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Drainage Strategy Report

COACH ROAD, WHITEHAVEN

23-C-16902

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CONTENTS

APPENDICES

1.0 INTRODUCTION

A L Daines & Partners LLP (ALD) have been engaged to undertake a Surface and Foul Water Drainage Strategy, in accordance with the National Planning Policy Framework (NPPF) [1] for the proposed creation of 35 dwellings on land adjacent to Coach Road, Whitehaven. It is noted that there is an extant planning approval on site (4/14/2124/0F1) to provide an extra care and dementia facility for people aged 55 and over for the site. For reference the facility included a three-storey apartment building providing 56 units and 4 bungalows.

The location details of the proposals are detailed below:

- land adjacent to Coach Road, Whitehaven. CA28 9DF
- National Grid Reference: Eastings 297408 Northings 517416

The purpose of this report is to provide a strategy to manage surface and foul water flows from the site, in support of the planning application, while fulfilling the requirements of the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA).

2.0 PLANNING POLICY

NPPF footnote 50 states that "*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; 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*."

Paragraph 165 reads *"Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*

a) take account of advice from the lead local flood authority.
b) have appropriate proposed minimum operational standards.
c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
d) where possible, provide multifunctional benefits."

A major development, as per The Town and Country Planning Order 2015, is partly, but not wholly, categorised as development involving the provision of dwellinghouses where the number of dwellinghouses to be provided is 10 or more and a development carried out on a site having an area of 1 hectare (ha) or more.

The Cumbria Minerals and Local Waste Plan – Strategic Flood Risk Assessment (June 2018) references the same criteria for local planning policy.

The site is therefore to be classed as a major development under the above criteria due to the proposals having greater than 10 dwellinghouses and a site area greater than 1ha.

3.0 PLANNING POLICY IN SITE CONTEXT

The site covers 1.039ha of brownfield land and according to the most recent Environment Agency (EA) flood risk maps, lies within Flood Zones 2 and 3. The area where the housing is proposed on site is located within Flood Zone 2 with an area designated as Flood Zone 3 at the proposed access location onto Coach Road. The flood risk mapping provided by the Environment Agency is detailed within *Appendix A* of this report.

The NPPF site categorisation Table 1.1 puts a residential development of this nature within the 'More vulnerable' category. Developments in the 'More vulnerable' category are appropriate within Flood Zone 2 and should be accompanied by a Flood Risk Assessment (FRA). A separate detailed FRA has been submitted as part of the planning application and has been included in *Appendix B* for reference.

4.0 SITE PLAN

The proposed development is located on an existing area of brownfield land to the north of Coach Road, Whitehaven (as shown on red line bordered plan in *Figure 1)*. The site is bounded by the culverted Pow Beck to the west and a section of the Coast 2 Coast cycle route to the east. The total site area is approximately 1.039ha in area with approximately 0.5ha covered in hardstanding. The remaining section, to the east of the site, is covered in scrubland. The proposed site plan is included within *Appendix C*.

