8. Flood Risk and Drainage

8.1 Introduction

8.1.1 In this chapter of the Environmental Statement an assessment of the Proposed Development with respect to flood risk and drainage is presented.

8.1.2 The Proposed Development is located in the south-west of the Trawsfynydd site below the lower slopes of Craig Gyfynys hill. Llyn Trawsfynydd is situated 150m to the south.

8.1.3 The Application Site is bounded by the Intermediate Level Waste store and woodland on the lower slopes of Craig Gyfynys to the west, with the former reactor buildings to the east. Various additional supporting buildings are situated to the north and south. Access roads and hardstanding surround the existing ponds complex buildings.

8.2 Relevant planning policy, legislation, and technical guidance

8.2.1 **Appendix 8A** identifies national and local policy, legislation and guidance relevant to the assessment of flood risk and drainage. Further information on the Reservoirs Act 1975[1] can be found in **Chapter 4: Regulatory**.

8.3 Data gathering methodology

8.3.1 The geographical extent of the Study Area extends 1.5km from the Application Site boundary. This Study Area is considered to be conservative in spatial terms and sufficient for the purposes of this assessment, based on hydrological knowledge of the Study Area and professional experience. The Study Area is illustrated in **Figure 8.1**. Baseline environmental characteristics for this area were identified using the sources of information summarised in **Table 8-1**. In addition, a site visit was undertaken by a WSP (formerly Wood) hydrologist on 8th July 2019 to confirm the local topography, develop an understanding of the local hydrology and Trawsfynydd site surface water drainage system and identify key features.

[1] *Reservoirs Act 1975.* [Online] Available at: https://www.legislation.gov.uk/ukpga/1975/23 [Accessed 01 December 2023].

Table 8-1 Sources of desk study information

Source	Data
Ordnance Survey (OS) mapping Topographic survey of the Trawsfynydd site	Topography (elevation, relief, springs, wells).
Natural Resources Wales (NRW) Development Advice Map* (2020)[2]	Flood risk – river and sea
NRW Flood Map for Planning (FMfP) (n.d.)[3] NRW Flood Risk Assessment Wales (n.d.)[4]	Flood risk – rivers and sea and surface water. Flood risk – reservoirs.
British Geological Survey (BGS) Geology of Britain Viewer (n.d.)[5]	Geology (solid and drift geology).
Cranfield University – LandIS soilscapes viewer (n.d.)[6]	Characteristics of local soils.

[2] Natural Resources Wales (NRW), (2020) *Development Advice Map*. [Online]. Available at: https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme=2 [Accessed 9th November 2023].

[3] Natural Resources Wales (NRW), (no date) Flood Map for Planning [Online]. Available at: https://flood-map-for-planning.naturalresources.wales/ [Accessed 9th November 2023].

[4] Natural Resources Wales (NRW), (no date) Flood Risk Assessment Wales [Online]. Available from: https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme=1 [Accessed 1st December 2023].

[5] British Geological Survey (BGS) (no date). Geology of Britain Viewer [Online]. Available from: http://www.bgs.ac.uk/data/mapViewers/home.html [Accessed 1st December 2023].

[6] Cranfield University (no date) LandIS soilscapes viewer [Online]. Available from: http://www.landis.org.uk/soilscapes/ [Accessed 9th November 2023].

Hydrogeological Interpretation[7], and A review of groundwater and surface water monitoring at Trawsfynydd[8]	Site description, surface water drainage system and local hydrology.
NRW Enquiries Unit	River flows and rainfall data.
Met Office Historic Station data[9] and UK Climate Average Data (n.d.)[10]	Rainfall data.

Notes: * TAN15[11] is supplemented by the Development Advice Map (DAM) which provides the basis for assessment under TAN15[11]. Consultation on an updated version of TAN15[11] has been completed (January 2020) however the new version is yet to be adopted. The draft update includes a range of changes to the guidance, in particular it removes reference to the Development Advice Map[2] and refers to a Flood Map for Planning[3] (FMfP) held by NRW. However, the consultation draft clearly states that the existing version of TAN15[11] remains current until such a time that the replacement is confirmed. The existing version of TAN15[11] has therefore been used to underpin this assessment.

8.4 Baseline conditions

Current baseline

Site Topography

8.4.1 The construction of the Trawsfynydd site involved levelling the local topography to create level areas for the power station and associated substation and switching compound at approximately 195.5 mAOD and 181.8 mAOD respectively[12]. Topographic levels across the Trawsfynydd site range from approximately 205

[7] Golder Associates (UK) Ltd. (2019), *Hydrogeological Interpretation (2018). TRA-LQF-268.* Golder; London, UK.

[8] See report '*A review of groundwater and surface water monitoring at Trawsfynydd*' (Serco, 2008)

[9] Met Office (no date). *Historic Station Data* [Online]. Available from: https://www.metoffice.gov.uk/pub/data/weather/uk/climate/stationdata/cwmystwythdata.txt [Accessed 1st December 2023].

[10] Met Office (no date). *UK Climate Average Data* [online]. Available from: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcmj3ef82 [Accessed 9th November 2023].

[11] Welsh Assembly Government (2004). Planning Policy Wales Technical Advice Note 15: Development and Flood Risk. [Online] Available at: https://gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf [Accessed 1st December 2023].

[12] Note that all elevations have been sourced from Environment Agency LIDAR.

mAOD at the western edge, to 201 mAOD at the southern edge and 175 mAOD at the northern edge. The Proposed Development is located on land above 195.4 mAOD.

Rainfall

8.4.2 Data for the Met Office[9] stations Cwmystwyth (approximately 64 km to the south) and Cwmystradllyn (approximately 15 km north-west) indicates a long-term total annual rainfall of 1,755 mm/year (1961 to 2010)[9] and 1,944 mm/year (1981 to 2010)[10,] respectively. More recent data (2009-2019) for Minafon station (5.5 km to the north) and Ffestiniog station (6.5 km to the north) provided by NRW[13] indicates an average total annual rainfall of 2,005 mm/year and 2,409 mm/year respectively. The data show that the months from October to January are significantly wetter than other months.

Waterbodies

8.4.3 The largest hydrological feature in proximity to the Proposed Development is Llyn Trawsfynydd which is a man-made reservoir dammed by four structures. These are the Hendre'r Mur and Gyfynys cut-off dams near the southern edge of the Trawsfynydd site and Maentwrog Dam (hydroelectric dam) to the west (where the reservoir flows into the Afon Prysor) and the Trawsfynydd cut-off dam on the southern edge of the reservoir (see **Figure 8.1**).

8.4.4 The Trawsfynydd site is located within the catchment of Afon Tafarn-helyg which flows northwards approximately 150 m east of the Proposed Development before joining the Afon Dwyryd, approximately 4.2 km to the north. Two small tributaries of the Afon Tafarn-helyg flow near the Proposed Development boundary: to the west, an unnamed stream flowing off Craig Gyfynys; and, in the east, the Nant Gwylan (see **Figure 8.2**).

8.4.5 The unnamed stream originates from springs on the east face of Craig Gyfynys and flows to the north-east, initially over ground 150 m to the north-west of the Application Site boundary. The watercourse then turns east to enter a culvert situated 50 m to the north of the Trawsfynydd site, resurfacing as a pipe discharge into the Afon Tafarn-helyg located downstream of the Trawsfynydd site sewage works. The upper section of the unnamed stream channel on Craig Gyfynys is approximately 0.50 m wide and 0.15 m deep and was dry near its origin during the

[13] Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved. [Online] Available at: https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ [Accessed 1st December 2023].

walkover survey undertaken on 8th July 2019, with minor flows observed after it resurfaces to the north of the Trawsfynydd site.

8.4.6 The Nant Gwylan originates from a valved outlet through the Gyfynys Dam. This is provided as a compensatory flow to ensure that the watercourse still receives an input from what was the upper part of its catchment, now within the reservoir. This watercourse flows to the north through a culvert under the eastern corner of the National Grid site before joining the Afon Tafarn-helyg. The typical flow rate is 2.5 litres/second (l/s)[7], but it was flowing at a lower rate (approximately 0.5 l/s) at the time of the walkover survey. The watercourse channel is approximately 0.75 m wide and 0.30 m deep (see **Appendix 8C**).

8.4.7 Two watercourses running off the hills to the east of the A470 and flowing in a west-south-westerly direction, are headwaters of the Afon Tafarn-helyg (see **Figure 8.1**). The mean flow in the uppermost (southernmost) of these watercourses (upstream of the confluence with the Nant Gwylan) is approximately 16 l/s (based on its catchment area and the effective rainfall). On this basis, the average flow in this part of the Afon Tafarn-helyg is greater than the typical flow in the Nant Gwylan (2.5 l/s). However, during dry weather, the controlled flow from the Gyfynys Dam into the Nant Gwylan can be expected to dominate.

8.4.8 The Afon Prysor flows into and out of Llyn Trawsfynydd in the south-east and north-west corners of the reservoir respectively (see **Figure 8.1**). The Afon Prysor then flows north-west for 3.2 km until it joins the Afon Dwyryd, which then drains into Tremadoc Bay. The Afon Prysor and Afon Dwyryd are designated as Main Rivers by NRW. The Afon Tafarn-helyg and associated tributaries are Ordinary Watercourses.

Trawsfynydd site surface water drainage system

8.4.9 Surface water runoff at the Trawsfynydd site is currently managed by a surface water drainage system. The surface water drainage system plan is provided in **Appendix 8B** and comprises the following elements:

- Surface runoff from the majority of the Trawsfynydd site, together with groundwater intercepted in groundwater drains around the reactor buildings, drain to the “diversion culvert sump” via the “drains diversion” oil interceptor and is pumped / discharged to Llyn Trawsfynydd at two discharge points (see **Figure 8.2**). These discharge routes are permitted under EPR permit GB3835DE (for radioactivity) and EPR permit CG0087701 (non-radiological).
- Storm overflow from the diversion culvert sump is discharged to the Nant Gwylan. This discharge route is permitted under the EPR permit GB3835DE (for radioactivity) and permit CG0409101 (non-radiological). Such discharges have been rare since the capacity of the pump was upgraded several years ago.

- Surface water runoff from the northern, lower lying, parts of the Trawsfynydd site (including the road leading to the sewage works and runoff from impermeable areas surrounding the sewage works) and emergent spring water in the vicinity is discharged via an oil interceptor to the unnamed stream flowing off Craig Gyfynys at the Northern Outlet Pipe (NOP), with discharges regulated under EPR permit CG0409001 (see **Figure 8.2**). Storm overflow from the sewage works is discharged to the unnamed stream feeding the Afon Tafarn-helyg at the NOP under EPR permit GB3835DE (see **Figure 8.2**).

