

WEPco | Rhondda Cynon Taf  
County Borough Council

**RCT 3 Primaries Batch**

Llanilltud Faerdref - Flood  
Consequences Assessment

2020/9590

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 278688

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**ARUP**

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## Appendices

## 1 Introduction

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The Client is promoting the re-development of an existing primary school site located in Llanilltud Faerdref, 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

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

The site is approximately 1.22 Ha in area and located within Church Village (centred around OS grid reference 308661,186028), approximately 2km west of Treforest Industrial Estate.

The site is bounded to the east by Central Park Lane and public car park, and beyond this residential housing. To the south is an all-weather sports pitch and to the west, a grassed rugby sports field.

An existing woodland is located on the northern side of the site and this runs beyond the site boundary. Within the woodland is an existing watercourse, Nant yr Aran, located just outside the north eastern boundary. This runs in an easterly direction and enters a culvert before continuing east. The diameter, invert level, material and condition of the culvert is unknown.

The vehicular access to the site is to the south western corner. This runs alongside the all-weather sports pitch, a building and car park before connecting to St. Illtyds Road. There is a gated access to the playing field in the north eastern corner of the site on to Central Park Lane that leads to Main Road via the Llantwit Fardre Sports Club access road.

A site location plan is shown in Appendix A.

There is one main existing school building with associated asphalt car park that spans the length of the north western boundary and covers approximately half of the site. The remaining south eastern side of the site is predominately grassed playing field.

In general, the site slopes from south west to north east towards the woodland. The existing asphalt playground north of the school building is sloped at 1:18, the grassed playing field 1:60 and a 1m tall 1:4 slope from the playground and building down to the playing field separates the land uses. Across the grassed area on the eastern boundary and the hard paved playground north of the building, the slope is gradual and consistent however becomes steeper nearer to the woodland.





- 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 shows the Flood zones overlaid on to the existing site contours. This is also shown in Appendix B.



Figure 4 – surface water and small watercourse flooding extents

The Flood Zone 2 flooding west of the existing school building implies that the existing school building is theoretically obstructing the natural overland flow path to the Nant yr Aran from the western portion of the site. It should be noted that a non intrusive utility survey has been undertaken of the site and shows that there is a linear drainage channel located adjacent to the building in this area which connects to a piped storm network (Appendix A). The maintenance regime and effectiveness of this channel is unknown however if the channel fails or is not operational, the 3D spot levels imply flooding is likely to occur west of the building in the playground.

Just north of the building, the topographical survey indicates there are local low spots in the asphalt playground. There are gullies located in parts of the playground however these are infrequently spaced therefore it is likely that

localised flooding may occur that corresponds to the Flood Zone 2 area north of the building.

Figure 4 shows that the existing playing field at the eastern tip of the site slopes from 103mAOD down to 101.15mAOD and then continues to fall at a shallower gradient towards the watercourse. This shallower gradient section, which partially extends along the north eastern boundary corresponds to the Flood Zone 2 and 3 areas of small watercourse flooding. It is however unclear why a short section of Flood Zone 2 extends beyond this flatter plateau as there is no clear path in the landscape for the flood water to follow and does not correlate to the site contours.

## 2.2 Groundwater

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

The British Geological Survey superficial mapping indicates Diamicton Till beneath the site and the BGS bedrock mapping indicates the site is underlain by the Hughes Member of the Carboniferous Period. The Hughes member is described as having permeable layers capable of supporting water supplies at a local rather than strategic scale.

7 windowless sampling boreholes (4.15m maximum depth), 1 cable percussive borehole (maximum depth 5.30m) and 5 rotary open hole boreholes (maximum depth 30m) have been undertaken, targeting the proposed school building location.

Groundwater strikes were encountered in two windowless borehole sampling sites at 1.80m begl and 2.50m begl. Groundwater strikes were encountered in 3 rotary open hole boreholes between 4.10 and 13.50m begl. No further details were provided from the drillers logs regarding the water strikes.

Groundwater level monitoring has been undertaken within the monitoring installations. The standpipes installed within two installations were recorded as flooded at the time of the monitoring. One installation recorded a groundwater level of 1.3m begl. A further three groundwater level monitoring visits will be undertaken. At this stage HSP consider that the recorded entries are trapped meteoric water which may have seeped into the borehole rather than a reflection of true groundwater levels.

## 3 Proposed Development

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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 associated hard landscaping works are generally located on the eastern portion of the development on the existing playing field. The MUGA and car parking are located over the existing school building and can

be constructed following the existing building demolition. The existing school playground north of the existing building is to be removed and replaced with grassed landscaping.

The existing vehicular site entrance is to be retained as will the gated access to the existing playing field. Generally, the existing utilities run along the site entrance and serve the building from that direction. A new dedicated pedestrian access in the centre of the southern site boundary will be provided.

Reprofiling will be required to provide a suitable platform for the new building footprint which is set at 105mAOD FFL. 105mAOD has been used to enable a reasonable gradient to rise from the building and connect at the pedestrian entrance located just south west of the building on the red line boundary.

All proposed slopes are in the general direction of the Nant yr Aran to retain the existing catchment flow paths. The proposed finished levels are shown on drawing RH0301-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

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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

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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 C.

