IED Application - Drainage Statement

Union Park

Bulls Bridge Industrial Estate, Hayes, UB3 4QQ

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APPENDICES

1.0 INTRODUCTION

HDR have been instructed to prepare a Drainage Report to accompany the IED permit application for Ark Data Centres Ltd (Ark) for a major new data centre campus at Bulls Bridge Industrial Estate, in Hayes, West London.

The purpose of this report is to outline the drainage strategy for the site and specifically how the risk of fuel entering the ground and surface water is minimised.

In addition, the report includes the proposed drainage strategy and an outline of the various sustainable drainage systems (SuDS) which have been utilised within the surface-water drainage strategy for this development.

2.0 FLOOD RISK

The Flood Risk Assessment as part of the consented scheme (under Planning Ref: 75111/APP/2022/1007), did not identify any significant sources of flooding risk posed to the site and surrounding areas. A summary of the main findings is shown below:

- The site is in Flood Zone 1 and any proposed buildings are built away from the Flood Zone 2 and 3 location in the River Crane to the south east corner of the site.

- The site has low risk of the following sources of flooding:

    - Fluvial
    - Pluvial
    - Artificial Watercourses or watercourses
    - Canals
    - Groundwater
    - Public Sewers
    - Surface Water

- The Environment Agency Product 4 information was also reviewed and the flood levels for the Flood Zone 2 and 3 areas do not exceed the existing topography of the site.

3.0 SURFACE WATER STRATEGY

The peak surface water run-off within the areas to be developed is restricted to greenfield runoff rate which was calculated using ICP SuDS (Interim Code of Practice for Sustainable Drainage Systems, Chapter 6). The maximum discharge rate for the developed site has been calculated to be 56.2l/s. Table 1 demonstrates the proposed peak run-off for varying return periods which include the 1:1, 1:30 and 1:100-year return period including 40% allowance for climate change.

The combined discharge from the developed site is restricted and does not exceed the calculated greenfield run-off rate for all storms up to and including 1:100-year return period with an allowance for 40% climate change.

The developed area which includes the proposed layby on the northern side of North Hyde Gardens has been included within the calculations. For pollution control the layby has been constructed using permeable paving and restricted using a flow control to the equivalent greenfield run-off of its catchment area.

Table 1: Proposed Site Runoff

Proposed Impermeable Areas	Area (m^2)	Area (ha)	Restricted Flows (L/S)		
			1yr	30yr	100yr*
HV Sub Station and Visitor Reception Centre Energy Centre 2 (Abellio Site)	7760	0.7760	4.7	8.1	9.7
Main Building and site	26645	2.6645	19.1	38.9	44.9
Layby (Restricted)	560	0.0560	0.4	1.3	1.6
Total catchment	30375	3.0375	23.8	48.7	56.2

*Includes an allowance for 40% Climate Change

4.0 SUSTAINABLE DRAINAGE SYSTEMS (SuDS)

With reference to the London Plan 2016 Policy 5.13 and London Borough of Hillingdon Sustainable Drainage Design & Evaluation Guide, the development has utilised SuDS systems for the development. These systems restrict the discharge to the greenfield run-off rate and ensure that surface water run-off is managed in accordance with the following drainage hierarchy:

1. Store rainwater for later use.
2. Use infiltration techniques such as porous surfaces in non-clay areas.
3. Attenuate rainwater in ponds or open water features for gradual release.
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release.
5. Discharge rainwater direct to a watercourse.
6. Discharge rainwater to a surface water sewer/drain; and
7. Discharge rainwater to the combined sewer.

Table 2 shows the SuDS techniques that are used within the drainage strategy for this development and a layout has been provided in Appendix A for the drainage strategy of the site.

