WEPco | Rhondda Cynon Taf County Borough Council

RCT 3 Primaries Batch

Penygawsi Flood Consequences Assessment

2020/9590

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ARUP

Contents

1 Introduction

The Client is promoting the re-development of an existing primary school site located in Penygawsi, Rhondda Cynon Taf. The site is currently an operational school and the proposal is to construct a new single school building with associated car parking and Multiple Use Games Area (MUGA). The existing school building and associated features including the asphalt playground will undergo a phased demolition.

Ove Arup & Partners Ltd. (Arup) has been commissioned to prepare and submit a planning application for the proposed new school development. This Flood Consequences Assessment (FCA) has been prepared in support of the planning application and has been undertaken in accordance with Technical Advice Note (TAN) 15 Development and Flood Risk 2021.

2 Existing Site

Penygawsi Primary School is currently an operational primary school located in Rhondda Cynon Taf, South Wales.

The site is approximately 2.39 Ha in area and located within Llantrisant (centred around OS grid reference 304712,182766).

The site is bounded on the north western, north eastern and south eastern sides by residential housing and along the southern western boundary is Chartist Road.

There are no watercourses within the site boundary and the nearest watercourse is Afon Clun, 400m south of the site.

The vehicular access to the site is mid way along the south west site boundary. The access road rises at approximately 1:20 into the middle of the site and turns east in to the existing car park. The land slopes down to existing woodland on the west and rises up to the school facilities to the east. The site access is directly on to Chartist Road. There is existing pedestrian access to the school on the south east boundary on to a footpath that connects Chartist Road to the south and Burgesse Crescent to the north. There is second pedestrian access to the north of the site that leads to a wooded area.

A site location plan is shown in Appendix A.

The site comprises of one main school building and a number of associated smaller buildings. There are areas of asphalt surfaced playgrounds adjacent to the main school building and car parking that connects to Chartist Road via the vehicular access point.

There are a number of trees located around the site but are predominantly located around the site boundaries. There is a line of trees on the southern boundary and trees located along a portion of the eastern boundary. There is a larger wooded area on the western side of the site.

The site contours generally fall from the north east (63-64mAOD) towards the south west (54mAOD). A 1:5 slope down from the north eastern boundary extends approximately 40m to the school building and western playing field. The

western playing field is approximately 80m long and 35m wide with a 1:40 slope east to west over the 35m side. A steep slope then falls down into the woodland however slopes within the wooded area are unknown as the survey company could not survey due to the dense vegetation.

The asphalt car park and playground areas are sloped gently around the school building. The landscaped slopes surrounding these areas are considerably steeper with a 1:6 slope down to the southern boundary, 1:2.5 slope to Chartist Road and a 1:5 slope down to the site entrance. The gradient of the access road is approximately 1:20 and the ground slopes at 1:12 gradient between the top half of the access road and the existing school building.

The existing school building is set at approximately 57.8mAOD and the western playing field is between 55-56mAOD.

The existing contours taken from topographical survey are included in Appendix A.

2.1 TAN15 Development Advice Map

The TAN15 Development Advice Map (DAM) for Llantrisant covering the Penygawsi school is included in Appendix B. There are no recorded Flood Extents or Flood Risk from Reservoirs

2.1.1 River and Sea Flooding

Figure 1 shows the River and Sea Flood zones near to the site. The map indicates that the site is outside of the River and Sea Flood Zone 2 or 3.

