is potential forexcessive mounding of the water table to take place. This could potentially result in thewater table intersecting the ground surface, resulting in water logging or ponding. On areas of sloping ground, this could result in effluent migrating down-slope as uncontrolled run-off.

As such, establishing an optimal application rate for the drip irrigation system is important. This aspect needs to be considered in the detailed design of the system and during commissioning of the system. It should be noted that the optimal application rate can be expected to vary by area, depending on the permeability of the soil and on the depth to groundwater.

Additional permeability testing of soil in the areas that have already been assessed is not considered necessary; rather, it is considered appropriate that once each drip-field is established, they are monitored over a period using a range of application rates to assess their hydraulic performance. Based on the results of these trials an optimum application rate can be determined for each drip-field.

The preliminary application rate of 3 $l/m^2/day$ is expected to be conservative for the areas of land where P values of up to 30 were observed and it is likely in some areas a higher application rate will be sustainable. It is possible that in areas of more clayey soil an application rate less than 3 $l/m^2/day$ will be achievable.

It is recommended that the north-east area of the site is assessed for possibly inclusion in the overall drip irrigation system; this includes the area around the slurry storage lagoon, and the areas west and south of the lagoon. Indications from GSI mapping are that these areas may be underlain by gravelly soils, which can be expected to have significantly higher infiltration capacity than the silts and clays observed elsewhere.

Regardless of the application rate that can be achieved in each drip-field, the degree of groundwater mounding that occurs in response to the discharge of effluent also needs to be considered. This may be the controlling factor in terms of application rate, particularly in areas where the water table is relatively shallow.

With a view to monitoring the degree of mounding in the water table over time, it is recommended that a groundwater monitoring well is installed within each drip-field. These wells will provide useful information that can be used to assist with system optimisation during the initial period of operation, and to monitor the performance of the drip-fields on an ongoing basis.

5.2 Subsoil Characterisation

As outlined earlier, GSI mapping indicates that soil type under the pasture lands close to the site is predominantly stiff light brown to brown gravelly silty clay derived from the local bedrock. Observations made during the percolation tests confirmed that the predominant soil type across the pasture lands is light brown clay with some areas of gravelly soil clay also present.

5.3 Groundwater Characterisation

As outlined earlier the bedrock formations that underlie the site are classified by the GSI as "Locally Important aquifers – bedrock which is generally moderately productive (Lm)". The GSI has classified the vulnerability of these aquifers as "low" across most of the site and the surrounding pasture land, with localised areas of "moderate" or "high" vulnerability indicated close to the north-eastern site boundary.

There are 6 existing wells on-site and two new wells and the GSI does not contain any borehole logs.

The Geological Survey of Ireland (GSI) characterises the Trim groundwater body as follows:

- main aquifer lithology comprises Dinantian Upper Impure Limestones (Calp Limestones) which are typically impure limestones and limestones interbedded with calcareous shales; extremely heterogenous, with highly variable karsification and structural deformation (folded and faulted) throughout the area;
- a locally important aquifer ('Lm' aquifer classification) which is generally moderately productive, although it includes small areas of regionally important karstified aquifer (<5km2) dominated by diffuse flow (Rkd), and
- small generally unproductive areas (Pl) except for local zones (Ll);
- Slane Water Scheme, Co. Meath, pumping tests indicate a permeability range of

70m2/day to 200m2/day (PW1) and specific yield of 0.002 (Trial Well No. 2), representing unconfined aquifer conditions groundwater flows from the areas of high recharge in the uplands, where soils are thin, to the main surface water bodies overlying the aquifer (e.g. River Boyne); variable aquifer thickness, due to highly variable structural and

- weathering influences on the bedrock across the region;
- evidence of groundwater inflows from cavities 50m below ground level (at Summerhill and Enfield, Co Meath).

At the Dawn Meats – Slane site, the Glacial Till overlying the unconfined bedrock aquifer is up to 3m in thickness. There is no overlying sand and gravel aquifer. The bedrock aquifer characteristics are shown in Figure 4.

A review of the GSI karst database indicates that there are no identified karst landforms or features within 5 km of the application site.

5.4 Risks to Receptors

The vulnerability of the bedrock aquifer is classified as "high" by the GSI across all areas where the drip irrigation system is currently proposed. This reflects both the thickness of the overburden in the areas of interest, as well as the relatively low permeability of the soils of the area.

Added to this, the levels of key COPCs in the treated effluent discharging from the waste water treatment plant are not particularly high relative to those observed in the groundwater. For example, average concentrations of total ammonia appear to be similar to background levels in the bedrock aquifer.

Concentrations of key COPCs can be expected to attenuate as the effluent migrates down through the overburden, and an element of dilution can be expected as the effluent discharges from the overburden into the bedrock aquifer. The degree of attenuation that will be observed is difficult to estimate with any accuracy.

With regard to pathogens, the travel time for the treated effluent to migrate vertically down to the bedrock aquifer can be expected to be approximately one year (based on a permeability of 0.01 m/day, porosity of 0.2, and an overburden thickness of 20m). It is unlikely that pathogens present in the treated effluent as it discharges to the drip-fields will survive that long in the subsurface.

As outlined earlier, the risk to water quality in the surface waters down-gradient of the drip-fields is considered low.

6 GROUNDWATER COMPLIANCE MONITORING

The site's current IE licence includes the requirement to monitor groundwater quality in AGW01, AGW02 and AGW03 biannually. Monitoring of these three wells is considered adequate for the purposes of compliance monitoring of the current operations at the site.

Additional groundwater monitoring is considered necessary linked to operation of the proposed drip irrigation system. The aims of this monitoring would be as follows:

- To monitor the degree of groundwater mounding within the overburden in each drip-field and to use measurements from this monitoring to optimise application rates across each drip-field;
- To monitor groundwater quality in the overburden for key COPCs. The analytical suite should include total ammonia and indicator pathogens E. Coli, total coliforms and faecal coliforms.

