Land at former Farmers' Arms, Liverpool Road (A57) Liverpool, L36 2NL

SUDS constrained by filling station operation requirements
Restrict to Greenfield Discharge Rate as feasible
Store for 100% of the 1in100year+45%
Utilize existing connection to separate surface water sewer with betterment

November 2026

SUDS Drainage for Planning

Company Reg 6943362

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EnviroSolution offers a broad set of services that allow the land or property owner or manager to access a suite of services that are not normally available from a single, high quality and professional source.

EnviroSolution has expertise and experience in all aspects of environmental enforcement, regulation and assessment, working in conjunction with the HSE, Local Authorities and Environment Agency. With specific capability in environmental protection and planning policy and control, EnviroSolution has a core knowledge base to assist clients in dealing with Flood Risk issues.

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1.0 Scope

This report contains the details of an FRA and SUDS Drainage Strategy for planning carried out by Envirosolution Ltd for Land at former Farmers' Arms, Liverpool Road (A57), Liverpool, L36 2NL, henceforth referred to as "the site" in this report.

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2.0 Introduction

The information source used to undertake this FRA has been collected from the following sources:

- British Geological Survey Website and iGeology Website
- EA Website, Mapping and Data as appropriate
- **New National SUDS Standards**
- Local Authority: SFRA's, SWMP's policies, mapping and guidance
- Lead Local Flood Authority SUDS guidance
- Internet mapping and searches

3.0 Existing Site Status and Setting

3.1 Site Location and Status

The site comprises an existing Brownfield plot with a connection to the sewers from previous operations. It is majority defined by impermeable areas and existing scrub vegetation.

The site is c. 0.4467ha (4,467.00m2).

3.2 Geology

Geology

Based on BGS mapping and historic on-site borehole

- Bedrock: Pennine Coal Measures Group
- Superficial deposits: Till Devension

Given the superficial geology, proximity to highways on all borders and the nature of the operation, the SUDS strategy necessarily needs to be storage on site with restricted discharge to the existing outfall(s) to the sewer.

There is no need to undertake BRE365 testing at the planning stage because a soakaway is confirmed as not being an option and the scheme has other viable methods being in an existing operating industrial area with sewers confirmed.

3.3 Existing Drainage and Greenfield Runoff rates

There is no evidence of any existing SUDS.

The site has an existing connection to the sewers. It is assumed that it discharges without attenuation to the sewer and surrounding land and probably some small informal soaking in to the ground in lower order storms.

The scheme will remove all informal discharges.

There are confirmed existing viable discharge methods.

The highest options in the SUDS hierarchy will be confirmed by the contractor on site via additional investigations.

See Appendix C for the Greenfield runoff rates.

See Appendix C for the Brownfield rates and the surface water storage requirements discussed in Section 4.4 to 4.5 below.

4.0 Assessment of Proposed Development

4.1 Proposed Development

The proposed development is (Appendix B) comprises:

- New industrial style buildings to house the operation of a Filling Station with associated infrastructure and parking
- **Separate "Dirty" and "Clean" areas with separate surface water drainage systems**
- **Compliant Petrol Interceptor as standard for "Dirty" line of surface water drainage**
- Landscaping to be maximized to be "softened up" at the perimeters where feasible: appropriate to the operation of the site
- Utilise existing surfaces that remain suitable as much as feasible
    - Sustainable approach
- Incorporate non-infiltration modern SUDS to meet EA requirements
- Structure inherently flood resilient
- No need for any floor raising
    - No other ground raising required

- Where pollution prevention guidance allows
    - Maximized hardstanding areas to be permeable with SUDS Source Control subbase storage for natural pollution control
    - Informal lower order storm Infiltration SUDS techniques prioritized and storage fully oversized for restricted discharge to sewer for all other order storm events
    - Maximisation of porous and permeable areas in available suitable non-operational areas as feasible (must be suitable to the operation of the site)
    - Maximisation of highest forms of SUDS as feasible to the operation / connections available at the site

SUDS to be of the highest in the hierarchy feasible at the site

REDUCES FLOOD RISK OVERALL:

- No increase in impermeable areas
- Modern facility
    - Use highest forms of SUDS feasible / suitable to site and scheme which will accommodate for climate change which would not be established without the scheme
    - Use existing drainage runs / extend where necessary
    - **NO soakaways required and not suitable at this site**

4.2 Foul Drainage

Based on proposed development the maximum peak foul discharge generated represents a minimal increase, which is unlikely to give rise to any capacity concerns within the public sewer network.

Subject to the approval of the Water company, it is proposed to connect the foul discharge to the public foul sewer via the existing connection, subject to condition and level.

Subject to exact confirmation of the public sewer invert level and the proposed finished development levels, it is expected that a gravity connection will be feasible.

