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European Union
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A30 Chiverton to Carland Cross
Environmental Statement

Volume 6 Document Ref 6.4 ES Appendix 13.1 WFD compliance assessment

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Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)
APFP Regulation 5(2)(a)

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13.1 Water Framework Directive Compliance Assessment

Introduction

13.1.1 A comprehensive review of options and extensive analysis of responses to the 2016 public consultation was undertaken and on 3rd July 2017, the preferred route for the A30 Chiverton to Carland Cross improvement scheme was announced. The preferred route provides a new dual carriageway running to the north of the existing A30 between Chiverton and Chybucca and to the south between Chybucca and Carland Cross. The existing A30 will be kept to provide a local route.

13.1.2 The scheme comprises the construction of 14km (8.7 miles) of offline dual carriageway between Chiverton Cross roundabout and Carland Cross junction on the A30. The existing Chiverton Cross and Carland Cross roundabouts are to be replaced with grade separated junctions to provide connections to the local highway network.

13.1.3 The scheme is required as this section of the A30 is the last remaining length of single carriageway between Camborne and the M5 motorway, and regularly experiences congestion and delays.

Purpose

13.1.4 The scheme has the potential to impact upon several surface water bodies and groundwater bodies and therefore an assessment of the compliance of the scheme against the objectives of the Water Framework Directive (WFD) 2000/60/EC is required.

13.1.5 This report summarises the assessment approach, results and additional mitigation requirements with respect to compliance with WFD objectives.

13.1.6 The WFD assessment is based on the baseline condition of the relevant surface water bodies and groundwater bodies, the scheme design and embedded mitigation.

13.1.7 The assessment methodology has been developed in accordance with The Planning Inspectorate guidance for WFD assessment of Nationally Significant Infrastructure Projects[1] (NSIPs).

Scope

13.1.8 The assessment has been undertaken at the water body scale and considers all WFD designated surface water and groundwater bodies potentially affected by the scheme.

13.1.9 All waterbodies crossed by the scheme are included and waterbodies hydrologically connected (i.e. downstream) are also included up to a point where

[1] The Planning Inspectorate, Advice Note Eighteen: The Water Framework Directive. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/06/advice_note_18.pdf

potential impacts are considered extremely unlikely. All quality elements for each waterbody are considered in the assessment.

13.1.10 Temporary impacts (defined as less than three years) are not considered to result in deterioration in the WFD status and so are not included within the assessment. Impacts are not considered to constitute deterioration of status of the water body if the water body:

- Is only impacted for a short time period (less than three years);
- Recovers within a short time period (less than three years) and/or;
- Recovers without the need for any restoration measures.

Methodology

13.1.11 The WFD assessment is undertaken as a stepped process as per the flow diagram shown in Figure 13-1. These steps are described in further detail in the following sections.