Flood risk

Terminology

8.4.10 In this assessment, the probability of a defined flood event occurring is expressed in terms of Annual Exceedance Probability (AEP), which is the reciprocal of the long-term average annual return period for a flood of that magnitude or greater. For example, the 100-year flood can be expressed as the 1% AEP flood, which is a flood event that has a 1% chance of being exceeded in any year.

8.4.11 The updated FMfP mapping have been used as a further reference point for the assessment of flood risk to the Trawsfynydd site, given that this is understood to be a more contemporary dataset than the Development Advice Map utilising the latest and improved datasets.

8.4.12 **Appendix 8D** is provided to clarify the use of the AEP terminology as well as a description of the flood band definitions as used by the NRW in the FMfP and elsewhere.

Historical flooding

8.4.13 NRW's online mapping of local historical flood extents[14] does not show historical flooding at or close to the Trawsfynydd site. Gwynedd Council have no records of historical flooding at or near the Trawsfynydd site, however the Applicant has provided the following details of historical flooding at or near the Trawsfynydd site:

- Flooding in February 2004 of the lower area of the sewage works during a period of extreme wet weather. Minor remedial work to the Trawsfynydd site's surface water drains in the area undertaken subsequently, which also intercept shallow groundwater, are considered to have alleviated the potential for further flooding.

[14] Natural Resources Wales (2022). *Online mapping of local historical flood extents*. [online] Available at: http://lle.gov.wales/catalogue/item/HistoricFl/?lang=en [Accessed 9th November 2023].

- Flooding on several occasions following heavy rainfall of an area west of the Application Site boundary. During flooding, water was observed to flow vigorously from the slope above the roadway. Flooding of this area has been less severe since Gwynedd Council improved drainage along the National Cycle Path Route 8 uphill from the Trawsfynydd site to the west (see **Figure 8.2**).
- Flooding at property known as Tafarn-helyg, Gellilydan in early 1998. The property lies upstream of the bridge crossing of the Afon Tafarn-helyg, approximately 1.4km north (downstream) of the Proposed Development. A tributary of the Afon Tafarn-helyg flows off Mynydd Maentwrog and crosses the property in a culvert before discharging into Afon Tafarn-helyg. A study by Golder Associates indicated that flooding at the property is unlikely to have been caused by flooding from the Afon Tafarn-helyg (the catchment within which the Proposed Development is located) but instead by flooding from its tributary flowing off Mynydd Maentwrog[15].

Fluvial and tidal flood risk

8.4.14 The NRW FMfP[3] (Rivers) (see **Figure 8.3**) shows that the Proposed Development and the Trawsfynydd site lies entirely within an area of very low risk of fluvial flooding (Flood Zone 1).

8.4.15 The NRW DAM (see **Figure 8.4**[2]) shows that the Proposed Development is in Flood Zone A (lowest risk). The southern boundary of the wider area of land leased by Magnox from the Nuclear Decommissioning Authority borders an area of high fluvial flood risk associated with Llyn Trawsfynydd. **Figure 8.4** shows that the Proposed Development and wider Trawsfynydd site is not located within or close to Flood Zone B and that Flood Zone C2 matches with the area of medium risk shown on **Figure 8.3**.

8.4.16 Whilst the Trawsfynydd site is situated below water levels in Llyn Trawsfynydd (Environment Agency LiDAR indicates levels to be around 196.6mAOD), it is afforded significant protection by the reservoir design. This is discussed further below.

8.4.17 There is no risk of tidal flooding from the sea due to the elevation of the Trawsfynydd site (175 to 205mAOD). Outside of an extreme event, the key areas of flood risk will be low-lying areas of the Trawsfynydd site and areas adjacent to the minor watercourses, as shown on **Figure 8.5**.

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[15] Golder Associates (UK) Ltd. (2002). *Trawsfynydd Power Station: Response to Environment Agency Concerns Regarding Potential for Flooding at Tafarn-Helyg, Gellilydan. 02525428/1 A.3.* Golder; London, UK.

Surface water flood risk

8.4.18 Surface water flooding occurs when the intensity of rainfall is greater than the local drainage, watercourse and ground infiltration capacity, causing water to flow overland. Where low-points or barriers to flow are present, particularly deep areas of flooding may occur. These areas are not limited to river corridors or floodplains.

8.4.19 Whilst the NRW FMfP (Surface Water and Small Watercourses)[3] (see **Figure 8.5**) shows that risk is generally Low across the Trawsfynydd site, in places there are notable areas of risk relevant to the Proposed Development from this source[3]. It should be noted that the NRW FMfP[3] does not take into account the site surface water drainage systems. The FMfP[3] mapping also uses broad-scale topographic data that does not fully represent minor local topographic detail such as kerbs, gullies, and minor falls. Any flows in excess of the existing site surface water drainage system capacity would drain generally north / north-east towards the Afon Tafarn-helyg, situated at a lower elevation.

8.4.20 The mapping highlights areas of medium to high flood risk in low-lying areas along the minor watercourses adjacent to the Trawsfynydd site. However, this surface water flooding along the Nant Gwylan and Afon Tafarn-helyg follows ground at an elevation of 186 to 170mAOD, well below the elevation of the Proposed Development.

8.4.21 The Applicant has reported historical surface water flooding at the Trawsfynydd site (although not within the Proposed Development boundary) following very heavy rainfall in exceedance of the capacity of the Trawsfynydd site's drainage system. Minor improvements have been made to the drainage system to reduce the likelihood of further flooding.

Groundwater flood risk

8.4.22 Shallow groundwater flow through the rockfill and/or superficial deposits is locally controlled via flow through the relatively permeable rock fill, and groundwater drains around the reactor buildings and other below-ground engineered structures. Groundwater emergence is limited over much of the Trawsfynydd site, as groundwater levels are substantially below the ground surface level of the made ground. The exceptions to this are in the far west of the Trawsfynydd site (groundwater flowing off Craig Gyfynys) and on Roadway 5 on the eastern edge of the Trawsfynydd site (groundwater flowing from the area beneath former Turbine Hall), where groundwater levels are nearer the surface and issue as spring lines (**Figure 8.2**). However, emergent flows are small and are captured by the existing surface water management system. As described in **paragraph 8.4.13**, the Applicant has reported historical surface water flooding at the wider Trawsfynydd site; groundwater emergence as springs along the south-western and eastern boundaries may have contributed to this (**Figure 8.2**).

8.4.23 Almost all below ground voids within the Application Site are dry with no water ingress, with the exception of few spaces, e.g. the final delay tanks which sit deeper into bedrock. Currently any accumulating water in the final delay tanks (likely to be mainly rainfall infiltration) is monitored and pumped out as necessary. This arrangement will continue prior to and during any infilling works required for the Proposed Development.

Sewer flood risk

8.4.24 The Trawsfynydd site is situated away from adjacent developed areas and thus there are few other drainage networks present that could act as a source of flooding to the Trawsfynydd site and subsequently the Proposed Development. The foul sewer network at the Trawsfynydd site is hydrologically separated from the surface water drainage system, such that heavy rainfall would not lead to surcharging. In response to exceptional events, exceedances at the sewage works in the lowest part of the Trawsfynydd site would spill to the unnamed stream feeding the Afon Tafarn-helyg, for which a permit is held.

8.4.25 On the basis that the Trawsfynydd site has its own self-contained sewer network, the current risk of flooding from sewers surcharging is considered to be very low. Any flows from surcharging from minor systems associated with existing nearby buildings would be expected to be minimal/intercepted by the surface water drainage system.

Artificial flood risk

8.4.26 NRW Flood Risk Assessment Wales (Flood risk from Reservoirs)[4] (see **Figure 8.6**) shows that parts of the wider Trawsfynydd site is within the area that would flood in the extreme event of failure of the impounding dams at Llyn Trawsfynydd[4]. However, the Application Site sits outside of the predicted reservoir impoundment failure flood extent resulting from a standard breach configuration used by NRW in their Wales-wide modelling.

8.4.27 An assessment of the potential flood hazard at the Trawsfynydd site resulting from failure of the Gyfynys and Hendre’r Mur Dams has been completed as part of the Nuclear Safety Case work associated with the site. Failure of the dams is considered to be a very unlikely event taking account of the existing inspection/maintenance regime of the dams. The proposed development is a temporary activity that will result in a slight increase in flood storage capacity, so upon completion there would be an improvement in terms of the consequence of dam failure in that part of the Trawsfynydd site.

8.4.28 The Llyn Trawsfynydd dams are regularly inspected, monitored and maintained in accordance with the provisions of the Reservoirs Act 1975[1] (as amended) – see **Chapter 4: Regulatory.**

8.4.29 There are no other artificial sources of flooding near the Proposed Development.

Off-site areas at risk of flooding

8.4.30 The NRW FMfP[3] (Rivers and Sea), for the area downstream of the Proposed Development (see **Figure 8.7**) shows that the Flood Zone 3 area, associated with Afon Tafarn-helyg, widens upstream of Pont Tafarn-helyg (bridge) in Gellilydan covering the area where the property known as Tafarn-helyg is located[15]. Downstream of the bridge, Flood Zone 3 is narrower as the watercourse flows through a wooded ravine, before joining the Afon Dwyryd upstream of Maentwrog. Whilst it is likely that the bridge constricts downstream conveyance on the Afon Tafarn-helyg at this location, exacerbating the potential for flooding in the area (including at the Tafarn-helyg property), the flood modelling methodology used to prepare NRW's FMfP at this location will not have included detailed representations of the channel and bridge structure to precisely model the degree of risk.

8.4.31 The NRW FMfP (Surface Water and Small Watercourses)[3] (see **Figure 8.7**), shows a wide band of elevated flood risk along the Afon Tafarn-helyg between Ty Gwyn and Pont Tafarn-helyg at Gellilydan, as well as a number of surface water flow pathways associated with runoff from land to the west and east and from mapped watercourses tributary to the Afon Tafarn-helyg, downstream of the Proposed Development. A number of these flow paths converge upstream of the Pont Tafarn-helyg (bridge) in Gellilydan beside the Tafarn-helyg property.

8.4.32 Areas at risk of flooding include the existing built environment and land uses along the Afon Tafarn-helyg, principally between the Trawsfynydd site and downstream of Pont Tafarn-helyg (bridge) at Gellilydan near the A487. These include agricultural buildings west of Ty Gwyn and access track crossing, Coed-y-Llwyn caravan park upstream of Gellilydan and several residential properties, the Tafarn-helyg property, Gellilydan access road to the A487, farmland (pasture), and woodland. The Tafarn-helyg property is likely to be the location most at risk of flooding downstream of the Trawsfynydd site. This is due to the low-lying location of the property, its location upstream of a bridge which restricts downstream conveyance and where a number of tributaries and surface water flow paths converge. Other potential receptors are either on ground higher than the Afon Tafarn-helyg (upslope, no pathway), along flow paths of tributaries of the Afon Tafarn-helyg (i.e. upstream, no pathway), or of limited sensitivity/vulnerability (i.e. marshy vegetation in the floodplain).