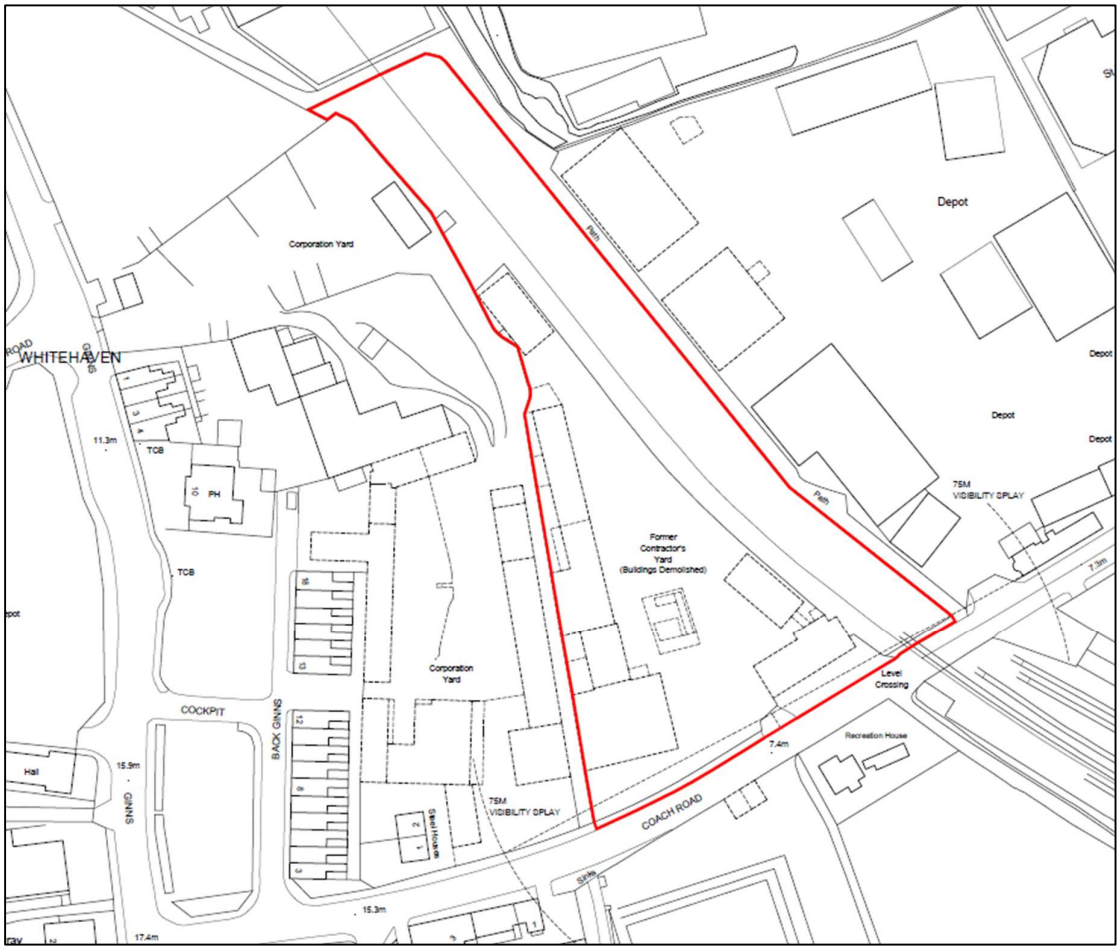

Figure 1: Location plan

5.0 DEVELOPMENT DESCRIPTION

The proposed development will see one new access created off Coach Road, Whitehaven leading to a new 35 dwelling housing development on the 1.039ha brownfield site. The brownfield site, prior to demolition, previously consisted of several commercial businesses including:

- A two-storey office block.
- A small detached commercial unit.
- A series of commercial units occupied the western section of the site.
- A brick-built low rise structure housing two fuel pumps was located to the east of the commercial units.

A topographical survey of the proposed development site was undertaken in October 2022 with the results located within *Appendix D*. A review of the topographical survey carried out at the site indicates ground levels range between 6.72m to 8.45m above Ordnance Datum (AOD). The lower elevations are present to the north of the site, and higher elevations to the west of the site bounded by Pow Beck.

The proposed development hardstanding areas are split as follows:

- 35 Dwellings = 0.189ha
- Roads and Driveways = 0.254ha
- Compensatory Floodplain Storage = 0.098ha

6.0 PERMEABILITY AND SOIL PROFILE

British Geological Survey (BGS) and Land Information Systems (LandIS) mapping services have been used determine the following land make-up:

- Bedrock: Pennine Middle Coal Measures Formation - Mudstone, siltstone, and sandstone.

- Superficial drift: Alluvium - Clay, silt, sand, and gravel.

- Soil: Soilscape 20 - Loamy and clayey floodplain soils with naturally high groundwater.

As part of the site investigations undertaken as part of the previously approved planning application 4/14/2124/0F1, it was identified that the site sits over varying depths of contaminated made ground over alluvium clays, sands, and gravels. It was concluded that these ground conditions are not favourable for the use of infiltration techniques for the disposal of surface water. This was accepted by the Local Planning Authority and as such infiltration techniques for the disposal of surface water are not proposed as part of the proposals to create 35 new dwellings. The ground investigation study is included within *Appendix E* of this report.

7.0 CURRENT FOUL AND SURFACE WATER DRAINAGE PROVISION

Existing watercourses

Along the western boundary of the site is a culverted section of Pow Beck as is illustrated within the drawing number 23-C-16902-001 and 23-C-16902-002 submitted as part of the planning application. Drawings 23-C-16902-001 and 23-C-16902-002 are also located within *Appendix J* of this report.

Existing sewers

As shown within *Appendix F* of this report, an adopted United Utilities (UU) combined sewer is located within Coach Road to the south of the proposed development site. In addition, an adopted surface water sewer flows across the development site from east to west. Existing on-site drainage for both foul and surface water discharges into the combined sewer within Coach Road to the south of the development site. It is noted that the existing surface water discharge rate is unrestricted.