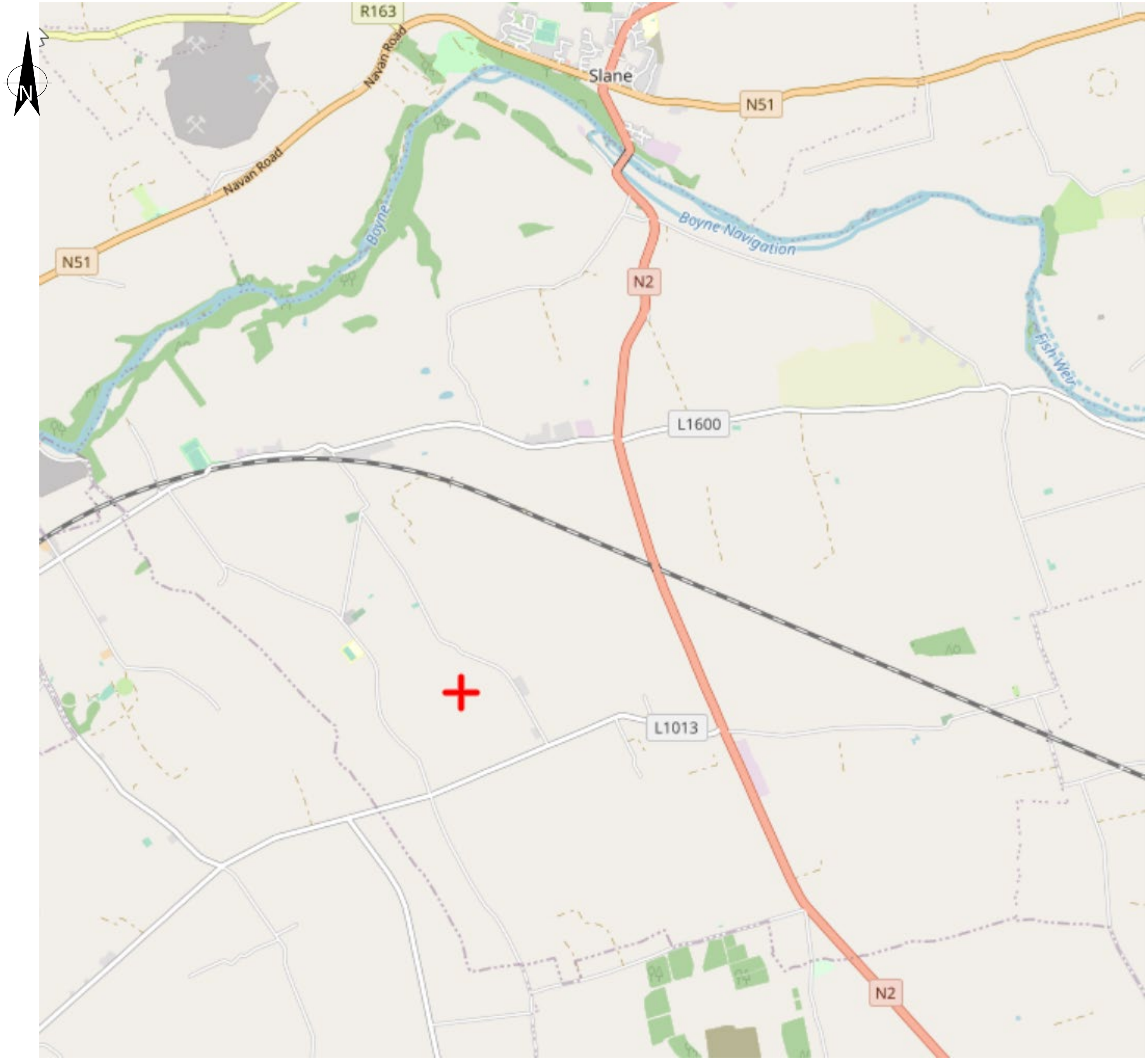
7 CONCLUSIONS

Based on the CSM presented herein, the following conclusions can be drawn:

- Any impact on the bedrock aquifer as a result of the proposed discharge in terms of increases in COPC concentrations is expected to be minor. Exceedance of GTVs for the key COPCs is not expected at any point within the aquifer;
- The discharge is not expected to have a significant impact on groundwater quality in the proposed groundwater well;
- The discharge is not expected to have an impact on local surface waters, provided application rates are monitored and controlled;

In summary, it is expected that the indirect discharge of effluent from the proposed drip irrigation system will be compliant with the Groundwater Regulations.

FIGURES



Legend

Site Location

ENVIRONMENT, HEALTH & SAFETY

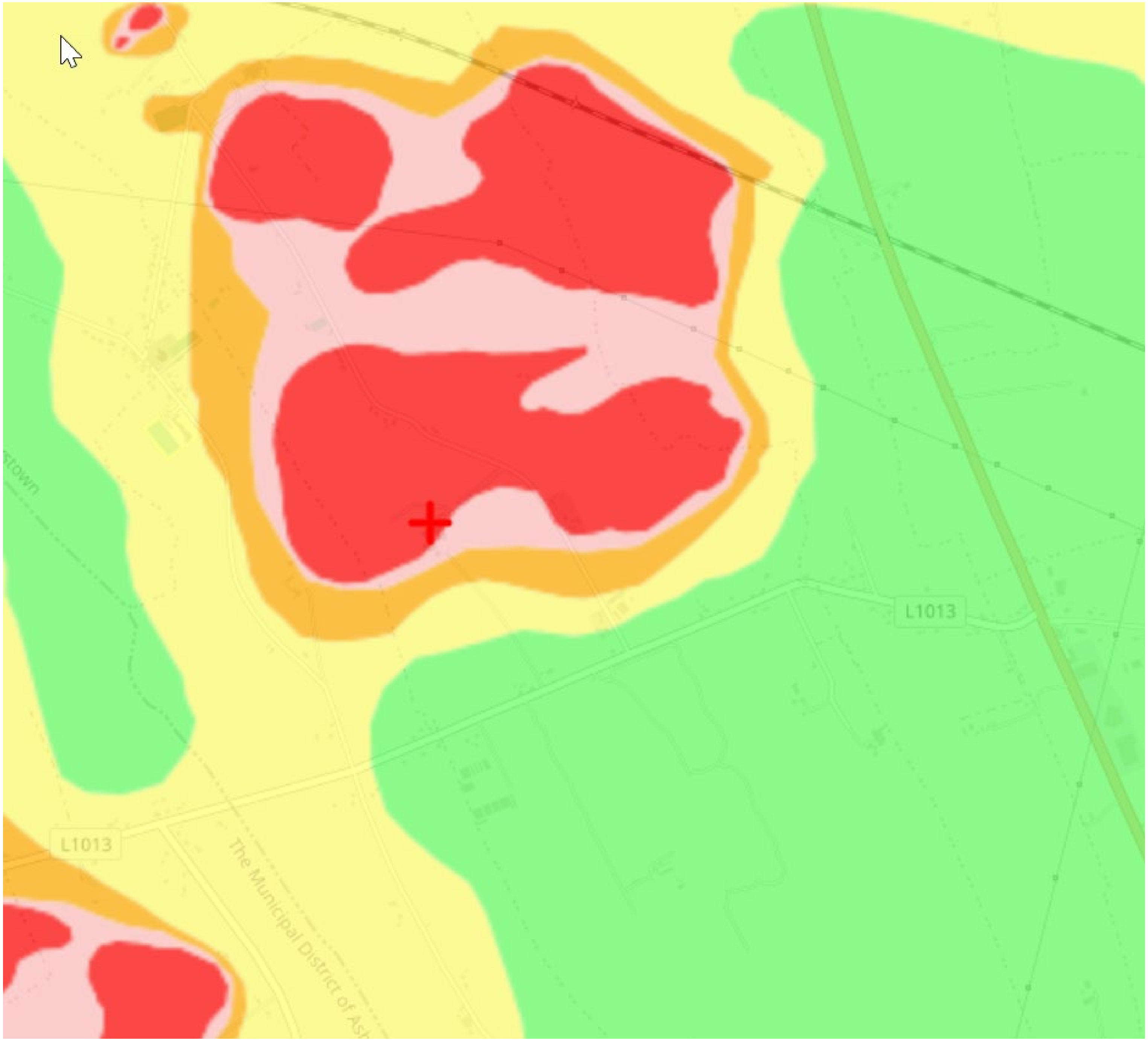
Client	Dawn Slane
Title	Mapping
Scale. NTS	Project No. P023 88
Figure No. Figure 1	Rev. A