4.3 Surface Water Drainage Connections / Infiltration

In accordance with the NPPF, PPG and LLFA policy requirements, sustainable drainage systems (SUDS) should be incorporated wherever possible to reduce positive surface water run-off and flood risk to other areas.

As a precaution for the discharge connection, so as not to rely on an unknown and to demonstrate a worse case of SUDS storage on site with restricted discharge, it is recommended that SUDS techniques are restricted to the use of the highest forms of SUDS feasible i.e. surface storage, with also permeable paving and underground storage.

It is proposed to provide an attenuation based surface water strategy to serve run-off from the proposed roof area; no restriction device is required given the extreme runoff rate is lower than the lowest suitable restriction rate.

Purely to show a precautionary approach that the worse case storge can be fitted in to the site, we based the storage on no soakaway and restricted discharge to the lower greenfield rate feasible for the site.

4.4 SUDS Storage Calculations

- Assume storage for 100% of the 1in100year and climate change
- Assume the site is 100% impermeable
    - Development area is c. 4,467m2 be developed is operationally requiring formal drainage
- Use 45% climate change
- Restrict to 2.0l/s for purposes of planning stage design

4.4b Windes and FEH Storage Calculations for Sensitivity Check

We provide below detailed calculations to show how even using the worse case input, including for climate change, the scheme has included more SUDS storage than is required as future-proofing.

1in100year+45% and maximum 2.0l/s controlled:

Brownfield Runoff Rates

EXISTING BROWNFIELD RUNOFF RATES (MODIFIED RATIONAL METHOD)

Calculated based on standard industry runoff coefficients (Cr = 0.70) for the pre-development brownfield configuration:

Return Period	Estimated Peak Intensity (mm/hr)	Brownfield Runoff Rate (l/s)	Proposed Restricted Rate (l/s)	Reduction Factor
1-in-1 Year Event	25.0	21.7 l/s	2.0 l/s	10.9x
1-in-30 Year Event	50.0	43.5 l/s	2.0 l/s	21.7x
1-in-100 Year Event	70.0	60.8 l/s	2.0 l/s	30.4x

Storage Calculations

SOURCE CONTROL ANALYSIS — 100 YEAR + 45% CC STORM SIMULATIONS

Storm Duration (mins)	Rain Depth (mm)	Rain Int. (mm/hr)	Total Inflow (m^3)	Total Outflow (m^3)	Storage Volume (m^3)	Status
15 min Winter	55.1	220.5	246.3	1.8	244.5	OK
30 min Winter	63.7	127.3	284.4	3.6	280.8	OK
60 min Winter	72.2	72.2	322.6	7.2	315.4	OK
120 min Winter	80.8	40.4	360.7	14.4	346.3	OK
240 min Winter	89.3	22.3	398.9	28.8	370.1	OK
360 min Winter	94.3	15.7	421.2	43.2	378.0	OK
480 min Winter	**97.8**	**12.2**	**437.1**	**57.6**	**379.5**	**CRITICAL**
720 min Winter	102.8	8.6	459.4	86.4	373.0	OK
1440 min Winter	111.4	4.6	497.5	172.8	324.7	OK

- **100% impermeable site:**
  - **379.50m3 storage**
  - **See Windes calculations in Appendix C**

The scheme provides a minimum of 477.13m3.

Regulatory Note: Due to practical constraints of orifice design to prevent blockages, a minimum allowable discharge limit of 2.0 L/s is adopted across all storm profiles using a vortex flow control device.

Due to the sensitivity of the operations at the site, the Filling Station specifications for surfacing require surfaces are also majority retained as or are new reinforced concrete.

The need for SUDS cannot override the safety requirements and hence the council and NPPF requirements for SUDS are not applicable for these areas.

However, there are areas on the perimeter which permit the inclusion of SUDS Source Control (greener / "softer") measures.

Additional tanking underground in the forecourt area / access areas for surface is considered the back up approach. The new car parking will not be permeable; this is a safety requirement at this site and the majority area HGV parking areas.

However, as a sensitivity check:

There are available "non -dirty" areas which can be used for SUDS within the site boundary.

Ciria Strict Guidance Pollution Control

Due to the high pollution hazards defined by the CIRIA SuDS Manual (C753), CIRIA specifies a mandatory multi-stage containment system consisting of a Class 1 Full Retention Fuel Separator (shown on the drainage drawing), ahead of an underground geocellular crate matrix fully encapsulated within a hydrocarbon-resistant geomembrane liner.

