De Clare Gardens Hendredenny Phase 2 and 3: Surface Water Management Plan

A REPORT FOR REDROW HOMES LTD
P19133_R11 V2
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De Clare Gardens Hendredenny Phase 2 and 3: Surface Water Management Plan

Client

Redrow Homes (South Wales) Ltd
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1 Introduction

1.1 INSTRUCTION

Yellow Sub Geo Ltd (Yellow Sub) has been instructed by Redrow Homes (South Wales) Ltd (the Client) in accordance with proposal reference P19133_P3 dated February 2021 and Purchase Order Reference PO 0 000 649 927 to provide advice with respect to the control of surface water quality during the construction phase of Phases 2 and 3 of the De Clare Gardens site, Hendredenny (the Site).

1.2 BACKGROUND

The De Clare Gardens residential development is to be constructed across a series of four fields that lie on a steeply sloping site to the north of the existing residential area of Hendredenny (see Figure 1-1 below. The Client is currently constructing Phase 1 of the development, which comprises the uppermost of the four fields and stretches across the entire width of the development site from north to south.

Phase 2 comprises the central, mid-slope portion of the Site, and is split into two fields (although the field boundary between these has largely been cleared of trees and hedgerow). Phase 3 comprises the largest of the fields which lies across the bottom of the Site, at its eastern end.

Yellow Sub has been providing advice to the Client on the control of surface water and run-off from the Phase 1 construction site. This report builds on the experience of managing surface wate run-off on Phase 1 and uses it to set out a strategy for the management of water through the two subsequent phases.

This report does not constitute a design. We understand that the Client and their chosen Principal Contractor will design and implement all temporary works necessary to manage surface water quality on Site, including due consideration of third-party consents and permissions, if required. The Client is seeking Yellow Sub's advice and guidance in order to provide added surety as to the solution chosen, and to demonstrate robustness in the approach.

This Version 2 of the document has some minor amendments to account for the evolution in the water management plan in response to developments on site and regulator representations in Spring 2021.

1.3 RELEVANT GUIDANCE

This document has been drawn up in accordance with the current available guidance including;

- CIRIA 532: Control of water pollution from construction sites: Guidance for consultants and contractors. 2001; and,
- CIRIA C741. Environmental good practice on site guide. 2015.

1.4 WHY WATER QUALITY MATTERS

Recent years has seen an increasing focus from Natural Resources Wales (NRW), Wales' environmental regulator, on the impact that construction sites are having on nearby streams and rivers. This is because a deterioration in water quality can cause serious consequences for the plants and animals that live within them. Whilst the protection and enhancement of the environment is motivation enough, it is important to note that NRW have powers to prosecute and fine those that cause pollution of streams and rivers. This has financial and reputational implications for the Client.

Figure 1-1 Site layout and field numbers used in this report

2 Site conditions

2.1 DEVELOPMENT CONTEXT

As discussed above, the Client has commenced Phase 1 of the development and has constructed most of the estate roads in this phase. House plots are in varying stages of construction, with the showhomes complete and open adjacent to the Site entrance at the southern Site boundary. The northern third of Phase 1 is currently being used as an area for soil storage, with construction yet to commence in this area.

Stormwater sewers have been constructed beneath the new estate roads, and the gully pots accept rainwater drainage. The sewer is to discharge to an attenuation basin to be formed in the south-eastern corner of Phase 1. This has not yet been completed, and so the water captured in the storm sewer network currently overtops the end-of-line manhole and flows overland into the southern Phase 2 field.

This storm sewer also currently collects natural spring water from behind the retaining wall to the rear of the showhomes, and stream water runoff from the land above the Site to the west. Works are currently being implemented to divert both of these sources of water away from the storm sewer network and so significantly lessening the flow of water exiting the end-of-line manhole.

At present, the works undertaken in Phases 2 and 3 have been deliberately limited in order to minimise disturbance of turf and soil in this area. Works undertaken in Phases 2 and 3 comprise;

- Diversion of two overhead power lines and removal of the wooden pole supports. This was undertaken in the summer of 2019 and the access tracks formed to facilitate the work remain stripped of topsoil but have largely revegetated. Small stockpiles of topsoil have been left in both Phase 2 and Phase 3, which have also since naturally revegetated.
- Construction of a cascade of settlement ponds through the southern Phase 2 field, through which the combined storm sewer water, plus spring and stream water, currently flows.
- Discharge to turf in Phase 3 of the water exiting the bottom of the cascade of settlement ponds.