8.4.33 There are limited receptors downstream of the Pont Tafarn-helyg bridge (campsite near A496 and the A496 bridge) and as the catchment of the Afon Tafarn-helyg becomes larger with progression downstream. Further downstream where Afon Tafarn-helyg joins the Afon Dwyryd (approximately 4.2km north of the site), any influence of the Trawsfynydd site is negligible given the much larger upstream

fluvial catchment of the watercourse and tidal influence in the low-lying Vale of Ffestiniog.

8.4.34 It should be noted that the overall Trawsfynydd site (0.25 km^2) represents 5.5% of the overall watercourse catchment (4.5km^2) to Pont Tafarn-helyg. Furthermore, the Proposed Development represents less than 1% of the overall watercourse catchment area and is already impermeable. This will not change as a result of the Proposed Development.

Summary – Sources of flood risk to the Proposed Development

8.4.35 Given the elevation of ground around the Proposed Development, flood risk from watercourses is negligible. The key risk in the area of the Proposed Development is associated with surface water accumulation in the lowest lying areas, generally the surrounding road network. Areas of mapped risk within or adjacent to the Application Site boundary are currently constrained by adjacent topography and existing buildings (**Figure 8.5**). Areas of High, Medium and Low surface water flood risk are present around most of the periphery of the ponds complex as well as a small area to north of the Proposed Development area. As noted earlier, these areas of risk and depth band do not take into consideration the existing Trawsfynydd site drainage system, which has been modelled as explained later in this chapter.

8.4.36 Access to the Proposed Development will utilise sections of the Trawsfynydd site's road network. NRW mapping[4] shows surface water flood risk as affecting some sections of this network, primarily to the south-west and south-east of the former turbine hall building (Low, Medium and High risk, depths of 0.15 to 0.30m) and to the west of the sewage works (Low risk only, depth below 0.15m). The remainder of the road network is mapped as being at Very Low risk of surface water flooding.

8.4.37 Groundwater flooding poses no risk to the Proposed Development, being present at considerable depth except along spring lines referred to above. Additionally, no dewatering or creation of new groundwater flow pathways is proposed as part of the works.

8.4.38 NRW's FMfP[3] shows that the risk to the area from fluvial sources is very low and there is no risk from tidal/coastal sources. The risk of flooding from sewer surcharging is very low as any flows from surcharging from minor systems associated with existing nearby buildings would be expected to be minimal/intercepted by the surface water drainage system.

8.4.39 The Proposed Development is potentially at risk should the dams retaining Llyn Trawsfynydd fail[16]. However, failure of the dams in a manner that could result in flooding of the development area is considered to be an extremely unlikely event taking account of the existing inspection/maintenance regime which, combined with a very high lake water levels event, has been judged to have a frequency

lower than 10^{-7} per annum[16]. In any case, there is greater potential for environmental harm with the ponds complex present as it is now, than there will be post-works.

Summary – Flood Risk from the Proposed Development

8.4.40 Given the existing impermeable nature of the ponds complex buildings and hardstanding and that the Proposed Development comprises their replacement with an impermeable capping slab, no change in the quantity of runoff is expected. As is the case currently, runoff from the capping slab will be routed into the existing site wide piped drainage system. The overall risk of exceedance of the diversion culvert sump pumps capacity will not be significantly increased by the Proposed Development. Therefore, the occurrence of surface water runoff passing away from the Proposed Development will not significantly change in frequency or magnitude and there is no potential to measurably increase the flood risk to third parties. Similar is expected to apply in respect of off-site receptors during construction.

Future baseline

8.4.41 Climate change is predicted to result in increased rainfall seasonality, with generally wetter winters and drier summers. High-intensity rainfall events will also become more common. The drainage performance modelling referred to later in this chapter has utilised the latest extreme rainfall predictions and does include allowances for climate change.

8.4.42 In general, climate change will also lead to greater variation in river flows (low flows and high flows) and increases in flood risk along water courses. However, the flow to the Nant Gwylan is controlled and not subject to such variation. It will also remain the case that the Proposed Development is well away from and at a significantly higher elevation than any local water courses that may flood.

8.4.43 To facilitate reactor dismantling, in the coming years there are likely to be some changes to the hardstandings / drained catchment areas across other parts of the Trawsfynydd site. However, all of this is yet to be designed and so no account can be taken of it here. It will, however, be designed being cognisant of on-site and off-site flood risks, and designed to applicable Welsh drainage standards, and the final drainage designs will require approval by the Sustainable drainage systems (SuDS) Drainage Approval Body (SAB).

[16] Magnox. (2013). *Trawsfynydd Site - Post Fukushima review of the consequences of flooding due to dam failure on site*. Document reference TRAWS/EJ/ENG/014/2594. Magnox; London, UK

8.4.44 Finally, at the present time there is a ground dewatering system on the south side of Reactor 1 which prevents the below-ground voids and basement areas on that side of Reactor 1 from accumulating groundwater. This dewatering system will be replaced with a permanent, passive solution at some point. That solution has not yet been designed. However, these issues do not affect ground-level flooding, because they only affect groundwater at considerable depth below ground level. It is a separate issue to the Proposed Development.

8.5 Consultation and engagement

8.5.1 A Scoping Opinion was provided by Flintshire County Council on behalf of Eryri National Park Authority (ENPA), on 23rd March 2023. A summary of the relevant responses received in the Scoping Opinion in relation to surface water and flood risk and confirmation of how these have been addressed within the assessment to date is presented in **Table 8-2**.

8.5.2 The response stated:
"With regards to flood risk, the LPA are satisfied with the content of Section 7 (Flood Risk and Drainage) [of the submitted Scoping Report]*. It is agreed that the application site (red line boundary) is not within an area shown to be at risk of flooding from rivers or sea according to the Flood Map for Planning (FMfP). The FMfP represents better and more up-to-date information on areas at flood risk (2004).*

NRW's remit, with regards to advising on flood risk and suitability of any assessment relates to flooding as shown on the FMfP/DAM and any associated main rivers or the sea. We note that the proposal is unlikely to have the potential to cause significant environmental effects in terms of flood risk. However, please be aware that the Flood and Water Management Act 2010 created Lead Local Flood Authorities (LLFA-Local authorities in Wales). This was to enable LLFAs to lead on managing local flood risks i.e. risks of flooding from surface water, ground water and ordinary (smaller) watercourses. As such we would advise that the LLFA - Gwynedd Council in this instance are consulted on this section (7) of the EIA process. Gwynedd Council also act as the Sustainable Drainage Approval Body (SAB), and it is noted in section 4 (Other Consents) that approval was obtained in May 2022. We therefore agree with the Summary (7.3.38 to 7.3.43) in that the key risk to the Proposed Development relates to surface water risk. As stated above, whilst we are satisfied with the content of section 7, we would advise that the LLFA should be the appropriate body to comment and advise on the management of flooding from this source. We note and accept the commentary made on the (unlikely) failure of the dams retaining Llyn Trawsfynydd. For completeness and future reference, we would advise that the table 7.3 footnote 10 that the Climate change guidance has been updated:- Climate change allowances and flood consequence assessments | GOV.WALES"

8.5.3 In May 2023 the Applicant responded to ENPA about these points, stating: *"The proposed drainage is functionally the same as the current drainage, meaning that the rainfall capture area is the same and the routing of collected water is the same (to the lake via the diversion culvert). The proposed drainage strategy, which does not include removal of the diversion culvert and its replacement with a Sustainable Drainage System (SuDS), has been approved by the SuDS Approving Body (SAB).*

Drainage performance calculations are currently being undertaken which include modelling of drains performance in extreme rainfall events. The results of these calculations will be summarised in the Environmental Statement, and exceedance flow paths presented.

For your information, depending on the demolition approach, it may be appropriate to screen out the impacts of water ingress into voids within the ponds complex.

The identified update to climate change guidance is noted and the flood risk and drainage Environmental Statement chapter will utilise this or any future updates at the time of writing.

How climate change could affect groundwater levels is also a consideration within the long-term impacts chapter."

Table 8-2 Summary of EIA Scoping Direction responses for Surface Water and Flood Risk

Consultee	Consideration	How addressed in this Environmental Statement
Local Planning Authority	Flood Risk and Drainage (general)	As requested, use has been made of NRW's FMfP[3] as the more accurate source of fluvial flood risk compared to the DAM[2] mapping.
NRW	Flood Risk and Drainage (general)	Noted that NRW's key remit covers tidal and fluvial flood risk, and that for surface water flood risk and drainage the Lead Local Flood Authority (LLFA) are the competent authority.
Gwynedd County Council as LLFA and	Surface water flood risk and drainage	A Surface Water management (drainage) strategy, compliant with current guidance and climate change allowances

Sustainable Drainage Approval Body (SAB)		has been developed and approved for the proposals in consultation with Gwynedd County Council.

8.5.4 Data requests were sent to NRW and Gwynedd Council to establish the current baseline for the Proposed Development boundary.

8.6 Assessment of impacts

Spatial scope

8.6.1 The spatial scope of the assessment of flood risk and drainage covers the area contained within the Application Site boundary and the wider Study Area described in **Section 8.3**.

Temporal scope

8.6.2 The temporal scope includes the Works Phase which is scheduled to take about 24 months. It also includes the post-Works phase prior to any final site landscaping and implementation of a passive drainage system to replace the diversion culvert pumps system (which would be subject to assessment and permissioning at that time).

Existing controls and environmental measures

8.6.3 Existing controls under other regulatory regimes that will have to be complied with have informed the development of the project description as part of the design process. As such, there are a number of measures that are an integral part of the development that will reduce the potential for impacts, as summarised in **Table 8-3**. These are presented here to provide the context on how potential significant effects would be avoided by the design.

Table 8-3 Summary of existing controls under other regulatory regimes and the embedded environmental measures for flood risk and drainage

Existing Designs and Controls	Compliance Mechanism
Drainage Strategy: Implementation of an appropriate drainage strategy for the Works Phase, for the post-Works Phase, and for post-works drainage maintenance. The post-works approach is set out in the approved drainage strategy document[17] and further developed in the subsequent commentary document[18].	Planning Condition, SAB approval
Water discharges: Runoff from the capping slab area once completed will be routed by the slab's perimeter drain into the existing site drainage network which will discharge into Llyn Trawsfynydd in the same way as at present. In situations when the diversion culvert sump pumps capacity is exceeded, discharge will be via overflow into Nant Gwylan (as now). Both the lake outfall and the stream overflow are NRW permitted discharge routes. No changes are proposed to the current discharge rate or location.	SAB approval Site environmental permit

Potential Impacts not assessed further

8.6.4 **Table 8-4 and Table 8-5** set out how a conclusion has been arrived at to exclude the matters identified from further assessment.