8.0 SURFACE WATER DRAINAGE STRATEGY

The aim of the strategy is to provide a design which will avoid, reduce, and delay the discharge of surface water flows into public sewers and watercourses. This will aid in the protection of watercourses but will also ensure that no knock-on effects are seen beyond the site and that the risk of localised flooding and pollution within the site are reduced as far as possible.

To satisfy these criteria, surface water flows shall be subject to assessment via the hierarchy of drainage in accordance with the LASOO Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance. The hierarchy is as follows:

Hierarchy options:

1. Drain 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.

The drainage strategy for the site is to be developed using the second level on the above hierarchy for the following reasons:

Drain into the ground (infiltration)

As detailed within section 6.0 of this report, it is considered that the development site is not suitable for infiltration as the preferred method of surface water disposal.

Surface Water Body

It is proposed to discharge surface water into the culverted Pow Beck to the west of the development site at the greenfield runoff rate (QBar) of 3.1l/s. Attenuation will also be provided on site to accommodate storm events up to and including a 6 hour 1 in 100 year plus 50% to account for climate change storm event. The MicroDrainage calculations demonstrating the attenuation can be safely accommodated on site are located within *Appendix G*. The contributory areas plan used to determine the site areas is located within *Appendix H*.

Surface water sewer, highway drain or another drainage system – Preferred method of discharge

As per the previous planning approval, the existing surface water connection from the development site to the combined sewer within Coach Road will be terminated and no runoff from the development will be discharged into Coach Road. This will contribute towards reduced flood risk from this source.

To a combined sewer

n/a

9.0 SURFACE WATER PROPOSED DESIGN

The greenfield run off calculations, via the ICP SuDS Mean Annual Flood method, have been calculated for the proposed development site and are detailed below. The detailed greenfield runoff calculations, generated by MicoDrainage are located within *Appendix I.*

AEP (%)	Rate (l/s)
QBAR	3.1
100	6.4
33.3	5.2
1	2.7

In accordance with the earlier mentioned hierarchy of drainage options, the system has been designed to utilise underground attenuation to offer the best solution for surface water drainage.

As per the LASOO guidance, the design is required to prevent flooding to any part of the site for storms up to and including the 1:30yr rainfall event, while any exceedance for the 6 hour 1:100yr event should be controlled within the site and should not flood any properties or service areas. In this case, the storage systems are to be sized to store the full 1:100yr events without any overland flow or above ground storage.

Consideration of SuDS components

A range of SuDS components are available and have been considered for use. Their applicability to the site has been addressed below:

- Rainwater harvesting – suitable for use on the site, however there is no guarantee the systems will be able to capture flows if already at capacity from previous events. Discounted for site flow calculations.
- Green roofs – suitable for use on the site, however due to the nature of the properties and low volume control potential these have been discounted for inclusion within the site flow calculations. Plot owners may still choose to use these and should be encouraged to do so where they would be appropriate.
- Soakaways – As noted previously, underlying ground conditions make infiltration-based SuDS components not viable.
- Water butts – suitable for use but their effectiveness is dependent on homeowner maintenance which cannot be enforced. Discounted for site flow calculations.
- Permeable paving – As noted previously, underlying ground conditions make infiltration-based SuDS components not viable. However, permeable pavements are an option for the storage of surface water for driveways on site. **Limited Viability**
- Swales – Not considered due to their large land uptake and porosity of the ground.
- Filter drains – Not required.
- Detention basins – Insufficient space on site to accommodate detention basins.
- Ponds/wetlands – Insufficient space on site to accommodate ponds and wetland.
- Underground closed storage crate/tank systems – **Viable**

Climate change

Environment Agency guidance issued in 2022 estimates that peak rainfall intensity will increase due to climate change over the next 100 years. There is therefore an allowance of 50% attributed to the 30yr and 100yr storm event calculations in line with the Upper End estimate of rainfall increases for small and urban catchments.

Compensatory Storage

Planning policy requires that new developments cannot cause detrimental flooding impacts to areas upstream or downstream of a site. Developments within a floodplain may remove areas where floodwater is stored during a flood and can displace floodwaters. There is thus the potential that flood levels surrounding the site could be increased without careful design consideration.