Table 2 SuDS Techniques

SuDS TECHNIQUE	DESCRIPTION	ADVANTAGES	CONTEXT
Green / Brown Roof	Green roofs are structures purposely fitted or cultivated with vegetation. Green roofs can reduce runoff volume by retention whilst filtering out silt and other particulates through the sub soil formation. They improve water quality and provide an array of pollution control treatments as described within the SuDS Manual. Green roofs also promote an improved ecological value.	Provides an array of treatment. Provides a means of storage for surface water. Promotes wildlife and natural habitats.	As the development provides large areas of low-pitched roofs this would be an effective SuDS technique.
Porous Asphalt	Porous asphalt paving allows rainwater to infiltrate through a hard-standing surface into an underlying storage/filtration sub-base layer. The voids within the coarse graded aggregate are then utilised as storage using a piped drainage system in which the construction will be underlain by an impermeable geotextile. These areas are also accompanied by a Permafilter treatment membrane and Permaceptors to capture oils before discharge to the piped network.	Provides a means of storage for surface water. Provides an array or treatment for surface water run-off.	Given the topology of the site, a large portion of the highway and impervious surfaces may require this SuDS technique as a means for water treatment.
Permeable Paving	Permeable paving allows rainwater to infiltrate through a hard-standing surface into an underlying storage/filtration sub-base layer. The water can then either infiltrate into the ground beneath the paving via a permeable geotextile or be utilised as storage using a piped drainage system in which the construction will be underlain by an impermeable geotextile.	Provides a means of storage for surface water. Provides an array or treatment for surface water run-off.	Given the topology of the site, a large portion of the highway and impervious surfaces may require this SuDS technique as a means for water treatment.
Swales, Rain Gardens	These facilities can range from depressions in grassed areas that generally remain dry to permanent pond facilities the level of which increase	Provide an array of treatment properties. Provides a means of surface water	The proposed site can incorporate such techniques into the drainage strategy.

SuDS TECHNIQUE	DESCRIPTION	ADVANTAGES	CONTEXT
	during periods of rainfall. Excess surface water is subsequently disposed of via a combination of evaporation and/or soakage whilst also being utilised as storage structures for attenuation purposes. In the right circumstances these facilities can also provide aesthetic and amenity value.	storage. Slow overland flows and surface run-off.	
Drainage Basins, Wetlands and Ponds	These are landscaped depressions that are normally dry except during and immediately following storm events. They can be lined components where surface run-off from regular events is routed through the basin and when the flow rises, because the outlet is restricted, the basin fills and provides storage of run-off and flow attenuation. They can also be off-line components into which run-off is diverted once the flow reaches a specified threshold.	Provides a means of storage for surface water. Can provide and promote wildlife habitat to the landscape areas.	Areas of the site may be feasible to introduce such a technique.
Filtration Trenches and Filter Drains	Filtration trenches provide a means to capture surface water either from above ground overland flows or directly piped into the trench. Surface water is then filtrated via gravel medium which can be tanked or infiltrated into the ground strata.	Provide an array of treatment properties. Provides a means of surface water storage. Slow overland flows and surface run-off.	The proposed site can incorporate such techniques into the drainage strategy.
Rainwater Harvesting	Rainwater harvesting systems entail the provision of buried or above ground tanks that store filtered rainwater for later use. The rainwater is typically pumped into the process network for non-potable use such as irrigation for gardens, and evaporative cooling in the data centre cooling systems. These systems can reduce surface water run-off generated by the development should the demand exceed the supply of rainwater.	They can reduce water demand on the site and provided a means for surface water storage.	The proposed site will have a large water demand and utilising such techniques will reduce demand of the local water supply network.

Attenuation is used throughout the site via the means of a variety of green and brown roofs, the permeable surfacing subbase storage, filtration trenches, attenuation tanks, swales, and a detention basin. The attenuation for this site is approximately 4344.5m^3 as shown in Table 3. It should be noted that the storage shown on the current drainage drawings exceeds the required volume. Some SuDS features are for water treatment purposes and exceedance flows only.

Table 3 Proposed Attenuation Storage

SuDS Type	Area	Depth	Void Ratio	Storage
Green and brown roofs	TBC	TBC	n/a	Not included in volume
Permeable Paving	8344m^2	0.3m subbase storage	30%	750m^3
Filtration Trenches (Tanked)	290m^2	0.6m	30%	56.5m^3
Attenuation Tanks	Varies	2m depth	95%	2980m^3
Swale	600m^2	0.6m depth	n/a	325m^3
Detention Basin	323m^2	1m^2	n/a	323m^3
			Total	4344.5m^3

The belowground drainage strategy also benefits with a rainwater harvesting system on site which provides 230m3 of potential storage across the campus. This acts as a soft water supply for the energy efficient evaporative cooling systems employed in the data centres.

Although these systems will provide additional benefit both in terms of water storage and water quality, they are not included in the flood attenuation calculations summarised in Section 3 above. Nor are they included in the water quality treatment train summarised in Section 5 below.

