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Executive summary

This report concludes that there is a low risk of flooding during the lifetime of the proposed Inland Border Facility. The proposed site is in Flood Zone 1.

This report concluded that the proposed border check facilities will not increase the risk of flooding to person or property in adjacent sites.

Drainage Strategy

The surface water run-off is proposed to discharge to Old Mill (Aylesford) Stream in the north and to two culverts that run beneath the HS1 (High Speed) railway line in the south which are tributaries to the East Stour River. The discharge shall be controlled to a greenfield run-off rate of 4l/s/ha, as specified in the Ashford Borough Council Sustainable Drainage Sustainable Planning Document (SPD), refer below to 2.8. The whole drainage system is designed to attenuate and impede discharge.

The foul water is proposed to outfall to a Southern Water pumping station to the north-east of the Site. Foul water in excess of the pumping station's capacity shall be stored on-site and discharged during off-peak times to the pumping station, tankered away or a combination of these options to ensure no flooding occurs to the development from the proposed foul water drainage strategy.

One option is to treat plant or animal contaminants on-site and waste that is acceptable to Southern Water via discharged to foul water or tankered away if not. This operational requirement has not been resolved when this Flood Risk Assessment had been written.

There is currently ongoing consultation with Southern Water regarding the foul water.

LASOO Table

The Local Authority SuDS (Sustainable Drainage System) Officer Organisation (LASOO) has released a publication that lays out the guidance documents and several technical standards that can be used to assess whether a proposed drainage scheme submitted through the planning process complies with current national and local policy. The publication is called the 'Non-statutory Technical Standards for Sustainable Drainage'.

Table 1.1 overleaf sets out how the proposed drainage for the Sevington Inland Border Facility complies with this guidance and meets technical standards.

Table 1.1: LASOO Guidance

	Run-off Description
General	LASOO states that "generally the aim should be discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable: 1. Into the ground (infiltration). 2. To a surface water body. 3. To a surface water sewer, highway drain or another drainage system. 4. To a combined sewer."[1]
	Flood Risk Outside of the Development
S1	Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control Standards (S2 and S3) and volume control Standards (S4 to S5) need not apply.
Strategy Comment	N/A
Report Ref.	N/A
	Peak Flow Control
S2	For greenfield developments, the peak run-off rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield run-off rate for the same event.
Strategy Comment	Site is proposed to discharge at greenfield run-off rate of 4 l/s/ha. Staged discharge may be provided, subject to Kent County Council (KCC)/ Environmental Agency (EA) agreement.
Report Ref.	2.8
S3	For developments which were previously developed, the peak run-off rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should be as close as reasonably practicable to the greenfield run-off rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.
Strategy Comment	N/A
Report Ref.	-
	Volume Control
S4	Where reasonably practicable, for greenfield development, the run-off volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6-hour rainfall event should never exceed the greenfield run-off volume for the same event.
Strategy Comment	Site is proposed to discharge the attenuated volume at greenfield run-off rate. The whole drainage system is designed to attenuate and impede discharge. Betterment may be provided with a staged discharge, subject to KCC/EA agreement.
Report Ref.	2.8
S5	Where reasonably practicable, for developments which have been previously developed, the run-off volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6-hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield run-off volume for the same event, but should never exceed the run-off volume from the development site prior to redevelopment for that event.
Strategy Comment	N/A
Report Ref.	-
S6	Where it is not reasonably practicable to constrain the volume of run-off to any drain, sewer or surface water body in accordance with S4 or S5 above, the run-off volume must be discharged at a rate that does not adversely affect flood risk.
Strategy Comment	Site is proposed to discharge the attenuated volume at greenfield run-off rate.

[1] LASOO, Non-Statutory Technical Standards for Sustainable Drainage: Practical Guidance, pg. 14

Run-off Description	
Report Ref.	2.8
Run-off Destination	
S7	The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the Site for a 1 in 30-year rainfall event.
Strategy Comment	The drainage is designed so that flooding does not occur on any part of the Site for a 1 in 30-year rainfall event.
Report Ref.	5.6
S8	The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement) or in any utility plant susceptible to water (e.g. pumping station or electricity substation within the development.
Strategy Comment	The drainage is designed so that flooding does not occur during a 1 in 100-year rainfall event anywhere that isn't designed to manage storage.
Report Ref.	5.6
S9	The design of the Site must ensure that so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property.
Strategy Comment	Flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property.
Report Ref.	5.8
Structural Integrity	
S10	Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.
Strategy Comment	D400 covers shall be used in all trafficked areas. Proprietary systems shall be installed as per supplier specifications.
Report Ref.	N/A
S11	The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.
Strategy Comment	Materials to be specified in accordance with Water UK Design and Construction Guidance and CIRIA SuDS Manual.
Report Ref.	N/A
Designing for Maintenance Consideration	
S12	Pumping should only be used to facilitate drainage for those parts of the Site where it is not reasonably practicable to drain water by gravity.
Strategy Comment	System drained by gravity, however, pumping may be required around the shallow buried high-pressure gas main as it may not be practical to cross with a gravity system. Subject to detailed design.
Report Ref.	5.6.1
Construction	
S13	The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be prejudicial to the structural integrity and functionality of the sewerage or drainage system.
Strategy Comment	Contractor to manage in accordance with surface water runoff control in the Construction Environmental Management Plan (CEMP).
Report Ref.	N/A
S14	Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.
Strategy Comment	Contractor to manage in accordance with surface water runoff control in the CEMP.
Report Ref.	N/A

Source: Adapted from, Non-statutory Technical Standards for Sustainable Drainage, LASOO

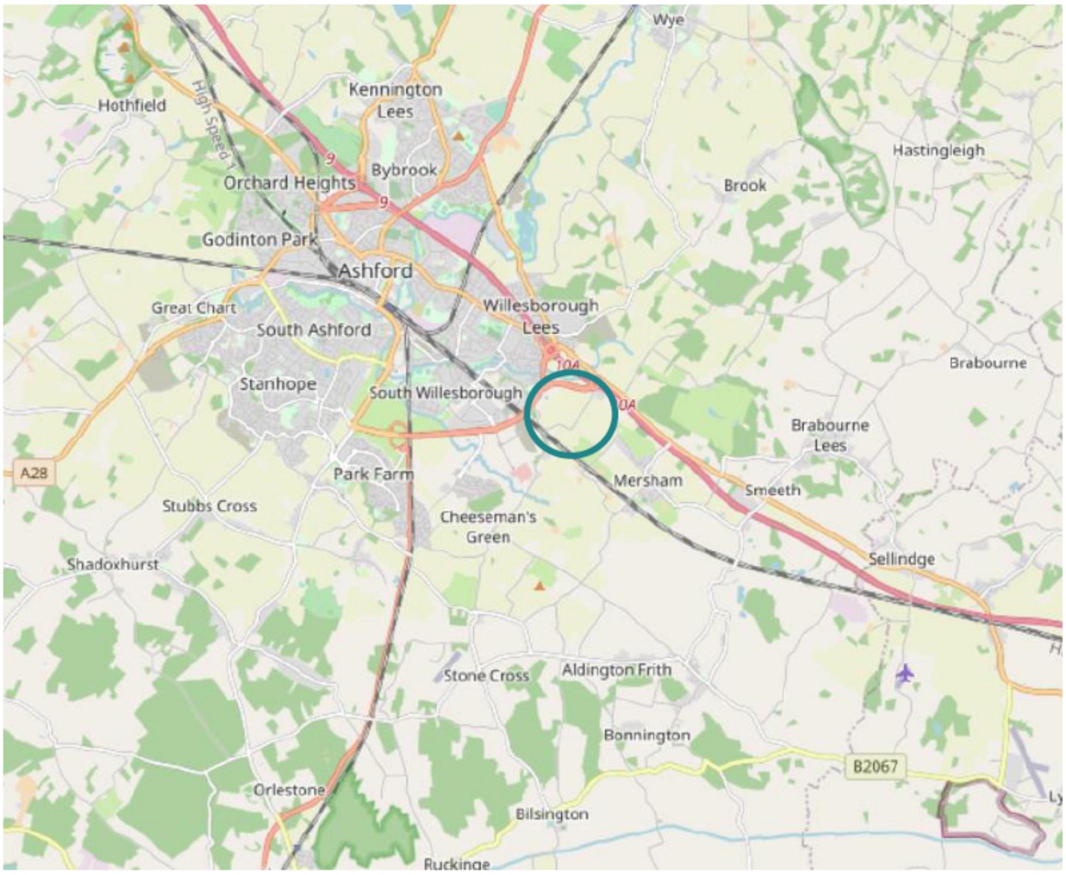
1 Introduction

1.1 This Application

This Flood Risk Assessment (FRA) and Drainage Strategy have been prepared by Mott MacDonald Ltd on behalf of the Department for Transport (DfT) in support of the purchase of the Sevington Inland Border Facility (IBF) in Kent ("the Site") and its subsequent change of use into a temporary Border check facility to support United Kingdom (UK) Government's wider infrastructure initiative related to preparations, for the UK leaving the European Union (EU), in Kent and the South of England.

The temporary parking facility would seek to accommodate up to approximate 2,000 Heavy Goods Vehicle (HGVs) from January 2021 for up to four hours at a time while 'border readiness checks' are carried out. The Site's operational lifespan is estimated to be up to 12 months with a decreasing demand in use after the initial four to six months. Alongside the HGVs parking areas, the Site would also accommodate welfare facilities for HGVs drivers, as well as office accommodation for Border Force staff utilising buildings of a temporary nature.

Map 1.1: Sevington IBF – The Site



Source: OpenStreetMap contributors

1.2 Consented Scheme

There is existing planning permission for this Site, application number 14/00906/AS, permission was granted on the 13 September 2017. The proposed scheme was an employment led mixed-use development. This scheme is still scheduled to go ahead after the temporary lorry park is no longer required.

1.3 Flood Risk Assessment Purpose

This report has been prepared to address the requirements of the National Planning Policy Framework (NPPF) and the Lead Local Flood Authority (LLFA) through:

- Assessing whether the proposed lorry park is likely to be affected by flooding
- Assessing whether the proposed lorry park is likely to increase the risk of other persons and property
- Proposing any mitigation measures that may be required to ensure that the proposed runway extension is not affected by flooding, and will not affect other persons or property
- Ensuring that Sustainable Urban Drainage Systems (SuDS) elements and local authority guidance are incorporated into the surface water management strategy

The planning mechanism for this lorry park is a Special Development Order (SDO) lodged in September 2020.

The consultant takes no liability for and gives no warranty against actual flooding of any property (client's or a third party) or the consequences of flooding in relation to the performance of the service beyond our control. This report has been prepared for the purposes of the SDO application only.

2 Site

2.1 Location

Table 2.1: Site Referencing Information

Item	Description
Site Name	Sevington Inland Border Facility (IBF)
County and Local Council Area	Kent County Council (KCC) (Lead Local Flood Authority (LLFA)) Ashford Borough Council (ABC) (Local Planning Authority (LPA)) Southern Water (Water Authority)
British National Grid	N: 140850, E: 603960

Source: Mott MacDonald

The Site is located to the south-east of Ashford in Kent, which is approximately 80km south-east of London and 20km north-west of Folkstone. The Site is adjacent to junction 10 of the M20.

The Site covers approximately 48 hectares of agricultural farmland and scrubland and is situated alongside Highways England’s Strategic Road Network (SRN), in close proximity to the M20 between junction 10 and the recent junction 10a scheme.

The Site lies to the south-west of the M20 and is bounded by the A2070 to its northern extents. To the east, the Site is bounded by a local road (Highfield Lane) running north to south and along its southern perimeter by Church Road, which provides access to the A2070, refer below to Figure 2.1.

Figure 2.1: Application Red Line Boundary - Sevington IBF

Source: OpenStreetMap contributors and Mott MacDonald accessed 29/07/2020

2.2 Topography

The Public Right of Way (PRoW) that runs west to east across the Site (Number AE639) is constructed on a ridge which defines the high points along the length of the field. To the north of the PRoW, the field generally falls in a north-westerly direction varying in level from 61.36m to approximately 50.00m. A ditch has been constructed to the south of the A2070 Link Road to provide drainage of the field, this ditch is culverted under the A2070 and outfalls to the Old Mill (Aylesford) Stream to the north of the A2070. To the north-west of the Site, there are sparse covering of trees and individual hedgerows.

To the south of the PRoW, the field falls in a south-westerly direction varying in level from 61.48m to approximately 46.64m. A culvert is provided under Church Road to the south-west of the plot which is assumed to drain the field. There is a small area of trees located close to the culvert.

Church Road runs to the south of the Site and Highfield Lane to the east of the Site, both bounded by trees and hedgerows along the majority of their length.

Photo 2.1: Highfield Lane – Looking south-west Towards Church Lane

Source: Mott MacDonald

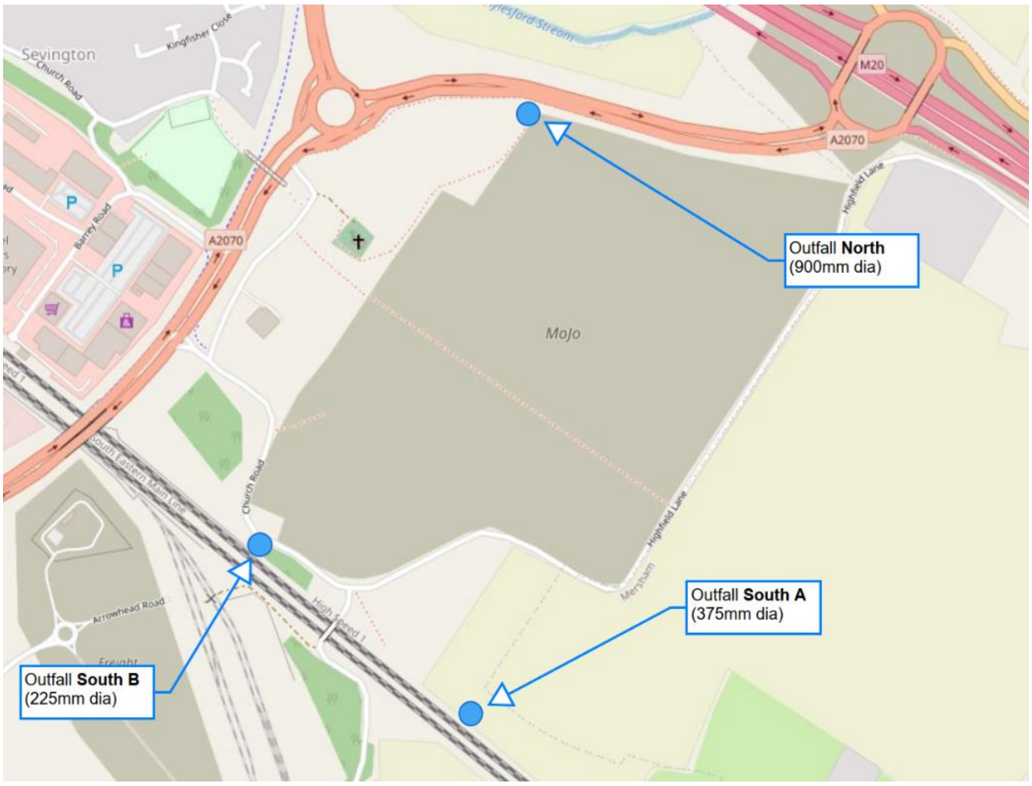
Photo 2.2: Highfield Lane – Looking north-west Towards St Mary's Church

Source: Mott MacDonald

The land to the east of the Site is worked agricultural land.

2.3 Existing Outfall Locations

Figure 2.2: Identified Outfall Locations - Sevington IBF



Source: OpenStreetMap contributors and Mott MacDonald accessed 29/07/2020

A drainage strategy for the same area of the Site, based on the industrial use for the Site, was produced in 2015 by Bradbrook Consulting. This identified two outfall locations from the Sevington IBF Site, one to the north of the Site and the other to the south.

Table 2.2: Three Proposed Outfall Locations

Outfall Name	Outfall Description	Outfall Destination	Outfall Owner
North	Land drain which runs into a 1200mm dia. culvert	Old Mill Stream	Kent County Council (KCC)
South A	Land drain which runs into a 375mm dia. culvert	East Stour River (tributaries to)	KCC (Network Rail own the culvert)
South B	900mm dia. culvert, Via new 300mm dia culvert under church Rd	East Stour River (tributaries to)	Network Rail

Source: Mott MacDonald

The first outfall to the north of the Site connects to the Old Mill Stream. The second is to an existing ditch to the south of the Site. The separately issued Flood Risk Assessment (FRA) Report of 2015[2] indicates that the ditch connects to a 225mm diameter pipe which passes under the railway line, an Approval in Principle was granted by Network Rail, to use this outfall. The suitability of these outfalls will be determined through the design of the drainage network on the Site and consultation with the Lead Local Flooding Authority.

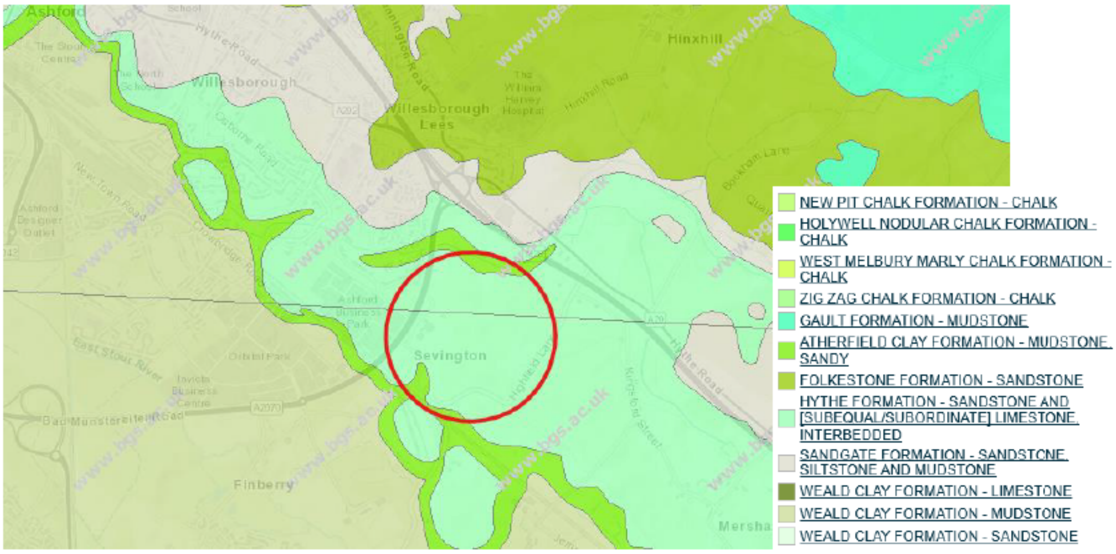
Three existing outfall locations have been identified within the Site extents. Two of these outfalls are from the Bradbrook proposal, with an additional outfall (South A) identified on-site. Their dimensions have been taken from records and shall be surveyed and inspected for detailed design.

2.4 Geology

2.4.1 Underlying Geology Formations

The British Geological Survey (BGS) online mapping indicates the Site is underlain by bedrock formations of Hythe Formation and Atherfield Clay Formation, refer to Figure 2.3.

Figure 2.3: Bedrock Geology

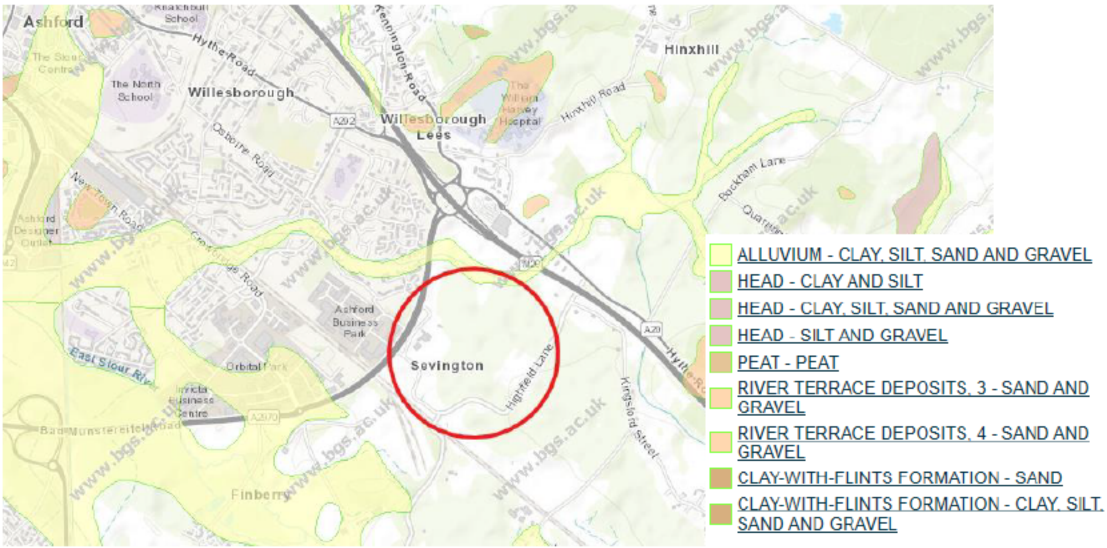


Source: http://mapapps.bgs.ac.uk/geologyofbritain/home.html, accessed 29/07/2020

[2] Bradbrook Consulting, Flood Risk Assessment, Rev. C, 14/09/2015

The maps indicate there is no superficial deposits, refer to Figure 2.4.

Figure 2.4: Superficial Geology



Source: http://mapapps.bgs.ac.uk/geologyofbritain/home.html, accessed 29/07/2020

Mapping / digital records suggest the majority of the Site is underlain by the Hythe Formation, which is subsequently underlain by the Atherfield Clay.

The Hythe Formation is typically described as a fine to medium-grained glauconitic sand, sandstone and silt. Locally it is pebbly with calcareous or siliceous cement beds. Locally clay beds are present.

The Atherfield Clay Formation is typically a sandy mudstone, with beds of pebbles and sandstone present. The unit weathers to sandy clay.

2.4.2 Infiltration Potential of Surface Water

Other than where rainwater falls directly onto grass space, the Infiltration potential has been excluded from the design of the Site's surface drainage infrastructure. This is so the potential risk of contaminant to the ground from the operation of the lorry park is minimised.

2.5 Hydrology

The closest fluvial water bodies are the Old Mill Stream, approximately 150m to the north and the East Stour River approximately 1.1km to the south.

The closest tidal water body is the English Channel approximately 13km to the south-east of the Site.

2.6 Hydrogeology

The Environment Agency (EA) aquifer designation map indicates that the Site is underlain by a Principal Aquifer that is composed of chalk. The EA definitions for aquifers are detailed below in Table 2.3.

Table 2.3: EA Aquifer Classifications

EA Classification	Definition
Principal Aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as a major aquifer.
Secondary Aquifer A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary Aquifer B	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Aquifer (Undifferentiated)	Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

Source: http://apps.environment-agency.gov.uk/wiyby/117020.aspx

2.7 Groundwater

The EA groundwater source protection map indicates that the Site is not in a groundwater protection area. There are no Source Protection Zones within 1km of the Site.

The Site is located within a surface water and groundwater Nitrate Vulnerable Zone.

2.8 Proposed Development

The proposed development is a border check facility.

The proposed catchment is approximately 47.75 hectares.

Table 2.4: Greenfield Run-off Rates

	Q_1 (l/s/ha)	Q_{BAR} (l/s/ha)	Q_{30} (l/s/ha)	Q_{100} (l/s/ha)	Q_{200} (l/s/ha)
Greenfield Run-off Rate	1.6	1.9	4.4	6.1	7.2

Source: https://www.uksuds.com/drainage-tools-members/greenfield-runoff-rate-tool.html#report-print accessed 13/08/2020

The Ashford Borough Council Sustainable Drainage SPD states that post-development run-off rates for developments south of the M20 are 4.0 l/s/ha.[3] This is the rate that the system shall be designed to. A multiple stage-discharge rate may be utilised, subject to agreement with KCC and EA.

[3] Ashford Borough Council, Local Development Framework: Sustainable Drainage SPD, Oct 2010, Table 3.2.

3 Planning Policy / Statutory Consultation

3.1 Policy Documents

The following policy documents were reviewed in the preparation of the Flood Risk Assessment (FRA) for any site-specific requirements relating to the Sevington Inland Border Facility (IBF).

1. Ministry of Housing, Communities and Local Government, National Planning Policy Framework (NPPF), February 2019.
2. Kent County Council (KCC), Drainage and Planning Policy, December 2019.
3. KCC, Kent Local Flood Risk Management Strategy (LFRMS) 2017-2023.
4. KCC, Flood Risk to Communities Ashford, June 2017.
5. Environment Agency (EA), The Environment Agency's approach to groundwater protection, v. 1.2, February 2018.
6. Ashford Borough Council (ABC), Local Development Framework: Sustainable Drainage Sustainable Planning Document (SPD), October 2010.
7. ABC, Ashford Borough Council Discharge Run-off Assessment, May 2016.
8. ABC, Ashford Local Plan 2030, February 2019.

The following non-statutory guidance documents were reviewed in the preparation of the FRA for any site-specific requirements relating to the Sevington IBF.

1. Construction Industry Research and Information Association (CIRIA), C753 Sustainable Drainage Systems (SuDS) Manual, 2015.
2. LASOO (Local Authority SuDS Officer Organisation), Non-statutory Technical Standards for Sustainable Drainage.

3.2 National Planning Policy Framework Requirements

A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; a land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.[4] The Site is in flood zone 1, but the area is greater than 1ha, therefore a site-specific flood risk assessment is required.

The proposed Site is within flood zone 1 therefore a sequential test is not required.[5]

3.3 Statutory Engagement with Relevant Bodies

3.3.1 Environment Agency

An engagement meeting with the EA occurred on the 30 July 2020. This meeting was to discuss the drainage strategy principles and design. The key items that came out of the meeting were:

- EA expressed their desire for early engagement based on past lorry park experiences

[4] Ministry of Housing, Communities and Local Government, National Planning Policy Framework (NPPF), February 2019, p..47

[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575184/Table_3_-_Flood_risk_vulnerability_and_flood_zone__compatibility_.pdf, accessed 17/09/2020

- EA want more details regarding the management of pollutants (construction and operations), this includes spill management, parking of vehicles with hazardous waste, and the potential for animals on the Site
- The discharge rates were to be agreed with KCC
- Control of Spilling and Other Possible Contamination Events

3.3.2 Kent County Council

An engagement meeting with KCC occurred on the 30 June 2020. This was to discuss surface water drainage requirements with the Lead Local Flood Authority (LLFA), KCC. The proposed approach for the drainage regime was discussed with KCC. One key outcome was for KCC to check records for details and capacity calculations for the culvert to Old Mill Stream and if these calculations could be used for this FRA.

3.3.3 Network Rail

Agreement in principle was given by Network Rail to use the 900Ø culvert under the railway at an outfall location in the south.[6]

[6] Bradbrook Consulting, Flood Risk Assessment, Rev. C, 14/09/2015, p. 1

4 Quantifying Existing Flood Risk

4.1 Introduction

This section summarises the existing flood risk to the Site from various sources. A summary of these various flood sources is shown in Table 4.1.

Table 4.1: Flood Risk Summary

Potential Sources of Flooding	Overall Risk
Fluvial (River)	Very Low
Tidal (Sea)	Negligible
Pluvial (Surface Water)	Very Low
Groundwater	Very Low
Sewer	Very Low
Artificial Sources	Negligible

Source: Mott MacDonald

4.2 Fluvial

Fluvial flood risk occurs when the water level of the river rises above its banks or retaining structures, and floods surrounding areas. Fluvial flooding is usually caused by prolonged periods of intense rainfall. Tidal flooding occurs where the tidal level rises above the shore level and floods surrounding areas.

The closest fluvial water body to the Site is the Old Mill Stream, which is located approximately 200m north of the Site, north of the A2070 link road.

The technical guidance to the National Planning Policy Framework (NPPF), divides areas at risk of flooding from rivers and sea into flood zones. These flood zones are defined in Table 4.2.

Table 4.2: Flood Zones

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map).
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map).
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map).

Source: https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-1-Flood-Zones (accessed 21/07/20)

Figure 4.1: Flood Risk: Fluvial

Source: https://flood-map-for-planning.service.gov.uk/, accessed 27/05/2020

The Environment Agency (EA) flood maps show that the Site is equivalent of Flood Zone 1 which is noted as "Very Low Risk". There is, therefore, a less than 1 in 1000 chance of flooding from tidal and fluvial sources. The risk from fluvial sources is very low and can therefore be discounted.

4.3 Tidal

The nearest tidal waterbody is the English Channel approximately 13km to the south-east. The Site is situated approximately 49-60m AOD (above ordnance datum). Therefore, due to the distance to the sea and the height of the Site, the risk of tidal flooding is negligible and can be discounted.

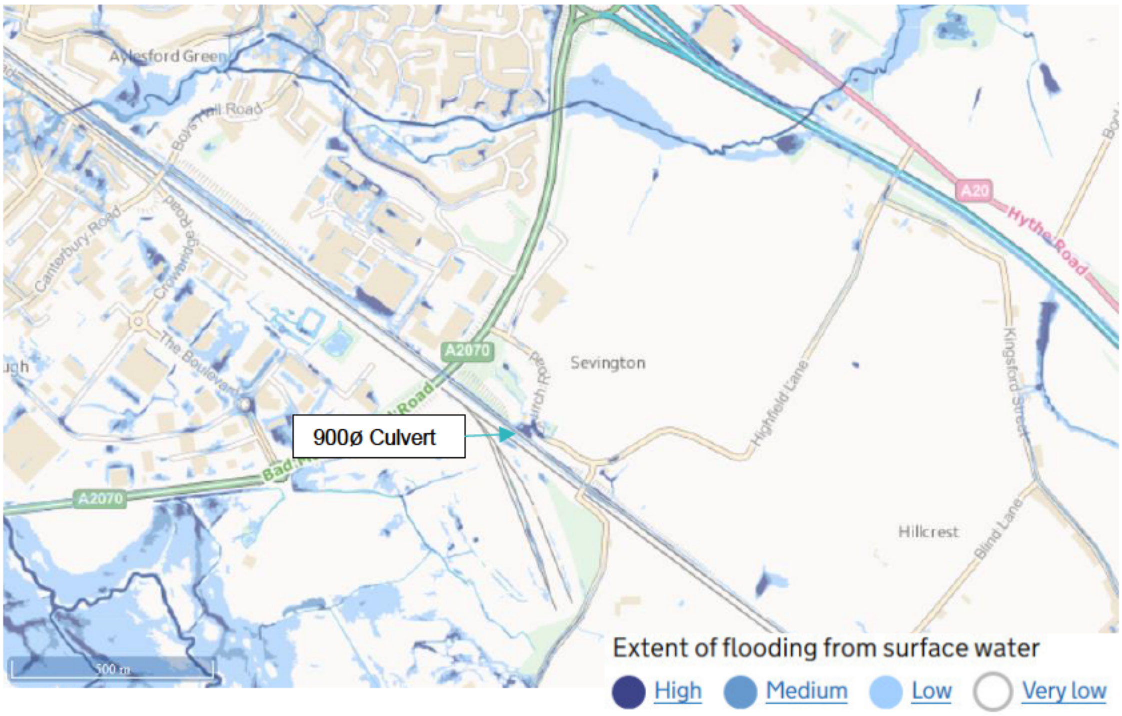
4.4 Pluvial

Pluvial flooding occurs as a result of intense rainfall, or overland flows being unable to infiltrate into the ground, discharge into surface water bodies, or enter surface water conveyance infrastructure. Pluvial flows follow the general topography and either flow into existing land drainage features or flow to a localised point of ponding.