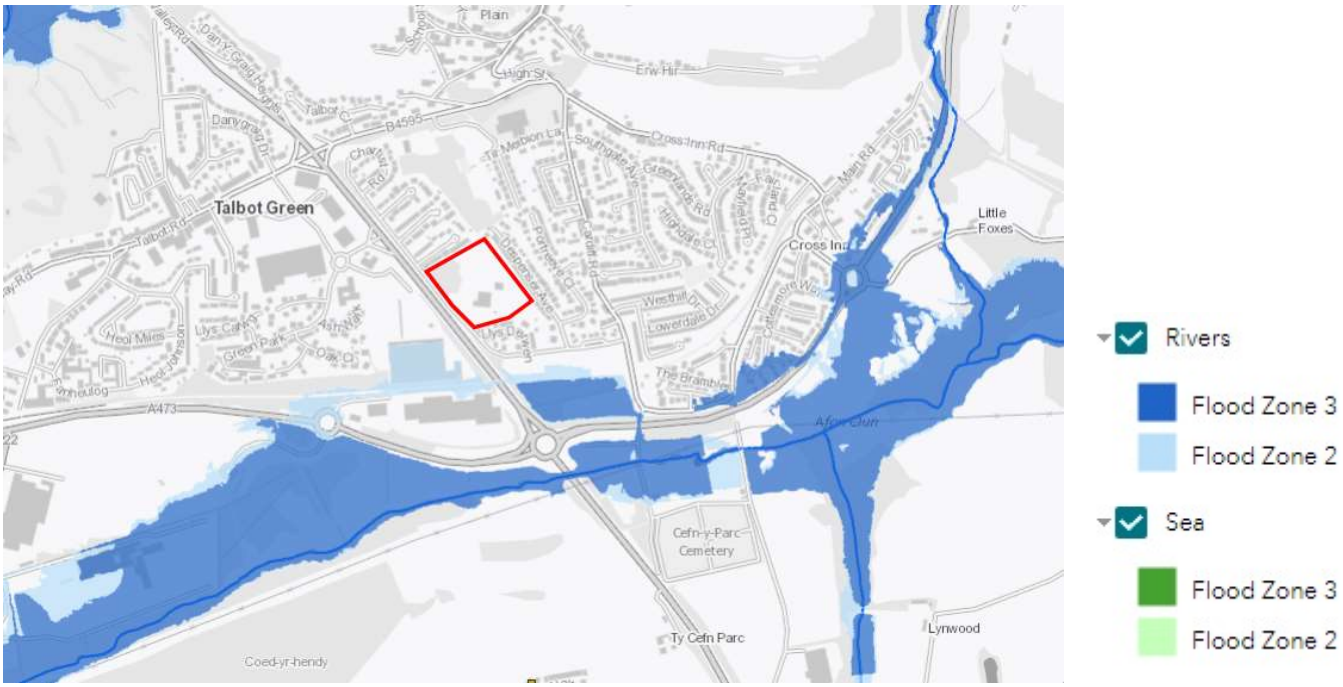

Figure 1: River and Sea flooding

The site is defined as Flood Zone 1 therefore there is less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year. The development advice

imposes no constraints relating to flooding from rivers or the sea, other than to avoid increasing risk elsewhere.

Access to and from the site is also in Flood Zone 1 and not impeded by river or sea flooding.

2.1.2 Surface Water Flooding and Small Watercourses

The surface water flooding and small watercourse Flood Zones taken from the TAN15 maps are shown in Figures 2 and 3.