In due course, an estate road is to be constructed from the northern end of Phase 1, down into Phase 2. It then doglegs to head south-east through the two Phase 2 fields, before turning to the north-east and running down into Phase 3. A spur road runs north-westwards along the alignment of the current hedge boundary between Phase 2 and Phase 3 (which is to be removed). Two further roads running north-west to south-east are to be constructed in Phase 3. Due to the slope of the Site, the land is to be terraced between these roads.

Two attenuation basins are to be constructed to accept flow from the new stormwater sewer network. The first is in the location of the hedgerow between Phases 2 and 3 adjacent to the southern Site boundary. This will outfall into the southern stream. The second is along the north-eastern Site boundary. This will outfall into the northern stream in the far north-eastern corner of Site.

2.2 GEOLOGICAL SETTING

British Geological Survey (BGS) published geology indicates that the Site is underlain by Coal Measures sandstone bedrock, with a band of mudstone shown running across the Site from north-west to south-east across Phase 1 and the south-western corner of Phase 2. This is shown as being overlain by Glacial Till across Phase 1 and across the upper, south-western portion of Phase 2. The Coal

Measures sandstone is shown to crop out across most of Phase 2 and the upper, south-western portion of Phase 3. The lower section of Phase 3 is then shown to covered by Glaciofluvial Deposits.

Ground investigation undertaken by Integral Geotechnique (IG) in 2015[1] indicates that the Site is underlain by a mixture of clays, silts, sands and gravels. The IG lithological descriptions are not sufficiently detailed to ascertain whether these represent weathered bedrock, till or other glaciofluvial deposits. The variation in the descriptions does highlight the fact that the soils will exhibit a variable permeability, both laterally and vertically.

2.3 TOPOGRAPHY

The entirety of the Site slopes down to the north-east. There is some local variation in this slope, as discussed on a field-by-field basis below. Figure 2-1 illustrates the breaks in slope and drainage features:

2.3.1 Phase 2 (northern field)

The highest point of this field is the north-western corner. There is a small plateau in this corner, with land then falling steeply to the field boundary between this and Phase 3. This steep slope is the steepest seen on the whole Site. Moving southwards, the width of the upper plateau decreases and the steepness of the slope to the north-east decreases as the width of the slope increases.

The plateau area in the north of this field broadly corresponds to the area mapped by the BGS as being covered in glacial till.

2.3.2 Phase 2 (southern field)

The field boundary between this and the northern field in Phase 2 approximately corresponds to a point at which the land starts to fall towards the east, rather than north-east. As a result, there is a slight trough-like shape to this southern field. This trough is open at its western end, draining into the southern stream at the Site boundary.

Whilst there is no watercourse in this trough-like depression, there is evidence of wetter ground, as discussed in Section 2.4.3 below.

2.3.3 Phase 3

Phase 3 comprises a single, large field. However, historical mapping indicates that this used to be separated into two fields, with a former field boundary demarcating a long, thin field parallel to the north-eastern bottom field boundary. There is a slight but noticeable step in the field topography along the line of this former field boundary.

Slightly further upslope from this former field boundary, there is a break in slope visible, with a small scarp slope crossing the field from the southern field boundary in an arc. This is broadly coincident with the line mapped as being the junction between Coal Measures sandstone outcrop above and glaciofluvial deposits below.

2.4 HYDROLOGY AND HYDROGEOLOGY

There are no watercourses on Site, but there is a watercourse along both the southern and northern Site boundaries and there is evidence of springs, seeps and drainage in various points on the Site. Figure 2-1 illustrates the water features noted on Site during the walkover in March 2021. It is important to note that the lateral and vertical

[1] Integral Geotechnique, 2015. Proposed residential development at Hendredenny, Caerphilly. Factual Site Investigation Report. 11335/PB/15/SI. October 2015.

variation in the clay content of the Site soils will contribute to unpredictability of the presence/ absence of significant groundwater flows, and as such it is possible that the cut and fill operations required during development will encounter subsurface springs or seeps over and above those noted in Figure 2-1.