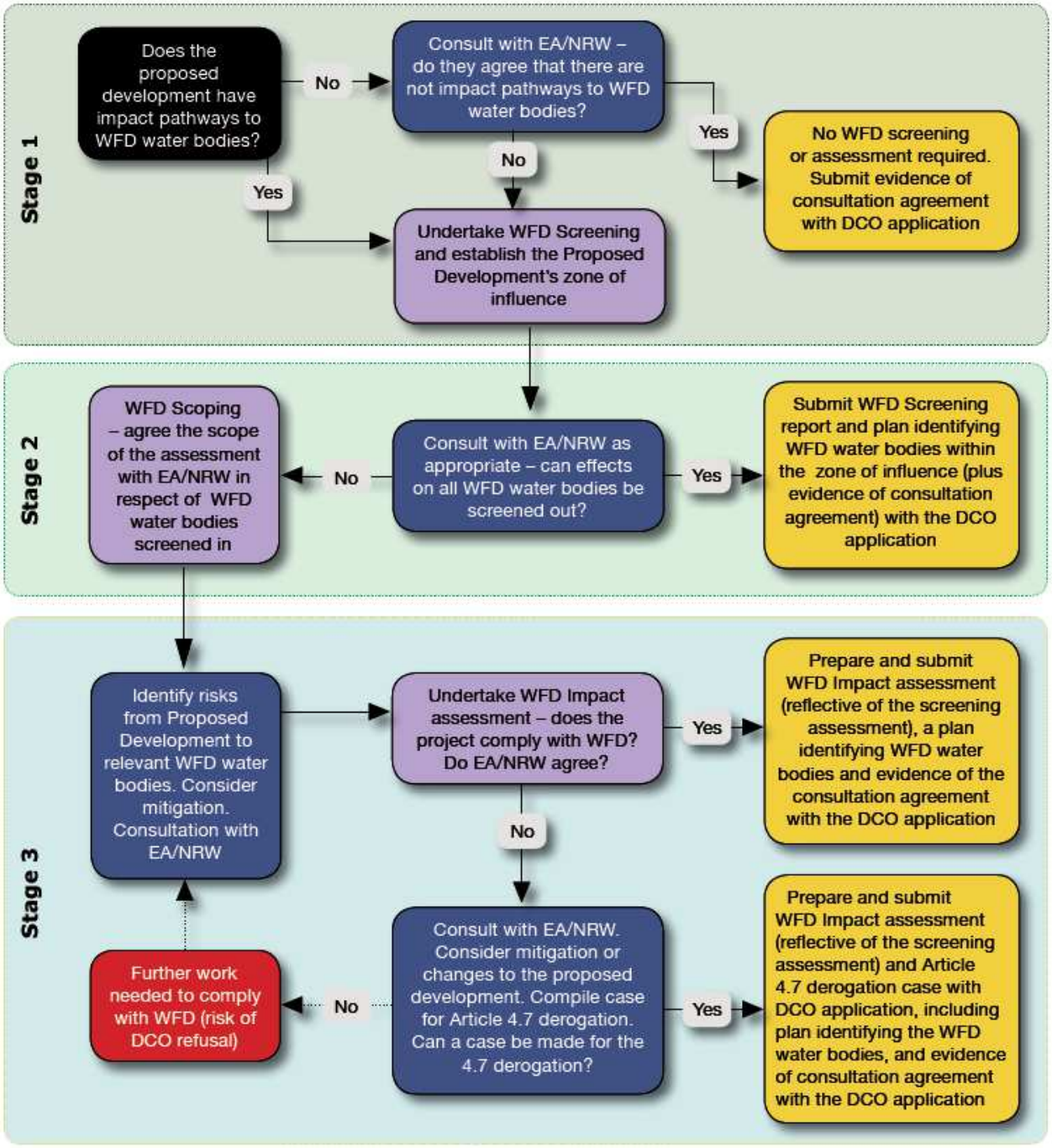

Figure 13-1 Steps in the WFD assessment process, as recommended by Planning Inspectorate Guidance[1].

Stage 1: Screening assessment

13.1.12 This stage has considered whether the scheme has impact pathways to WFD water bodies. Where impact pathways have been considered possible, the proposed zone of influence has been established based on the scheme baseline and baseline information for WFD surface water and groundwater bodies.

Scheme baseline

13.1.13 All scheme components that have the potential to permanently affect surface water and groundwater bodies, and that therefore have the potential to impact on WFD status, have been identified based on the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1) and the design drawings (for operation; Volume 6 Document Ref 6.3 Figure 2.1). This has included the identification of all relevant embedded mitigation measures within the scheme construction strategy and design.

13.1.14 Scheme components related to road construction are repeatable along a scheme and have therefore been categorised into generic component types (e.g. culverts, outfalls) with regards to their likely impacts on surface water and/or groundwater bodies.

13.1.15 Key assumptions regarding the aspects of the scheme assessed with respect to WFD status of surface water and groundwater bodies are:

- The potential impacts associated with general construction activities, such as vehicle movements, wastewater management and storage of materials, have not been explicitly assessed. It is assumed that adoption of best practice site management in compliance with the Outline CEMP will mitigate the potential risks to surface waters and groundwaters; and
- The temporary footprint associated with construction compounds and storage areas has not been assessed.

WFD baseline

13.1.16 This was established by identifying the WFD surface water and groundwater bodies potentially affected by the scheme and identifying their baseline condition, using a combination of desktop assessment and, where possible, field surveys.

13.1.17 The desktop assessment has collated and reviewed the water body status and status objectives information for the relevant WFD water bodies based on Environment Agency data (2016 Cycle 2 Water Body Status Classification data). These data are considered to provide the current best estimate of status and are the formal baseline against which the Environment Agency will assess compliance with the 'no deterioration' objective in 2017.

13.1.18 The following datasets have also been used to further establish the nature and existing condition of those watercourses located within WFD water bodies that are affected by the scheme:

- Observations from a site walkover on 16th November 2017;
- EA Catchment Data Explorer[2];
- South West River Basin Management Plan (2015);
- Existing highway drainage plans;
- National River Flow Archive[3];
- Natural England, MAGIC[4];

[2] The Environment Agency, "Catchment Data Explorer," Environment Agency, 01 11 2017. [Online]. Available: http://environment.data.gov.uk/catchment-planning/. [Accessed 10 2017].
[3] Centre for Ecology and Hydrology, "National River Flow Archive," 10 2017. [Online]. Available: http://nrfa.ceh.ac.uk/data/station/meanflow/64001. [Accessed 10 2017].http://nrfa.ceh.ac.uk/data/station/meanflow/64001
[4] MAGIC, "Interactive mapping at your fingertips," 10 2017. [Online]. Available: http://www.magic.gov.uk/. [Accessed 10 2017].

- Ordnance Survey (OS) mapping (including topography);
- British Geological Survey (BGS) mapping[5];
- Information from historic and recent ground investigations;
- A30 River Habitat Appraisal[6];
- A30 Fish Population Surveys report[7];
- A30 Aquatic Ecology Surveys[8]; and
- The Coal Authority interactive map viewer[9].

13.1.19 Groundwater dependent terrestrial ecosystems (GWDTEs) have been identified from statutory environmental designations in the study area whilst spring features have been identified from issues labelled on the OS maps. Licensed and unlicensed groundwater abstraction details have been respectively provided directly by the Environment Agency or Cornwall Council.

13.1.20 The geomorphology baseline conditions were identified during a site walkover and using information contained in the River Habitat Appraisal report[6]. A visual inspection during a site visit is an appropriate method for undertaking a geomorphology survey to inform this level of assessment.

13.1.21 To establish a baseline condition, fisheries and invertebrate surveys[10,11] have been conducted for watercourses and ponds that would potentially be modified by the scheme.

13.1.22 Groundwater monitoring has also been undertaken by Structural Soils[10], in 13 No. boreholes across the scheme area. The results are presented within the WSP GIR[11].

Stage 2: Scoping assessment

13.1.23 The objective of the scoping stage was to identify the risks from the scheme to receptors within the zone of influence (identified in the previous stage). This considered relevant water body information, including risk to individual quality elements, and identified surface water and groundwater bodies where a detailed impact assessment is required.

Stage 3: Detailed assessment

13.1.24 The objective of the detailed impact assessment was to establish the nature and anticipated magnitude of the effects of relevant scheme components on the WFD quality elements of the surface water and groundwater bodies affected by the scheme. These effects were considered in terms of the potential for deterioration of current status and/or the prevention of status objectives.