5.0 WATER QUALITY

The aim of the drainage strategy for the development was to enhance the WFD status of the River Crane, which was classified as poor. Existing surface outfall connections within the River Crane have been utilised and do not receive flows directly from the development without treatment.

The drainage strategy manages all sources of surface water run-off to improve water quality and prevent pollution to the River Crane. In line with the LBH Sustainable Drainage Design & Evaluation Guide and set out in Policy G5 of the Mayors intend to Publish London Plan.

In accordance with Chapter 26.7 of the SuDS Manual the water quality treatment was assessed using the simple index approach criteria. The development consists of mostly commercial roof area and public realm and the pollution hazard indices for this land use are in Table 4.

Table 4 Pollution hazard indices, SuDS Manual Table 26.2

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other Roofs (commercial/industrial roofs)	Low	0.3	0.2	0.05
Low traffic roads (general access roads) and non-residential car parking with infrequent change i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Total		0.8	0.6	0.45

Water quality treatment has been provided by ensuring all run-off is routed through an appropriate treatment via SuDS measures. The drainage strategy improves water quality by utilising green roofs, permeable paving, drainage basin and filtration trenches whereby the level of treatment proposed is appropriate for the use of the area.

With reference to Tables 26.3 of the SuDS Manual the following pollution mitigation index has been reviewed against each contaminant type. Table 5 demonstrates this.

Table 5 Indicative SuDS mitigation indices

Land Use	Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other Roofs (commercial/industrial roofs)	Green Roof (Partial)	0.8	0.7	0.9
	Filtration Trench	0.4	0.4	0.5
	Total SuDS Mitigation	>0.95	>0.95	>0.95

Land Use	Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Low traffic roads (general access roads) and non-residential car parking with infrequent change i.e., < 300 traffic movements/day	Porous Paving	0.7	0.6	0.7
	Filtration Trench	0.4	0.4	0.5
	Swale	0.5	0.6	0.6
	Detention Basin	0.5	0.5	0.6
	Total SuDS Mitigation	>0.95	>0.95	>0.95

The land uses of the development together with the use of SuDS elements ensures all water discharging to the River Crane has an appropriate and acceptable level of treatment using the Simple Index Approach. To represent the how the various water quality treatment stages Figure 1 shows the SUDs Train flow diagram.

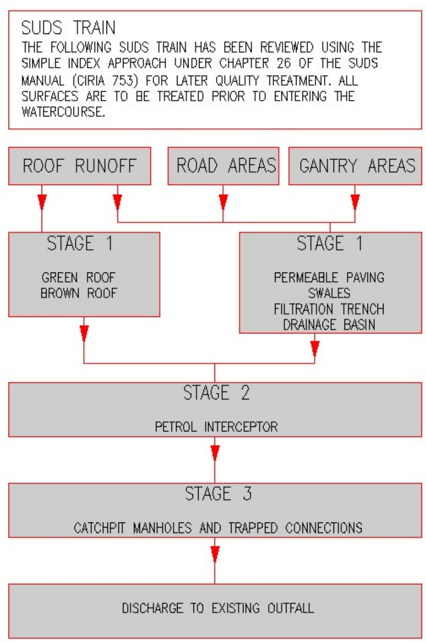


Figure 1 Table showing the proposed SuDS train for water quality treatment within the drainage strategy

6.0 POLLUTION PREVENTION DEVICES

The transformers that are located on the gantry of the data hall buildings are all bunded to cater for the full oil volume of each unit, which will prevent any leaks and spills from entering the drainage network.

The generators are double skinned bunded belly tanks fully welded internally and externally and manufactured to the water environment standard for oil storage. Each tank has capacity for 20% overfill prevention and comes complete with probes suitable for alarming fuel Low-Low, Low, High and High-High. The Tanks OLE C2020-B contents gauge shall provide detailed fuel level information and the tank bund shall incorporate a leak detect float switch to alarm if a leak is detected.

There are 4 petrol interceptors (located in loading dock ramps) and 3 forecourt separators (located at fuel filling areas) onsite. All surface water from the loading dock ramps and fuel refilling areas drains through one of these.