[17] Mott MacDonald (2022). *ponds complex – Detailed SuDS Drainage Design Proposal (doc ref – TPC-MML-FB25-XX-T-C-0001)*. May 2022.

[18] Mott MacDonald (2023). *Trawsfynydd Decommissioning Site: ponds complex – Drainage Design Commentary* (doc ref – TPC-MML-FB25-XX-T-C-0002_Rev06). August 2023.

Table 8-4 Works Phase: Flood risk and drainage effects not subject to further assessment

Effect	Receptor	Reasoning
Flooding from tidal sources	Application Site	Trawsfynydd site's elevation (175 mAOD – 205 mAOD) above sea level means that there is no risk of tidal flooding.
Flooding from fluvial sources	Application Site	The Proposed Development is located away from and at a higher elevation than all significant watercourses. Only the unnamed stream is in proximity, but this is small stream with a significant gradient.
Flooding from groundwater sources	Application Site	The infilling and capping works do not include deep excavations. In general, there is no possibility of the works resulting in any change to the existing groundwater level, quantity, or flow routes. The only potential exception to this is theoretical localised small changes to groundwater level at several metres depth below ground level due to the proposed permanent blocking of some under-ponds drains.
Changes to fluvial flood risk downgradient	Humans, property, and infrastructure downstream of the Trawsfynydd site (via Diversion Culvert) – key receptor Tafarn-helyg property	There is no potential to influence fluvial flood risk off site during the Works Phase as: there is no proposal to store significant volumes of water on site for discharge from the site via storm drains in large, short releases; the total

		discharges and average discharge rates of water from the site will remain unchanged (both being controlled by the rainfall); and the routing of the discharges from site will remain unchanged.

Table 8-5 Post-Works Phase: Flood risk and drainage effects not subject to further assessment

Effect	Receptor	Reasoning
Post-development changes to the site runoff/drainage regime resulting in increased risk of flooding (extreme rainfall events)	Trawsfynydd site	The drainage design results in no detriment over existing run off, and a small margin of betterment on site in extreme rainfall events, as discussed later in this chapter.
Post-development changes to the site runoff/drainage regime resulting in increased risk of flooding (extreme rainfall events)	Humans, property, and infrastructure downstream of the Trawsfynydd site (via Diversion Culvert) – key receptor Tafarn-helyg property	The drainage design results in no significant detriment over existing run off. There is no proposal to store significant volumes of water on site for discharge from the site via the storm drains in large, short releases; the total discharges and average discharge rates of water from the site will remain unchanged (both being controlled by the rainfall); and the routing of the discharges from site will remain unchanged.

Potential Receptors

8.6.5 Based on the baseline assessment of the existing Trawsfynydd site, the following receptors were identified: the proposed works area within the Trawsfynydd site; and the wider Trawsfynydd site.

Potential Works Phase Impacts

8.6.6 The infilling and capping works do not include deep excavations or ground de-watering activities.

8.6.7 Whilst during the demolition and infilling works at the ponds complex voids there is negligible potential for groundwater and rainwater ingress and accumulation within below ground workings, this will be avoided by the required use of over-buildings, pumps, and temporary covers, as explained in the Project Description. With respect to rainwater, any accumulation of water would only occur over a short period if no temporary cover is in place to prevent incident rainfall. Any accumulation within below ground voids would be slow and would be managed as appropriate.

8.6.8 All below ground voids are dry with no water ingress with the exception of the final delay tanks. Currently water accumulating (very slowly) in the final delay tanks is monitored and pumped out as necessary. This arrangement will continue prior to and during any infilling works.

Potential Post-Works Phase Impacts

8.6.9 During the post-Works Phase, the new areas of hardstanding associated with the proposed impermeable capping slab will not change the overall extent of low permeability surfaces. The final design ensures there will be negligible changes to runoff rates and volumes, and therefore no change to the existing level of flood risk to flood risk receptors. There is no change in total impermeable area.

8.6.10 An outline drainage strategy was produced for the Proposed Development and approved by the SAB on 9th June 2022[19], further assessed within the August 2023 drainage strategy[18] document. The main conclusions are:

- As the runoff regime from the capped former ponds complex area will not change, the quantity of runoff generated during extreme rainfall events will be no different from the current baseline. Some minor localised capacity increases are provided by the new elements of the drainage network local to the capping

[19] Gwynedd County Council as SAB (2022). Approval (ref 0223/22/SUDS) - *Demolition of Ponds Complex at Trawsfynydd Nuclear power station* (09/06/22).

slab, although overall system performance remains controlled by the wider network capacity.

- The specified approach has been modelled, and modelling confirms that the Proposed Development's drainage system will result in a slight improvement over existing (i.e. reduced flooding from some manholes during intense rainfall events compared to existing).
- Runoff from the capping slab area is proposed to be routed by the slab's perimeter drain into the existing wider Trawsfynydd site drainage network, and then to the diversion culvert sump from where the water is pumped to Llyn Trawsfynydd. Occasionally, when the water volume exceeds the sump pumps capacity, there is an overflow to Nant Gwlyan. Such overflow discharges have been rare since the capacity of the sump pumps was upgraded several years ago. Both the lake outfall and the overflow to the stream are permitted discharge routes (EPR permits GB3835DE, CG0409101 and CG0087701). No changes are proposed to the current discharge rate or location, nor will there be any changes to the frequency or magnitude of overflows as a result of the Proposed Development.
- The capping slab will be in place permanently as part of the wider decommissioning works at the Trawsfynydd site. During this period, runoff from the slab will increase due to the effects of climate change. Modelling of the proposed drainage system has taken this into account. The March 2024 drainage strategy[18] reports potential values for exceedance (for a range of return periods and rainfall event durations), with an estimated volume of circa 37m^3 of flood water produced in manhole MH115, 38m^3 at manholes MH122 and MH123 and 13m^3 at manhole MH120 for the 1 in 100 year +40% Climate Change event adjacent to the ponds complex. The ditch to the west (rear) of the Intermediate Level Waste Storage building (outside the application site) is expected to surcharge but not over top. There is also a very small volume (<20m^3 total) of surcharging predicted by the model in manholes MH132, MH133 and MH129 on the east side of the reactor buildings. Reviewing the predicted flood locations and local topography any flood volume will either dissipate quickly across the generally flat area of the site and enter the drainage system via different routes where capacity allows or stay within a local depression until the drains have capacity to accommodate the water. The depth of water ponding is assessed to be below 100mm in all instances and presents no risk to any existing buildings or the existing floor slabs of the ponds complex.
- In the events of manhole flooding, runoff will follow overland routes and drain north towards the Afon Tafarn-helyg, situated at a lower elevation, unless captured by parts of the drainage system that are not exceeded. Exceedance flow paths local to the Proposed Development are shown in **Figure 8.8**.

8.7 Conclusion on flood risk and drainage

8.7.1 The Proposed Development results in no significant impacts in relation to flooding and drainage. The only required mitigation is for the proposed new drainage within the Application Site boundary to be subject to a routine maintenance regime.

Appendix 8A
Relevant planning policy, legislation, and technical guidance

Planning Policy

This Appendix identified the relevant national and local policy, legislation and guidance that has informed the scope of assessment relevant to flood risk and drainage. A summary of the planning policies relevant to flood risk and drainage is given in **Table A-1**. Note only the documents most pertinent to the Proposed Development are detailed.

Table A-1 Planning policy relevant to flood risk and drainage

Policy reference	Policy relevance
National planning policies	
Planning Policy Wales, Edition 12[1] (2024)	Outlines requirements for flood risk management and use of sustainable drainage (SuDS) within the spatial planning system.
Technical Advice Note (TAN) 15[2] (2004)	Supports Planning Policy Wales with detailed guidance on flood risk management and SuDS requirements for new development. A draft updated TAN15 was prepared for consultation and proposed adoption in 2021. This has not yet been adopted as of November 2023, therefore the existing guidance remains relevant.
SuDS Statutory Guidance[3] (2019)	Sets out mandatory use of SuDS and the role of the SuDS Approving Body (SAB).

[1] Welsh Government (2024*). Planning Policy Wales. Edition 12*. [Online] Available at: https://www.gov.wales/sites/default/files/publications/2024-07/planning-policy-wales-edition-12.pdf [Accessed 25 July 2024].
[2] Welsh Assembly Government (2004). *Planning Policy Wales Technical Advice Note 15: Development and Flood Risk*. [Online] Available at: https://gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf [Accessed 25 July 2024].
[3] Welsh Government (2019). *Sustainable Drainage (SuDS) Statutory Guidance*. [Online] Available at: https://gov.wales/sites/default/files/publications/2019-06/statutory-guidance.pdf [Accessed 25 July 2024].

Policy reference	Policy relevance
Local planning policies	
Eryri Local Development Plan 2016 – 2031 Written Statement[4] (2016)	Development Policy 1 - General Development Principles – development proposals must demonstrate that: "*The risks of, and consequences of flooding can be managed on and off site to an acceptable level in line with national planning policy*."
Snowdonia National Park Authority Supplementary Planning Guidance (2015)[5]	SPG12. *'Enabling Sustainable Development in the Welsh National Parks'* reiterates the need to manage flood risk and utilise SuDS and appropriate technical design guidance, such as that provided by CIRIA.
Gwynedd Council Local Flood Risk Management Strategy[6] (2013), Gwynedd Council Preliminary Flood Risk Assessment (PFRA)[7] (2011) and PFRA review[8] (2017), Anglesey & Gwynedd Joint Planning Policy Unit Strategic Flood Consequence Assessment (Stage 1)[9] (2015)	Details the flood risk role and responsibilities of Gwynedd Council and other relevant Risk Management Authorities over the Gwynedd area, (as Lead Local Flood Authority (LLFA) and SuDS Approving Body Gwynedd covers the Snowdonia National Park Planning Authority area).