[5]British Geological Survey, "Geology of Britain viewer," 2017. [Online]. Available: http://mapapps.bgs.ac.uk/geologyofbritain/home.html . [Accessed 10 2017].
[6] Volume 6 Document Ref 6.4 ES Appendix 8.4 River Habitat Appraisal Report.
[7] Volume 6 Document Ref 6.4 ES Appendix 8.10 Fish Survey Report.
[8] Volume 6 Document Ref 6.4 ES Appendix 8.9 Freshwater Macroinvertebrates Survey Report.
[9] The Coal Authority, "Coal Mining Reporting Area," 2017. [Online]. Available: http://mapapps2.bgs.ac.uk/coalauthority/home.html. [Accessed 10 2017].
[10] Structural Soils, "Factual report on ground investigation, A30 - Chiverton to Carland Cross. Project number 732088.," 2017.
[11] WSP | Parsons Brinkerhoff, A30 Chiverton to Carland Cross Ground Investigation Report. Report Reference HA551502-WSP-VGT-000-RE-GE-00001., 2017.

13.1.25 The Environment Agency provides guidance on the definition of no deterioration[12]. Necessary measures must be taken to prevent deterioration from one water body status class to a lower one. Furthermore, according to the recent European Union Court of Justice ruling[1], within-class deterioration should also be considered as an overall deterioration of the water body status.

13.1.26 The approach to detailed assessment suggested by the PINS guidance[1] has been used and builds upon the establishment of a baseline and zone of influence (Stage 1: Screening) and an initial identification of potential impacts (Stage 2: Scoping). The approach includes the following steps:

- Identification of water bodies that are potentially affected (directly or indirectly) or could be at risk as a result of the scheme;
- The baseline characteristics of the water bodies concerned;
- A description of the scheme and the aspects of the development considered within the scope of the WFD assessment;
- The methods used to determine and quantify the scale of WFD impacts;
- An assessment of the risk of deterioration, as an Article 4.7 derogation may be required where is a there is a risk the scheme will prevent the achievement of good status or result in deterioration in status (further details in Annex A, Section 3.6);
- An explanation of any mitigation required and how its delivery is secured; and
- An explanation of any enhancements and/or positive contributions to the RBMP objectives proposed and how their delivery would be secured.

Scheme description

Scheme components

13.1.27 The primary sources of information for this assessment have been the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1) and the design drawings (for operation; Volume 6 Document Ref 6.3 Figure 2.1).

13.1.28 The assessment has considered all 'scheme components' that have the potential to permanently affect surface water and groundwater bodies, and therefore have the potential to impact upon WFD status. All scheme components have been assessed individually before the combined effect on quality element status is considered.

13.1.29 Linear infrastructure projects, such as roads, typically have generic scheme components that are repeated across the length of the scheme. A total of six such scheme components have been identified that may directly or indirectly affect surface water bodies along the proposed alignment. These include:

- culverts (Table 13-1; a pipe or box shaped structure that carries a watercourse under a road or railway crossing);
- watercourse realignments (Table 13-1; permanent, localised realignment of a watercourse involving the creation of a new section of river channel tying back into the existing watercourse at the downstream extent);

[12] UK Technical Advisory Group (2006), *Prevent Deterioration of Status*, https://www.wfduk.org/sites/default/files/Media/Setting%20objectives%20in%20the%20water%20environment/Prevent%20deterioration%20of%20status_Draft_010506.pdf.

- infiltration basins (Table 13-1; a component of the road drainage system that allows runoff to infiltrate to ground);
- road drainage outfalls (Table 13-1; a discrete headwall that discharges road runoff from the road drainage system to the wider water environment);
- embankments (Table 13-2; a bank of earth or stone built to carry a road or railway over an area of low ground); and
- cuttings (Table 13-2; an area where earth or stone is excavated to carry a road or railway through an area of high ground).

Table 13-1 Proposed infiltration basins, road drainage outfalls and culverts along the scheme alignment. Locations and extents of culverts and infiltration basins are shown on the drawings in Volume 6 Document Ref 6.3 Figure 2.1. These will be further developed and refined at detailed design.

Watercourse	Chainage (m)	WFD Water Bodies (SW: surface water, GW: groundwater)	Description
Calenick Stream	0+200	SW: Calenick Stream (GB108048001250) GW: South Cornwall (GB40802G800200)	Mainline attenuation basin A (partially infiltrating) & outfall to watercourse.
Perranporth Stream	1+300	SW: Undesignated GW: West Cornwall (GB40802G800100)	Mainline attenuation basin A (dominantly infiltrating), Side road attenuation basin 1 (partially infiltrating) & outfall to watercourse.
Tributary of River Kenwyn	2+200	SW: Kenwyn (GB108048002340) GW: West Cornwall (GB40802G800100)	Mainline attenuation basin C (dominantly infiltrating) & outfall to watercourse.
Bolingey Stream	4+200	SW: Bolingey Stream (GB108049000700) GW: West Cornwall (GB40802G800100)	Mainline attenuation basin D (dominantly infiltrating), Side road attenuation basin 2 (dominantly infiltrating) & outfall to watercourse.
N/a	4+600	GW: South Cornwall (GB40802G800200)	Side Road Pond 3 (infiltration only).
Tributary of Zelah Brook	6+000	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	Mainline attenuation basin E (dominantly infiltrating), Side road attenuation basin 4 (dominantly infiltrating) & outfall to watercourse. 1.2m culvert.
Tributary of Zelah Brook	7+200	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	Mainline attenuation basin F (dominantly infiltrating) & outfall to watercourse.
N/a	7+900	GW: West Cornwall (GB40802G800100)	Side Road Pond 5 (infiltration only).