Legend

Site Location

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Mapping
Scale. NTS	Project No. P023 88
Figure No. Figure 3	Rev. A

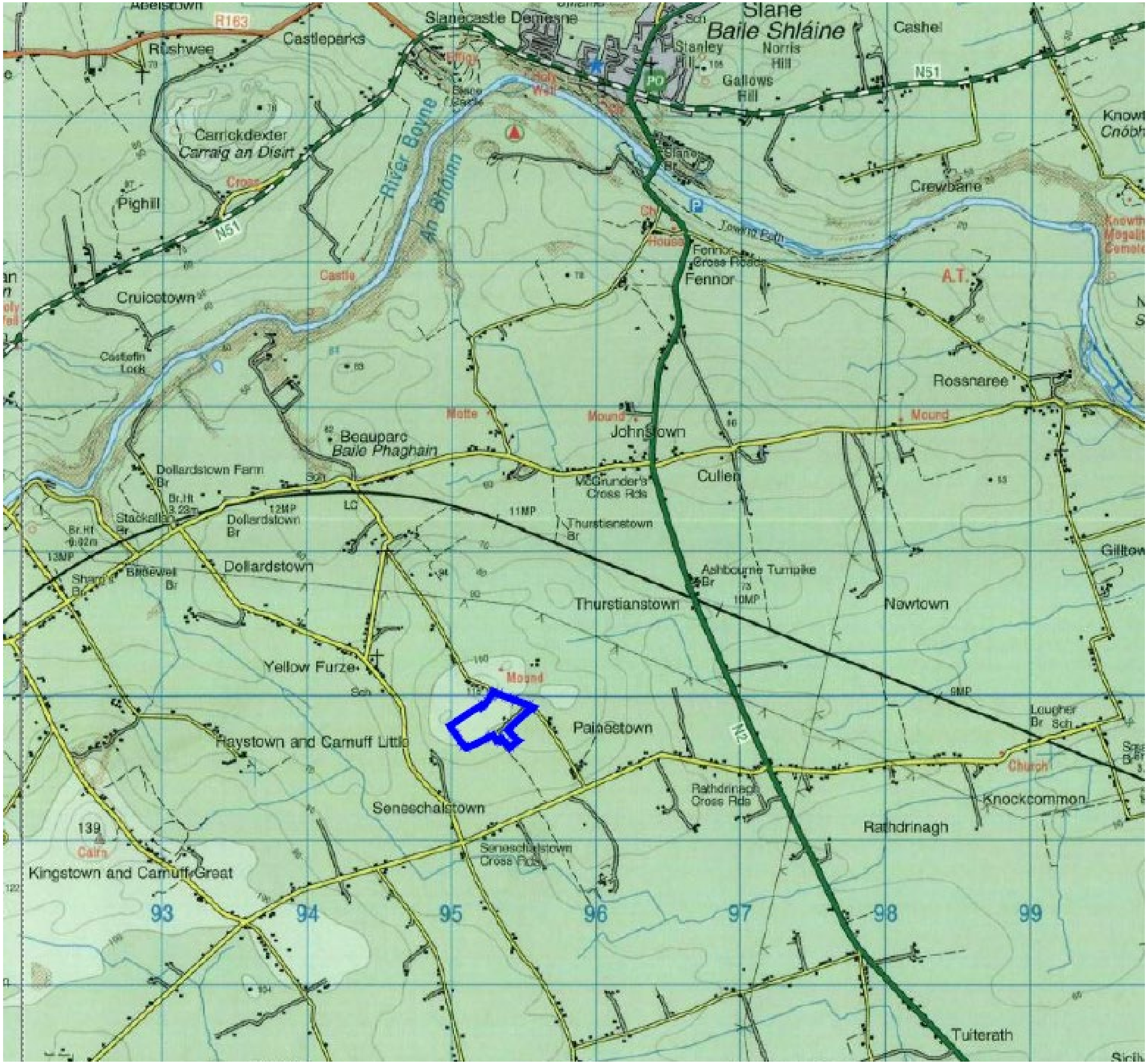


Legend

Site Location

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Groundwater Vulnerability
Scale.	NTS
Project No.	P023 88
Figure No.	Figure 2.5
Rev.	A