[4] Snowdonia National Park Authority (2016). *Local Development Plan* [Online] Available at: https://planning.snowdonia.gov.wales/policy/local-development-plan/ [Accessed 25 July 2024].
[5] Snowdonia National Park Authority (2015) *Supplementary Planning Guidance* [Online] Available at: https://snowdonia.gov.wales/wp-content/uploads/2022/02/Supplementary-Planning-Guidance-12-%E2%80%93-Enabling-Sustainable-Development-in-the-Welsh-National-Parks.pdf [Accessed 25 July 2024].
[6] Gwynedd Council (2013) *Local Flood Risk Management Strategy*. [Online] Available at: https://www.gwynedd.llyw.cymru/en/Residents/Documents-Residents/Parking,-roads-and-travel/Flood-and-Coastal-Risk-Management/Local-Flood-Risk-Management-Strategy.pdf [Accessed 25 July 2024].
[7] Gwynedd Consultancy (2011). *Flood Risk Regulations 2009. Preliminary Flood Risk Assessment Report. Draft.* [Online] Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20140328171811mp_/http://cdn.environment-agency.gov.uk/flho1111bvez-e-e.pdf [Accessed 25 July 2024]
[8] Gwynedd Council (2017). *Part 4: Template for addendum to update the original Preliminary Flood Risk Assessment report*. [Online] Available at: https://www.gwynedd.llyw.cymru/en/Residents/Documents-Residents/Parking,-roads-and-travel/Flood-and-Coastal-Risk-Management/Gwynedd-PFRA-phase-1-review-questionnaire-Part-4.pdf [Accessed 25 July 2024].
[9] Anglesey & Gwynedd Joint Planning Policy Unit Strategic (2015) *Flood Consequence Assessment (Stage 1).* [Online] Available at:

Legislation

Table A-2 sets out the legislation relevant to the assessment of the potential effects on flood risk and drainage receptors.

Table A-2 Legislation relevant to flood and drainage

Legislation	Relevance
Reservoirs Act 1975[10]	Llyn Trawsfynydd is a reservoir. The Act provides regulation for the operation and maintenance of reservoirs to ensure the design is fit for purpose, and that maintenance (including frequent inspections of reservoir embankments) ensures the condition of the embankments. Consequently, the chance of them failing and giving rise to flooding problems is remote.
Flood and Water Management Act 2010[11]	Sets out the Government's proposals to improve flood risk management, water quality, to ensure water supplies are more secure, and to improve reservoir safety. The Act includes consideration and responsibilities for managing flood risk and consideration of drainage including the use of SuDS, and the setting up of SABs.

Technical guidance

The assessment has been prepared in accordance with the best-practice guidance set out in **Table A-3**.

Table A-3 Technical guidance relevant to flood risk and drainage

Technical guidance document	Relevance
Flood consequence assessments: climate change allowances (2021)[12]	Guidance regarding uplifts to be applied to hydrological modelling inputs to be used to help minimise vulnerability and provide resilience to the impacts of climate change.

https://www.gwynedd.llyw.cymru/en/Council/Documents---Council/Strategies-and-policies/Environment-and-planning/Planning-policy/Supporting-documents/Topic-Paper-8A---SFCA-(PT.015).pdf [Accessed 25 July 2024].

[10] *Reservoirs Act 1975*. [Online] Available at: https://www.legislation.gov.uk/ukpga/1975/23 [Accessed 25 July 2024].

[11] *Flood and Water Management Act 2010*. [Online] Available at: https://www.legislation.gov.uk/ukpga/2010/29/contents [Accessed 25 July 2024].

[12] Natural Resource Wales. (2021*). Flood consequence assessments: climate change allowances*. [Online] Available at: https://www.gov.wales/climate-change-allowances-and-flood-consequence-assessments [Accessed 25 July 2024].

Technical guidance document	Relevance
CIRIA Report C753: The SuDS Manual (2015)[13]	Best practice guidance on the planning, design, construction, operation and maintenance of SuDS to facilitate their effective implementation within developments.

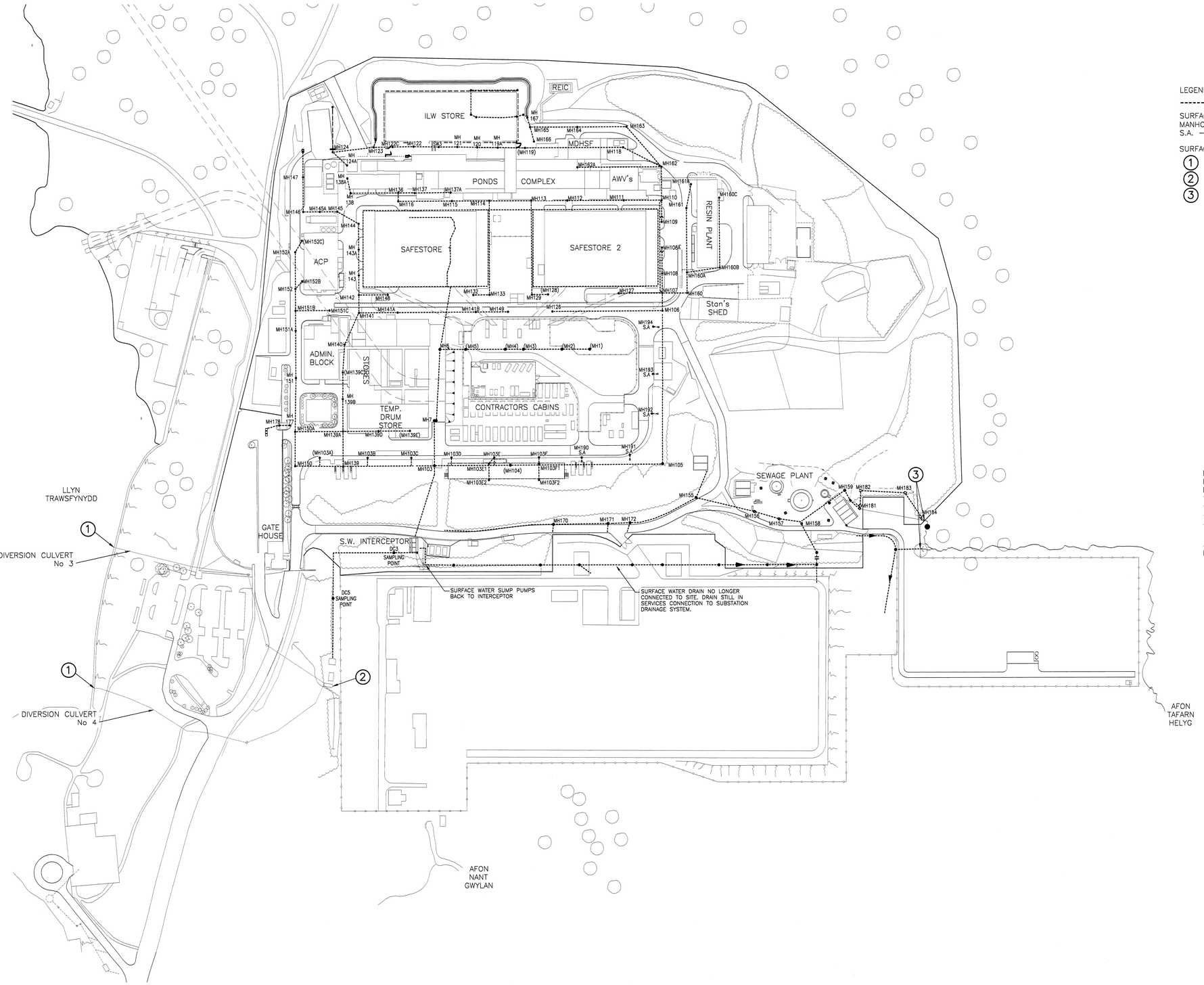
[13] Woods Ballard, S., Wilson, S., Udale-Clarke, H., Illman, S., Scott, T., Ashley, R. and Kellagher, R. (2015*). The SuDS Manual. C753*. CIRIA; London, UK.

Appendix 8B
Surface water drainage system

Drawing Number TRA/3210/LA/11210

DO NOT SCALE – IF IN DOUBT ASK

THIRD ANGLE PROJECTION UNLESS OTHERWISE STATED



LEGEND:–

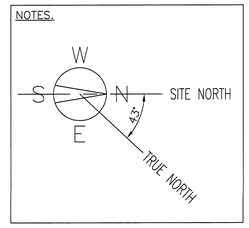
---------- SURFACE WATER SEWER

SURFACE WATER MANHOLES ARE NUMBERED 100 TO 199 AND PAINTED BLUE
MANHOLES IDENTIFICATION ILLUSTRATED IN ENCLOSED BRACKETS ARE EITHER BURIED OR CAPPED
S.A. – SOAK AWAY

SURFACE WATER CONSENT DISCHARGE POINTS

1. PUMPED TO LAKE FROM DIVERSION CULVERT SUMPS
2. DIVERSION CULVERT SUMPS OVERFLOW
3. NORTHERN DISCHARGE POINT TO AFON TAFARN HELYG

NOTES.



REFERENCES:
FOR INDIVIDUAL SEWERS REFER TO THE FOLLOWING DRAWINGS
DA–11–00–C5020 LAYOUT OF SITE SEWERS
TRA/3210/LA/11211–01 FOUL DRAINAGE SYSTEM LAYOUT
TRA/3210/LA/11212–01 OIL DRAINAGE SYSTEM LAYOUT
TRA/3210/LA/11213–01 ACTIVE DRAINAGE SYSTEM LAYOUT
TRA/3210/LA/44910–01 TRAWSFYNYDD BURIED DRAINAGE SYSTEMS AREA KEY

ADDITIONAL INFORMATION REF – MANHOLE DETAILS CAN BE PICKED UP IN GROUP DA/11/00/ SEQUENCE NUMBERING

Modifications							
01	AW JS GWG 06/03/12	FIRST ISSUE	02	AW RH AI 29/11/12	SITE LAYOUT UPDATED	03	AW MM AI 17/02/13
						04	AW 22/8/13 AI

DRAIN LINE FROM MH110 TO 107 ADDED. NO LINK BETWEEN MH108A & 109 MH155 & 139B ADDED.

