Ministry of Defence

Deep Space Advanced Radar Capability (DARC)

Environmental Statement Volume 3: Appendices

Draft for Pre-application Consultation
Planning Application: 22/1136/SO
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Ministry of Defence

ES Appendix 12.1: Groundwater Monitoring

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Images

Groundwater Monitoring

1.1 Introduction

The GIs from which information on groundwater monitoring has been taken from do not relate specifically to this project and therefore installations are not targeted in optimal locations for understanding groundwater conditions below the two key construction areas, receive (Rx) and Transmit (Tx) antenna arrays. Additionally, there are no groundwater level monitoring installations for the southern end of the application site where the Tx Array is located and the bedrock geology is different from the rest of the site. Therefore, there are some gaps in our understanding on geology and groundwater levels in the south of the study area.

Groundwater monitoring was conducted over two periods, 3 August 2011 to 4 October 2011 and 7 October 2014 to 22 January 2015 during two separate ground investigations (GIs)[1][2]. However, the number of installations monitored during the 2015 GI was significantly reduced from the 2011 rounds of monitoring.

The data provide from the GIs are assumed to be accurate and conducted in accordance with the relevant standards. Limitations with the data are outlined in ES Chapter 12 Section 12.3 Assumptions and Limitations.

1.2 Groundwater levels and flows

Image 12.1 presents groundwater monitoring within the Lingula Flags Formation mudstone bedrock between September and October 2011 and Image 12.2 presents groundwater monitoring in the superficial deposits and Lingula Flags (undifferentiated) over the same period. Image 12.3 presents groundwater level monitoring from the more recent 2015 GI with data collected between October 2014 and January 2015.

Images 12.1 and 12.3 show that groundwater monitoring installations in the Lingula Flags Formation have recorded groundwater levels ranging between 1.36 and 6.61 metres below ground level (m bgl) in RO01 on 17 November 2014 and RO02 on 11 August 2011 respectively.

Image 12.2 shows that groundwater within the overlying superficial deposits, where present, has been found at shallower depths than in the bedrock. However, monitoring installations (WS07, WS08, WS09, WS10, WS11, WS33) that monitor both Lingula Flags Formation and overlying deposits were found to be dry. These GI locations are located either within or near to the Rx Array and Ops area. The base of the installations found to be dry range from 1.9 mbgl to 2.9 mbgl.

Groundwater was encountered in superficial deposits to the north and west of the application site. This is thought to be perched groundwater, which is associated with deposits of glacial till, having been identified in several monitoring installations (WS01, WS14, WS39) with groundwater levels ranging from 0.19 to 2.96 mbgl. However, in WS14, located within the Rx Array area, there was only one groundwater reading recorded, with all remaining visits to this location recording the installation as dry.

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[1] *Amec. (2012). Cawdor Barracks, Pembrokeshire. Phase 2: Intrusive Survey Report*
[2] *Amec Foster Wheeler. (2015). Cawdor Barracks – Targeted Groundwater and Vapour Assessment LQA Report*

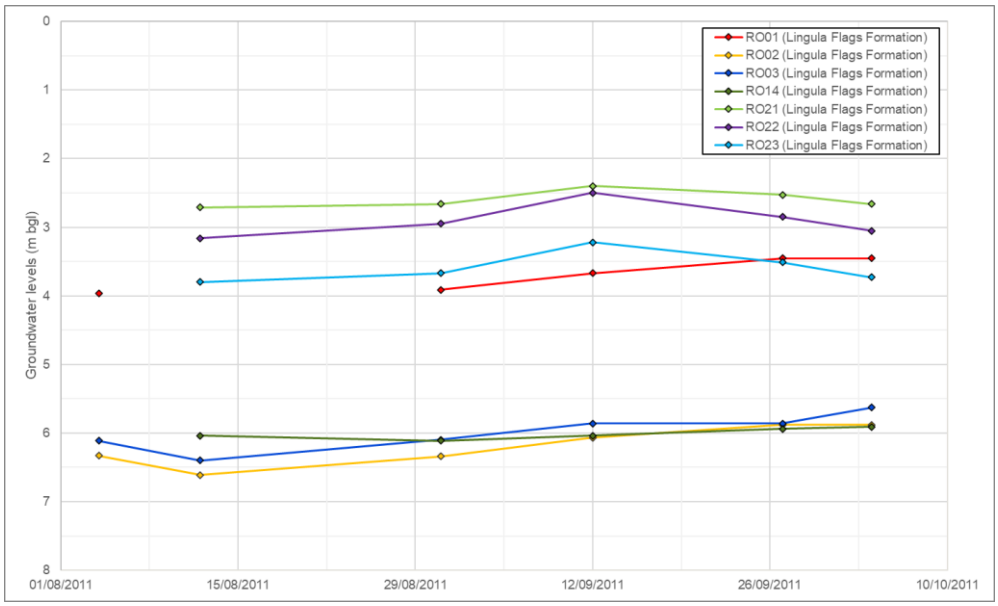

Image 12.1: Groundwater level monitoring within Lingula Flags Formation between 4 September 2011 to 4 October 2011. This data has been collated from the Phase 2 Intrusive Survey Report by AMEC (2012)[1].

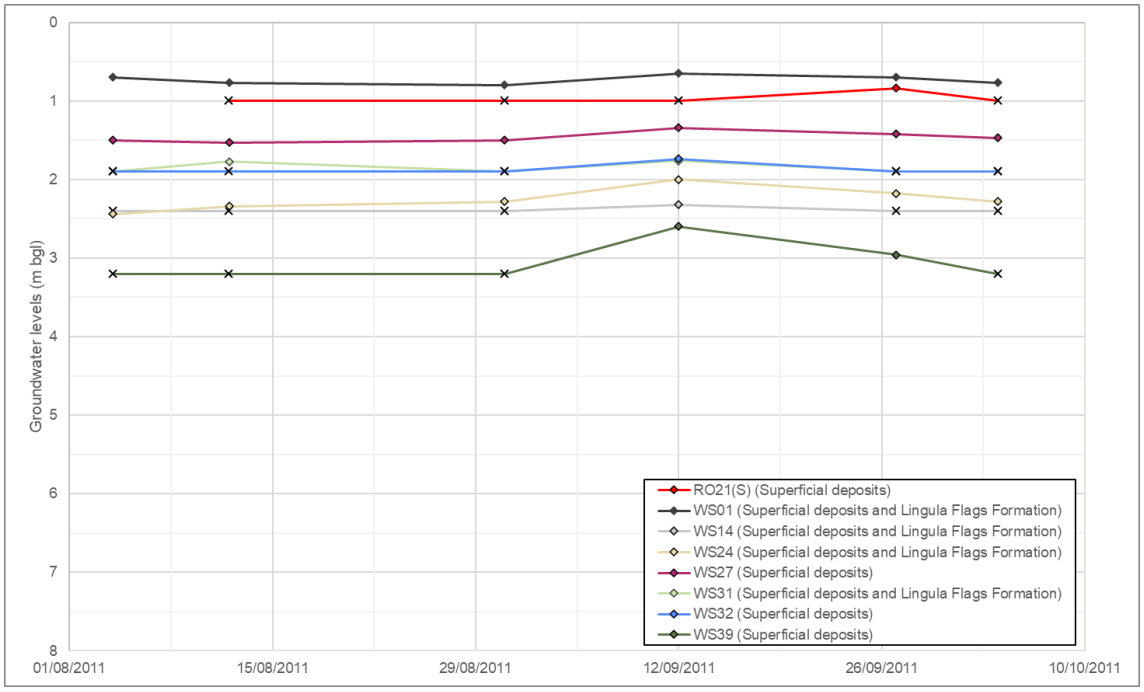

Image 12.2: Groundwater level monitoring within superficial and undifferentiated deposits between 4 September 2011 to 4 October 2011. Note x represents dry conditions. This data has been collated from the Phase 2 Intrusive Survey Report by AMEC (2012)[1].

Image 12.3 shows that the 2014/15 groundwater level monitoring in the study area encountered groundwater at depths typically within 1 and 4.0 mbgl within the Lingula Flags bedrock and groundwater flow was inferred to be likely driven by fracture flow[2] due to the low permeability of

the mudstone. These groundwater levels recorded over winter months in 2014/15 are around 2 to 3 metres higher than the 2011 monitoring rounds which took place over autumn months.

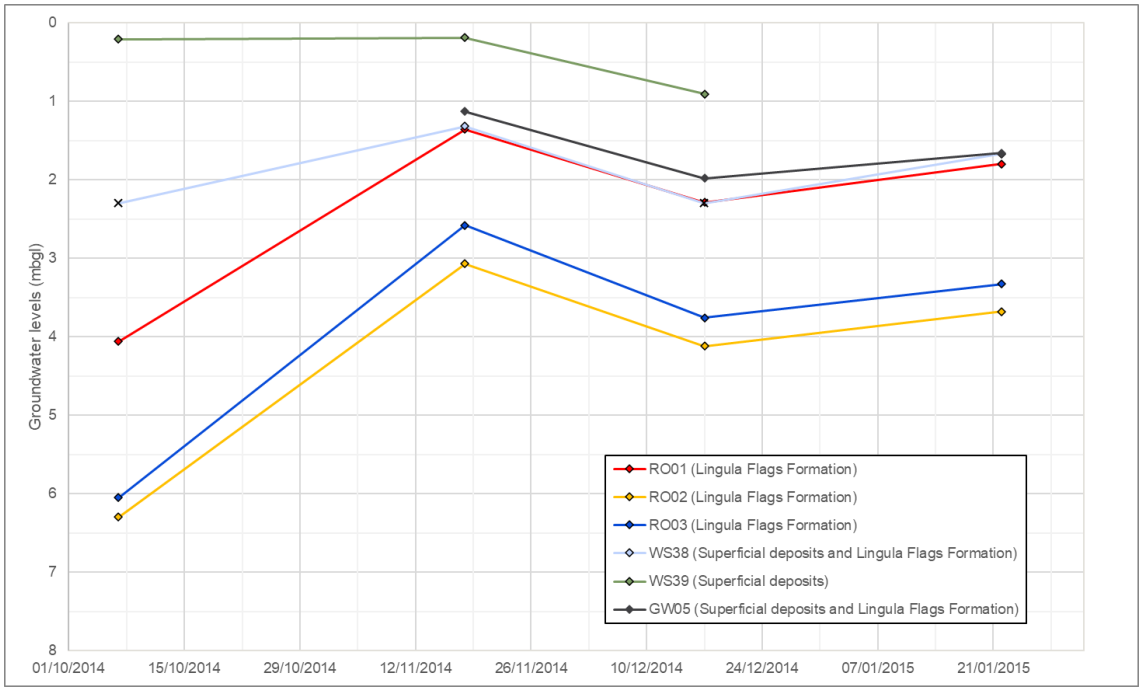

Image 12.3: Groundwater level monitoring between 7 October 2014 to 22 January 2015. Note x represents dry conditions. This data has been collated from the Targeted Groundwater and Vapour Assessment LQA Report by AMEC Foster Wheeler (2015)[2].

1.3 Site conceptualisation

Shallow groundwater from the raised plateau of the airfield is considered to flow radially outwards towards the site boundaries. Several groundwater-fed springs that feed unnamed surface water streams are present on the western and eastern boundary of Cawdor Barracks[3]. These springs are likely to be reliant on the groundwater table of the Lingula Flags Formation as a baseflow with contribution from perched aquifers above glacial till deposits following periods of high recharge. The shallowest groundwater levels in both the Lingula Flags Formation and in overlying glacial till were found to the west of the Rx array, outside of the application site, and adjacent to a spring near Maerdy.

[3] Water Watch Wales. Groundwater Cycle 3 2021. Available online at: naturalresourceswales.gov.uk. Accessed 27/02/2024.

There are also records of historic spring sources presumably discharging from the Lingula Flags Formation approximately 6 km to the west at Solva, confirming that the bedrock can potentially support local supplies[4].

[4] British Geological Survey (BGS). Borehole records. Available online at Geoindex onshore: https://mapapps2.bgs.ac.uk/geoindex/home.html, accessed 22/02/2024.

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ES Appendix 12.2: Flood Compensation Assessment

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Flood Consequences Assessment

1. Summary

1.1. This Flood Consequences Assessment (FCA) has been prepared by Sweco and Jacobs to support Chapter 12 Water Environment, Flood Risk and Drainage of the Environmental Statement (ES). The planning application relates to the development of Deep Space Advanced Radar Capability (DARC) on the existing Cawdor Barracks site in Pembrokeshire, south-west Wales, hereafter referred to as the proposed development. Within the proposed development the area of development is referred to as the application site and the surrounding 1km buffer is referred to as the study area. Further details of the proposed development may be found in ES Chapter 3; Proposed Development.

1.2. Table 1 shows the key requirements for information to be included in an FCA from TAN 15 and how they are addressed in this document.

Table 1: Technical requirements of a Flood Consequences Assessment from TAN 15

Requirement	How it is addressed in this FCA
A location plan identifying all possible sources of flooding including overtopping and/or breach of existing defences and any in-channel structures that may be prone to blockage.	This plan is included in Image 8. Flood risk mapping is only available for flooding from rivers, the sea and surface water/small watercourses. There are no existing formal flood defences in the vicinity of the application site. No in-channel structures which are likely to pose a flood risk to the proposed development have been identified.
A plan of the site showing existing and proposed levels related to Ordnance Datum.	Existing levels are shown in Image 2. No significant changes to ground levels on site are proposed.
A plan identifying any flood alleviation measures already in place.	There are no existing flood alleviation measures in place, therefore no plan has been produced.
An assessment of all sources of potential flooding including, but not confined to rivers, the sea, wave action, groundwater, surface flow or any combination of these.	The assessment of all sources of flooding is documented in Section 4,
Existing and proposed cross-sections of the site showing proposed development and site levels relative to the source of flooding, and to anticipated water levels and associated probabilities.	Given the very low level of flood risk to the proposed development, no cross-sections have been produced. Due to the proposed development location at a high point in the topography, all watercourses (including small watercourses and surface water flow routes) flow away from the proposed development and therefore do not pose a significant flood risk to the site.
An assessment of peak flood depth and velocities at which various parts of the site might flood, the likely duration of flood events and impacts of flooding.	Given the low level of flood risk, a qualitative assessment only has been completed. The only significant source of flooding identified within the application site is surface water and small watercourses, with mapping showing small, localised areas of ponding at low points in the topography. As these are areas of ponding they are not expected to have a high velocity. Flooding in these areas is expected to be shallow and short duration, further mitigated by the site's existing drainage system. Further information on the current and proposed drainage strategies can be referred to within the drainage strategy report Appendix 12.3 of ES Chapter 12.

Requirement	How it is addressed in this FCA
	The depth and velocity of flooding are not expected to exceed the tolerable conditions identified in TAN 15 and summarised in Table 4.
Information regarding the extent and depth of past flood events and future predictions.	A summary of the flood history at the proposed development is provided in Section 4 of this FCA, No recorded instances of flooding within the application site have been identified.
A plan of the area to show overland flow routes and appropriate access/evacuation routes from the proposed development site that are operational under all conditions.	No significant overland flow routes have been identified within the application site in the surface water flood mapping (Image 7). The main access/egress route to/from the application site is through the main Cawdor Barracks site to the west. No significant overland flow routes have been identified which would prevent safe access and egress.
A plan and description of any structures which may influence local hydraulics, including bridges, pipes/ducts crossing the watercourse, culverts, screens, embankments or walls, overgrown or collapsing channels.	No structures have been identified that would significantly impact local hydraulics.
An assessment of the implications of any drains or sewers, existing or proposed, on the site during flood events.	The site's existing and proposed surface water drainage system are described in the drainage strategy report Appendix 12.3 of ES Chapter 12. An assessment of flood risk from third party sewers is included in Section 4 of this FCA.
An assessment of the flood storage volume that would be lost and/or displaced from the site.	The proposed development will not result in a loss of flood storage volume from the site.
An assessment of the run-off likely to be generated from the development.	Additional runoff resulting from the porposed development would be stored and attenuated to greenfield rates to ensure no increase in peak flows as described in the drainage strategy report Appendix 12.3 of ES Chapter 12.
Details of flood avoidance, mitigation and resilience measures to be implemented.	These are described in Section 6.
Details to demonstrate that the development will not cause or exacerbate the nature and frequency of flood risk elsewhere.	This is demonstrated in Section 4.
An assessment of the risks after the construction of any necessary mitigation measures.	This is included in Section 4.
A clear and comprehensive summary of the assessment describing the outcomes and recommendations.	This is provided in Section 7.

2. Introduction

2.1. The existing Cawdor Barracks is under current use by the British Army whilst being owned by the Ministry of Defence (MoD). This report evaluates the risk of flooding and its relevant impacts as a result of the proposed development. The report is aligned with the relevant national and local planning policies and offers appropriate mitigation measures where necessary.

Aims and objectives

2.2. The FCA has considered the following:

- Existing risks of flooding to the application site;

- Potential risks of flooding from the proposed development;
- Predicted impacts of climate change; and
- Mitigation measures required to address flood risk to and from the application site.

Methodology

2.3. This FCA has relied upon desk-based assessments completed in accordance with the current Welsh guidance set out in the Planning Policy Wales (PPW) and supported by the March 2025 version[1] of Technical Advice Note 15 (TAN 15): Development, flooding and coastal erosion discussed further in Section 2.

Data Sources

2.4. This report has been informed by a walkover survey carried out in June 2024 and the following data sources:

- Natural Resources Wales (NRW) Flood and Coastal Erosion Risk Maps[2];
- NRW Flood Map for Planning (FMfP)[3];
- Welsh Government Data Map Wales[4];
- South West Wales Strategic Flood Consequence Assessment (SFCA)[5];
- EIA Scoping Report (65208061-SWE-XX-XX-T-J-0002-CawdorScopingReport);
- Pembrokeshire County Council Local Development Plan – Adopted 2013[6]; and
- River Basin Management Plan for the Pembrokeshire River Basin District[7].

Legislation, Policy and Guidance

Planning Policy Wales

2.5. PPW sets out the land use planning policies of the Welsh Government. The PPW sets out the following policies in relation to development and flood risk:

- Development should reduce, and must not increase, flood risk arising from river and/or coastal flooding on and off the application site itself. The priority should be to protect the undeveloped or unobstructed floodplain from development and to prevent the cumulative effects of incremental development.
- In areas of floodplain currently unobstructed, where water flows in times of flood, built development should be wholly exceptional and limited to essential transport and utilities infrastructure. Such infrastructure should be designed and constructed so as to remain operational even at times of flood, to result in no net loss of floodplain storage, to not impede water flows and to not increase flood risk elsewhere.
- TAN 15: Development and Flood Risk should be referred to for further policy advice on development and flood risk.
- Development should not cause additional runoff, which can be achieved by controlling surface water as near to the source as possible by the use of Sustainable Drainage Systems (SuDS). Care should be taken in places of shallow groundwater or where flooding is caused by combined surface and groundwater processes.
- The ability of emergency services to respond to flood events should be taken into account when considering if a development in a flood risk area is appropriate.

- In addition PPW includes the following policies relating to SuDS and development:
- New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100 square metres also require approval from the SuDS Approval Body (SAB) before construction can commence. Adoption and management arrangements, including a funding mechanism for maintenance of SuDS infrastructure and all drainage elements are to be agreed by the SAB as part of this approval. This will ensure that SuDS infrastructure is properly maintained and functions effectively for its design life.
- The provision of SuDS must be considered as an integral part of the design of new development and considered at the earliest possible stage when formulating proposals for new development.
- Development proposals should incorporate design for surface water management, based on principles which work with nature to facilitate the natural functioning of the water cycle, providing issues such as land contamination would not result in the mobilisation of contaminants which may have an impact over a wider area. Design for multiple benefits and green infrastructure should be secured wherever possible and as part of Green Infrastructure Assessments suitable approaches towards the provision of SuDS should be identified. It may, in some circumstances, be necessary for 'hard' infrastructure solutions to be preferred because of practical or archaeological considerations, but taking into account the role of water services in contributing to the quality of place, nature based solutions should be the preference.

TAN 15: Development, flooding and coastal erosion

2.6. An updated version of TAN 15 was published by Welsh Government in March 2025 and this FCA has been prepared based on this version. TAN 15 refers to the Wales FMfP flood zones, which are defined as shown in Table 2.

Table 2: Definition of Flood Map for Planning Flood Zones

Zone	Flooding from rivers	Flooding from the sea	Flooding from surface water and small watercourses
1	Less than 1 in 1,000 (0.1%) (plus climate change) chance of flooding in a given year.		
2	Less than 1 in 100 (1%) but greater than 1 in 1,000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 200 (0.5%) but greater than 1 in 1,000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (1%) but greater than 1 in 1,000 (0.1%) chance of flooding in a given year, including climate change.
3	A greater than 1 n 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 n 200 (0.5%) chance of flooding in a given year, including climate change.	A greater than 1 n 100 (1%) chance of flooding in a given year, including climate change.
TAN 15 Defended Zones	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard*).	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard*).	Not applicable.
* Climate change and freeboard allowances are required on any flood defence scheme planned and constructed since 2016. Freeboard refers to the uncertainty allowance applied within the design and implementation of flood risk management schemes, such as flood walls and earth embankments.			