The Porous Asphalt around the main data hall buildings and Energy Centre 1 utilises the Polypipe Permafilter geotextile that is specifically designed for the capture and treatment of hydrocarbons, above the coarse grade aggregate layer. At each outlet from the coarse graded aggregate, Polypipe Permaceptor run-off collection units are provided which collect and treat oils and sediments.

To the south of North Hyde Gardens, the roads and carparks of Visitor Centres 1 and 2 and Energy Centre 2 utilise a traditional permeable block paving with sand bedding, geomembrane and coarse graded aggregate.

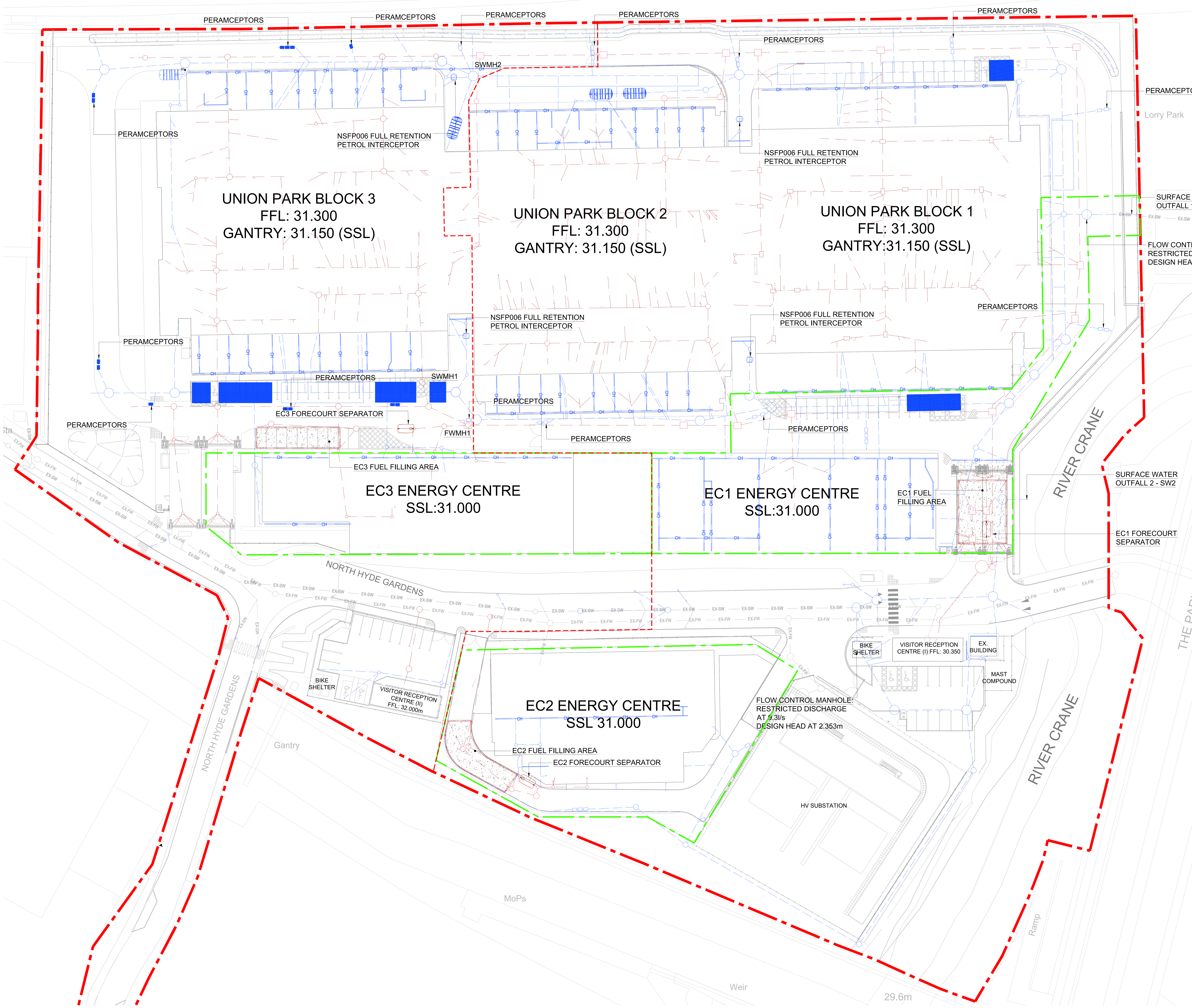
Loading Dock ramps, which are areas that have a higher risk of leak occurring from the vehicles that use them, are drained through a full retention Petrol Interceptor for each loading dock.