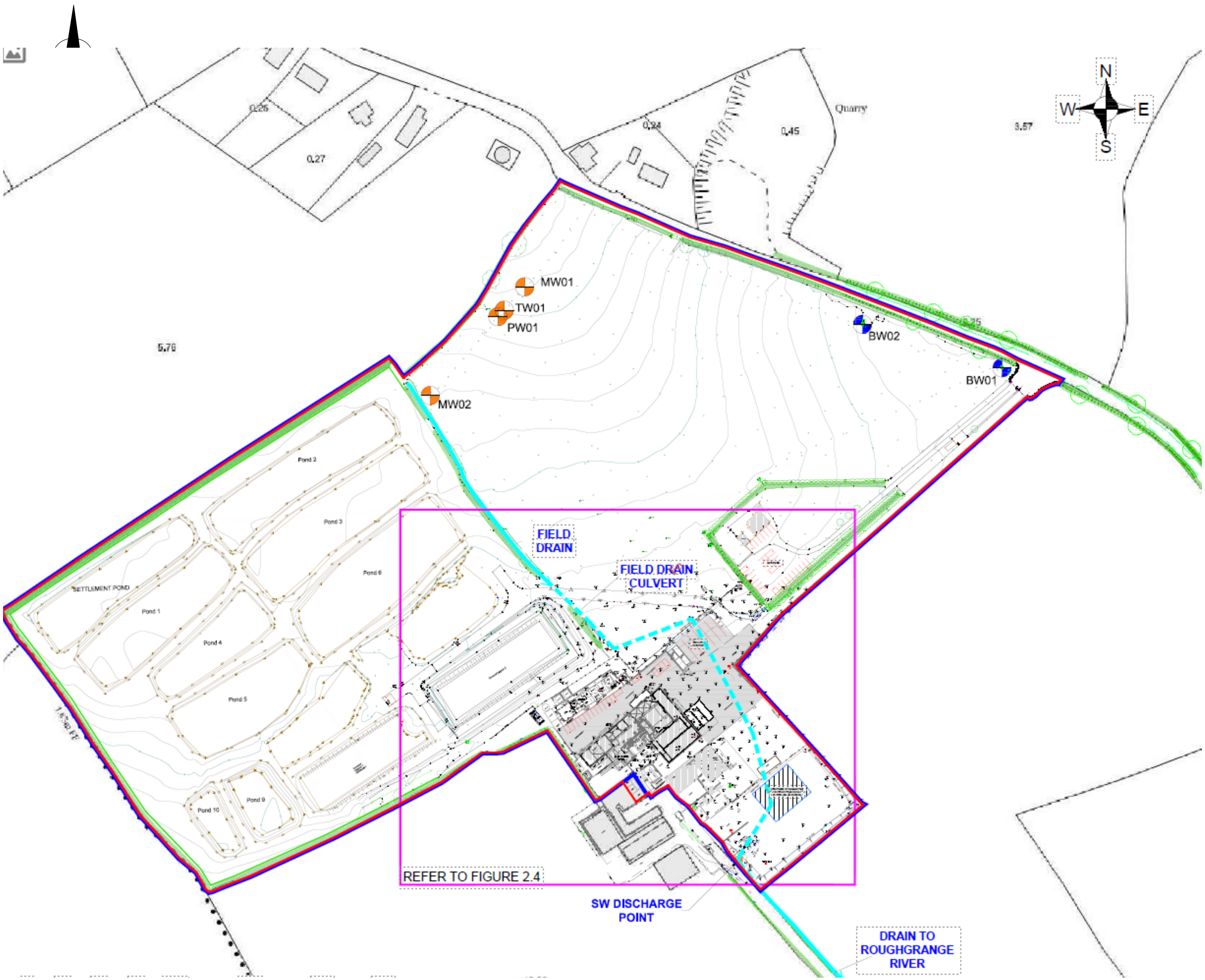


Legend

DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)

ENVIRONMENT, HEALTH & SAFETY

Client	**Dawn Slane**
Title	**Groundwater Vulnerability**
Scale. NTS	Project No. P023 88
Figure No. Figure 2.2	Rev. A



Legend

DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)

PLANNING APPLICATION AREA (C. 11.5 HA)

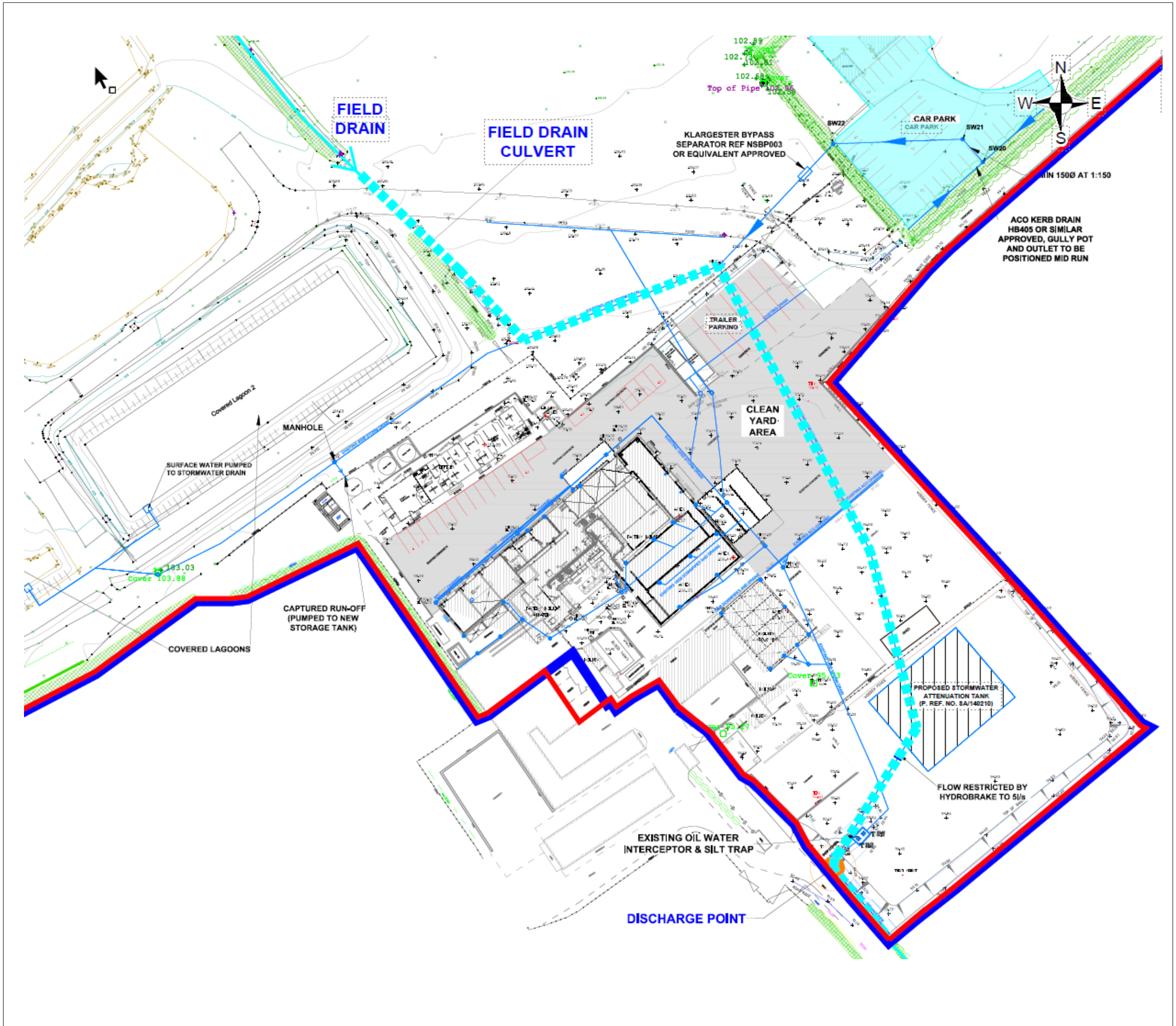
FIELD DRAINAGE □ STORMWATER DRAIN

E□ISTING SUPPLY WELLS (BW01 □ BW02)