2.7. The FMfP displays predicted future flood risk under the central climate change estimate. Detailed FCA's, to accompany planning applications, will be required to consider a range of climate change scenarios, including upper end estimates, making reference to the Welsh Government guidance on climate change allowances for planning purposes.

2.8. The fundamental principle of the TAN is to restrict new development in Zone 3, subject to limited exceptions, and to ensure that decision makers have taken flood risk matters into consideration in all other zones.

2.9. In Flood Zone 1 all types of development, change of use or conversion are acceptable in principle.

2.10. In Flood Zone 2 applications must be consistent with acceptability considerations set out in the TAN. Applications for new highly vulnerable development on greenfield land are only considered appropriate where the site has been allocated in adopted development plans. Proposals for redevelopment on brownfield land of any vulnerability will need to assist, and be consistent with, the development plan strategy to regenerate an existing settlement or achieve key economic or environmental objectives. Where proposals for redevelopment include residential use, this should not occur at ground floor level and would need to be compatible with tolerable conditions set out in the TAN and exhibit resilient flood design.

2.11. In Flood Zone 3, no new highly vulnerable development on greenfield land should be permitted. Other proposals will only be appropriate if they are essential to the development plan strategy to regenerate an existing settlement or achieve key economic or environmental objectives. Any redevelopment proposal must be consistent with the acceptability considerations set out in the TAN. In addition, proposals which include residential development must ensure that such uses do not occur at ground floor level. Proposals that address national security or energy security needs, mitigate the impacts of climate change, that are necessary to protect and promote public health may also, by exception, be appropriate provided that their locational need is clear and the potential consequences from flooding have been considered and found to be acceptable.

2.12. In TAN 15 Defended Zones applications for new development on greenfield sites are not considered appropriate unless they are allocated in adopted development plans.

2.13. A FCA must be produced for all development within Flood Zones 2, 3 or the TAN 15 Defended Zone.

2.14. Acceptability considerations as noted in the criteria above are as follows:

- No increase in flooding elsewhere
- Occupiers aware of flood risk
- Escape/evacuation routes present
- Flood emergency plans and procedures agreed and in place
- Flood resistant and resilient design
- Acceptable consequences for type of use

2.15. The FCA should establish if avoidance and mitigation measures can be incorporated, in a manner compatible with the placemaking aims of Planning Policy Wales, within the site design to ensure that development is safe and there is:

- Minimal risk to life;
- Minimal disruption to people living and working in the area;
- Minimal potential damage to property;

- Minimal impact of the proposed development on flood risk generally; and
- Minimal disruption to the sustainable management of natural resources.

2.16. TAN 15 sets out frequency thresholds for which different types of development should be flood free, as shown in Table 3, described in terms of annual probability of occurrence. The thresholds may be applied with more flexibility for redevelopment, changes of use, conversions and extensions, where the ability to substantially redesign a development is limited.

Table 3: Flood events in which development must be flood-free

Vulnerability Categories		Flood event type	
		Rivers	Sea
Highly vulnerable	Emergency services (command centres and hubs)	0.1% + climate change (1 in 1,000)	0.1% + climate change (1 in 1,000)
	All other types	1% + climate change (1 in 100)	0.5% + climate change (1 in 200)
Less vulnerable development Water compatible development that may be occupied by people		1% + climate change (1 in 100)	0.5% + climate change (1 in 200)

2.17. The flood free thresholds outlined above relate to very serious but not the most extreme flood events (with the exception of thresholds for emergency services). During extreme flood events there is recognition that it may not be possible to keep all development flood-free. In these circumstances it is imperative that flooding does not endanger life, therefore it needs to be demonstrated that conditions within the development during an extreme event will be tolerable. TAN 15 defines the tolerable flood depth and velocity conditions below which new development may be acceptable, as shown in Table 4. This should be assessed for the 0.1% (1 in 1000) Annual Exceedance Probability (AEP) extreme flood event, including an allowance for climate change.

Table 4: Tolerable conditions in an extreme flood event

Types of new development	Maximum depth of flooding (mm)	Maximum velocity of flood waters (m/s)
Highly vulnerable development	600	0.15
Less vulnerable development Infrastructure associated with highly vulnerable development e.g. car parks, access, paths and roads Water compatible development (limited to those built elements of development that may be occupied by people)	600	0.3

Flood and Water Management Act (2010)[8]

2.18. The Flood and Water Management Act (FWMA) created the role of the Lead Local Flood Authority (LLFA) to take responsibility for leading the co-ordination of local flood risk management in their areas. In accordance with the Act:

- NRW is responsible for the management of risks associated with main rivers (such as the River Solva), the sea and reservoirs

- LLFAs are responsible for the management of risks associated with local sources of flooding such as ordinary watercourses, surface water and groundwater. The proposed development is located within the jurisdiction of Pembrokeshire County Council.

2.19. Schedule 3 of the Flood and Water Management Act 2010 (FWMA) which came into effect on 7 January 2019 established SuDS Approving Bodies (SABs) in Welsh unitary authorities, these bodies have statutory responsibility to evaluate and approve drainage applications for new developments where construction work has drainage implications and adopt and maintain SuDS schemes, subject to conditions and exemptions. Pembrokeshire County Council is the SAB for the County of Pembrokeshire alongside their duties as LLFA.

Local policies

Pembrokeshire County Council Local Development Plan – Adopted 2013

2.20. The Pembrokeshire County Council Local Development Plan was adopted in 2013. Whilst the plan was originally made with a timescale up to 2021, subsequent direction from the Welsh Minister for Housing and Local Government (and subsequently Minister for Climate Change) has indicated that Local Development Plans in effect before 2016 should continue to remain in place until replaced by a further Local Development Plan. An updated plan is in development and currently being examined by Welsh Government. However, as this has not yet been adopted the policies from the 2013 plan remain in place.

2.21. The following policies from the 2013 Local Development Plan are relevant to flood risk:

- Policy GN.1: General Development policy which includes a criterion that development would not cause or result in unacceptable harm to health in safety. Supporting text to the policy notes that professional advice will be sought from the relevant authority where there are concerns that a proposal would cause harm to health and safety through flooding or erosion. Where such concerns relate to fluvial or coastal flooding and / or erosion, the provisions of the relevant Shoreline Management Plan and / or Catchment Flood Management Plan will inform consideration of the health and safety issues. In some instances, anticipated on-site or off-site problems may render development inappropriate; in other cases, development may be possible if mitigation is available, to make the proposal resilient to the identified problems.

- Policy GN.2: Sustainable Design policy which includes the need to incorporate sustainable drainage systems. Supporting text to the policy notes that designs will need to incorporate responses to the likely impact of climate change in relation to increased implications of storms and flooding.

- Policy GN.3: Infrastructure and New Development policy. Supporting text indicates that, where necessary, developments will be required to contribute towards infrastructure, landscape improvements and mitigation measures, through planning obligations. Requirements for contributions could include affordable flood alleviation schemes and SuDS This policy allows for the relocation of critical infrastructure, such as roads, where this is either adversely affected by fluvial or coastal flooding and / or erosion or identified as extremely vulnerable in the relevant plan.

South West Wales - Stage 1 Strategic Flood Consequence Assessment (SFCA) (2022)

2.22. The Stage 1 SFCA provides evidence on flood risk in support of Local Development Plans for the following Local Planning Authorities: Carmarthenshire County Council, Neath Port Talbot Council, Pembrokeshire County Council, Swansea County Council, Brecon Beacons National Park Authority and Pembrokeshire Coast National Park Authority. As a

Stage 1 study it does not provide site-specific information, although it does provide a high-level summary of various applicable policies and legislative drivers including those described above.

Climate change

2.23. TAN 15 requires that FCA take account of the impacts of climate change, making reference to Welsh Government guidance on climate change allowances for planning purposes. Flood Zones shown on the FMfP already show flood risk under the central climate change estimate but TAN15 requires that a range of scenarios are considered, including upper end estimates.

2.24. The FCA : Climate change allowances[9] sets out the climate change allowances to be used in FCA submitted in support of relevant planning applications, and to inform development plan allocations. In line with TAN 15, the allowances are informed by latest available information on climate change projections and different scenarios of increased global mean surface temperatures.

2.25. Allowances for peak river flow for the West Wales river basin district are shown in Table 5. The guidance recommends that the central estimate for the 2080s is used to assess the potential impact of climate change in a FCA. In addition to this, an assessment of risk should be made using the upper end estimate to inform mitigation measures to help ensure the long-term resilience of the development.

Table 5: Peak river flow allowances for West Wales river basin district (compared to a 1961 to 1990 baseline)

Allowance	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
Upper end estimate	25%	40%	75%
Change factor / central estimate	15%	25%	30%
Lower end estimate	5%	10%	15%

2.26. Allowances for peak rainfall intensity across Wales are shown in Table 6. These are also applicable to small river catchments (less than 5km^2). The guidance requires that, as a minimum, development proposals are assessed against the central estimate to inform design levels. Where the assessment indicates a significant flood risk for the upper estimate, the FCA will need to include mitigation measures required to protect people and property.

Table 6: Change to extreme rainfall intensity (compared to a 1961 to 1990 baseline)

Allowance	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
Upper end estimate	10%	20%	40%
Central estimate	5%	10%	20%

2.27. The guidance also includes allowances for sea level rise and extreme wave height allowance but, as the proposed development is located inland and at significantly higher elevation than the coast, these have not been reproduced in this FCA.

3. Existing Site and Proposed Development

Site description

3.1. Cawdor Barracks is located within the county of Pembrokeshire, approximately 600m west of the hamlet of Brawdy and approximately 9km east of St Davids. The Barracks spans an area of 3.1km^2 and consists of a formerly operational military air base comprised of military buildings, roads and runways. The barracks is still active after being transferred to the British Army, currently home to the 14 Signal Regiment. Image 1 shows the location of the existing Cawdor Barracks and the application site. The surrounding land use of the application site is predominantly agricultural. There are no designated flood defence structures within the application site.

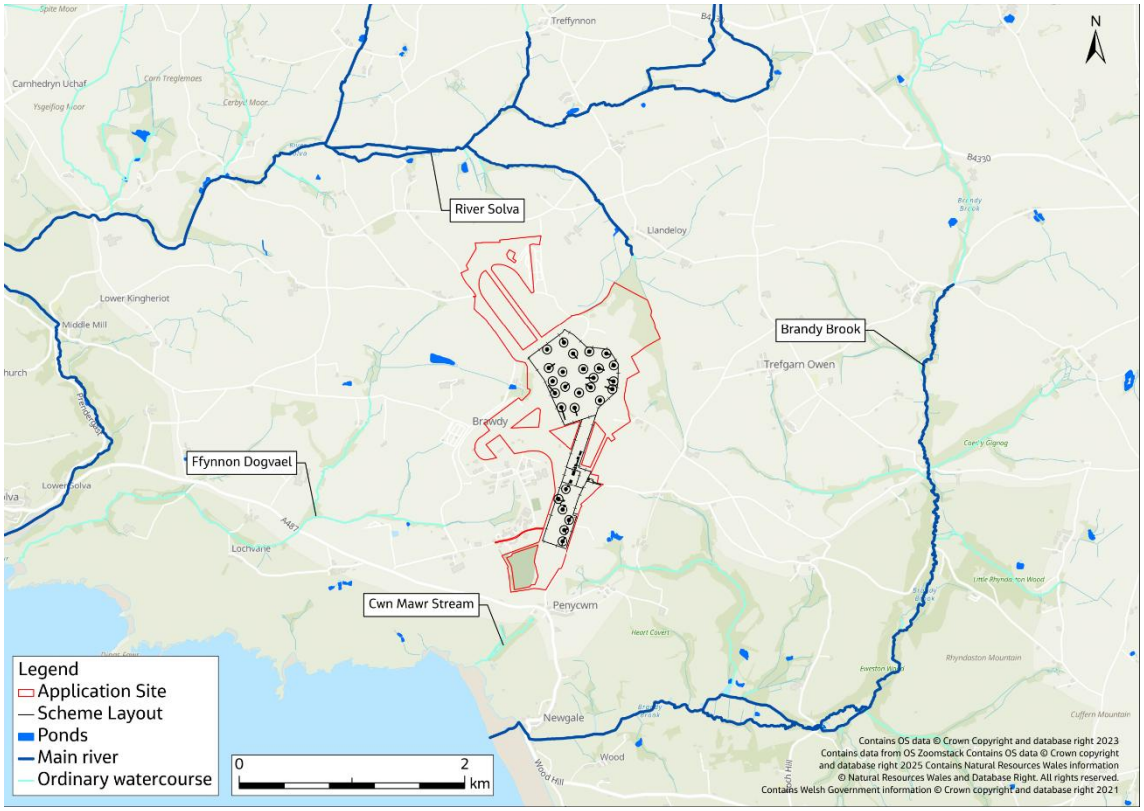

Image 1: Site location and watercourses

Topography

3.2. The application site varies in elevation between 94mAOD to 113mAOD[10]. The proposed development area of receive radar antenna (RX) and transmit radar antenna (TX) construction (Image 2) sits at approximately 110mAOD. The application site slopes down to the southwest where the barracks buildings are located to approximately 98mAOD. Areas outside the application site slope down southwards towards the coast. The surrounding area north-eastwards increases to 115mAOD outside the application site. Image 2 shows the topography of the area.

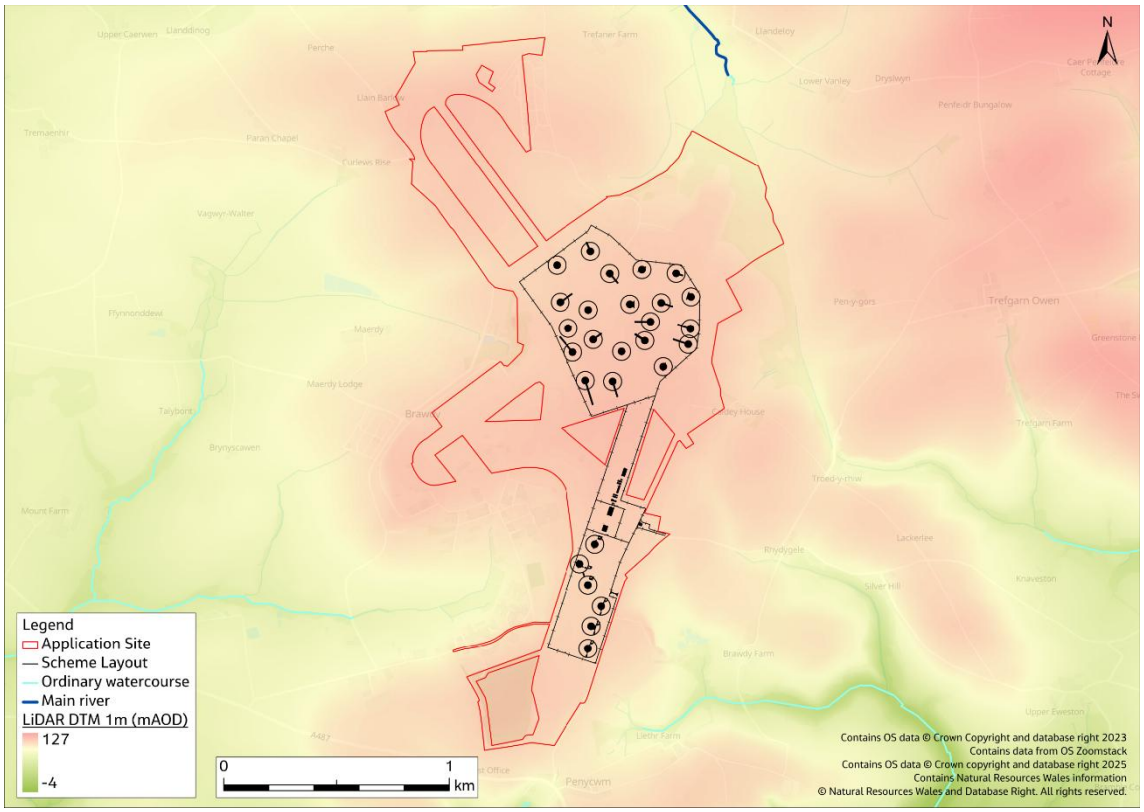

Image 2: Topography

Hydrology

3.3. Within proximity of the application site there are three principal watercourse catchments as shown in Image 1 and described below:

- The River Solva - headwaters to tidal limit (ID: GB110061038340) WFD waterbody catchment covers northern areas of the application site. The River Solva, including several of its tributaries, is designated as a statutory Main River. An unnamed tributary of the Solva, which runs through Llandeloy, flows along the north eastern boundary of the application site in a northerly direction and is designated as Main River from a point immediately north of the application site. There are also several other smaller ordinary watercourse tributaries in this area. The River Solva discharges into St. Brides Bay approximately 4.5 km downstream of the application site.

- The Brandy Brook – headwaters to tidal limit (ID: GB110061021160) WFD waterbody catchment covers the eastern area of the application site. The Brandy Brook itself is designated as a Main River and is located approximately 3km to the east of the application site. There are two unnamed ordinary watercourse tributaries of the Brandy Brook within 500m of the application site's eastern boundary, which flow eastwards and southwards away from the site and towards the Brandy Brook.

- The Ffynnon Dogvael (also referred to as the Brawdy Brook) catchment covers the southern and western area of the application site. It has several tributaries which originate close to the application site's western boundary and flow away from the site in a westerly or south westerly direction. The Ffynnon Dogvael and its tributaries are all ordinary watercourses.

3.4. All of the above watercourses are located within the Cleddau and Pembrokeshire Coastal Rivers Management catchment and the Coastal Streams – Druidston to Fishguard operational catchment.

3.5. The southernmost tip of the site lies within the catchment of Cwm Mawr stream, which rises in the village of Penycwm and flows to the south-west. It flows through the Pembrokeshire Coast National Park discharging to St. Brides Bay south of the application site (Image 1).

3.6. There are nine small pond water bodies within 1 km of the application site. A group of two ponds lie to the southwest, 350 m from the application site. A further two ponds are located to the west of the application site at respective distances of 100 m and 700 m, and one to the northeast at 650 m (Image 1) and one pond 220 m north of the application site. There are three ponds located 360 m southeast of the application site.

Geology

3.7. The geology underlying the application site is described in Chapter 12 Water Environment, Flood Risk and Drainage of the Volume 1 Environmental Statement. A summary is provided below.

Made Ground

3.8. Made Ground was identified throughout the study area in localised areas of the airfield associated with construction and infrastructure. This made ground is generally comprised of clays, sands and silts with varying gravel compositions, as well as anthropogenic material such as brick, tile, metal, concrete, clinker, ceramics, glass and wood.[11]

Superficial Deposits

3.9. Superficial deposits are largely absent within the study area except for Devensian glaciofluvial sands and gravels in the south and Mid Pleistocene glacial till in the north-east. Glacial till was not mapped within the study area. [12][13]

Bedrock Geology

3.10. The bedrock underlying most of the superficial deposits, where present, within the study area is the Cambrian Lingula Flags Formation. This is composed of interbedded silty mudstones and sandstones. The northernmost extent of the study area, overlying the Lingula Flags Formation, is the Ordovician Triffleton Group which is comprised of sandstones and sandy mudstones. The dominant lithology in both units is mudstone.

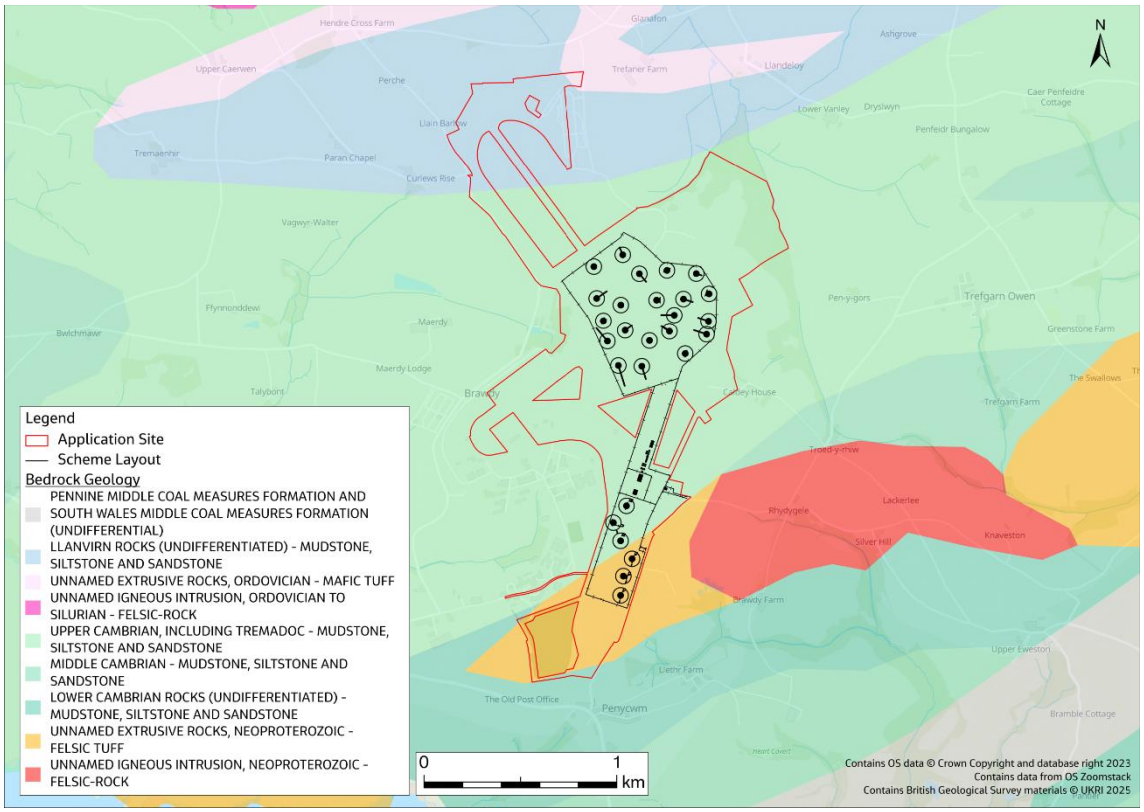

Image 3: Bedrock geology

Hydrogeology

Aquifer Designations

3.11. Table 7 summarises the Environment Agency/NRW aquifer designation along with their approximate extents within the study area:[14]

3.12. Groundwater vulnerability mapping (Annex A) indicates that groundwater contained within the bedrock and glaciofluvial aquifers underlying the study area is classed as high vulnerability, with the glacial till classed as medium vulnerability.[15]

Table 7: Aquifer designations

Geological unit	Period	EA Aquifer Designation	Approximate Extents
Glaciofluvial deposits	Quaternary and recent	Secondary A aquifer	Limited to the southern extent of the application site
Glacial till	Quaternary and recent	Secondary (undifferentiated) aquifer	Continuous deposit located in the wooded valley to the northeast of the application site. Also found in the shallow valley to the east with several ponds present
Triffleton Group	Ordovician	Secondary B aquifer	Located at the northern most extents of the study area
Lingula Flags Formation	Upper Cambrian	Secondary B aquifer	Present as a thick band across the study area. Not present at northern and southern most reaches
Caerfai Group	Lower Cambrian	Secondary B aquifer	Present east and south of the application site
Ramsey Sound Group	Ediacaran	Secondary B aquifer	At the southern extent of the application site

Unnamed igneous rocks	Pre Cambrian	Secondary B aquifer	Located at the south east region of the study area

Existing Drainage

3.13. The existing drainage across the barracks includes filter drains and a gully system along the runways, and a kerb and gully system across Cawdor Barracks. Further information on the current and proposed drainage strategies can be referred to within the drainage strategy report Appendix 12.3 of ES Chapter 12.