ADDITIONAL INFO ADDED FOLLOWING FURTHER SITE AND HISTORICAL DRAWING CHECKS

Current Issue	Signature	Name	Date	Scope of Verification
Drawn by:		ADRIAN WILLIAMS	20/08/13	SITE CHECK
Verified by:		STUART GENSON	21/8/13	
Approved by:		ANDREW LOWES	21-8-13	
Issue: 04	Drawing Status	Q.A. Grade	Classification	
Date: 22/8/13	ISSUE	2	COMMERCIAL	

ORIGINAL DRAWING SIZE A0	CREATED IN AUTOCAD	Scale 1:1000
DRAWING TO BS8888 MIN. TEXT HEIGHT 3,5mm		
ALL DIMENSIONS ARE mm UNLESS OTHERWISE STATED		

Contractor Details

NRC/RGP Acceptance Signature required only when contractor details present.	Print Name: Signature: Date:
DRAWING ENTERED ON SITE REGISTER	Office 22/8/13

Magnox

Magnox Limited
Trawsfynydd Site
Registered in England No.2264251
Registered Office: Berkeley Centre, Berkeley, Gloucestershire. GL13 9PB

Location TRAWSFYNYDD | Project Number

Title: TRAWSFYNYDD DECOMMISSIONING SITE SURFACE WATER DRAINAGE SYSTEM

Drawing Number TRA/3210/LA/11210 | Issue 04

Appendix 8C
Site Visit Photographs

Photo Collection 1: Views of Diversion Culvert Sumps including Overflow discharge into Nant Gwylan, north of the site NGR - SH 69274 38321

Photo Collection 2: View of Hendre Dam, south of the site NGR - SH 69549 38341

Photo Collection 3: View of Gyfynys Dam, south of the site NGR - SH 69323 38165

Photo Collection 4: Unnamed stream to the west of the site – before it flows beneath the site (dry during walkover survey on 7 July 2019) NGR - SH 68742 38420

Photo Collection 5: Area between Safestore buildings 1 and 2 (where the liquid waste storage pit (also known as 'black hole' is located) NGR - SH 68956 38186



Photo Collection 6: Northern Outlet Pipe (NOP) discharge into unnamed stream with oil skimmer, north of the site NGR - SH 68917 38507


Photo Collection 7: Unnamed stream at northeast corner of site (before joining Afon Tafarn-helyg) NGR - SH 68858 38755

Photo Collection 8: Surface water oil interceptor, southeast corner of the site NGR - SH 69154 38223

Photo Collection 9: View of sewage works NGR - SH 68970 38453

Appendix 8D
Flood Zone definitions and associated annual exceedance probability

This Appendix is provided to clarify the use of Annual Exceedance Probability (AEP) terminology and descriptions of flood band definitions as used by Natural Resources Wales (NRW) in the Flood Map for Planning[1].

Table D-1 Flood Zone definitions from Development Advice Map[2]

Development Advice Map Flood Zone	Probability of flooding	AEP	Definition
Flood Zone A	Considered to be at little or no risk of fluvial or tidal/coastal flooding	-	Used to indicate that justification test is not applicable and no need to consider flood risk further.
Flood Zone B	Areas known to have been flooded in the past evidenced by sedimentary deposits.	-	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1% AEP) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further
Flood Zone C1 (developed and served by significant flood defences)	Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	Equal or greater than 0.1% AEP (river, tidal or coastal)	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.

[1] Natural Resources Wales (no date). Flood Map for Planning [Online]. Available at: https://flood-map-for-planning.naturalresources.wales/ [Accessed 01 December 2023]

[2] Natural Resources Wales (2020) Development Advice Map. [Online]. Available at: https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme=2 [Accessed 01 December 2023]

Flood Zone C2 (no significant flood defences)	Areas of the floodplain without significant flood defence infrastructure.	Equal or greater than 0.1% AEP (river, tidal or coastal)	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

Table D-2 Flood Zone definitions from Flood Map for Planning[1]

Flood Map for Planning			
Flood Zone	**Probability of flooding**	**AEP**	**Definition**
Flood Zone 1	Very low probability	<0.1% AEP of flooding	Land with less than 0.1% AEP (1 in 1,000) probability of flooding from rivers or the sea, in any given year,
Flood Zone 2	Low probability	Between 1% and 0.1% AEP of river flooding Between 1% and 0.5% AEP of sea flooding	Land with 0.1% to 1% (1 in 1000 to 1 in 100) probability of flooding from rivers in a given year, including the effects of climate change; or Land with 0.5% to 1% (1 in 200 to 1 in 100) probability of flooding from the sea in a given year, including the effects of climate change.
Flood Zone 3	Medium and high probabilities	>1% AEP of river flooding >0.5% AEP of sea flooding	Land having a 1 in 100 or greater probability of river flooding in any year; or Land having a 1 in 200 probability or greater of sea flooding in any year. including the effects of climate change.

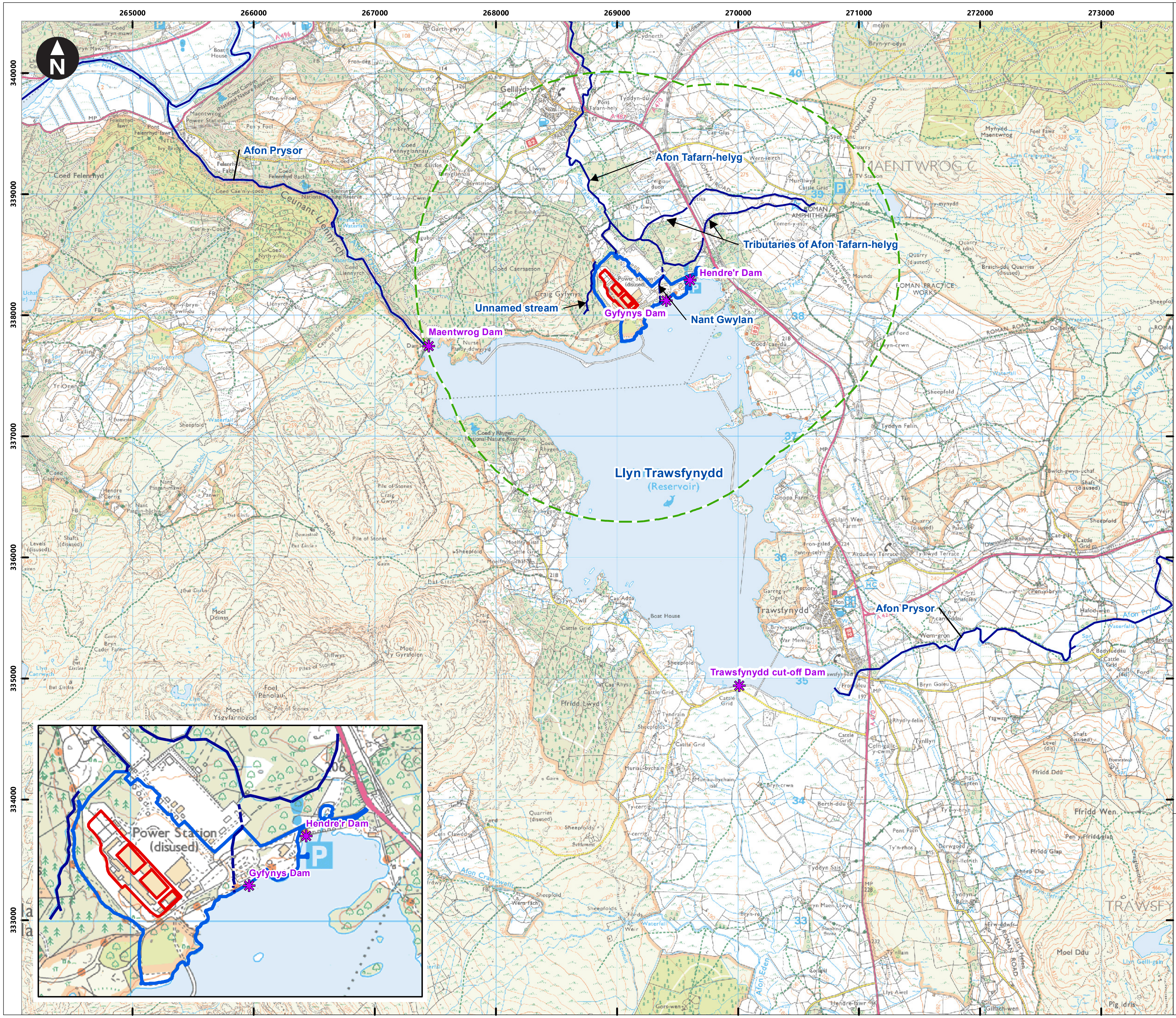
Table D-3 Flood Zone definitions from Flood Map for Planning – Surface Water and Small Watercourses[1]

Flood risk from surface water and small watercourses			
Flood Zone	**Probability of flooding**	**AEP**	**Definition**
Flood Zone 1	Very Low Probability	Less than 0.1% AEP of flooding	Land with less than 1 in 1,000 probability of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.
Flood Zone 2	Low Probability	Between 1% and 0.1% AEP of flooding	Land with between a 1 in 100 and 1 in 1,000 probability of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.
Flood Zone 3	Medium and High Probabilities	> 1% AEP of flooding	Land having a 1 in 100 or greater probability of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.

Table D-4 Groundwater flood risk definitions

Groundwater flood risk			
Flood Zone	**Probability of flooding**	**AEP**	**Definition**
N/A	N/A	N/A	Flood risk bands assessed by professional judgement, in the absence of criteria set by NRW.
Sewer flood risk			
N/A	N/A	N/A	Flood risk bands assessed by professional judgement, in the absence of criteria set by NRW.
Artificial flood risk			
N/A	N/A	N/A	Flood risk assessed on the basis of flood extent shown on NRW Flood Risk from Reservoir Map[3].

[3] Natural Resources Wales (NRW), (no date). *Flood Risk Assessment Wales* [Online]. Available from: https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme=1 [Accessed 01 December 2023].



Key

- Area of Land Leased by Magnox from the Nuclear Decommissioning Authority
- Proposed Development boundary
- Study Area
- Watercourse
- Dam

0 250 500 750 1,000 1,250 1,500 m

Scale at A3: 1:30,000

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Decommissioning of Trawsfynydd Ponds Complex
Environmental Statement

Figure 8.1
Surface water and flood risk study area

November 2023

807521-WSPE-XX-XX-FG-OW-00001_S2_P01.2

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H:\Projects\807521 Trawsfynydd Site Ponds Complex Demolition and Disposal EIA\Deliver Stage\D Design_Technical\Drawings\GIS\807521-WSPE-XX-XX-FG-OW-00002_S2_P01.1.mxd Originator: jacqui.parkin

269000

269500

338500

338000

N

Afon Tafarn-helyg

CG0087801

CG0409001 and GB3835DE

Nant Gwylan

GG0409101

GG0408801

CG0314901

CG0087701

CG0087701

Unnamed stream

Source area for historic surface water runoff before cycle path drainage improvements

CG0088101

CG0409201

Key

- Area of Land Leased by Magnox from the Nuclear Decommissioning Authority
- Proposed Development boundary
- Watercourse
- Culverted watercourse
- Access road
- Surface water discharge