The EA surface water flood maps show the Site is at very low risk of surface water flooding (0.1% to 1% AEP (Annual Exceedance Probability)).

The pluvial flood maps, refer below to Figure 4.2, indicate that there is a risk of pluvial flooding on Church Road at the point where the 225mm diameter culvert passes beneath the railway line. The EA flood maps do not indicate that the flooding will affect the existing dwellings, exceedance flows routes will be assessed to ensure that the risk of flooding to the dwellings on Church Road does not increase, refer to section 5.8.

Figure 4.2: Flood Risk: Pluvial Sources



Source: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map, accessed 17/07/2020

The land to the east of Highfield Lane is higher than the Site, however the existing overland flow is severed by Highfield Lane. In the end use of the Site, there will be a 2m high bund along the east of the Site. The risk of pluvial flooding can therefore be discounted.

4.5 Groundwater

Groundwater flooding occurs as a result of the emergence of groundwater from the surface as a result of abnormally high rainfall, causing damage to property and infrastructure.

The historical flooding maps do not indicate that there has been any groundwater flooding in the vicinity. The risk from groundwater flooding is very low and can therefore be discounted.

4.6 Sewer

Sewer flooding occurs as a result of underground sewers reaching their capacity and emerging from the conveyance system.

The historical flooding maps do not indicate that there has been any sewer flooding in the vicinity. The risk of sewer flooding is very low and can therefore be discounted.

4.7 Artificial Sources

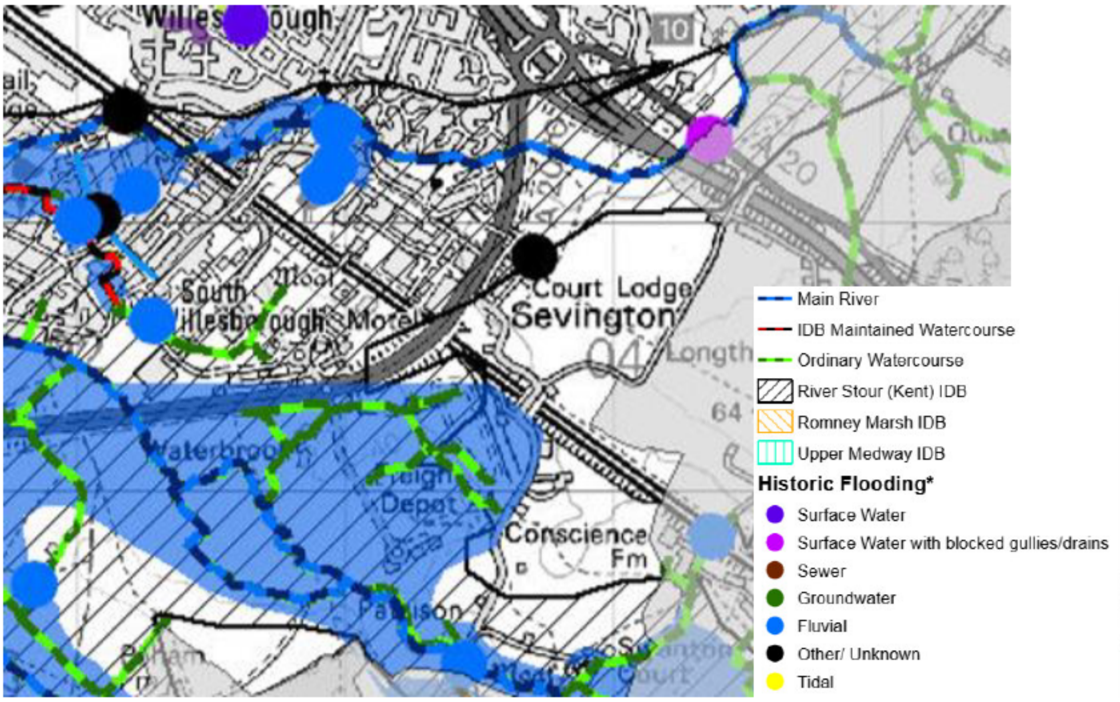
Flooding as a result of artificial sources occurs as a result of the failure of infrastructure in place holding water, such as reservoirs, canals, lakes and other artificial sources.

The EA flood maps indicate that the Site is not in an area that would be affected by reservoir flooding. The risk of flooding from artificial sources is negligible and can therefore be discounted.

4.8 Historical Flooding

Ashford Surface Water Management Plan indicates several historical flood events in the vicinity of the Site, refer to Figure 4.3.

Figure 4.3: Historic Flooding



Source: Kent County Council, Ashford Surface Water Management Plan, Appendix B, DA02 - Ashford Town

4.8.1 Fluvial

A fluvial flooding event is recorded as having come up to that came up to the HS1 rail line.

The historical fluvial flooding event on the south side of the HS1 railway occurred prior to extensive development that has now taken place in this area. For the purposes of this Flood Risk Assessment (FRA), it is assumed that mitigations for this flooding has been included in the developments and subsequently is not a constraint on our design.

4.8.2 Tidal

There are no recorded historic tidal flooding events.

4.8.3 Pluvial

There is no historic flooding recorded in Figure 4.3 above. KCC for the Ashford SWMP.

A resident in the area has reported flooding along Church Road in December 2019, refer to Photo 4.1. According to the correspondence, the flooding only happens when the drain running under the railway is not maintained.

Further investigations during the enabling works have reviled ground over gullies and a lack of sufficient capacity in the church drainage infrastructure. It is proposed to update the drainage on

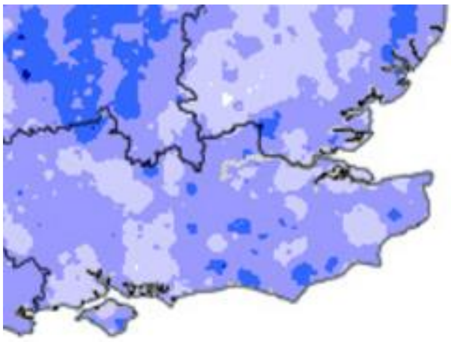
Church Road as part of the off-site highway works relating to lorry park, and in specifically for this location the staff car park access on Church Road.

Photo 4.1: December 2019 Flooding Church Road

Source: Personal communication, 15 July 2020

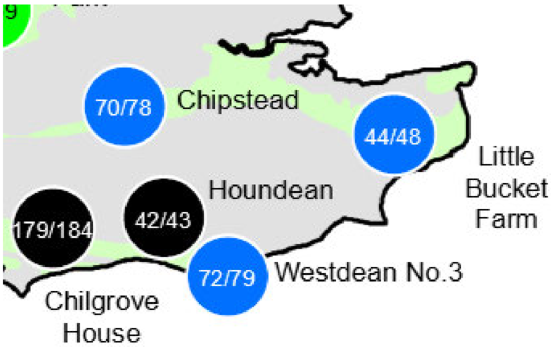
This lines up with what the EA flood maps indicate in this area. The Hydrological Summary for December 2019[7] showed that the Ashford area had 150-170% of the average rainfall, refer to Figure 4.4 and notably high groundwater levels in the Chalk Aquifer, refer to Figure 4.5. The combination of high rainfall and notably high groundwater levels is likely to have generated a higher % of surface water run-off. Surface water flooding occurs in this location because the existing 225mm diameter culvert has insufficient capacity to take the catchment draining to this point.

Figure 4.4: October 2019 - December 2019 Rainfall as % of 1981-2010 Average



Source: NRFA, Hydrological Summary for the United Kingdom, December 2019, p.3

Figure 4.5: Groundwater Levels - December 2019



Source: NRFA, Hydrological Summary for the United Kingdom, December 2019, p.9

[7] NRFA, Hydrological Summary for the United Kingdom, December 2019, https://nrfa.ceh.ac.uk/sites/default/files/HS_201912.pdf,

4.8.4 Groundwater

There are no recorded historic groundwater flooding events.

4.8.5 Sewer

There are no recorded historic sewer flooding events.

4.8.6 Artificial Sources

A flooding event on Church Road on 1 July 2009. Reports suggest that this incident was caused by a water leak.[8]

[8] KCC, Ashford SWMP, Appendix C, Flood History Table, C.2, DA02, D

5 Surface Water Management

5.1 Existing Surface Water System

The Site is a greenfield site. The landscape falls across two catchments. The catchment to the north currently slopes towards the Old Mill Stream. The Old Mill Stream flows into the East Stour River approximately 3km west of the Site. The catchment to the south outfalls to several culverts that run beneath the HS1 (High Speed) railway line. These culverts outfall to the East Stour River approximately 1.5km to the south of the Site after being conveyed via an existing land drainage system.

Three outfalls have been identified, refer to Figure 2.2. The first outfall (Outfall North) to the north of the Site is a 900mm diameter culvert constructed as part of A2070 works and connects to the Old Mill Stream. The second (Outfall South A) and third (Outfall South B) are to existing land drainage in the south of the railway line. A Flood Risk Assessment Report of 2015[9] indicates that one of the ditches connects to a 225mm diameter pipe which passes under the railway line, an Agreement in Principle (AIP) was in place with Network Rail, at that time to continue to use this outfall. The third outfall was identified on the topographical survey and confirmed on-site, refer to Photo 5.1 and Photo 5.2.

Photo 5.1: Land Drain– Looking South

Source: Mott MacDonald

Photo 5.2: Land Drain – Looking North

Source: Mott MacDonald

5.2 The Lead Local Flood Authority

The Local Lead Flood Authority (LLFA) for the Site is Kent County Council (KCC).

5.3 The Water Company

The water authority for the Site is Southern Water, no record of adopted Southern Water surface water drainage infrastructure.

[9] Bradbrook Consulting, Flood Risk Assessment, Rev C, 14/09/2015

5.4 Relevant Design Guidance

All drainage will be designed in accordance with the following design guidance:

1. Water UK, Design and Construction guidance, v.2, March 2020.
2. Relevant Design Manual for Roads and Bridges drainage design guidance.
3. Construction Industry Research and Information Association (CIRIA), C753 Sustainable Drainage Systems (SuDS) Manual, 2015.
4. HM Government, Building Regulations Part H, 2015
5. LASOO, Non-statutory Technical Standards for Sustainable Drainage

5.5 Climate Change

While the current proposal is for temporary use, elements of the drainage shall remain for future Site use. The drainage will therefore be designed in accordance with Design and Construction Guidance (2020) for the 1 in 100-year storm event plus a 40% allowance for climate change.[10]

Table 5.1: Peak Rainfall Intensity Allowance in Small and Urban Catchments

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

Source: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances, Table 2 (accessed 13/07/20)

5.6 Proposed Surface Water Drainage Strategy

The principle of the Surface Water Drainage Strategy is to collect, convey, and outfall surface water run-off in a way that will not increase the risk of flooding to person or property. According to the hierarchy of outfalls,[11] the preferred method of outfall is to watercourses.

The design of based on cascading surface water drainage infrastructure which is where possible on the surface is swale, ponds and channel is that visible, and can and isolated and replaced in the event of a potential contamination spill.

Infiltration to the ground would only be employed for a direct run-off from building roofs or rainwater caught in green spaces.

The Site is divided into eight catchments, refer below to Figure 5.1.

The proposed drainage for the Site is shown in Table 5.2.

Table 5.2: Drainage Strategy

Catchment 7 (North)	Run-off collected in a permeable catchment (Lined) and conveyed via a swale to the controlled outfall to the highway ditch. There is a widened portion of the swale at the outfall to attenuate the run-off from this catchment.
Catchments 4 and 8 (North)	Run-off collected in a permeable catchment (Lined), conveyed via a swale to a wetland which has a controlled outfall to the highway ditch.
Catchments 5 and 6 (North)	Run-off collected by slot drains, conveyed Swale (Lined) to a wetland which has a controlled outfall to the swale for catchment 7 (north).

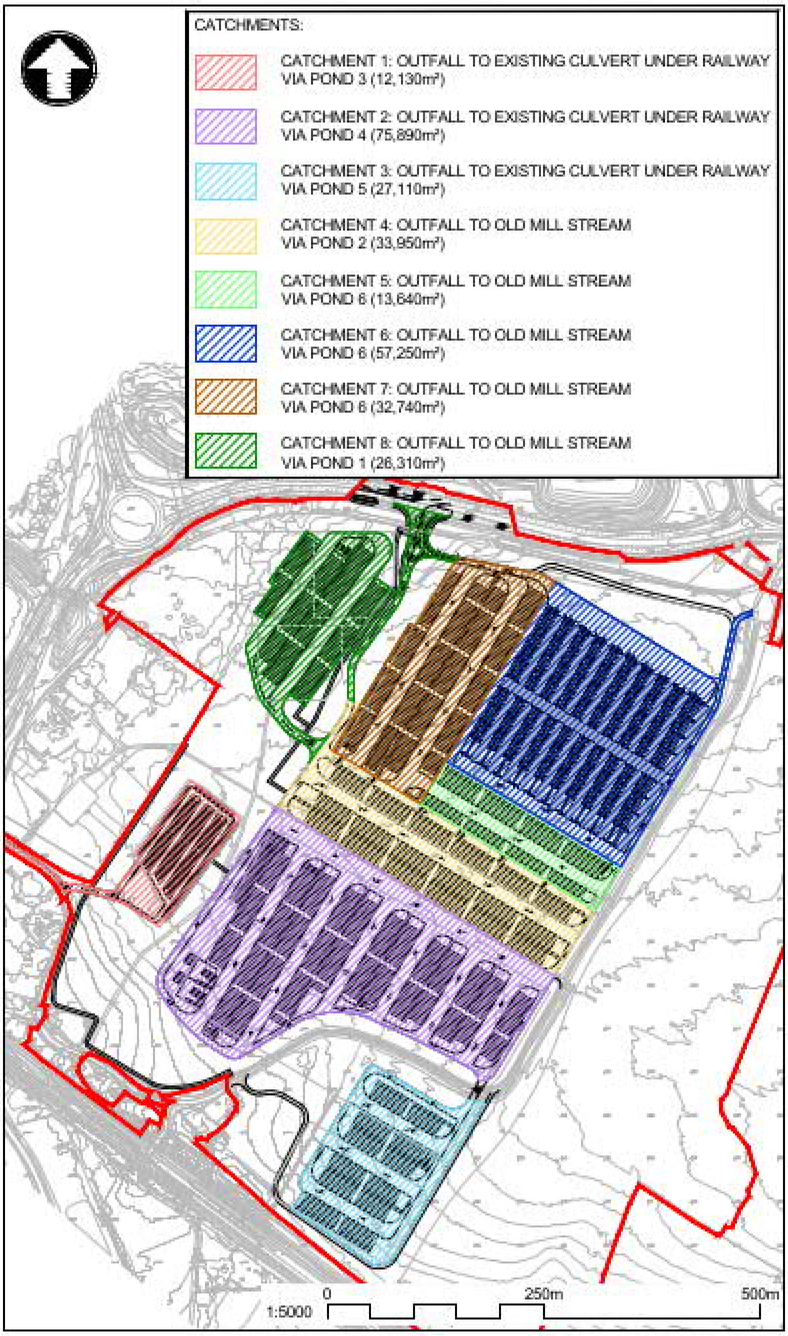
[10] Water UK, Design and Construction Guidance, C6.3

[11] HM Government, Building Regulations 2010, Part H, 2015, p.39

Catchments 1 and 2 (South)	Run-off collected in a permeable catchment (Lined), conveyed via a swale to a wetland which has a controlled outfall to the 225mm dia. railway culvert.
Catchment 3 (South)	Run-off collected in a permeable catchment (Lined), conveyed via a swale to a wetland which has a controlled outfall to the 225mm dia. railway culvert.

Source: Mott MacDonald

Figure 5.1: Catchment Plan



Source: 419419-MMD-01-MO-DR-D-0501

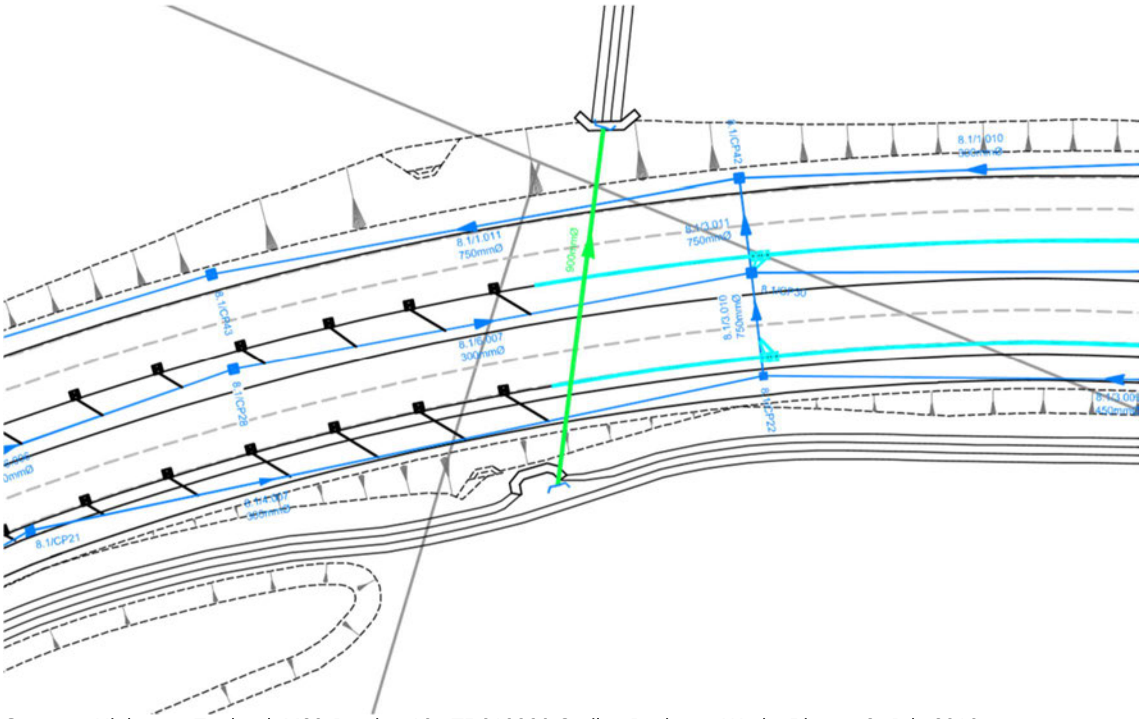
Refer to Appendix B for the drainage layout plan.

An estimate, calculated using Micro-drainage, indicated that a required storage volume of between 25,000m^3 to 30,000m^3 would be required, this would be spread across the permeable pavements, swales and infiltration basins. These volumes are estimates based on a discharge rate of 4l/s/ha (subject to agreement with KCC) and would be subject to detailed design and ground investigation. The whole system is designed as attenuation / SuDS treatment.

If a fully impermeable surface is provided, then it is likely that a series of gullies or channels with connections to chambers and pipes will be required leading to the proposed outfall locations. This option is not preferred due to the size of the pipework required, the Site levels and the gas main crossing.

There is a 1,200mm diameter crossing beneath the A2070, refer below to Figure 5.2. This was installed as part of the junction 10a works to maintain the existing land drainage regime.[13] It is assumed that the existing northern catchment of the Site discharges to the existing land drainage that this culvert maintains, therefore it will have the capacity to take the greenfield discharge rate of the proposed drainage regime.

Figure 5.2: A2070 900mm Diameter Culvert



Source: Highways England, M20 Juncion 10a TR010006 Outline Drainage Works Plans, v2, July 2016

5.6.1 Interaction with Existing Utilities

There are several points of the existing drainage system that will require the crossing of an existing high-pressure gas main. The depth of the gas main will be determined to confirm if a gravity drainage system can be taken over the gas main. If this is not possible then a pumped solution would need to be investigated. Specific working requirements with SGN are being agreed.

[13] Highways England, Drainage Strategy: M20 J10a Access to South Ashford, Rev. 6, May 2016, p.6

5.7 Environmental

It is assumed the discharge from this Site will be agreed in accordance with the memorandum of understanding between Highways England and the Environment Agency (EA).[14]

5.7.1 Environmental Risk Assessment

A Pollution Prevention Plan shall be prepared, and the risk assessed in accordance with CIRIA C753 SuDS Manual, CIRIA C736 Containment systems for the prevention of pollution and EA Requirements. This shall be co-ordinated with the Construction Environmental Management Plan (CEMP). A generic spill response is detailed in Appendix D.

5.7.1.1 Non-Hazardous or Low Hazard loads

Many substances, deemed to be a **non-hazardous** or **low hazard**, may still pose significant risks to the environment. This is especially significant if allowed to enter the drainage system or make its way to a watercourse. A prime example is dairy products (milk, yoghurt, cream and ice cream) which must be disposed of as Category three ABP (Animal By-Products) via an appropriate contractor. The products are particularly harmful because of their high 'oxygen demand': bacteria that feed on them use up the oxygen that is otherwise used by fish and other living things in the watercourse, effectively suffocating aquatic life.

In light of such non-hazardous or low-hazard loads possibly being harmful to the environment ALL spills that are discovered on-site will be referred to the Environment Agency for a response assessment. The course of action prescribed will be managed by staff who have been trained by the Environment Agency in pollution response, the Senior Marshal of the team will assume the role of Ground Commander for such incidents. The Duty Manager will undertake a tactical role in liaison with the Environment Agency.

5.7.1.2 Checking and Parking of Vehicles

The arrangements for assessing, document checking, parking and releasing of the vehicles from the Site is detailed in the **Operational Management Plan** (the overarching plan for the Site and to which this plan supports) and is linked to the **Parking and Transport Management Plan**.

[14] Highways Authority et al, Memorandum of Understanding between the Environment Agency and the Highways Agency, November 2009

5.7.1.3 Hazard Register

Table 5.3: Hazard Register

Haz Ref	Activity/Process/ Material/Element - what is being undertaken?	Hazard	Designer Risk Control Measures: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken
1	Operation of the IBF, minor hydrocarbon and heavy metals deposition	Contamination of watercourse and drainage channels, environmental damage	All operational pavements to be positively drained with inline silt collection and online full retention interceptors. Permanent assets to be regularly inspected and maintained as required and in accordance with the Operation & Maintenance (O&M) manual.
2	Operation of the IBF - Major spill from, storage tank failure or accident	Gross spillage of hydrocarbons, environmental damage, risk of explosion	High-risk vehicles to be parked in a contained area with a full retention oil interceptor specified with an automatic closure device fitted to manage flow rate and sized for the upstream catchment. Residual hydrocarbon capacity storage capacity based on maximum single spill of 7,600l.[15] Vehicles to be inspected for defects upon entry to the Site and directed to a contained area if any signs of leaks are detected.
3	Operation of auto close device	Fails to operate in a spill scenario	An integral device included with sensors above normal flow to avoid fouling. System to be maintained and tested regularly. Suggest inclusion of back-up pollution control valve on the downstream end of the system.
4	Presence of animals on-site	Runoff from trucks or catchments that have animals entering surface water	All areas that contain animals will be isolated with its own foul water system to take the foul water to storage tanks where it will be disposed by either tanker.
5	Runoff during construction	Silt and other displaced material. Sediment and erosion	Construction phase management and control of surface water management: • Silt traps • Material stockpiling • Material storage methodology • Oil traps • Extreme weather management plan.[16]

Source: Mott MacDonald

5.7.2 SuDS Mitigation Index

The pollution risk of the drainage options has been undertaken using the simple index approach.[17] The hazard indices for a border check facility are shown below in Figure 5.3.

15 BS EN 858-2, cl 4.3.6
16 Likely to be included in the CEMP
17 CIRIA, C753 SuDS Manual, 2015, Box 26.2

Figure 5.3: Hazard Indices

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Source: CIRIA C753 SuDS Manual, Table 26.2

The mitigation indices[18] for the proposed SuDS features indicate that these options provide adequate treatment to surface water run-off, refer below to. Table 5.4.

Table 5.4: Surface Water Run-off SuDS Train

Options	Description	TSS Mitigation Index	Metals Mitigation Index	Hydrocarbon Mitigation Index
Catchment 7 (North)	Permeable catchment (Lined)	0.7	0.6	0.7
	Swale (Lined)	0.5	0.6	0.6
	Total	0.95	0.9	1.0
Catchments 4 and 8 (North)	Permeable catchment (Lined)	0.7	0.6	0.7
	Swale (Lined)	0.5	0.6	0.6
	Wetland (Lined)	0.8	0.8	0.8
	Total	1.35	1.3	1.4
Catchments 5 and 6 (North)	Swale (Lined)	0.5	0.6	0.6
	Wetland (Lined)	0.8	0.8	0.8
	Total	0.9	1.0	1.0
Catchments 1 and 2 (South)	Permeable catchment (Lined)	0.7	0.6	0.7
	Swale (Lined)	0.5	0.6	0.6
	Wetland (Lined)	0.8	0.8	0.8

[18] Taken from CIRIA C753 SuDS Manual, Table 26.3

Options	Description	TSS Mitigation Index	Metals Mitigation Index	Hydrocarbon Mitigation Index
	Total	1.35	1.3	1.4
Catchment 3 (South)	Permeable catchment (Lined)	0.7	0.6	0.7
	Swale (Lined)	0.5	0.6	0.6
	Total	0.95	0.9	1.0

Source: Based on values from C753 SuDS Manual, Table 26.3 & Table 26.4

These indices indicate that the proposed drainage will manage pollutants in the run-off under normal conditions.

5.7.3 Penstock Valves

At the critical points of the network, namely the outlets into off-site watercourses and key pond outlets, refer below to Figure 5.4.

Figure 5.4: Penstock Locations

Source: Mott MacDonald

These valves will be able to be manually operated in the case of a spill to prevent contaminants from exiting the Site while the clean-up is being undertaken.

5.7.4 Construction Management

5.7.4.1 Construction Phasing

The contractor shall include a detailed construction phasing plan as part of their Construction Management Plan (CMP).

5.7.4.2 Disposal of Contaminated Material and Water Runoff

The contractor shall include a detailed strategy as part of their CEMP.

5.8 Designing for Exceedance

Based on levels, the exceedance flow from the north catchment is likely to flow overland to the A2070 culvert and pond in the landscape until the exceedance event has passed and will outfall into the culvert.

The exceedance flow from the south catchment will flow overland along Church Road and sit in the landscape upstream of the 225-diameter culvert that passes under the railway line. This is an existing overland flow route, as indicated in the surface water flood map, refer to Figure 4.2.

5.8.1 Existing Exceedance Routes

The development will provide betterment to the existing overland flow route (refer to section 4.8.3) from the existing situation in a number of ways:

1. The control of surface water run-off to greenfield run-off rates up to the 1 in 100-year plus 40% climate change event.
2. Utilisation of an additional outfall under the railway line meaning less flow to the culvert, refer to section 5.1, subject to agreement with the asset owner.

The exceedance routes both pass through culverts (1,200Ø beneath A2070 and 900Ø beneath HS1). There is a risk that these are blocked in an exceedance event.

5.9 Operations and Maintenance

Operation and maintenance of the whole Site is a requirement of its use with regards to flood risk and drainage. Therefore, all drainage features in the system shall be monitored in accordance with the maintenance requirements.

All SuDS designed elements have recommended maintenance requirements, these are detailed below in Table 5.5.

Table 5.5: SuDS Maintenance Requirements

Maintenance Schedule	Required Action	Permeable Paving	Swale	Infiltration Basin
Regular (Weekly)	Inspection (inlet/outlet pipework, standing water, blockages, structural damage, mechanical devices, silt in forebay)	N/A	■	■
	Litter and debris removal	N/A	■	■
	Grass cutting	N/A	■	■
	Remove sediment from forebay	N/A	N/A	■
	Weed and invasive plant control	N/A	■	■

Maintenance Schedule	Required Action	Permeable Paving	Swale	Infiltration Basin
Occasional (6 months- 1 year)	Stabilise and mow contributing and adjacent areas	☐	N/A	N/A
	Removal of weeds	☐	☐	N/A
	Remove sediment when pond volume is reduced by 20%	N/A	N/A	☐
	Reseed areas of poor vegetation growth	N/A	☐	N/A
Remedial (As required)	Remediate any landscaping beginning to encroach on paving	☐	N/A	N/A
	Remedial work to any depressions	☐	☐	
	Rehabilitation of surface and upper substructure by remedial sweeping	☐	N/A	N/A
	Repair erosion and relevel uneven surfaces	N/A	☐	N/A
	Scarify and spike topsoil to improve infiltration performance	N/A	☐	N/A
	Aerate pond when signs of eutrophication are detected	N/A	N/A	☐
	Repair erosion, rip rap, inlets/outlets, overflows.	N/A	N/A	☐
	Remove build-up of sediments and hydrocarbons.	N/A	☐	N/A
Monitoring (Monthly)	Inspect for evidence of weed growth	■	N/A	N/A
	Inspect silt accumulation rates	■	N/A	N/A
	Monitor inspection chambers	■	N/A	N/A
	Inspect for evidence of poor operation (i.e. check if soakaway is emptying)	■	N/A	N/A
Key	■ = Required regularly ☐ = Required as necessary			

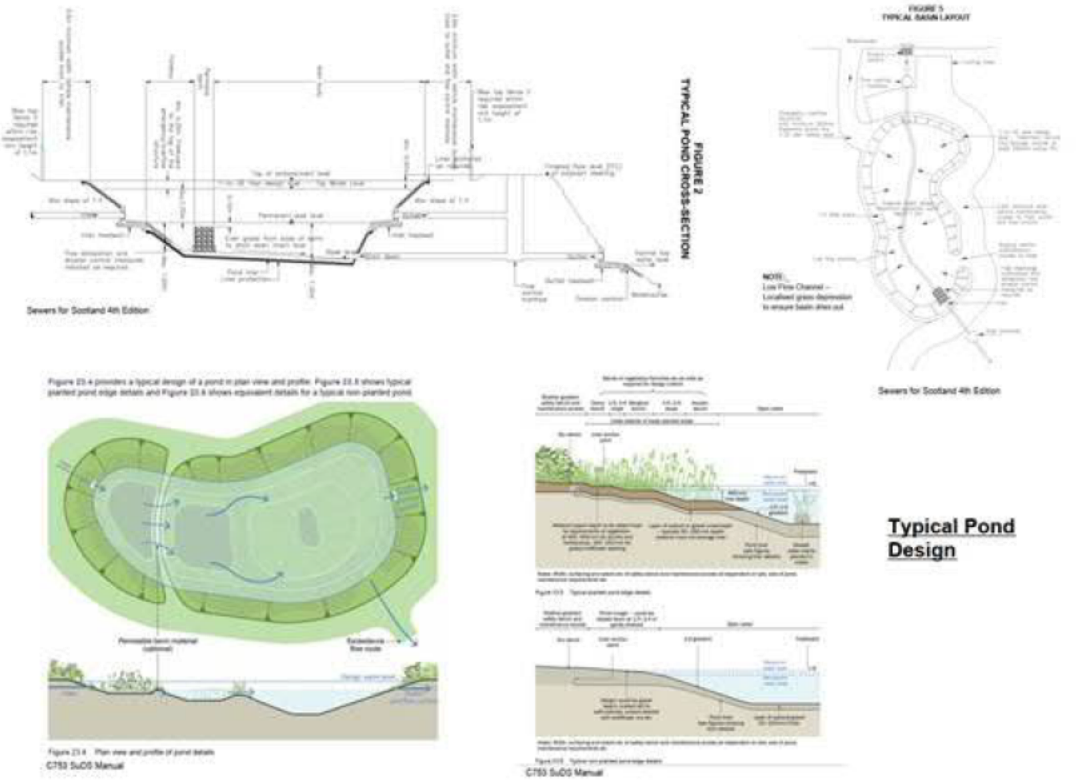
Source: C753 SuDS Manual, Tables 13.1, 20.15, 23.1

5.9.1 Upgrade Church Road Drainage Infrastructure

The existing inadequacies the drainage infrastructure on Church Road are to be eased with the providing another outfall and additional gullies.