Proposed Development

3.14. The proposed development will include construction and operation of the DARC facility and all associated ancillary infrastructure. The proposed development will include the implementation of six transmit radar antennas (TX), 21 receive radar antennas (RX), a radar antenna operations area (proposed to be within the receiver array area) a sub-station and grid connection. Image 4 shows the location of the proposed development areas of the radar systems.

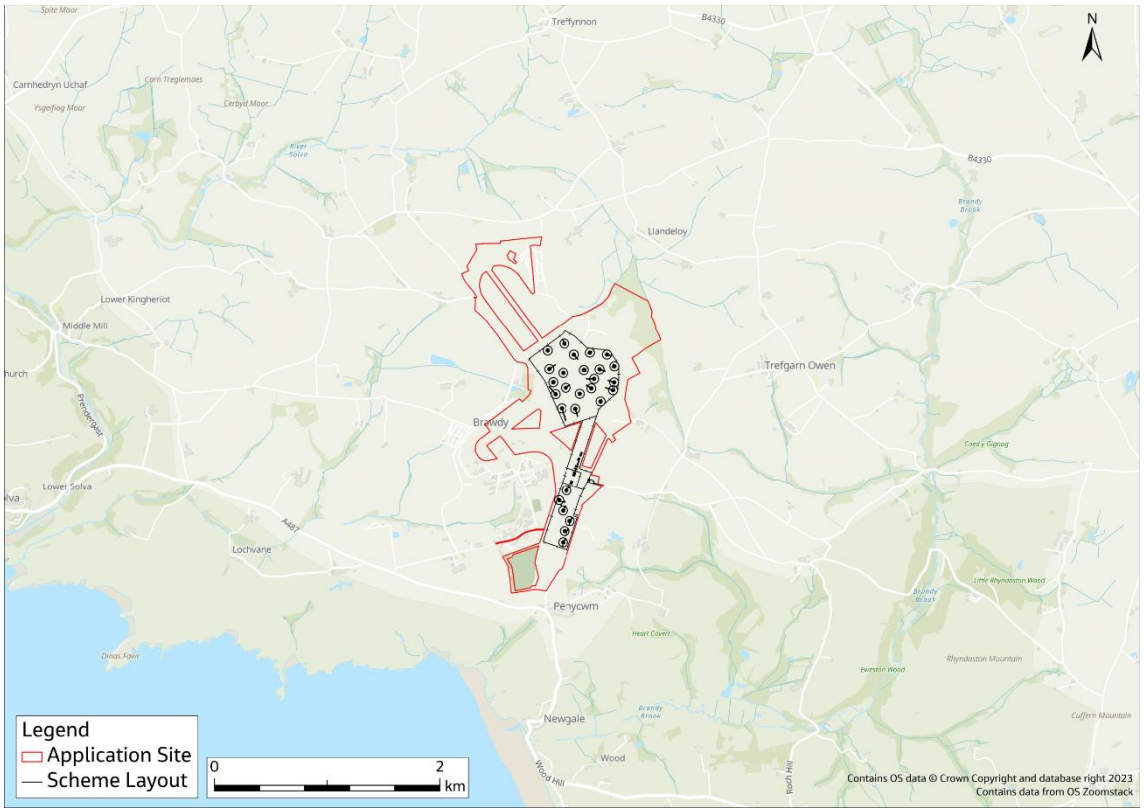

Image 4: Proposed development drawing

4. Assessment of Flood Risk

Sources of potential flooding

4.1. Sources of flood risk affecting the study area have been assessed to understand the baseline condition and impacts arising from the proposed development. Relevant potential sources of flooding to the application site include fluvial, pluvial, tidal, sewer and groundwater flood risk. Flooding from canals and reservoir failure has not been included due to there being no canals or reservoirs within of upstream of the study area.

Historical flooding

4.2. There are no recorded historic flood events located within the proposed development area identified within the local SFCA.

4.3. The NRW FMfP[16] also shows no recorded flood extents of historical flooding within the application site.

4.4. Consultation with Pembrokeshire County Council also noted there were no recorded previous instances of historic flooding within the application site.

Fluvial flood risk

Baseline

4.5. Fluvial flooding occurs due to an increase in water level within a watercourse causing it to overtop its banks and flood the surrounding area.

4.6. The NRW FMfP[16] has been used to determine the flood risk to the proposed development from rivers (Image 5). The classifications of fluvial flood risk areas as shown on the map are:

- Flood Zone 3 – the area has a 1% (1 in 100) AEP.
- Flood Zone 2 – the area has between a 0.1% (1 in 1000) and 1% (1 in 100) AEP.
- All areas outside the shaded area in Image 5 are categorised as having a less than 0.1% (1 in 1000) AEP of flooding and are classified as Flood Zone 1.

4.7. The above extents all include an allowance for climate change (central estimate).

4.8. The map shows that areas at risk of fluvial flooding are all outside the application site and the existing Cawdor Barracks site are located within Flood Zone 1 and therefore at very low risk of fluvial flooding.(Image 5).

With the proposed development

4.9. Given its location outside of areas which are at significant risk of fluvial flooding, the proposed development will not result in an increase in fluvial flood risk to the application site or to third party land. The fluvial flood risk following development is therefore considered to be very low.

4.10. Potential increases in fluvial flows due to discharge from the site's surface water drainage system is considered separately in the pluvial flood risk section below.

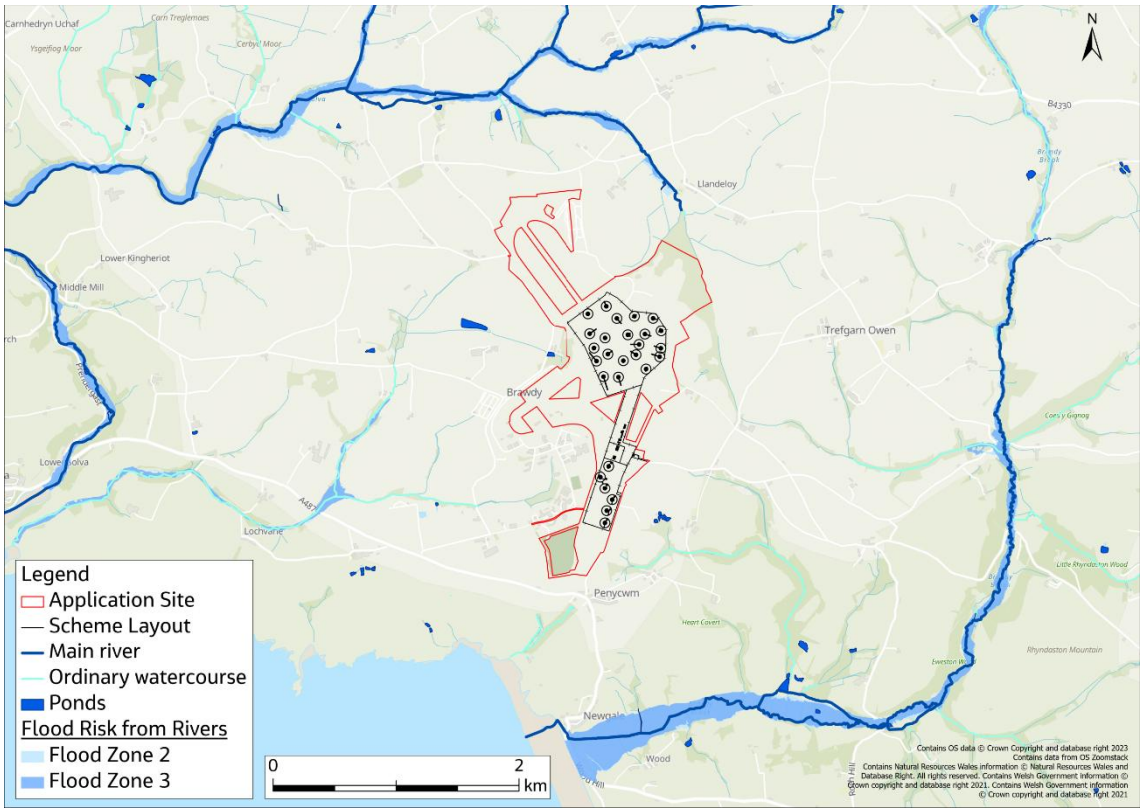

Image 5: Fluvial flood risk

Tidal and Coastal Flood Risk

Baseline

4.11. Tidal flooding occurs due to an increase in water level in the sea or a tidal river during a storm surge causing it to exceed ground levels or overtop defences and flood the surrounding area. In coastal or estuarine areas this can be combined with additional flood risk from wave overtopping.

4.12. The NRW FMfP[17] has been reviewed to determine the flood risk to the proposed development from the sea (Image 6). The classifications of flood risk areas as shown on the map are:

- Flood Zone 3 – the area has 0.5% (1 in 200) AEP;
- Flood Zone 2 – the area has between 0.1% (1 in 1000) and 0.5% (1 in 200) AEP; and
- All areas outside the shaded area are categorised as having a less than 0.1% (1 in 1000) AEP and are classified as Flood Zone 1.

4.13. These extents all include an allowance for climate change (central estimate).

4.14. The FMfP shows that the application site and the existing Cawdor Barracks site are located within Flood Zone 1 for flooding from the sea. Due to the elevation of the application site at 115mAOD and the proposed development being situated 1.1 km north of the Pembrokeshire coast the risk of flooding from the sea is considered negligible.

With the proposed development

4.15. Given its location outside of areas which are at significant risk of flooding from the sea, the proposed development will not be at significant risk and will not result in an increase in flood risk to the application site or to third party land. The flood risk from the sea following development is therefore considered to be negligible.

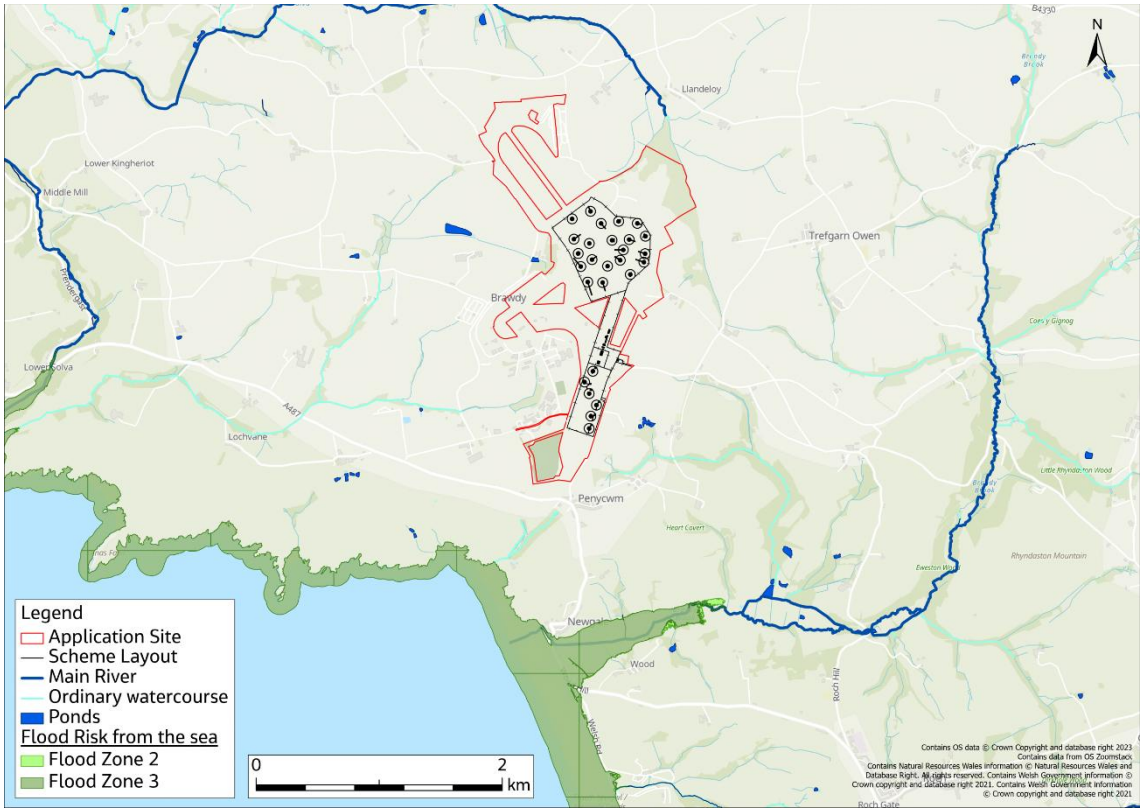

Image 6: Flood risk from the sea

Pluvial flood risk

Baseline

4.16. Pluvial flooding occurs when intense rainfall falls onto impermeable surfaces or saturated ground which is unable to absorb it, resulting in overland flows and ponding.

4.17. The NRW FMfP[18] has been used to determine the pluvial flood risk to the proposed development (Image 7). The classifications of flood risk areas as shown on the map are:

- Flood Zone 3 – the area has a 1% (1 in 100) AEP;
- Flood Zone 2 – the area has between a 0.1% (1 in 1000) and a 1% (1 in 100) AEP; and
- All areas outside the shaded area are categorised as having a less than 0.1% (1 in 1000) AEP, and are classified as Flood Zone 1.

4.18. The above extents all include an allowance for climate change (central estimate).

4.19. Image 7 shows that the majority of the application site is not at significant risk of surface water (pluvial) flooding. However, there are small isolated areas of low to high risk which are associated with surface water pooling in topographic low points.

4.20. The application site is served by an existing drainage system which collects surface water runoff via a combination of filter drains and gullies and conveys flows to nearby small ordinary watercourses through a piped drainage network. The existing surface water drainage infrastructure on the existing runway is expected to reduce the risk of flooding compared to that mapped. The risk of flooding to the application site from surface water is therefore considered to be low.

With the Proposed Development

4.21. Parts of the proposed development are located in areas shown to be at risk of pluvial flooding due to ponding in topographic depressions. However, as noted above, it is expected that the risk in these areas is considerably reduced by the existing site surface water drainage system not accounted for in the flood mapping.

4.22. Furthermore, a new surface water drainage system serving the proposed development will be constructed in accordance with the principles outlined in the surface water drainage strategy (see ES Appendix 12.3). This will further reduce the surface water flood risk to the proposed development. The risk of surface water flooding to the proposed development is therefore considered to be low.

4.23. The proposed development will create additional impermeable surfaces including antenna aprons, buildings and highway access roads. The potential for increased runoff from the proposed development will be mitigated through its new surface water drainage system. Further information is provided in Section 6. With this mitigation in place, there will be no change in the flood risk to third parties as a result of the proposed development.

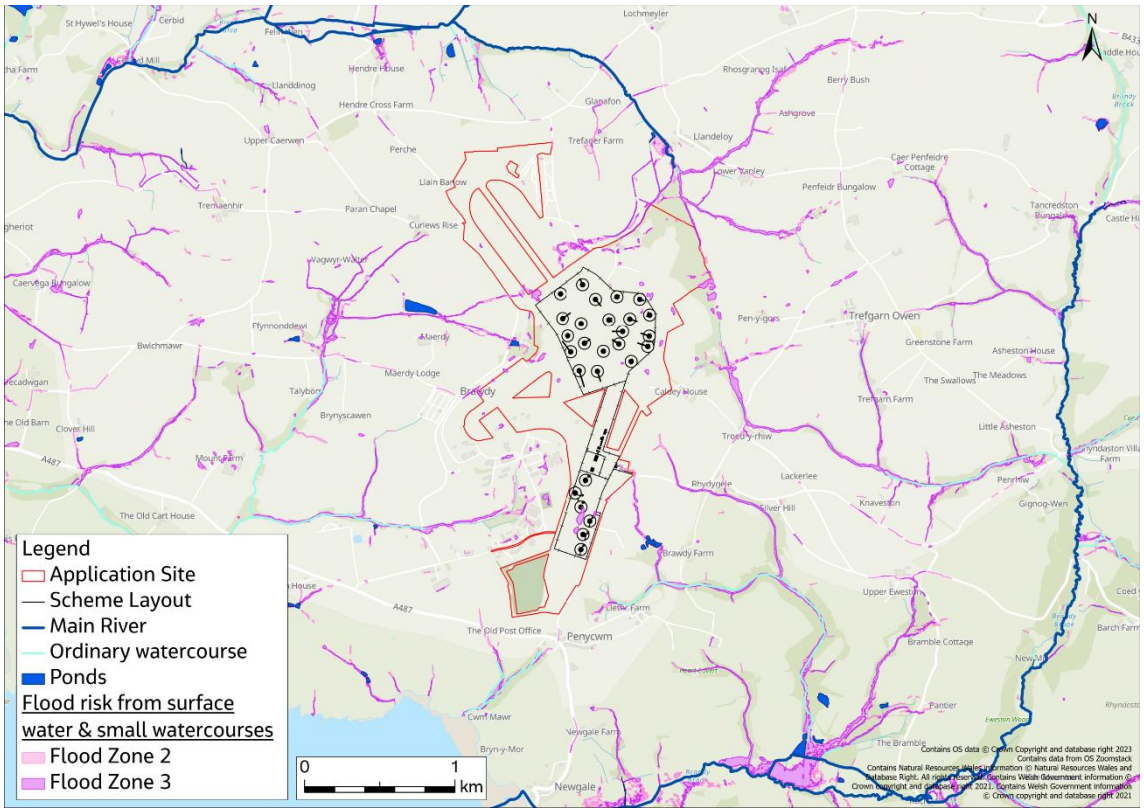

Image 7: Pluvial flood risk

Groundwater Flood Risk

Baseline

4.24. Groundwater flooding occurs when the natural level of water stored within the ground rises above the local ground level. In some places this can result in deep and long-lasting flooding of low-lying or underground areas.

4.25. BGS Groundwater Flooding Susceptibility data from the 2022 Envirocheck report[19] indicates that the majority of the application site is not at risk of groundwater flooding. However, there is a potential for groundwater flooding to occur at properties situated below ground level (e.g. basements) in the south eastern corner where the proposed Tx Array is to be located and, in the west, to the south of the Barracks. Around this area, there is an area of limited potential for groundwater flooding to occur. In the wider study area, beyond the application site there is potential for groundwater flooding at the surface along watercourses.

With the proposed development

4.26. Given the general limited potential for groundwater emergence across the majority of the site, the risk of groundwater to the application site with the proposed development is considered low. It is likely that any groundwater emerging in the vicinity of the proposed development would be intercepted by the site's drainage system and would not pose a significant risk to the proposed development.

4.27. The drainage system serving the proposed development will be constructed in accordance with the principles outlined in the surface water drainage strategy (see ES Appendix 12.3). It is currently anticipated that the site will be unsuitable for infiltration and drainage features will therefore be lined, meaning that storage and conveyance of surface water from the site will not increase the risk of groundwater flooding to third parties. If infiltration is found to be

feasible, following further testing, the drainage system will be designed to avoid adverse impacts on groundwater flood risk.

Sewer flood risk

Baseline

4.28. Flooding from sewers occurs when flow entering the sewerage system exceeds its capacity or if the network capacity has been reduced through blockage or damage to the sewer.