"Clean areas" only (Roof and non-petrol areas)

A. Source Control SUDS storage:

- Pea Gravel linear area / Type 3 subbase under porous planting or permeable paving area with granular subbase
- This is an area in total of c. 25m by 1.1m
- This can accommodate a lined subbase of Type 3 No Fines granular material
- At 0.2m depth
- Sub Total of c. 5.5m3 of storage
- Assume 30% void space for Type 3 No Fine granular material
    - 1.65m3 of SUDS storage

B. Cellular Attenuation before discharge

- 18.2m by 12.2m at 1.8m depth = 399.67m3
- Assume 95% void ratio
- **= 379.68m3**

“Dirty Areas” Only

1 Number Cellular Storage Tank

1.6m deep with a length of 12.110m and width of 5.205m = 100.85m3

Assume 95% void ratio as cellular

= 95.80m3

Cellular Storage areas with discharge via Vortex Control and Petrol / Pollution Interceptors from Network of Gulley Drains.

With respect to other SUDS techniques, the majority of the proposed scheme is not suitable for the use of a green roof (lightweight structure for the sales building) or internal rainwater harvesting or rainwater butts.

It will be necessary for the surface water drainage system to comply with the Environment Agency’s pollution prevention guidance. Roof run-off is classified as uncontaminated and, in accordance with EA pollution prevention guidance, will not require any treatment. Any surface water run-off draining through the lined pea gravel area with angular granular subbase will receive an adequate level of filtration through the associate substrate but will not enter the ground below.

Design for Exceedance

The scheme has been designed with perimeter porous areas which can contain all non dirty surface water including roof rainwater.

The scheme has also been designed to address the “dirty water” areas of operation using gully drains with oil interceptors, draining to a storage tank before discharging to the sewer.

All these areas drain away from the perimeter and in to the site not away from the site.

This will be confirmed as part of detailed setting out and levels setting as part of detailed design.

4.5 SUDS Specifications: SUDS Hierarchy Compliant

Formal SUDS Type	Source Control	Dimensions	Storage Volume
Soft landscape buffer areas Can incorporate swales	YES	Included	Not required to meet the total storage volume
Permeable Surfacing for the hardstanding areas where feasible for operation uses	YES	n/a	n/a
Select area of porous / permeable areas with lined granular underground storage	YES Permeable paving takes roof runoff	Area of c. 25m by 1.1m This can accommodate a lined subbase of Type 3 No Fines granular material At 0.2m depth Sub Total of c. 5.5m3 of storage Assume 30% void space for Type 3 No Fine granular material 1.65m3 of SUDS storage	1.65m3
Cellular storage areas for "dirty forecourt) with Petrol Interceptor immediately upstream	Part if via permeable paving first	1.6m deep with a length of 12.110m and width of 5.205m = 100.85m3 Assume 95% void ratio as cellular = 95.80m3	95.80m3
Cellular Storage area for "clean" areas including roof and non petrol forecourt areas	Part if via permeable paving first	• 18.2m by 12.2m at 1.8m depth = 399.67m3 •Assume 95% void ratio •= 379.68m3	379.68m3
		Total	**477.13m3** **Greater than the worse case required**
Sedum / Green Roof Areas	YES	On the flat roofs if structurally feasible without increasing embodied carbon	Feasible and to be looked into in order to further maximise the compliance with the New National SUDS Standards

This is betterment with future-proofing for the 100 year lifetime of the scheme with climate change and reduces flood risk to and from the infrastructure.

4.6 Sedum & Green Roofs

The rooftop areas have not been included as part of the final total SUDS storage volumes because of the nature of the structures: lightweight and additional weight at height is not feasible without significant structural changes which increases embodied carbon.

The SUDS strategy has been done in this way at this stage so there is no reliance on an unknown to demonstrate compliance.

4.7 Pipe Sizes / Manholes / Pipe Runs

The pipe sizes, runs, inverts and manholes will be confirmed as part of detailed designs; specifications of landscaping and drainage products need to be confirmed through planning and at a later date.

This is not required at this stage to demonstrate scheme can accommodate the surface water flows or meet LLFA requirements.

Further Enhancements

The SUDS strategy does not rely on any green roof areas to meet the required storage volumes.

Whilst internal rainwater harvesting is not proposed, rainwater pipes do not need to be fitted with water butts as there is no need for formal irrigation. (Regardless, whilst the use of water butts won't reduce the design criteria of the receiving below ground drainage system, their use provides a supply of water for irrigation rather than using potable water).

It will be necessary for the surface water drainage system to comply with the Environment Agency's pollution prevention guidance. Roof run-off is classified as uncontaminated and, in accordance with EA pollution prevention guidance, will not require any treatment. Any surface water run-off draining through permeable paving and the granular storage will receive an adequate level of filtration through the associate substrate.

4.8 Maintenance

With respect to maintenance, the proposed SUDS techniques should be maintained in accordance with the appropriate regimes set out within the SUDS manual and will be the responsibility of the owner / management company.