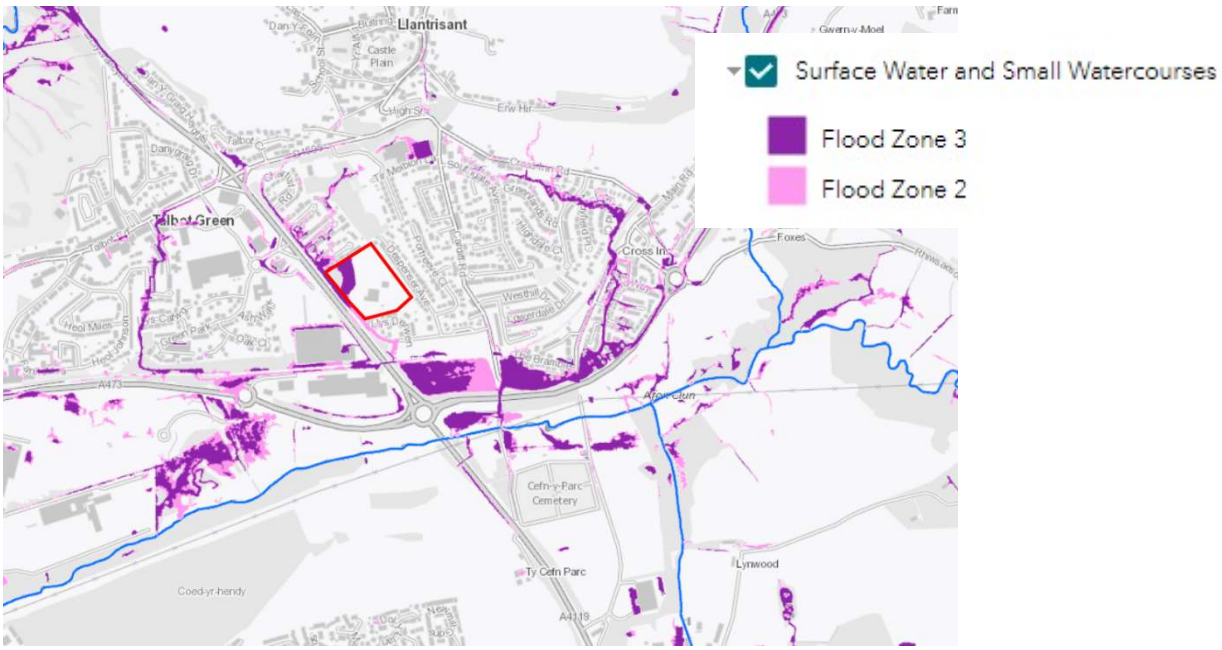

Figure 2: Surface water and small watercourse flooding

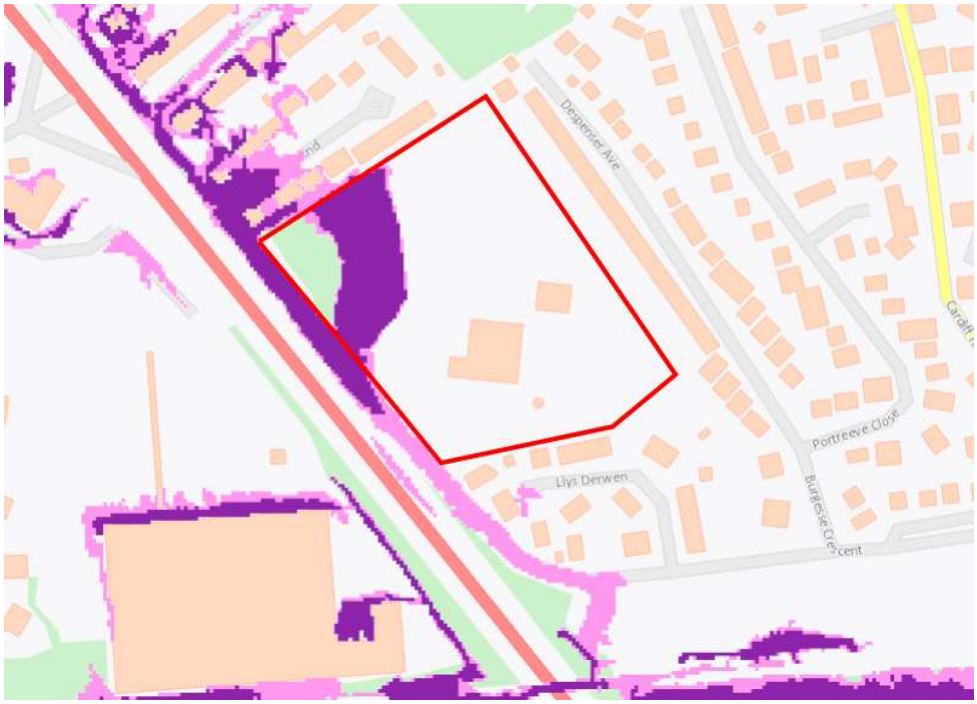

Figure 3: Surface water and small watercourse flooding

The majority of the site is in Flood Zone 1 however within the site boundary, there is an area of Flood Zone 2 and 3 identified on the west portion of the site and across the existing site access. The majority of the Flood Zone 2 and 3 is concentrated in the existing wooded area.