4.29. The sewer network within Cawdor Barracks is managed by Project Aquatrine on behalf of the MoD. It is understood that there is no sewerage infrastructure within the airfield area. This area is at a higher elevation than the sewered area therefore the risk of sewer flooding to the application site is negligible.

With the proposed development

4.30. Arrangements for sewerage provision for the proposed development are summarised in the surface water drainage strategy (see ES Appendix 12.3). A new sewerage system is proposed serving the proposed development, which will connect via requisitioned sewer to Newgale Wastewater Treatment Works (WwTW). Dŵr Cymru Welsh Water have confirmed that there is sufficient capacity at this site for discharges from the proposed development. Therefore, the proposed development is not expected to increase sewer flood risk to the application site or to third parties.

Summary of risk of flooding from all sources

4.31. Analysis of the flood risks from each source of flooding identified that:

- There is a very low risk of flooding from fluvial sources and a negligible risk of flooding from the sea.
- Small areas of low topography within the application site are at risk of pluvial (surface water) flooding. However, it is expected that this risk is reduced by the existing site drainage system and will be further mitigated by construction of a new surface water drainage system associated with the proposed development. This will also mitigate increased runoff from impermeable surfaces as a result of the proposed development, avoiding impacts to third parties.
- There is a potential for groundwater flooding to occur at properties situated below ground level in the south eastern corner of the development site and, in the west, to the south of the Barracks. Around this area, there is an area of limited potential for groundwater flooding to occur. However, this is not expected to pose a significant risk to the proposed development.
- There is a negligible risk of flooding from existing sewerage systems. A new sewerage system will be constructed to serve the proposed development and connected to Newgale Wastewater Treatment Works (WwTW). Dŵr Cymru Welsh Water have confirmed that there is sufficient capacity for this connection and the risk of sewer flooding to the application site or to third parties is not expected to be significantly increased by the proposed development.

5. Compliance with TAN 15

Flood Zones

5.1. The proposed development has been assessed against the requirements of TAN 15. The application site is located within FMfP Zone 1 for flood risk from rivers and the sea (Image 8). Whilst there are some small areas of the application site that are shown to be in Flood Zones 2 and 3 for flood risk from surface water and small watercourses, these appear to

be associated with isolated areas of ponding which are expected to be addressed by the site's drainage system.

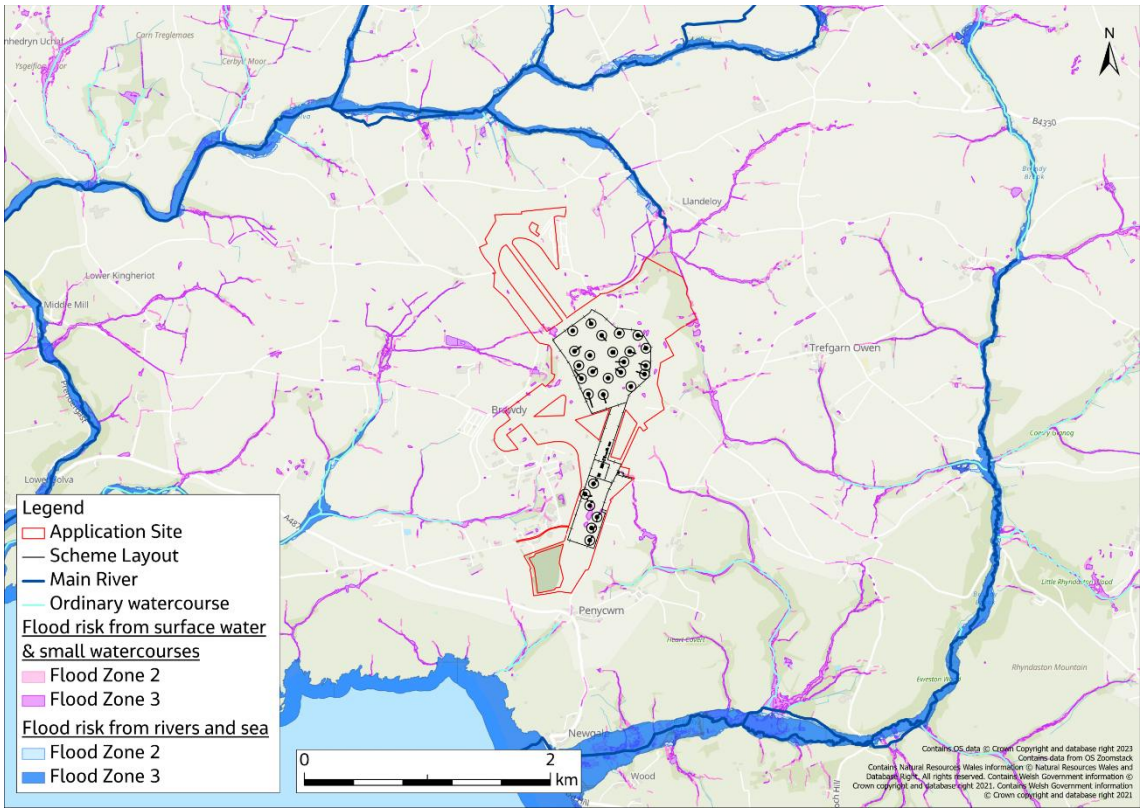

Image 8: NRW Flood Map for Planning

5.2. In Flood Zone 3, no new highly vulnerable development on greenfield land is acceptable under TAN 15 and other proposals are only considered appropriate if they are essential to the development plan strategy to regenerate an existing settlement or achieve key economic or environmental objectives. The proposed development is located on brownfield land which forms part of the existing Cawdor Barracks site. It does not fit into the specific development types categorised for vulnerability in TAN 15. However, it is reasonable to assume that it will be less vulnerable to flooding.

5.3. Furthermore, it is considered to meet the description of "proposals that address national security or energy security needs" which are considered acceptable in Flood Zone 3 under TAN 15 provided that their locational need is clear and the potential consequences from flooding have been considered and found to be acceptable. The proposed development is of high national importance and its location has been selected as the most suitable based on a number of criteria, indicating that there is a clear locational need for the development. The potential consequences of flooding have been assessed within this Flood Consequences Assessment.

5.4. Given the very small areas of the site that are shown to be at flood risk, the acceptability criteria documented in paragraph 2.11 are considered to be met.

5.5. As noted above, whilst there are small isolated areas of the application site within Flood Zone 3, the majority of the site lies within Flood Zone 1, where all types of development are considered acceptable in principle.

Climate Change

5.6. TAN 15 requires that FCAs take account of the impacts of climate change, making reference to Welsh Government guidance on climate change allowances for planning purposes. The Flood Consequences Assessments: Climate change allowances[20] sets out the climate change allowances to be used in Flood Consequences Assessments submitted in support of relevant planning applications, and to inform development plan allocations.

5.7. The design life of the proposed development is 25 years (stated in ES Chapter 3). However, as a reasonable worst case it is assumed the proposed development will exist beyond this into the 2080s. Therefore, assessment of the impacts of climate change is based on the 2080s (2070 to 2115) epoch, appropriate for the lifetime of the development.

5.8. The climate change allowances guidance states that, for peak river flows, it is recommended that the central estimate, or change factor, for the 2080s for the relevant river basin district is used to assess the potential impact of climate change and to inform design levels. In addition, an assessment of risk should be made using the upper end estimate to inform mitigation measures to help ensure the long-term resilience of the development.

5.9. The application site is located in the West Wales region and the central estimate for peak river flow for the 2080s epoch is 30% and the upper end estimate is 75% (see Table 8).

Table 8: Peak river flow allowances for West Wales river basin district (compared to a 1961 to 1990 baseline)

Allowance	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
Upper end estimate	25%	40%	75%
Change factor / central estimate	15%	25%	30%
Lower end estimate	5%	10%	15%

5.10. Flood zones shown on the FMfP already show flood risk under the central climate change estimate and this shows no significant flood risk to the application site from this source (see Image 8). Given the small flood extent under the central allowance scenario, the location of the application site at the very upstream extent of the watercourse catchments and the relatively steep topography sloping away from the site, the upper end scenario is not considered to have a significant impact on fluvial flood risk to the site or require any specific additional mitigation.

5.11. The climate change allowances guidance states that, for extreme rainfall intensity, both the central and upper end estimates should be assessed to understand the range of impact. As a minimum, development proposals should be assessed against the central estimate to inform design levels. Where the assessment indicates a significant flood risk for the upper estimate, the flood consequences assessment should indicate the mitigation measures required to protect people and property.

5.12. The central estimate for peak rainfall is 20% and the upper end estimate is 40% (Table 9). The flood zones for surface water and small watercourses shown on the FMfP include uplift using the central allowance. As this does not indicate a significant flood risk the central estimate can be accepted following the guidance. However, as a precautionary approach, the upper end estimate has been used in the design of the drainage system as summarised in the surface water drainage strategy (see ES Appendix 12.3).

Table 9: Change to extreme rainfall intensity (compared to a 1961 to 1990 baseline)

Allowance	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s

Upper end estimate	10%	20%	40%
Central estimate	5%	10%	20%

6. Flood Risk Mitigation Measures

6.1. Section 4 indicates that there are no significant sources of flood risk affecting the application site which might impact on the proposed development.

6.2. A new drainage system will be constructed serving the proposed development, to mitigate any increases in surface water flood risk to third parties due to the increase in impermeable surfaces. The drainage system will be designed in accordance with the principles outlined in the surface water drainage strategy (see ES Appendix 12.3), the requirements of TAN 15 and the national standards for sustainable drainage systems (SuDS)[21] for Wales.

6.3. Any localised ponding will be avoided through suitable master planning and the development of the above-mentioned surface water drainage strategy. Where this is not possible, depressions will be infilled to match with higher ground levels. All radar antennas and all associated infrastructure will be located on platforms that are/have finished floor levels a minimum of 150mm above adjacent ground levels. Therefore, reducing the risk of pluvial flooding to the radar antennas. The drainage strategy details that the surface water drainage network will be sufficiently robust to withstand the impacts of climate change.

7. Conclusion

7.1. The proposed development will include construction and operation of the DARC facility and all associated ancillary infrastructure. The proposed development will include the implementation of six transmit radar antennas (TX), 21 receive radar antennas (RX), a radar antenna operations area (proposed to be within the receiver array area) a sub-station and grid connection.

7.2. Analysis of the risks of flooding to the proposed development from each source of flooding identified a low to negligible risk of flooding from fluvial and tidal sources as well as sewer networks. There is the potential for groundwater flooding to buildings and infrastructure below ground level and at the surface within the application site. However, groundwater flooding is not expected to pose a significant risk to the proposed development.

7.3. The FCA identified small areas of pluvial flooding within the application site associated with low points of topography. However, it is anticipated that the risk from this source would be reduced by the existing drainage system and risk to the proposed development further mitigated through construction of a new surface water drainage system. The proposed drainage system will also mitigate any increased risks to third parties as a result of increased run-off from impermeable surfaces.

7.4. The proposed development has been assessed against the requirements of TAN 15 and, as a proposal to address national security needs, is considered appropriate for the Flood Zones in which it is located. The majority of the site is located within Flood Zone 1 from all sources, with only small isolated areas shown to be in Flood Zones 2 and 3 for flood risk from surface water and small watercourses. These areas are associated with the small areas of ponding in low points in the topography as described above.

7.5. No significant impacts on flood risk to the proposed development as a result of climate change have been identified. The new surface water drainage system for the proposed development will be designed to accommodate the 1 in 100 (1%) annual event including an upper end allowance for climate change, providing further resilience to climate change for the proposed development.

7.6. In conclusion, flood risk is not a constraint to the proposed development.

8. References

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[18] Natural Resources Wales (2025). Flood Map for Planning Available at: https://flood-map-for-planning.naturalresources.wales/ Accessed: 26/11/2025

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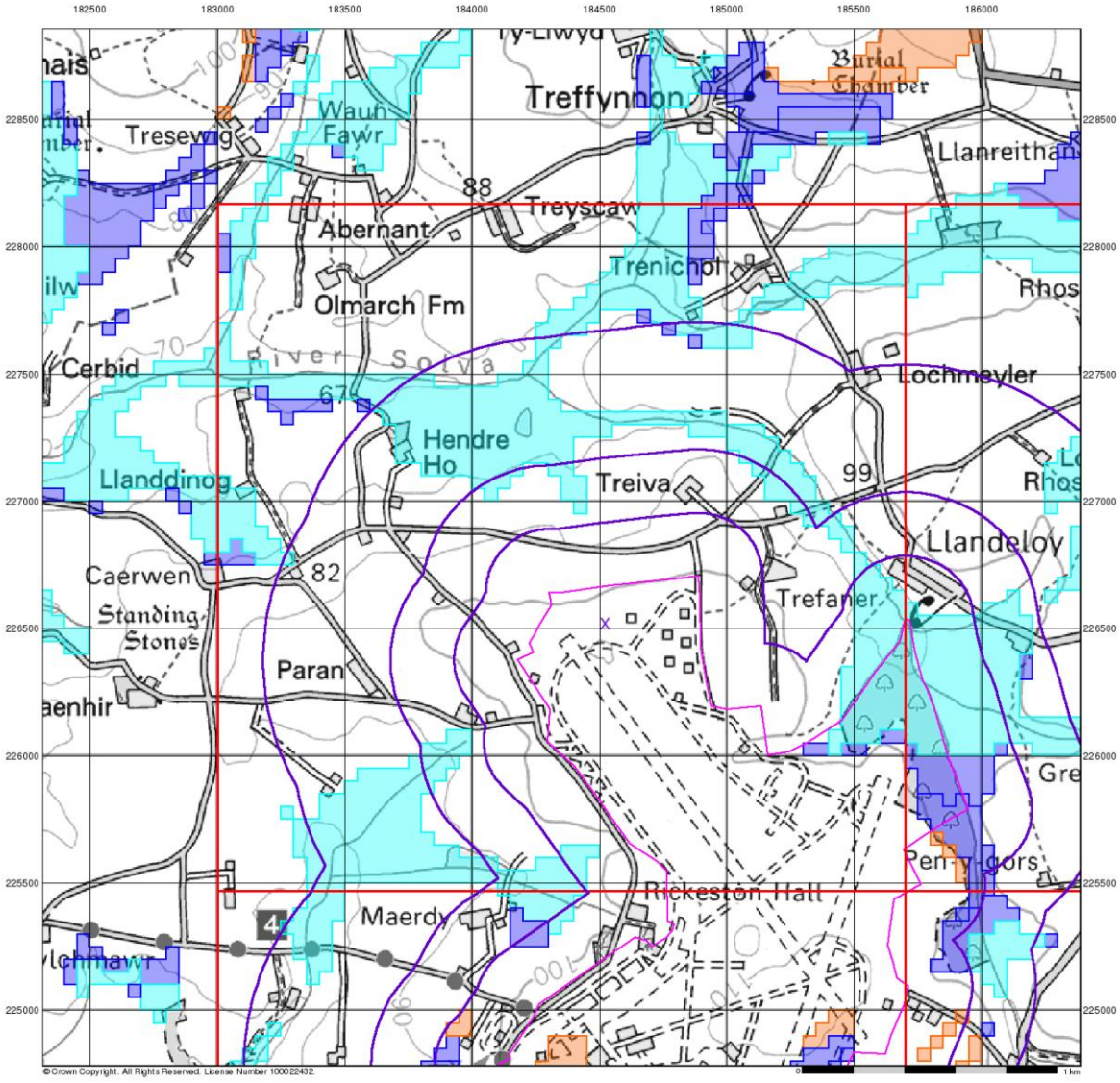
Annex A. Groundwater vulnerability figures



SWECO

BGS Flood GFS Data

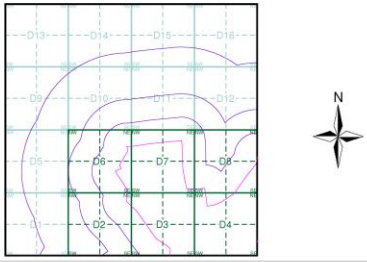
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice D



Order Details

Order Number:	305022956_1_1
Customer Ref:	65208061
National Grid Reference:	184520, 226520
Slice:	D
Site Area (Ha):	308.46
Search Buffer (m):	1000

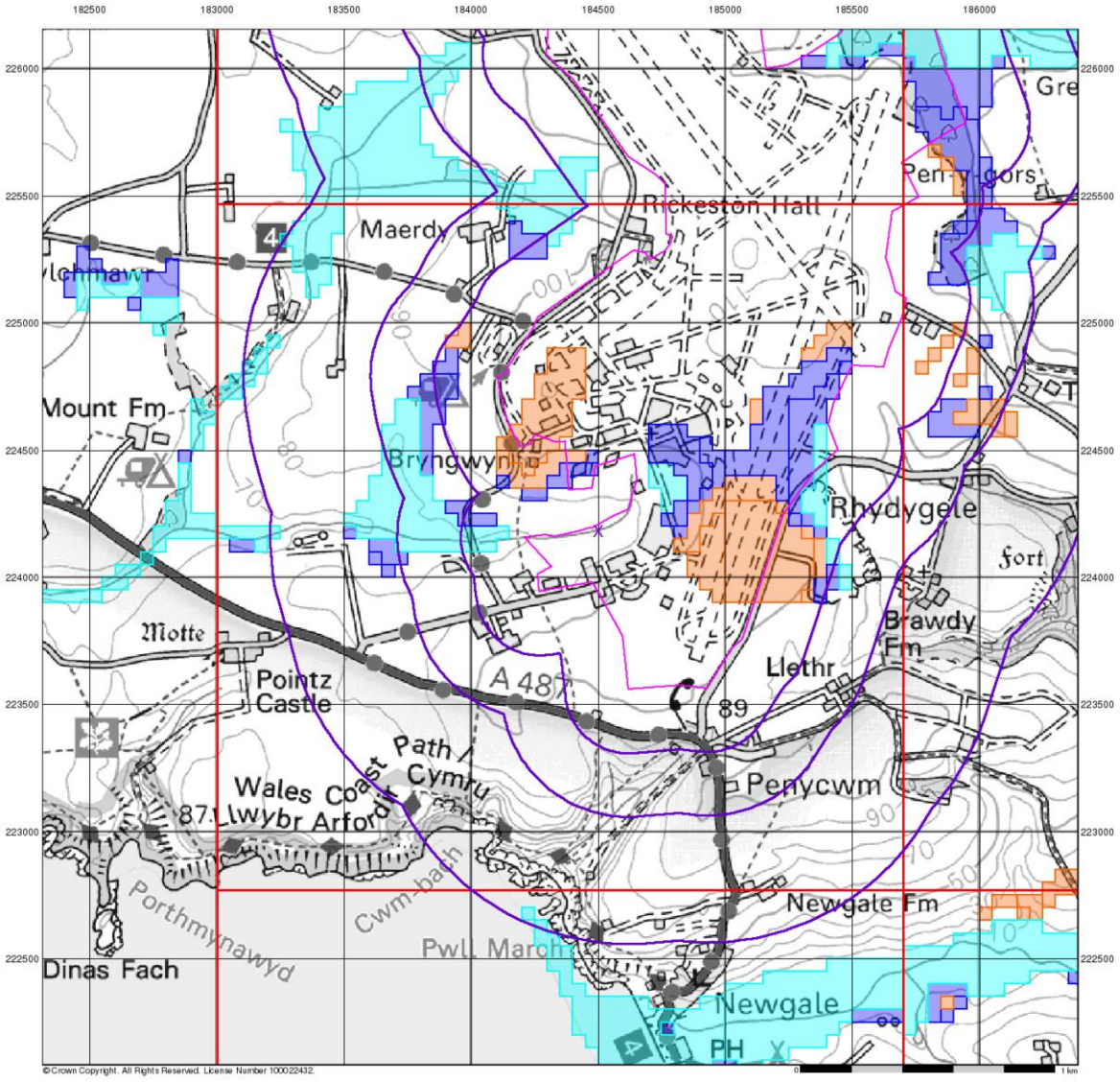
Site Details

Cawdor site

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

A Landmark Information Group Service v15.0 14-Dec-2022 Page 6 of 6



SWECO

BGS Flood GFS Data

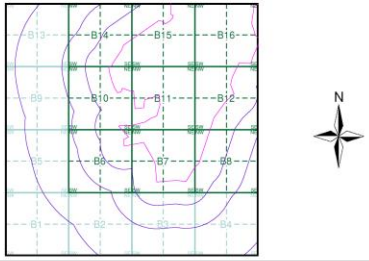
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice B



Order Details

Order Number:	305022956_1_1
Customer Ref:	65208061
National Grid Reference:	184500, 224180
Slice:	B
Site Area (Ha):	308.46
Search Buffer (m):	1000

Site Details

Cawdor site

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

A Landmark Information Group Service v15.0 14-Dec-2022 Page 6 of 6

Ministry of Defence

ES Appendix 12.3: Drainage Strategy

TECHNICAL NOTE 1

DATE:	05 February 2026	**CONFIDENTIALITY:**	Public
SUBJECT:	DS2 Drainage Strategy Design Note		
PROJECT:	UK0041901.5971 DS2	**AUTHOR:**	AB
CHECKED:	CJ	**APPROVED:**	CJ

BACKGROUND

This Technical Note has been prepared by WSP to outline the proposed foul and surface water drainage strategies for the Deep Space Advanced Radar Capability (DARC) development, located on the existing Cawdor Barracks site in Pembrokeshire, Wales. This development includes the installation of 27 ground antenna terminals and associated support buildings, constructed on or adjacent to existing runway surfaces. Additional improvements include site access and an interconnecting roadway. This note provides a summary of the approach adopted to ensure compliance with relevant regulations and policies relating to sustainable drainage design.