2.4.1 Southern stream

The southern stream can be seen rising from the ground on the boundary of Phase 1 upslope from the development area. It also historically received water from a spring in the south of Phase 1. This has temporarily been diverted into the stormwater sewer in Phase 1, but works are underway to restore its connection into the southern stream.

It then flows along the Site's southern boundary, before flowing beneath the railway cycle path and into the Nant yr Aber off Site to the east.

2.4.2 Northern stream

The northern stream emanates from ground beneath a pile of made ground that appears to have been used to fill the original stream gully between the Site and Hendredenny Ganol Farm. It is likely that this received water from the drainage ditch around the upper, northern edge of Phase 1, but that this connection has been lost due to silting and blockage of this ditch. Works are in underway to restore this ditch connection, at which point the water flowing onto Phase 1 from upslope will be carried into the northern stream.

This stream flows down the northern boundary of the Site through Phases 2 and 3 and into the Nant yr Aber off Site to the east.

2.4.3 Drainage and springs

IG note in their Site Investigation Report that a drain existed crossing the southern field of Phase 2, carrying water from the wet area of Phase 1 down to the southern stream. No evidence of this remains at ground surface. However, there are notable springs (see Springs A and B in Figure 2-1)) in the turf in the base of the trough-like feature in this field. It is feasible that these are linked to the drainage recorded by IG. They may, alternatively, be associated with springs from more permeable layers in the Glacial Till in this area.

Water can be seen flowing from a 100 mm diameter pipe in the base of the hedgerow between Phase 2 and Phase 3 where it meets the southern Site boundary (see Drain C on Figure 2-1). This flows into the southern stream. It is possible that this represents the end-of-line of a drainage ditch that collects water along this field boundary. It was flowing at about 20% capacity at the time of the Site walkover on Wednesday 3rd March, during a period of dry weather. It therefore would appear to drain a spring, rather than simply drain surface water.

An area of hydrophilic/ rushy vegetation indicates the presence of seeps in the turf in Phase 3, at a point downslope of the end of the settlement pond cascade (see Seep D in Figure 2-1). These rushes predate the settlement pond cascade, and so are not attributable to this.

There were rushes growing along the line of the former field boundary in Phase 3 (see Seep E on Figure 2-1). These are indicative of either impeded drainage or seeps associated with the small change in slope seen in this location.

A small possible seep was noted in the far north-east corner of the Site (see Seep F on Figure 2-1). Given its location at the low point in

the north-eastern corner, this is unlikely to pose a concern with respect to management of surface water.

A probable spring feature was noted at the base of the steep slope in the north of Phase 2. This may be associated with the change from Coal Measures to glaciofluvial deposits in this area (see Spring G on Figure 2-1).

IG note in their Site Investigation Report an area of possible spring in the plateau area of the northern field of Phase 2 (see Spring H in Figure 2-1). This area is currently being used to stockpile soils and has been stripped of topsoil and so the original vegetation surface and soil type cannot be inspected. Evidence from Site walkovers during Phase 1 works suggest that there is not a spring in this area, but the possibility cannot be discounted.