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 3 in the eastern corner of the site. The proposed land use in Flood Zone 3 is designated green landscaping and the proposal is to retain the existing ground levels in the Flood Zone. This also applies to the Flood Zones 2 areas associated with the Nant yr Aran on the north east site boundary. As the existing levels and surfacing are not changing, the existing flooding regime is not impacted.

It should also be noted that there is a risk that the culvert on the Nant yr Aran could become blocked. The diameter, invert level, material, condition and maintenance regime of the culvert are unknown therefore the likelihood of this occurrence is unknown. The Highly Vulnerable Development areas are situated approximately 2.5-3m above the small watercourse Flood Zone 3 area with no works within approximately 19m of the watercourse. It is therefore extremely unlikely a blockage will impact the Highly Vulnerable Development.

#### 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 areas around the site and outfall into the Nant yr Aran at a controlled rate via the existing outfall point. The existing outfall point is shown on the existing utility plan in Appendix A. If the existing outfall point cannot be used due to levels or condition, a new outfall location into the Nant yr Aran has been shown in Appendix D.

Rainwater 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 and permeable paving has been proposed.

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

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 footpath rises to the site boundary. A linear drain has been proposed in this area to manage the storm water.

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.

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 generally be directed towards the Nant yr Aran as per the existing regime.

#### **5.1.1.1 Managing the Flood Zone 2 north and west of the existing school building**

The Flood Zone 2 area located north and west of the existing building is proposed to be redeveloped. The existing building is proposed to be demolished and the asphalt playground removed. In its place, a permeable asphalt MUGA, permeable block paved car parking bays with associated asphalt road, asphalt footway and green landscaping are proposed.

The permeable asphalt MUGA is designed to capture and attenuate storm water before outfalling into the new proposed piped drainage system. The block paving will also allow water to percolate through the pavement layers and outfall into the piped network. The asphalt road and footway and designed to slope towards either the block paving or MUGA or to a linear channel located against the kerblines which connects to the main drainage network. The landscaped areas have been sloped so that any rainfall that does not percolate into the ground will be directed to the permeable paving.

These proposed drainage measures will remove the flooding that may occur in Flood Zone 2.

## **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 this uncontrolled flood storage with a positive storm drainage network, the flood risk could increase at the outfalling watercourse or on other areas of the site.

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. A detention basin in conjunction with a vortex control device will reduce the outflow into the Nant yr Aran to 70% of the existing 1:1 year brownfield flow rate produced by the existing impermeable catchment. The total discharge leaving the site and reaching the watercourse is reduced by 30% in the 1-year event and by up to 40% in the 100-year event (+ 40% climate change).

The area of the grassed playing field is 1800m<sup>2</sup> less than the existing greenfield and is sloped toward the Nant yr Aran. Assuming that the proposed grassed area behaves similarly to the existing green field (with similar infiltration and overland



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.

### 5.3 Groundwater

The proposed levels (Appendix D) have been designed so that the new building and built features closest to the Nant yr Aran are in fill, with fill depth increasing from south to north, consequently the depth to the water table will increase. The areas of cut are predominantly the attenuation basin and the MUGA. These features may require lining to reduce the risk of groundwater ingress.

It should also be noted that the area of green landscaping is less than the existing scenario therefore it is likely that less storm water will percolate into the ground, therefore infiltration and recharging of groundwater will reduce. The location of the grassed areas have moved from the eastern part of the site to the north western portion. The depth to groundwater in the eastern side of the site could become deeper as there will be less inflow however with more water entering the ground in the north west portion the depth to ground water could decrease.

Groundwater flooding is rare in South Wales, and the risk of ground water flooding for this site is considered very low, however the site features should be assessed for risk of flooding from groundwater and designed accordingly.

## 6 Access and Egress

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Access to the site is provided along the existing site entrance in the western corner of the site.

The site access is located in River and Sea Flood Zone 1 and surface water and small watercourse Flood Zone 1. The site access connects to the public highway at St Illtyd Road which is also located in Flood Zone 1.

There is a proposed pedestrian access on the south western boundary. This access and the route to the access from the school building is in Flood Zone 1.

## 7 Summary of technical requirements

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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

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A Flood Consequences Assessment (FCA) has been undertaken for a proposed school development on the existing Llanilltud Faerdref primary school site located in 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 along the north eastern boundary. The existing flood regime therefore is unchanged.

A positive drainage system has been proposed to drain the hard impermeable areas and the permeable paved areas of the site into the Nant yr Aran. 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 and in the storm pipes.

The exceedance flow paths have been considered and designed so that if the drainage network floods, the flows are gathered in the grassed landscaping between the hard paving west of the proposed building and east of the MUGA. If this is then overwhelmed, the flow path is directly into the detention basin which has been designed with a 300mm freeboard above the 1:100 plus climate change event. This means that some of the storm event over the 1:100 year plus climate change will remain on the site, replicating the uncontrolled storage up to the 1:1000 year event that the Surface Water Flood Zone 2 area north and west of the existing building implies.

The risk of groundwater flooding is considered low, however ingress should be considered in the design of the site features.

The access points to the site are in River and Sea Flood Zone 1 and surface water and small watercourse Flood Zone 1.

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 9