To ensure there is not a detrimental flood risk impact to neighbouring areas, any development resulting in a loss of floodplain storage may be required to provide compensatory storage to negate these potential impacts. The amount of compensation required is dependent on:

- The footprint of any development within the floodplain, and
- The potential depth of flooding in these areas. Together these factors indicate the potential volume of floodwater that could be displaced by development.

As detailed within the FRA submitted as part of this application, if flood water were to be kept out of the dwellings this would equate to a maximum loss of approximately 1,269.11m^3 of flood water during a 0.1% flood event. The surrounding driveways, access and landscaping areas will be set at an elevation that matches the existing ground levels.

To mitigate against the loss of floodplain storage, as identified within the proposed drainage plans (*Appendix J*), 1269.53m^3 of compensatory floodplain storage is to be provided on site. It is proposed to provide direct compensatory floodplain storage through the re-orientation of the land by lowering ground levels at two locations through the site.

The northern site basin provides 717.23m^3 of compensatory storage and the storage basin in the middle of the site provides 552.30m^3.

This design ensures that the proposed scheme does not impact the site's flood storage potential for any modelled event.

Both compensatory storage areas have direct access from either the highway (middle storage area) or cycleway (northern storage area) via a 1:3 slope. It is not proposed to fully fence the storage areas off, instead they are to be planted to provide a biodiversity and amenity space for the residents.

Resistance to identified flooding risk

The proposed finished floor levels of the dwellings are to be 300mm above the 0.1% AEP flood level of 7.91m at 8.21m AOD. In addition, the attenuation to be provided through underground pipes is to be resistant to floatation during flood events with the outfalls into Pow Beck fitted with non-return valves.

Exceedance Routes

For rainfall events with a return period more than 100 years, surface flooding of open spaces such as landscaped areas or car parks is acceptable for short periods, but the layout and landscaping of the site should aim to route water away from dwellings and avoid creating hazards for access and egress routes.

The proposed surface water scheme allows for an exceedance route away from Coach Road and towards the compensatory storage areas provided. Outfall manholes are also to be fitted with high level overflows to mitigate against the risk of surface water exceeding onto the surface.

Percentage impermeability (PIMP)

All impermeable areas are modelled as 100% PIMP. This will allow for sufficient capacity for all hardstanding areas to be positively drained.

Volumetric Runoff Coefficient (Cv)

Industry standard Cv values vary for summer and winter and account for water volumes which do not enter the drainage system i.e., that is lost through infiltration, depression storage, evaporation, initial wetting etc. Standard values are 0.75 for summer and 0.84 for winter.

Surface water quality

In the absence of statutory requirements and prescriptive standards, The SuDS Manual provides best industry practice for assessing the pollutant potential of developments and providing mitigation methods to increase run off water quality using SuDS components.

The simple index approach has been utilised here to assess the pollutant hazard indices and proposed treatment components. Note, this has been carried out in conjunction with the above SuDS component suitability assessment for the site.

Table 26.2 from The SuDS Manual below outlines the pollution hazard indices for different land uses.

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]

Figure 2: SuDS Manual Table 26.2 Pollution hazard indices

This development is to be classed as a mix of 'Very low' and 'low' risk land uses due to the presence of residential roofs and individual property driveways.

This level of risk suggests the following level of pollution control:

Land use	Suspended solids	Metal	Hydrocarbons
Residential roofs	0.2	0.2	0.05
Driveways / roads	0.5	0.4	0.4

The highest risk elements (albeit still categorised as 'low') originate from the parking and driveways of each plot. It is proposed to route the surface water associated with residential roofs and driveways through an ACO V Septor to ensure efficient removal of pollutants.

Land use	Suspended solids	Metal	Hydrocarbons
Driveways	0.5	0.4	0.4
ACO V-Septor	0.5	0.5	0.4

The above table shows that an ACO V-Septor would provide sufficient pollutant removal for the other roof area categories on the development site. The introduction of further treatment would be deemed inappropriate.

The manufacturers specification sheets for the proprietary treatment systems stated above are located within *Appendix K*.

10.0 MAINTENANCE

All components shall be maintained in accordance with the relative requirements shown in the SuDS Manual. These intervals should be deemed as a minimum frequency and reference should also be made to the manufacturers guidance to ensure all components are maintained correctly.