TEST AND MONITORING WELLS (2014)

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Site layout
Scale. NTS	Project No. P023 88
Figure No. Figure 2.2	Rev. A

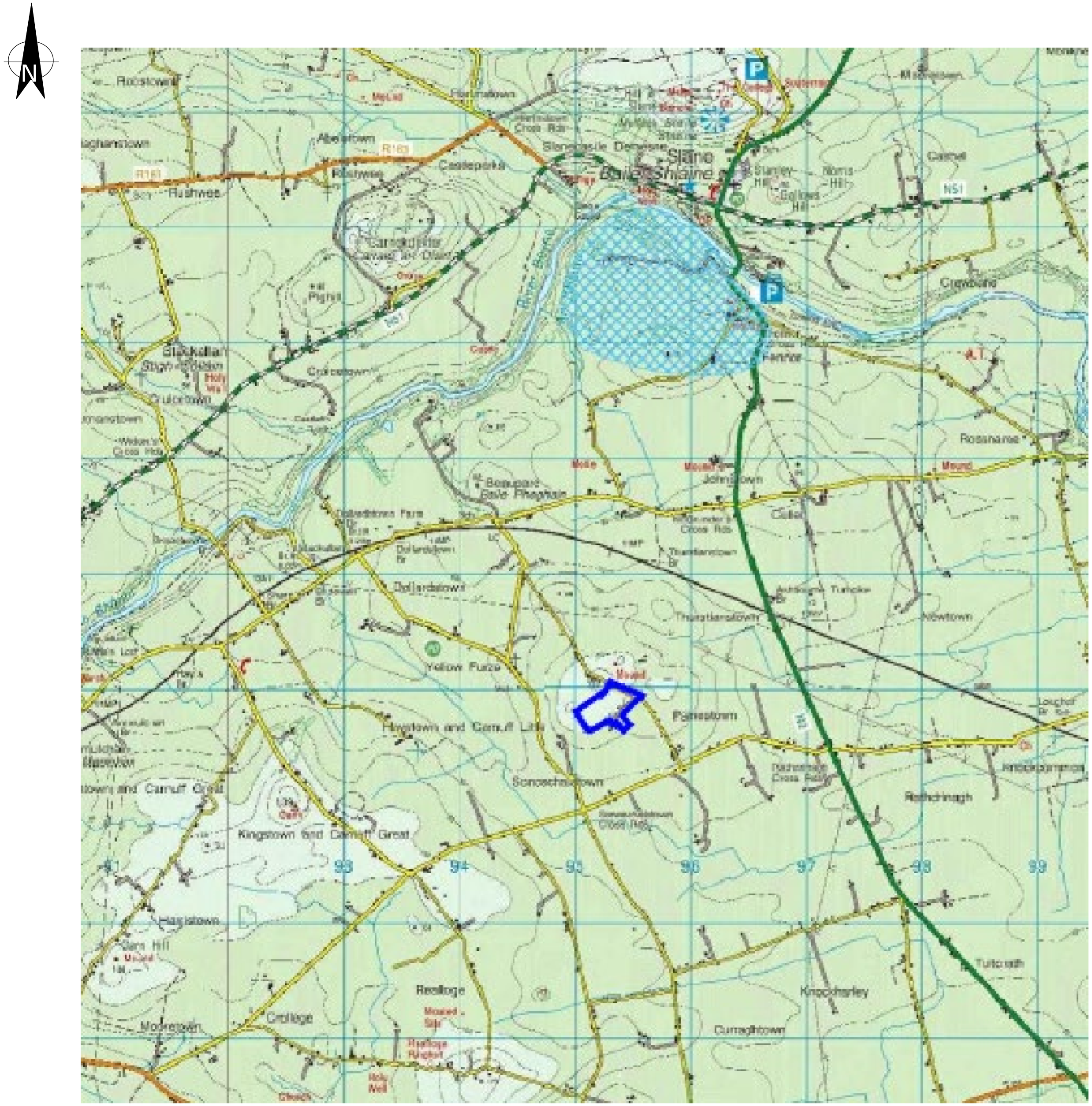


Legend

- DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)
- PLANNING APPLICATION AREA (C. 11.5 HA)
- FIELD DRAINAGE □ STORMWATER DRAIN
- SURFACE WATER DRAINAGE INFRASTRUCTURE

MEHS ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	Detailed Site Layout
Scale: NTS	Project No. P023 88
Figure No. Figure 2.3	Rev. A