Watercourse	Chainage (m)	WFD Water Bodies (SW: surface water, GW: groundwater)	Description
Zelah Brook	8+900	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	Mainline attenuation basin G (partially infiltrating) & outfall to watercourse. 2.4m box culvert.
Zelah Brook	9+250	SW: Zelah Brook (GB108048002360)	2.4m box culvert.
Zelah Brook	9+750	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	Side road attenuation basin 6 (dominantly infiltrating) & outfall to watercourse.
Upper River Allen (Fal)	10+900	SW: Upper River Allen (Fal) (GB108048002370) GW: South Cornwall (GB40802G800200)	Mainline attenuation basin H (partially infiltrating), Side road attenuation basin 7 & outfall to watercourse. 1.2m culvert.
Tributary of River Allen	12+000	SW: Upper River Allen (Fal) (GB108048002370) GW: South Cornwall (GB40802G800200)	Mainline attenuation basin I & outfall to watercourse.
Tributary of Benny Stream	13+200	SW: Benny Stream (GB108049000210) GW: South Cornwall (GB40802G800200)	Side road attenuation basin 8 & outfall to watercourse.
Kestle Stream	13+400	SW: Kestle Stream (GB108048002380) GW: South Cornwall (GB40802G800200)	Mainline attenuation basin J – connected to existing highway drainage, presumed to outfall to Kestle Stream.
Tributary of Benny Stream	13+500	SW: Benny Stream (GB108049000210) GW: South Cornwall (GB40802G800200)	Mainline attenuation basin K (dominantly infiltrating) & outfall to watercourse. 1.2m culvert. Watercourse Realignment.
Tributary of Benny Stream	13+900	SW: Benny Stream (GB108049000210) GW: North Cornwall (GB40802G800300)	Mainline attenuation basin L (partially infiltrating) & outfall to watercourse.

Table 13-2 Summary of proposed embankments and cuttings along the scheme alignment. Locations and extents are shown on the drawings in Volume 6 Document Ref 6.3 Figure 2.1. These will be further developed and refined at detailed design. Detailed information regarding the monitoring used to determine groundwater levels is available in DMRB assessments (Volume 6 Document Ref 6.4 ES Appendix 13.3).

Feature type	Chainage (m)	WFD water bodies (SW: surface water, GW: groundwater)	Potential interaction with groundwater?
Mainline Cutting 1	0+500 to 1+000	SW: Calenick Stream (GB108048001250) GW: South Cornwall (GB40802G800200)	No - Groundwater anticipated to be below base of cutting.
Side Road Cutting 1	0+500 to 1+000	SW: Calenick Stream (GB108048001250) GW: South Cornwall (GB40802G800200)	Yes
Mainline Cutting 2	2+500 to 3+100	SW: Bolingey Stream (GB108049000700) GW: West Cornwall (GB40802G800100)	No - Groundwater anticipated to around 1.0m below base of cutting.
Mainline Cutting 3	4+700 to 5+900	SW: Kenwyn (GB108048002340) & Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	No - Groundwater anticipated to be below base of cutting.
Embankment 1	5+900 to 6+200	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	Surface water flow path – collects 80m south-east, downstream of the culvert, as a tributary of Zelah Brook.
Side Road Cutting 2	6+000	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	No - Groundwater anticipated to be below base of cutting.
Mainline Cutting 4	6+300 to 7+450	SW: Bolingey Stream (GB108049000700) & Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200) & West Cornwall (GB40802G800100)	Yes
Mainline Cutting 5	7+450 to 7+900	SW: Bolingey Stream (GB108049000700) & Zelah Brook (GB108048002360)	Yes

Feature type	Chainage (m)	WFD water bodies (SW: surface water, GW: groundwater)	Potential interaction with groundwater?
		GW: South Cornwall (GB40802G800200) & West Cornwall (GB40802G800100)	
Mainline Cutting 6	7+900 to 8+750	SW: Bolingey Stream (GB108049000700) & Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200) & West Cornwall (GB40802G800100)	No - Groundwater anticipated to be below base of cutting.
Side Road Cutting 3	8+150	SW: Bolingey Stream (GB108049000700) & Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200) & West Cornwall (GB40802G800100)	Yes
Embankment 2	8+750 to 8+950	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	Headwater stream – spring 45m north-west feeds the headwaters before crossing at ch 8+910 (new culvert). Stream continues to flow east before joining a river network eventually merging with the River Allen.
Mainline Cutting 7	8+950 to 9+200	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	No - Groundwater anticipated to be below base of cutting.
Embankment 3	9+200 to 9+400	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	Spring and headwater stream – spring beneath or at the toe of the existing A30 embankment. Headwater crosses under the scheme at ch 9+250 (new culvert). Stream flows south-east before joining a river network eventually merging with the River Allen.
Mainline Cutting 8	9+400 to 9+500	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200)	No - Groundwater anticipated to be below base of cutting.
Mainline Cutting 9	9+900 to 10+500	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200) & West Cornwall (GB40802G800100)	Yes