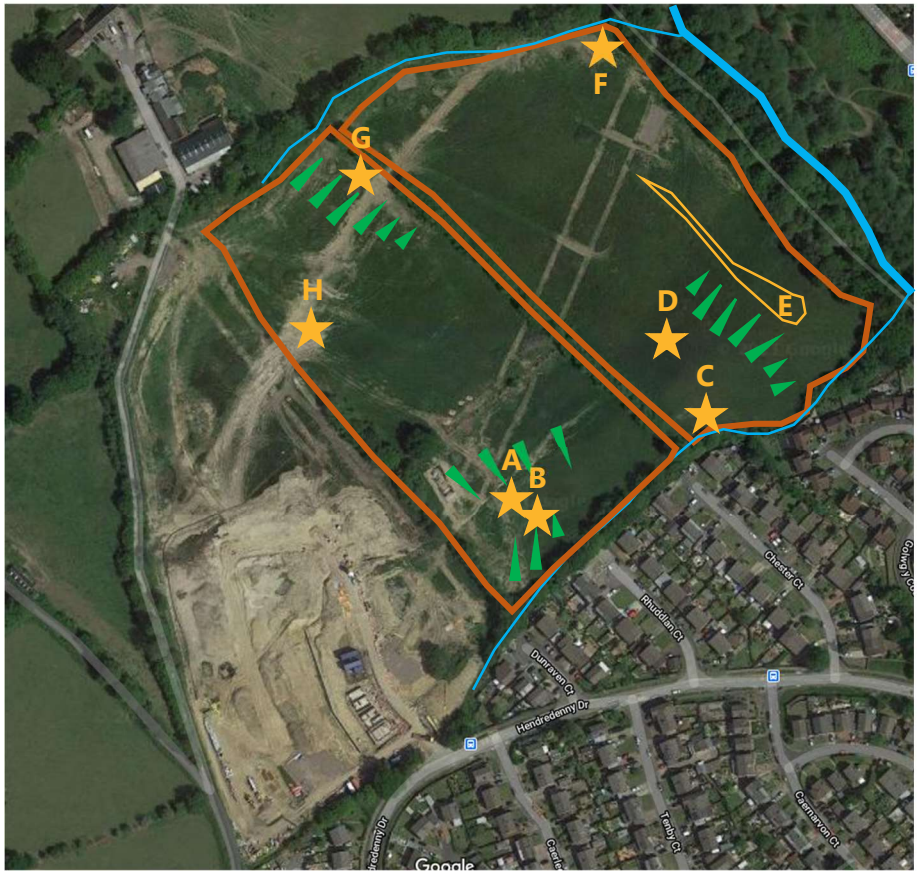

Figure 2-1 Seeps and springs (yellow stars) and slope features (green triangles) noted during walkover March 2021

3 Key principles

Minimising the run-off from a construction site requires the effective management of water – both rainfall falling directly on the ground and the water being gathered on the impermeable surfacing that is formed by both temporary and permanent roofs, pavements and roadways. The key principles can be listed as follows:

3.1 PREVENT WATER FROM FLOWING ONTO SITE

The less water that enters the Site, the less water there is to control on Site. Install grip drains on the upslope edge of Site, to capture clean water and divert it around the construction Site. If a spring is present on Site, divert water directly from it away from the construction site area, before it has chance to pick up silt and sediment.

3.2 MAKE STORMWATER DRAINAGE A PRIORITY DURING INFRASTRUCTURE INSTALLATION

The earlier a stormwater system is in place and operational, the sooner it can be employed to help control water quality. This is particularly important on steeply sloping sites.

3.3 GRASS AND VEGETATION ARE NATURAL FILTERS

Do not strip more turf or vegetation than is actually required to undertake that phase of work. The Site is currently bounded by semi-mature hedgerows which should be left undisturbed as much as is practicable. Try to keep work phased so that turf or vegetation is in place for as long as possible. Leave turf strips adjacent to Site boundaries and around construction sites to act as natural filters. Reinstate grass and other vegetation as soon as possible.

3.4 PRIORITISE POLLUTION CONTROL MEASURES

It is far cheaper and easier to install sediment and pollution control measures before a problem arises. Trying to retrofit silt control measures is much more difficult and costly.

3.5 WORKS TIMING

If at all possible, do not strip sites and undertake earthworks through the winter period. The higher rainfall and saturated ground during the winter makes pollution of neighbouring sites and storm sewers (and therefore streams and rivers) with silt much more likely.

3.6 GOOD SITE MANAGEMENT

Silt can only be generated if rainfall and runoff can come into contact with and erode bare earth. Simple measures can minimise erosion, including placing stockpiles orientated across slopes (rather than down them), sealing stockpiles to minimise water ingress and seeding or turfing bare earth as soon as possible. Better still, do not create any bare earth until it is really necessary, even if this means stripping a site in numerous phases.

Once new sealed road surfaces are formed with new stormwater sewer beneath, good site management can minimise the volume of dirt and silt washed into these sewers (and therefore reduce the amount of effort needed to remove this silt again before it leaves site). Available measures include:

- Using separate plant for designated "clean" and "dirty" areas, with a lay-down area at the entrance to all areas of groundworks or in-ground operations.
- Create separate but parallel haul routes for on-site plant and delivery/ staff and contractor vehicles with only designated crossing points, thus minimising the length of road where both sets of vehicles mix.