5.0 Conclusion

The scheme is re-using an existing Brownfield site and will significantly improve the SUDS on the site as required by legislation and local policy.

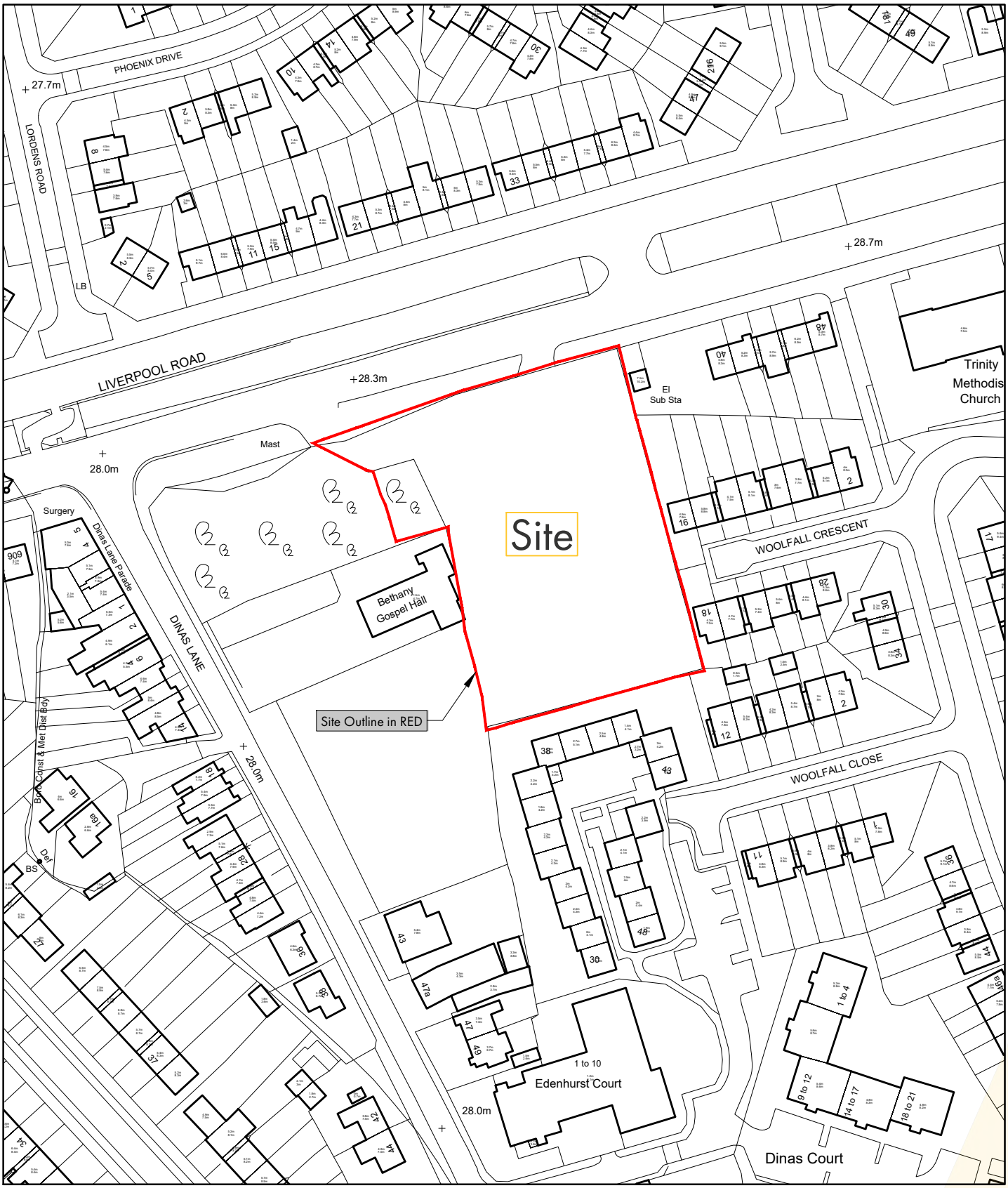
SUDS incorporated as betterment suitable to the site constraints and pollution management required for a filling station.

Modern flood resilient scheme as betterment.

The SUDS are oversized and appropriate to the nature of the operation at the site.

APPENDICES

APPENDIX A



Location Map Scale 1:1250

1:1250

25m 0 25m 50m 75m 100m 125m

Stage	Project No.	Dwg.No.	Rev	Page Size	Scale	Date	Work Status	Drawn By	Checked By
3	3736	01	A	A4	1:1250	May 26	Developed Design	KD	DC

rev	description	date	by
Rev B	Planning Consultant Amendments	08.06.26	KD
Rev A	Planning Consultant Amendements	02.06.26	KD

Project Title
Proposed Development Of Lands At
Liverpool Road (A57),
Liverpool, L36 2NL.