Feature type	Chainage (m)	WFD water bodies (SW: surface water, GW: groundwater)	Potential interaction with groundwater?
Side Road Cutting 4	10+000	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200) & West Cornwall (GB40802G800100)	Yes
Side Road Cutting 5	11+000	SW: Zelah Brook (GB108048002360) GW: South Cornwall (GB40802G800200) & West Cornwall (GB40802G800100)	Yes
Embankment 4	11+000 to 11+150	SW: Upper River Allen (Fal) (GB108048002370) GW: South Cornwall (GB40802G800200)	Headwater stream – flows south-east, crossing scheme at ch 11+040. Continues to flow south-east before joining the River Allen.
Mainline Cutting 10	11+200 to 11+750	SW: Upper River Allen (Fal) (GB108048002370) GW: South Cornwall (GB40802G800200)	Yes
Mainline Cutting 11	12+650 to 12+950	SW: Upper River Allen (Fal) (GB108048002370) & Benny Stream (GB108049000210) GW: North Cornwall (GB40802G800300)	No - Groundwater anticipated to be below base of cutting.
Embankment 5	13+400 to 13+850	SW: Kestle Stream (GB108048002380) & Benny Stream (GB108049000210) GW: North Cornwall (GB40802G800300) & South Cornwall (GB40802G800200)	Spring and headwater stream – flows north-east at ch 13+680 (new culvert) and continues north before joining the River Gannel.
Mainline Cutting 12	13+850 to 14+300	SW: Benny Stream (GB108049000210) GW: North Cornwall (GB40802G800300)	No - Groundwater anticipated to be 1.1m below base of cutting.
Side Road Cuttings 6	13+850 to 14+300	SW: Benny Stream (GB108049000210) GW: North Cornwall (GB40802G800300)	No - Groundwater anticipated to be below base of cutting.

Design assumptions and embedded mitigation

13.1.30 Mitigation has been embedded within the scheme to minimise any effects on the water environment and to ensure that the scheme is, where possible, inherently compliant with the objectives of the WFD for both surface water and groundwater bodies. This includes mitigation embedded within construction methodology and operational design and is described in the following sections.

13.1.31 The mitigations described in these sections would be refined at the detailed design stage.

Engineering design

13.1.32 The carriageway drainage would follow the principles of SuDS and include a two-stage or three-stage treatment train, consisting of filter drains and detention ponds, along with grassed swales (dry) or wet ponds where additional treatment is required. Following this treatment train, infiltration to groundwater would be promoted as the primary method of drainage where ground conditions allow.

13.1.33 The levels of soluble and sediment bound treatment embedded in the drainage system design would be sufficient to reduce soluble and sediment bound pollutants in the road runoff to levels that achieve a PASS of HAWRAT, the methodology used by Highways England and the Environment Agency to assess the potential quality of discharges from road runoff. Details of the treatment trains for each area of road drainage, along with the HAWRAT assessments carried out, are included in **DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3). Therefore, the quality of discharges to surface waters or infiltration to groundwater would be sufficient to ensure to no detriment to the status or objectives of WFD water bodies.

13.1.34 Attenuation/infiltration basins would be designed to ensure that groundwater levels would not impede their performance. In addition, where embankments are to be constructed above key groundwater/surface water interactions (springs), culverts or drainage blankets will be incorporated into the design to maintain the existing flow regime and to ensure the sub-surface flows do not compromise the integrity of the earthworks.

13.1.35 The drainage of cuttings seeks to retain existing flow directions within catchment areas where possible and to maintain flow regimes in groundwater-fed features. In these areas, road runoff would be drained to combined surface water/groundwater drains in the verge.

13.1.36 Where the scheme crosses watercourses, flows would be maintained within their catchment through culverts. These culverts would be designed to convey flow equivalent to the 100-year event plus 40% and would have a minimum size of 1200mm. The design of the culverts would be refined at detailed design and shall ensure that:

- The base of the culvert is set >150mm below the existing bed of the watercourse with structures attached to the base of the culvert (e.g. wooden batons) to retain sediment within the full length of the culvert. This will help to retain ecological connectivity either side of the culvert and promote continued sediment transport downstream; and

- Scour protection at the inlet or outlet uses bioengineering methods wherever practicable to maximise habitat potential.

13.1.37 Road drainage outfalls would be installed adjacent to attenuation basins where they are not fully infiltrating. The design of these outfall would be refined at detailed design and shall ensure that:

- The headwall structure is set back from or flush with the channel profile and does not protrude into the channel;
- The outfall is angled to direct flow at an angle no greater than 60 degrees from the existing flow direction in the watercourse; and
- Any scour protection surrounding the outfall headwall uses bioengineering methods wherever practicable to maximise habitat potential.

13.1.38 A fluvial geomorphologist should be consulted during the detailed design of all culvert and outfall structures.

Construction mitigation

13.1.39 **The Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1) includes measures that would be implemented by the construction contractor to avoid or minimise the likelihood of effects upon the water environment. This includes Water and Pollution Management Plans which describe the mitigations relevant to this assessment in detail.

Operational mitigation

13.1.40 **The Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1) includes measures that would be implemented by the contractor which are to be maintained by the operator in accordance with the Handover Management Plan (HEMP) to ensure the required level of performance is maintained within the drainage system.

WFD baseline

13.1.41 The baseline information for all WFD surface water and groundwater bodies in direct contact with the proposed route of the scheme are listed in the following sections. The information is based on the 2016 Cycle 2 data where available, otherwise 2015 Cycle 2 data has been used.

Benny Stream (GB108049000210)

13.1.42 The existing status, failing elements and reasons for failure of the Benny Stream (GB108049000210) river water body for Cycle 2 (2016) of the WFD are outlined in Table 13-3. The waterbody extent is shown in Volume 6 Document Ref 6.3 ES Figure 13-3. The water body contains Newlyn Downs SAC (200m north of the scheme) and an area protected under the Nitrates Directive[13].

[13] EA Catchment Data Explorer: http://environment.data.gov.uk/catchment-planning/WaterBody/GB108049000210

Table 13-3 WFD status of the Benny Stream river water body.