The objectives of the report are to:

- Demonstrate the compliance of Sustainable Drainage Systems (SuDS) proposals within the development to control and discharge surface water runoff to comply with the requirements of the Statutory National Standards for Sustainable Drainage Systems (Welsh Government, 2018), referred to as the SNSSDS within this report;
- Provide design principles for surface water systems including preliminary sizing of storage/attenuation features and estimate the equivalent greenfield run-off rates for the proposed development area.
- Provide an overview of the approach to the disposal of foul water for the development.
- Provide guidance for next steps in developing the detailed strategy.

SITE OVERVIEW

Topography

The site which adjoins the former RAF Brawdy airfield in north Pembrokeshire is situated at a high point in the local topography, with land generally falling away in all directions.

Ground conditions

Based on the Phase 2 LQA site investigation prepared by Amec February 2012, the ground conditions in the study area are summarised as follows:

- Made Ground: Located near the airfield, it typically consists sandy, gravelly clay and has been found at some locations to contain materials such as bitumen, tile, and clinker.
  Infiltration in these areas could mobilise contaminants, posing a risk to groundwater and downstream receptors.
- Natural Ground: Natural Drift Deposits, gravelly clay, glacial till and weathered mudstone. Underlain by mudstone bedrock with occasional sandstone or shale.
  Mudstone is known to have low permeability and tends to become saturated during periods of heavy rainfall.
- Localised sources of contamination that may contain Extractable Petroleum Hydrocarbons

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Drainage

Surface Water:
The existing drainage infrastructure within the barracks consists of a combination of filter drains and a gully system serving the runways, complemented by a kerb and gully system. There are no surface water outfalls located within the application site; instead, all surface water runoff is conveyed offsite to adjacent ordinary watercourses through piped drainage networks.

Foul Water:
Foul water from the barracks is conveyed via gravity to an on-site pumping station, which subsequently discharges beyond the site boundary through a rising main to the local wastewater treatment works. It is also understood that this onsite pumping station serves the adjacent business park located next to the development site.

DRAINAGE STRATEGY

Surface Water: Demonstration for compliance with SNSSDS

Standard	Designer's Response
S1 – Runoff Destination	Whilst infiltration drainage cannot be discounted as a means of surface water disposal, in line with the recommendations of the current phase 2 LQA a precautionary approach has been adopted whereby the surface water is managed via a network of overland features before discharge to the onsite surface water sewers. Further ground investigation to prove infiltration as a viable method of surface water disposal is required. Given the nature of the development, there is limited potential for surface water reuse within the site. As a result, this option has been discounted. Antenna Aprons: There are private surface water drains located through the site. It is envisaged that the existing drainage ditch/French drain systems situated on the edge of the runway will likely be the most viable destination for surface water. This will be subject to level confirmation for the proposed antenna bases. Discharge will be conveyed via overland flow methods such as ditches and swales Proposed buildings: The buildings proposed on the runway will connect to the nearest existing surface water drainage system. Highway access roads will discharge via swale/ditches to the nearest highway surface water network, subject to agreement with the local highway authority.

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S2 – Hydraulic Control	Antenna Aprons: The antenna aprons will be formed of a permeable pavement construction. Given the risk of mobilising existing ground contamination (e.g. EPH) it is currently proposed that this pavement be underlain with an impermeable geotextile liner. Surface water flows from the antenna aprons are to be restricted to greenfield discharge rate of 13.8 litres per second per hectare at a 1 in 2-year event (QBAR) as derived from FEH22 data. Attenuated surface water flows over and above those attenuated in the permeable pavement would be stored within shallow conveyance ditch/swales. All storage has been sized to accommodate the critical storm from a 100-year return period event plus an additional allowance of 40% for climate change. Exceedance flows will be directed overland and away from buildings through careful level design. This approach will be illustrated in an exceedance route plan. A summary of storage estimates for each catchment is contained in Table 1. Proposed Buildings: The proposed buildings are located on existing impervious runway surfaces and will not result in any increase in impermeable area. Highway Access Roads: Newly constructed access road' runoff will be collected via a ditch /swale alongside the edge of carriageway which will provide attenuation for these areas. The flows will outfall to the existing highway surface water ditch adjacent to the site subject to confirmation of the levels and agreement with the local highway authority at Pembrokeshire County Council. Surface water flows are to be restricted to greenfield discharge rate of 13.8 litres per second per hectare at a 1 in 2-year event (QBAR) as derived from FEH22 data. All storage has been sized to accommodate the critical storm from a 100-year return period event plus an additional allowance of 40% for climate change. Exceedance flows will be directed overland and away from

	buildings through careful level design. This approach will be illustrated in an exceedance route plan.
S3 – Water Quality	Antenna Bases: Pollution index ratings for the antenna base is classed as low , subject to detailed design and further details of mechanical operation and management. Thid will be demonstrated though application of Simple Index Approach Source control treatment is provided through the permeable pavement layers beneath the antenna, which provide filtration at source. Runoff is then conveyed via outfalls overland or to a vegetated ditch or swale, where further treatment occurs through absorption, and evapotranspiration by vegetation. Highway Access Roads: The edge of carriageway surface water collector ditch, this will provide a level of treatment though, absorption, and evapotranspiration by vegetation.
S4 – Amenity	As the site is not intended for public use, no amenity provision is proposed. This approach will be discussed with the Sustainable Drainage Approval Body (SAB) to confirm whether this requirement can be waived.
S5 – Biodiversity	Biodiversity benefits may be achieved through the proposed ditch/swale system, which is designed to replicate natural landscape and drainage conditions and support local ecological processes. The site includes ecologically sensitive fungal habitats that should remain undisturbed. Any proposed drainage solutions will be designed to avoid impacting these areas.
S6 – Construction, Operation and Maintenance	Not considered at this stage, however, the Construction Phase Plan and Construction Environmental Management Plan documents are to be produced by the Contractor. These documents will be produced in the later design stages of the project and shall be submitted as part of the Full SAB Application. The proposed SuDS assets will require routine inspection and maintenance as part of the operational & maintenance regime for the facility.

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Table 1 – Attenuation Storage Estimate

Catchment / Attenuation Feature	Location Description	Total contributing area (ha)	Discharge Rate (l/s)	Proposed attenuation (m3)
Catchment 1	RX10, RX11, RX12	0.243	3.4	230
Catchment 2	RX5, RX9	0.140	1.9	111
Catchment 3	RX3	0.066	0.9	52
Catchment 4	RX2, RX7	0.135	1.9	105
Catchment 5	RX1, RX13, RX16, RX17, RX18	0.309	4.3	243
Catchment 6	RX14, RX15, RX19	0.208	2.9	197
Catchment 7	Highway	0.185	2.6	-
Catchment 8	TX1, TX2, TX3	0.144	2.0	136
Catchment 9	Highway	0.028	0.24	22
Total		**1.458**	**20.14**	**1096**

Design Assumptions:

- Based on a discharge rate of 13.8l/s/ha from FEH22 data
- Permeability factor of Apron Bases 0.8
- Permeability factor of highway (access roads) 1.0
- Catchment areas are indicated on drawing ref: 5981-WSP-XX-XX-DR-C-0505 & 0506

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Surface Water Drainage Strategy Summary

A precautionary approach to surface water management for the proposed development, based on available ground information is currently recommended. The approach can be further developed and refined at the detailed design stage to incorporate infiltration wherever feasible and where further ground investigation and testing prove and better define ground conditions.

The proposed system includes the collection of surface water via a lined permeable pavement system, supplemented by overland flow features such as shallow ditches and swales. These features will be designed to minimise alterations to the existing landform. Final discharge is proposed to the existing surface water system at the runway edge or overland flow to perimeter ditches where present , pending confirmation of levels.

The surface water drainage strategy will be developed to reflect the site's natural hydrological regime, employing a combination of overland flow and infiltration methods (where ground conditions permit). This approach is intended to replicate existing flow paths and catchment characteristics. The final design will be informed by further intrusive ground investigations.

Foul Water

WSP has submitted a pre-development enquiry to Dŵr Cymru Welsh Water (DCWW) on behalf of the Developer, and the response (ref:PPA0006920) was received on 23/09/2025 The nearest public sewerage systems are located approximately 1.9km to the south and 1.6km to the north of the site. These drain to the Newgale Wastewater Treatment Work (WwTW). DCWW confirms that no problems are envisaged at this WwTW for the treatment of domestic discharges from this site.

It is not proposed to connect to the existing on-site foul sewer network. Instead, a new gravity foul drainage system is proposed, discharging to a chamber at the boundary of the barracks site. From this point, WSP intends to engage with DCWW to requisition a new sewer under sections 98- of the Water industry Act 1991. The design and construction of this requisition route would likely be undertaken by DCWW. The recommended next step would be to formally request a proposal from DCWW for the design and delivery of this off-site connection

Next Steps

- Confirm surface water connection levels through further site topographical survey .
- Develop pavement specifications for antenna aprons with a focus on promoting infiltration. This will help reduce surface runoff and minimise the required attenuation volumes as well as providing treatment for water quality.
- Engage with the Sustainable Drainage Approval Body (SAB) to agree on the proposed surface water drainage approach to be taken forward to detailed design.
- Undertake targeted ground investigations to assess soakaway potential (infiltration, groundwater monitoring and contamination) at each proposed antenna base location.

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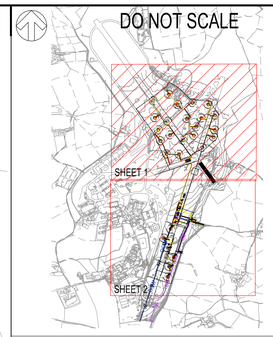

EXISTING RUNWAY

Rickston Hall

RX1 TO CONNECT INTO EXISTING DITCH LOCATED TO THE SIDE OF RUNWAY VIA OVERLAND FLOWS AND PERMEABLE PAVING LINED WITH AN IMPERMEABLE GEOTEXTILE MEMBRANE

RX16 TO CONNECT INTO EXISTING DITCH LOCATED TO THE SIDE OF RUNWAY VIA OVERLAND FLOWS AND PERMEABLE PAVING LINED WITH AN IMPERMEABLE GEOTEXTILE MEMBRANE

RX14, RX15 AND RX19 SEEK TO DISCHARGE VIA OVERLAND FLOWS. THIS IS TO BE ASSESSED ONCE FURTHER INTRUSIVE GROUND INVESTIGATION RESULTS ARE CONFIRMED.

ALTERNATIVELY THESE ANTENNAS MAY DISCHARGE TO THE EXISTING DITCHES BESIDE THE RUNWAY VIA PERFORATED PIPES AND A SWALE/DITCH.

RX20 TO CONNECT INTO EXISTING DITCH LOCATED TO THE SIDE OF RUNWAY VIA OVERLAND FLOWS AND PERMEABLE PAVING LINED WITH AN IMPERMEABLE GEOTEXTILE MEMBRANE

Youth Hostel

NOTES/RISKS

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4. SURVEY INFORMATION PROVIDED BY WSP IN JUNE 2025 SHOWN IN THE BACKGROUND IN GREY.
5. ALL APRONS TO CONNECT TO EXISTING DITCHES LOCATED TO THE SIDE OF THE RUNWAYS. CONNECTION LOCATIONS TO BE CONFIRMED AT DETAILED DESIGN.
6. FLOW CONTROLS ARE TO BE USED TO CONTROL SURFACE WATER AND RESTRICT GREENFIELD RUNOFF RATES.
7. ATTENUATION SWALE/DITCHES ASSUMED 750mm DEPTH. TO BE CONFIRMED AT DETAILED DESIGN.
8. ANTENNA APRON PAVEMENT DESIGN TO UTILISE PERMEABLE PAVING, LINED IN AN IMPERMEABLE GEOTEXTILE MEMBRANE. DETAILS TO BE CONFIRMED AT DETAILED DESIGN.
9. PERFORATED PIPE TO BE USED AS A COLLECTOR SYSTEM UNDER ANTENNA APRONS, WITHIN PERMEABLE PAVING AND ABOVE IMPERMEABLE GEOTEXTILE MEMBRANE TO CONVEY SURFACE WATER.

KEY

- FLOW ROUTES
- PROPOSED ATTENUATION AREA
- PROPOSED ATTENUATION SWALE/DITCH
- PROPOSED WIDENING OF SWALE/DITCH TO PROVIDE ADDITIONAL ATTENUATION
- PROPOSED PERFORATED PIPE
- PROPOSED ANTENNA APRON AND PERMEABLE PAVING LINED WITH AN IMPERMEABLE GEOTEXTILE MEMBRANE
- CP — PROPOSED TIE IN POINT TO EXISTING DITCHES TO THE SIDE OF THE RUNWAY. TO BE CONFIRMED AT DETAILED DESIGN

REV	DATE	BY	DESCRIPTION	CHK	APP
P04	04/02/2026	JL	UPDATED SITE LAYOUT AND PROJECT TITLE	AB	CJ
P03	28/10/2025	JL	STRATEGY FOR RX14, RX15 AND RX19 UPDATED	AB	CJ
P02	21/10/2025	JL	ANTENNA AND BUILDING LABELS ADDED. SWALE TIE INS UPDATED	AB	CJ

DRAWING STATUS: S2 - FOR INFORMATION

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1 Capital Quarter, Tyndall St, Cardiff, CF10 4BZ, UK
T+ 44 (0) 292 076 9200
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CLIENT: NORTHROP GRUMMAN

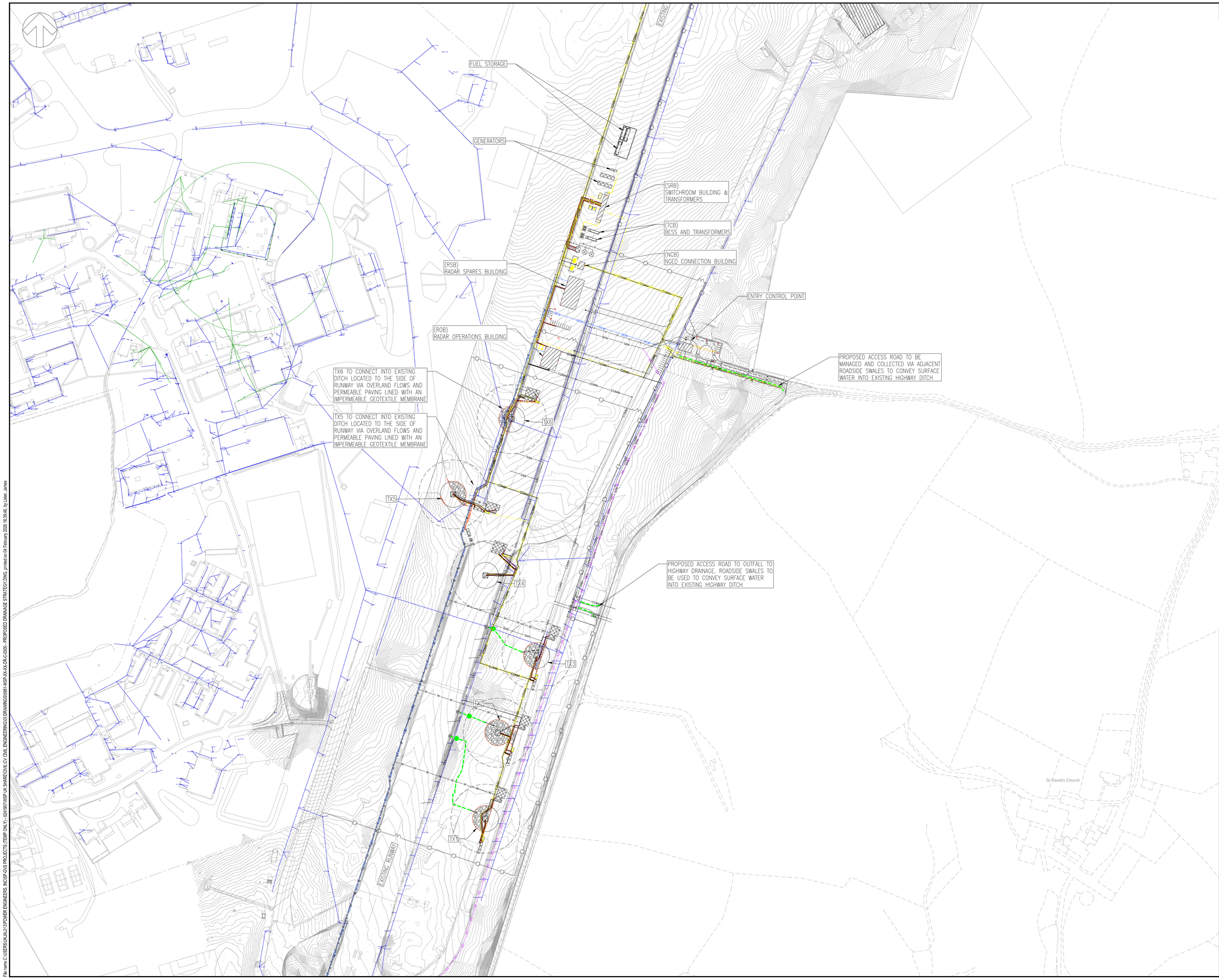
ARCHITECT: -

SITE/PROJECT: DS2

TITLE: PROPOSED DRAINAGE STRATEGY SHEET 1 OF 2

SCALE @ A1:	CHECKED:		APPROVED:
1:2000	AB		CJ
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
2025UK365981	JL	JL	OCTOBER 25

DRAWING No: 5981-WSP-XX-XX-DR-C-0500 REV: P04



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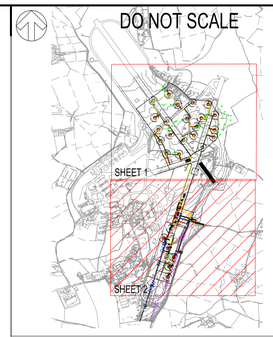

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8. ANTENNA APRON PAVEMENT DESIGN TO UTILISE PERMEABLE PAVING, LINED IN AN IMPERMEABLE GEOTEXTILE MEMBRANE. DETAILS TO BE CONFIRMED AT DETAILED DESIGN.
9. PERFORATED PIPE TO BE USED AS A COLLECTOR SYSTEM UNDER ANTENNA APRONS, WITHIN PERMEABLE PAVING AND ABOVE IMPERMEABLE GEOTEXTILE MEMBRANE TO CONVEY SURFACE WATER.

KEY

- FLOW ROUTES
- PROPOSED ATTENUATION AREA
- PROPOSED ATTENUATION SWALE/DITCH
- PROPOSED WIDENING OF SWALE/DITCH TO PROVIDE ADDITIONAL ATTENUATION
- PROPOSED PERFORATED PIPE
- PROPOSED ANTENNA APRON AND PERMEABLE PAVING LINED WITH AN IMPERMEABLE GEOTEXTILE MEMBRANE
- CP — PROPOSED TIE IN POINT TO EXISTING DITCHES TO THE SIDE OF THE RUNWAY, TO BE CONFIRMED AT DETAILED DESIGN

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P04	04/02/2026	JL	UPDATED SITE LAYOUT AND PROJECT TITLE	AB	CJ
P03	28/10/2025	JL	STRATEGY FOR TX1, TX2 & TX3 UPDATED	AB	CJ
P02	21/10/2025	JL	ANTENNA AND BUILDING LABELS ADDED. SWALE TIE INS UPDATED	AB	CJ

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2025UK365981	JL	JL	OCTOBER 25

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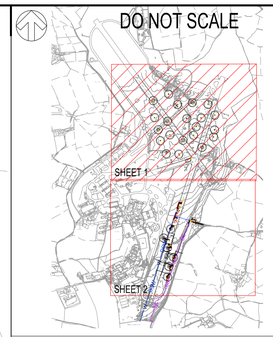

CATCHMENT 3:
ATTENUATION APPROXIMATELY 52m³
BASED ON IMPERMEABLE AREA: 0.066HA
DISCHARGE RATE: 0.9L/S

CATCHMENT 2:
ATTENUATION APPROXIMATELY 111m³
BASED ON IMPERMEABLE AREA: 0.14HA
DISCHARGE RATE: 1.9L/S

CATCHMENT 4:
ATTENUATION APPROXIMATELY 105m³
BASED ON IMPERMEABLE AREA: 0.135HA
DISCHARGE RATE: 1.9L/S

CATCHMENT 5:
ATTENUATION APPROXIMATELY 243m³
BASED ON IMPERMEABLE AREA: 0.309HA
DISCHARGE RATE: 4.3L/S

CATCHMENT 6:
SEEK TO DISCHARGE VIA OVERLAND FLOWS. THIS IS TO BE ASSESSED ONCE FURTHER INTRUSIVE GROUND INVESTIGATION RESULTS ARE CONFIRMED.

ALTERNATIVELY THESE ANTENNAS MAY DISCHARGE TO THE EXISTING DITCHES BESIDE THE RUNWAY VIA PERFORATED PIPES AND A SWALE/DITCH.