The definition of surface water and small watercourse flood zones are as follows:

- Flood Zone 1 - Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.
- Flood Zone 2 – Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
- Flood Zone 3 - A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.

Figure 4 and the drawing in Appendix B shows the Flood zones overlaid on to the existing site contours.

Figure 4 – surface water and small watercourse flooding extents

With no designated watercourse within the site boundary, the area of Flood Zone 2 and 3 that is located within the wooded area is likely to correlate with a localised depression in the topography. The topographical surveyor could not survey within the woodland due to the dense vegetation.

Outside the site boundary, there is an area of Flood Zone 3 that runs along Chartist Road from just south of the site entrance continuing north. The Flood

Zone 3 area in the woodland connects to the Chartist Road Flood Zone 3 at the site entrance. An area of Flood Zone 2 then continues south along Chartist Road before continuing across a field to the join Flood Zone 2 and 3 areas that accompany the east/west non motorised user path located at the natural topographical low point.

The contours imply that any surface water flooding leaving the site will take the route to the south along Chartist Road to the non motorised user path.

2.2 Groundwater

A Phase 2 Geo-Environmental Desk Study Report, was produced in June 2021 by HSP Consulting Engineers for the Penygawsi Primary School site.

The British Geological Survey superficial mapping indicates Diamicton Till beneath the majority of the site with Devensian Glaciofluvial Deposits, which generally comprise sands and gravels, under the north western corner of the site. The BGS bedrock mapping indicates the southern section of the site is underlain by South Wales Upper Coal Measures Formation. The northern half of the site is underlain by the Rhondda Member Sandstone. Both bedrock formations are part of the South Wales Upper Coal Measures Group of the Carboniferous Period.

6 windowless sampling boreholes (4.45m maximum depth), 1 cable percussive borehole (maximum depth 4.50m) and 5 rotary open hole boreholes (maximum depth 30.7m) have been undertaken, targeting the proposed school building location.

Groundwater strikes were encountered during drilling within two window sample boreholes and two rotary boreholes at depths between 1.40m and 4.50m bgl associated with groundwater strikes within the Diamicton Till and Upper Coal Measures. In one rotary hole groundwater was recorded at 12.70m bgl associated with flooded workings within the Upper Coal Measures.

Groundwater level monitoring has been undertaken within the monitoring installations on one occasion and groundwater levels have been recorded between 1.30m begl and 1.70m begl.

3 Proposed Development

To provide the appropriate school facilities, the proposed site will contain a single school building, 2 number MUGA pitches, car parking and a mixture of impermeable and grassed landscaping.

The illustrative site layout of the school development is included in Appendix C.

The proposed building and hard landscaping works are generally located on the western portion of the development on the gently sloping portion of the existing playing field.

The proposed car park and MUGA are located over the footprint of the existing building. The existing access road is to be retained as is the existing entrance on to Chartist Road. Pedestrian access will also be provided through the vehicular access and the existing pedestrian access to the south east will also be retained. This will provide a route across the landscaped areas, north of the MUGA to the school buildings.

The proposed building has been located at 56.5mAOD FFL. This level has been set to allow a 1:25 slope rise from the access road to the building entrance. Generally slopes have been designed to fall at 1:40 away from the building. The slope between the proposed pitch and the building across the landscaping however is 1:15.