WFD waterbody	Benny Stream
River Basin District	South West
ID	GB108049000210
Type of Waterbody	River
Management Catchment	North Cornwall Seaton Looe and Fowey
Area (km^2)	21.678
Hydromorphological Designation	Not designated artificial or heavily modified
Overall Status	Moderate
Objective	Good by 2027
ECOLOGICAL STATUS	Moderate
Biological Quality Elements	Good
Invertebrates	High
Macrophytes and Phytobenthos Combined	Good
Hydromorphological Supporting Elements	Supports Good
Physiochemical Quality Elements	Moderate
Acid Neutralising Capacity	High
Ammonia (Phys-Chem)	Good
Dissolved Oxygen	High
pH	High
Phosphate	High
Temperature	High
Specific Pollutants	Moderate
CHEMICAL STATUS	Fail
Drivers of failure to achieve Good status	Cadmium, Lead, Nickel, Zinc
Reasons for not achieving Good status	Abandoned mine

Kestle Stream (GB108048002380)

13.1.43 The existing status, moderate elements and reasons for the moderate classification Kestle Stream (GB108048002380) water body for Cycle 2 (2016) of the WFD are outlined in Table 13-4. The stream is within the Nitrates Directive Area 187 which overlaps with the works. The extent of the river water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-3.

Table 13-4 WFD status of the Kestle Stream water body

WFD Waterbody	Kestle Stream
River Basin District	South West
ID	GB108048002380
Type of Waterbody	River
Management Catchment	Cornwall West and the Fal
Area (km^2)	14.878
Hydromorphological Designation	not designated artificial or heavily modified
Overall Status	Moderate
Objective	Good by 2027
ECOLOGICAL STATUS	Moderate
Biological Quality Elements	Moderate
Invertebrates	High
Macrophytes and Phytobenthos Combined	Moderate
Hydromorphological Supporting Elements	Supports Good
Physiochemical Quality Elements	Good
CHEMICAL STATUS	Good
Drivers of failure to achieve Good status	Macrophytes and Phytobenthos Combined
Reasons for not achieving Good status	

Upper River Allen (Fal) (GB108048002370)

13.1.44 The existing status, moderate elements and reasons for the moderate classification of Upper River Allen (Fal) (GB108048002370) water body for Cycle 2 (2016) of the WFD are outlined in Table 13-5. The watercourse is within the Nitrates Directive Area 187. The extent of the river water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-3.

Table 13-5 WFD status of the Upper River Allen (Fal) water body

WFD Waterbody	Upper River Allen (Fal)
River Basin District	South West
ID	GB108048002370
Type of Waterbody	River
Management Catchment	Cornwall West and the Fal
Area (km^2)	11.236
Hydromorphological Designation	not designated artificial or heavily modified
Overall Status	Moderate
Objective	Good by 2027

WFD Waterbody	Upper River Allen (Fal)
ECOLOGICAL STATUS	Moderate
Biological Quality Elements	Moderate
Invertebrates	High
Macrophytes and Phytobenthos Combined	Moderate
Hydromorphological Supporting Elements	Supports Good
Physiochemical Quality Elements	High
Ammonia (Phys-Chem)	High
Dissolved Oxygen	High
pH	High
Phosphate	High
Temperature	High
CHEMICAL STATUS	Good
Drivers of failure to achieve Good status	Macrophytes and Phytobenthos Combined
Reasons for not achieving Good status	Livestock, Sewage discharge (intermittent)

Zelah Brook (GB108048002360)

13.1.45 The existing status, ecological and chemical condition of Zelah Brook (GB108048002360) water body for Cycle 2 (2016) of the WFD are outlined in Table 13-6. The brook is within the Nitrates Directive Area 187. The extent of the river water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-3.

Table 13-6 WFD status of the Zelah Brook water body

WFD waterbody	Zelah Brook
River Basin District	South West
ID	GB108048002360
Type of Waterbody	River
Management Catchment	Cornwall West and the Fal
Area (km^2)	13.363
Hydromorphological Designation	not designated artificial or heavily modified
Overall Status	Good
Objective	Good by 2015
ECOLOGICAL STATUS	Good
Biological Quality Elements	Good
Invertebrates	High
Macrophytes and Phytobenthos Combined	Good
Hydromorphological Supporting Elements	Supports Good
Physiochemical Quality Elements	Good

WFD waterbody	Zelah Brook
CHEMICAL STATUS	Good

Holywell Stream (GB108049000710)

13.1.46 The existing status, ecological and chemical condition of Holywell Stream (GB108049000710) water body for Cycle 1 (2016) of the WFD are outlined in Table 13-7. The stream is within the Nitrates Directive Area 187. The extent of the river water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-3.

Table 13-7 WFD status of the Holywell Stream water body

WFD waterbody	Zelah Brook
River Basin District	South West
ID	GB108049000710
Type of Waterbody	River
Management Catchment	Cornwall West and the Fal
Area (km^2)	9.426
Hydromorphological Designation	not designated artificial or heavily modified
Overall Status	Moderate
Objective	Good by 2027
ECOLOGICAL STATUS	Moderate
Biological Quality Elements	Moderate
Fish	Moderate
Invertebrates	High
Macrophytes and Phytobenthos Combined	High
Hydromorphological Supporting Elements	Supports Good
Physiochemical Quality Elements	High
Specific Pollutants	Moderate
CHEMICAL STATUS	Good
Drivers of failure to achieve Good status	Zinc, Fish
Reasons for not achieving Good status	Barriers, Abandoned mines

Kenwyn (GB108048002340)

13.1.47 The existing status, ecological and chemical condition of Kenwyn (GB108048002340) water body for Cycle 1 (2009-2015) of the WFD are outlined in Table 13-8. The river is within the Nitrates Directive Area 187. The extent of the river water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-3.