- Locate materials storage area adjacent to construction area, thus lessening site traffic on spine road.
- Scrape all roadways daily, to remove the surface layer of dirt that accumulates.
- Undertake daily roadsweeping, with a dedicated gully-sucker/ roadsweeper vehicle.
- Use gullybags, sandbags and in-line silt filters to help remove silt that does enter the sewer system.

4 Surface Water Management Plan

The key receptors that may be impacted by water runoff from the Site are:

- The southern stream, either directly via overland flow of polluted water, or via discharge of polluted water from newly installed headwalls from the new storm water sewer system;
- The northern stream, either directly via overland flow of polluted water, or via discharge of polluted water from newly installed headwalls from the new storm water sewer system;
- The adjacent land between the southern, lower Site boundary and the railway cycle-path. There is a ditch in this area that has historically collected water emanating from the bottom of the Site in times of intense or prolonged rainfall, when the turf of the Phase 3 field downstream of the settlement pond cascade becomes saturated and water is unable to soakaway; and,
- The Nant yr Aber Main River. This may be impacted by polluted water flowing down either the northern or southern stream. It is unlikely to be impacted by water collecting in the off-site ditch adjacent to the railway cycle-path – experience in Phase 1 shows that water soaks to ground here and does not flow to the Nant yr Aber.

The design of temporary works to protect these and any other receptors shall be the responsibility of the Principal Contractor on Site. The following text provides the minimum requirements that should be met by the Principal Contractor in this regard.

4.1 HAZARDS POSED TO SURFACE WATER BY THE WORKS

These works present three key hazards to the surface water environment:

- Pollution from fuels, oils and other chemicals that are being used and/ or stored on site entering the stream following spills, leaks or accidental releases;
- Impact from surface water run-off and any associated sediment/ silt on the adjacent residential properties and receiving storm sewer; and,
- Direct impact to the southern and northern watercourses when constructing headwalls immediately adjacent to the stream channel, and when constructing new pedestrian pathways across the southern stream.

The following paragraphs provide outline measures to manage these hazards. The Principal Contractor shall adopt these measures, or similar alternative measures, as part of their works:

4.2 POLLUTION FROM FUELS, OILS OR CHEMICALS

Set out below are actions that shall be undertaken across the Site to minimise the risk of pollution incidents. Note that the plans are indicative and Site water management shall be constantly reviewed by the Principal Contractor and pollution prevention measures will be updated or revised as required in response to changing conditions on Site.

4.2.1 Fuel storage and refuelling

All fuel storage on Site will be in double bunded locked tanks, located in secure areas.

No fuel storage shall take place within 30m of a watercourse. All practicable means of securing fuel will be utilised. Refuelling shall be carried out by appointed competent persons only and shall not be undertaken within 30m of watercourses, stormwater sewer gully pots or the Site boundary.

Drip trays shall be utilised underneath ALL static plant, including generators. Drip trays shall be utilised underneath all mobile plant whilst parked. When emptying drip trays care shall be taken and the waste oil/ fuel shall be returned to the designated oil recycling facility.

Spill kits shall be available at all locations where mechanical plant is operating, ideally held within each item of plant. The spill kits shall be checked weekly by a nominated member of staff. At all times, a trained person shall be present on Site to deal with fuel spillage.

4.2.2 Emergency materials

At the Site compound, an emergency kit shall be present. This shall include hay bales or silt wattles, 6ft pins to secure these, silt fencing and spill kits.

4.3 IMPACT FROM SEDIMENT/ SILT

As the vegetation is progressively removed from the Site surface to facilitate construction of the infrastructure works, this will open up soils to rainwater and the potential for run-off contaminated with suspended solids.

Silty run-off from construction sites can take two main pathways;

- by being washed off the new sealed road network into the new stormwater sewer, and then on into the attenuation basins/ settlement ponds, then on into the southern and northern streams; and,
- by overland flow over exposed soil surfaces. If uncontrolled this will flow directly into the northern and southern streams, or off Site over the southern site boundary.

Both of these mechanisms are anticipated to occur on Site. Due to the steep gradients on the Site, experience from Phase 1 works indicates that overland run-off will play a major role if not properly controlled, particularly in the infrastructure and earthworks period of development. This will continue to be a key concern as the development progresses, paired with the increasing influence of dirty water collecting in the new stormwater drainage network as it is installed.