The slope of the car park has been designed to fall at 1:30. This allows a suitable gradient between the western car park edge and the access road. The MUGA has been designed to fall at 1:100 with the landscape strip between the car park and MUGA used to achieve the level difference with a maximum 1:8 slope. The slope across the football pitch is 1:100 and has been sloped towards the MUGA so any overland flow will be captured by the MUGA permeable paving. The general slope of the proposed development is north east to south west as per the existing scenario.

The existing access road levels have been retained as existing which is at a 1:20 gradient. There is little scope to steepen this as pedestrian footway access is provided along this route.

The proposed finished levels are shown on drawing RH0401-ARP-ZZ-00-DR-C-00031 in Appendix D.

3.1 Vulnerability Classification

Flood risk vulnerability classification for various types of development is given in Figure 3, Section 6 of TAN15 Development and Flood Risk. Developments are classified into the following three categories depending upon the ability of the occupants to decide on whether or not they wish to accept the risk to life and property associated with flooding:

- Highly Vulnerable Development;
- Less Vulnerable Development;
- Water compatible development

The proposed school development is classified as a **Highly Vulnerable Development** however as per paragraph 6.6 of Section 6, it may not be appropriate to classify the entire site as highly vulnerable.

It is recommended that the school building and necessary infrastructure for the school to function is classed highly vulnerable, including the mechanical yard.

The associated hard landscaping (footways and playground), access road, site entrance, car parking, MUGA and playing fields may be classed as Less Vulnerable Development.

The flood impacts on the access road and site entrance in an emergency are discussed in Section 6.

4 Justification of development

As stated in TAN15 Section 10, all types of development are acceptable in principle in Zone 1.

Regardless of whether parts of the site are classified as highly vulnerable or less vulnerable, as the site is Zone 1, the River and Sea flood frequency is sufficiently low to allow development.

As the site is in River and Sea Flood Zone 1, the site is suitable for a primary school.

5 Flood Consequence Assessment

As the site is within River and Sea Flood Zone 1, no assessment is made for this type of flooding. The assessment is only made for the surface water and small watercourse Flood Zones.

5.1 Surface Water and Small Watercourse Flooding Risk Management

When developing the site masterplan, the surface water and small watercourse flood zones have been carefully considered. The site proposed 3D levels are shown in Appendix D.

In general, the site is being reprofiled and the proposed slope gradients and direction have been designed to manage storm water and convey it to a suitable receptor.

All built development has been located outside of the area indicated as Flood Zone 2 and 3 associated with the woodland. Retaining structures have been used to keep all earthworks outside of the Flood Zone extent therefore the existing natural site levels within the Flood Zone are retained.

It is also proposed to retain the existing site entrance in the same location and form. The access currently serves the existing school site and the form is suitable for the proposed school use.

As the site layout, features and 3D levels are not being altered in the Flood Zone 2 and 3 areas, the existing surface water flooding regime is unchanged. The site is therefore not making surface water flooding worse and the proposed attenuated positive drainage system will reduce the surface water runoff reaching the wooded area.

5.1.1 Proposed surface water drainage strategy

The proposed drainage strategy and sustainable drainage solutions has been discussed and agreed in principle with the RCT SAB. A positive piped drainage network has been designed to collect surface water from the impermeable and permeable paved areas around the site and outfall into the existing private manhole at the site entrance. This manhole is at the low point of the site. The route of the drainage network beyond this manhole is unknown and will be determined by proposed further site investigation.

There are two proposed positively drained storm water catchments. The western catchment serves the main building and associated hard landscaping as well as the access road. The eastern catchment serves the car park, MUGA and surrounding hard landscaping.

Rainwater in the western catchment will be collected through gutters and downpipes on the building roof and where possible the storm water on the other hard standing areas will be directed into raingardens or onto the proposed green landscaped areas. Where this is not possible, linear drainage channels at the building entrance have been proposed as well as a grass topped filter drain at the base of the retaining structure.

Similar capture methods are used in the eastern catchment however are supplemented by the permeable paved MUGA and car parking bays. Flow landing directly on these surfaces or directed on to these surfaces can percolate through the pavement layers and connect to the positive drainage network.