5.9.2 Pond Design Characteristics

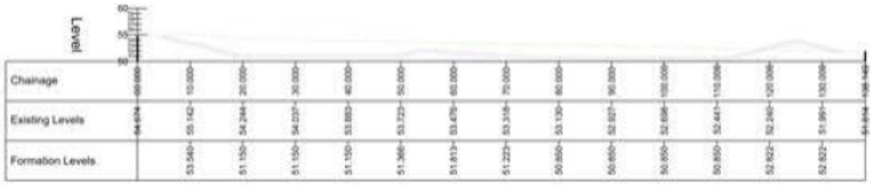
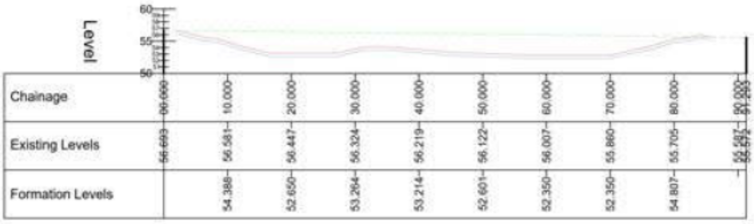
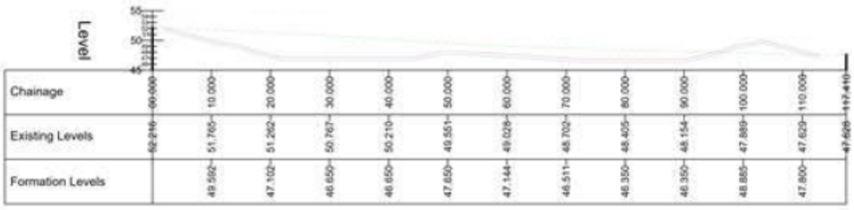
Figure 5.5: The SuDS Manual (CIRIA 753) Typical Pond Detail Template



The Typical Pond Detail Template has been used to inform the design of the pond and how they are to be planted and integrated into the landscaping design.

Table 5.6: Pond Design Characteristics

Pond			Pond Design Level					
Lining			Impermeable Liner					
Landscaping				Soil Slope Retention with Topsoil for temporal wetland tolerant planting		Swallow Root planting	Deep root Planting with transitions to landscaping	
	Storm Design Year							
	Outfall Level	Base (Depth of Per Wet)	1:1	1:30	1:30+(CC 40%)	1:100	1:100+(CC 40%)	Top of Pond (150mm fb)
1	52.30	51.00$^{(1.3)}$	52.70	52.80	53.00	53.30	53.85	54.00

								
8,200 m^3	7.5 l/s controlled discharge	½ drain time > 24 hours *Note 1*	• Pond Defined Under Exiting Planning Permission utilised for Sevington IBF, modified for alignment to SIBF Staff Car park • Accessible to the public • Maintenance via St Mary's Car Park Access					
2	54.30	53.00(1.3)	54.55	55.10	55.45	55.75	55.85	56.00
								
4,770 m^3	7.5 l/s controlled discharge Cascade to 1 , *Note 1.*	½ drain time < 24 hours	• Pond Defined Under Exiting Planning Permission utilised for Sevington IBF, modified for alignment to SIBF Staff Car park. • Pond is for temporary use of Central Corridor Catchment for first 200 days, then catchment returns to Landscaping, *Note 1.* • Inside the Secure Site, Not Accessible to the public. • Maintenance via Church Road Staff Car park Access.					
3	48.30	47.30(1.0)	48.55	49.15	49.50	49.75	49.85	50.00
								
5,250m^3	45 l/s controlled discharge	½ drain time < 24 hours	• Pond Defined Under Exiting Planning Permission utilised for Sevington IBF, modified for alignment to SIBF Staff Car park • Inside the Secure Site, Not Accessible to the public • Maintenance via Church Rd Staff Car park Access					
4	49.30	48.20(1.1)	49.55	50.15	50.50	50.75	50.85	51.00

								
4,200 m^3	24 l/s controlled discharge Cascade to 3.	½ drain time < 24 hours	• Pond Defined Under Exiting Planning Permission utilised for Sevington IBF • Inside the Secure Site, Not Accessible to the public • Maintenance via Church Road Staff Car park Access					
5			51.70	52.80	52.00	52.30	52.85	53.00
			Work In Progress					
3,300 m^3	19 l/s controlled discharge	½ drain time = < 24 hours	• Accessible to the public via PROW cycle link, pond to be post and rail fenced for separation for 1:3 pond slope • Maintenance via Highfield Lane at Diverted Public Right of Way (PRoW) Cycle Link Access.					
6	53.40	52.20[1.2]	53.70	53.75	53.95	54.30	54.60	54.80
								
7,000 m^3	112.5 l/s controlled discharge	½ drain time = < 12 hours	• Accessible to the Lorry drivers, pond to be post and rail fenced for separation for 1:3 pond slope • Maintenance via Internal North Perimeter Rd.					

6 Foul Water Management Strategy

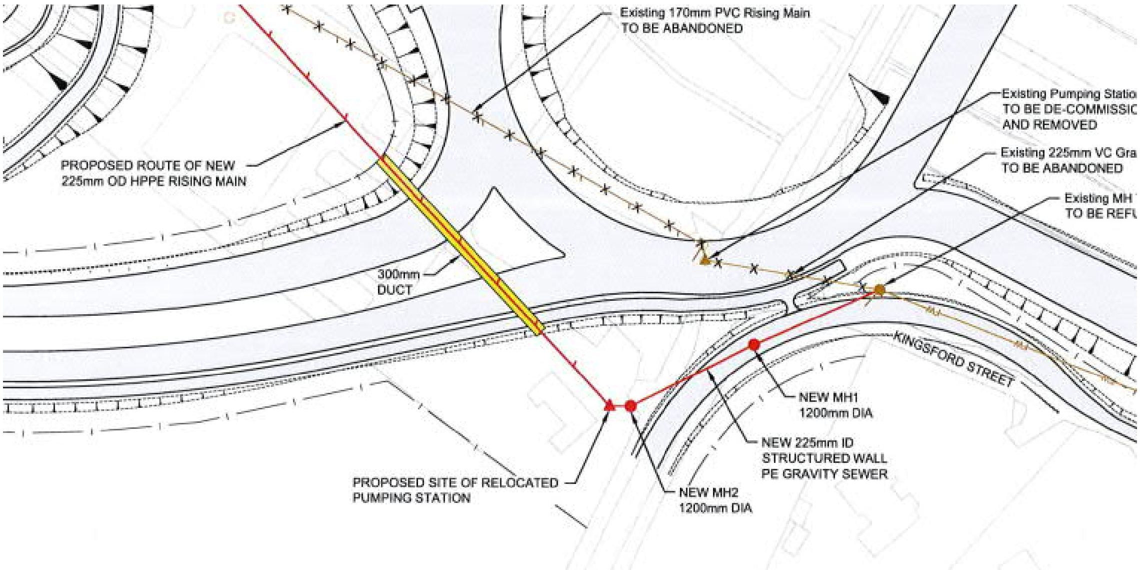
6.1 Existing Foul Water Drainage

There is an existing rising main which runs beneath Highfield Lane which is understood to service the private properties adjacent to the HS1 (High Speed) rail link. The capacity of the associated pumping station is presently unknown and shall not form part of the drainage strategy for this Site.

6.2 Consented Foul Water Drainage Proposal

The Drainage Strategy Report for the Sevington Inland Border Facility (IBF) from the prior planning application indicates that there is a foul pumping station to the north-east of the Sevington IBF. This Southern Water pumping station was relocated during the junction 10a scheme, refer to Figure 6.1.

Figure 6.1: Foul Water Pumping Station



Source: Southern Water, JN.630146-55.0Z0801, Rev. A, 17/07/15

The proposed foul water network in the north-east corner of the Site is shown on the extract of the junction 10a design proposals in Figure 6.2 below. This shows the existing rising main to be abandoned and diverted to the south via a newly associated pumping station.

It is assumed that the capacity of this pumping station Southern Water Pumping Station (Kingsford Street WPS / Rising main) was increased in line with the Southern Water capacity study in this area.[19]

The consented scheme puts forward two flows: 22.85l/s[20] and 3.85l/s.[21] The lower of the two figures were discussed with Southern Water in the capacity check. Ongoing conversations at the date of writing this Flood Risk Assessment have are now based on the capacity of the

[19] Bradbrook Consulting, Foul Strategy Report, Rev E, 14/05/2015, Appendix D

[20] Bradbrook Consulting, Foul Strategy Report, Rev E, 14/05/2015, Appendix D

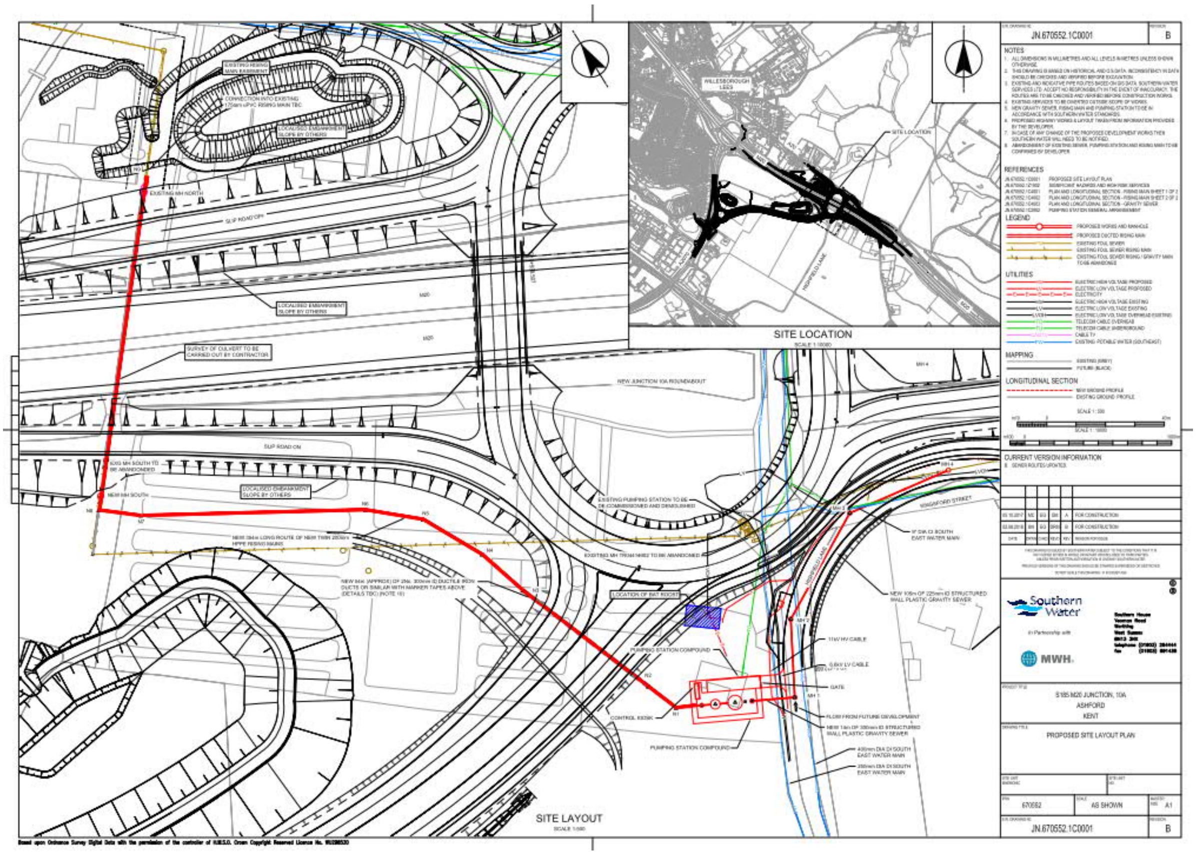
[21] Ibid, Appendix E

relocated Southern Water Pumping Station (Kingsford Street WPS / Rising main), a working figure for the spare capacity.

The pump is reported to be Xylem NP3202HT -456 with 32l/s with 36m Head.

However, it is stressed that an updated capacity check is prerequired based on the IBF and facilities proposed foul load composition.

Figure 6.2: Relocated Southern water Foul Water Pumping Station.



6.3 Proposed Foul Water Drainage for Commercial Land Use

An initial estimation of the peak foul water loading for industrial developments has been calculated using Design and Construction Guidance 2020, which recommends an estimated value of 0.6l/s/ha of developable land.[22] Given that the total Site area is 47.75ha, this equates to an estimated peak flow of 28.65l/s. This value is like the values outlined in the consented scheme as shown in Section 6.2. In lieu of more detailed plans of the proposed Site amenities, the estimated value of 28.65l/s shall be used for this foul water drainage strategy.

In accordance with the Southern Water capacity assessment, the pumping station when relocated had the capacity increased by 3.9l/s. The flows above this rate during the 9-hour working day (shift patterns are to be determined) shall be stored in storage tanks. 800m^3 of

[22] Water UK, Design and Construction Guidance, v.2, 10/03/2020, B3.1.2 (a)

storage shall be provided at this design stage, with the view to reduce when the details of amenities are finalised.

6.4 Proposed Foul Water Drainage for Animal Waste

The Border Control Post (BCP) will come into operation from Day 200. It will have its own closed off below ground drainage system to capture all wastewater from live animal, plant and produce. The below ground drainage will be designed as two separate networks – a surface water and foul water network.

The washdown water from the inspection bays used for live animals and plants will be drained by an isolated system into an effluent tank where it will be tested for contaminants. It will be tankered offsite to be disposed of at a wastewater treatment works outside of the Stour Valley catchment, effectively ensuring that no nutrients enter the site-wide drainage system, the Stour Valley catchment or Stodmarsh designated sites.

It is anticipated that when the BCP is fully operational, the 600-litre tank will be emptied between 2-4 times daily.

Once taken off site the captured foul water would then be treated offsite at a WWTW that resides outside of the Stour Valley catchment area.

6.5 Proposed Foul Water Drainage for Produce Waste

The BCP will come into operation from Day 200. It will have its own closed off below ground drainage system to capture all wastewater from live animal, plant and produce.

6.6 Proposal for Southern Water to receive treated animal, plant or produce waste

In accordance with Natural England's guidance on the nutrient loading impact on Stodmarsh designated sites[23] and as noted within the Habitat Regulations Assessment (419419-MMD-XX-SV-RP-BD-0001), locations for receiving the tankered treated water for disposal has an Agreement in Principle with Southern Water to an WwTW outside the Stour Valley Catchment area. The extract below is this agreement.

Southern Water currently has five sites in the Kent region permitted by the Environment Agency to accept certain types of low risk non-hazardous tankered trade waste.

1. Aylesford WwTW
2. Canterbury WwTW
3. Ham Hill WwTW
4. Sittingbourne WwTW
5. Tonbridge WwTW

Certain criteria must be met as a requirement of Southern Water's internal management system for the acceptance of any of these waste types by adhering to a pre-acceptance process.

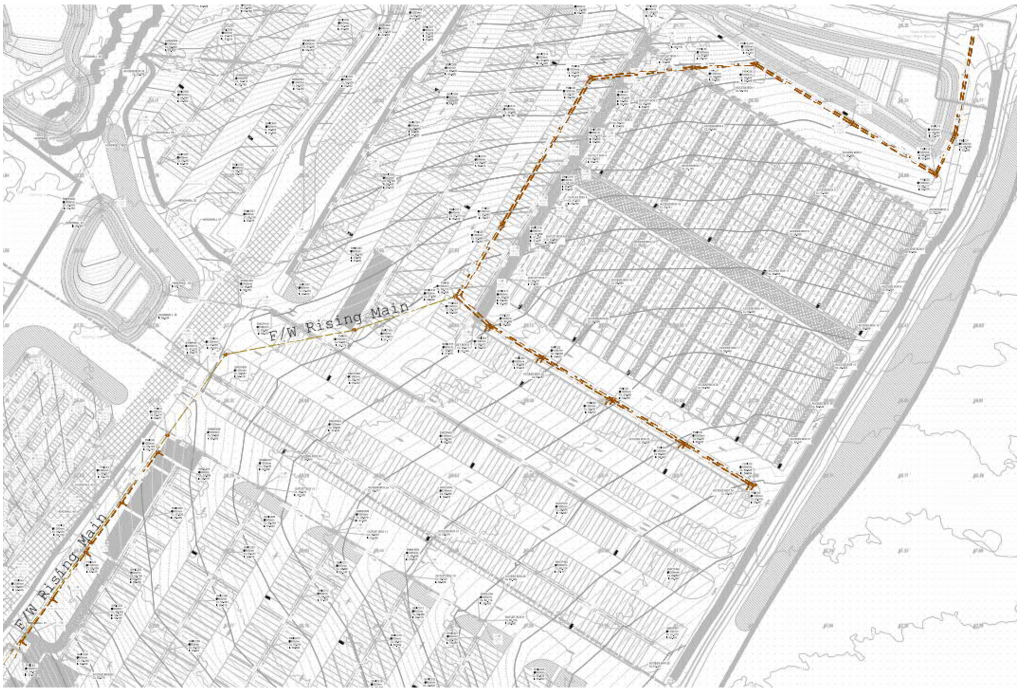
Without a detailed description of the waste including waste classification, composition, volume and disposal rates it's not possible to give a definitive answer as to whether Southern Water can accept any of this waste.

[23] Natural England, 2020. Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites - For Local Planning Authorities.

6.7 Preliminary Foul Water Drainage Design

The construction programme has demanded a primary drainage network be designed and built in the early phases of construction, the proposed network is shown in Figure 6.3 below.

Figure 6.3: Preliminary Foul Water Drainage Design



6.8 Preliminary Assessment of Human Foul Waste

The on-site package pumping station, which is to discharge to gravity network, which will be then discharged to the Southern Water pumping station for relay to Ashford FWTW will be subjected to capacity assessment and section 106 connection agreement with Southern Water. A Preliminary Assessment of Human Foul Waste not including the requirements of DEFRA operation and facilities after day 200 are shown below:

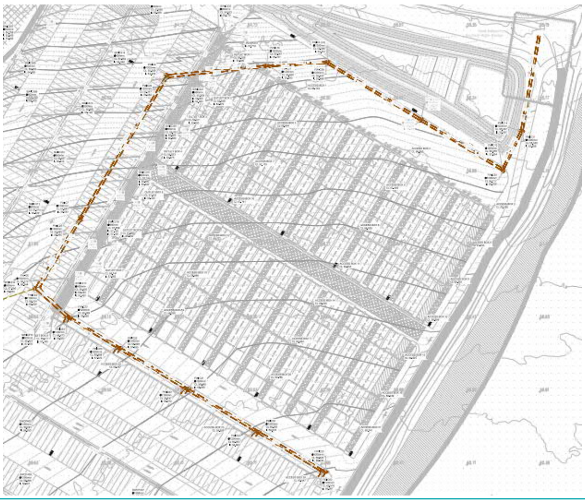
Table 6.1 : Preliminary Assessment of Human Foul Waste

	Loading Volume (ltrs/person/24hr)[ref1]		**Phase 1** **(total /24hr)**	**Phase 2** **(total /24hr)**
Office / with small canteen	**75**		300 staff	400 staff
Driver Facilities				
Toilet Blocks in long stay car parks/lorry parks (per use)	**20**		300 drivers	300 drivers
Volume				
HMRC + dft Volume / 24hr			22,500 ltrs	30,000 ltrs
Driver Facilities Volume / 24hr			6,000 ltrs	6,000 ltrs
			28,500 ltrs	**36,000 ltrs**
Frequency of Removal from Site 3,000-gallon (13,500 ltrs) tankers for removing, transporting and disposing of bulk liquid effluent and sludge waste)				
Condor 60,000 ltr (60m3)			Approx. 2 standard removal tankers /48 hr	Approx. 3 standard removal tankers /48 hr
Ref 1 - Flows and Loads – 4 Sizing Criteria, Treatment Capacity for Sewage Treatment Systems; British Water				

6.9 Recommended Construction Phasing

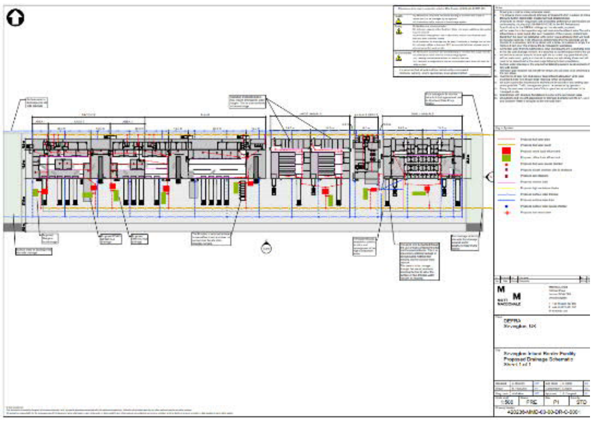
The foul and wastewater drainage infrastructure will be designed to accommodate a number of changing scenarios through the construction programme. These have been outlined further in Table 6.2.

Table 6.2: Foul Water Drainage Construction and Operational Phasing

Site Enabling Phase		The Gravity System to be constructed up to the Southern Water Pumping Station with temporary provision for collection in tank(s) and incremental removal from Site via tankers.
Phase 1 Jan – Sept 2021		The area of the Site shown in the adjacent image excerpt is to be operated by Her Majesty's Revenue & Customs (HMRC) and other Operations (Potentially Boarder Force and Department for Transport (DfT)). The Gravity System Serving the buildings shall be collected in tank(s) and be removed from Site via tankers.
		

Phase 2

Sept 2021 Onwards



The Department for Environment Food and Rural Affairs (Defra) buildings as shown on the adjacent plans are to connect to the same gravity drainage system serving the buildings constructed in Phase 1. This will be collected in tank(s) and removed from Site via tankers.

The proposed building shown in the image below is located in the green hatched area in the above figure.

6.10 Capacity of Southern Water Foul Water Treatment Works and Drainage Infrastructure.

Figure 6.4: Relocated Southern Water Pumping Station (Kingsford Street WPS / Rising main) Arrangement

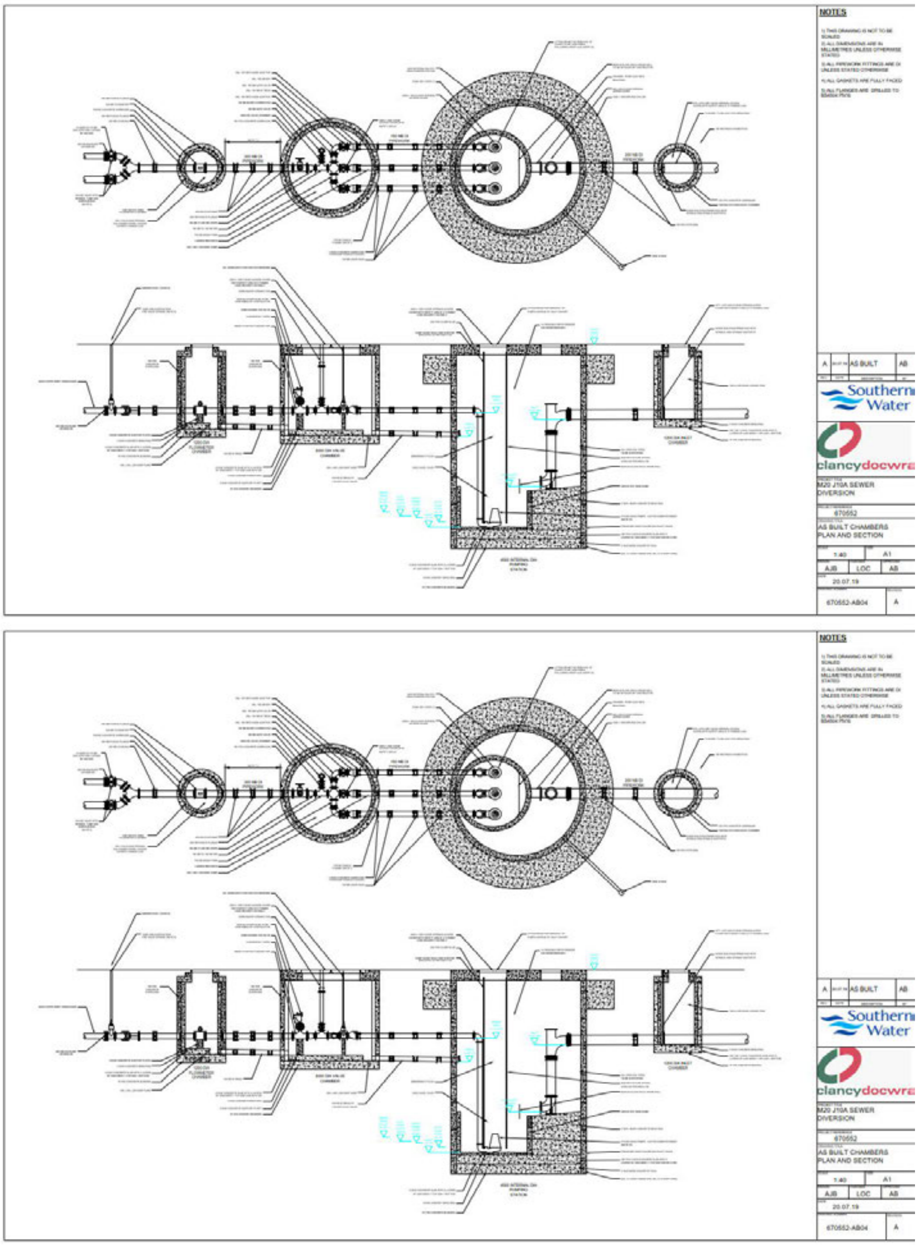


Photo 6.1: Southern Water Pumping Station (Kingsford Street WPS / Rising main)

Source: Mott MacDonald

Figure

7 Recommendations and Conclusions

7.1 Flood Risk

This report concludes that there is a low risk of flooding from external sources. The Site is in a Flood Zone 1 and therefore has less than 0.1% Annual Exceedance Probability (AEP) probability of flooding.

This report concludes that this Site will not increase the risk of flooding to person or property.

7.2 Surface Water Management

7.2.1 Proposed Surface Water Drainage

The proposed surface water run-off is proposed to discharge into the Old Mill Stream in the north and to two culverts that run beneath the HS1 (High Speed) railway line in the south. The discharge shall be controlled to greenfield run-off rate and attenuation shall be provided by ponds.

7.2.2 Environmental

In the general operation of the Site, the Sustainable Drainage Systems (SuDS) features will provide enough treatment to the run-off.

Exceptional circumstances shall be managed as detailed in the Pollution Prevention Strategy.

7.3 Foul Water Management

The foul water is proposed to outfall to a Southern Water pumping station to the north-east of the Site. Foul water in excess of the pumping stations capacity shall be attenuated on-site and discharged during off-peak times to the pumping station or tankered away where required.

Foul water from areas used by animals and plant shall be drained in accordance with the Department for Environment, Food and Rural Affairs (Defra) testing regime.

7.3.1 Southern Water Consultation

This capacity assessment is underway Southern Water at the writing of this document.

7.4 Operations and Maintenance

A site-specific Operations and Maintenance for the drainage systems will be produce for this site to include all aspects to ensure the integrity of the systems functions again the risk of flood or pollution.

Appendices

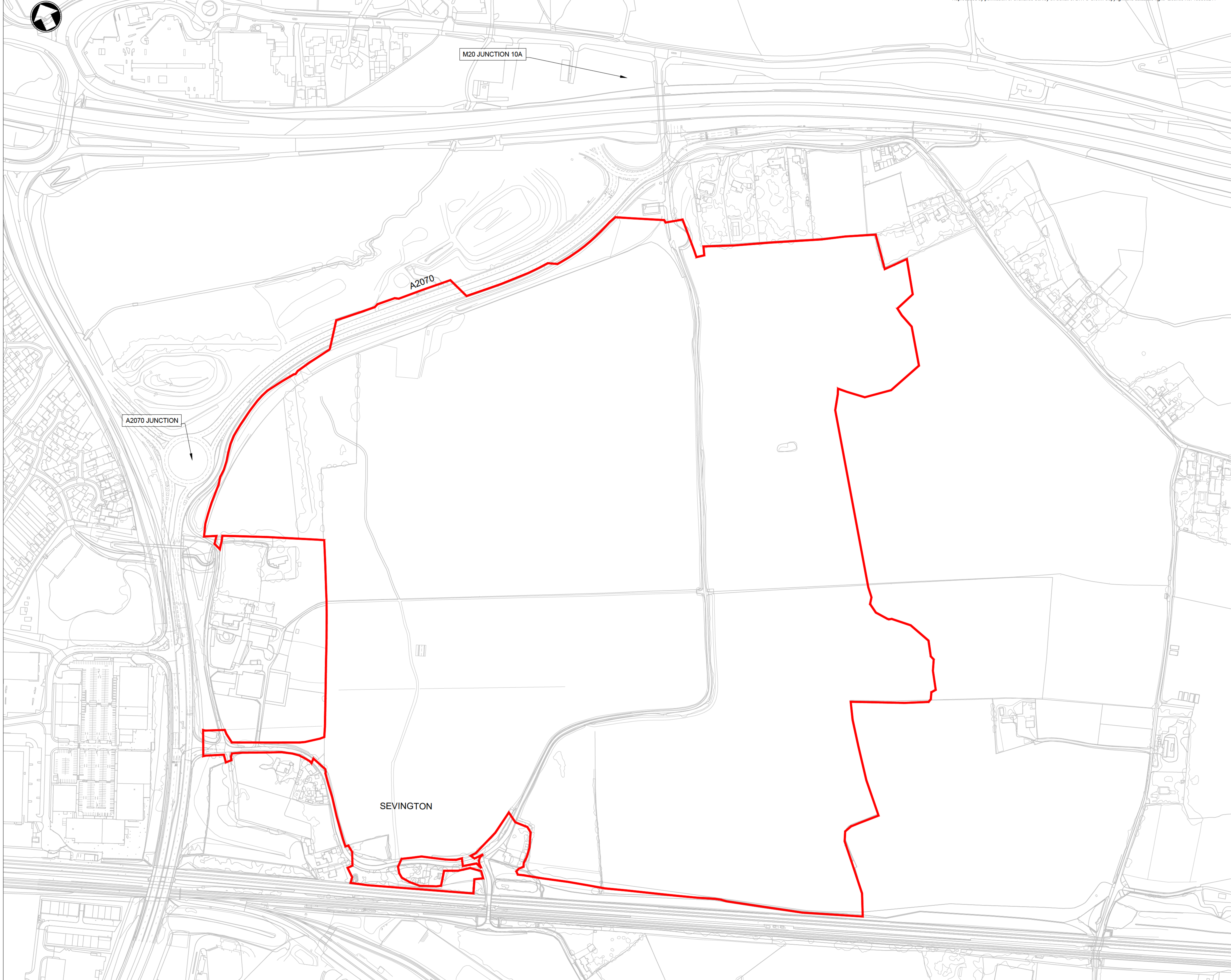
A. Topographical Survey 45

B. Drainage Layout 46

C. Micro-drainage Calculation 47

D. Pollution Prevention Plan 48

A. Topographical Survey



Notes

1. THIS DRAWING SUPERIMPOSES THE NEW ALIGNMENTS OF THE M20 JUNCTION 10A AND A2070 ON THE BASE MAPPING SINCE THE OS MAPPING HAS NOT YET BEEN UPDATED TO SHOW THIS.