In order to minimise potential impacts that this may have on the streams, the following measures are to be employed:

4.3.1 Phasing

Vegetation shall be left intact for as long as is possible, with only those areas to be constructed upon in the near future being stripped of topsoil. The works will be undertaken in a phased approach, with each section stripped of vegetation and topsoil sequentially.

Where possible, completed areas will be seeded immediately upon completion. This minimises the area of bare soil.

The earthworks for the project must be phased such that the attenuation basins and outlets from them are formed before any other aspect of the programme, thus providing drainage runs and settlement areas that can be used as temporary features during the construction works. Attenuation basins should be constructed before the stormwater drainage that feeds into them. This will require temporary haul roads to enable plant to access the two attenuation basin areas.

Prior to any works being undertaken on Site, the investigation of sources of water shall be undertaken, as set out in Section 4.3.2 below.

4.3.2 Identifying sources of water and isolating them from the works

Before any other works are undertaken on Phases 2 and 3, the following works shall be undertaken;

1) Retrospective amendment to the land drain to the rear of Plot 1 in Phase 1 to convey the spring water emanating from ground directly into the southern stream. This will lessen the flow of water through the attenuation basin in Phase 1 and in turn reduce potential flow through its overflow to the phase 2 basin (see Section 4.3.4 below).
2) Design and implementation of a permanent solution to carry the spring water emanating from the ground in locations A and B in Figure 2-1 directly to the southern stream and so isolate this flow from the future earthworks and groundworks.
3) Investigation of the suspected field drain (location C in Figure 2-1) in order to determine the area it drains, whether it accepts subsurface seep or spring flow. The drain should not be excavated and removed until a permanent drainage solution has been determined and implemented to carry water from any springs and seeps directly to the southern stream, so isolating this water from the future earthworks and groundworks.
4) Investigation of the area of rushy ground (location E in Figure 2-1) to determine if the rushes are associated with a former field drain along this former field boundary. This may represent a preferential pathway for water if not identified and assessed.
5) Drafting of a provisional design to capture and convey spring water away from the works area at location G in Figure 2-1. A possible spring has been identified towards the base of the steep slope in this location. An excavation is required to install a crate attenuation system near this location and the cut required may lead to exposure of a sub-surface stream. If a provisional design is in place to capture and carry this water directly to the northern stream, this will enable isolation of this clean spring water from the works area.

4.3.3 Silt fence or earth bund and ditch protection to boundaries

Before any topsoil is stripped, a silt fence or earth bund and ditch protection must be constructed along critical, downslope Site boundaries. Indicative locations for this are shown on Drawing P19133_R11_D01.

The design, location and extent of these bunds and ditches shall be updated regularly to take account of changing Site runoff and erosion potential characteristics as works progress across the Site.

Using an earth bank and ditch is preferable, as it will likely need less maintenance than a silt fence. If a silt fence is chosen, it shall be dug into the ground, overlapped and supported in accordance with the manufacturer's instructions.

These defences shall be constructed such that a point of overtopping is created and such that this flows in a pipe or gravel-filled ditch to the next bund/ silt fence, thus preventing it leading to flow off-Site into streams.

A sequence of such protection measures are proposed on Drawing P19133_R11_D01 across-slopes down the Site topography, thus

separating the Site into a series of sub-catchments and hence minimising the pressure on any one point in the system.

The lowest silt fence/ bund shall have a controlled point of overtopping into the Phase 3 attenuation pond, which shall be used as a settlement lagoon during the construction programme.

4.3.4 Settlement ponds

The Phase 1 attenuation basin shall be constructed and used as a settlement pond prior to Phase 2 works commencing. The Phase 2 attenuation basin shall be constructed at the start of the Phase 2 programme and then be used as a settlement pond during the construction phase. The same will occur in Phase 3, with the attenuation basin being constructed ahead of all other works in Phase 3.

The area of attenuation crate in the north of Phase 2 shall be excavated to form a settlement pond prior to the stormwater drainage being formed along this roadway.

The settlement ponds will then require cleaning, regrading and (if required) attenuation crates installed once the build phase is complete.

During the construction period, water will be diverted away from hydrobrake and direct into the attenuation basins/ settlement ponds, via a Nailor box to provide filtration. Access to the flow between Nailor box and pond will be required to enable installation of a flocculant dosing device if and as required (subject to Environmental Permit). A temporary outfall to stream shall be formed from each settlement pond, with a second Nailor box placed to provide final line of defence.