Drawing Title
Location Map

Client
LCC Group Ltd

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APPENDIX B

Note:
Petroleum Infrastructure to meet the requirements set out in the (Apea Blue Book 5th Edition) Guidance for Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations.

Existing Footpath

Vent Stack

Control Room + Store

Offset Fill Point + HGV Bunkering Canopy (1 Pump Island)

Existing Fence Retained Around Site.

New 3.0m high Jakoustic Fence (Noise Barrier) Around Site.

Existing Foul Mains to be Removed between Manhole F3 and F14
to be connected to existing Public Foul (in accordance with United Utilities Details and Specifications)

Diverted Foul Mains
to be connected to existing Public Foul (in accordance with United Utilities Details and Specifications)

A min 5.0m Wide Landscaped Buffer Zone is proposed around the boundary of the site between the existing residential and the development
Note: Refer to Ecology Report for Detailed Planting and Maintenance schedule

Proposed Lance Washes & Canopy (4 Bays)

New PCP

4.5m x 120m Sight Lines to Access

Exit Signage

Existing access arrangement realigned Aco Channels provided to prevent water flowing onto public road, New Tactile Finishes to both access

New PCP

New 3.0m high Jakoustic Fence (Noise Barrier) Around Site.

Existing Fence Retained Around Site.

Proposed Valet Bays (2 bays) + EV Charging Point (2 bays)

Existing Dwellings

UG Tank Farm

6,000l Car Wash Interceptor

10,000l Petrol Interceptor

Existing Footpath Realigned

Services Bay Air/Water Vac

Existing Mains Water Supply & Wayleave (Max 5m Shown)
Note: No Structural constructed within Wayleave as per discussions with United Utilities.

New PCP

Entrance Signage

Existing access arrangement realigned Aco Channels provided to prevent water flowing onto public road, New Tactile Finishes to both access

Existing Foul Mains
to be connected to existing Public Foul (in accordance with United Utilities Records)

New PCP

Existing Fence Retained Around Site.

Double Drive Thru Wash
Note: Drive-thru car wash housing shall provide a sound reduction of 30 dB, Achieved by two 30mm Kingspan KS1000RW panels

Existing Dwellings

Underground Attenuation Tank

Proposed Forecourt Canopy with 4 Islands.

Existing Electric Substation

4.5m x 120m Sight Lines to Access

New 3.0m high Jakoustic Fence (Noise Barrier) Around Site.

Existing Footpath

Existing Dwellings

Codes:

28.66 Proposed Levels

Finishes

Paving To Driveway Areas
Paving Blocks 200x100x60mm as supplied by Tobermore laid in a Herringbone pattern on a layer of 50mm sand bedding on
50mm concrete screed in accordance with BS en 7533 on
225mm Reinforced Concrete (C35 Sulphate Resistant) on
300mm Granular Sub-Base
Type 3 hardcore compacted in 225mm layers max.
Overall Depth as Specified by Engineer.

Paving Layout Paths Flanked Areas
Paving Blocks 200x100x60mm as supplied by Tobermore laid in a Herringbone pattern on a layer of 50mm sand bedding on
Type 3 hardcore compacted in 225mm layers max.
Overall Depth as Specified by Engineer.

Paving Layout at Boundary Fence
Paving Blocks 200x100x60mm as supplied by Tobermore laid in a Soldier Course pattern along Existing Fence + row of Soldier Course on a layer of 50mm sand bedding on
Type 3 hardcore compacted in 225mm layers max.
Overall Depth as Specified by Engineer.

Concrete Areas
Existing concrete 3% str armoured with 2 layers of A252 mesh top & bottom.
40mm cover min top 450mm, on
1200 gauge polythene sheet dpc membrane, on
50mm Sand Blinding, on
Type 3 hardcore compacted in 225mm layers max.
Overall Depth as Specified by Engineer.

Vehicular Asphalt Areas & Service Bays
Wearing Course
To be 50mm thick (Compacted Depth) Hot Rolled Asphalt to B.S. 594 Part 1:2000
Close Graded to 6/4 Schedule 1.
Base Course
100mm Thk (Compacted Depth) 20mm size Dense Base course Macadam in Accordance with BS 4987-1993 Cl.6.3 on Type 2 Hardcore compacted in 225mm layers max. Overall Depth as Specified By Engineer.

Pedestrian Asphalt Areas
Wearing Course
13% course Aggregate Hot Rolled Asphalt to BS4456 Part 1:1992, Table 6, Cat. 6/2, schedule 1b, compacted depth 25mm and clean dry light coloured chippings rolled in to surface.
Base Course.
20mm size dense b/c bitumen macadam in accordance with bs4987-1988 Cl. 6.3 is a compacted depth of 50mm on 63mm nom. on Type 3 hardcore compacted in 225mm layers max Overall Depth as Specified By Engineer.