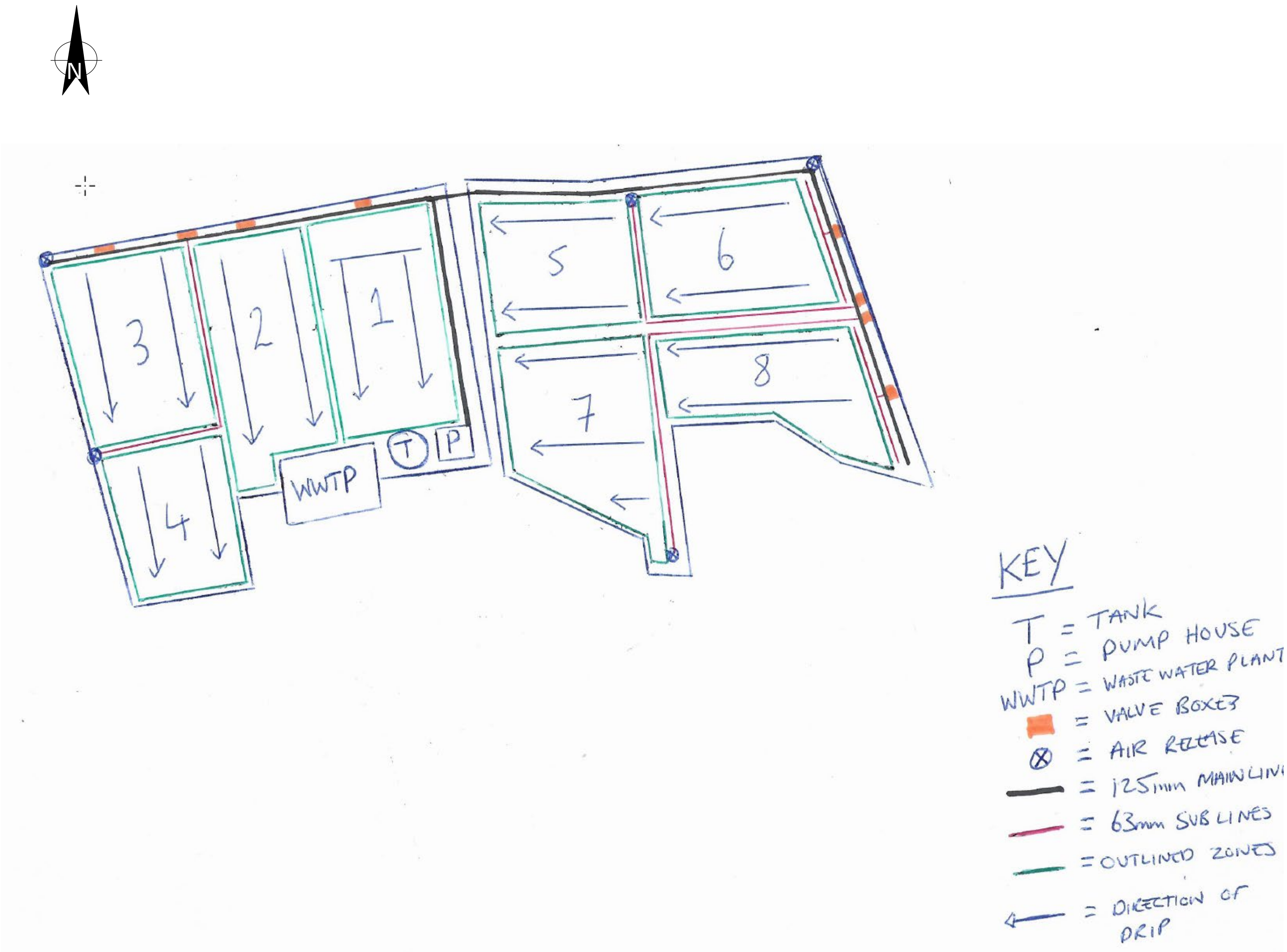
Legend

DUNBIA (SLANE) LAND OWNERSHIP (C. 11.5 HA)

SLANE WELL SOURCE PROTECTION ZONE

MEHS ENVIRONMENT, HEALTH & SAFETY

Client	Dawn Slane
Title	SOURCE PROTECTION ZONE MAP
Scale. NTS	Project No. P023 88
Figure No. Figure 2.4	Rev. A



Legend

DUNBIA (SLANE)
LAND OWNERSHIP (C. 11.5 HA)

SLANE WELL SOURCE
PROTECTION ZONE

MEHS
ENVIRONMENT, HEALTH & SAFETY

Client	**Dawn Slane**
Title	**Irrigation Zones**
Scale. NTS	Project No. P023 88
Figure No. Figure 4	Rev. A

APPENDIX A
Report on Percolation Tests – September 2023

Reply to: Dawn Slane Our ref: RF
Your ref: Date: 15th Nov 2023

Dawn Meats – Slane
Greenhills,
Beauparc,
Co. Meath,
C15 CF38

Re:- Site Assessment for Proposed Drip Irrigation System at Dawn Meats – Slane

Dear Michelle McCarthy,

With reference to above-mentioned and prior discussions with Dawn Meats – Slane. I confirm that I attended on site to carry out site assessment study of the existing landsfor determination of suitability for dispersal of treated wastewater using a drip irrigation system andreport as follows:-

Scope of Works:

To determine the type and classification of soils/subsoils on site, the depth of soils/subsoils, and the depth to water table.

Purpose of Works:

To enable a decision on the suitability of the lands for dispersal of treated wastewater using a drip irrigation system.

Assessment Parameters:

It was decided following discussions with Joe Walsh of Ash Environmental Technologies to adapt measures outlined in the EPA Code of Practice Wastewater Treatment and Disposal Systems Serving Single Houses 2009, using the British Standard BS5930:1999 for soil classification and the Percolation Test procedure for the percolating properties of the soils.

Assessment Requirements:

Based on the parameters set, a three day period of assessment was required. It was agreed that I would attend on site on 19th to 21st September 2023 to carry out the assessment. We had advised that he would attend on site from the commencement of the assessment and that a suitable machine and sufficient water would be provided by MEHS to enable us to carry out the assessment.

Assessment Process:

It was decided, given the expanse and location of the lands identified for possible dispersal, to excavate a number of trial holes throughout the land at varying locations and field positions. It was also decided to excavate a Percolation Test Hole at each trial hole location.

Trial Holes:

A total of 11 trial holes were excavated throughout the lands, each to a depth of 2.7 to 3.1 m. The location points for the trial holes are marked as approximate on the attached site location map (Appendix A).Each of these trial holes were assessed as follows:-

(i) Soil layers/type/classification
(ii) Depth to water ingress when excavated
(iii) Depth to water table after 24 hours
(iv) Depth to water table after 48 hours
(v) Depth to bedrock

Trial hole assessment results are detailed individually and marked as trial holes 1 to 11 attached (Appendix A).

Percolation Test Holes:

A total of 11 percolation test holes were excavated throughout the lands, adjacent to each trial hole. The dimensions of each hole was 300mm x 300mm x 400mm deep. Each of these holes were pre-soaked twice on 19th September, 2023 at 10am and 4pm. In order to achieve an indication of any percolation qualities of the soils it was decided that pre-soaking would be carried out twice and the level of water remaining in the hole prior to testing on the 20th September 2023 would be recorded.

Percolation test hole results are detailed individually and marked as P-Test holes 1 to 2 attached (Appendix A).

General Findings:

My assessment concluded that there are very similar soils across the two fields. A common trend concluded that the soils generally are deep poorly drained soils with very little mottling evident suggesting a seasonally adjusting water table in only 2 of the 11 trial holes.

A good depth of soil was recorded above recorded water table levels, ranging from 2.6 to in excess of 3.1 m., and the predominant soil type recorded was silty in nature with sand and gravelcontent common.

Conclusion:

I would be of the opinion that such soils would be acceptable for a drip irrigation system, given the depth to water table, the seasonal nature of the water table, and the percolating quality of the soils. The use of drip irrigation in Ireland is relatively new and has tended thus far to be used as an option where percolating qualities are poor.