The proposed surface water drainage network is shown in Appendix D.

Where proposed low spots have been designed out of the scheme however where these are present e.g. against kerblines, suitable collection measures have been proposed to convey flow into the positive drainage system to avoid new areas of localised surface flooding.

The proposed slope has been designed to fall away from the building. At the building entrance a localised low point has been designed before the path rises to the access road. A linear drain has been proposed in this area to manage the storm water.

In general, proposed surface levels have been designed to slope in the same direction as the existing catchment.

Any flow landing on the grassed landscaped areas that does not infiltrate to ground will be directed towards the positively drained network, the woodland or if landing on the existing earthwork slopes at the boundaries, towards the site boundary as per the existing condition.

5.2 Impact of Flood risk

The surface water Flood Zone 2 and 3 areas on site could act as uncontrolled flood storage in a flood event. By removing some, or all, of this uncontrolled flood storage area the flood risk could increase elsewhere.

The development has been designed to avoid the surface water and small watercourse Flood Zone 2 and 3 areas. As there will be no change to the topography or increased flow to the Flood risk zones, there will be no impact to the Flood Zone 2 and 3 areas or the flood regime.

The storm drainage serving the hard impermeable areas and the permeable paving has been sized to cater for the storms up to the 1:100 year event, including 40% climate change. Vortex flow controls in both catchments have been used to restrict the discharge to a reduced rate. Pipe storage and cells will be used to store the flow in the western catchment and a detention basin in conjunction with the permeable paving will store the water in the eastern catchment. The combined discharge at the existing storm drainage outfall will be reduced to 70% of the

existing 1:1 year brownfield flow rate produced by the existing impermeable catchment. The total discharge leaving the site and entering the existing network will be reduced by 30% in the 1-year event and by up to 50% in the 100-year event (+ 40% climate change).

For storm events less frequent than the 1:100 storm event, the proposed positive network may surcharge and flood. The flow paths have been assessed to ensure that the route of the flood water flows for events less frequent then that 1:100 storm are directed to a suitable receptor.

A snapshot of the overland flow paths are shown in Figure 5 with detailed drawing contained in Appendix E.