10.1 UNDEGROUND PIPED SYSTEMS / GULLIES

Maintenance Schedule	Required Action	Minimum Frequency
Regular maintenance	Ensuring drainage intakes are clear of debris/silt.	Monthly (or as required)
Occasional maintenance	Clear gully pots.	6 monthly
	Jet clean sewer lines, gully tails and kerb channels to remove grease, grit, sediment, and other debris to ensure conveyance capacity is not compromised.	Every 2 years
	Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autum	Annually
Intermittent maintenance	CCTV survey of sewer lines to identify any defects/signs of performance degradation such as: • Cracked / deteriorating pipes. • Leaking joints/seals at manholes. • High water lines showing regular high stage in pipes (sign of lack of capacity or downstream constraint); and • Suspected infiltration or exfiltration.	Every 2 – 5 years
Remedial actions	Repair defects using suitable methods. Effective temporary repairs may be sufficient in short term until scheduled/capital improvements can be made.	As required
Monitoring	Record areas of surface ponding / intake bypassing / surcharging (photos, inundated areas, depths) during extreme storm events and investigate the reasoning for this post-storm.	As required

Figure 3: Typical piped system operation and maintenance requirements

10.2 COMPENSATORY STORAGE AREAS

Maintenance Schedule	Required Action	Minimum Frequency
Regular maintenance	Ensuring drainage outfalls are clear of debris/silt.	Monthly (or as required)
	Grass to be mown at 35-50mm minimum and 75mm maximum, or as specified, within the compensatory storage area monthly from March to October to maintain capacity of the storage area.	Monthly
	Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly
Occasional maintenance	Jet clean outfall to remove grease, grit, sediment, and other debris to ensure the outfall works as designed and the non-return valve is not compromised.	Every 2 years
Intermittent maintenance	CCTV survey of the outfalls to identify any defects/signs of performance degradation such as: • Cracked / deteriorating pipes. • Leaking joints/seals at manholes. • High water lines showing regular high stage in pipes (sign of lack of capacity or downstream constraint); and • Suspected infiltration or exfiltration.	Every 2 – 5 years
Remedial actions	Repair defects using suitable methods. Effective temporary repairs may be sufficient in short term until scheduled/capital improvements can be made.	As required

Figure 4: Typical compensatory storage area operation and maintenance requirements

10.3 NON-RETURN VALVES

The non-return valve should be checked on a regular basis to ensure optimum performance. Key checks that should be performed during maintenance include checking that the valve flap opens freely and has not become caught or dislodged. The valve should also be cleaned of any debris that could be affecting the sealing or closing.

10.4 OVERFLOWS AND FLOOD ROUTES

Maintenance Schedule	Required Action	Minimum Frequency
Regular maintenance	Overflows. Jet pipes leading from overflow structures annually and check by running water through the overflow. Check free flow at next SUDS feature – inlet to basin or chamber.	Monthly
	Overflows. Remove any accumulated grass cuttings or other debris on top of grass weirs or stone filled baskets overflows.	Monthly
	Flood Routes. Make visual inspection. Check route is not blocked by new fences, walls, soil or other rubbish. Remove as necessary.	Monthly
Remedial actions	Overflows. If overflow is not clear then dismantle structure and reassemble to design detail.	As required

Figure 5: Overflows and flood route operation and maintenance requirements

11.0 FOUL WATER DRAINAGE STRATEGY

All foul water from the proposed 35 dwellings is to be connected into the existing combined sewer network on Coach Road via a pumping station within the development site.

The water will be pumped via a private rising main up the highway to a stilling chamber before discharging into the existing public sewer approximately 8m south of the site. The details of the pumping station are stated below within *Figure 6*.

Foul Water Pump Station	Specification
Marsh product code	TSG25076H09Q
Material to be pumped	Sewage
No. of pumps	2
Impeller type	Vortex
Power rating per pump [kW]	1.5
Electrical connection phase	**1**
Internal pipework	90mm PVC
Static lift [m]	4.64
Rising main length supplied by others [m]	28.4
Level control	Floats
Length of cable	10 metres
Pump turret diameter [m]	1.5
Pump turret depth [m]	0.8
Chamber diameter [m]	2.50
Sump depth [m]	NA
Total depth of chamber [m]	3.30
Total chamber length	7.60
Inlet invert [m]	1.00
Total storage capacity [litres]	35000
Inlet connection [mm]	160
MDPE outlet connection [mm]	90
Outlet invert [m]	0.6

Figure 6: Foul water pumping station details

A plan of the proposed foul sewer route is shown in *Appendix J.*

12.0 MANAGEMENT

All separate surface and foul water drainage systems within the site are proposed to remain private and be maintained by a newly formed management company contributed to by all plot owners.