0 50 100 150 200 m

Scale at A3: 1:4,000

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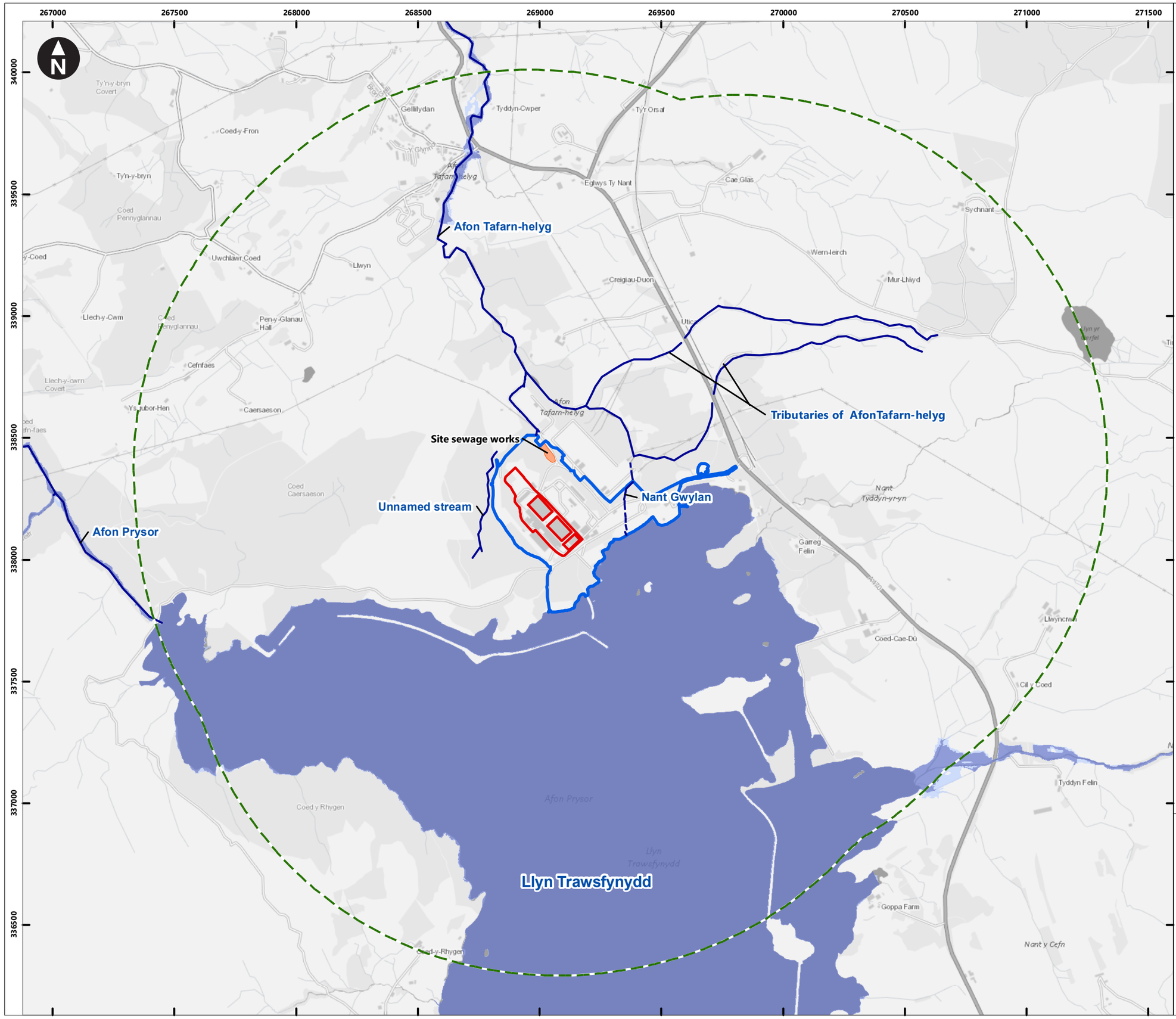
Decommissioning of Trawsfynydd Ponds Complex
Environmental Statement

Figure 8.2
Local hydrology and site surface water discharge locations

October 2022

H:\Projects\807521 Trawsfynydd Site Ponds Complex Demolition and Disposal EIA\Deliver Stage\D Design_Technical\Drawings\GIS\807521-WSPE-XX-XX-FG-OW-00003_S2_P01.1.mxd Originator: jacqui.parkin



Key

- Area of Land Leased by Magnox from the Nuclear Decommissioning Authority
- Proposed Development boundary
- Study Area
- Watercourse
- Flood Zone 3
- Flood Zone 2
- Flood Zone 1

0 250 500 750 m

Scale at A3: 1:15,000

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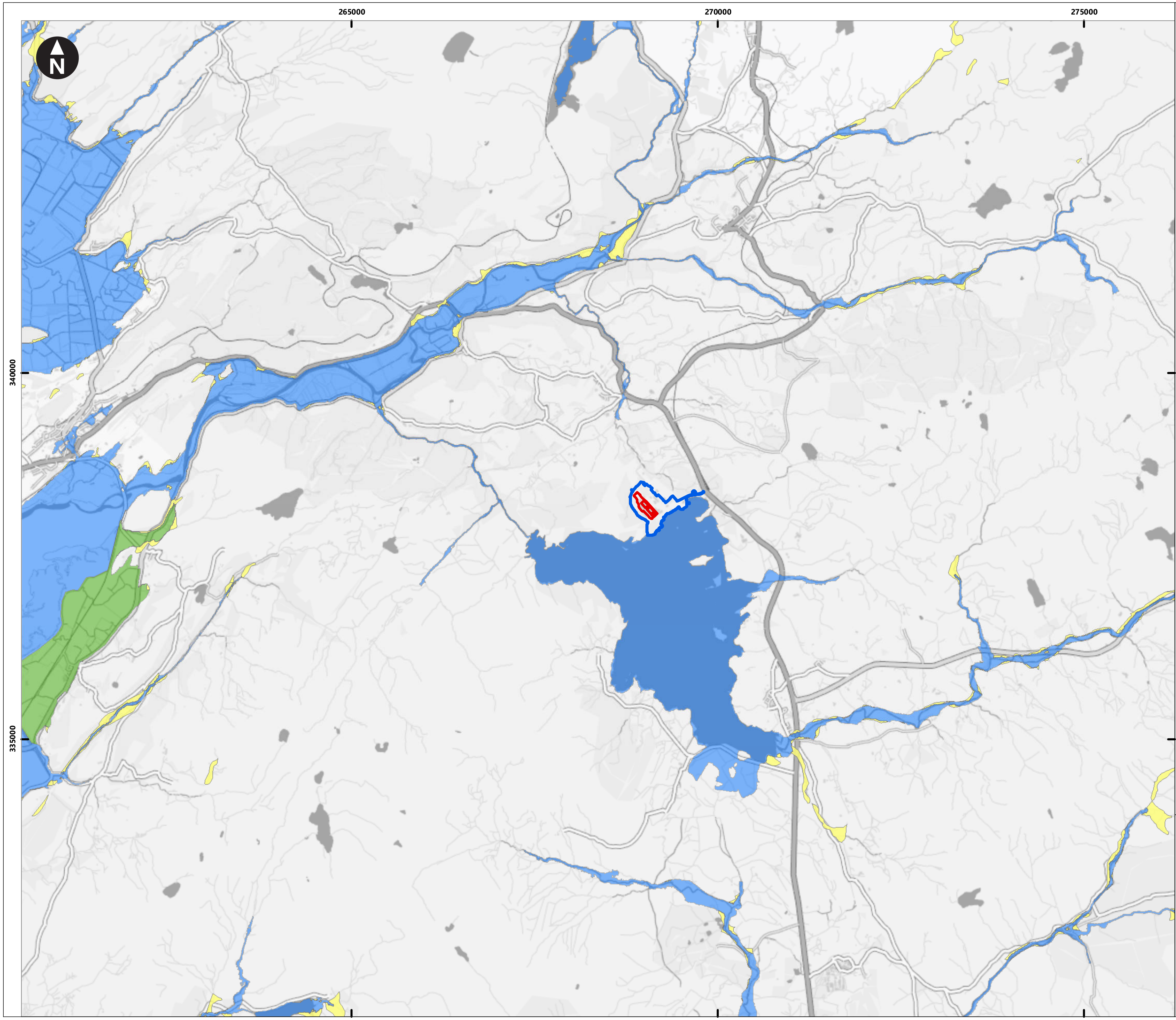
Decommissioning of Trawsfynydd Ponds Complex
Environmental Statement

Figure 8.3
Flood Map for Planning (Rivers)

October 2022



Key

Area of Land Leased by Magnox from the Nuclear Decommissioning Authority

Proposed Development boundary

Development Advice Map Zone B

Development Advice Map Zone C1

Development Advice Map Zone C2

All areas not mapped as Flood Zones B, C1 or C2 are Flood Zone A

0 1,000 2,000 3,000 m

Scale at A3: 1:50,000

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Decommissioning of Trawsfynydd Ponds Complex
Environmental Statement

Figure 8.4
Development Advice Map (Flood Zones B, C1 and C2)

October 2022

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269000

269500

338500

338000

N

Unnamed stream

Nant Gwylan

Key

Area of Land Leased by Magnox from the Nuclear Decommissioning Authority

Proposed Development boundary

Watercourse

Surface Water and Small Watercourses

Flood Zone 3

Flood Zone 2

Flood Zone 1

0 50 100 150 200 m

Scale at A3: 1:4,000

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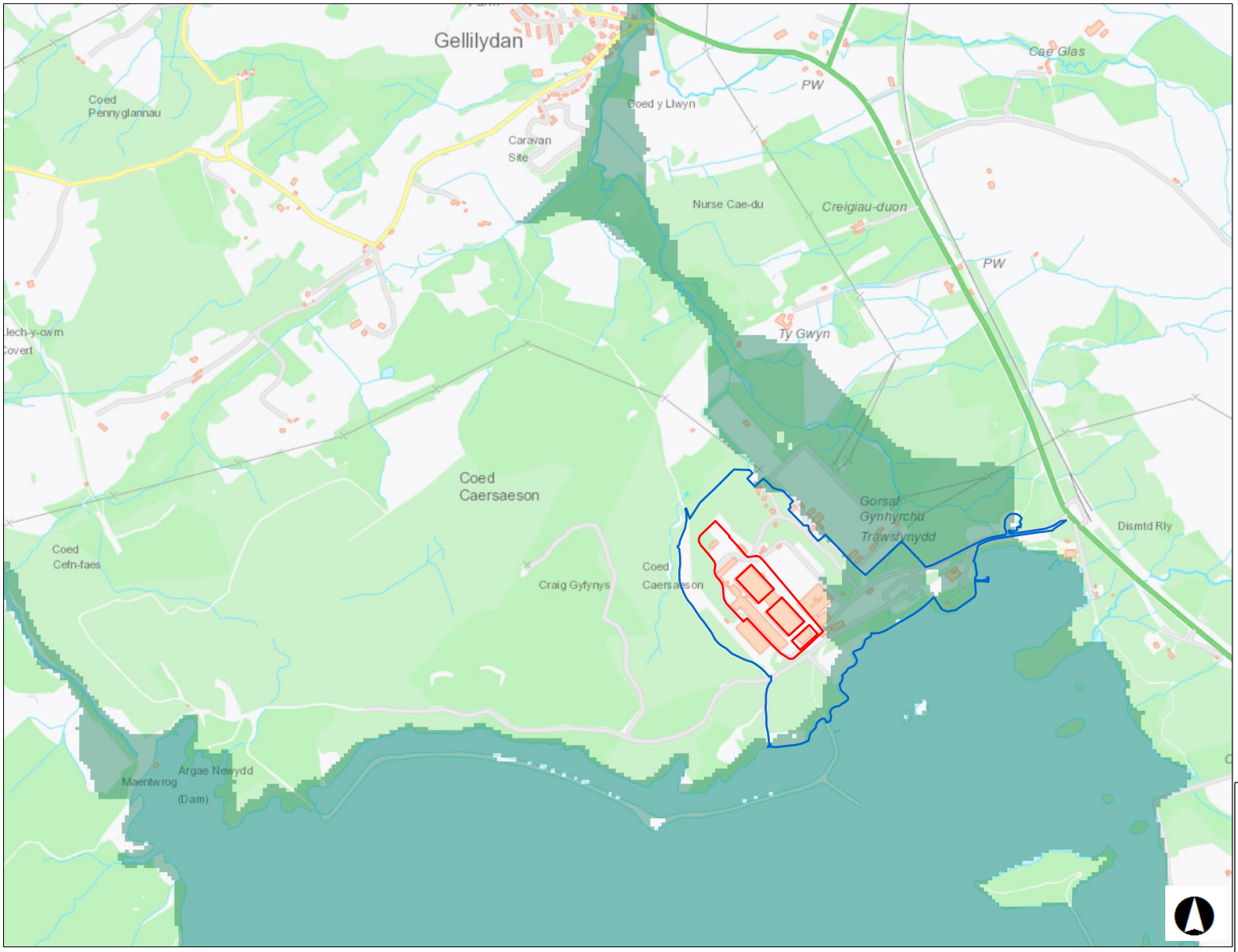
Decommissioning of Trawsfynydd Ponds Complex
Environmental Statement