However, the low levels of water in trial holes after 48 hours and the complete absence in some, combined with the low loading rates envisaged in the region of 3 litres/m^2 would seem to indicate that sub-surface infiltration aided by horizontal movement in the upper soil horizons should be achieved. In addition, the removal of the build-up of vegetation from the existing drains in the lands so that surface water can move more freely, would assist the drainage of the lower lying areas.

Comment:

This report as is our normal practice is for the benefit of the addressee only and should not be relied upon in whole or in part by any third party without the consent of the undersigned.

Please do revert should you have any questions or require any further particulars.

Yours sincerely,

Trevor Montgomery
Montgomery EHS Ltd

Appendix A Report on Percolation Tests – September 2023

SITE CHARACTERISATION FORM
COMPLETING THE FORM

Note: This form requires the latest version of Adobe Acrobat Reader

and on PC's Windows 7 or later. Windows XP produces errors in calculations

Step 1:

Goto Menu Item **File, Save As** and save the file under a reference relating to the client or the planning application reference if available.

Clear Form

Use the **Clear Form** button to clear all information fields.

Notes:

All calculations in this form are automatic.

Where possible information is presented in the form of drop down selection lists to eliminate potential errors.

Variable elements are recorded by tick boxes. In all cases only one tick box should be activated.

All time record fields must be entered in twenty four hour format as follows: HH:MM

All date formats are DD-MM-YYYY.

All other data fields are in text entry format.

This form can be printed out fully populated for submission with related documents and for your files. It can also be submitted by email.

Section 3.2 In this section use an underline _____ across all six columns to indicate the depth at which changes in classification / characteristics occur.

Section 3.4 Lists supporting documentation required.

Section 4 Select the treatment systems suitable for this site and the discharge route.

Section 5 Indicate the system type that it is proposed to install.

Section 6 Provide details, as required, on the proposed treatment system.

APPENDIX A: SITE CHARACTERISATION FORM

File Reference:

1.0 GENERAL DETAILS (From planning application)

Prefix: First Name: Dawn Meats - Slane Surname:

Address: Greenhills, Beauparc, Co. Meath, C15 CF38

Site Location and Townland: Greenhills, Beauparc, Co. Meath, C15 CF38

Number of Bedrooms: Maximum Number of Residents: 4

Comments on population equivalent

Site is a cattle slaughtering plant which is EPA licensed site operating a wastewater treatment plant.

Proposed Water Supply:

Mains ☐ Private Well/Borehole ☑ Existing well on-site Group Well/Borehole ☐

2.0 GENERAL DETAILS (From planning application)

Soil Type, (Specify Type): Soil Association 38:
Grey Brown Podzolics (75%), Gleys (20%), Brown earths (5%)

Subsoil, (Specify Type): Silt/Clay

Bedrock Type: DUIL-Dinantian Upper Impure Limestone

Aquifer Category: Regionally Important Locally Important LI Poor

Vulnerability: Extreme ☐ High ☑ Moderate ☐ Low ☐

Groundwater Body: IE_EA_G_002 Status Good

Name of Public/Group Scheme Water Supply within 1 km: None

Source Protection Area: ZOC ☐ SI ☐ SO ☐ Groundwater Protection Response:

Presence of Significant Sites (Archaeological, Natural & Historical): None on-site

Past experience in the area: GENERALLY GOOD P AND T VALUES COMMON

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

Note: Only information available at the desk study stage should be used in this section.

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position: Plot 1 & Plot 2

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☐ Relatively Flat (<1:20) ☑

Slope Comment

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses:

Two fields on the North site of the Plant and entrance

Existing Land Use:

Improved grassland

Vegetation Indicators:

grass land

Groundwater Flow Direction: South easterly

Ground Condition:

Grass

Site Boundaries:

tree line, stream

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Roads:

Site is 0.2 km from Windmill Lane

Outcrops (Bedrock And/Or Subsoil):

None on the area of the irrigation system

Surface Water Ponding:

None

Lakes:

None

Beaches/Shellfish Areas:

N/A

Wetlands:

N/A

Karst Features:

None

Watercourses/Streams:*

There is a drainage ditch to the North of Plot 1 and then between Plot 1 & 2.

***Note and record** water level

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Drainage Ditches:*

As above

Springs:*

None

Wells:*

As per Figure

Comments:
(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

R1 = Acceptable subject to normal good practice. Site may be suitable for discharge to ground, if the minimum depths are met on the site and if there exists suitable percolation. As the soil type in the area is Grey Brown Podzolics (75% of the land area), and as the area is mapped as ‘High’ Vulnerability. Groundwater as a resource will be at risk if the minimum depths required are not achieved on the site, or if the percolation rate is too rapid. Older wells in the area may also be at risk, if the minimum separation distances are not adhered to. Groundwater and wells are therefore the main targets, following the desk study. Given the response and the aquifer type, the site is potentially suitable for a conventional septic tank system if the minimum depths required are met on the site, if the minimum separation distances can be met, and if the percolation rate is adequate.

***Note and record** water level

Trial Hole 1 Grid Reference N 95052 69729

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.1

Depth from ground surface to bedrock (m) (if present): 3.0

Depth from ground surface to water table (m) (if present): 2.7

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19-Sep-2023 09:00

Date and time of examination: 19-Sep-2023 09:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-3100mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m			GWT				
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. (‘Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 2 Grid Reference N 95034 69796

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 09:30

Date and time of examination: 19/09/2023 09:30

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 3 Grid Reference N 95085 69771

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.1

Depth from ground surface to bedrock (m) (if present): Not Present

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 09:45

Date and time of examination: 19/09/2023 09:45

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-3100mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 4 Grid Reference N 95114 69821

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 10:00

Date and time of examination: 19/09/2023 10:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

Trial Hole 5 Grid Reference N 95034 69796

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 10:30

Date and time of examination: 19/09/2023 10:30

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 6 Grid Reference N 95149 69895

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 10:30

Date and time of examination: 19/09/2023 10:30

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 7 Grid Reference N 95222 69914

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 11:00

Date and time of examination: 19/09/2023 11:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads	Crumb	Low	Brown	No
0.6 m							
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

Trial Hole 8 Grid Reference N 95034 69796

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.1

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): 2.8

Depth of water ingress: 2.7

Rock type (if present): shales

Date and time of excavation: 19/09/2023 11:30

Date and time of examination: 19/09/2023 11:30

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-3100mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m			GWT				
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

Trial Hole 9 Grid Reference N 95270 70003

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.0

Depth from ground surface to bedrock (m) (if present): 3.0

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 12:00

Date and time of examination: 19/09/2023 12:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-3000mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 10 Grid Reference N 95339 69964