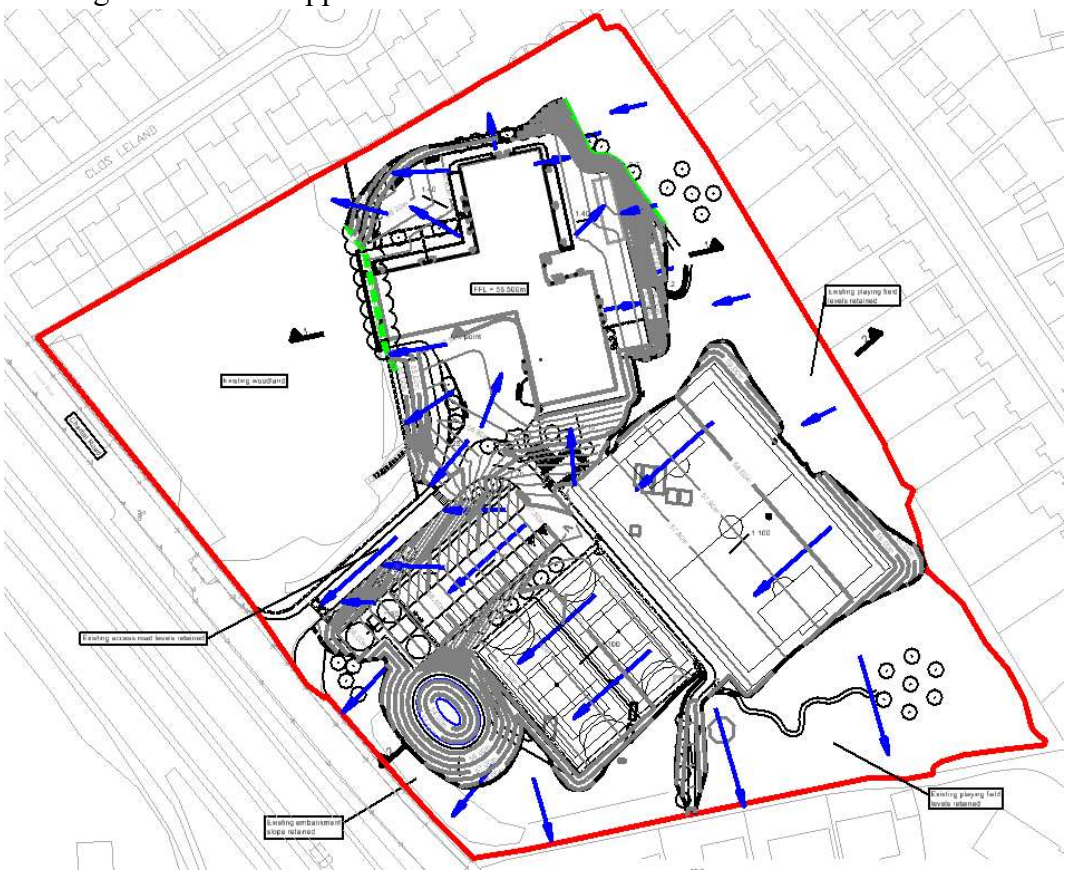

Figure 5 – overland flow paths

In the western catchment, the flows west of the building will be directed into the existing woodland replicating the existing overland flow path. It is assumed the water will be stored in the woodland as implied on the Flood Zone maps. East of the building, the flows have been directed to the base of the retaining wall to the grassed topped filter drain. If the filter drain becomes overwhelmed the water will locally be held on the surface in that area.

In the eastern catchment the flow running off the grassed football pitch will run on to the MUGA. The MUGA is sloped towards the attenuation basin so any flow that overwhelms the permeable paving will run directly into the basin overground. The attenuation pond has been designed with a 300mm freeboard above the 1:100 plus climate change event therefore this additional storage could be used in this extreme situation.

In the car park, rainwater will naturally build up against the southern kerbing if the permeable block paving is overrun. This will offer a small amount of storage and then overtop and run down the bank to Chartist Road as per the existing conditions.

5.3 Groundwater

The proposed levels (Appendix D) have been designed so that the proposed building is in fill, consequently the depth to groundwater will increase. The largest cuts are associated with the attenuation pond and the area north east of the building into the existing bank. Features, including the underground attenuation cells, may require lining to reduce the risk of groundwater ingress. The retaining structure into the bank north east to the building will also need to be designed to manage the groundwater.

The cut depths around the rest of the site are generally less than 1m depth.

It should be noted that the total area of green landscaping is less than the existing scenario. The proposed total area of impermeable and permeable paving served by the positive drainage system is approximately 0.592Ha compared to the existing 0.459Ha impermeable area. It is therefore likely that less storm water will percolate into the ground, thus reducing the risk of groundwater flooding.

Due to the deep cuts to the north east of the building there is a risk of ground water ingress and the retaining structure should be designed to manage this. The attenuation features and deeper cuts will also be designed to manage groundwater accordingly.

Groundwater flooding is rare in South Wales, the risk of groundwater flooding on this site is considered low.

6 Access and Egress

Access to the site is provided along Chartist Road through the existing site entrance on the south west boundary of the site.

The site access and Chartist Road are within River and Sea Flood Zone 1.

The site access is in surface water and small watercourse Flood Zones 2 and 3. Although the surface water flood map does not provide a surface water flood depth, by overlaying the extent of the flood on to the topographical contours, the top of the flood water is assessed to be at approximately 54.5mAOD (refer to Appendix B).