Key to symbols

ARTICLE 4 LAND

Reference drawings

1:2500 0 125m 250m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P01	13/10/20	[redacted]	FIRST ISSUE	[redacted]	[redacted]
P02	15/10/20	[redacted]	UPDATED HATCHING	[redacted]	[redacted]
P03	04/11/20	[redacted]	RLB CHANGED IN SOUTH WEST	[redacted]	[redacted]

Status Stamp

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Title
SEVINGTON INLAND BORDER FACILITY
ARTICLE 4(2)(B)
RED LINE BOUNDARY
Sheet 1 of 1

Designed	[redacted]	DN	Eng check	[redacted]	[redacted]
Drawn	[redacted]	DN	Coordination	[redacted]	[redacted]
Dwg check	[redacted]	RB	Approved	[redacted]	[redacted]

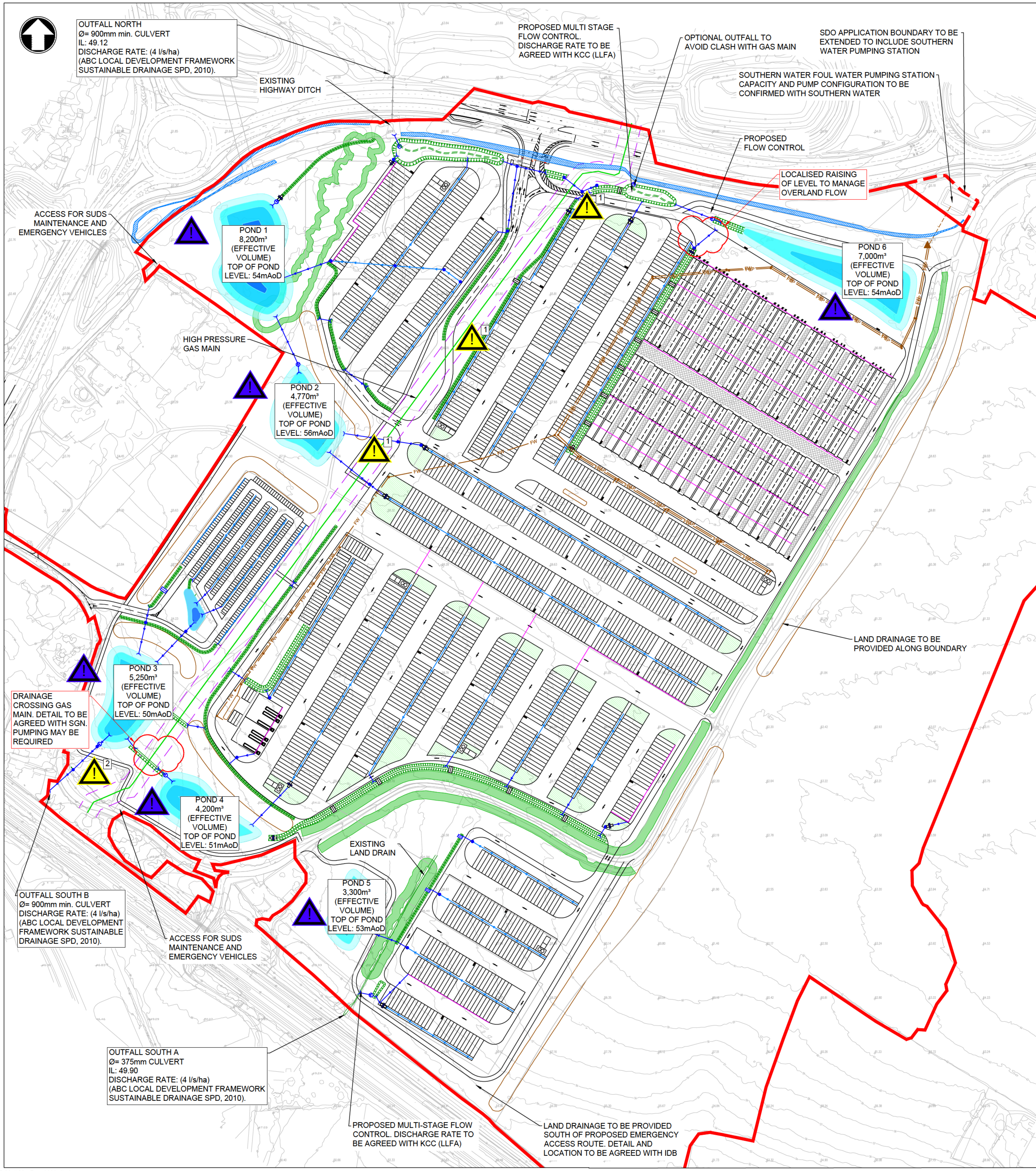
MMD Project Number	Scale at A1	Security
419419	1:2500	STD

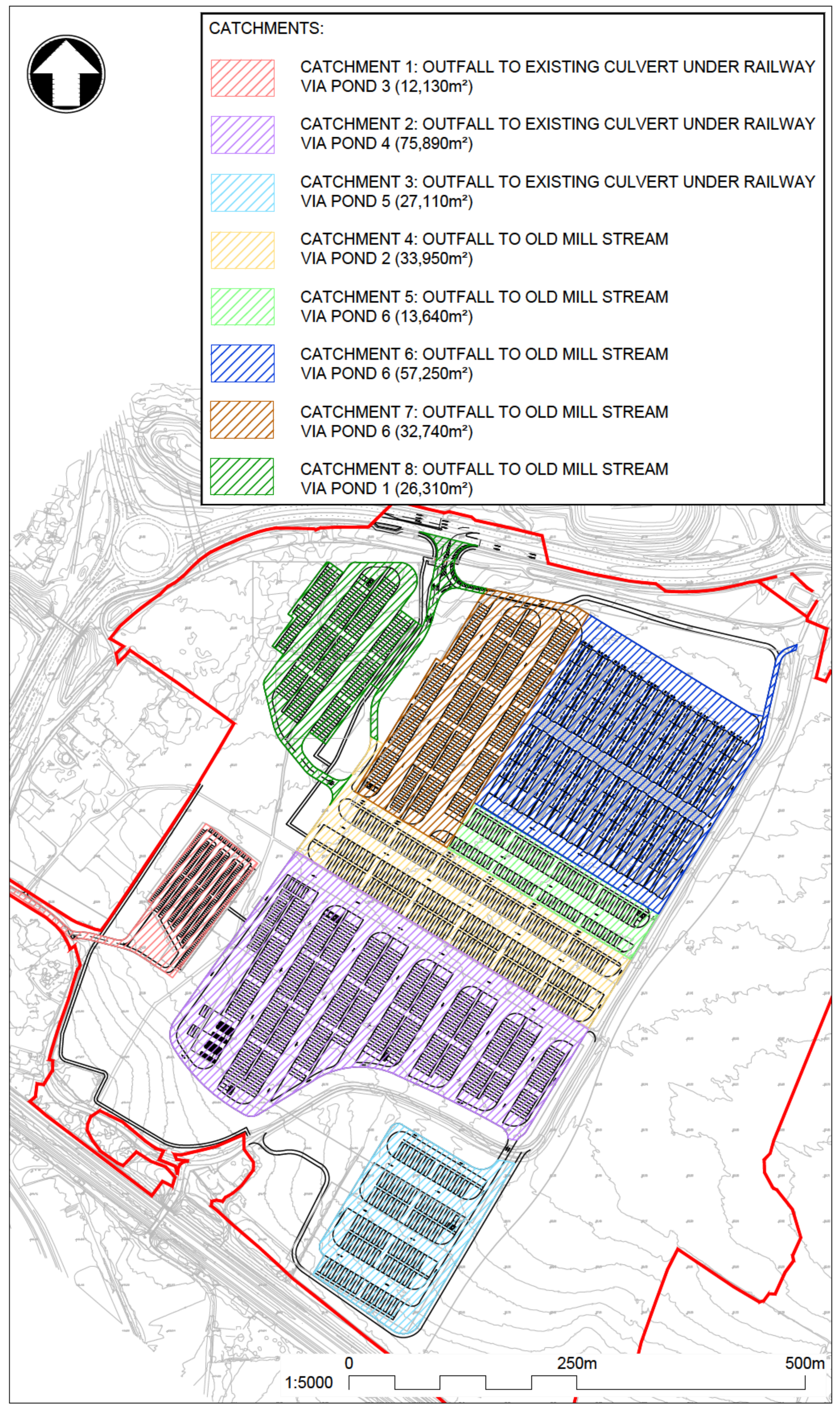
Suitability Description	Suit. Code
Suitable for Information	S2

Drawing Number	Revision
419419-MMD-01-MO-DR-Z-0002	P03

C:\users\tom83357\appdata\local\projectwise\workdir\mott-gb-pw-03\d0269148\419419-MMD-01-MO-DR-Z-0002.dwg Nov 12, 2020 - 5:26PM
NEW90932

B. Drainage Layout





SURFACE WATER FLOW IMPEDANCE POLLUTION CONTROL FEATURE
- HARENA SAND PENSTOCK CHAMBER
- HARENA SAND SWALE CHECK DAM
- SWALE CHECK DAM

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

DESIGN RISK ASSESSMENT REFERENCE GIVING FULL DETAILS:-

CONSTRUCTION
1. HP GAS MAIN (SGN)
2. KCC HIGHWAY CROSSING

MAINTENANCE
1. LIMITED ACCESS TO ATTENUATION POND FOR MAINTENANCE.

DECOMMISSIONING/ DEMOLITION

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

1:2000 0 100m 200m

Notes

1. TOPO SURVEY PROVIDED BY SENSAT ON 27/05/2020.
2. SUBJECT TO:
   - COORDINATION WITH FINAL LEVELS
   - GROUND INVESTIGATION
   - AGREEMENT WITH LLFA
   - CAPACITY ASSESSMENT OF OUTFALLS
   - GROUNDWATER LEVELS
   - INFILTRATION RATES
   - CONSULTATION WITH SOUTHERN WATER
3. TO BE READ IN CONJUNCTION WITH DRAINAGE STRATEGY AND FLOOD RISK ASSESSMENT.
4. DESIGNED IN ACCORDANCE WITH WATER UK DESIGN AND CONSTRUCTION GUIDANCE.
5. ALL MANHOLE CHAMBERS, SLOT DRAINS AND OUTLET BOXES ARE D400 UNLESS SPECIFIED OTHERWISE.
6. OUTFALL LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION.
7. CONSTRUCTION TO COMMENCE AT THE DOWNSTREAM CONNECTION.
8. FLOTATION CHECKS ON UNDERGROUND STRUCTURES REQUIRED WHEN GROUNDWATER IS CONFIRMED.
9. REFER TO DRAINAGE RISK REGISTER FOR MORE INFORMATION.
10. DESIGN DOES NOT ACCOUNT FOR GROUND WATER LEVELS OR COORDINATION WITH UTILITIES.
11. CONDITION OF EXISTING DRAINAGE SYSTEM AT OUTFALLS TO BE CONFIRMED BY CCTV.
12. DRAINAGE INFRASTRUCTURE IS SHOWN INDICATIVELY ONLY, REFER TO PLOT SPECIFIC DETAILED DRAWINGS.

Key to symbols

- SITE BOUNDARY
- POTENTIAL LANDSCAPING AREA
- LANDSCAPE BUFFER PLANTING INCORPORATING BUNDS
- EXISTING HIGHWAYS ENGLAND DRAINAGE DITCH
- PROPOSED DRAINAGE SWALE
- PROPOSED ATTENUATION BASIN
- PROPOSED MANHOLE
- PROPOSED CARRIER DRAIN
- PROPOSED FILTER DRAIN
- PROPOSED FOUL WATER RISING MAIN
- FW — PROPOSED FOUL WATER SEWER
- P&P — PROPOSED PLANTS & PRODUCE WASTE FOUL WATER
- PROPOSED ACO QMAX350 SLOT DRAIN
- PROPOSED CULVERT
- PROPOSED FLOW CONTROL
- PROPOSED PUMPING STATION

Reference drawings

PRIVATE & CONFIDENTIAL

Rev	Date	Drawn	Description	Ch'k'd	App'd
P01	25/08/20	[redacted]	FIRST ISSUE	[redacted]	[redacted]
P02	14/10/20	[redacted]	COMPLETE DRAINAGE PACKAGE ISSUE	[redacted]	[redacted]
P03	05/11/20	[redacted]	SITE BOUNDARY AMENDED	[redacted]	[redacted]

Status Stamp

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Title
FUTURE EU ROADS RELATIONSHIP
SEVINGTON IBF
DRAINAGE STRATEGY

Sheet 1 of 1

Designed	[redacted]	AH	Eng check	[redacted]	[redacted]
Drawn	[redacted]	RB	Coordination	[redacted]	[redacted]
Dwg check	[redacted]	RB	Approved	[redacted]	[redacted]

MMD Project Number	Scale at A1	Security
419419	AS SHOWN	STD

Suitability Description	Suit. Code
Suitable for Information	S2

Drawing Number	Revision
419419-MMD-01-MO-DR-D-0501	P03

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C. Micro-drainage Calculation

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	[redacted]
Site name:	MOJO
Site location:	Ashford

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.12925° N
Longitude:	0.91375° E
Reference:	462417285
Date:	Aug 13 2020 10:21

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 47.75

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	734	734
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	91.99	91.99
1 in 1 year (l/s):	78.19	78.19
1 in 30 years (l/s):	211.57	211.57
1 in 100 year (l/s):	293.44	293.44
1 in 200 years (l/s):	344.03	344.03

ACO HYDRAULIC DESIGN

+ SUMMARY REPORT - Page 1

Project Name: MOJO **Designer:** [redacted] **Project Date:** 13th August 2020

Location: Unnamed Road, Sevington, Ashford TN24 0LD, UK **Print Date:** 13th August 2020

+ INPUTS

M5-60: 20mm/hr **Ratio R:** 0.34

RUN / OPTION	LENGTH (m)	AREA (m2)	SLOPE (%)	IMPERMEABILITY FACTOR	RETURN PERIOD (years)	CLIMATE CHANGE (%)	STORM DURATION (mins)	RAINFALL INTENSITY (mm/hr)	INFLOW CONTROL (l/s/m)	Point Inflow Interlinked from	Cumulative Point Inflows (l/s)	Discharge control (l/s)
1A	310.00	9,300.00	0.83	1.0	30	20	30	59.92	Free	None	0.00	None

+ OUTPUTS

M5-60: 20mm/hr **Ratio R:** 0.34

RUN / OPTION	ACO PRODUCT	Part Number	METERAGE (m)	OUTFLOW (l/s)	CAPACITY (%)	MAX* VELOCITY (m/s)	MIN FREEBOARD (m)	EXCAVATION VOLUME (m3)	CONCRETE VOLUME (m3)
1A	Qmax Qmax 350	32810	310.00	154.94	95.80**	1.78**	0.03**	141.67	105.40

*ACO would typically suggest flow velocities of 0.7m/s or greater in channels to be considered self-cleansing velocities. Flow velocities in the upper reaches of linear drainage systems are not likely to achieve self-cleansing velocities.

**The flow in this channel varies betwen sub-critical and super-critical conditions so the depth / velocity calculation is not precise. However, your selected channel will have sufficient capacity to accomodate the defined flow.
Note that optimised solutions will only suggest non-turbulent, sub-critical flow regimes.

+ SUMMARY OF PARTS

ACO PRODUCT	Cumulative Product Meterage (m)	Part Number	CUMULATIVE OUTFLOW (l/s)	EXCAVATION VOLUME (m3)	CONCRETE VOLUME (m3)
Qmax Qmax 350	310.00	32810	154.94	141.67	105.40

ACO HYDRAULIC DESIGN

+ SUMMARY REPORT - Page 2

Project Name: MOJO

Designer: [redacted]

Project Date: 13th August 2020

Location: Unnamed Road, Sevington, Ashford TN24 0LD, UK

Print Date: 13th August 2020

+ CUMULATIVE ATTENUATION REQUIREMENTS

Max permitted outflow (l/s): 154.94

+ CONTRIBUTING AREAS

RUN	CATCHMENT AREA (m2)
1A	9,300.00
Effective Catchment Area	9,300.00
Additional Contibuting Area	0.00
TOTAL AREA	9,300.00

+ RAINFALL DATA

Duration	Intensity (mm/h)	Required Storage Volume (m3)
5 mins	47.62	0.00
10 mins	36.60	0.00
15 mins	30.17	0.00
30 mins	19.67	0.00
1 hour	12.40	0.00
2 hours	7.83	0.00
4 hours	4.81	0.00
6 hours	3.70	0.00
10 hours	2.60	0.00
24 hours	1.42	0.00
48 hours	0.85	0.00

+ NET STORAGE VOLUME REQUIRED

0.00 m3

+ GROSS ATTENUATION STORAGE REQUIREMENT

0.00 m3

+ EXAMPLE STORMBRIXX CONFIGURATIONS

DEPTH (NUMBER OF UNITS)	LENGTH (NUMBER OF UNITS)	WIDTH (NUMBER OF UNITS)	STORAGE VOLUME M3 (GROSS/NET)
1 (= 0.61m)	0 (= 0.00m)	0 (= 0.00m)	0.00 (0.00)
2 (= 1.22m)	0 (= 0.00m)	0 (= 0.00m)	0.00 (0.00)
3 (= 1.83m)	0 (= 0.00m)	0 (= 0.00m)	0.00 (0.00)

Please note that any changes to your design criteria are likely to affect the attenuation requirement.
Please contact ACO Design Services with the details of your tank selection, with salient details such as proposed Cover Level, Invert Level, Ground Water Level and soil conditions. We will quickly prepare a Structural Analysis to fully assess your requirements.

+ DISCLAIMER

This simplified estimate of storage determines the largest volume required using the rainfall intensities for a range of different rainfall durations, for the location and return period specified by the designer. The type of flow control device is not known, so the calculation assumes a constant rate of outfall from the storage volume for the whole duration of the storm. Please contact ACO Design Services for further advice and details of the ACO Q-Brake Vortex Flow Control and the ACO StormBrixx Cellular Storage tank.

ACO HYDRAULIC DESIGN

+ DETAILED RUN REPORT - Page 1

Project Name: MOJO

Designer: [redacted]

Project Date: 13th August 2020

Location: Unnamed Road, Sevington, Ashford TN24 0LD, UK

Print Date: 13th August 2020

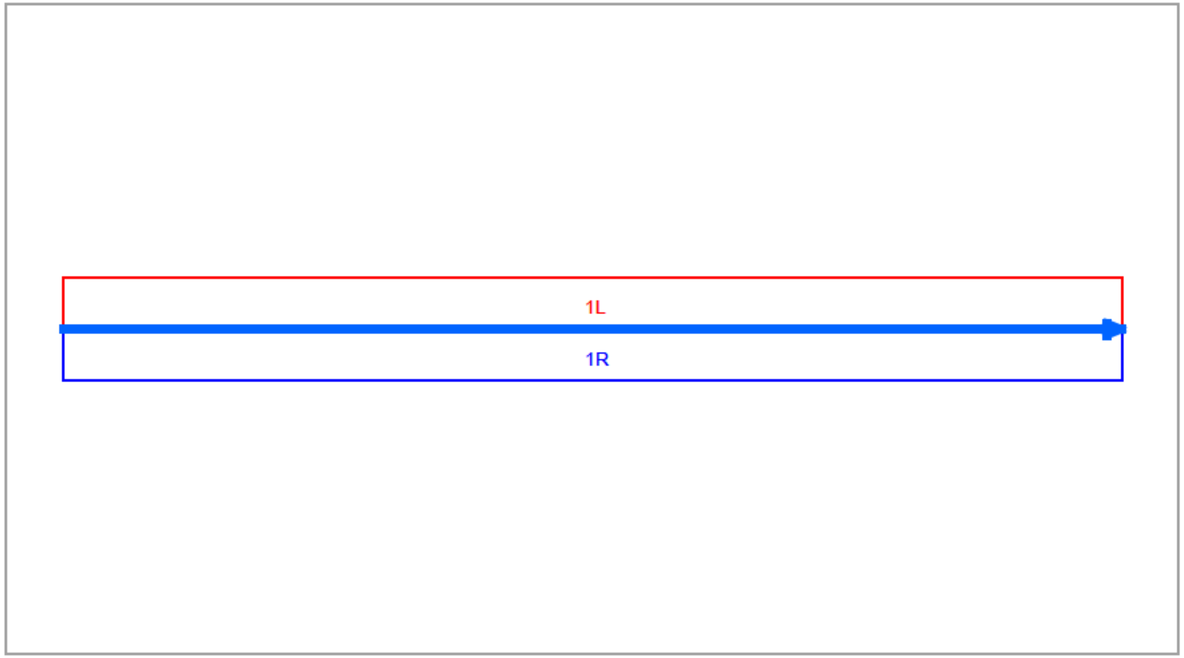
Project Notes:

+ INPUT DATA:- Run 1: 'New Run', Option A 'New Option'

M5-60: 20mm/hr **Ratio R:** 0.34

LENGTH (m)	AREA (m2)	SLOPE (%)	IMPERMEABILITY FACTOR	RETURN PERIOD (years)	CLIMATE CHANGE (%)	STORM DURATION (mins)	RAINFALL INTENSITY (mm/hr)	INFLOW CONTROL (l/s/m)	Point Inflow Interlinked from	Cumulative Point Inflows l/s
310.00	9,300.00	0.83	1.00	30	20.00	30 mins	59.92	None	None	0.00

+ CHANNEL LAYOUT



+ RAINFALL DATA

Duration	Intensity (mm/h)
5 mins	111.21
10 mins	91.45
15 mins	75.39
30 mins	49.93
1 hour	31.48
2 hours	19.57
4 hours	11.66
6 hours	8.56
10 hours	5.87
24 hours	3.03
48 hours	1.70

ACO HYDRAULIC DESIGN

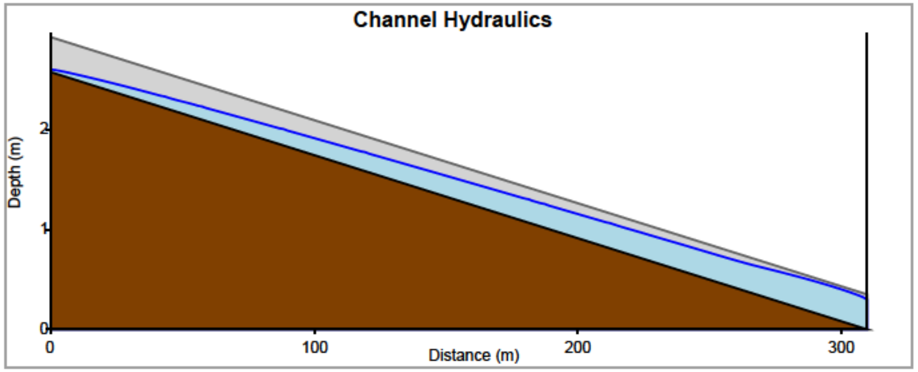
+ DETAILED RUN REPORT - Page 2

Project Name: MOJO **Designer:** [redacted] **Project Date:** 13th August 2020

Location: Unnamed Road, Sevington, Ashford TN24 0LD, UK **Print Date:** 13th August 2020

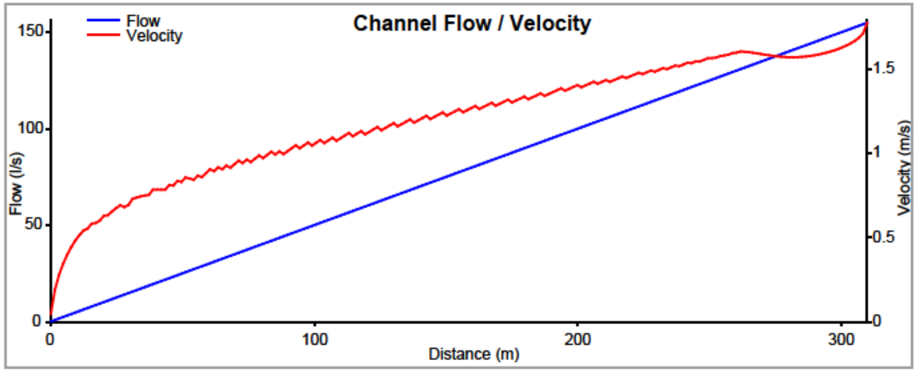
+ OUTPUTS:- Run 1: 'New Run', Option A 'New Option'

OUTFLOW (l/s)	CAPACITY (%)	MAX* VELOCITY (m/s)	MIN FREEBOARD (m)	EXCAVATION VOLUME (m3)	CONCRETE VOLUME (m3)
154.94	95.80**	1.78**	0.03**	141.67	105.40



Qmax

	1
System	Qmax 350
W - Width (mm)	350
H - Invert (mm)	550
Length (m)	310.00



**The flow in this channel varies betwen sub-critical and super-critical conditions so the depth / velocity calculation is not precise. However, your selected channel will have sufficient capacity to accomodate the defined flow.
Note that optimised solutions will only suggest non-turbulent, sub-critical flow regimes.

ICP SUDS Mean Annual Flood

Input

Return Period (years)	5	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	730	Region Number	Region 7

Results	**l/s**
QBAR Rural	4.6
QBAR Urban	4.6
Q5 years	5.9
Q1 year	3.9
Q30 years	10.5
Q100 years	14.7

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	20.000	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.357	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.600		

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
7.000	11.218	0.047	240.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
7.001	225.999	1.800	125.6	1.471	0.00	0.0	0.600		o	450	Pipe/Conduit	
7.002	50.692	1.395	36.3	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
8.000	10.171	0.042	240.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
8.001	211.011	1.900	111.1	2.488	0.00	0.0	0.600		o	525	Pipe/Conduit	
8.002	63.628	1.538	41.4	0.000	0.00	0.0	0.600		o	525	Pipe/Conduit	
7.003	28.556	0.283	100.9	0.000	0.00	0.0		0.045	3 \=/	1500	1:3 Swale	
7.004	40.928	0.406	100.8	0.000	0.00	0.0		0.045	3 \=/	1500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
7.000	50.00	4.29	57.750	0.000	0.0	0.0	0.0	0.64	11.4	0.0
7.001	50.00	6.37	57.403	1.471	0.0	0.0	0.0	1.81	288.4	199.2
7.002	50.00	6.62	55.603	1.471	0.0	0.0	0.0	3.38	537.7	199.2
8.000	50.00	4.26	58.155	0.000	0.0	0.0	0.0	0.64	11.4	0.0
8.001	50.00	5.92	57.738	2.488	0.0	0.0	0.0	2.12	460.0	336.9
8.002	50.00	6.22	55.838	2.488	0.0	0.0	0.0	3.49	755.5	336.9
7.003	50.00	6.98	54.300	3.959	0.0	0.0	0.0	1.30	3656.3	536.1
7.004	50.00	7.51	54.017	3.959	0.0	0.0	0.0	1.30	3658.0	536.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
7.005	84.152	1.311	64.2	0.000	0.00	0.0		0.045	3 \=/	1500	1:3 Swale	
7.006	68.633	0.579	118.5	2.959	0.00	0.0		0.045	3 \=/	10800	1:3 Swale	
7.007	134.303	2.523	53.2	0.000	0.00	0.0		0.045	3 \=/	10800	1:3 Swale	
7.008	50.809	0.503	101.0	0.000	0.00	0.0		0.045	3 \=/	10800	1:3 Swale	
9.000	7.146	0.042	170.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
9.001	52.828	3.162	16.7	0.738	0.00	0.0	0.600		o	225	Pipe/Conduit	
10.000	41.792	3.065	13.6	0.427	4.00	0.0		0.045	3 \=/	600	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
7.005	50.00	8.37	53.611	3.959	0.0	0.0	0.0	1.63	4584.2	536.1
7.006	50.00	10.41	52.300	6.918	0.0	0.0	0.0	0.56	944.6	936.7
7.007	50.00	13.09	51.721	6.918	0.0	0.0	0.0	0.84	1409.7	936.7
7.008	50.00	14.49	49.198	6.918	0.0	0.0	0.0	0.61	1023.3	936.7
9.000	50.00	4.16	59.300	0.000	0.0	0.0	0.0	0.77	13.6	0.0
9.001	50.00	4.43	59.183	0.738	0.0	0.0	0.0	3.22	127.9	100.0
10.000	50.00	4.53	59.086	0.427	0.0	0.0	0.0	1.31	206.5	57.8