Given the clay content of the substrate, it is anticipated that flocculent will be required to aid settlement within these settlement ponds.

It may be prudent to construct low-level earth bunds to separate these settlement ponds into three or four sections, thus providing a sequence of settlement ponds within each basin.

The outflow from each settlement pond shall be via filtration mechanism, by means of use of silt wattles/ bales/ silt fences etc, to provide a final end-of-line level of protection.

A cascade of further settlement ponds shall be installed uphill of the Phase 2 attenuation basin, to take water draining from the spine road drainage and from high level overflow from Phase 1 basin, if required.

4.3.5 Grass filter strips

Where the proposed layout allows, maintenance of a grass filter strip in landscape buffers along the Site boundaries will help manage the surface water runoff.

4.3.6 Control of silt in new stormwater sewers

A controlled means of outfall **MUST** be constructed prior to a stormwater line being put into service. A stormwater sewer network must not be constructed such that it drains to ground, unless this is in an appropriately designed and constructed soakaway. This will otherwise create large volumes of silty water that need to be controlled and managed.

Once a stormwater sewer has been constructed, with appropriate outfall, it is important that the generation of silt in the drainage system is minimised. This can be managed by:

- Regular (at least daily) roadsweeping.
- Regular (preferably daily) scraping of road surface with a blade to remove and prevent dirt building up on the road surface.
- Use of gully bags and sandbags to filter water as it enters the sewer system.

- Use of in-line filtration within manholes (for example Nailor filter panel or Nailor boxes. These are to be installed as shown in Drawing P19133_R11_01Rev01, but additional ones may also be required to maintain good water quality at point of discharge).

It shall be the responsibility of the Principal Contractor to obtain the necessary consents to discharge surface run-off water from the construction site into the streams.

4.3.7 Storage of materials

Unless Site constraints prevent it, all storage of soils shall be undertaken on the ground up-slope of the construction area (thus placing greater distance between the stored soils and watercourses).

Soils shall not be stockpiled on stream banks or near to stream banks.

The surfaces of all storage areas (stockpiles) of soils will be sealed using an excavator bucket at the end of each shift, to minimise the potential for sediment to be washed off during a rainfall event.

Soil stockpiles shall be formed perpendicular to the slope, thus minimising potential for erosion and gully formation along their length.

4.4 DIRECT IMPACT TO WATERCOURSES; HEADWALL OUTFALLS AND CROSSINGS

Two headwall outfalls and two crossing points are to be constructed as part of the development. The Phase 2 attenuation basin outfall is to the southern stream, whereas the Phase 3 attenuation basin outfall is to the northern stream. Two pedestrian routes require crossings over the southern stream. These locations are detailed in Drawing P19133_R11_D01.

Some impact to watercourses is unavoidable, due to the need to undertake works within 2 metres of the watercourses. Work within proximity to the watercourse will require Ordinary Watercourse Consent from Caerphilly County Borough Council.

Works to these outfalls and crossings should be programmed for the drier summer months, when flows in the streams will be minimal, and the streams may be completely dry.

If the pedestrian crossing points can be constructed by bridge rather than culvert, this will minimise the interaction with the stream channel and may negate the need for some or all of the suggested methods outlined below.

In order to minimise impact as much as possible, the following sequence of works is to be undertaken:

1. Damming of the stream flow upstream of the works using dumpy bags or similar.
2. Over-pumping of stream water to a point downstream of the required works area, allowing the length of channel within the works area to drain of water.
3. Blocking of the stream channel downstream of the works area using dumpy bags or similar to isolate the area of works from the stream channel downstream.
4. Continued over-pumping from upstream to downstream of works area during full duration of the works, maintaining streamflow.
5. Use of a separate sump and pump to keep the isolated length of channel within the construction area dry. This water must not be directly pumped into the downstream or upstream channel but must be diverted into the silt management set-up elsewhere on Site.

6. Excavate stream bed sediments and stockpile separately, for replacement in new stream channel upon completion.
7. Deploy sediment weirs/ bales/ sedimats in downstream channel if required, as a precaution against migration of silt downstream.
8. Construct culvert/ headwall.
9. Complete landscaping works in immediate vicinity of stream channel and replace bed sediment into channel.
10. Remove downstream and then upstream dams to return flow to stream, keeping over-pumping in operation until dams are fully removed (to prevent build-up of large volumes of water that might cause erosion and damage upon release of upstream dam).