Table 13-8 WFD status of the Kenwyn water body

WFD waterbody	Kenwyn
River Basin District	South West
ID	GB108048002340
Type of Waterbody	River
Management Catchment	Cornwall West and the Fal
Area (km^2)	19.999
Hydromorphological Designation	not designated artificial or heavily modified
Overall Status	Good
Objective	Good by 2015
ECOLOGICAL STATUS	Good
Biological Quality Elements	Good
Fish	Good
Invertebrates	Good
Macrolagae	Good
Macrophytes and Phytobenthos Combined	Good
Hydromorphological Supporting Elements	Supports Good
Physiochemical Quality Elements	High
Ammonia (Phys-Chem)	High
Biological Oxygen Demand (BOD)	High
Dissolved Oxygen	High
pH	High
Phosphate	High
Temperature	High
Specific Pollutants	High
CHEMICAL STATUS	Good

Calenick Stream (GB108048001250)

13.1.48 The existing status, moderate elements and reasons for the moderate classification of Calenick Stream (GB108048001250) water body for Cycle 2 (2015-2021) of the WFD are outlined in Table 13-9. The river is within the Nitrates Directive Area 187 and affects the Carrine Common SAC which is 5.7km from the works. The extent of the river water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-3.

Table 13-9 WFD status of the Calenick Stream water body

WFD waterbody	Calenick Stream
River Basin District	South West
ID	GB108048001250
Type of Waterbody	River

WFD waterbody	Calenick Stream
Management Catchment	Cornwall West and the Fal
Area (km^2)	17.553
Hydromorphological Designation	not designated artificial or heavily modified
Overall Status	Moderate
Objective	Good by 2027
ECOLOGICAL STATUS	Moderate
Biological Quality Elements	Moderate
Invertebrates	Moderate
Macrophytes and Phytobenthos Combined	Good
Hydromorphological Supporting Elements	Supports Good
Physiochemical Quality Elements	High
Acid Neutralising Capacity	High
Ammonia (Phys-Chem)	High
Dissolved Oxygen	High
pH	High
Phosphate	High
Temperature	High
Specific Pollutants	Moderate
CHEMICAL STATUS	Fail
Drivers of failure to achieve Good status	Copper, Zinc, Cadmium and Its Compounds, Invertebrates
Reasons for not achieving Good status	Abandoned mine, Natural mineralisation, Incidents

Bolingey Stream (GB108049000700)

13.1.49 The existing status, moderate elements and reasons for the moderate classification of Bolingey Stream (GB108049000700) water body for Cycle 2 (2015-2021) of the WFD are outlined in Table 13-10. The area is within the 187 Nitrates Directive area. The extent of the water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-3.

Table 13-10 WFD status of the Bolingey Stream water body

WFD waterbody	Bolingey Stream
River Basin District	South West
ID	GB108049000700
Type of Waterbody	River
Management Catchment	Cornwall West and the Fal
Area (km^2)	24.792
Hydromorphological Designation	not designated artificial or heavily modified

WFD waterbody	Bolingey Stream
Overall Status	Moderate
Objective	Good by 2027
ECOLOGICAL STATUS	Moderate
Biological Quality Elements	Moderate
Fish	Good
Invertebrates	High
Macrophytes and Phytobenthos Combined	Moderate
Hydromorphological Supporting Elements	Supports Good
Physiochemical Quality Elements	Good
Acid Neutralising Capacity	High
Ammonia (Phys-Chem)	High
Biological Oxygen Demand (BOD)	High
Dissolved Oxygen	High
pH	High
Phosphate	Good
Temperature	High
Specific Pollutants	Moderate
CHEMICAL STATUS	Fail
Drivers of failure to achieve Good status	Zinc, Cadmium and its compounds, Macrophytes and Phytobenthos Combined
Reasons for not achieving Good status	Abandoned mine, Sewage discharge (continuous)

North Cornwall (GB40802G800300)

13.1.50 The existing status, failing elements and reasons for failure of the North Cornwall (GB40802G800300) groundwater body for Cycle 2 (2016) of the WFD are outlined in Table 13-11. The North Cornwall groundwater body is within the North Cornwall Drinking Water Protected Area and an area protected under the Nitrates Directive. The extent of the water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-4.

Table 13-11 WFD status of the North Cornwall groundwater body

WFD waterbody	North Cornwall
River Basin District	South West
ID	GB40802G800300
Type of Waterbody	Groundwater
Management Catchment	South West GW
Area (km^2)	851.479
Hydromorphological Designation	not applicable
Overall Status	Poor

WFD waterbody	North Cornwall
Objective	Poor by 2015
Quantitative	Good
Quantitative Dependent Surface Water Body Status	Good
Quantitative GWDTEs test	Good
Quantitative Saline Intrusion	Good
Quantitative Water Balance	Good
Chemical (GW)	Poor
Chemical Status element	Poor
Chemical Dependent Surface Water Body Status	Poor
Chemical Drinking Water Protected Area	Poor
Chemical GWDTEs test	Good
Chemical Saline Intrusion	Good
General Chemical Test	Poor
Drivers of failure to achieve Good status	Chemical Dependent Surface Water Body Status, Trend Assessment, Chemical Drinking Water Protected Area
Reasons for not achieving Good status	Abandoned mines, Livestock

South Cornwall (GB40802G800200)

13.1.51 The existing status, failing elements and reasons for failure of the South Cornwall (GB40802G800200) groundwater body for Cycle 2 (2016) of the WFD are outlined in Table 13-12. The water body is within the South Cornwall Drinking Water Protected Area and has three areas under the Nitrates Directive (20, 21 and 154). Area 20 underlies the scheme around Carland Cross. The extent of the water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-4.