Landscaped Area
Allow for low maintenance shrubs on Grassd finish to these areas

Drainage Codes

Indicates existing sewer Line running through proposed development site (indicative) to be removed

Indicates existing sewer line running through proposed development site (indicative0 to be diverted

Proposed Manhole

Manhole Covers	Type
Pedestrian Landscaped Areas	A15
Carparks/Footpaths/Private Drives	B125
Public roads/ Parking areas	D400
Areas subject to High wheel Loads	F900

Proposed Road Gully and Connection Line

Aco Channel

Drainage Way Leaves Codes

Indicates existing water mains pipe line (indicative) incorporating 10m wide easement (5m either side of pipe centreline, United Utilities)

Indicates proposed new public foul sewer pipe line (indicative, redirected) incorporating 6m wide way leave (3m either side of pipe centreline, United Utilities)

Site Layout Plan

Scale 1:200

1:200
4m 0 4m 8m 12m 16m 20m

Page Size	Scale	Date
A1	1:200	May 26

Work Status	Drawn By	Checked By
Developed Design	KD	DC

Project Title

Proposed Development Of Lands At
Liverpool Road (A57)
Liverpool, L36 2NL

Rev	description	date	by
B	Red Line Amended	08.06.26	KD
A	Planning Consultant Amendments	02.06.26	KD

Stage	Project No.	Dwg.No.	Rev
3	3736	01-02	B

Drawing Title
Site Layout Plan
General

Client
LCC Group Ltd

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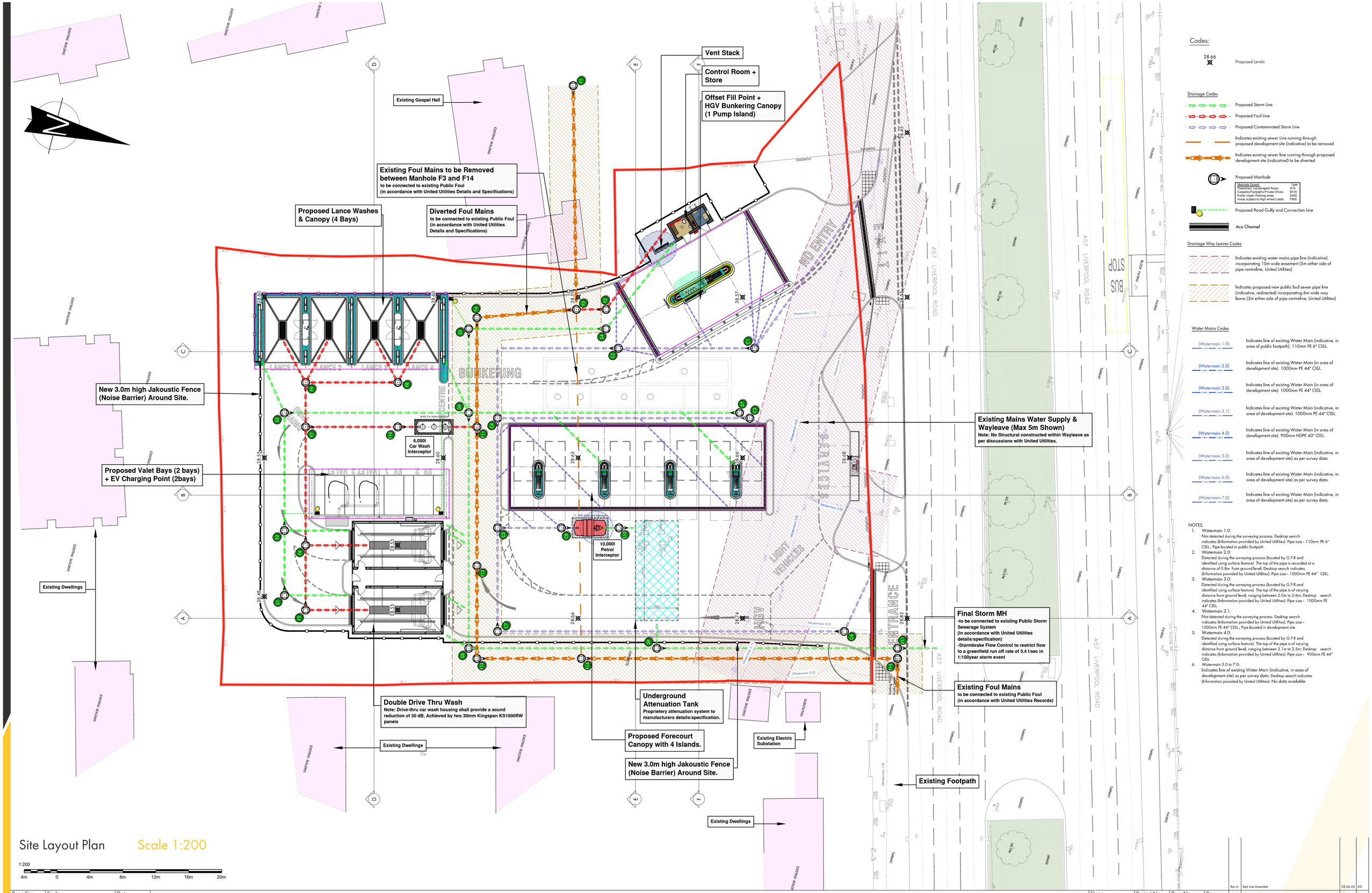