Each Energy Centre has dedicated Fuel Filling Point that has concrete surfacing and is bound by channel drains to capture any fuel spills within this area. Spill kits, and spill incidents procedures are stored at the fuel filling points also which enables swift response/escalation in the event of an incident. The drainage from each of these areas is discharged to the foul water network via a forecourt separator which captures any fuel spills. The size of storage in the forecourt separators is based on the compartment size of a fuel tanker. In a worst-case scenario, such as if the fuel tanker's compartment ruptures, the operator forgets to close the valve, or the valve malfunctions,
the fuel is captured and stored in the separator and does not enter the downstream drainage network.

The interceptor and separator tanks will contain a sensor that will be linked to the BMS and trigger an alarm if the presence of fuel is detected. The interceptors have a capacity for 600 litres of silt and 60 litres of oil and the forecourt separator has a capacity to collect up to 10000 litres of fuel. When contaminated water enters the unit, the internal design and configuration ensures lighter than water pollutants, i.e., oil, petrol and diesel rise to the surface of the water within the separator. Separated liquid is discharged through the core tube/coalescer assembly.

An oil probe should be positioned to detect the build-up of oil in no or low flow conditions so that the alarm operates when the oil has accumulated to 90% of the maximum recommended oil storage volume.

APPENDIX A DRAINAGE STRATEGY



LEGEND

PLANNING BOUNDARY	
OPERATOR BOUNDARY	
PERMIT BOUNDARY	
EXISTING SURFACE WATER	
EXISTING PRIVATE FOUL WATER	
EXISTING PUBLIC FOUL WATER	
PROPOSED SURFACE WATER	
PROPOSED BACK DROP	BD
PROPOSED FOUL WATER	
EXISTING THAMES VALLEY SEWER	TVS
PERMEABLE PAVING CONNECTIONS	PP01.XX
RAINWATER & CHANNEL CONNECTIONS (RWP01.XX)	RWP01.XX
DRAINAGE CHANNEL (CH01.XX,FWCH01.XX)	CH
SOIL VENT PIPE & FLOOR GULLY CONNECTIONS (SVP01.XX,FG01.XX)	
GULLY CONNECTION (GU01.XX)	
EXISTING GULLY CONNECTION (EXGU01.XX)	
SEWER NETWORK TO BE ABANDONED	
SWALE (SL01.XX)	
FILTRATION TRENCH (FT01.XX)	
LAND DRAIN (REFER DETAILS)	
FUEL FILLING POINT	
FORECOURT SEPARATOR	
FULL RETENTION PETROL INTERCEPTOR	
DRAINAGE INTERFACE BETWEEN OPERATORS (SWMH1, SWMH2, FWMH1)	SWMH2

NOTES:

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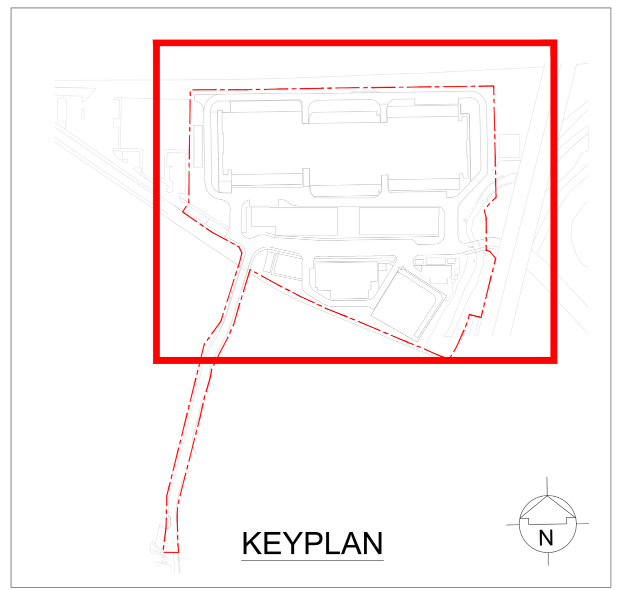

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Architect: NWA

Project: UNION PARK

Title: SITE WIDE BELOW FINISHED GROUND LEVEL FOUL AND SURFACE DRAINAGE SITE LAYOUT

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