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
9.002	56.610	1.274	44.4	0.000	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
11.000	7.730	1.232	6.3	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
11.001	56.702	1.232	46.0	0.750	0.00	0.0	0.600		o	300	Pipe/Conduit	
9.003	60.183	0.912	66.0	0.000	0.00	0.0		0.045	3 \=/	2100	1:3 Swale	
12.000	7.018	0.041	170.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
12.001	63.798	3.684	17.3	0.813	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.002	50.00	5.75	56.021	1.165	0.0	0.0	0.0	0.77	168.1	157.8
11.000	50.00	4.03	58.415	0.000	0.0	0.0	0.0	4.05	71.6	0.0
11.001	50.00	4.44	57.033	0.750	0.0	0.0	0.0	2.32	164.2	101.5
9.003	50.00	7.22	54.747	1.915	0.0	0.0	0.0	0.69	262.2	259.3
12.000	50.00	4.15	57.635	0.000	0.0	0.0	0.0	0.77	13.6	0.0
12.001	50.00	4.49	57.519	0.813	0.0	0.0	0.0	3.16	125.6	110.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
9.004	87.632	1.169	75.0	0.000	0.00	0.0		0.045	3 \=/	3300	1:3 Swale	
13.000	8.585	0.051	170.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
13.001	125.878	4.293	29.3	1.184	0.00	0.0	0.600		o	300	Pipe/Conduit	
9.005	50.500	1.025	49.3	0.000	0.00	0.0		0.045	3 \=/	3900	1:3 Swale	
9.006	37.703	1.826	20.6	0.000	0.00	0.0		0.045	3 \=/	3900	1:3 Swale	
14.000	7.589	0.045	170.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
14.001	162.111	6.125	26.5	1.458	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.004	50.00	9.41	53.835	2.728	0.0	0.0	0.0	0.67	375.0	369.4
13.000	50.00	4.19	57.160	0.000	0.0	0.0	0.0	0.77	13.6	0.0
13.001	50.00	4.91	56.959	1.184	0.0	0.0	0.0	2.91	206.0	160.3
9.005	50.00	10.42	52.666	3.912	0.0	0.0	0.0	0.83	542.4	529.7
9.006	50.00	10.91	51.641	3.912	0.0	0.0	0.0	1.28	838.1	529.7
14.000	50.00	4.16	56.135	0.000	0.0	0.0	0.0	0.77	13.6	0.0
14.001	50.00	5.05	55.940	1.458	0.0	0.0	0.0	3.07	216.9	197.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
9.007	58.562	0.515	113.7	0.000	0.00	0.0		0.045	3 \=/	8200	1:3 Swale	
15.000	13.137	0.078	168.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
15.001	168.647	5.143	32.8	1.558	0.00	0.0	0.600		o	375	Pipe/Conduit	
9.008	113.964	1.000	114.0	0.000	0.00	0.0		0.045	3 \=/	10800	1:3 Swale	
16.000	4.879	0.049	100.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
16.001	160.064	3.500	45.7	0.474	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.007	50.00	12.63	49.815	5.370	0.0	0.0	0.0	0.57	735.3	727.2
15.000	50.00	4.28	55.585	0.000	0.0	0.0	0.0	0.77	13.7	0.0
15.001	50.00	5.17	55.282	1.558	0.0	0.0	0.0	3.17	350.5	210.9
9.008	50.00	15.96	49.300	6.928	0.0	0.0	0.0	0.57	963.4	938.1
16.000	50.00	4.08	55.410	0.000	0.0	0.0	0.0	1.00	17.8	0.0
16.001	50.00	5.46	55.286	0.474	0.0	0.0	0.0	1.94	77.1	64.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
16.002	101.553	3.486	29.1	0.000	0.00	0.0		0.045	3 \=/	600	1:3 Swale	
17.000	6.859	0.069	100.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
17.001	153.093	3.500	43.7	0.490	0.00	0.0	0.600		o	225	Pipe/Conduit	
17.002	105.023	3.000	35.0	0.000	0.00	0.0		0.045	3 \=/	600	1:3 Swale	
9.009	62.663	0.546	114.8	0.126	0.00	0.0		0.045	3 \=/	600	1:3 Swale	
18.000	7.226	0.072	100.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
18.001	66.541	2.590	25.7	0.675	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
16.002	50.00	7.34	51.786	0.474	0.0	0.0	0.0	0.90	141.3	64.1
17.000	50.00	4.11	55.780	0.000	0.0	0.0	0.0	1.00	17.8	0.0
17.001	50.00	5.40	55.636	0.490	0.0	0.0	0.0	1.98	78.9	66.4
17.002	50.00	7.54	52.136	0.490	0.0	0.0	0.0	0.82	128.9	66.4
9.009	50.00	6.31	48.300	0.000	10.0	0.0	0.0	0.45	71.2	10.0
18.000	50.00	4.12	57.750	0.000	0.0	0.0	0.0	1.00	17.8	0.0
18.001	50.00	4.55	57.603	0.675	0.0	0.0	0.0	2.59	103.1	91.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
18.002	57.785	3.494	16.5	0.000	0.00	0.0		0.045	3 \=/	600	1:3 Swale	
19.000	6.578	0.066	100.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
19.001	66.655	5.340	12.5	0.735	0.00	0.0	0.600		o	225	Pipe/Conduit	
18.003	57.670	0.678	85.0	0.000	0.00	0.0		0.045	3 \=/	1700	1:3 Swale	
20.000	6.004	0.060	100.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
20.001	68.736	4.474	15.4	0.703	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
18.002	50.00	5.36	55.013	0.675	0.0	0.0	0.0	1.19	187.5	91.4
19.000	50.00	4.11	57.000	0.000	0.0	0.0	0.0	1.00	17.8	0.0
19.001	50.00	4.41	56.859	0.735	0.0	0.0	0.0	3.72	148.1	99.5
18.003	50.00	6.98	51.519	1.410	0.0	0.0	0.0	0.59	191.0	190.9
20.000	50.00	4.10	55.450	0.000	0.0	0.0	0.0	1.00	17.8	0.0
20.001	50.00	4.44	55.315	0.703	0.0	0.0	0.0	3.36	133.4	95.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
18.004	36.365	0.520	70.0	0.000	0.00	0.0		0.045	3 \=/	2400	1:3 Swale	
21.000	36.148	0.358	101.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
21.001	30.758	0.621	49.5	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
18.005	19.771	0.179	110.5	0.000	0.00	0.0		0.045	3 \=/	3100	1:3 Swale	
22.000	6.492	0.065	100.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
22.001	71.802	2.000	35.9	0.346	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
18.004	50.00	7.88	50.841	2.113	0.0	0.0	0.0	0.67	287.9	286.1
21.000	50.00	4.60	51.300	0.000	0.0	0.0	0.0	1.00	17.7	0.0
21.001	50.00	4.96	50.942	0.000	0.0	0.0	0.0	1.43	25.3	0.0
18.005	50.00	8.48	50.321	2.113	0.0	0.0	0.0	0.55	291.2	286.1
22.000	50.00	4.11	52.850	0.000	0.0	0.0	0.0	1.00	17.8	0.0
22.001	50.00	4.65	52.710	0.346	0.0	0.0	0.0	2.19	87.1	46.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
18.006	15.320	0.100	153.2	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
23.000	53.122	0.055	967.4	7.021	4.00	0.0		0.045	3 \=/	31300	1:3 Swale	
23.001	53.691	0.493	108.8	0.000	0.00	0.0		0.045	3 \=/	31300	1:3 Swale	
24.000	8.024	0.033	240.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
24.001	181.874	3.990	45.6	1.307	0.00	0.0	0.600		o	375	Pipe/Conduit	
23.002	39.729	0.224	177.4	0.090	0.00	0.0		0.045	3 \=/	16100	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
18.006	50.00	4.20	49.992	0.000	70.0	0.0	0.0	1.27	89.6	70.0
23.000	50.00	8.44	52.300	7.021	0.0	0.0	0.0	0.20	950.7	950.7
23.001	50.00	9.94	52.245	7.021	0.0	0.0	0.0	0.60	2834.7	950.7
24.000	50.00	4.21	56.000	0.000	0.0	0.0	0.0	0.64	11.4	0.0
24.001	50.00	5.33	55.742	1.307	0.0	0.0	0.0	2.69	297.1	177.0
23.002	50.00	11.37	51.752	8.418	0.0	0.0	0.0	0.46	1146.5	1139.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
25.000	9.183	0.038	240.0	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
25.001	167.992	3.000	56.0	1.682	0.00	0.0	0.600		o	375	Pipe/Conduit	
23.003	67.191	0.788	85.3	0.000	0.00	0.0		0.045	3 \=/	13200	1:3 Swale	
23.004	24.729	0.033	749.4	0.000	0.00	0.0		0.045	3 \=/	39700	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
25.000	50.00	4.24	55.750	0.000	0.0	0.0	0.0	0.64	11.4	0.0
25.001	50.00	5.39	55.487	1.682	0.0	0.0	0.0	2.43	267.9	227.8
23.003	50.00	13.06	51.528	10.100	0.0	0.0	0.0	0.66	1358.2«	1367.7
23.004	50.00	14.87	50.740	10.100	0.0	0.0	0.0	0.23	1368.9	1367.7

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
PPN2	59.266	1.516	Open Manhole	1200	7.000	57.750	150				
PPN2A	59.159	1.756	Junction		7.001	57.403	450	7.000	57.703	150	
18	56.399	0.796	Open Manhole	1350	7.002	55.603	450	7.001	55.603	450	
PPN1	59.336	1.181	Open Manhole	1200	8.000	58.155	150				
PPN1A	59.230	1.493	Junction		8.001	57.738	525	8.000	58.113	150	
3	56.908	1.070	Open Manhole	1500	8.002	55.838	525	8.001	55.838	525	
Pond 2	56.000	1.791	Open Manhole	10000	7.003	54.300	1500	7.002	54.209	450	
								8.002	54.300	525	
21	55.784	1.767	Junction		7.004	54.017	1500	7.003	54.017	1500	
22	55.056	1.445	Junction		7.005	53.611	1500	7.004	53.611	1500	
Pond 1	54.000	1.700	Junction		7.006	52.300	10800	7.005	52.300	1500	
24	52.287	0.566	Junction		7.007	51.721	10800	7.006	51.721	10800	
Outfall	51.000	1.802	Junction		7.008	49.198	10800	7.007	49.198	10800	
A2070 Culvert	48.527	0.000	Open Manhole	900		OUTFALL		7.008	48.695	10800	
PPS6	59.953	0.653	Open Manhole	1200	9.000	59.300	150				
PPS6	59.878	0.695	Junction		9.001	59.183	225	9.000	59.258	150	
33	60.289	1.203	Junction		10.000	59.086	600				
31	59.485	3.464	Junction		9.002	56.021	1000	9.001	56.021	225	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN (Pipe Out)	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN (Pipes In)	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								10.000	56.021	600	
PPS5	59.070	0.655	Open Manhole	1200	11.000	58.415	150				
PPS5	58.887	1.853	Junction		11.001	57.033	300	11.000	57.183	150	
32	57.897	3.150	Junction		9.003	54.747	2100	9.002	54.747	1000	
								11.001	55.802	300	1205
PPS4	58.289	0.654	Open Manhole	1200	12.000	57.635	150				
PPS4	58.104	0.586	Junction		12.001	57.519	225	12.000	57.594	150	
32	56.479	2.644	Junction		9.004	53.835	3300	9.003	53.835	2100	
								12.001	53.835	225	
PPS3	57.817	0.657	Open Manhole	1200	13.000	57.160	150				
PPS3	57.636	0.676	Junction		13.001	56.959	300	13.000	57.109	150	
33	54.476	1.810	Junction		9.005	52.666	3900	9.004	52.666	3300	
								13.001	52.666	300	
34	53.475	1.834	Junction		9.006	51.641	3900	9.005	51.641	3900	
PPS2	56.789	0.654	Open Manhole	1200	14.000	56.135	150				
PPS2A	56.628	0.688	Junction		14.001	55.940	300	14.000	56.090	150	
35	52.871	3.056	Junction		9.007	49.815	8200	9.006	49.815	3900	
								14.001	49.815	300	
PPS1	56.240	0.655	Open Manhole	1200	15.000	55.585	150				

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
PPS1A	55.958	0.676	Junction		15.001	55.282	375	15.000	55.507	150	
Pond 4	51.000	1.700	Junction		9.008	49.300	10800	9.007	49.300	8200	
								15.001	50.139	375	1064
CPPP1	56.085	0.675	Open Manhole	1200	16.000	55.410	150				
CPPP1A	56.052	0.766	Junction		16.001	55.286	225	16.000	55.361	150	
46	52.354	0.568	Junction		16.002	51.786	600	16.001	51.786	225	
CPPP2	56.436	0.656	Open Manhole	1200	17.000	55.780	150				
CPPP2A	56.365	0.729	Junction		17.001	55.636	225	17.000	55.711	150	
48	52.948	0.811	Junction		17.002	52.136	600	17.001	52.136	225	
Pond 3	50.000	1.700	Junction		9.009	48.300	600	9.008	48.300	10800	
								16.002	48.300	600	
								17.002	49.136	600	836
225 Railway	47.004	0.000	Open Manhole	225		OUTFALL		9.009	47.754	600	
Porous 1	58.351	0.601	Open Manhole	1200	18.000	57.750	150				
Porous 1A	58.142	0.539	Junction		18.001	57.603	225	18.000	57.678	150	
42	55.992	0.979	Junction		18.002	55.013	600	18.001	55.013	225	
Porous 2	57.453	0.453	Open Manhole	1200	19.000	57.000	150				
Porous 2A	57.297	0.438	Junction		19.001	56.859	225	19.000	56.934	150	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
43	55.020	3.501	Junction		18.003	51.519	1700	18.002	51.519	600	
								19.001	51.519	225	
Porous 3	56.180	0.730	Open Manhole	1200	20.000	55.450	150				
Porous 3A	56.029	0.714	Junction		20.001	55.315	225	20.000	55.390	150	
45	53.975	3.134	Junction		18.004	50.841	2400	18.003	50.841	1700	
								20.001	50.841	225	
Pond 5	53.000	1.700	Open Manhole	1200	21.000	51.300	150				
47	52.167	1.225	Open Manhole	1200	21.001	50.942	150	21.000	50.942	150	
46	52.016	1.695	Junction		18.005	50.321	3100	18.004	50.321	2400	
								21.001	50.321	150	
Porous 4	53.590	0.740	Open Manhole	1200	22.000	52.850	150				
Porous 4A	53.324	0.614	Junction		22.001	52.710	225	22.000	52.785	150	
Ex Land Drain	51.686	1.694	Junction		18.006	49.992	300	18.005	50.142	3100	
								22.001	50.710	225	643
375 Railway	51.484	1.592	Open Manhole	375		OUTFALL		18.006	49.892	300	
Pond 6	54.000	1.700	Junction		23.000	52.300	31300				
48	54.094	1.849	Junction		23.001	52.245	31300	23.000	52.245	31300	
PPN4	57.368	1.368	Open Manhole	1200	24.000	56.000	150				

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
PPN4A	57.259	1.518	Junction		24.001	55.742	375	24.000	55.967	150	
7	53.500	1.748	Junction		23.002	51.752	16100	23.001	51.752	31300	
								24.001	51.752	375	
PPN3	56.796	1.046	Open Manhole	1200	25.000	55.750	150				
PPN3A	56.643	1.156	Junction		25.001	55.487	375	25.000	55.712	150	
7	53.500	1.972	Junction		23.003	51.528	13200	23.002	51.528	16100	
								25.001	52.487	375	1184
Wide Swale	51.705	0.966	Junction		23.004	50.740	39700	23.003	50.740	13200	
Highway Ditch	51.388	0.681	Open Manhole	0		OUTFALL		23.004	50.707	39700	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
PPN2	604052.284	140689.236	604052.284	140689.236	Required	
PPN2A	604042.518	140694.755			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
18	603849.382	140812.117	603849.382	140812.117	Required	
PPN1	604021.451	140640.295	604021.451	140640.295	Required	
PPN1A	604012.503	140645.130			No Entry	
3	603832.539	140755.306	603832.539	140755.306	Required	
Pond 2	603798.772	140809.235	603798.772	140809.235	Required	
21	603794.077	140837.402			No Entry	
22	603785.969	140877.519			No Entry	
Pond 1	603741.396	140948.897			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
24	603750.583	141016.913			No Entry	
Outfall	603875.617	141065.943			No Entry	
A2070 Culvert	603872.444	141116.653			No Entry	
PPS6	604058.034	140487.356	604058.034	140487.356	Required	
PPS6	604055.411	140480.708			No Entry	
33	604067.143	140418.104			No Entry	
31	604028.920	140435.002			No Entry	
PPS5	604008.470	140514.576	604008.470	140514.576	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
PPS5	604005.028	140507.655			No Entry	
32	603977.283	140458.204			No Entry	
PPS4	603957.239	140539.695	603957.239	140539.695	Required	
PPS4	603953.342	140533.859			No Entry	
32	603920.802	140478.983			No Entry	
PPS3	603906.928	140567.843	603906.928	140567.843	Required	
PPS3	603902.843	140560.292			No Entry	
33	603837.134	140452.925			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
34	603792.362	140429.564			No Entry	
PPS2	603843.640	140573.300	603843.640	140573.300	Required	
PPS2A	603839.730	140566.796			No Entry	
35	603754.667	140428.795			No Entry	
PPS1	603792.626	140601.943	603792.626	140601.943	Required	
PPS1A	603785.840	140590.695			No Entry	
Pond 4	603698.771	140446.262			No Entry	
CPPP1	603748.710	140735.598	603748.710	140735.598	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
CPPP1A	603745.882	140731.622			No Entry	
46	603650.035	140603.427			No Entry	
CPPP2	603777.623	140713.342	603777.623	140713.342	Required	
CPPP2A	603773.674	140707.734			No Entry	
48	603678.174	140588.078			No Entry	
Pond 3	603605.716	140512.055			No Entry	
225 Railway	603612.517	140449.762			No Entry	
Porous 1	603988.546	140389.966	603988.546	140389.966	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
Porous 1A	603982.237	140393.489			No Entry	
42	603925.652	140428.502			No Entry	
Porous 2	603959.466	140340.599	603959.466	140340.599	Required	
Porous 2A	603954.243	140344.597			No Entry	
43	603896.811	140378.428			No Entry	
Porous 3	603931.238	140290.553	603931.238	140290.553	Required	
Porous 3A	603925.801	140293.102			No Entry	
45	603867.162	140328.964			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
Pond 5	603831.247	140351.157	603831.247	140351.157	Required	
47	603823.285	140315.898	603823.285	140315.898	Required	
46	603848.237	140297.912			No Entry	
Porous 4	603905.346	140239.178	603905.346	140239.178	Required	
Porous 4A	603899.468	140241.933			No Entry	
Ex Land Drain	603838.895	140280.487			No Entry	
375 Railway	603830.678	140267.557			No Entry	
Pond 6	604241.236	140961.805			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
48	604191.921	140981.555			No Entry	
PPN4	604043.314	140838.483	604043.314	140838.483	Required	
PPN4A	604047.695	140845.205			No Entry	
7	604141.811	141000.835			No Entry	
PPN3	604010.383	140858.206	604010.383	140858.206	Required	
PPN3A	604015.380	140865.911			No Entry	
7	604102.984	141009.252			No Entry	
Wide Swale	604037.179	141022.826			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
Highway Ditch	604041.969	141047.087			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
7.000	o	150	PPN2	59.266	57.750	1.366	Open Manhole	1200
7.001	o	450	PPN2A	59.159	57.403	1.306	Junction	
7.002	o	450	18	56.399	55.603	0.346	Open Manhole	1350
8.000	o	150	PPN1	59.336	58.155	1.031	Open Manhole	1200
8.001	o	525	PPN1A	59.230	57.738	0.968	Junction	
8.002	o	525	3	56.908	55.838	0.545	Open Manhole	1500
7.003	3 \=/	1500	Pond 2	56.000	54.300	0.950	Open Manhole	10000

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
7.000	11.218	240.0	PPN2A	59.159	57.703	1.306	Junction	
7.001	225.999	125.6	18	56.399	55.603	0.346	Open Manhole	1350
7.002	50.692	36.3	Pond 2	56.000	54.209	1.341	Open Manhole	10000
8.000	10.171	240.0	PPN1A	59.230	58.113	0.968	Junction	
8.001	211.011	111.1	3	56.908	55.838	0.545	Open Manhole	1500
8.002	63.628	41.4	Pond 2	56.000	54.300	1.175	Open Manhole	10000
7.003	28.556	100.9	21	55.784	54.017	1.017	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
7.004	3 \=/	1500	21	55.784	54.017	1.017	Junction	
7.005	3 \=/	1500	22	55.056	53.611	0.695	Junction	
7.006	3 \=/	10800	Pond 1	54.000	52.300	1.550	Junction	
7.007	3 \=/	10800	24	52.287	51.721	0.416	Junction	
7.008	3 \=/	10800	Outfall	51.000	49.198	1.652	Junction	
9.000	o	150	PPS6	59.953	59.300	0.503	Open Manhole	1200
9.001	o	225	PPS6	59.878	59.183	0.470	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
7.004	40.928	100.8	22	55.056	53.611	0.695	Junction	
7.005	84.152	64.2	Pond 1	54.000	52.300	0.950	Junction	
7.006	68.633	118.5	24	52.287	51.721	0.416	Junction	
7.007	134.303	53.2	Outfall	51.000	49.198	1.652	Junction	
7.008	50.809	101.0	A2070 Culvert	48.527	48.695	-0.318	Open Manhole	900
9.000	7.146	170.0	PPS6	59.878	59.258	0.470	Junction	
9.001	52.828	16.7	31	59.485	56.021	3.239	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
10.000	3 \=/	600	33	60.289	59.086	1.053	Junction	
9.002	3 \=/	1000	31	59.485	56.021	3.314	Junction	
11.000	o	150	PPS5	59.070	58.415	0.505	Open Manhole	1200
11.001	o	300	PPS5	58.887	57.033	1.553	Junction	
9.003	3 \=/	2100	32	57.897	54.747	3.000	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
10.000	41.792	13.6	31	59.485	56.021	3.314	Junction	
9.002	56.610	44.4	32	57.897	54.747	3.000	Junction	
11.000	7.730	6.3	PPS5	58.887	57.183	1.553	Junction	
11.001	56.702	46.0	32	57.897	55.802	1.795	Junction	
9.003	60.183	66.0	32	56.479	53.835	2.494	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
12.000	o	150	PPS4	58.289	57.635	0.504	Open Manhole	1200
12.001	o	225	PPS4	58.104	57.519	0.361	Junction	
9.004	3 \=/	3300	32	56.479	53.835	2.494	Junction	
13.000	o	150	PPS3	57.817	57.160	0.507	Open Manhole	1200
13.001	o	300	PPS3	57.636	56.959	0.376	Junction	
9.005	3 \=/	3900	33	54.476	52.666	1.660	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
12.000	7.018	170.0	PPS4	58.104	57.594	0.361	Junction	
12.001	63.798	17.3	32	56.479	53.835	2.419	Junction	
9.004	87.632	75.0	33	54.476	52.666	1.660	Junction	
13.000	8.585	170.0	PPS3	57.636	57.109	0.376	Junction	
13.001	125.878	29.3	33	54.476	52.666	1.510	Junction	
9.005	50.500	49.3	34	53.475	51.641	1.684	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.006	3 \=/	3900	34	53.475	51.641	1.684	Junction	
14.000	o	150	PPS2	56.789	56.135	0.504	Open Manhole	1200
14.001	o	300	PPS2A	56.628	55.940	0.388	Junction	
9.007	3 \=/	8200	35	52.871	49.815	2.906	Junction	
15.000	o	150	PPS1	56.240	55.585	0.505	Open Manhole	1200
15.001	o	375	PPS1A	55.958	55.282	0.301	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.006	37.703	20.6	35	52.871	49.815	2.906	Junction	
14.000	7.589	170.0	PPS2A	56.628	56.090	0.388	Junction	
14.001	162.111	26.5	35	52.871	49.815	2.756	Junction	
9.007	58.562	113.7	Pond 4	51.000	49.300	1.550	Junction	
15.000	13.137	168.0	PPS1A	55.958	55.507	0.301	Junction	
15.001	168.647	32.8	Pond 4	51.000	50.139	0.486	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.008	3 \=/	10800	Pond 4	51.000	49.300	1.550	Junction	
16.000	o	150	CPPP1	56.085	55.410	0.525	Open Manhole	1200
16.001	o	225	CPPP1A	56.052	55.286	0.541	Junction	
16.002	3 \=/	600	46	52.354	51.786	0.418	Junction	
17.000	o	150	CPPP2	56.436	55.780	0.506	Open Manhole	1200
17.001	o	225	CPPP2A	56.365	55.636	0.504	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.008	113.964	114.0	Pond 3	50.000	48.300	1.550	Junction	
16.000	4.879	100.0	CPPP1A	56.052	55.361	0.541	Junction	
16.001	160.064	45.7	46	52.354	51.786	0.343	Junction	
16.002	101.553	29.1	Pond 3	50.000	48.300	1.550	Junction	
17.000	6.859	100.0	CPPP2A	56.365	55.711	0.504	Junction	
17.001	153.093	43.7	48	52.948	52.136	0.586	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
17.002	3 \=/	600	48	52.948	52.136	0.661	Junction	
9.009	3 \=/	600	Pond 3	50.000	48.300	1.550	Junction	
18.000	o	150	Porous 1	58.351	57.750	0.451	Open Manhole	1200
18.001	o	225	Porous 1A	58.142	57.603	0.314	Junction	
18.002	3 \=/	600	42	55.992	55.013	0.829	Junction	
19.000	o	150	Porous 2	57.453	57.000	0.303	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
17.002	105.023	35.0	Pond 3	50.000	49.136	0.714	Junction	
9.009	62.663	114.8	225 Railway	47.004	47.754	-0.900	Open Manhole	225
18.000	7.226	100.0	Porous 1A	58.142	57.678	0.314	Junction	
18.001	66.541	25.7	42	55.992	55.013	0.754	Junction	
18.002	57.785	16.5	43	55.020	51.519	3.351	Junction	
19.000	6.578	100.0	Porous 2A	57.297	56.934	0.213	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
19.001	o	225	Porous 2A	57.297	56.859	0.213	Junction	
18.003	3 \=/	1700	43	55.020	51.519	3.351	Junction	
20.000	o	150	Porous 3	56.180	55.450	0.580	Open Manhole	1200
20.001	o	225	Porous 3A	56.029	55.315	0.489	Junction	
18.004	3 \=/	2400	45	53.975	50.841	2.984	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
19.001	66.655	12.5	43	55.020	51.519	3.276	Junction	
18.003	57.670	85.0	45	53.975	50.841	2.984	Junction	
20.000	6.004	100.0	Porous 3A	56.029	55.390	0.489	Junction	
20.001	68.736	15.4	45	53.975	50.841	2.909	Junction	
18.004	36.365	70.0	46	52.016	50.321	1.545	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
21.000	o	150	Pond 5	53.000	51.300	1.550	Open Manhole	1200
21.001	o	150	47	52.167	50.942	1.075	Open Manhole	1200
18.005	3 \=/	3100	46	52.016	50.321	1.545	Junction	
22.000	o	150	Porous 4	53.590	52.850	0.590	Open Manhole	1200
22.001	o	225	Porous 4A	53.324	52.710	0.389	Junction	
18.006	o	300	Ex Land Drain	51.686	49.992	1.394	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
21.000	36.148	101.0	47	52.167	50.942	1.075	Open Manhole	1200
21.001	30.758	49.5	46	52.016	50.321	1.545	Junction	
18.005	19.771	110.5	Ex Land Drain	51.686	50.142	1.394	Junction	
22.000	6.492	100.0	Porous 4A	53.324	52.785	0.389	Junction	
22.001	71.802	35.9	Ex Land Drain	51.686	50.710	0.751	Junction	
18.006	15.320	153.2	375 Railway	51.484	49.892	1.292	Open Manhole	375

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
23.000	3 \=/	31300	Pond 6	54.000	52.300	1.550	Junction	
23.001	3 \=/	31300	48	54.094	52.245	1.699	Junction	
24.000	o	150	PPN4	57.368	56.000	1.218	Open Manhole	1200
24.001	o	375	PPN4A	57.259	55.742	1.143	Junction	
23.002	3 \=/	16100	7	53.500	51.752	1.598	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
23.000	53.122	967.4	48	54.094	52.245	1.699	Junction	
23.001	53.691	108.8	7	53.500	51.752	1.598	Junction	
24.000	8.024	240.0	PPN4A	57.259	55.967	1.143	Junction	
24.001	181.874	45.6	7	53.500	51.752	1.373	Junction	
23.002	39.729	177.4	7	53.500	51.528	1.822	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
25.000	o	150	PPN3	56.796	55.750	0.896	Open Manhole	1200
25.001	o	375	PPN3A	56.643	55.487	0.781	Junction	
23.003	3 \=/	13200	7	53.500	51.528	1.822	Junction	
23.004	3 \=/	39700	Wide Swale	51.705	50.740	0.816	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
25.000	9.183	240.0	PPN3A	56.643	55.712	0.781	Junction	
25.001	167.992	56.0	7	53.500	52.487	0.638	Junction	
23.003	67.191	85.3	Wide Swale	51.705	50.740	0.816	Junction	
23.004	24.729	749.4	Highway Ditch	51.388	50.707	0.531	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
7.008	A2070 Culvert	48.527	48.695	49.120	900	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
9.009	225 Railway	47.004	47.754	0.000	225	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
18.006	375 Railway	51.484	49.892	49.900	375	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
23.004	Highway Ditch	51.388	50.707	50.707	0	0

Online Controls for Storm

Orifice Manhole: PPN2A, DS/PN: 7.001, Volume (m³): 0.2

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 57.403

Orifice Manhole: PPN1A, DS/PN: 8.001, Volume (m³): 0.2

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 57.738

Orifice Manhole: Pond 1, DS/PN: 7.006, Volume (m³): 709.5

Diameter (m) 0.060 Discharge Coefficient 0.600 Invert Level (m) 52.300

Orifice Manhole: PPS6, DS/PN: 9.001, Volume (m³): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 59.183

Orifice Manhole: PPS5, DS/PN: 11.001, Volume (m³): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 57.033

Orifice Manhole: PPS4, DS/PN: 12.001, Volume (m³): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 57.519

Orifice Manhole: PPS3, DS/PN: 13.001, Volume (m^3): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 56.959

Orifice Manhole: PPS2A, DS/PN: 14.001, Volume (m^3): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 55.940

Orifice Manhole: PPS1A, DS/PN: 15.001, Volume (m^3): 0.2

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 55.282

Orifice Manhole: Pond 4, DS/PN: 9.008, Volume (m^3): 3126.9

Diameter (m) 0.114 Discharge Coefficient 0.600 Invert Level (m) 49.300

Orifice Manhole: CPPP1A, DS/PN: 16.001, Volume (m^3): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 55.286

Orifice Manhole: CPPP2A, DS/PN: 17.001, Volume (m^3): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 55.636

Orifice Manhole: Pond 3, DS/PN: 9.009, Volume (m^3): 3471.7

Diameter (m) 0.103 Discharge Coefficient 0.600 Invert Level (m) 48.300

Orifice Manhole: Porous 1A, DS/PN: 18.001, Volume (m³): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 57.603

Orifice Manhole: Porous 2A, DS/PN: 19.001, Volume (m³): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 56.859

Orifice Manhole: Porous 3A, DS/PN: 20.001, Volume (m³): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 55.315

Orifice Manhole: 45, DS/PN: 18.004, Volume (m³): 2466.5

Diameter (m) 0.063 Discharge Coefficient 0.600 Invert Level (m) 50.841

Orifice Manhole: 47, DS/PN: 21.001, Volume (m³): 2.0

Diameter (m) 0.060 Discharge Coefficient 0.600 Invert Level (m) 50.942

Orifice Manhole: Porous 4A, DS/PN: 22.001, Volume (m³): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 52.710

Orifice Manhole: Ex Land Drain, DS/PN: 18.006, Volume (m³): 277.1

Diameter (m) 0.063 Discharge Coefficient 0.600 Invert Level (m) 49.992

Orifice Manhole: 48, DS/PN: 23.001, Volume (m³): 3287.2

Diameter (m) 0.060 Discharge Coefficient 0.600 Invert Level (m) 52.245

Orifice Manhole: PPN4A, DS/PN: 24.001, Volume (m³): 0.1

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 55.742

Orifice Manhole: PPN3A, DS/PN: 25.001, Volume (m³): 0.2

Diameter (m) 0.141 Discharge Coefficient 0.600 Invert Level (m) 55.487

Hydro-Brake® Optimum Manhole: Wide Swale, DS/PN: 23.004, Volume (m³): 2532.9

Unit Reference	MD-SHE-0314-6060-1500-6060	Sump Available	Yes
Design Head (m)	1.500	Diameter (mm)	314
Design Flow (l/s)	60.6	Invert Level (m)	50.740
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	375
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	2100
Application	Surface		

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.500	60.6	Kick-Flo®	1.087	51.9
Flush-Flo™	0.529	60.5	Mean Flow over Head Range	-	50.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Hydro-Brake® Optimum Manhole: Wide Swale, DS/PN: 23.004, Volume (m³): 2532.9

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.5	0.600	60.4	1.600	62.5	2.600	79.1	5.000	108.7	7.500	132.5
0.200	32.2	0.800	58.8	1.800	66.2	3.000	84.8	5.500	113.8	8.000	136.7
0.300	55.9	1.000	55.3	2.000	69.6	3.500	91.3	6.000	118.8	8.500	140.8
0.400	59.7	1.200	54.4	2.200	72.9	4.000	97.5	6.500	123.5	9.000	144.8
0.500	60.5	1.400	58.6	2.400	76.1	4.500	103.2	7.000	128.1	9.500	148.7