Figure 8.5
NRW Flood Map for Planning (Surface water and small watercourses)

October 2022



Cyfoeth Naturiol Cymru
Natural Resources Wales

Area of Land Leased by Magnox from the Nuclear Decommissioning Authority

Proposed Development boundary

Flood Risk from Reservoirs

Note
The shading on the map shows the worst-case scenario for the area that could be flooded if a large reservoir were to fail and release the water it holds. A large reservoir is one that holds over 10,000 cubic metres of water.

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Environmental Statement

Figure 8.6
Flood Risk Assessment Wales map - Flood risk from reservoirs

October 2022

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268200 268400 268600 268800 269000 269200 269400

339800 339600 339400 339200 339000

N

Gellilydan

Cross Church

yddyn-Cwper

Ty'r Orsaf

Property known as Tafarn-helyg (1.3km north of the Proposed Development)

Gellilydan access road to the A487

Y Glynnor

Coed-Y-Llwyn

Eglwys Ty Nant

A470

Llwyn

Creigiau-Duon

Agricultural buildings west of Ty Gwyn

Key

Area of Land Leased by Magnox from the Nuclear Decommissioning Authority

Proposed Development boundary

Surface Water and Small Watercourses

Flood Zone 3

Flood Zone 2

Flood Zone 1

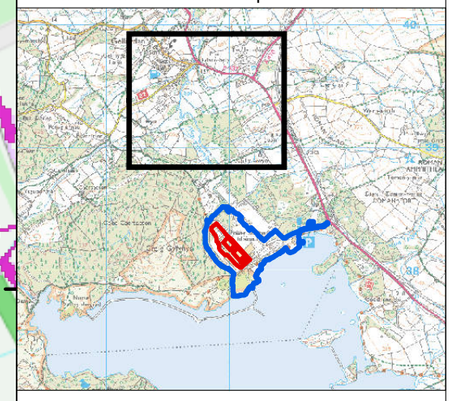
Rivers

Flood Zone 3

Flood Zone 2

Flood Zone 1

Location of extents of map in relation to site



0 50 100 150 200 m

Scale at A3: 1:4,000

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Decommissioning of Trawsfynydd Ponds Complex
Environmental Statement

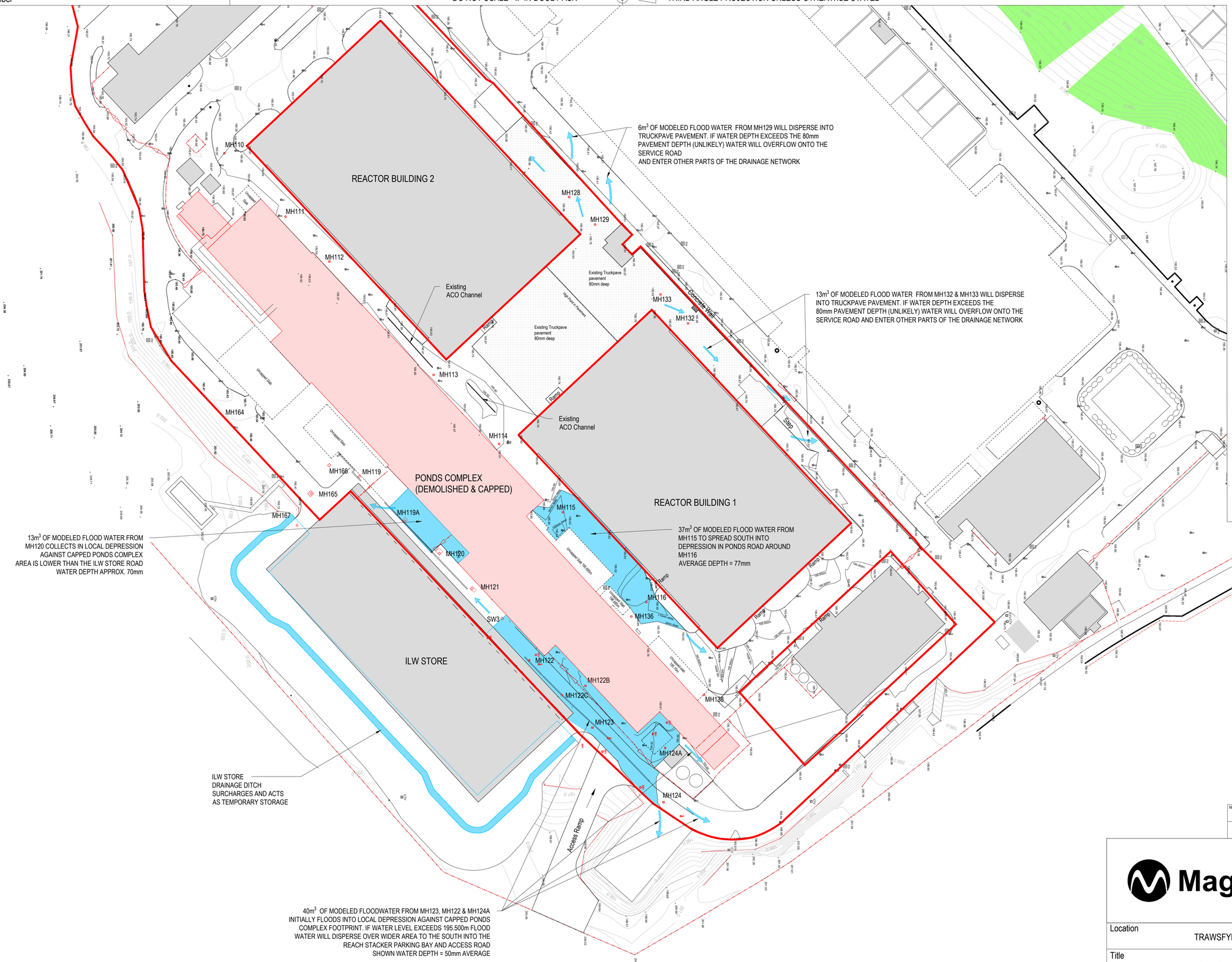
Figure 8.7
NRW Flood Map for Planning (Rivers and Surface water and small watercourses) downstream of the Proposed Development

October 2022

Drawing Number TRA/3210/LA/46119

DO NOT SCALE - IF IN DOUBT ASK

THIRD ANGLE PROJECTION UNLESS OTHERWISE STATED



NOTES

1. Drawing produced from topographical survey ref. TRA/3210/LA/11308
2. The flooding visually represented within this drawing are derived from the drainage capacity review contained with Mott MacDonald report *TPC-MML-FB25-XX-T-C-0002 Rev 07*.
3. Flooding illustrated related to the critical strom event of 1 in 100 year storm event + 40% Climate Change
4. It is NOT a full site wide review of drainage capacity.
5. The flood extents illustrated on this drawings are based upon a very basic visual review of available survey data and site observations.
6. Shaded areas of flooding indicate an initial flood volume which is sufficiently large to illustrate the predicted flooding volumes prior to wider dispersion into other areas of the site.
7. Flood depths do not exceed the threshold / floor levels of any adjacent buildings, exposed slabs or flood sensitive assets.

KEY

- FLOOD WATER ESTIMATED LVL 195.60m
- EXISTING BUILDING
- CAPPING SLAB
- DENSE VEGETATION
- TRUCKPAVE PAVEMENT
- LOCATIONS WHERE FLOOD WATER OVERFLOWS AREA SHOWN AND DISPERSES OVER A WIDER AREA
- APPLICATION BOUNDARY

Modifications				
01	CWJ	TS	DT	
FIRST ISSUE				

Current Issue	Signature	Name	Date	Scope of Verification
Drawn by:		C W Jones	Mar 2024	FUNCTIONALITY
Verified by:		T Slaven	Mar 2024	
Approved by:		D Thomas	Mar 2024	
Issue: 01		Drawing Status	Q.A. Grade	Classification
Date: Mar 2024		ISSUED	3	COMMERCIAL

ORIGINAL DRAWING SIZE A1	CREATED IN AUTOCAD	Scale NTS
DRAWING TO BS8888 MIN. TEXT HEIGHT 2,5mm		
ALL DIMENSIONS ARE mm UNLESS OTHERWISE STATED		

NRE/SQEP Acceptance Signature required only when contractor details present. Print Name / Signature / Date

DRAWING ENTERED ON SITE REGISTER

Contractor Details

Magnox

Magnox Limited
Trawsfynydd Site
Registered in England No.02264251
Registered Office: Oldbury Technical Centre, Oldbury Naite, Thornbury, South Gloucestershire, BS35 1RQ

Location	TRAWSFYNYDD	Project Number	L28305

Title

PONDS COMPEX DEMOLITION & DISPOSAL
FLOOD CONSEQUENCE
ESTIMATED FLOOD EXTENTS
CRITICAL STORM EVENT 1 IN 100 YEAR + 40% CLIMATE CHANGE

Drawing Number	TRA/3210/LA/46119	Issue	01

UNLESS OTHERWISE STATED, DRAWING IS UNCONTROLLED IF PRINTED