Codes:

28.66 Proposed Levels

Drainage Codes

- Proposed Storm Line
- Proposed Foul Line
- Proposed Contaminated Storm Line
- Indicates existing sewer Line running through proposed development site (indicative) to be removed
- Indicates existing sewer line running through proposed development site (indicative0 to be diverted
- Proposed Manhole

Manhole Covers	Type
Pedestrian/ Landscaped Areas	A15
Carparks/Footpaths/Private Drives	B125
Public roads/ Parking areas	D400
Areas subject to High wheel Loads	F900

- Proposed Road Gully and Connection Line
- Aco Channel

Drainage Way Leaves Codes

- Indicates existing water mains pipe line (indicative) incorporating 10m wide easement (5m either side of pipe centreline, United Utilities)
- Indicates proposed new public foul sewer pipe line (indicative, redirected) incorporating 6m wide way leave (3m either side of pipe centreline, United Utilities)

Water Mains Codes

- (Watermain 1.0) Indicates line of existing Water Main (indicative, in area of public footpath). 110mm PE 6" CISL.
- (Watermain 2.0) Indicates line of existing Water Main (in area of development site). 1000mm PE 44" CISL.
- (Watermain 3.0) Indicates line of existing Water Main (in area of development site). 1000mm PE 44" CISL.
- (Watermain 3.1) Indicates line of existing Water Main (indicative, in area of development site). 1000mm PE 44" CISL.
- (Watermain 4.0) Indicates line of existing Water Main (in area of development site). 900mm HDPE 40" CISL.
- (Watermain 5.0) Indicates line of existing Water Main (indicative, in area of development site) as per survey data.
- (Watermain 6.0) Indicates line of existing Water Main (indicative, in area of development site) as per survey data.
- (Watermain 7.0) Indicates line of existing Water Main (indicative, in area of development site) as per survey data.

NOTES.

1. Watermain 1.0:
   Not detected during the surveying process. Desktop search indicates (Information provided by United Utilities): Pipe size - 110mm PE 6" CISL.; Pipe located in public footpath.
2. Watermain 2.0:
   Detected during the surveying process (located by G.P.R and identified using surface feature). The top of the pipe is recorded at a distance of 0.8m from ground level. Desktop search indicates (Information provided by United Utilities): Pipe size - 1000mm PE 44" CISL
3. Watermain 3.0:
   Detected during the surveying process (located by G.P.R and identified using surface feature). The top of the pipe is of varying distance from ground level, ranging between 2.0m to 2.6m; Desktop search indicates (Information provided by United Utilities): Pipe size - 1000mm PE 44" CISL.
4. Watermain 3.1:
   Not detected during the surveying process. Desktop search indicates (Information provided by United Utilities): Pipe size - 1000mm PE 44" CISL.; Pipe located in development site.
5. Watermain 4.0:
   Detected during the surveying process (located by G.P.R and identified using surface feature). The top of the pipe is of varying distance from ground level, ranging between 2.1m to 2.5m; Desktop search indicates (Information provided by United Utilities): Pipe size - 900mm PE 44" CISL
6. Watermain 5.0 to 7.0:
   Indicates line of existing Water Main (indicative, in area of development site) as per survey data. Desktop search indicates (Information provided by United Utilities): No data available.

Site Layout Plan

Scale 1:200

1:200

4m 0 4m 8m 12m 16m 20m

Page Size	Scale	Date
A1	1:200	May 26

Work Status	Drawn By	Checked By
Developed Design	KD	DC

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Proposed Development Of Lands At
Liverpool Road (A57)
Liverpool, L36 2NL

Rev	rev	description	date	by
Rev A	Red Line Amended		08.06.26	KD

Stage	Project No.	Dwg.No.	Rev
3	3736	01-03	A

Drawing Title
Site Layout Plan
Drainage

Client
LCC Group Ltd

CLARMAN ARCHITECTS
Unit 1, 33 Dungannon Road, Cookstown, Co Tyrone, Tel 02887 767900 , e-mail: em@clarman.com