Offline Controls for Storm

Weir Manhole: PPN2A, DS/PN: 7.001, Loop to PN: 7.002

Discharge Coef 0.544 Width (m) 22.000 Invert Level (m) 58.003

Weir Manhole: PPN1A, DS/PN: 8.001, Loop to PN: 8.002

Discharge Coef 0.544 Width (m) 42.000 Invert Level (m) 58.413

Weir Manhole: PPS6, DS/PN: 9.001, Loop to PN: 9.002

Discharge Coef 0.544 Width (m) 42.000 Invert Level (m) 59.558

Weir Manhole: PPS5, DS/PN: 11.001, Loop to PN: 9.003

Discharge Coef 0.544 Width (m) 42.000 Invert Level (m) 57.408

Weir Manhole: PPS4, DS/PN: 12.001, Loop to PN: 9.004

Discharge Coef 0.544 Width (m) 42.000 Invert Level (m) 57.894

Weir Manhole: PPS3, DS/PN: 13.001, Loop to PN: 9.005

Discharge Coef 0.544 Width (m) 41.000 Invert Level (m) 57.409

Weir Manhole: 34, DS/PN: 9.006, Loop to PN: 21.000

Discharge Coef 0.544 Width (m) 1.500 Invert Level (m) 51.841

Weir Manhole: PPS2A, DS/PN: 14.001, Loop to PN: 9.007

Discharge Coef 0.544 Width (m) 42.000 Invert Level (m) 56.390

Weir Manhole: PPS1A, DS/PN: 15.001, Loop to PN: 9.008

Discharge Coef 0.544 Width (m) 22.000 Invert Level (m) 55.807

Weir Manhole: CPPP1A, DS/PN: 16.001, Loop to PN: 16.002

Discharge Coef 0.544 Width (m) 13.000 Invert Level (m) 55.661

Weir Manhole: CPPP2A, DS/PN: 17.001, Loop to PN: 17.002

Discharge Coef 0.544 Width (m) 13.000 Invert Level (m) 56.011

Weir Manhole: Porous 1A, DS/PN: 18.001, Loop to PN: 18.002

Discharge Coef 0.544 Width (m) 22.000 Invert Level (m) 57.978

Weir Manhole: Porous 2A, DS/PN: 19.001, Loop to PN: 18.003

Discharge Coef 0.544 Width (m) 27.000 Invert Level (m) 57.234

Weir Manhole: Porous 3A, DS/PN: 20.001, Loop to PN: 18.004

Discharge Coef 0.544 Width (m) 41.000 Invert Level (m) 55.690

Weir Manhole: 45, DS/PN: 18.004, Loop to PN: 21.000

Discharge Coef 0.544 Width (m) 1.500 Invert Level (m) 52.800

Weir Manhole: Porous 4A, DS/PN: 22.001, Loop to PN: 18.006

Discharge Coef 0.544 Width (m) 22.000 Invert Level (m) 53.085

Weir Manhole: PPN4A, DS/PN: 24.001, Loop to PN: 23.002

Discharge Coef 0.544 Width (m) 22.000 Invert Level (m) 56.267

Weir Manhole: PPN3A, DS/PN: 25.001, Loop to PN: 23.003

Discharge Coef 0.544 Width (m) 41.000 Invert Level (m) 56.012

Storage Structures for Storm

Porous Car Park Manhole: PPN2A, DS/PN: 7.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	57.703	Depression Storage (mm)	5
Max Percolation (l/s)	1949.4	Width (m)	319.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	22.0	Cap Volume Depth (m)	0.170

Porous Car Park Manhole: PPN1A, DS/PN: 8.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	58.113	Depression Storage (mm)	5
Max Percolation (l/s)	3633.1	Width (m)	319.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	41.0	Cap Volume Depth (m)	0.170

Tank or Pond Manhole: Pond 2, DS/PN: 7.003

Invert Level (m) 54.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3280.0	1.700	5062.0

Tank or Pond Manhole: Pond 1, DS/PN: 7.006

Invert Level (m) 52.300

Tank or Pond Manhole: Pond 1, DS/PN: 7.006

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	5778.0	1.700	8305.0

Porous Car Park Manhole: PPS6, DS/PN: 9.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	59.258	Depression Storage (mm)	5
Max Percolation (l/s)	831.4	Width (m)	73.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	41.0	Cap Volume Depth (m)	0.170

Porous Car Park Manhole: PPS5, DS/PN: 11.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	57.183	Depression Storage (mm)	5
Max Percolation (l/s)	831.4	Width (m)	73.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	41.0	Cap Volume Depth (m)	0.170

Porous Car Park Manhole: PPS4, DS/PN: 12.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	57.594	Depression Storage (mm)	5
Max Percolation (l/s)	831.4	Width (m)	73.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	41.0	Cap Volume Depth (m)	0.170

Porous Car Park Manhole: PPS3, DS/PN: 13.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	57.109	Depression Storage (mm)	5
Max Percolation (l/s)	1622.9	Width (m)	142.5	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	41.0	Cap Volume Depth (m)	0.170

Porous Car Park Manhole: PPS2A, DS/PN: 14.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	56.090	Depression Storage (mm)	5
Max Percolation (l/s)	1742.5	Width (m)	153.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	41.0	Cap Volume Depth (m)	0.170

Porous Car Park Manhole: PPS1A, DS/PN: 15.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	55.507	Depression Storage (mm)	5
Max Percolation (l/s)	849.4	Width (m)	139.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	22.0	Cap Volume Depth (m)	0.170

Tank or Pond Manhole: Pond 4, DS/PN: 9.008

Invert Level (m) 49.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2214.0	1.700	3804.0

Porous Car Park Manhole: CPPP1A, DS/PN: 16.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	55.361	Depression Storage (mm)	5
Max Percolation (l/s)	555.6	Width (m)	100.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	20.0	Cap Volume Depth (m)	0.210

Porous Car Park Manhole: CPPP2A, DS/PN: 17.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	55.711	Depression Storage (mm)	5
Max Percolation (l/s)	555.6	Width (m)	100.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	20.0	Cap Volume Depth (m)	0.210

Tank or Pond Manhole: Pond 3, DS/PN: 9.009

Invert Level (m) 48.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2920.0	1.700	4580.0

Porous Car Park Manhole: Porous 1A, DS/PN: 18.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	57.678	Depression Storage (mm)	5
Max Percolation (l/s)	531.7	Width (m)	22.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	87.0	Cap Volume Depth (m)	0.170

Porous Car Park Manhole: Porous 2A, DS/PN: 19.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	56.934	Depression Storage (mm)	5
Max Percolation (l/s)	990.8	Width (m)	41.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	87.0	Cap Volume Depth (m)	0.170

Porous Car Park Manhole: Porous 3A, DS/PN: 20.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	55.390	Depression Storage (mm)	5
Max Percolation (l/s)	990.8	Width (m)	41.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	87.0	Cap Volume Depth (m)	0.170

Tank or Pond Manhole: Pond 5, DS/PN: 21.000

Invert Level (m) 51.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2410.0	1.700	4112.0

Porous Car Park Manhole: Porous 4A, DS/PN: 22.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	52.785	Depression Storage (mm)	5
Max Percolation (l/s)	446.1	Width (m)	73.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	22.0	Cap Volume Depth (m)	0.170

Tank or Pond Manhole: Pond 6, DS/PN: 23.000

Invert Level (m) 52.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3679.0	1.700	6344.0

Porous Car Park Manhole: PPN4A, DS/PN: 24.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	55.967	Depression Storage (mm)	5
Max Percolation (l/s)	1923.8	Width (m)	27.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	256.5	Cap Volume Depth (m)	0.170

Porous Car Park Manhole: PPN3A, DS/PN: 25.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	55.712	Depression Storage (mm)	5
Max Percolation (l/s)	1822.5	Width (m)	27.0	Evaporation (mm/day)	0
Safety Factor	2.0	Length (m)	243.0	Cap Volume Depth (m)	0.170

Tank or Pond Manhole: Wide Swale, DS/PN: 23.004

Invert Level (m) 50.740

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	680.0	0.965	1321.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 18 Number of Time/Area Diagrams 0
Number of Online Controls 24 Number of Storage Structures 23 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.359 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status OFF Inertia Status ON
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 20, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
7.000	PPN2	120 Winter	1	+0%	30/120 Winter				57.750	-0.150	0.000	0.00		0.0
7.001	PPN2A	120 Winter	1	+0%	30/60 Winter		30/120 Winter	23	57.740	-0.113	0.000	0.07	0.0	21.4
7.002	18	30 Summer	1	+0%					55.666	-0.387	0.000	0.04		20.8

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
7.000	PPN2	OK	
7.001	PPN2A	OK*	
7.002	18	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
8.000	PPN1	120 Winter	1	+0%	30/120 Winter				58.155	-0.150	0.000	0.00		0.0
8.001	PPN1A	180 Winter	1	+0%	30/60 Winter		30/120 Winter	27	58.154	-0.108	0.000	0.05	0.0	24.4
8.002	3	180 Winter	1	+0%					55.901	-0.461	0.000	0.04		24.4
7.003	Pond 2	480 Winter	1	+0%					54.368	-1.632	0.000	0.00		40.0
7.004	21	480 Winter	1	+0%					54.085	-1.699	0.000	0.00		40.1
7.005	22	480 Winter	1	+0%					53.671	-1.385	0.000	0.00		40.1
7.006	Pond 1	1440 Winter	1	+0%					52.586	-1.414	0.000	0.00		3.8
7.007	24	1440 Winter	1	+0%					51.723	-0.564	0.000	0.00		3.8
7.008	Outfall	180 Summer	1	+0%					49.200	-1.800	0.000	0.00		2.3
9.000	PPS6	180 Winter	1	+0%	30/60 Winter				59.319	-0.131	0.000	0.00		0.0
9.001	PPS6	180 Winter	1	+0%	30/30 Winter		30/60 Winter	30	59.319	-0.088	0.000	0.07	0.0	8.4
10.000	33	15 Winter	1	+0%					59.165	-1.124	0.000	0.00		61.5
9.002	31	15 Winter	1	+0%					56.109	-3.376	0.000	0.00		62.0
11.000	PPS5	120 Winter	1	+0%					58.415	-0.150	0.000	0.00		0.0
11.001	PPS5	120 Winter	1	+0%	30/30 Winter		30/60 Winter	24	57.225	-0.109	0.000	0.09	0.0	14.0
9.003	32	15 Winter	1	+0%					54.816	-3.080	0.000	0.00		70.5
12.000	PPS4	240 Winter	1	+0%	30/30 Winter				57.663	-0.122	0.000	0.00		0.0
12.001	PPS4	240 Winter	1	+0%	30/30 Summer		30/60 Summer	37	57.663	-0.081	0.000	0.07	0.0	9.2
9.004	32	30 Summer	1	+0%					53.885	-2.594	0.000	0.00		70.5
13.000	PPS3	120 Winter	1	+0%	30/120 Winter				57.160	-0.150	0.000	0.00		0.0
13.001	PPS3	180 Winter	1	+0%	30/60 Winter		30/120 Winter	25	57.151	-0.108	0.000	0.07	0.0	14.0
9.005	33	15 Winter	1	+0%					52.715	-1.761	0.000	0.00		78.6
9.006	34	15 Winter	1	+0%				0	51.674	-1.802	0.000	0.00	0.0	78.2
14.000	PPS2	180 Winter	1	+0%	30/60 Winter				56.144	-0.141	0.000	0.00		0.0
14.001	PPS2A	180 Winter	1	+0%	30/30 Winter		30/60 Winter	36	56.144	-0.096	0.000	0.07	0.0	15.2

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
8.000	PPN1	OK	
8.001	PPN1A	OK*	
8.002	3	OK	
7.003	Pond 2	OK	
7.004	21	OK	
7.005	22	OK	
7.006	Pond 1	OK	
7.007	24	OK	
7.008	Outfall	OK	
9.000	PPS6	OK	
9.001	PPS6	OK*	
10.000	33	OK	
9.002	31	OK	
11.000	PPS5	OK	
11.001	PPS5	OK*	
9.003	32	OK	
12.000	PPS4	OK	
12.001	PPS4	OK*	
9.004	32	OK	
13.000	PPS3	OK	
13.001	PPS3	OK*	
9.005	33	OK	
9.006	34	OK	
14.000	PPS2	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
14.001	PPS2A	OK*	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
9.007	35	30 Summer	1	+0%					49.844	-3.027	0.000	0.00	
15.000	PPS1	120 Winter	1	+0%	30/15 Summer				55.606	-0.129	0.000	0.00	
15.001	PPS1A	120 Winter	1	+0%	30/15 Summer		30/15 Summer	46	55.606	-0.051	0.000	0.06	0.0
9.008	Pond 4	1440 Winter	1	+0%					49.760	-1.240	0.000	0.00	
16.000	CPPP1	120 Winter	1	+0%	100/30 Summer				55.410	-0.150	0.000	0.00	
16.001	CPPP1A	120 Winter	1	+0%	30/60 Winter		100/30 Winter	12	55.410	-0.101	0.000	0.09	0.0
16.002	46	120 Winter	1	+0%					51.815	-0.539	0.000	0.00	
17.000	CPPP2	120 Winter	1	+0%	100/30 Summer				55.780	-0.150	0.000	0.00	
17.001	CPPP2A	120 Winter	1	+0%	30/60 Winter		100/30 Winter	13	55.762	-0.099	0.000	0.09	0.0
17.002	48	120 Winter	1	+0%					52.167	-0.780	0.000	0.00	
9.009	Pond 3	1440 Winter	1	+0%					48.586	-1.414	0.000	0.00	
18.000	Porous 1	120 Winter	1	+0%	30/30 Summer				57.754	-0.146	0.000	0.00	
18.001	Porous 1A	120 Winter	1	+0%	30/15 Winter		30/30 Summer	37	57.756	-0.072	0.000	0.10	0.0
18.002	42	120 Winter	1	+0%					55.042	-0.949	0.000	0.00	
19.000	Porous 2	120 Winter	1	+0%	30/180 Winter				57.000	-0.150	0.000	0.00	
19.001	Porous 2A	240 Winter	1	+0%	30/60 Winter		100/30 Summer	20	56.986	-0.098	0.000	0.05	0.0
18.003	43	720 Winter	1	+0%					52.015	-3.005	0.000	0.00	
20.000	Porous 3	120 Winter	1	+0%	100/30 Summer				55.450	-0.150	0.000	0.00	
20.001	Porous 3A	240 Winter	1	+0%	30/60 Winter		100/30 Summer	20	55.440	-0.100	0.000	0.05	0.0
18.004	45	720 Winter	1	+0%			30/360 Winter	28	52.014	-1.960	0.000	0.00	0.0
21.000	Pond 5	120 Winter	1	+0%	100/240 Winter				51.300	-0.150	0.000	0.00	
21.001	47	120 Winter	1	+0%	30/180 Winter				50.942	-0.150	0.000	0.00	
18.005	46	1440 Winter	1	+0%					50.941	-1.075	0.000	0.00	
22.000	Porous 4	120 Winter	1	+0%	100/30 Summer				52.850	-0.150	0.000	0.00	
22.001	Porous 4A	120 Winter	1	+0%	100/15 Winter		100/30 Winter	10	52.823	-0.112	0.000	0.07	0.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
9.007	35	87.7	OK	
15.000	PPS1	0.0	OK	
15.001	PPS1A	20.9	OK*	
9.008	Pond 4	17.2	OK	
16.000	CPPP1	0.0	OK	
16.001	CPPP1A	7.1	OK*	
16.002	46	7.1	OK	
17.000	CPPP2	0.0	OK	
17.001	CPPP2A	7.3	OK*	
17.002	48	7.3	OK	
9.009	Pond 3	10.7	OK	
18.000	Porous 1	0.0	OK	
18.001	Porous 1A	10.1	OK*	
18.002	42	10.1	OK	
19.000	Porous 2	0.0	OK	
19.001	Porous 2A	7.4	OK*	
18.003	43	13.1	OK	
20.000	Porous 3	0.0	OK	
20.001	Porous 3A	7.2	OK*	
18.004	45	8.7	OK	
21.000	Pond 5	0.0	OK	
21.001	47	0.0	OK	
18.005	46	7.7	OK	
22.000	Porous 4	0.0	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
22.001	Porous 4A	6.1	OK*	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
18.006	Ex Land Drain	1440 Winter	1	+0%	1/15 Summer				50.940	0.648	0.000	0.10	
23.000	Pond 6	1440 Winter	1	+0%					52.655	-1.345	0.000	0.00	
23.001	48	1440 Winter	1	+0%					52.655	-1.439	0.000	0.00	
24.000	PPN4	120 Winter	1	+0%	100/30 Summer				56.000	-0.150	0.000	0.00	
24.001	PPN4A	120 Winter	1	+0%	30/120 Winter		100/30 Summer	20	56.001	-0.115	0.000	0.06	0.0
23.002	7	30 Winter	1	+0%					51.760	-1.740	0.000	0.00	
25.000	PPN3	180 Winter	1	+0%	30/60 Summer				55.767	-0.133	0.000	0.00	
25.001	PPN3A	120 Winter	1	+0%	30/30 Winter		30/60 Summer	39	55.767	-0.095	0.000	0.07	0.0
23.003	7	30 Winter	1	+0%					51.538	-1.962	0.000	0.00	
23.004	Wide Swale	480 Winter	1	+0%					51.019	-0.687	0.000	0.00	

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
18.006	Ex Land Drain	7.9	SURCHARGED*	
23.000	Pond 6	16.8	OK	
23.001	48	4.6	OK	
24.000	PPN4	0.0	OK	
24.001	PPN4A	18.0	OK*	
23.002	7	27.0	OK	
25.000	PPN3	0.0	OK	
25.001	PPN3A	19.0	OK*	
23.003	7	44.2	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
23.004	Wide Swale	35.8	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 18 Number of Time/Area Diagrams 0
Number of Online Controls 24 Number of Storage Structures 23 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.359 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status OFF Inertia Status ON
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 20, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
7.000	PPN2	180 Winter	30	+20%	30/120 Winter				58.024	0.124	0.000	0.01		0.1
7.001	PPN2A	180 Winter	30	+20%	30/60 Winter		30/120 Winter	23	57.873	0.020	0.000	0.11	22.2	30.6
7.002	18	180 Winter	30	+20%					55.696	-0.358	0.000	0.09		45.5

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
7.000	PPN2	SURCHARGED	
7.001	PPN2A	SURCHARGED*	
7.002	18	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
8.000	PPN1	180 Winter	30	+20%	30/120 Winter				58.436	0.131	0.000	0.04		0.4
8.001	PPN1A	180 Winter	30	+20%	30/60 Winter		30/120 Winter	27	58.283	0.020	0.000	0.07	59.5	32.8
8.002	3	240 Winter	30	+20%					55.954	-0.409	0.000	0.11		75.9
7.003	Pond 2	360 Winter	30	+20%					54.388	-1.612	0.000	0.00		60.9
7.004	21	360 Winter	30	+20%					54.105	-1.679	0.000	0.00		60.9
7.005	22	360 Winter	30	+20%					53.688	-1.368	0.000	0.00		60.9
7.006	Pond 1	1440 Winter	30	+20%					52.993	-1.007	0.000	0.00		6.1
7.007	24	1440 Winter	30	+20%					51.724	-0.563	0.000	0.00		6.1
7.008	Outfall	1440 Winter	30	+20%					49.200	-1.800	0.000	0.00		6.1
9.000	PPS6	120 Winter	30	+20%	30/60 Winter				59.579	0.129	0.000	0.01		0.1
9.001	PPS6	120 Winter	30	+20%	30/30 Winter		30/60 Winter	30	59.428	0.020	0.000	0.18	33.5	23.6
10.000	33	15 Winter	30	+20%					59.222	-1.067	0.000	0.01		180.8
9.002	31	15 Winter	30	+20%					56.178	-3.307	0.000	0.00		186.8
11.000	PPS5	120 Winter	30	+20%					58.415	-0.150	0.000	0.00		0.0
11.001	PPS5	240 Winter	30	+20%	30/30 Winter		30/60 Winter	24	57.353	0.020	0.000	0.14	4.7	23.2
9.003	32	15 Winter	30	+20%					54.874	-3.023	0.000	0.00		200.0
12.000	PPS4	60 Winter	30	+20%	30/30 Winter				57.919	0.134	0.000	0.04		0.5
12.001	PPS4	360 Winter	30	+20%	30/30 Summer		30/60 Summer	37	57.764	0.020	0.000	0.19	16.8	23.4
9.004	32	15 Winter	30	+20%					53.940	-2.539	0.000	0.00		207.4
13.000	PPS3	180 Winter	30	+20%	30/120 Winter				57.422	0.112	0.000	0.01		0.1
13.001	PPS3	360 Winter	30	+20%	30/60 Winter		30/120 Winter	25	57.279	0.020	0.000	0.11	0.0	22.0
9.005	33	120 Winter	30	+20%					52.755	-1.721	0.000	0.00		211.2
9.006	34	120 Winter	30	+20%				0	51.710	-1.765	0.000	0.00	0.0	211.6
14.000	PPS2	120 Winter	30	+20%	30/60 Winter				56.417	0.132	0.000	0.03		0.4
14.001	PPS2A	720 Winter	30	+20%	30/30 Winter		30/60 Winter	36	56.260	0.020	0.000	0.12	3.4	25.8

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
8.000	PPN1	SURCHARGED	
8.001	PPN1A	SURCHARGED*	
8.002	3	OK	
7.003	Pond 2	OK	
7.004	21	OK	
7.005	22	OK	
7.006	Pond 1	OK	
7.007	24	OK	
7.008	Outfall	OK	
9.000	PPS6	SURCHARGED	
9.001	PPS6	SURCHARGED*	
10.000	33	OK	
9.002	31	OK	
11.000	PPS5	OK	
11.001	PPS5	SURCHARGED*	
9.003	32	OK	
12.000	PPS4	SURCHARGED	
12.001	PPS4	SURCHARGED*	
9.004	32	OK	
13.000	PPS3	SURCHARGED	
13.001	PPS3	SURCHARGED*	
9.005	33	OK	
9.006	34	OK	
14.000	PPS2	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
14.001	PPS2A	SURCHARGED*	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
9.007	35	1440 Winter	30	+20%					50.380	-2.491	0.000	0.00	
15.000	PPS1	30 Winter	30	+20%	30/15 Summer				55.871	0.136	0.000	0.04	
15.001	PPS1A	120 Winter	30	+20%	30/15 Summer		30/15 Summer	46	55.677	0.020	0.000	0.08	175.5
9.008	Pond 4	1440 Winter	30	+20%					50.378	-0.622	0.000	0.00	
16.000	CPPP1	120 Winter	30	+20%	100/30 Summer				55.535	-0.025	0.000	0.00	
16.001	CPPP1A	120 Winter	30	+20%	30/60 Winter		100/30 Winter	12	55.535	0.023	0.000	0.23	0.0
16.002	46	120 Winter	30	+20%					51.835	-0.520	0.000	0.01	
17.000	CPPP2	120 Winter	30	+20%	100/30 Summer				55.892	-0.038	0.000	0.00	
17.001	CPPP2A	120 Winter	30	+20%	30/60 Winter		100/30 Winter	13	55.892	0.030	0.000	0.23	0.0
17.002	48	120 Winter	30	+20%					52.188	-0.760	0.000	0.00	
9.009	Pond 3	1440 Winter	30	+20%					48.911	-1.089	0.000	0.00	
18.000	Porous 1	30 Winter	30	+20%	30/30 Summer				58.018	0.118	0.000	0.04	
18.001	Porous 1A	480 Winter	30	+20%	30/15 Winter		30/30 Summer	37	57.848	0.020	0.000	0.23	5.0
18.002	42	60 Winter	30	+20%					55.121	-0.871	0.000	0.01	
19.000	Porous 2	180 Winter	30	+20%	30/180 Winter				57.185	0.035	0.000	0.01	
19.001	Porous 2A	120 Winter	30	+20%	30/60 Winter		100/30 Summer	20	57.104	0.020	0.000	0.13	0.0
18.003	43	720 Winter	30	+20%					52.852	-2.168	0.000	0.00	
20.000	Porous 3	180 Winter	30	+20%	100/30 Summer				55.559	-0.041	0.000	0.00	
20.001	Porous 3A	180 Winter	30	+20%	30/60 Winter		100/30 Summer	20	55.559	0.019	0.000	0.13	0.0
18.004	45	720 Winter	30	+20%			30/360 Winter	28	52.851	-1.124	0.000	0.00	15.0
21.000	Pond 5	1440 Winter	30	+20%	100/240 Winter				51.359	-0.091	0.000	0.12	
21.001	47	1440 Winter	30	+20%	30/180 Winter				51.362	0.270	0.000	0.09	
18.005	46	1440 Winter	30	+20%					51.378	-0.638	0.000	0.00	
22.000	Porous 4	120 Winter	30	+20%	100/30 Summer				52.927	-0.073	0.000	0.00	
22.001	Porous 4A	120 Winter	30	+20%	100/15 Winter		100/30 Winter	10	52.927	-0.008	0.000	0.18	0.0

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
9.007	35	81.6	OK	
15.000	PPS1	0.5	SURCHARGED	
15.001	PPS1A	29.4	FLOOD RISK*	
9.008	Pond 4	27.4	OK	
16.000	CPPP1	0.0	OK	
16.001	CPPP1A	17.5	SURCHARGED*	
16.002	46	17.5	OK	
17.000	CPPP2	0.0	OK	
17.001	CPPP2A	17.8	SURCHARGED*	
17.002	48	17.8	OK	
9.009	Pond 3	16.6	OK	
18.000	Porous 1	0.6	SURCHARGED	
18.001	Porous 1A	23.3	FLOOD RISK*	
18.002	42	103.8	OK	
19.000	Porous 2	0.1	FLOOD RISK	
19.001	Porous 2A	18.5	FLOOD RISK*	
18.003	43	29.7	OK	
20.000	Porous 3	0.0	OK	
20.001	Porous 3A	17.3	SURCHARGED*	
18.004	45	10.4	OK	
21.000	Pond 5	2.1	OK	
21.001	47	2.1	SURCHARGED	
18.005	46	9.5	OK	
22.000	Porous 4	0.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
22.001	Porous 4A	15.9	OK*	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
18.006	Ex Land Drain	1440 Winter	30	+20%	1/15 Summer				51.377	1.085	0.000	0.12	
23.000	Pond 6	1440 Winter	30	+20%					53.093	-0.907	0.000	0.00	
23.001	48	1440 Winter	30	+20%					53.091	-1.003	0.000	0.00	
24.000	PPN4	180 Winter	30	+20%	100/30 Summer				56.130	-0.020	0.000	0.00	
24.001	PPN4A	120 Winter	30	+20%	30/120 Winter		100/30 Summer	20	56.130	0.014	0.000	0.08	0.0
23.002	7	15 Winter	30	+20%					51.769	-1.731	0.000	0.00	
25.000	PPN3	120 Winter	30	+20%	30/60 Summer				56.051	0.151	0.000	0.04	
25.001	PPN3A	360 Winter	30	+20%	30/30 Winter		30/60 Summer	39	55.882	0.020	0.000	0.11	49.4
23.003	7	120 Winter	30	+20%					51.566	-1.933	0.000	0.00	
23.004	Wide Swale	360 Winter	30	+20%					51.121	-0.584	0.000	0.00	

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
18.006	Ex Land Drain	9.6	SURCHARGED*	
23.000	Pond 6	45.2	OK	
23.001	48	6.8	OK	
24.000	PPN4	0.0	OK	
24.001	PPN4A	23.4	SURCHARGED*	
23.002	7	55.6	OK	
25.000	PPN3	0.4	SURCHARGED	
25.001	PPN3A	28.6	SURCHARGED*	
23.003	7	167.4	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
23.004	Wide Swale	56.5	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 18 Number of Time/Area Diagrams 0
Number of Online Controls 24 Number of Storage Structures 23 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.359 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status OFF Inertia Status ON
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 20, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
7.000	PPN2	30 Winter	100	+40%	30/120 Winter				58.078	0.178	0.000	0.11		1.1
7.001	PPN2A	60 Winter	100	+40%	30/60 Winter		30/120 Winter	23	57.873	0.020	0.000	0.11	360.0	31.5
7.002	18	60 Winter	100	+40%					55.840	-0.214	0.000	0.53		260.8

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
7.000	PPN2	SURCHARGED	
7.001	PPN2A	SURCHARGED*	
7.002	18	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
8.000	PPN1	60 Winter	100	+40%	30/120 Winter				58.476	0.171	0.000	0.06		0.6
8.001	PPN1A	120 Winter	100	+40%	30/60 Winter		30/120 Winter	27	58.283	0.020	0.000	0.07	389.8	33.5
8.002	3	60 Winter	100	+40%					56.125	-0.238	0.000	0.58		399.4
7.003	Pond 2	180 Winter	100	+40%					54.491	-1.509	0.000	0.01		248.8
7.004	21	180 Winter	100	+40%					54.207	-1.577	0.000	0.01		248.9
7.005	22	180 Winter	100	+40%					53.778	-1.278	0.000	0.01		248.8
7.006	Pond 1	1440 Winter	100	+40%					53.291	-0.709	0.000	0.00		7.4
7.007	24	1440 Winter	100	+40%					51.725	-0.562	0.000	0.00		7.4
7.008	Outfall	1440 Winter	100	+40%					49.200	-1.800	0.000	0.00		7.4
9.000	PPS6	30 Winter	100	+40%	30/60 Winter				59.615	0.165	0.000	0.06		0.7
9.001	PPS6	120 Winter	100	+40%	30/30 Winter		30/60 Winter	30	59.428	0.020	0.000	0.19	124.8	24.0
10.000	33	15 Winter	100	+40%					59.251	-1.038	0.000	0.01		273.4
9.002	31	30 Winter	100	+40%					56.240	-3.245	0.000	0.00		337.4
11.000	PPS5	120 Winter	100	+40%					58.415	-0.150	0.000	0.00		0.0
11.001	PPS5	60 Winter	100	+40%	30/30 Winter		30/60 Winter	24	57.353	0.020	0.000	0.15	199.3	24.3
9.003	32	30 Winter	100	+40%					54.979	-2.918	0.000	0.00		556.2
12.000	PPS4	30 Winter	100	+40%	30/30 Winter				57.946	0.161	0.000	0.05		0.6
12.001	PPS4	120 Winter	100	+40%	30/30 Summer		30/60 Summer	37	57.764	0.020	0.000	0.19	139.8	24.1
9.004	32	30 Winter	100	+40%					54.069	-2.410	0.000	0.01		812.4
13.000	PPS3	30 Winter	100	+40%	30/120 Winter				57.457	0.147	0.000	0.05		0.6
13.001	PPS3	120 Winter	100	+40%	30/60 Winter		30/120 Winter	25	57.279	0.020	0.000	0.13	182.7	26.8
9.005	33	60 Winter	100	+40%					52.864	-1.612	0.000	0.02		900.9
9.006	34	60 Winter	100	+40%				0	51.795	-1.680	0.000	0.01	0.0	901.6
14.000	PPS2	60 Summer	100	+40%	30/60 Winter				56.445	0.160	0.000	0.04		0.5
14.001	PPS2A	120 Winter	100	+40%	30/30 Winter		30/60 Winter	36	56.260	0.020	0.000	0.12	251.7	26.9