ATTENUATION APPROXIMATELY 197m³
BASED ON IMPERMEABLE AREA: 0.208HA
DISCHARGE RATE: 2.9L/S

CATCHMENT 1:
ATTENUATION APPROXIMATELY 230m³
BASED ON IMPERMEABLE AREA: 0.243HA
DISCHARGE RATE: 3.4L/S

EXISTING RUNWAY

Rickeston Hall

Youth Hostel

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KEY

- CATCHMENT 1
- CATCHMENT 2
- CATCHMENT 3
- CATCHMENT 4
- CATCHMENT 5
- CATCHMENT 6
- CATCHMENT 7
- CATCHMENT 8
- CATCHMENT 9

REV	DATE	BY	DESCRIPTION	CHK	APP
P03	04/02/2026	JL	UPDATED SITE LAYOUT AND PROJECT TITLE	AB	-
P02	28/10/2025	JL	CATCHMENTS AREAS UPDATED	AB	CJ
P01	16/10/2025	JL	FIRST ISSUE	AB	CJ

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PROPOSED CATCHMENT PLAN
SHEET 1 OF 2

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2025UK365981	JL	JL	OCTOBER 25

DRAWING No: 5981-WSP-XX-XX-DR-C-0505
REV: P03

FUEL STORAGE

FUEL STORAGE

GENERATORS

(RSB)
RADAR SPARES BUILDING

(ROB)
RADAR OPERATIONS BUILDING

EXISTING

(SRB)
SWITCHROOM BUILDING &
TRANSFORMERS

(TCB)
BESS AND TRANSFORMERS

(NCB)
NGED CONNECTION BUILDING

ENTRY CONTROL POINT

CATCHMENT 7:
HIGHWAY
IMPERMEABLE AREA: 0.151HA
DISCHARGE RATE: 2.1L/S

TX6

TX5

TX4

TX3

TX2

TX1

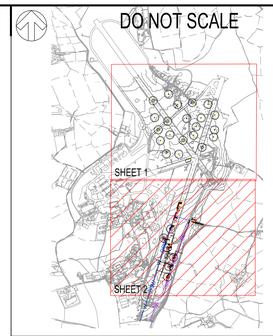
CATCHMENT 9:
ATTENUATION APPROXIMATELY 22m³
BASED ON IMPERMEABLE AREA: 0.028HA
DISCHARGE RATE: 0.4L/S

CATCHMENT 8:
ATTENUATION APPROXIMATELY 136m³
BASED ON IMPERMEABLE AREA: 0.144HA
DISCHARGE RATE: 2.0L/S

EXISTING RUNWAY

St David's Church

DO NOT SCALE



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- CATCHMENT 7
- CATCHMENT 8
- CATCHMENT 9

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P02	28/10/2025	JL	CATCHMENTS AREAS UPDATED	AB	CJ
P01	16/10/2025	JL	FIRST ISSUE	AB	CJ

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NORTHROP GRUMMAN

ARCHITECT:
-

SITE/PROJECT:
DS2

TITLE:
PROPOSED CATCHMENT PLAN
SHEET 2 OF 2

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1:2000	AB		CJ
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
2025UK365981	JL	JL	OCTOBER 25

DRAWING No: 5981-WSP-XX-XX-DR-C-0506
REV: P03

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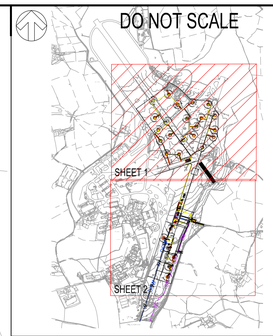

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- CATCHMENT 4
- CATCHMENT 5
- CATCHMENT 6
- CATCHMENT 7
- CATCHMENT 8
- CATCHMENT 9
- CATCHMENT 10

REV	DATE	BY	DESCRIPTION	CHK	APP
P04	04/02/2026	JL	UPDATED SITE LAYOUT AND PROJECT TITLE	AB	-
P03	10/12/2025	JL	CATCHMENT 6 UPDATED	AB	-
P02	03/12/2025	JL	UPDATED LAYOUT AND CATCHMENT 10 ADDED	AB	-
P01	26/11/2025	JL	FIRST ISSUE	AB	-

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DS2

TITLE:
INDICATIVE SITE-WIDE CATCHMENT PLAN
SHEET 1 OF 2

SCALE @ A1:	CHECKED:		APPROVED:
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PROJECT NO:	DESIGNED:	DRAWN:	DATE:
2025UK365981	JL	JL	NOVEMBER 25

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REV: P04

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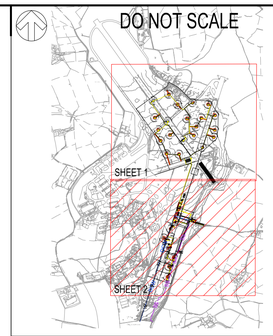

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- CATCHMENT 1
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- CATCHMENT 9
- CATCHMENT 10

REV	DATE	BY	DESCRIPTION	CHK	APP
P04	04/02/2026	JL	UPDATED SITE LAYOUT AND PROJECT TITLE	AB	-
P03	10/12/2025	JL	CATCHMENT 7 & 10 UPDATED	AB	-
P02	03/12/2025	JL	UPDATED LAYOUT AND CATCHMENT 10 ADDED	AB	-
P01	26/11/2025	JL	FIRST ISSUE	AB	-

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TITLE: INDICATIVE SITE-WIDE CATCHMENT PLAN SHEET 2 OF 2

SCALE @ A1:	CHECKED:		APPROVED:
1:2000	AB		-
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Ministry of Defence

ES Appendix 12.4: Preliminary Water Framework Directive Assessment

Contents

Water Framework Directive Assessment

1. Introduction

Purpose of the Report

1.1. This compliance assessment has been prepared for the DARC – Cawdor Barracks scheme (referred to as the proposed development), as required by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD Regulations). Compliance with the provisions of the legislation needs to be taken into account in the planning of all new activities in the water environment.

1.2. The WFD Regulations require that all natural water bodies achieve both good chemical status and good ecological status. This is undertaken through the implementation of a River Basin Management Plan (RBMP) which outlines the actions required to enable natural water bodies to achieve this. Those water bodies designated in the RBMP as Heavily Modified Water Bodies (HMWB) or Artificial Water Bodies (AWB) may be prevented from reaching good ecological status by the physical modifications for which they are designated or purpose for which they were constructed (e.g. navigation, flood defence, urbanisation). In this case, the requirement to achieve good ecological potential is through the implementation of a series of mitigation measures outlined in the applicable RBMP.

1.3. The WFD objectives are to:

- Prevent deterioration in the status of all surface and groundwater bodies;
- Achieve “good status” for all water bodies;
- Good ecological status: based on biological, hydromorphological, and physicochemical elements;
- Good chemical status: meeting Environmental Quality Standards (EQS) for priority substances;
- Protect and enhance aquatic ecosystems, including wetlands directly dependent on water bodies;
- Promote sustainable water use based on long-term protection of available resources;
- Reduce pollution from priority substances and other pollutants;
- Prevent and/or limit pollution inputs into groundwater;
- Mitigate the effects of floods and droughts; and
- Achieve good ecological potential for artificial or heavily modified water bodies (HMWBs).

1.4. The following assessment identifies the likely impacts arising from the proposed development in relation to the objectives of the WFD Regulations 2017.

2. Methodology

Introduction

2.1. As part of a flood risk management/coastal defence authority’s activities there is a requirement to assess the impact of the proposed development on the associated WFD water bodies. The Environment Agency has published guidance on how to assess the

impact of activities in transitional and coastal waters for the WFD, referred to as 'Clearing the Waters for All' (Environment Agency 2017, updated 2023). The guidance sets out the following three discrete stages to WFD assessments, which have been followed for the proposed development:

- Screening: excludes any activities that do not need to go through the scoping or impact assessment stages;
- Scoping: identifies the receptors that are potentially at risk from an activity (which is requiring assessment, and need consideration) and the need for impact assessment to the receptor; and
- Impact Assessment: considers the potential impacts of an activity, identifies ways to avoid or minimise impacts, and indicates if an activity may cause deterioration or jeopardise the water body achieving Good Ecological Status or Potential (GES or GEP). Assessment is based on the risk of the activity to the quality element and receptor (and at water body scale). The assessment is based on no mitigation embedded.

2.2. The study area used for Clearing the Waters for all assessments is based on a 2km buffer around the proposed development as shown on Figure 2-1.

Data

2.3. Information to assist defining the existing baseline conditions has been obtained from the following sources:

- DEFRA Magic Map;
- Natural Resources Wales Flood and Coastal Erosion Risk Maps; and
- WFD data map Wales.

3. Application Background

3.1. The proposed development sits within the Cawdor Barracks site. Cawdor Barracks is presently used as a working military base and is the site of the former airfield Royal Air Force (RAF) Brawdy. The airfield comprises three redundant runways and associated infrastructure. The airfield is now used by the army for training. The entire Cawdor Barracks site is owned by the Ministry of Defence (MOD) and managed by Defence Infrastructure Organisation (DIO). It is located within the jurisdiction of Pembrokeshire County Council (PCC). The Cawdor Barracks site measures approximately 300ha and is centred at OS Grid Reference SM 85206 25339. A full description can be found in Chapter 3: the proposed development of the ES.

3.2. The majority of operational barracks buildings, including a series of accommodation blocks, mess halls, married quarters, storage areas and other support buildings, are concentrated within a secured compound surrounded by an existing security fence, located to the southwest of the Cawdor Barracks site. The rest of Cawdor Barracks site includes an airfield comprising three redundant runways and associated infrastructure including dispersals, where the majority of the application site is located.

3.3. The Cawdor Barracks site is located within a rural area on St David's peninsula in Pembrokeshire, South Wales. The Cawdor Barracks site is approximately 1.2 kilometres (km) northeast of the coast. The Cawdor Barracks site is to the north of the A487 between Haverfordwest and St David's. The nearest settlements are the hamlets of Penycwm to the immediate south, Landeloy to the north and the villages of Solva (4.5 km to the southwest) and Newgale (2 km to the south).

3.4. Potable water enters the site at three metered points from the Dwr Cymru Welsh Water Potable water main. There is no potable water treatment or storage on site. There are three

Emergency Water Storage (EWS) Tanks situated on the barracks which are used for firefighting purposes.

3.5. Foul sewerage drains to the sewage treatment works adjacent to the barracks. There is a single sewage pumping station which lifts sewage to the foul sewerage system from areas which would not drain freely. Cawdor Barracks has a sewage treatment works which also treats the sewage from the adjacent Brawdy Business Park. The STW is a Condor Clereflow and Ammonia Removal plant. Surface water passes by gravity through a surface water drainage system which incorporates oil water interceptors situated around the barracks. Surface water is discharged to either soak away or local watercourse.

Proposals

3.6. DARC's primary missions are providing Space Domain Awareness (SDA) of satellites with geosynchronous orbits and launch surveillance. The proposed development will include construction and operation of the DARC facility and associated ancillary infrastructure. The potential developed footprint associated with the proposed development will encompass a smaller area within the wider Cawdor Barracks site, with the small areas of proposed infrastructure dispersed over an area of approximately 51 ha. The proposed development will comprise the following key elements which are described further in ES Chapter 3: The Proposed Development:

- Receiver (Rx) Array area;
- Transmit (Tx) Array area;
- Operations (Ops) area;
- Ancillary Infrastructure; and
- Temporary dish assembly building.

Drainage

3.6.1. The drainage strategy is described in Appendix 12.3 (and also in Chapter 12, section 12.5) and proposes the continued use of the current drainage plan along the existing runways. French drains, which will be lined, and gully systems along areas of new hardstanding are proposed to feed into the existing system. Runoff resulting from the increase in impermeable area will be restricted to greenfield rates (Qbar). These drainage features have been designed to hold a 1% (1 in 100) AEP event plus a 40% increase in rainfall intensity allowance for climate change. Attenuation basins / swales are located in areas to store and attenuate runoff and prevent an increase in existing flood risk from the surface water drainage network for the lifetime of the development (see Appendix 12.4).

3.7. Further details on key components are described in 'Chapter 3: the proposed development of the Environmental Statement (ES)'.

4. Assessment

Screening of Activities

4.1. This section presents the screening exercise of construction and operational activities to determine if they need to be considered further as part of an impact assessment. Those that do not require further assessment to be screened out. A scoping assessment is not required if the activity is classed as low risk; the following activities can be excluded according to the Clearing the Waters for All guidance:

- maintaining pumps at pumping stations;

- removing blockages or obstacles like litter or debris within 10m of an existing structure to maintain flow;
- replacing or removing existing pipes, cables or services crossing over a water body – but not including any new structure or supports, or new bed or bank reinforcement; and
- 'over water' replacement or repairs to, for example bridge, pier and jetty surfaces – if you minimise bank or bed disturbance.

4.2. Those activities to be screened in include those included in Table 4-1.

Table 4-1: Screening of activity

Activity Details	Description
Name of activity	; DARC – Cawdor Barracks
Brief description of activity	The proposed development will include construction and operation of the DARC facility and associated ancillary infrastructure. This will include the installation of ARRAY-SYSTEM-program Receive (Rx) and Transmit (Tx) antenna arrays, which will be supported by the Operation Area.
Footprint of activity (ha)	Proposed infrastructure dispersed within the application site which is 189 ha.
Timings of activity	Construction is due to commence in April 2027 and is anticipated to take approximately 21 months to complete followed by demobilisation (which is not required to be covered in assessment) (See section 3.6 in Chapter 3).
Extent of activity	Construction: Local traffic volumes are expected to increase during the construction phase. Demolition and construction of the proposed development. Operational phase: There will potentially be a minor increase in the volume of traffic across the site. Potential risk of spillage of chemicals in the water that will be used within the closed loop cooling system of the proposed development.
Use or release of chemicals	Construction phase: There is potential for accidental leakages and spills of chemicals (including fuels, lubricants or other harmful substances) during construction. Construction activities such as the use of machinery and / or demolition as well as stockpiling, washing of plant material, cleaning of areas of hardstanding for example pose a risk to the water environment. Rainfall and associated surface water runoff from the construction site may mobilise sediments (increasing turbidity) and small quantities harmful substances into the water environment. However, there is not expected to be any significant volumes of chemicals or pollutants released during construction, or pathways created between the construction sites and surface water features. Appropriate controls and temporary drainage design will be in place through the Framework Construction Environmental Management Plan (CEMP). Operational phase: There is potential for accidental leakages and spills of chemicals associated with minor increase in road traffic

	(including fuels) during operation. Rainfall and associated surface water runoff during operation may mobilise sediments and small quantities of contaminants into the water environment. However, there is not expected to be any significant volumes of chemicals or pollutants released during operation as an appropriate permanent drainage strategy will be in place which will include sustainable drainage systems (SuDS).

Scoping of Water Bodies

4.3. The proposed development lies within three WFD surface water body catchments and one groundwater (Figure 4-1; Table 4-2 and Table 4-3):

- The Solva – headwaters to tidal limit (ID: GB110061038340) WFD water body catchment covers the central and northern areas of the application site and the study area. It lies within the Cleddau and Pembrokeshire Coastal Rivers Management catchment and the Coastal Streams – Druidston to Fishguard Bay Operational Catchment. During WFD Cycle 3 (interim 2024) it was classified as of good overall status and good ecological status. It is known to contain small stocks of salmon and sea trout.

- The Brandy Brook – headwaters to tidal limit (ID: GB110061021160) WFD water body catchment covers the eastern area of the application site and the study area. It lies within the Cleddau and Pembrokeshire Coastal Rivers Management catchment and the Coastal Streams – Druidston to Fishguard Bay Operational Catchment. It was considered to be of moderate overall status and moderate ecological status during Cycle 3 (interim 2024).

- The Pembrokeshire South (ID: GB611008590003) WFD coastal catchment covers the area of coastline in the southwestern study area. It lies within the Cleddau and Pembrokeshire Coastal Rivers TraC Management catchment and the Pembrokeshire South Operational Catchment. Its overall status and ecological status were considered good during Cycle 3 (interim 2024).

- The study area is underlain by the Cleddau and Pembrokeshire groundwater body (WBID: GB41002G200400) WFD groundwater body as shown in ES Figure 12.3. The Cleddau and Pembrokeshire groundwater body has an overall moderate status. The Cleddau and Pembrokeshire groundwater body covers a significant area (more than 1000km^2) in comparison to the study area. It comprises a number of bedrock aquifer units, varying in productivity and including both Secondary A and Secondary B aquifers. The aquifer units beneath the study area are primarily Secondary B. Superficial deposits are limited, both across the study area and the Cleddau and Pembrokeshire groundwater body.

Table 4-2: Summary of the WFD surface water bodies within the study area

Water Body	**Description**		
WFD water body name	Solva - headwaters to tidal limit	Brandy Brook - headwaters to tidal limit	Pembrokeshire South WFD coastal catchment
Water body ID	GB110061038340	GB110061031160	GB611008590003
River basin district name	Western Wales	Western Wales	Western Wales

Management catchment	Cleddau and Pembrokeshire Coastal Rivers	Cleddau and Pembrokeshire Coastal Rivers	Cleddau and Pembrokeshire Coastal Rivers Transitional and Coastal (TraC)
Operational catchment	Coastal streams - Druidston to Fishguard Bay	Coastal streams - Druidston to Fishguard Bay	Pembrokeshire South
Water body type	River	River	Coastal
Overall water body status (interim 2024)	Good	Moderate	Good
Ecological status (interim 2024)	Good	Moderate	Good
Chemical status (interim 2024)	High	High	High
Higher sensitivity habitats present	North West Pembrokeshire Commons Special Areas of Conservation (SAC).		Ramsey and St David's Peninsula Coast Special Protection Areas (SPA) (UK9014062), St David's Peninsula Coast SSSI, St David's SAC (UK0013045), Pembrokeshire Marine SAC (UK0013116)

Table 4-3: Summary of the WFD groundwater body within the study area

Water Body	**Description**
WFD water body name	Cleddau and Pembrokeshire
Water body ID	GB41002G200400
River basin district name	Western Wales
Management catchment	Cleddau and Pembrokeshire Coastal Rivers GW
Operational catchment	Cleddau and Pembrokeshire
Water body type	Groundwater
Overall water body status (interim 2024)	Poor
Quantitative status (interim 2024)	Good
Chemical status (interim 2024)	Poor

Protected Areas

4.4. The WFD Regulations require that activities associated with the proposed development are in compliance with other relevant legislation, as considered below. The 'Clearing the Waters for All' guidance recommends that all such protected areas are assessed to ensure no deterioration in status as a result of the activity if they fall with the 2km buffer. The following protected areas are within the buffer (Figure 5-1):

- Newgale Beach is a designated bathing water (approximately 2km).
- North West Pembrokeshire Commons Special Areas of Conservation (SAC), St David's SAC (UK0013045), and Pembrokeshire Marine SAC (UK0013116); Milford Haven Inner Waterbody SAC.
- Ramsey and St David's Peninsula Coast Special Protection Areas (SPA) (UK9014062).
- There are no designated shellfish waters.
- Cleddau and Pembrokeshire groundwater body is a drinking water protected area.
- Solva - headwaters to tidal limit (GB110061038340) drinking water protected area (river).
- There are nutrient sensitive areas within 2km of Cawdor Barracks in Pembrokeshire. The Milford Haven Inner Waterbody, which is part of the Pembrokeshire Marine Special Area of Conservation (SAC), has been identified by Natural Resources Wales (NRW) as having features in an unfavourable condition due to nutrient enrichment—specifically Dissolved Inorganic Nitrogen (DIN) and biological indicators like phytoplankton and macroalgae.

5. Scoping Assessment of Receptors

5.1. This section provides a site-specific scoping appraisal of the proposed development against biological, physico-chemical and hydromorphological quality elements for the coastal/transitional water bodies.

5.2. The proposed elements of the proposed development are considered in terms of their impact on the water bodies using the Water Watch Wales data (Tables 4-2 and 4-3, Section 4) and is used as part of the assessment. Mitigation is stated where necessary.

Hydromorphology

5.3. This section provides a summary of the known existing hydromorphology risk issues for each of the 'scoped' in water bodies (Table 5-1).

Table 5-1: Hydromorphology scoping summary

Hydromorphology considerations	Solva - headwaters to tidal limit	Brandy Brook - headwaters to tidal limit	Pembrokeshire South WFD coastal catchment
Consider if your activity could impact on the hydromorphology (for example morphology or tidal patterns) of a	No, the activities of the Proposed Development could not impact on the hydromorphology. That is because there are no water bodies at high status within the study area.		

water body at high status?			
Consider if your activity could significantly impact the hydromorphology of any water body?	The activities could influence hydromorphological conditions, particularly where close to/in sensitive SAC-designated marine sediment areas but there would not be a signficant impact.	The Proposed Scheme would not significantly impact on the hydromorphology of this water body	The proposals could influence hydromorphological conditions, particularly where close to/in sensitive SAC-designated marine sediment areas but there would not be a significant impact.
Consider if your activity is in a water body that is heavily modified for the same use as your activity?	No, there are no water bodies which are designated as HMWB.		

5.4. The following water bodies are included in assessment in this section as they have a hydrological connection to those listed in Table 5-1:

- In the southern section of the study area, Cwm Mawr stream, an ordinary watercourse, originates in the village of Penycwm and flows to the south-west. It flows for around 800m through the Pembrokeshire Coast National Park before discharging to St. Brides Bay at the southern boundary of the study area.
- There are five ordinary watercourses in the eastern part of the study area, which receive surface water runoff from the study area. These flow eastwards to their confluence with the Brandy Brook approximately 1.6 km from the study area, which discharges into St Brides Bay at Newgale.
- In the north and north-eastern areas of the study area, there are six ordinary watercourses, two of which receive water from, and flow along the boundary of the application site. These watercourses flow northwards to join the Llandeloy water body, before joining the River Solva at the northern most extent of the study area. The River Solva flows west, then south to discharge into St Brides Bay at Solva.