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.9

Depth from ground surface to bedrock (m) (if present): 2.9

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 12:30

Date and time of examination: 19/09/2023 12:30

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-2900mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads				
0.6 m				Crumb	Low		
0.7 m						Brown	No
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

Trial Hole 11 Grid Reference N 95461 69917

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.1

Depth from ground surface to bedrock (m) (if present): Not Present

Depth from ground surface to water table (m) (if present): Not present

Depth of water ingress: none

Rock type (if present): shales

Date and time of excavation: 19/09/2023 13:00

Date and time of examination: 19/09/2023 13:00

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Depth of Surface Test Clay intermixed With stone	Ribbons, 30.30.40 2,2,2Threads	Crumb	Low	Brown	Yes, Grass
0.2 m							
0.3 m	TA/P						
0.4 m							
0.5 m		350 mm-3100mm silt/Clay cobbles Avg threads, avg 125mm ribbon, not dilatant	Ribbons 50.60.60 2,2,3Threads	Crumb	Low	Brown	No
0.6 m							
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m	TA/P						
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m	TA/P						
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: 75

Likely Surface Percolation Value: 50

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date	19-Sep-2023	19-Sep-2023	19-Sep-2023
	Time	10:00	10:00	10:00
2nd pre-soak start	Date	19-Sep-2023	19-Sep-2023	19-Sep-2023
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm (P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time	10:00	10:00	10:00
2nd pre-soak start	Date			
	Time	18:00	18:00	18:00

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	20-Sep-23	20-Sep-23	20-Sep-2023
Time filled to 400 mm	08:55	09:00	09:05
Time water level at 300 mm	10:02	10:13	10:11
Time to drop 100 mm P_{100})	67.00	73.00	66.00
Average P_{100}			68.67

3.4 The following associated Maps, Drawings and Photographs should be appended to this site characterisation form.

1. Discovery Series 1:50,000 Map indicating overall drainage, groundwater flow direction and housing density in the area.
2. Supporting maps for vulnerability, aquifer classification, soil, subsoil, bedrock.
3. North point should always be included.
4. (a) Scaled sketch of site showing measurements to Trial Hole location and
   (b) Percolation Test Hole locations,
   (c) wells and
   (d) direction of groundwater flow (if known),
   (e) proposed house (incl. distances from boundaries)
   (f) adjacent houses,
   (g) watercourses,
   (h) significant sites
   (i) and other relevant features.
5. Site specific cross sectional drawing of the site and the proposed layout[1] should be submitted.
6. Photographs of the trial hole, test holes and site including landmarks (date and time referenced).
7. Pumped design must be designed by a suitably qualified person.

[1] The calculated percolation area or polishing filter area should be set out accurately on the site layout drawing in accordance with the code of practice's requirements.

4.0 CONCLUSION of SITE CHARACTERISATION

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Slope of proposed infiltration / treatment area: level ground

Are all minimum separation distances met? ✓

Depth of unsaturated soil and/or subsoil beneath invert of gravel (or drip tubing in the case of drip dispersal system)

Percolation test result: Surface: Sub-surface:

Not Suitable for Development ☐ **Suitable for Development** ✓

Identify all suitable options

1. Septic tank system (septic tank and percolation area) **(Chapter 7)**
2. Secondary Treatment System **(Chapters 8 and 9)** and soil polishing filter **(Section 10.1)**
3. Tertiary Treatment System and Infiltration / treatment area **(Section 10.2)** Yes

Discharge Route [1]

5.0 SELECTED DWWTS

Propose to install: Tertiary Treatment System and Infiltration /treatment area

and discharge to: Ground Water

Invert level of the trench/bed gravel or drip tubing (m) 0.50

Site Specific Conditions (e.g. special works, site improvement works testing etc.

Watewater treatment system as per design document with sub-surface irrigation system.

[1] A discharge of sewage effluent to "waters" (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.4.

6.0 TREATMENT SYSTEM DETAILS

SYSTEM TYPE: Septic Tank Systems (Chapter 7)

Tank Capacity (m^3): 50.00

Percolation Area		Mounded Percolation Area	
No. of Trenches		No. of Trenches	
Length of Trenches (m)		Length of Trenches (m)	
Invert Level (m)		Invert Level (m)	

SYSTEM TYPE: Secondary Treatment System (Chapters 8 and 9) and polishing filter (Section 10.1)

Secondary Treatment Systems receiving septic tank effluent (Chapter 8)

Media Type	Area (m^2)*	Depth of Filter	Invert Level
Sand/Soil			
Soil			
Constructed Wetland			
Other			

Packaged Secondary Treatment Systems receiving raw wastewater (Chapter 9)

Type:

Capacity PE:

Sizing of Primary Compartment: m^3

Polishing Filter*: (Section 10.1)

Surface Area (m^2)*	
Option 1 - Direct Discharge Surface area (m^2)	
Option 2 - Pumped Discharge Surface area (m^2)	
Option 3 - Gravity Discharge Trench length (m)	
Option 4 - Low Pressure Pipe Distribution Trench length (m)	
Option 5 - Drip Dispersal Surface area (m^2)	70,000.00

SYSTEM TYPE: Tertiary Treatment System and infiltration / treatment area (Section 10.2)

Identify purpose of tertiary treatment	Provide performance information demonstrating system will provide required treatment levels	Provide design information
Primary screening and balancing. Primary DAF Activated Sludge Clarification Tertiary automatic filtration Sub-Surface Irrigation System		

DISCHARGE ROUTE:

Groundwater	☐	Hydraulic Loading Rate * (l/m^2.d)		Surface area (m^2)	70,000.00
Surface Water **	☐	Discharge Rate (m^3/hr)	8.75		

* Hydraulic loading rate is determined by the percolation rate of subsoil

** Water Pollution Act discharge licence required

6.0 TREATMENT SYSTEM DETAILS

QUALITY ASSURANCE:

Installation & Commissioning

Installation of the wastewater treatment plant by Glanua Industrial
Installation of sub-surface irrigation by MEHS

On-going Maintenance

Glanua Industrial & MEHS

7.0 SITE ASSESSOR DETAILS

Company: Montgomery EHS Ltd

Prefix: Mr First Name: Trevor Surname: Montgomery

Address: Kantoher Business Park, Killeedy, Ballagh, Co. Limerick

Qualifications/Experience: BSc, Post Graduate, Dip Poll Ass & Control, Cert Envn Mon

Date of Report: 27-Sep-2023

Phone: 0872390421 E-mail trevor@mehs.ie

Indemnity Insurance Number: HU PI6 1827155 (34)

Signature: ____