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
8.000	PPN1	SURCHARGED	
8.001	PPN1A	SURCHARGED*	
8.002	3	OK	
7.003	Pond 2	OK	
7.004	21	OK	
7.005	22	OK	
7.006	Pond 1	OK	
7.007	24	OK	
7.008	Outfall	OK	
9.000	PPS6	SURCHARGED	
9.001	PPS6	SURCHARGED*	
10.000	33	OK	
9.002	31	OK	
11.000	PPS5	OK	
11.001	PPS5	SURCHARGED*	
9.003	32	OK	
12.000	PPS4	SURCHARGED	
12.001	PPS4	SURCHARGED*	
9.004	32	OK	
13.000	PPS3	SURCHARGED	
13.001	PPS3	SURCHARGED*	
9.005	33	OK	
9.006	34	OK	
14.000	PPS2	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
14.001	PPS2A	SURCHARGED*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
9.007	35	1440 Winter	100	+40%					50.813	-2.058	0.000	0.00	
15.000	PPS1	15 Winter	100	+40%	30/15 Summer				55.890	0.155	0.000	0.04	
15.001	PPS1A	120 Winter	100	+40%	30/15 Summer		30/15 Summer	46	55.677	0.020	0.000	0.08	284.4
9.008	Pond 4	1440 Winter	100	+40%					50.808	-0.192	0.000	0.00	
16.000	CPPP1	60 Winter	100	+40%	100/30 Summer				55.705	0.145	0.000	0.04	
16.001	CPPP1A	480 Winter	100	+40%	30/60 Winter		100/30 Winter	12	55.571	0.060	0.000	0.30	0.2
16.002	46	60 Winter	100	+40%					51.898	-0.456	0.000	0.03	
17.000	CPPP2	60 Winter	100	+40%	100/30 Summer				56.058	0.128	0.000	0.04	
17.001	CPPP2A	480 Winter	100	+40%	30/60 Winter		100/30 Winter	13	55.921	0.060	0.000	0.30	3.5
17.002	48	60 Winter	100	+40%					52.257	-0.690	0.000	0.02	
9.009	Pond 3	1440 Winter	100	+40%					49.101	-0.899	0.000	0.00	
18.000	Porous 1	30 Summer	100	+40%	30/30 Summer				58.043	0.143	0.000	0.04	
18.001	Porous 1A	120 Winter	100	+40%	30/15 Winter		30/30 Summer	37	57.848	0.020	0.000	0.24	111.7
18.002	42	30 Winter	100	+40%					55.182	-0.809	0.000	0.02	
19.000	Porous 2	60 Summer	100	+40%	30/180 Winter				57.282	0.132	0.000	0.03	
19.001	Porous 2A	30 Winter	100	+40%	30/60 Winter		100/30 Summer	20	57.104	0.020	0.000	0.16	117.5
18.003	43	480 Winter	100	+40%					52.895	-2.125	0.000	0.00	
20.000	Porous 3	60 Winter	100	+40%	100/30 Summer				55.725	0.125	0.000	0.04	
20.001	Porous 3A	60 Winter	100	+40%	30/60 Winter		100/30 Summer	20	55.560	0.020	0.000	0.18	136.0
18.004	45	480 Winter	100	+40%			30/360 Winter	28	52.887	-1.087	0.000	0.00	57.0
21.000	Pond 5	1440 Winter	100	+40%	100/240 Winter				51.600	0.150	0.000	0.17	
21.001	47	1440 Winter	100	+40%	30/180 Winter				51.602	0.510	0.000	0.12	
18.005	46	1440 Winter	100	+40%					51.569	-0.447	0.000	0.00	
22.000	Porous 4	60 Winter	100	+40%	100/30 Summer				53.119	0.119	0.000	0.03	
22.001	Porous 4A	240 Winter	100	+40%	100/15 Winter		100/30 Winter	10	52.955	0.020	0.000	0.27	13.5

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
9.007	35	129.2	OK	
15.000	PPS1	0.5	SURCHARGED	
15.001	PPS1A	29.7	FLOOD RISK*	
9.008	Pond 4	32.7	FLOOD RISK*	
16.000	CPPP1	0.5	SURCHARGED	
16.001	CPPP1A	22.9	SURCHARGED*	
16.002	46	79.3	OK	
17.000	CPPP2	0.6	SURCHARGED	
17.001	CPPP2A	23.3	SURCHARGED*	
17.002	48	89.4	OK	
9.009	Pond 3	19.2	OK	
18.000	Porous 1	0.6	SURCHARGED	
18.001	Porous 1A	24.3	FLOOD RISK*	
18.002	42	248.2	OK	
19.000	Porous 2	0.5	FLOOD RISK	
19.001	Porous 2A	24.2	FLOOD RISK*	
18.003	43	88.2	OK	
20.000	Porous 3	0.5	SURCHARGED	
20.001	Porous 3A	24.1	SURCHARGED*	
18.004	45	11.0	OK	
21.000	Pond 5	2.9	SURCHARGED	
21.001	47	2.8	SURCHARGED	
18.005	46	10.1	OK	
22.000	Porous 4	0.5	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
22.001	Porous 4A	23.5	SURCHARGED*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
18.006	Ex Land Drain	1440 Winter	100	+40%	1/15 Summer				51.568	1.276	0.000	0.13	
23.000	Pond 6	1440 Winter	100	+40%					53.415	-0.585	0.000	0.00	
23.001	48	1440 Winter	100	+40%					53.411	-0.683	0.000	0.00	
24.000	PPN4	60 Winter	100	+40%	100/30 Summer				56.333	0.183	0.000	0.08	
24.001	PPN4A	30 Winter	100	+40%	30/120 Winter		100/30 Summer	20	56.137	0.020	0.000	0.10	176.0
23.002	7	60 Winter	100	+40%					51.809	-1.691	0.000	0.00	
25.000	PPN3	15 Winter	100	+40%	30/60 Summer				56.072	0.172	0.000	0.07	
25.001	PPN3A	120 Winter	100	+40%	30/30 Winter		30/60 Summer	39	55.882	0.020	0.000	0.11	309.9
23.003	7	60 Winter	100	+40%					51.618	-1.882	0.000	0.00	
23.004	Wide Swale	240 Winter	100	+40%					51.461	-0.245	0.000	0.00	

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
18.006	Ex Land Drain	10.3	FLOOD RISK*	
23.000	Pond 6	64.2	OK	
23.001	48	8.0	OK	
24.000	PPN4	0.7	SURCHARGED	
24.001	PPN4A	29.4	SURCHARGED*	
23.002	7	229.7	OK	
25.000	PPN3	0.7	SURCHARGED	
25.001	PPN3A	29.3	SURCHARGED*	
23.003	7	567.7	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
23.004	Wide Swale	60.4	FLOOD RISK*	

D. Pollution Prevention Plan

HM Revenue & Customs

Department for Transport

Department for Environment Food & Rural Affairs

Sevington Inland Border Facility

Appendix D - Pollution Prevention Plan

November 2020

Confidential

Sevington Inland Border Facility

Appendix D - Pollution Prevention Plan

November 2020

Confidential

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P01	03/09/20	[redacted]	[redacted]		
P02	15/10/20		[redacted]		
P03	06/11/20	[redacted]	[redacted]	[redacted]	Final
P04	13/11/20	[redacted]	[redacted]	[redacted]	Revised Final

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Appendix D - Pollution Prevention Plan

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Maps

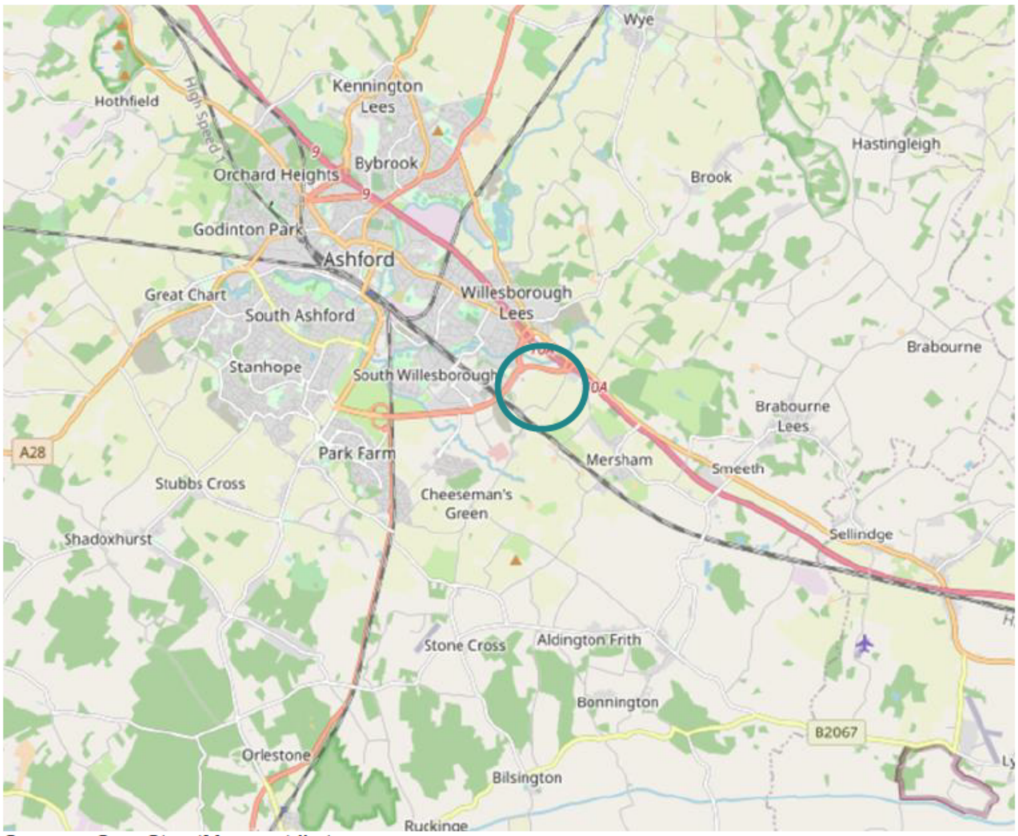
Map 1.1: Sevington, Ashford Site 1

1 Introduction

1.1 The Site

The site is a greenfield site in Sevington, a suburb in east Ashford, refer below to Map 1.1.

Map 1.1: Sevington - Site



Source: OpenStreetMap contributors

The proposal is to construct a 2,000 bay (approx.) lorry park to support the Government's wider infrastructure initiative related to Brexit preparations for Kent and the South of England.

The temporary parking facility would seek to accommodate up to approximately 2,000 Heavy Goods Vehicle (HGVs) from January 2021 for up to four hours at a time while 'border readiness checks' are carried out. The site's lifespan is estimated to be up to 36 months with a decreasing demand in use after the initial four to six months. Alongside the HGV parking areas, the site would also accommodate welfare facilities for HGV drivers, as well as office accommodation for Border Force staff utilising buildings of a temporary nature.

1.2 The Plan

The site-specific Pollution Prevention Plan is to be used as an Appendix to the Operational Management Plan (OMP) under strict compliance with the Special Development Order (SDO). The operator is to train a Specialist Site Safety Team as outlined in this document. The

Specialist Site Safety Team shall have the primary roles of fire safety and pollution prevention with a dedicated manager and with the relevant expertise.

Specialist Site Safety Team on-site will have relevant specialist advice / response capability alongside their normal day to day operational pollution prevention oversight. They should be working to the site management plan to ensure there is good site management in place, to prevent pollution in the first instance.

In case of a significant incident, your pollution prevention team / contractors can contact our Incident Communications Hotline on 0800 80 70 60 to report environmental incidents.

The pollution management during construction shall be covered in the Construction and Environmental Management Plan (CEMP).

2 Operational Risk Assessment

2.1 Non-Hazardous or Low Hazard loads

Many substances, deemed to be a non-hazardous or low hazard, may still pose significant risks to the environment. This is especially significant if allowed to enter the drainage system or make its way to a watercourse. A prime example is dairy products (milk, yoghurt, cream and ice cream) which must be disposed of as Category 3 ABP (Animal By-Products) via an appropriate contractor. The products are particularly harmful because of their high 'oxygen demand': bacteria that feed on them use up the oxygen that is otherwise used by fish and other living things in the watercourse, effectively suffocating aquatic life.

In light of such non-hazardous or low hazard loads possibly being harmful to the environment, all spills that are discovered on-site will be referred to the Environment Agency (EA) for a response assessment. The course of action prescribed will be managed by staff who have been trained by the EA in pollution response, the Specialist Site Safety Team of the team will assume the role of Ground Commander for such incidents. The Duty Manager will undertake a tactical role in liaison with the EA.

2.2 Checking and Parking of Vehicles

The arrangements for assessing, document checking, parking and releasing of the vehicles from the site is detailed in the **Operational Management Plan** (the overarching plan for the site and to which this plan supports).

2.3 Hazard Register

Table 2.1: Hazard Register

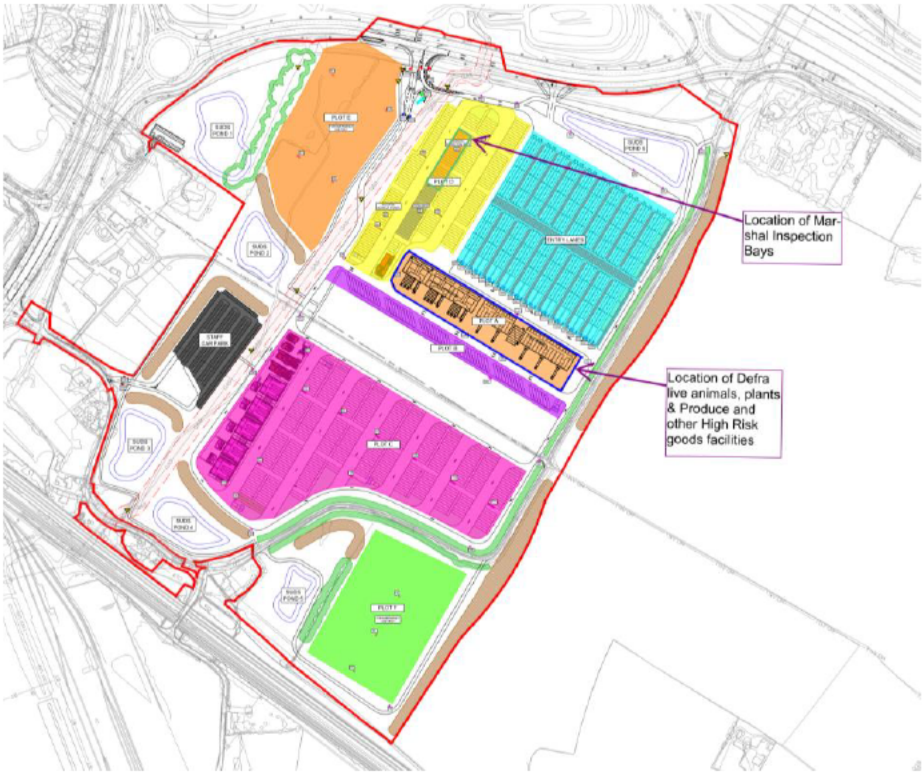
Haz Ref	Activity / Process / Material/Element - what is being undertaken?	Hazard	Designer Risk Control Measures: Design action taken, record of decision process including options considered, design constraints and justification for options/actions not having been taken
1	Operation of the Inland Border Facility (IBF), minor hydrocarbon and heavy metals deposition	Contamination of watercourse and drainage channels, environmental damage	• All operational pavements to be positively drained in a tiered isolatable with multiple isolation points identified in the Operation & Maintenance (O&M). Permanent assets to be regularly inspected and maintained as required and in accordance with supplier operational requirements. • Spill kits to be provided on-site and procedure detailed in O&M manual.
2	Operation of IBF - Major spill from, storage tank failure or accident	Gross spillage of hydrocarbons, environmental damage, risk of explosion	• Residual hydrocarbon capacity storage capacity based on the maximum single spill of 7600l.[1] • Vehicles to be inspected for defects upon entry to the site and directed to a contained area if any signs of leaks are detected.
3	Operation of auto close device	Fails to operate in a spill scenario	• An integral device included with sensors above normal flow to avoid fouling. • System to be maintained and tested regularly. Inclusion of back up pollution control valve on downstream end of system.

[1] BS EN 858-2, cl 4.3.6

Haz Ref	Activity / Process / Material/Element - what is being undertaken?	Hazard	Designer Risk Control Measures: Design action taken, record of decision process including options considered, design constraints and justification for options/actions not having been taken
4	Presence of animals on-site	Run-off from trucks or catchments that have animals entering surface water	• All areas that contain animals will be isolated with its own foul water system to take the foul water to storage tanks where it will be disposed by either tanker or pumping to local sewer.
5	Run-off during construction	Silt and other displaced material Sediment and erosion	• Construction phase management and control of surface water management: – Silt traps – Material stockpiling – Material storage methodology – Oil traps – Extreme weather management plan[2]
6	Run-off from Fire	Run-off from burning trucks or catchments from spills	• All operational pavements to be positively drained in a tiered isolatable with multiple isolation points identified in the O&M. • Permanent assets to be regularly inspected and maintained as required and in accordance with supplier operational requirements. • Spill kits to be provided on-site and procedure detailed in O&M manual.

2.4 Hazard Plan

Figure 2.1: Hazard Plan

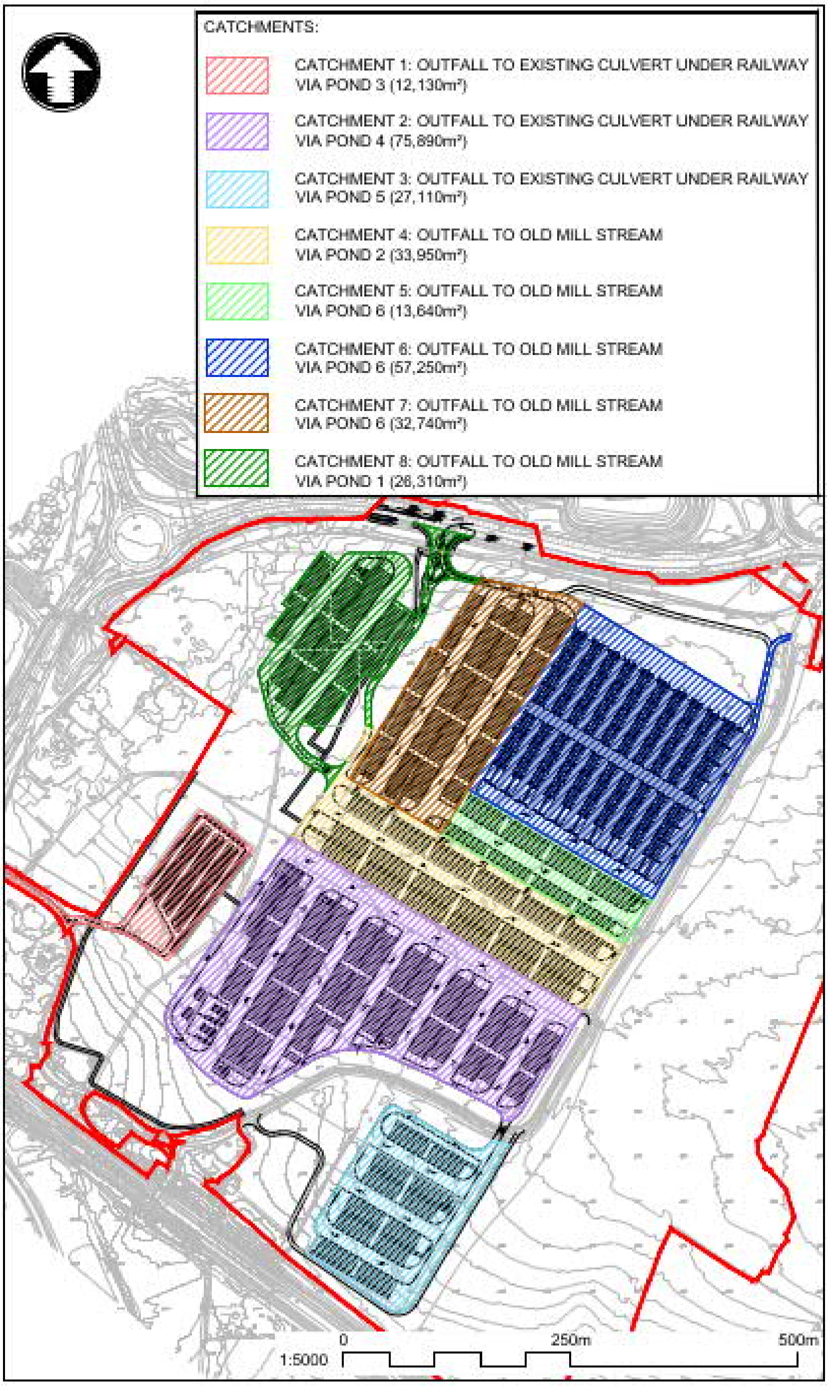


[2] Likely to be included in the CMP

3 Pollution Prevention Strategy

The proposed catchments are shown below in Figure 3.1.

Figure 3.1: Catchment Plan



3.1 Sustainable Drainage Systems Mitigation Index

The pollution risk of the drainage options has been undertaken using the simple index approach[3]. The hazard indices for a lorry park are shown below in Figure 3.2.

Figure 3.2: Hazard Indices

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Source: CIRIA C753 SuDS Manual, Table 26.2

The mitigation indices[4] for the proposed sustainable drainage systems (SuDS) features indicate that these options provide adequate treatment to surface water run-off, refer Figure 3.1.

Table 3.1: Surface Water Run-off SuDS Train

Options	Description	TSS Mitigation Index	Metals Mitigation Index	Hydrocarbon Mitigation Index
Catchment 7 (North)	Permeable catchment (Lined)	0.7	0.6	0.7
	Swale (Lined)	0.5	0.6	0.6
	Total	0.95	0.9	1.0
Catchments 4 and 8 (North)	Permeable catchment (Lined)	0.7	0.6	0.7
	Swale (Lined)	0.5	0.6	0.6
	Wetland (Lined)	0.8	0.8	0.8
	Total	1.35	1.3	1.4
	Swale (Lined)	0.5	0.6	0.6

[3] CIRIA, C753 SuDS Manual, 2015, Box 26.2
[4] Taken from CIRIA C753 SuDS Manual, Table 26.3

Options	Description	TSS Mitigation Index	Metals Mitigation Index	Hydrocarbon Mitigation Index
Catchments 5 and 6 (North)	Wetland (Lined)	0.8	0.8	0.8
	Total	0.9	1.0	1.0
Catchments 1 and 2 (South)	Permeable catchment (Lined)	0.7	0.6	0.7
	Swale (Lined)	0.5	0.6	0.6
	Wetland (Lined)	0.8	0.8	0.8
	Total	1.35	1.3	1.4
Catchment 3 (South)	Permeable catchment (Lined)	0.7	0.6	0.7
	Swale (Lined)	0.5	0.6	0.6
	Total	0.95	0.9	1.0

Source: Based on values from C753 SuDS Manual, Table 26.3 & Table 26.4

These indices indicate that the proposed drainage will manage pollutants in the run-off under normal conditions.

3.2 Control of Spills

Spill kits are to be placed strategically around the site and 'Muster Points' may also be co-located at these locations.

- Spill kits should:
  - Be fully equipped with absorption mats and granules, drip trays and 'Plug and Dyke' product for 'plugging' split diesel tanks and lines are located around the site (typical details are described in Table 3.2 below)
  - Each spill kit will contain equipment which has been agreed by the Environment Agency (EA) and will be replenished as and when required
  - All will be paired with the fire extinguishers and marshal's shelters

Table 3.2: Planned Spill Kit Items

	No.
Spill Kit	6
660 litre drop front wheelie bin (green)	6
Emergency Spill Kit Sign	6
80 litre pop up tank	6
150 maintenance absorbent pads	900
One maintenance absorbent mini roll	6
Five maintenance absorbent socks	30
Two maintenance absorbent cushions	12
One maintenance absorbent boom	6
One Dammit mat®	6
Three disposal bags and ties	18
Two stakes	12
800g Dammit® applicator pack	6
One personal safety kit	6
One Shovel	6
One Broom	6
One Hammer	3
Harena' sand (25kg bag)	30
Harena' sand (25kg bag) / penstock weir	6/penstock

This list is to be reviewed with the Specialist Site Safety Team so that spares and replacement of stored and accounted for.

Similarly, fire extinguisher points (FEs) are to be co-located with the spill kits as shown. Each FE is to include 2 x 6kg powder portable extinguishers and 9 x 25kg large mobile powder extinguishers.

The positioning of spill kits and FEs are such that each can be reached within 50m of any point of the trafficked area.

Refer to Highways England, **Diesel Spillage Best Practice Guide**

https://assets.highwaysengland.co.uk/Commercial+Vehicles/Diesel+Spillages+Best+Practice+Guide.pdf

3.3 Contamination Containment Area

Contamination containment areas are to be provided and allocated for those vehicles which pose a higher risk to the environment.

These vehicles include:

- Vehicles with leaking fluids
- Vehicles carrying hazardous waste

- Vehicles carrying hazardous goods and/or goods hazardous to the environment

3.4 Department for Environment, Flood & Rural Affairs Operations: Proposed Foul and Wastewater Drainage Strategy.

The animal, plant and produce Department for Environment, Food and Rural Affairs (Defra) buildings will include various fenced areas where animals are held and inspected. It is proposed that these areas will have channel drains to collect liquid effluent and liquids from any wash-downs to the areas. The site is to be managed so that any solid effluent is removed from the building and does not enter the below ground drainage network.

There shall be channel drains within the corridors to collect any washdown water. All the liquid effluent will be isolated and discharged into a trade effluent tank. The temporary storage of this waste from the Defra operations will be stored in tanks and removed from site under licence.

3.5 Contaminants Found

Should contaminants be found it shall be isolated and removed from the site to be disposed of under licence. During the inspection, if no contaminants are found, a penstock should be opened to allow the wash down material to discharge directly to the wider foul water network.

3.6 Water Resources

The Water Resources (Silage, Slurry and Agricultural Fuel Oil) Regulations 2010 (hereby referred to as SSAFO) noted that the discharge from the site will be classified as a dilute slurry and is taken to mean: “A dilute form of slurry produced from any water collected from yards and buildings used temporarily by livestock and where, as far as reasonably practicable, the yard or building is scraped or brushed down immediately after use to minimise contamination with livestock excreta.”

3.7 Trade Effluent Agreement

A trade effluent agreement will be required with the statutory drainage supplier prior to operation. All inspection bays should have oil spill kits in case of an oil spill / leak from any vehicles. This should be part of the operation and management plan of the inspection bays. Between the large animal building and small animal building, there will be an office block which includes toilets, a shower room / changing rooms and an open plan office space. The toilets and shower rooms are proposed to discharge unattenuated and by gravity into the site-wide foul drainage system. The processes should be managed on-site such that any personnel entering the toilet / changing room facility should be free of any potential contaminants.

The site-wide design team lead in any discussions with the Environment Agency (EA), Lead Local Flooding Authority (LLFA) and any drainage providers regarding discharge permissions. If, through the stakeholder engagement being carried out by the site-wide team, it is determined that there is insufficient capacity within the public sewer network a package treatment plant and/or reed beds may be required.

3.8 On-Site Treatment

An On-Site Treatment plant requirement forms part of the ongoing design required from the Defra buildings. Additional tanking will be required from the site depending on the contaminants within the liquid effluent. This is to be managed by the operator.

4 Spill Response Procedure

All incidents involving a spill of either a fuel (diesel) or a chemical are to be initially managed by the Specialist Site Safety Team who are trained in pollution management and who have assumed the role of Ground Commander for the incident. The Ground Commander is supported by the Duty Manager and staff in the Incident Command Centre (ICC) together with staff who have received training from the Environment Agency (EA).

The most effective place to stop a spill is where the spill is happening, at the source. If the primary container or secondary containment have been breached or failed for any reason, attempts should be made, if safe to do so, to contain the spill where it's happening. This will reduce the quantity of material released, meaning there's less spilt material that can cause pollution.

4.1 Checks on Vehicles

The site will use a series of checks on all vehicles when entering and staying on-site.

4.2 Arrival at Site

On the arrival of the first and subsequent vehicles the marshals on duty at the main entrance gate will briefly (10-seconds) assess if:

- A passenger can be seen in the cab (consider that a passenger may be a member of the media)
- There appears to be a fuel leak from the vehicle
- There is a substance leaking from the load
- There is a strong smell of burning (clutch or brake drums)

If any of these circumstances are apparent the vehicle will be moved to the emergency pull-off area prior to entering the nearby hangers. The problem will be assessed, and the Duty Manager advised, and appropriate actions undertaken. The gate marshals will direct the vehicles to the marshalling shed where the vehicle and driver will be assessed as to understand or carry out:

- If the documentation for the vehicle to leave the country are already completed
- The front registration number to be recorded by automatic number plate recognition (ANPR)
- The handing to the driver a two-part document to record the drivers' name and the registration number(s) of the vehicle
- The handing out of an explanatory note regarding the process regarding the vehicle's stay on-site and the facilities available to the driver, in serval languages
- The placing of a mark (coloured cards) in the front windscreen of the vehicle to denote whether the vehicle's documentation to leave the country are already completed or not
- A second brief but more detailed assessment concerning possible passengers, vehicle or product leaks and the possibility of being an 'exempt' vehicle on-site
- An examination by the Driver and Vehicle Standards Agency (DVSA)

4.3 Parking On-Site

The Operational Management Plan (OMP) contains greater detail concerning the arrangements for the Heavy Goods Vehicles (HGVs) on-site.

4.4 Spill Checks Regime Whilst Vehicles are Parked On-Site

Whilst the vehicles are on-site, the spill check regime to be followed is shown below in Table 4.1.

Table 4.1: Spill Checking Regime

Lorry Park Location	Mobile Patrol (Specialist Site Safety Team)	Marshal Patrol
Designated for refrigerated vehicles and isolated dangerous goods vehicles	Patrols to be undertaken and recorded every half hour over each 24-hour period	Marshals are to maintain and hourly record a continuous patrol in this area
Designated for Refrigerated Vehicles and vehicles with hazardous loads	Patrols to be undertaken and recorded every half hour over each 24-hour period	Marshals are to maintain an hourly inspection of their designated area and maintain a record to this effect
Designated for all other types of Goods Vehicles	Patrols to be undertaken and recorded every hour over each 24-hour period	Marshals are to maintain an hourly inspection of their designated area and maintain a record to this effect

4.5 Drainage Gullies and Slot Drains

No vehicles will be parked over the top of any drainage gully, there must be clear access to the gullies with sufficient room to deploy clay matts and to boom around them.

4.6 Spill Checks Following Vehicles Leaving Site

All lanes and areas that have previously been used for the parking of vehicles will be checked by the marshals designated to that area immediately after the vehicles have been released from the site and a record made to this effect.

4.7 Preventing Further Spillage and Use of Sorbent Products to Soak Up the Spill

The prevention of further spills should be the initial action undertaken if safe to do so. This can be a simple matter of the vehicle's driver isolating a leaking diesel tank or the application of putty from the spill kits situated across the site.

Sorbents will be available on-site and will include loose granules, sheets or rolls, pillows or booms. They can be used to soak up a spill and stop it spreading. There are different types of sorbent available, oil selective or chemically resistant sorbents.

The use of sorbents generates waste; and are only to be used on small spills, or where a spill has been contained to stop any further spread. All used sorbents must be disposed of according to the Duty of Care for waste and, if soaked in oil or chemicals, will be classed as hazardous waste. There will be a clearly marked skip on-site for hazardous waste.

Small containers may be able to collect material that's spilling as it leaves the primary container or secondary containment, for example, a damaged vehicle fuel tank or split pipework, these incidents are to be dealt with in contained areas.

4.8 Containment on the Surface

If the spill is spreading and it cannot be safely or effectively contained near to its source, the aim then is to stop the material getting into the drainage system or onto any unsurfaced ground. This method is crucial in addressing the need for the current drainage system being capable of containing a spill. Once a spill has been contained, it's easier to remove or transfer into a suitable temporary container to stop it causing more contamination; this must be achieved as soon as it's safe.

If it is possible to contain the spill on the surface, before it reaches your drainage system, it may be able to transfer it to a temporary container to stop it causing more contamination before you finish cleaning up the spill.

4.9 Use of Booms to Prevent the Material Spreading

The deployment of booms can be used to divert or contain spills on hard surfaces. There are two main types:

- Harena sandbag dams or physical barrier boom, often made of plastic, with different sections that will require to be filled with water; the boom can be positioned to contain a spill, isolate a drain or to divert the flow towards a specific area.
- Sorbent booms that can soak up a spill and stop it flowing any further. These can be used together with a barrier boom to soak up any spill leaking from below the barrier.