It is proposed that the existing entrance arrangement and levels are not changed from the current layout that serves the existing school development. Site levels at the entrance range from 54mAOD to 54.5m AOD therefore there is potential for 500mm depth flood water if the top of flood water reaches 54.5mAOD.

Chartist Road is also shown as surface water Flood Zone 3 north of the site access and Flood Zone 2 south of the access. Therefore, vehicular access to the site entrance will be limited in these flood events.

The vehicular access also has an associated pedestrian access, therefore this access is also compromised in these flood events.

The secondary pedestrian access on the south eastern boundary however is within surface water Flood Zone 1. It is possible to use this pedestrian access and then travel east to Burgese Close where vehicular access could be made to the A4119 as per Figure 6

Figure 6: Potential route to the site

There are small patches of surface water and small watercourse Flood Zone 2 and 3 on the route to the A4119, however the extent and depth of flooding is considered to be limited.

7 Summary of Technical Requirements

In the TAN15 documentation, Figure 9 outlines the technical requirements to be considered as part of the FCA. Appendix F contains the completed TAN15 Figure 9.

8 Conclusions

A Flood Consequences Assessment (FCA) has been undertaken for a proposed school development on the existing Penygawsi primary school site located in Llantrisant, Rhondda Cynon Taf, South Wales. The FCA has been undertaken in accordance with the guidelines provided in TAN15 Development and Flood Risk 2021.

The TAN15 Development Advice Map (DAM) shows that the site is in River and Sea Flood Zone 1 however there are areas of Surface Water and Small Watercourse Flood Zones 2 and 3.

As the site is in River and Sea Flood Zone 1, locating a primary school on the site is justified.

When developing the site masterplan, the surface water and small watercourse flood zones have been carefully considered. No works are proposed in the Flood Zone 2 and 3 areas therefore the existing flood regime is unchanged.

A positive drainage system has been proposed to drain the hard impermeable areas and the permeable paved areas of the site. This has been designed to accommodate the 1:100 year storm event with allowance for climate change with discharge rate controlled with a vortex control device. Storage on site will be in permeable paving, a detention basin, attenuation cells and in the storm pipes. The network will connect to the existing storm network at the site entrance.

The exceedance flow paths have been considered and designed so that if the drainage network floods, the flows are directed towards suitable location. This includes either the woodland area, as controlled low point at the base of the retaining wall or directly into the detention basin. The detention basin has been designed with a 300mm freeboard above the 1:100 plus climate change event providing additional storage in the extreme events. Other flow paths direct flow off site along the existing overland flow routes on to the footway east of the site or Chartist Road as per the existing conditions.

The existing school vehicular access point has been retained in its current location and form. The access is located in River and Sea Flood Zone 1 however is in surface water and small watercourse Flood Zones 2 and 3. Overlaying the extent of the flood zone on to the topographical survey, the flood water level is at approximately 54.5mAOD implying the surface water flood depth could reach 500mm at the site entrance. Chartist Road is also shown in Flood Zone 3 north of the access and Zone 2 south of the access.

The proposed pedestrian access on to the footway east of the site is located in Surface Water Flood Zone 1 and this leads to Burgesse Crescent. There is an indicative vehicular route from Burgesse Crescent to the A4119 although there are small patches on surface water and small watercourse Flood Zone 2 and 3 areas, although the extent and depth of flooding is considered to be limited.

The risk of groundwater flooding is considered low, however groundwater ingress will be considered in the design of the site features particularly the deeper cuts associated with the retaining wall into the bank north east of the proposed building and the attenuation features.

The FCA concludes that the risk of flooding for the proposed development is acceptable in accordance with TAN15 Development and Flood Risk.

Appendix A

Existing Development

Site Location Plan

Existing Ground Levels

Existing Utilities

Appendix B

TAN15 flood maps

Appendix C

Proposed Masterplan

Appendix D

Proposed Site Contours
Proposed Storm Water Drainage

Appendix E

Overland Flow Paths

Appendix F

TAN15 – Figure 19