Construction Impacts

5.5. There will be construction impacts related to debris, movement of plant etc. Temporary disturbance during construction may affect hydrological pathways and sediment deposition.

5.6. It is anticipated that there will be no disturbance to any water bodies as a result of construction. Any debris, and potential for runoff of debris into water bodies will be controlled by the implementation of on-site controls.

5.7. Construction of above ground structures will either be on antenna foundations or on the existing runways and taxiways. Antennas will be placed on foundations and will be a minimal, if any, impediment to flow. As a result there will be no change to any water body.

- The following mitigation would reduce any construction risks:
- Implementation of Sustainable Drainage Systems (SuDS) to manage flow and sediment.

- Construction phase controls including silt fencing, sediment traps, and timing restrictions.
- Monitoring of discharge points to ensure compliance with flow and quality standards.

Operation Impacts

5.8. No direct channel modification is proposed, reducing the likelihood of morphological impact at the site level, and during operation. For these reasons, hydromorphology can be scoped out of further assessment.

Biology

Habitats

5.9. Higher sensitivity habitats have a low resistance to, and recovery rate from, anthropogenic pressures. Table 5-2 presents a summary of biology (habitat) considerations and associated risk issues.

Table 5-2: Biology scoping summary

Biology (habitats) considerations	Solva - headwaters to tidal limit	Brandy Brook - headwaters to tidal limit	Pembrokeshire South WFD coastal catchment
Is the footprint of the activity 0.5 km^2 or larger?	Yes. Chapter 3 describes the size of the footprint. The development size is 50ha, however, the individual array comprises individual and discrete units which are relatively small. Each antenna (21 No.) has a concrete foundation of 5.5 x 5.5m (635m^2); the area surrounding this will be a 20m radius.		
Is the footprint of the activity 1% or more of the water body's area?	Solva - headwaters to tidal limit = 0.113% of the water body.	Brandy Brook - headwaters to tidal limit – 0.1308%	Pembrokeshire South WFD coastal catchment – N/A. There is no size attributed to the coastal water body.
Is the footprint of the activity within 500m of any higher sensitivity habitat?	No, the footprint of the activity is not within 500m of a higher sensitivity habitat.		
Is the footprint of the activity 1% or more of any lower sensitivity habitat?	No lower sensitive habitats are present and the footprint of the activity is not 1% or more of any lower sensitivty habitat.		

5.10. The area of infrastructure covers a very low percentage of any water body as is demonstrated in Table 5-2. The arrays are discrete areas which are small and, in isolation will not cause an impact. For this reason, and combined with the distance from a designated surface water body, there is unlikely to be an impact because of the footprint.

5.11. As the footprint of the activity is not within 500m of any higher sensitivity habitat, there will be no further assessment needed for construction and/or operation impacts.

5.12. As the footprint of the activity is not within 500m of any lower sensitivity habitat, there will be no further assessment needed.

5.13. Any debris, and potential for runoff of debris into water bodies will be controlled by the implementation of on-site controls.

5.14. It is considered the proposed development would not cause any WFD water body to deteriorate or prevent it from reaching its objective.

Fish

5.15. Activities occurring within an estuary or inshore environment could impact on normal fish behaviour such as movement, migration or spawning. Table 5-3 presents a summary of biology (fish) considerations and associated risk issues with the proposed development.

Table 5-3: Biology (fish) scoping summary

Biology (fish) considerations	**Solva - headwaters to tidal limit**	**Brandy Brook - headwaters to tidal limit**	**Pembrokeshire South WFD coastal catchment**
Consider if your activity is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary?	The proposed works do not take place within an estuary and would not affect fish entering an estuary.		
Consider if your activity could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)?	The proposed works do not take place within the estuary itself and would not affect fish entering an estuary. The works do not occur near watercourses and any pollution risk via flow pathways would be mitigated through the Framework CEMP, which will include best practice measures to limit the risk of pollutants entering surface water features, and the proposed drainage strategy, which includes SuDS.		
Consider if your activity could cause entrainment or impingement of fish?	No. The nature of the proposed development would not impinge fish or cause entrainment. No new permanent or temporary impoundments are proposed.		

5.16. There are no receptors scoped into further assessment. It is considered the proposed development would not cause any water body to deteriorate or prevent it from reaching its objective.

Water Quality

5.17. Consideration should be made regarding whether phytoplankton status and harmful algae could be affected by the Scheme, as well as identifying the potential risks of using, releasing or disturbing chemicals.

5.18. Table 5-4 presents a summary of water quality considerations and associated risk issues of the proposed development for the coastal water body.

Table 5-4: Water quality scoping summary

Water quality considerations	Solva - headwaters to tidal limit	Brandy Brook - headwaters to tidal limit	Pembrokeshire South WFD coastal catchment
Consider if your activity could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)?	Construction is due to commence in April 2027 and is anticipated to take approximately 21 months to complete followed by demobilisation (which is not required to be covered in assessment) (See section 3.6 in Chapter 3). The works do not take place near watercourses and any pollution risk via flow pathways would be mitigated through the Framework CEMP and the proposed drainage strategy, which include SuDS.		
Consider if your activity is in a water body with a phytoplankton status of moderate, poor or bad?	Solva - headwaters to tidal limit water body is not monitored for phytoplankton.	Brandy Brook - headwaters to tidal limit water body is identified as moderate.	Pembrokeshire South WFD coastal catchment water body is identified as high.
Consider if your activity is in a water body with a history of harmful algae?	The water bodies are not monitored for potential harmful algae. No record is available.		
Construction works may disturb and mobilise contamination for accidental spillage or pollution incidents which may be washed by rainfall into the water body via flow pathways.	Construction works may disturb and mobilise contamination for accidental spillage or pollution incidents which may be washed by rainfall into the water body via flow pathways. Potential increased risk of spillage and road runoff during construction and operation could occur. During construction, there is also the potential for pollution of surface water features due to accidental spillage or leakage of fuel and oils, or due to placement of construction materials, washing of plant, cleaning areas of hardstanding etc. Zinc and copper may enter the water environment from routine road runoff, although there will be very low levels of vehicle movements. The works do not take place near watercourses and any pollution risk via flow pathways or outfalls would be mitigated through the Framework CEMP and the proposed drainage strategy, which include SuDS.		
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if it disturbs sediment with contaminants above Cefas Action Level 1?	No specific sources of construction work likely to release chemicals which are above the Cefas Action Level 1. CEMP will be in place prior to construction to limit and mitigate for such impacts. The works do not take place near watercourses and any pollution risk via flow pathways or outfalls would be mitigated through the Framework CEMP and the proposed drainage strategy, which include SuDS. In addition to this, the Framework CEMP will control contaminated land disruption etc. and will also protect against mobilisation of sediment from contaminated sources, as detailed in Chapter 11.		

If your activity has a mixing zone (like a discharge pipeline or outfall) consider if the chemicals released are on the Environmental Quality Standards Directive (EQSD) list?	No. The proposed development has no associated discharge with a mixing zone. Yes, chemicals that are used in relation to the operation of the proposed development and potentially zinc and copper from routine road runoff, although there will be very low levels of vehicle movements, which are on the EQSD list. However, these would only enter the water environment should there be a spillage or via routine run off. Any pollution risk via flow pathways or outfalls would be mitigated through the Framework CEMP and the proposed drainage strategy, which include SuDS.

5.19. The construction of the proposed development could lead to water quality impacts related to increased spillage. The proposed development is not located adjacent to the scoped in water bodies, and it is anticipated the impacts on them will be negligible. However, as the proposed development is hydraulically connected to these water bodies via surface water flow pathways, mitigation will be included to minimise the impacts from spillage or leakage.

5.20. During construction, there is the potential for pollution of surface water features due to accidental spillage or leakage of fuel and oils, or due to placement of construction materials, washing of plant, cleaning areas of hardstanding etc. However, the works do not take place near watercourses and any pollution risk via flow pathways or discharged via outfalls would be mitigated through the Framework CEMP and the proposed drainage strategy, which include SuDS.

5.21. Mitigation will include best practice measures to limit the risk of pollutants entering surface water features. This should include an appropriate treatment train to prevent accidental spillages reaching water features, remove sediment and other contaminants as well as attenuating runoff. Water quality monitoring should also be undertaken during construction.

5.22. Given that the proposed construction period exceeds 14 days, water quality would normally be scoped into further assessment. However, given the linkages to the receptors and the inclusion of the Framework CEMP, this can be scoped out. Due to the above, the risk associated with potential contaminants due to construction works or accidental spillage is considered negligible. It is considered the proposed development would not cause the WFD water body to deteriorate or prevent it from reaching its objective.

Operation

5.23. Surface water features that could be affected by accidental spillages include the River Solva, Pembrokeshire coastal catchment, Brandy Brook catchment and ordinary watercourses. However, with the inclusion of SuDS and the utilisation of the existing drainage system, as described in section 12.4 and the drainage strategy (ES Appendix 12.4), this risk would be mitigated.

5.24. The temporary surface water drainage strategy should implement SuDS principles, where appropriate, to attenuate runoff to existing rates as well as provide water treatment.

5.25. There are areas of new hardstanding proposed, and these areas will increase the drainage area and therefore the increase in potential pollutant loads. This could result in a long-term increase in diffuse pollution, with the potential to adversely impact upon water quality, including the River Solva, Pembrokeshire coastal catchment and ordinary watercourses. However, with the inclusion of SuDS and the utilisation of the existing drainage system, as described in section 12.4 and the drainage strategy (ES Appendix 12.3), this risk would be mitigated.

5.26. Further assessment of the impacts as a result of increased flood risk have been laid out in the FCA (ES Appendix 12.2) and the drainage strategy (ES Appendix 12.3). As part of the drainage strategy, attenuation basins / swales are located in areas to hold runoff and alleviate surface water flood risk. The increase in impermeable area will be restricted to

greenfield runoff rates and the attenuation basins have been designed to hold a 1 in 100 year plus 40% climate change event.

5.27. The proposed drainage works associated with the DARC development at Cawdor Barracks have the potential to influence water quality within the Milford Haven Inner transitional water body. This water body is currently classified as having moderate ecological status, with known pressures from nutrient enrichment and sediment inputs. The site lies within the catchment of the Pembrokeshire Marine SAC, which includes sensitive marine sediment habitats and is subject to nutrient neutrality requirements. Potential water quality impacts may arise from increased surface runoff, sediment mobilisation during construction, and the introduction of pollutants such as hydrocarbons or nutrients from disturbed soils. While no direct discharge to watercourses is proposed, hydrological connectivity to downstream receptors necessitates careful management. Mitigation measures, including SuDS, sediment control, and pollution prevention protocols, will be implemented to ensure no deterioration in water body status and to protect designated habitats and species.

5.28. The impacts to the River Solva, Pembrokeshire South Coastal Catchment, and the Brandy Brook Catchment would be negligible. Overall, it is considered the proposed development would not cause any water body to deteriorate or prevent it from reaching its objective.

Protected Areas

5.29. Consideration should be made regarding whether WFD protected areas are at risk from a proposed activity. Table 5-5 presents a summary of protected area considerations and associated risk issues of the works.

Table 5-5: Protected areas scoping summary

Protected Areas considerations	Protected Areas
Consider if your activity is within 2 km of any WFD protected area?	The following 'screened in' protected areas occur within 2km: Milford Haven Inner Waterbody SAC Newgale Beach is a designated bathing water (approximately 2km). North West Pembrokeshire Commons SAC, St David's SAC (UK0013045), and Pembrokeshire Marine SAC (UK0013116). Ramsey and St David's Peninsula Coast Special Protection Areas (SPA) (UK9014062). Cleddau and Pembrokeshire groundwater body is a drinking water protected area. Solva - headwaters to tidal limit (GB110061038340) drinking water protected area (river) There are nutrient sensitive areas within 2km of Cawdor Barracks in Pembrokeshire. The Milford Haven Inner Waterbody, which is part of the Pembrokeshire Marine Special Area of Conservation (SAC), has been identified by Natural Resources Wales (NRW) as having features in an unfavourable condition due to nutrient enrichment—specifically Dissolved Inorganic Nitrogen (DIN) and biological indicators like phytoplankton and macroalgae. This area is subject to nutrient neutrality requirements, meaning any development generating wastewater must demonstrate that it will not increase nutrient levels.

5.30. Bathing water quality is determined by the presence and levels of two types of bacteria, Intestinal Enterococci (IE) and Escherichia coli (EC). The Scheme would not discharge

material containing these bacteria nor would they impact on existing levels. Therefore, no risks to bathing water quality for the listed sites are anticipated as a result of the Scheme.

5.31. The Milford Haven Inner Waterbody, which is part of the Pembrokeshire Marine Special Area of Conservation (SAC), has been identified by Natural Resources Wales (NRW) as having features in an unfavourable condition due to nutrient enrichment—specifically Dissolved Inorganic Nitrogen (DIN) and biological indicators like phytoplankton and macroalgae. This area is subject to nutrient neutrality requirements, meaning any development generating wastewater must demonstrate that it will not increase nutrient levels. There is no wastewater strategy associated with this proposed development.

5.32. The proposed drainage works associated with the DARC development at Cawdor Barracks have the potential to influence water quality within the Milford Haven Inner transitional water body. This water body is currently classified as having moderate ecological status, with known pressures from nutrient enrichment and sediment inputs. The site lies within the catchment of the Pembrokeshire Marine SAC, which includes sensitive marine sediment habitats and is subject to nutrient neutrality requirements. While no direct discharge to watercourses is proposed, hydrological connectivity to downstream receptors necessitates careful management. Mitigation measures, including Sustainable Drainage Systems (SuDS), sediment control, and pollution prevention protocols, will be implemented.

5.33. However, note there are no works over or next to any watercourses and any pollution risk via flow pathways would be mitigated through the Framework CEMP and the proposed drainage strategy, which include SuDS (including lined filter drains). Given the limited impacts, duration of the construction works and distance from the water body, no changes to any protected areas are anticipated. Protected areas are therefore scoped out of further assessment.

Invasive and Non-Native Species

5.34. Consideration should be made regarding whether there is a risk the activity could introduce or spread Invasive Non-Native Species (INNS). Risks of introducing or spreading INNS include materials or equipment that have come from, had use in or travelled through other water bodies, as well as activities that help spread existing INNS, either within the immediate water body or other water bodies. Table 4-6 presents a summary of marine INNS considerations and associated risk issues of the works.

5.35. Potential risks include:

- Spread during construction via soil movement or water runoff;
- Disturbance of existing INNS populations, increasing their range; and
- Indirect impacts on sensitive habitats through hydrological connectivity.

5.36. *Cotoneaster horizontalis* are present within the works area (see ES Figure 8.4).

5.37. The chance of machinery, plant and vessels introducing and spreading INNS will be negated through biosecurity measures outlined in the CEMP (to include ensuring cleaning and drying of equipment and machinery before delivery to the site).

5.38. While no INNS have been confirmed on-site at Cawdor Barracks, the potential for their presence or spread during drainage works associated with the DARC development warrants precautionary measures. Construction activities, soil movement, and water runoff could facilitate the dispersal of INNS if biosecurity protocols are not followed. A pre-construction ecological survey will be undertaken to identify any INNS, and appropriate control and containment measures will be implemented in line with Natural Resources Wales guidance. This will ensure compliance with environmental legislation and prevent deterioration in ecological status of nearby water bodies and protected habitats.

5.39. The Framework CEMP will detail good practice measures required to prevent the spread of INNS (see ES Chapter 8: Biodiversity). Due to this it is considered the proposed

development would not affect invasive non-native species. For the reasons outlined above, this receptor has therefore been scoped out of impact assessment.

Groundwater

5.40. The impact assessment considers the risks to the Cleddau and Pembrokeshire groundwater body as a reasonable worst-case approach. Table 5-6 indicates that the construction and operation of the proposed development will not cause deterioration in the status of Cleddau and Pembrokeshire groundwater body, nor will it impact upon the ability of the water bodies to achieve its objectives and standards under the WFD.

Table 5-6: Summary of groundwater WFD Cleddau and Pembrokeshire waterbody assessment

WFD element	WFD sub-element	Impact on status or ability to meet target
Quantitative	Quantitative saline intrusion	Application site does not encroach on areas of saline water. Due to the size of the application site, limited groundwater and mitigation, construction activities and site operation will not impact on the quantitative saline intrusion.
	Quantitative water balance	No construction related impacts due to best practice mitigation outlined in construction method statements, risk assessments and the Framework CEMP, and obtaining all relevant licences and permits. Negligible operational impacts due to mitigation to be included in Scheme design (i.e. the SuDS treatment train). Therefore, no impact to quantitative water balance test.
	Quantitative GWDTEs test	No designated GWDTEs identified. Therefore, there is no impact on the quantitative GWDTE test.
	Quantitative dependent surface water body status	No construction related impacts due to best practice mitigation outlined in construction method statements, risk assessments and the Framework CEMP, and obtaining all relevant licences and permits. Negligible operational impacts due to mitigation included in Scheme design. Subsequently no impact to quantitative dependent surface water body status.
Chemical	Chemical drinking water protected area	No construction related impacts due to best practice mitigation outlined in construction method statements, risk assessments and the Framework CEMP, and obtaining all relevant licences and permits. Negligible operational impact due to mitigation included in Scheme design. Subsequently no impact to chemical drinking water protected area.
	General chemical test	No construction related impacts due to best practice mitigation outlined in construction

		method statements, risk assessments and the Framework CEMP, and obtaining all relevant licences and permits. Negligible operational impacts due to mitigation included in Scheme design. Subsequently no impact to general chemical test.
	Chemical GWDTEs test	No designated GWDTEs identified. Therefore, there is no impact on the chemical GWDTE test.
	Chemical dependent surface water body status	No construction related impacts due to best practice mitigation outlined in construction method statements, risk assessments and the Framework CEMP, and obtaining all relevant licences and permits. Negligible operational impacts due to mitigation included in Scheme design. Subsequently no impact to quantitative dependent surface water body status.
	Chemical saline intrusion	No construction related impacts due to best practice mitigation outlined in construction method statements, risk assessments and the Framework CEMP, and obtaining all relevant licences and permits. Negligible operational impacts due to mitigation included in Scheme design. Subsequently no impact to quantitative dependent surface water body status.
	Chemical dependent surface water body status	No construction related impacts due to best practice mitigation outlined in construction method statements, risk assessments and the Framework CEMP, and obtaining all relevant licences and permits. Negligible operational impacts due to mitigation included in Scheme design. Subsequently no impact to quantitative dependent surface water body status.
	Chemical GWDTEs test	No designated GWDTEs identified. Therefore, there is no impact on the chemical GWDTE test.

5.41. Temporary dewatering may be required for the Rx and Tx structures, where foundation excavation depths may intercept groundwater (see ES Appendix 12.2) with the potential to impact the Cleddau and Pembrokeshire water body. This could be through altering groundwater levels at nearby receptors, and flow pathways, reducing recharge volumes and deterioration of groundwater quality through sediment disturbance. Downgradient springs may be impacted from dewatering activities. This would be managed by dewatering assessments, which would be required to identify likely inflows into any excavation and to inform licensing and permitting requirements. This will be controlled through the Framework CEMP.

5.42. Construction activities, including the mobilisation of existing ground contamination, demobilisation of site compounds and excavations increase the risk of a pollution incident from accidental spillages or leakages of fuels, oils, chemicals, wastewater, concrete or

cement admixtures used during the construction phase. Such accidental spillages may potentially impact the Cleaddau and Pembrokeshire WFD groundwater body and associated superficial deposits and indirect groundwater receptors such as springs and streams in the surrounding area by detrimentally impacting groundwater quality. However, potential impacts on groundwater quality relating to accidental spillages, leakages and runoff would be managed thorough the implementation of the Framework CEMP. With the above controls and management in place, the magnitude of impact is negligible. Overall, it is considered the proposed development would not cause any water body to deteriorate or prevent it from reaching its objective.

Sub-surface Construction

5.43. Sub-surface construction activities, including excavations, have the potential to adversely impact the groundwater bodies and indirect groundwater receptors which are reliant on groundwater supply, in terms of both groundwater levels and flows. Example construction activities include foundation emplacement and drainage network diversions. This is of particular relevance for the western antennas of the proposed Rx Array.

5.44. Construction of sub-surface structures may also detrimentally impact the groundwater quality within the proposed development. Excavations and piling may potentially create contaminant flow pathways between the open excavation to the underlain groundwater, resulting in groundwater contamination due to accidental spillages or leakages. However, subsurface structures and excavation should be appropriately designed to minimise any disruption to groundwater flows and resultant alteration to hydraulic properties within the study area during construction. This will be set out in construction method statements, risk assessments and the Framework CEMP. Construction materials should be appropriately selected to minimise any groundwater contamination via direct contact. This should include the use of appropriately selected fill materials for working within saturated ground, enabling the groundwater to dissipate effectively. This will be set out in construction method statements, risk assessments and the Framework CEMP.