4.10 Use of Drain Mats to Cover Surface Drain Openings and Manhole Covers

Drain mats or surface drain seals seal a drain by covering the surface of a manhole cover or drainage gully. They stop liquid flowing into the drainage system and help contain it. There are different types, including clay mats and water-filled bags. Clay mats are single use only but may be able to have other types cleaned for re-use. Drain mats should be kept close to where they might be used. Identifying where liquid that is held back by a drain mat will collect may result in a need to keep people away from it until it can be cleaned up.

4.11 Use of Temporary Storage Containers, Portable Tanks

Once a spill has been contained it may be possible to transfer it into a temporary storage container, where it can be held safely until it's cleaned up. Portable tanks are usually made from synthetic rubber, polymers or reinforced plastic. Such items will be supplied and utilised by the specialist contractor.

4.12 Contaminant Entering the Drainage System

At present this is not an option at the operational site and will remain as such drainage systems are designed above ground where practical, inspectable, isolatable and replaceable. As such the whole surface water drainage infrastructure is designed as tiered drainage systems with multiple stages of interception. There are a series of penstocks, check dams and filter mediums in the permeable parking bays, which provide an additional preventative system in place.

4.13 Operation of Penstocks / Pumps in Emergency Conditions

In the event of a spill or fire, it is vital to ensure the surface water drainage system is sealed. The drainage systems serving the various catchments incorporate a number of penstock valves which require to be manually closed in the event of a vehicle spill or fire. This is to prevent any contaminants from leaving the site should they enter the surface water drainage system. The locations of the Isolation Control Penstock Locations are shown below in Figure 4.1.

Figure 4.1: Isolation Control Apparatus Locations

4.14 Contacts

A list of contacts, including hospital details, specialist clean-up contractors, water/sewage company, Environment Agency (EA) and Environmental Health Officer will be available in the on-site Incident Command Centre (ICC) should they need to be contacted in the event of an incident with the potential to cause pollution.

5 Conclusion

It has been assessed that the site, while creating a risk to the environment by the nature of its operations, will have the procedures in place to manage the risk of contamination.

5.1 General Operation

In the general operation of the site, the sustainable drainage systems (SuDS) features will provide tiered stages of treatment to the surface water run-off.

5.1.1 Vehicles with Hazardous Goods

Vehicles that contain hazardous goods are to be contained in an area isolated and managed.

5.1.2 Animal Waste

Any areas containing animals are to be isolated and waste drained to the foul water sewer or drained to a tank to be emptied by tanker.

5.2 Event Management

In the event of a spill incident, the Site Safety Team will:

- Refer to Pollution Incident Flow Chart (Appendix A)
- Go to Spill Kits located on-site for the management of minor spills:
  - Penstock valves at key locations for the management of major spills shall be identified and closed
  - A full record of the above shall be kept

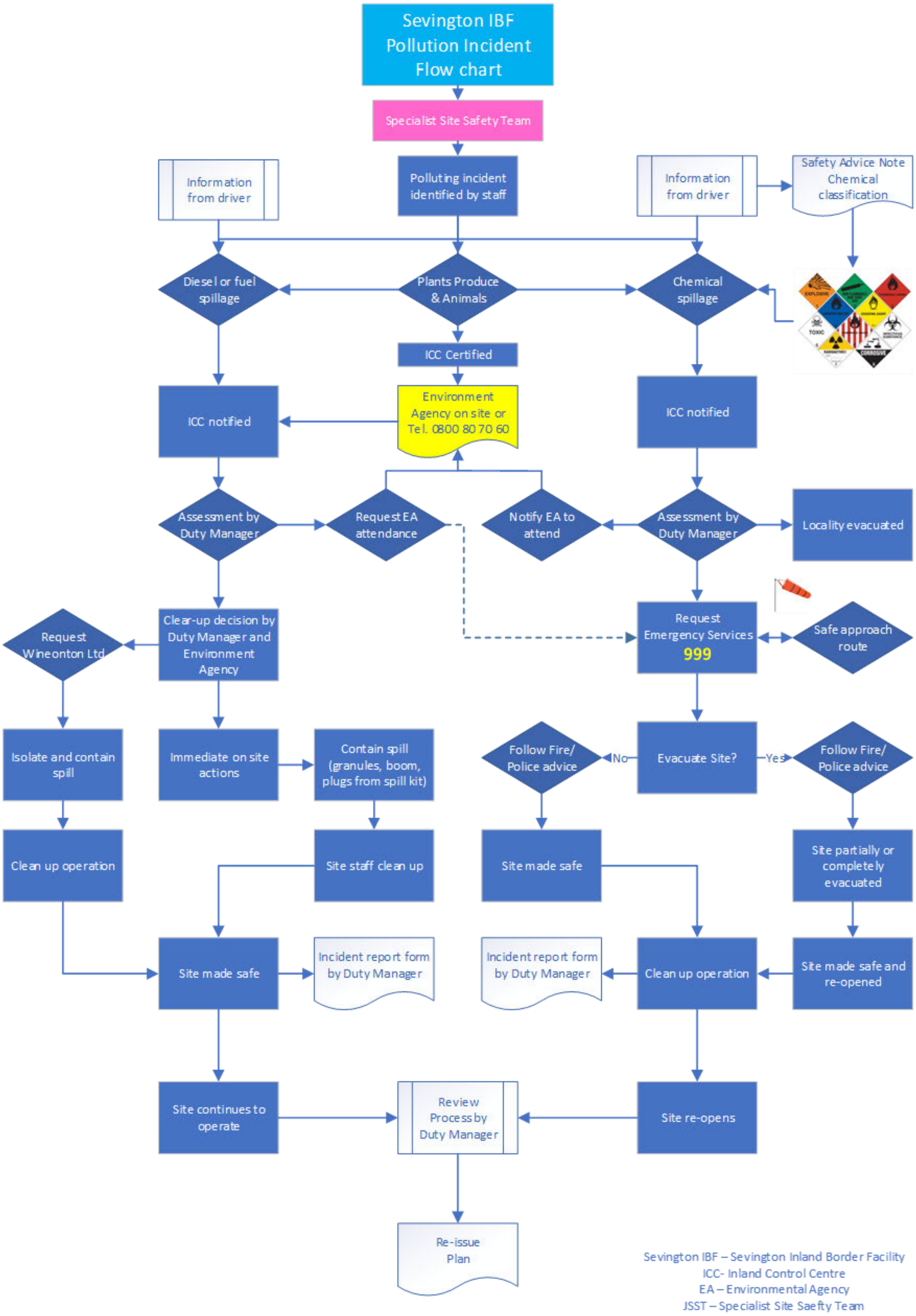
5.3 Operations and Management

The site's drainage infrastructure shall be monitored and maintained by strict guidance. The site-specific Operation and Maintenance Manual has been produced in parallel to this document and forms part of the strict staff training regime to prevent and control of potential pathway of contamination.

5.4 Engagement with Site Operators (Wincanton plc, Mitie Security & Fire)

- Operations and Maintenance Plan
- Site Visit November 2020
- In operation Review January 2021
- In operation Review June 2021
- Day 200 Site Reconfiguration
- In Operational Review December 2021

A. Pollution Incident Flow Chart



B. Appendix B

Named Person	Contact Number
Incident Communications Hotline	Tel. **0800 80 70 60**
TBC, Highways England Head of Operations [redacted]	Tel. [redacted]
[redacted], KCC Senior Highways Manager.	Tel. [redacted]
TBC, Security (MD).	Tel. xxxxx xxxxxx
TBC (Lighting units & generators 24/7).	Tel. xxxxx xxxxxx
TBC (Spill Coordinator).	Tel. xxxxx xxxxxx
TBC (Spill Supervisor).	Tel. xxxxx xxxxxx
TBC Engineering, (MD).	Tel. xxxxx xxxxxx
TBC (Forklift, MEWP & Maintenance).	Tel. xxxxx xxxxxx

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Sevington Inland Border Facility

Carbon Assessment and Reduction Report

06 November 2020

Confidential

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1 Introduction

1.1 Overview

Mott MacDonald has been appointed by the Department for Transport (DfT) to undertake an *Analysis of the Likely Environmental Effects of the Development Report* (document ref: 419419-MMD-XX-SV-RP-YE-0002) for the proposed use of a site at Sevington near Ashford in Kent (hereafter referred to as 'the site') for a temporary Inland Border Facility (hereafter referred to as 'the scheme'). The analysis is presented within this report, and it is required as per article 4(2)(h) of the *Town and Country Planning (Border Facilities and Infrastructure) (EU Exit) (England) Special Development Order 2020*. Further details on the scheme including a description of the location of the site is provided in the Sevington Inland Border Facility – An *Analysis of the Likely Environmental Effects of the Development Report* (document ref: 419419-MMD-XX-SV-RP-YE-0002). This climate assessment has been undertaken to support the *Analysis of the Likely Environmental Effects of the Development Report*.

The climate impacts of the scheme are reviewed and assessed in accordance *with Design Manual for Roads and Bridges (DMRB) Sustainability and Environment Appraisal LA 114 – Climate*[1], hereafter referred to as '*DMRB LA 114*'.

This assessment refers to the term 'movement'. One movement is defined as one HGV travelling in a single direction to or from the site. Where an HGV returns along the same route this will count as two movements.

1.2 Purpose of this Report

This assessment considers the effect of the scheme upon climate change, the greenhouse gas emissions associated with the scheme, hereafter referred to as carbon assessment and carbon emissions. A greenhouse gas is a gas that absorbs and emits radiant energy within the thermal infrared range. Greenhouse gases cause the greenhouse effect. The primary greenhouse gases in Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide and ozone. Greenhouse gases are measured in terms of carbon dioxide equivalents (CO_2e) where the global warming potential of the gas is measured compared to that of carbon dioxide.

[1] Highways England (2019) *Design Manual for Roads and Bridges, Sustainability and Environment Appraisal LA 114 Climate*

2 Legislative and Policy Framework

2.1 European Legislation

2.1.1 The Commission Implementing Regulation (2014/749/EU)

Article 17 states that Member States shall report approximated greenhouse gas inventories as referred to in *Article 8(1) of Regulation (EU) No 525/2013* at a level of disaggregation of source categories reflecting the activity data and methods available for the preparation of estimates for the year X-1. An explanation for the main drivers for the trends in emissions should also be reported[2].

2.2 National Legislation and Policy

2.2.1 Legislation

2.2.1.1 Climate Change Act 2008

The *Climate Change Act 2008* forms part of the UK government's plan to reduce carbon emissions, committing the government to a reduction of carbon by at least 100% of 1990 levels by 2050: a commitment to "net zero" carbon emissions by 2050[3].

The *Climate Change Act* creates an approach to managing and responding to climate change in the UK, by:

- Setting ambitious, legally binding emission reduction targets
- Taking powers to help meet those targets
- Strengthening the institutional framework
- Enhancing the UK's ability to adapt to the impact of climate change
- Establishing clear and regular accountability to the UK Parliament and to the devolved legislatures[4]

Key provisions of the 2008 Act in respect of climate change mitigation include the requirement for the government to set legally binding carbon budgets capping the amount of carbon emitted in the UK over a five-year period, as set out in Table 2.1.

Table 2.1: UK Carbon reduction targets

Carbon Budget	Carbon Budget Level	Reduction Below 1990 Levels
3rd carbon budget (2018- 2022)	2,544MtCO_2e	37% by 2020
4th carbon budget (2023- 2027)	1,950MtCO_2e	51% by 2025
5th carbon budget (2028- 2032)*	1,725MtCO_2e	57% by 2030

Source: *Department of Energy and Climate Change (2011)*[5] *and *Department for Business, Energy and Industrial Strategy (2016)*[6]

[2] Official Journal of the European Union (2014) Commission Implementing Regulation (2014/249/EU) [online] available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0749 (last accessed April 2019)

[3] Gov.uk (2019) PM Theresa May: we will end UK contribution to climate change by 2050: https://www.gov.uk/government/news/pm-theresa-may-we-will-end-uk-contribution-to-climate-change-by-2050 (last accessed August 2019)

[4] DECC (2012) Climate Change Act 2008

[5] Department of Energy and Climate Change (2011). *The Carbon Plan: Delivering our low carbon future.*

[6] Department for Business, Energy and Industrial Strategy (2016). *The Carbon Budget Order 2016*

Key provisions of the Act in respect of climate change adaptation include:

- A requirement for the government to report, at least every six years, on the risks to the UK of climate change, and to publish a programme setting out how these will be addressed. This Act also introduces powers for government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address those risks; and
- The Adaptation Sub-Committee of the Committee on Climate Change, will provide advice to, and scrutiny of, the government's adaptation work.

2.2.1.2 The UK Town and Country Planning (Environmental Impact Assessment) Regulations 2017

The requirements of the 2014 amended EU EIA Directive were transposed into UK law by the *UK Town and Country Planning (Environment Impact Assessment) Regulations 2017*[7] and came into force on the 16 May 2017.

The amended regulations introduce climate change as a new topic, broadening the potential scope of an EIA. The regulations require the impact that the project will have on climate change to be assessed.

2.2.2 Policy

2.2.2.1 The Carbon Plan 2011

The Carbon Plan was presented to UK Parliament pursuant to Sections 12 and 14 of the *Climate Change Act 2008*. The plan sets out how the UK will achieve decarbonisation within the framework of the energy policy. UK Local Authorities and regional level authorities must report on their carbon dioxide (CO_2) emissions. However, all emissions from the motorways sector have been removed and are not factored into the annual CO_2 emissions.

2.2.2.2 Infrastructure Carbon Review

The *Infrastructure Carbon Review*[8] sets out actions that infrastructure organisations can take to reduce the carbon impact of their assets. In terms of the scheme, this means that emission reduction actions should be considered when developing scheme specific mitigation measures, where relevant.

2.2.2.3 PAS2080:2016 Carbon Management in Infrastructure

PAS2080[9] sets out a common approach and understanding of whole life carbon management in the provision of economic infrastructure as a result of the *Infrastructure Carbon Review*. It promotes reduced carbon, reduced cost infrastructure delivery, more collaborative ways of working, and a culture of challenge in the infrastructure value chain.

[7] Gov.uk (2017) The UK Town and Country Planning (Environmental Impact Assessment) Regulations 2017: http://www.legislation.gov.uk/uksi/2017/571/schedule/2/made (last accessed March 2020)

[8] HM Treasury (2013) Infrastructure Carbon Review [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/260710/infrastructure_carbon_review_251113.pdf (last accessed November 2019)

[9] BSI (2016) PAS 2080: Carbon management in infrastructure [online] available at: https://shop.bsigroup.com/ProductDetail?pid=000000000030323493 (last accessed November 2019)

2.3 Local Policy

2.3.1 Adopted Local Plan

The *Ashford Local Plan 2030*[10] *(2019)* sets out a framework of policies to manage and control development within the District. Policy SP1 is the strategic objectives with one specifically relating to climate change, stating:

'To ensure new development is resilient to and mitigates against the effects of climate change by reducing vulnerability to flooding, promoting development that minimises natural resource and energy use, reduces pollution and incorporates sustainable construction practices, including water efficiency measures.

[10] Ashford Borough Council. *Ashford Adopted Local Plan to 2030.* Available at: https://www.ashford.gov.uk/planning-and-development/planning-policy/adopted-development-plan-documents/adopted-local-plan-to-2030/

3 Carbon reduction principles

3.1 Introduction

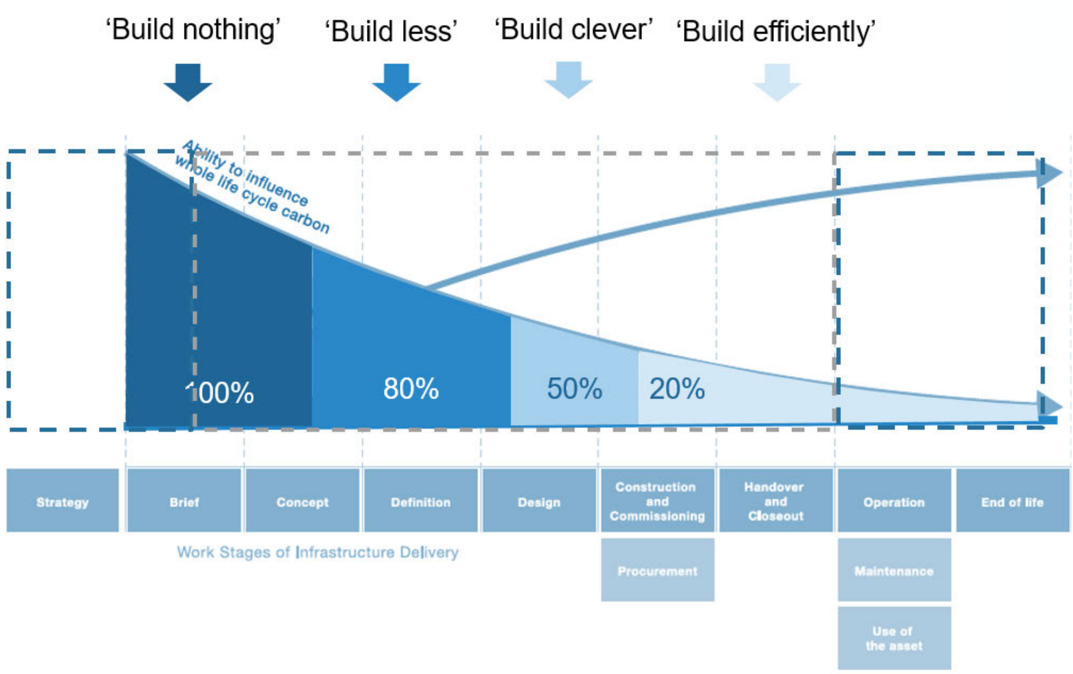
Carbon reduction has been considered as part of the design approach across the scheme. This section outlines the methods employed to minimise carbon emissions through design and operation which has been considered by the design consultants and would be considered by the construction contractor.

The measures have been produced considering and building upon the prevent, reduce and remediate measures included within Section 3.22.1 *DMRB LA114*.

The measures listed are not presented in a particular priority order. All opportunities to reduce the carbon impact of construction and operation of the assets would be taken, where possible. Any reduction opportunities would be assessed in terms of their whole life benefit considering both capital carbon and operational carbon reductions.

The principles of the carbon emission reduction hierarchy (as set out in *PAS 2080*[9]) would be followed. The principles of identifying assets which can be designed out (build nothing), opportunities to build less, build clever and build smart are shown in Figure 3.1.

Figure 3.1: Carbon emission reduction hierarchy



3.2 Design and Construction

The following elements have been the main focus for carbon reduction through design and construction.

Any earthworks would be designed to deliver the optimum balance between cut and fill to minimise the quantity of material needed to be imported to or exported from site.

Any transportation associated with delivering the asset would prioritise low-carbon modes, where possible, even if this is only for a part of the journey. An effective reverse logistics strategy would be put in place.

Resource efficiency would be maximised with opportunities to minimise material use, waste generation, energy use and water use explored throughout the design and construction process. This would extend to the consideration of decommission and reinstatement, rather than demolition, of existing assets on the site and making best use of materials, products and assets consequently made available.

Assets and sites would be designed with consideration of the end of life. Circular principles, such as design for flexibility and design for de-construction and disassembly, would be considered to maximise carbon efficiency and economic value at the end of life.

The design for the building types of prefabricated modular unit construction have been established to promote a fast, efficient solution with ease of delivery, as detailed in the Department for the Environment, Food and Rural Affairs (Defra) EUX Inland Sites DfT Performance Specification[11]. Low carbon design and the reuse of the building structures are also part of the main principles adopted in the design. It is therefore proposed to minimise or eliminate embodied and operational carbon in the building design whilst meeting the prime objectives. The design and construction would follow the principles of reduce, reuse, recycle, as follows:

- Reduce: The building design and construction would minimise the amount of material used and associated embodied carbon, except where additional material gives a significant benefit to the long-term value and carbon footprint of the building
- Reuse: The design would aim to maximise the long-term use of the buildings following their prime use. An effort to provide flexibility and increased residual value would be made. For each site on which the buildings are constructed, a sustainability strategy would be developed in accordance with the site-specific requirements, which may include:
  - Retaining the buildings on site for long term use
  - Dismantling the buildings and rebuilding it elsewhere
  - Dismantling the buildings and returning components to the market for reuse.
- Recycle: The buildings would be built from materials with low embodied carbon. The use of the materials in their current form would be maximised, either as part of an extended design life of the building or use in a disassembled form. Where materials need to be demolished and recycled after the prime use, they would be reduced in quantity to the minimum

Where possible, low-carbon construction materials and products will be preferred. Maintenance, replacement frequency and design life would be considered to reduce the carbon impact through employing strategies such as designing in layers. Material and product selection would match the durability and lifespan of the assets' service life.

Where possible low-carbon construction plant and equipment would be used. Renewable energy (electricity) would be used on-site wherever possible. On-site welfare facilities would be energy efficient.

[11] Mott MacDonald (2020) *DEFRA EUX Sites DfT Buildings Performance Specification 420236-MM-SP-002 B.*

The use of non-potable water sources for non-potable construction purposes would be prioritised. The water hierarchy would be followed, where the hierarchy includes, from the highest to the lowest in terms of the priority for water conservation: elimination, reduction, outsourcing or reuse and regeneration. Water efficiency measures would be put in place wherever possible, regardless of source.

Provision should be made to enable waste to be effectively segregated during construction, enabling materials to be effectively managed using the waste hierarchy, prioritising re-use and recycling over disposal. Circular economy principles, such as Modern Methods of Construction, should be implemented, where possible.

A landscape design has been completed as part of the scheme to mitigate against the effects caused by the scheme and bring benefits through and beyond operation of the scheme. Details of this are found within the Landscape Environmental Management Plan. The design includes the provision of 3.6 hectares (ha) of planting. Through the lifetime of the planting the plants would sequester carbon and reduce regional emissions. An estimate of the sequestering potential of the planting is included within Section 5.

3.3 Operation

All assets would be designed in such a way that energy use is minimised, and that the energy hierarchy is followed. The hierarchy includes, from highest priority to lowest priority, energy conservation, energy efficiency, use of renewable or sustainable resources, use of non-renewable sources by low-carbon technologies and use of conventional (non-renewable not low carbon) resources. Where possible, measures would be put in place to limit profligate energy use by unintended user behaviours e.g. using motion sensors to control lights. Renewable energy (electricity) would be used, including on-site renewable energy generation, wherever possible.

Provision would be made to enable waste to be effectively segregated during operation, enabling materials to be effectively managed using the waste hierarchy, prioritising re-use and recycling over disposal.

All assets would be designed in such a way that water use is minimised. Where possible, measures would be put in place to enable the use of non-potable sources. The water hierarchy would be followed. Measures should also be put in place to limit profligate water use by unintended user behaviours e.g. using aerated taps.

4 Assessment approach

4.1 Scope of assessment

The scope of assessment is presented below within Table 4.1 which provides additional detail on the Publicly Available Specification (PAS) 2080[9] lifecycle stages scoped into the assessment of impacts on climate and their study areas are explored below.

Table 4.1: Lifecycle stages within scope of assessment and the affected study area

Lifecycle scope	Study area	Emissions scope
A1-3 (products and materials)	Construction materials within the construction site boundary and the supply chains associated with these will be included. This includes the modular buildings	Primary raw material extraction, manufacturing, and transportation within the supply chain of all materials required for the permanent assets.
A4 (transport to works site)	Transport of permanent construction materials to site using Royal Institute of Chartered Surveyors (RICS) assumptions if Scheme specific data is not available.	Emissions from vehicles transporting materials to site.
A5 (construction plant)	Construction plant would consider the plant quantities, sizes and operating hours.	Plant emissions, where plant specification data is available and included within the Moata Carbon Portal.
B6 (operational energy use)	Lighting for the operational period	Energy consumption for lighting for the operational period
B9 (user utilisation of infrastructure)	Emissions from traffic use of the infrastructure within the defined study area, see Section 4.2.2	Emissions from vehicles effected by the implementation of the Scheme. This includes the forecasted impacts to personal vehicles, heavy good vehicles and public transport vehicles which would be used for the Inland Border Facility.
D (benefits and loads beyond the system boundary)	Emission reduction by sequestration of the trees incorporated into the design.	Broadleaved and Conifer trees included within the planting design.

4.2 Assessment Methodology

4.2.1 Construction

The assessment of the estimated carbon emissions associated with the construction was completed based upon the available design information and the use of the Mott MacDonald Moata Carbon Portal.

Due to the modular nature of much of the design, the timescales associated with the scheme and in the absence of a completed detailed design the materials and quantities were estimated from the General Arrangement Drawing (drawing references: Day 1 (419419-MMD-01-MO-SK-C-0028) and Day 200 (419419-MMD-01-MO-SK-C-0029), design drawings, the Defra EUX Sites HMRC Buildings Performance Specification11[11] and the DEFRA EUX Inland Sites DfT Performance Specification[12] with assumptions from relevant discipline professionals.

[12] Mott MacDonald (2020) Defra EUX Sites HMRC Buildings Performance Specification 420236-MM-SP-002 B. September 2020

The key assumptions include:

- Transport of materials to site used the RICS assumptions[13]
- Foundations for the modular buildings were estimated to be $1m^2$ 500mm thick concrete pads located at the corner of each bay and one centrally on either side
- An allowance of 50kg per m^2 of secondary beams for the roof and walls of the inspection shed was used
- Floor tiles for the modular buildings were assumed to be 42mm thick aluminium
- Booth constituents were estimated from the other modular buildings
- Internal fixings have been omitted including sinks, toilets and air circulation systems
- Construction plant emissions have not been entirely accounted for due to the limited level of information on construction of the modular buildings therefore the estimated emissions for A5 (construction plant) are considered lower than the true value

4.2.2 Operation

The study area for the operational assessment has been determined through annual average traffic flows provided from the scheme traffic modelling. Two potential Do-Something scenarios which include the scheme have been assessed against a Do-Minimum scenario which is representative of traffic flows without the scheme. These two scenarios have been included within the assessment sequentially rather than as two separate scenarios. The two Do-Something scenarios are:

- Scenario 1: With disruption
  - Do-Minimum traffic flows with disruption caused by the Quick Moveable Barrier (QMB) and an extended (by distance) Operation TAP.
  - Do-Something
    - Traffic flows with disruption caused by the Quick Moveable Barrier (QMB) and an extended (by distance) Operation TAP.
    - Traffic flows associated with rerouting of HGVs heading into and out of the UK
  - 549 staff movements per day (i.e. 1098 two-way movements)
- Scenario 2: No disruption
  - Do-Minimum traffic flows
  - Traffic flows associated with rerouting of HGVs heading into and out of the UK
  - 549 staff movements per day (i.e. 1098 two-way movements)

The site is assumed to operate from January 2021 for five years. The first six months of operation is expected to be at the highest capacity the remaining time at lower capacity. This assessment has modelled the maximum operating capacity for 12 months based on 2021 traffic flows and emission factors. Whilst the site will be operational from January 2021 for five years, the use of 2021 emission factors rather than 2022 – 2025 is considered a conservative approach as emission rates from traffic are anticipated to reduce in future years due to improvements in vehicle emissions as new cleaner cars enter the road fleet and replace older more polluting vehicles.

The assessment considers the two scenarios successively, with disruption being relevant for the first six months and no disruption relevant for the operation beyond six months. The total carbon

[13] Royal Institute of Chartered Surveyors (2017). Whole life carbon assessment for the built environment.

emissions are of interest for the assessment and as such the results are reported as the total emissions for the operational period and not disaggregated per scenario.

In accordance with *DMRB LA 114*, the following criteria have been applied to the change between the Do-Minimum and Do-Something scenario traffic flows. These criteria have been used in order to identify which roads are likely to be affected by the scheme (referred to as affected roads) to a degree that they require consideration within the operational climate assessment.

The criteria are:

– A change of more than 10% in Annual Average Daily Traffic
– A change of more than 10% to the number of heavy duty vehicles
– A change in daily average speed of more than 20km/hr

The difference in traffic flows between the Do-Minimum and Do-Something traffic flows for both scenarios has been assessed in accordance with *WebTAG Unit A3*.

4.2.3 Carbon sequestration from planting

The required planting for the landscape design would result in the secondary benefit of carbon sequestration. To determine the carbon reduction associated with this planting the Woodland Carbon Code (WCC) Carbon Calculation Spreadsheet (V2.3)[14] and associated guidance has been utilised. The 'Small Project Carbon Calculator' was applicable due to the tree planting being less than 5ha which considers the total area of planting for trees. The draft Outline Planting Species List[15] was used to determine the hectares of planting for both broadleaved and conifer trees. Anything other than broadleaved or conifer trees were omitted from the calculations due to these plants and shrubs not being significant for sequestration or included within the WCC calculator.

[14] https://www.woodlandcarboncode.org.uk/standard-and-guidance/3-carbon-sequestration/3-3-project-carbon-sequestration

[15] Mott MacDonald (2020) Outline Planting Species List. (Document reference: 419419-MMD-XX-MO-SC-L-0001)

5 Carbon Assessment

5.1 Construction

The assessment of the emissions lifecycle stages A1-3 (products and materials) and A4 (transport of materials to works site) estimated a total of 33,094tCO_2e through the construction of the scheme. The breakdown of these emissions is shown in Table 5.1.

Table 5.1: Construction emissions

Lifecycle stage	Emissions (tCO_2e)	Proportion of total emissions (%)
A1-3 (products and materials)	20,835	63
A4 (transport of materials to works site)	5,624	17
A5 (construction plant)	6,634	20
Total	33,094	100

5.2 Operation

The emissions associated with the operation of the scheme for the five year period would result in an estimated 3,307tCO_2e this includes both operational lighting and operational user utilisation of the scheme. A breakdown between the different lifecycle stages and the two scenarios is shown in Table 5.2 below.

Table 5.2: Operation emissions

Lifecycle stage	Operational emissions (tCO_2e)
B2 (operational energy)	239
B9 (user utilisation of the scheme)	3.069
Total	3,307

5.3 Carbon sequestration from planting

The planting of 3.6ha of broadleaved and conifer trees would result in an estimated reduction of carbon emissions of 8tCO_2e.

6 Conclusion

The assessment of the carbon emissions through construction and operation is summarised below in Table 6.1.

Table 6.1: Total emissions for the scheme

Project stage	Estimated total carbon over carbon budget (tCO_2e) ('Do something' Scenario)	Net CO2 project GHG emissions (tCO_2e) (Do something - Do minimum)	Relevant carbon budget
Construction	33,094	33,094	3rd Carbon Budget
Operation	584,466	-56	3rd Carbon Budget
	885,384	3,363	4th Carbon Budget
Total	617,560	33,038	3rd Carbon Budget
	885,384	3,363	4th Carbon Budget

The total emissions associated with the scheme are estimated to be 36,393tCO_2e. The quantity of emissions is relatively small equating to 0.0013% of the 3rd Carbon Budget and 0.00017% of the 4th Carbon Budget (detailed in Table 2.1). In addition, through the implementation of the carbon reduction principles, detailed in Section 3, and the implemented planting the emissions have been minimised as far as possible. *DMRB LA114*, states that *"The assessment of projects on climate shall only report significant effects where increases in GHG emissions will have a material impact on the ability of Government to meet its carbon reduction targets*." It is not considered that the carbon emissions would have a material impact on the ability of the government meeting the carbon reduction targets, therefore, no significant effects are anticipated.

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