APPENDIX C

Surface Water Drainage Hydrological Report

MicroDrainage™ Source Control Formatting Style

Project/Site Location:	Farmers' Arms, Liverpool Road (A57)	**Postcode:**	L36 2NL
Total Site Area:	4,467.00 m² (0.4467 ha)	**Existing Surface:**	100% Impermeable (Brownfield)
Climate Change Risk:	+45% Peak Intensity Allowance	**Limiting Discharge:**	2.0 l/s Restricted Outfall

> **Hydrological Sizing Summary:**
> A comprehensive baseline assessment has been executed comparing original **Greenfield Runoff Rates** (using the pro-rata IH124 formula for small catchments) against active **Pre-development Brownfield Rates** (via the Modified Rational Method). Post-development discharge is heavily constrained to mitigate surface flooding downslope.

1. Greenfield Runoff Rates (IH124 Regional Methodology)

Calculated pro-rata from a 50 ha catchment baseline utilizing typical hydrological matrices for the Liverpool region (Region 10).

SAAR (Standard Rainfall):	860 mm / annum	**Soil Vector Index:**	SOIL Type 3 (SPR = 0.37)
Base Mean Annual Flood (QBAR):	1.63 l/s	**Calculated Footprint Basis:**	0.4467 Hectares

Return Period Storm Event	Regional Growth Factor	Calculated Peak Greenfield Rate (l/s)
1-in-1 Year Return Event	0.85	1.39 l/s
QBAR (Mean Annual Flow Baseline)	1.00	1.63 l/s
1-in-30 Year Design Horizon	2.30	3.76 l/s
1-in-100 Year Critical Risk Event	3.19	5.21 l/s

MICRODRAINAGE SOURCE CONTROL REPORT

Hydraulic Design & Storage Volume Calculations — WinDes Style Output

Site Name:	Farmers' Arms	**Date:**	10/11/2026
Address:	Liverpool Road (A57), Liverpool, L36 2NL	**File Ref:**	FA-SWM-001-V3

DESIGN PARAMETERS & SITE PROFILE

Total Site Area	4,467.00 m²	*(0.4467 hectares)*
Proposed Impermeable Area (100%)	4,467.00 m²	PIMP = 100%
Climate Change Allowance	+45 %	Applied to 100-year depths
Permitted Discharge Rate (Q-Limit)	2.0 l/s	Hydro-Brake® Controlled

EXISTING BROWNFIELD RUNOFF RATES (MODIFIED RATIONAL METHOD)

Calculated based on standard industry runoff coefficients (Cr = 0.70) for the pre-development brownfield configuration:

Return Period	Estimated Peak Intensity (mm/hr)	Brownfield Runoff Rate (l/s)	Proposed Restricted Rate (l/s)	Reduction Factor
1-in-1 Year Event	25.0	21.7 l/s	2.0 l/s	10.9x
1-in-30 Year Event	50.0	43.5 l/s	2.0 l/s	21.7x
1-in-100 Year Event	70.0	60.8 l/s	2.0 l/s	30.4x

SOURCE CONTROL ANALYSIS — 100 YEAR + 45% CC STORM SIMULATIONS

Storm Duration (mins)	Rain Depth (mm)	Rain Int. (mm/hr)	Total Inflow (m³)	Total Outflow (m³)	Storage Volume (m³)	Status
15 min Winter	55.1	220.5	246.3	1.8	244.5	OK
30 min Winter	63.7	127.3	284.4	3.6	280.8	OK
60 min Winter	72.2	72.2	322.6	7.2	315.4	OK
120 min Winter	80.8	40.4	360.7	14.4	346.3	OK
240 min Winter	89.3	22.3	398.9	28.8	370.1	OK
360 min Winter	94.3	15.7	421.2	43.2	378.0	OK
480 min Winter	**97.8**	**12.2**	**437.1**	**57.6**	**379.5**	**CRITICAL**
720 min Winter	102.8	8.6	459.4	86.4	373.0	OK
1440 min Winter	111.4	4.6	497.5	172.8	324.7	OK

SUDS STORAGE & ATTENUATION STRUCTURE SIZING SUMMARY

Critical Design Volume Required	**379.5 m³**	(Based on 480 min Winter Storm)
Assumed SuDS Structure Void Ratio Matrix	95 %	(Geocellular Crates)
Effective Target Void Volume Required	399.5 m³	(Gross physical tank structure)
Design Structure Depth	1.20 m	(Below finish floor level)
Required Plan Footprint Area	**332.9 m²**	**(e.g., 20.0m x 16.6m matrix)**

This is for informational purposes only. For medical advice or diagnosis, consult a professional. AI responses may include mistakes.

Report produced by MicroDrainage-Style Emulation Engine. Checked in accordance with CIRIA C753 guidelines.