The above provides some indicative methods that the Principal Contractor could employ to manage the direct impact on the watercourses during culvert construction. There may be alternative options and it will be up to the Principal Contractor to ascertain the best working method. This must however meet the minimum criteria:

- Prevent release of sediment-laden water into the watercourses on Site;
- Minimise the period during which the watercourses are not flowing under gravity (i.e. minimising the period of over-pumping); and,
- Avoid undertaking works in times of high or prolonged rainfall.

4.5 GENERAL SITE PRACTICES

4.5.1 Dust suppression

Dust suppression measures will be implemented by the Principal Contractor during dry conditions in order to prevent dust from being carried into watercourses and other sensitive neighbouring habitats. The frequency of the suppression will need to be varied dependant on the weather conditions and ground conditions within the working areas. This will be carried out by spraying water to damp down the dust.

4.5.2 Weather forecasting and prediction

The weather forecast will be monitored by the Principal Contractor on a daily basis throughout the project, in order to predict periods of likely heavy rainfall. Where heavy rainfall is predicted works may need to be suspended. Ahead of a period of forecasted heavy rain, the Site Management Team shall inspect the works to assess areas susceptible to sediment run-off and take additional precautions as necessary. Such precautions may include additional sediment trap weirs, or covering of stockpiles, for example.

4.5.3 Permissions

It shall be the responsibility of the Principal Contractor to obtain the necessary consents to discharge surface run-off water from the construction site into watercourse and for any works within close proximity of the watercourses.

4.5.4 Emergency arrangements

The Principal Contractor shall design and implement an Emergency Procedure in the event of an actual or suspected pollution incident involving spillage of oils or chemicals or a discharge of silty water or

other pollutant into a watercourse. This shall include as a minimum the following steps:

- Report immediately to the Site Management Team;
- Identify the source, stop the flow;
- Stop it spreading by containing (in order of priority);
    - at source;
    - close to source;
    - on the surface;
    - in a drainage system or as a last resort;
    - in the watercourse.
- Check the Site drainage plan – where will the spillage go?; and,
- Seek specialist advice.

Drawings

YELLOW SUB GEO

Notes:
1. All dimensions and locations are indicative, and should be checked prior to use in costing or design.

N

Form settlement pond in area of crate and divert storm via Nailor box and flocculant dosser into this. Temporary outfall may be required via second Nailor box. Or reconnect back into storm line to permanent outfall if constructed.

Hydrobrake by-passed during construction period. Outfall to stream via temporary Nailor box.

Area to be set aside for settlement pond cascade feeding into Phase 2 attenuation basin/ settlement pond

High level overflow from Phase 1 attenuation pond into Phase 2 silt management system

Temporary diversion of stormwater direct to attenuation pond via Nailor box and flocculant dosser.

Hydrobrake by-passed during construction period. Outfall to stream via temporary Nailor box.

Deepen drain behind retaining wall to rear of Plot 1 to intercept buried sping (circa 2 - 3 m below ground level). Convey direct to stream via dedicated pipe already installed

Ditch Diversion (subject to detailed design)

Existing ditch to be re-instated(subject to detailed design)

KEY

- Proposed silt fence/ earth bund and ditch
- Stream crossing point/ outfall
- Attenuation basin/ crate area to be used as settlement pond
- Spring/ seep/ drainage feature
- Phase boundary
- Nailor box
- Flocculant doser
- Temporary pipe for construction run-off
- Permanent drain to take spring water from rear of Plot 1 showhome

Client
Redrow Homes (South Wales) Ltd

Project
De Clare Court, Hendredenny. Phases 2 and 3

Revision record

Revision	Drawn by	Check by	Notes
00	GRO	JEM	First Issue
00	GRO	JEM	Minor amendments 14-5-21

Drawing Number
P19133_R11_D01

Drawing Title
Surface water management plan

Scale @ A0
1:500

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Appendices

Appendix A: Report Conditions

Report Conditions

This report has been prepared by Yellow Sub Geo Ltd. (Yellow Sub Geo) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client, and is provided by Yellow Sub Geo solely for the internal use of its client.

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