Obstruction of Flow

5.45. Sections of infill and the presence of subsurface structures such as foundations and drainage structures (carrier drains), which extend below the natural groundwater level, may potentially impede or divert groundwater flow and result in groundwater mounding on the upgradient face of the structure, whilst reducing localised groundwater levels on the down-gradient face. At the maximum proposed depth of 2.175m below ground level, these sub-surface structures will not extend more than a metre below the natural groundwater level, resulting in minimal impacts only.

Spillages

5.46. There is a risk from contaminated surface water runoff from accidental spillage or pollution incidents infiltrating to ground and polluting the receiving groundwater body and subsequent indirect receptors. With the inclusion of SuDS and the utilisation of the existing drainage system, as described in Section 12.4 and the drainage strategy (ES Appendix 12.3), this risk would be mitigated. In particular all drainage ponds and French drains will be lined to avoid infiltration to ground.

Summary

5.47. The site-specific impacts of the scheme on the biological, physico-chemical and hydromorphological quality elements of the water bodies are shown in the assessment above and summarised in Table 5-7.

Table 5-7: Scoping summary

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	No	There are no waterbodies with high status or heavily modified within the study area. There are no works within, over or next to a watercourse. Mitigation will be implemented through the Framework CEMP and the proposed drainage strategy. Due to this it is considered the proposed development would not affect hydromorphology.
Biology: habitats	No	The proposed development is for small areas of infrastructure. Chapter 3 describes the size of the footprint. The development size is 50ha, however, the individual array comprises individual and discrete units which are relatively small. Each antenna (21 No.) has a concrete foundation of 5.5 x 5.5m (635m^2); the area surrounding this will be a 20m radius. The % of water body is small, and calculated in Table 5.2. Because of the location of the proposed development, and the lack of interaction with the footprint of the lower and higher sensitivity habitats, this can be scoped out. Mitigation will be implemented through the Framework CEMP and the proposed drainage strategy. Water quality monitoring should also be undertaken during construction.
Biology: fish	No	The proposed works do not take place within an estuary and would not affect fish entering an estuary, no new permanent or temporary impoundments are proposed. The works do not take place near watercourses and any pollution risk via flow pathways would be mitigated through the Framework CEMP and the proposed drainage strategy.
Water quality	No	Potential increased risk of spillage and road runoff during construction and operation. During construction, there is also the potential for pollution of surface water features due to accidental spillage or leakage of fuel and oils, or due to placement of construction materials, washing of plant, cleaning areas of hardstanding etc. However, the works do not take place near watercourses and any pollution risk via flow pathways or discharged via outfalls would be mitigated through the Framework CEMP and

		the proposed drainage strategy. Water quality monitoring should also be undertaken during construction.
Protected areas	No	Milford Haven Inner Waterbody SAC Newgale Beach is a designated bathing water (approximately 2km). North West Pembrokeshire Commons Special Areas of Conservation (SAC), St David's SAC (UK0013045), and Pembrokeshire Marine SAC (UK0013116). Ramsey and St David's Peninsula Coast Special Protection Areas (SPA) (UK9014062). Cleddau and Pembrokeshire groundwater body is a drinking water protected area. Solva - headwaters to tidal limit (GB110061038340) drinking water protected area (river). The Milford Haven Inner Waterbody, which is part of the Pembrokeshire Marine Special Area of Conservation (SAC), has been identified as having features in an unfavourable condition due to nutrient enrichment and subject to nutrient neutrality requirements, meaning any development generating wastewater must demonstrate that it will not increase nutrient levels. There are no works over or next to any watercourses and any pollution risk via flow pathways would be mitigated through the Framework CEMP and the proposed drainage strategy. Water quality monitoring should also be undertaken during construction.
Invasive non-native species	No	Cotoneaster horizontalis are present within the works area. The Framework CEMP will detail good practice measures required to prevent the spread of INNS (see ES Chapter 8: Biodiversity).
Groundwater	No	Temporary dewatering may be required for construction for a number of antennas, which has the potential to impact groundwater by altering groundwater levels at nearby receptors, altering of groundwater flow pathways, reducing recharge volumes and deterioration of groundwater quality through disturbance of sediment. There is the risk for reduced groundwater infiltration and recharge due to increased hardstanding/impermeable surfaces within the proposed development. This reduction in infiltration and groundwater recharge may affect both the available recharge volume and

		the groundwater flow pathways, reducing baseflow to groundwater receptors. The increase in hardstanding is minimal across the application site.

6. Compliance Conclusions

6.1. The purpose of this preliminary compliance assessment report is to establish the nature and magnitude of the effects of any components of the proposed development which are anticipated to impact WFD classification elements of the water bodies.

6.2. The proposed drainage works associated with the DARC development at Cawdor Barracks have been assessed under the Water Framework Directive (WFD) to determine potential impacts on water body status and protected areas. The proposed development has assessed the potential impacts to the Solva - headwaters to tidal limit WFD water body (GB110061038340), Brandy Brook - headwaters to tidal limit WFD water body (GB110061031160) and Pembrokeshire South WFD coastal catchment (GB611008590003) which surrounds the proposed development. The potential impacts to the Cleddau and Pembrokeshire groundwater body have also been identified.

6.3. Contaminants from runoff or accidental spillage represented the largest potential for degradation of the receptors during operation and construction. Any pollution risk would be mitigated through the Framework CEMP which will include best practice measures to limit the risk of pollutants entering surface water features. The drainage strategy has been designed to incorporate lined french drains, swales and attenuation basins, which will mitigate any water quality or sedimentation issues.

6.4. The potential spread of INNS during construction would be mitigated and outlined in the Framework CEMP to cover safe removal and disposal.

6.5. The proposed works are not expected to cause deterioration to WFD status, nor prevent the achievement of WFD objectives on the basis that mitigation and monitoring measures are fully implemented. The compliance assessment concludes that the works are compliant with the WFD and the Scheme can be said to satisfy the following at the water body level (Table 6-1).

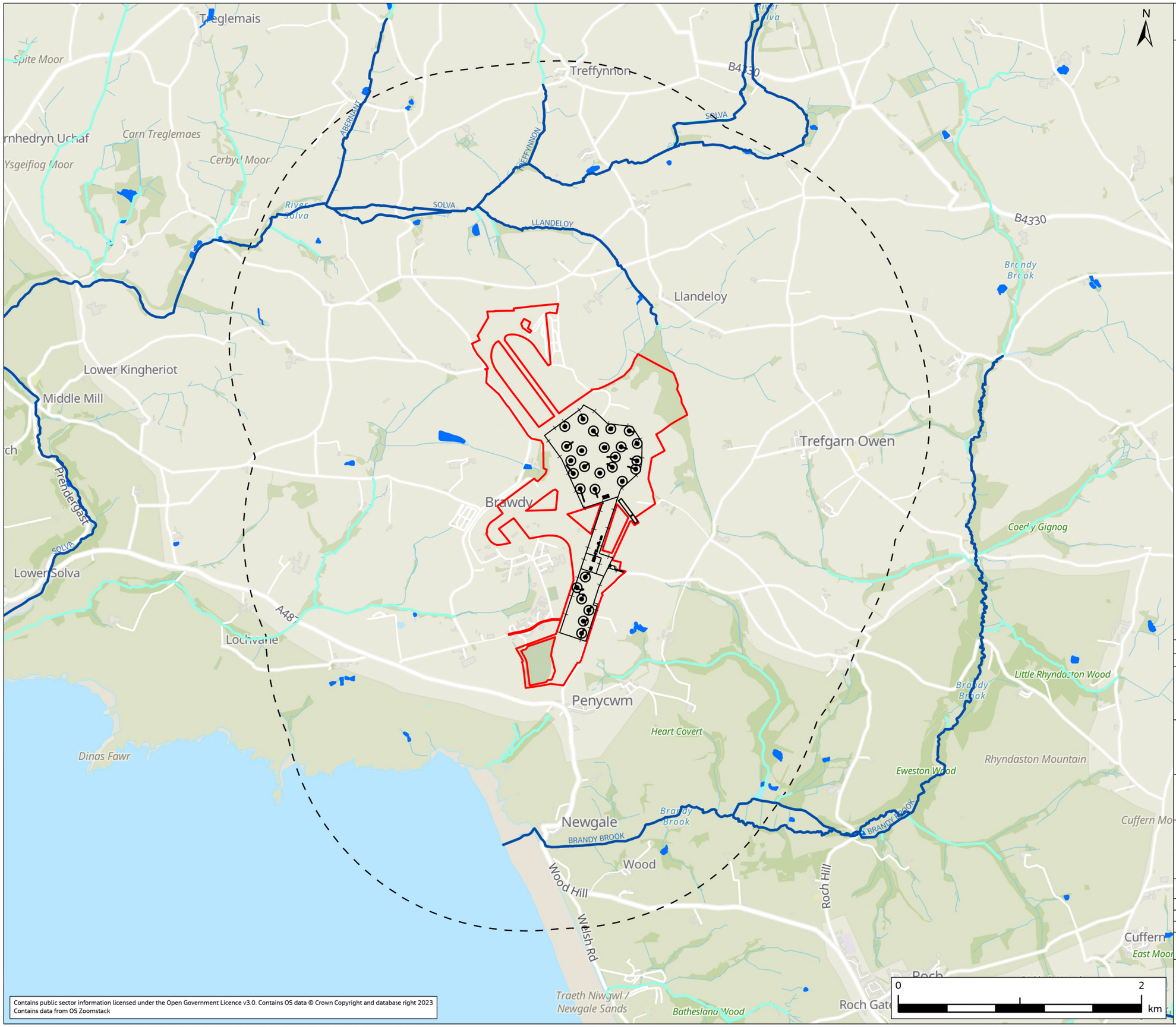
Table 6-1: Proposed development compliance with the environmental objectives of the WFD Regulations

Objective	Details of compliance of the proposed development	Compliance with WFD Objectives
Prevent deterioration in the status of all surface and groundwater bodies.	Maintain current ecological and chemical status of the water body. Drainage works must not introduce pollutants or alter flow regimes that could degrade status.	Yes
Achieve good ecological status or potential	The current status will be maintained; there will be no activity which would either improve or deteriorate water body status, or prevent the acheievement of good ecological status or potential.	Yes
Achieve good chemical status	Meet Environmental Quality Standards (EQS) for priority substances. Prevent	Yes

	discharge of hydrocarbons, nutrients, or construction-related chemicals.	
Reduce pollution from priority substances and other pollutants, and prevent and/or limit pollution inputs into groundwater.	Prevent priority substances and other pollutants from entering water bodies. Implement mitigation appropriate to contaminant in order to contain pollution risk.	Yes
Protect designated areas, enhance them and support protected areas in achieving compliance with any standards and objectives	Site lies within catchment of Pembrokeshire Marine SAC and near Newgale bathing water.	Yes
Promote and Support sustainable water use, and mitigate the effects of floods and drought	Promote long-term protection of water resources. Incorporate SuDS and water-efficient design in drainage strategy.	Yes

7. Figures

APPENDIX FIGURE 2.1



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Legend

- Application Site
- 2km Application Site buffer
- Scheme layout
- Main river
- Ordinary watercourse
- Ponds

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P01	FEB 26	Draft for Pre-Application Consultation	CS	RW	RW	KW

Jacobs

Client: Ministry of Defence

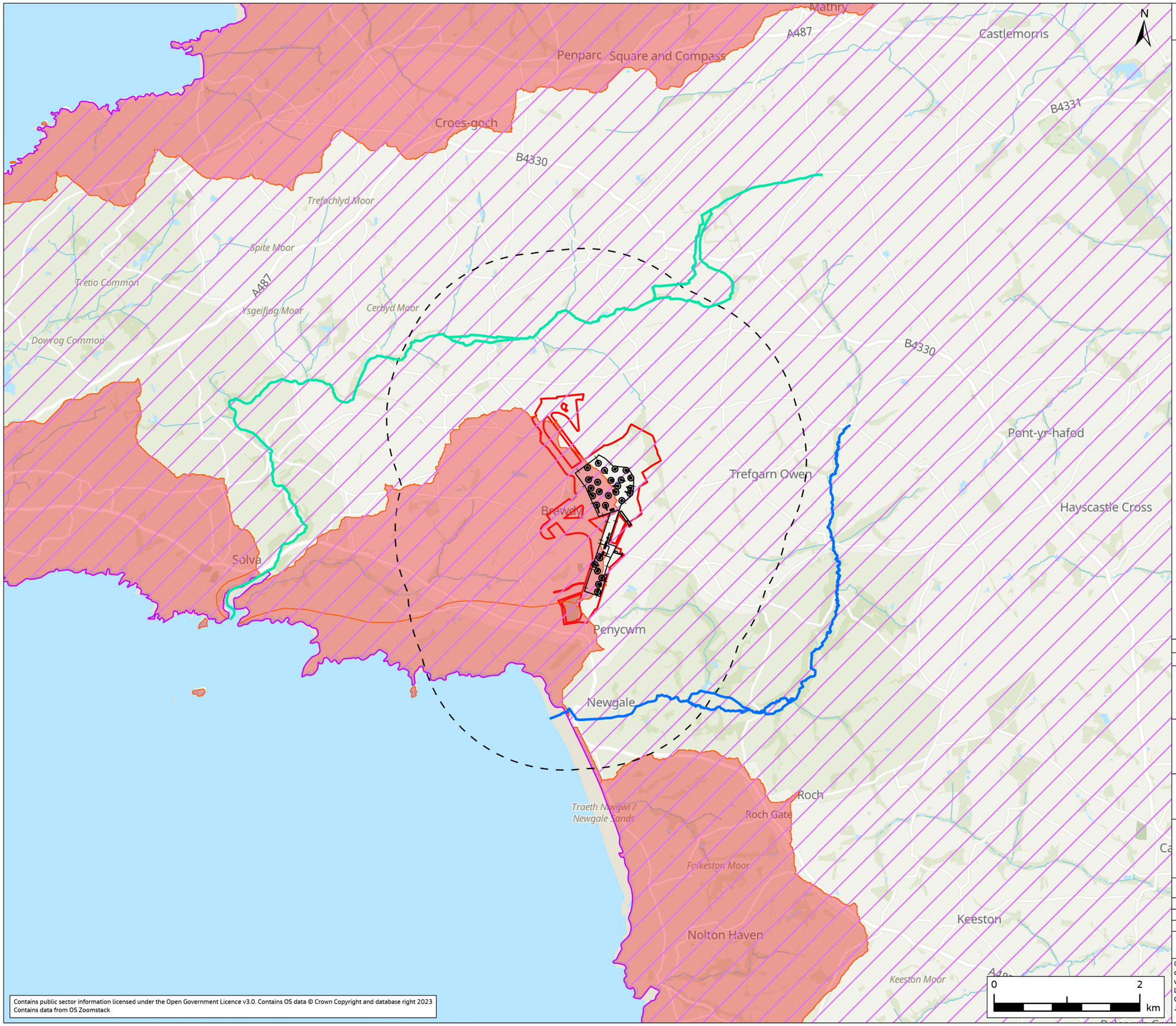
Project: Project DARC - Cawdor Barracks

Drawing Title: WFD Study Area

Drawing Status: INITIAL ISSUE

Scale @ A3	1:30,000	DO NOT SCALE
Jacobs No.	B5007000	
Client No.		
Drawing No.		

APPENDIX FIGURE 4.1



Legend

- Application Site
- 2km Application Site buffer
- Scheme layout
- Brandy Brook - Headwater to Tidal Limit
- Solva - Headwaters to Tidal Limit
- Cleddau and Pembrokeshire WFD - Coastal River Catchments
- Cleddau and Pembrokeshire WFD - Groundwater Bodies

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P01	FEB 26	Draft for Pre-Application Consultation	CS	RW	RW	KW

Jacobs

Client: Ministry of Defence

Project: Project DARC - Cawdor Barracks

Drawing Title: WFD Water Bodies

Drawing Status: INITIAL ISSUE

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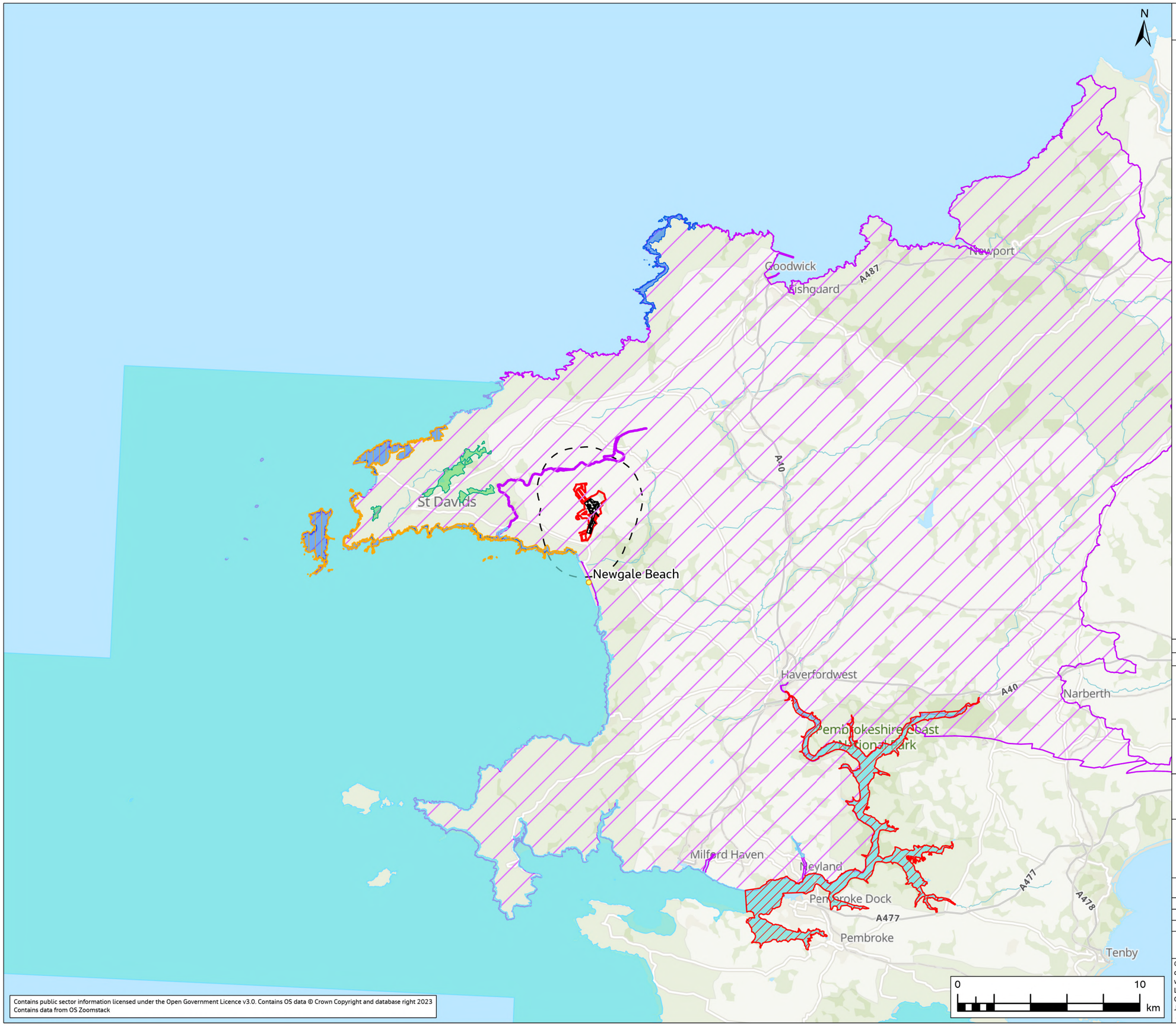
Jacobs No.	B5007000	
Client No.		
Drawing No.		

APPENDIX FIGURE 5.1



Legend

- Application Site
- 2km Application Site Buffer
- Scheme layout
- Milford Haven Inner Water Body Sensitive Area
- Designated Bathing Waters

Drinking Water Protected Areas

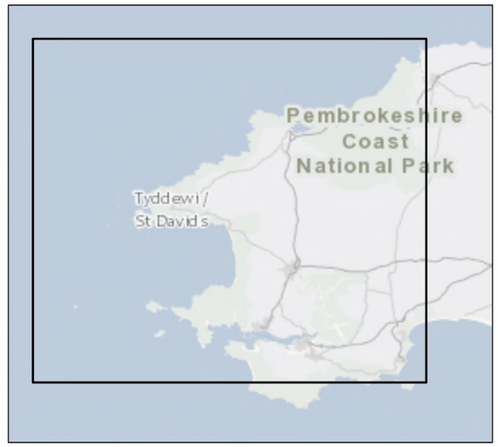
- Cleddau and Pembrokeshire Groundwater Body
- Solva Headwaters to Tidal Limit

Special Protection Areas (SPAs)

- Ramsey and St David's Peninsula Coast

Special Areas of Conservation (SACs)

- North West Pembrokeshire Commons / Comin Gogledd Orllewin Sir Benfro
- Pembrokeshire Marine / Sir Benfro Forol
- St David's / Ty Ddewi



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P01	FEB 26	Draft for Pre-Application Consultation	CS	RW	RW	KW

Jacobs

Client: Ministry of Defence

Project: Project DARC - Cawdor Barracks

Drawing Title: Location of Protected Areas

Drawing Status	INITIAL ISSUE	
Scale @ A3	1:200,000	DO NOT SCALE
Jacobs No.	B5007000	
Client No.		
Drawing No.		