Table 13-12 WFD status of the South Cornwall groundwater body

WFD waterbody	South Cornwall
River Basin District	South West
ID	GB40802G800200
Type of Waterbody	Groundwater
Management Catchment	South West GW
Area (km^2)	885.9
Hydromorphological Designation	not applicable
Overall Status	Poor
Objective	Poor by 2015
Quantitative	Good

WFD waterbody	South Cornwall
Quantitative Dependent Surface Water Body Status	Good
Quantitative GWDTEs test	Good
Quantitative Saline Intrusion	Good
Quantitative Water Balance	Good
Chemical (GW)	Poor
Chemical Status element	Poor
Chemical Dependent Surface Water Body Status	Poor
Chemical Drinking Water Protected Area	Poor
Chemical GWDTEs test	Good
Chemical Saline Intrusion	Good
General Chemical Test	Poor
Drivers of failure to achieve Good status	Chemical Dependent Surface Water Body Status, Chemical Drinking Water Protected Area, Trend Assessment
Reasons for not achieving Good status	Abandoned mine, Livestock

West Cornwall (GB40802G800100)

13.1.52 The existing status, failing elements and reasons for failure of the West Cornwall (GB40802G800100) groundwater body for Cycle 2 (2016) of the WFD are outlined in Table 13-13. The water body contains a Drinking Water Protected Area and two areas protected under the Nitrates Directive (22 and 23) but none are near the scheme (>10km away). The extent of the water body is shown in Volume 6 Document Ref 6.3 ES Figure 13-4.

Table 13-13 WFD status of the West Cornwall groundwater body

WFD waterbody	West Cornwall
River Basin District	South West
ID	GB40802G800100
Type of Waterbody	Groundwater
Management Catchment	South West GW
Area (km^2)	601.042
Hydromorphological Designation	not applicable
Overall Status	Poor
Objective	Poor by 2016
Quantitative	Good
Quantitative Dependent Surface Water Body Status	Good
Quantitative GWDTEs test	Good
Quantitative Saline Intrusion	Good

WFD waterbody	West Cornwall
Quantitative Water Balance	Good
Chemical (GW)	Poor
Chemical Status element	Poor
Chemical Dependent Surface Water Body Status	Poor
Chemical Drinking Water Protected Area	Poor
Chemical GWDTEs test	Good
Chemical Saline Intrusion	Good
General Chemical Test	Poor
Drivers of failure to achieve Good status	Chemical Dependent Surface Water Body Status, Chemical Drinking Water Protected Area, Trend Assessment
Reasons for not achieving Good status	Abandoned mine, Livestock

WFD protected areas

13.1.53 There is one WFD protected area within 2km of the scheme. It is known as Newlyn Downs SAC and is located 143m to the north of the proposed route near to Carland Cross. The boundary of the SAC is shown on Volume 6 Document Ref 6.3 Figure 8.1.

13.1.54 Newlyn Down SAC is primarily designated for the presence of the Annex 1[14] habitat Temperate Atlantic wet heaths with Dorset heath (*Erica ciliaris*) and cross-leaved heath (*Erica tetralix*). This is the largest area of Dorset heath in Cornwall and helps to represent the full geographical range of the distribution of this habitat.

Stage 1: Screening

Proposed Activities

13.1.55 Activities may have impact pathways to WFD quality elements during construction and/or operation of the scheme. Table 13-14 details the expected activities, whether they have been screened in/out of further assessment, along with an explanation for the screening decision. Where potential impact pathways have been considered to be present, these activities have been carried over to the scoping stage.

13.1.56 Embedded design mitigation along with additional mitigation proposed during construction and operation of the scheme, as described in Section 13.3, is considered where relevant for each activity.

14 Annex I of the Habitats Directive (as amended by the 2003 Treaty of Accession) comprises a list of 189 habitat types. Member States must consider designation of SACs for each of the features that occur in their European territory.

13.1.57 This assessment should be revisited during detailed design and construction to ensure that all anticipated activities are considered, and that any previously unknown impact pathways are included in the assessment.

Table 13-14 Screening of proposed activities

Proposed activity	Screen in/out	Explanation
Construction Activities		
Temporary dewatering to allow construction of cuttings	In	**Permanent impacts to the current status or status objectives of WFD quality elements are possible because of this activity. Further assessment is required.** Given the scheme route broadly follows a ridgeline at the intersection of three WFD groundwater bodies, the groundwater resource beneath the scheme is relatively isolated and localised. Despite this, the construction of cuttings has the potential to temporarily lower groundwater levels which may impact upon nearby receptors that are reliant upon groundwater.
Works in or near to watercourses (e.g. construction of culverts and drainage outfalls)	Out	**No permanent impacts on the current status or status objectives of WFD quality elements are expected because of this activity.** In-channel or floodplain works will be undertaken to install new culverts and drainage outfalls as listed in Table 13-1. These works will be subject to conditions imposed by an Ordinary Watercourse Consent (OWC). The temporary nature of these works and the construction mitigations described in the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1) minimises the potential for permanent impacts upon WFD quality elements.
Sediment mobilisation from site runoff	Out	**No permanent impacts on the status or future potential of WFD quality elements are expected because of these activities.** Construction activities increase the risk of pollutants entering the wider water environment from spillages from vehicles/plant, concrete wash-waters and sediment mobilisation. These risks would be present over the length of the construction sequence, with high-risk periods during topsoil stripping and works in or near to watercourses. The risk of sediment mobilisation remains until vegetation is established (at least one growing season). The **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1) details how water and sediment would be managed across the site and include provisions to minimise the likelihood of runoff, provide containment of spillage and capture or treat wastewaters where necessary. These mitigation measures are intended to prevent permanent impacts upon WFD surface water or groundwater quality elements.
Discharge of site runoff	Out	
Accidental spillage of pollutants (e.g. fuel leakage from storage or plant)	Out	
Operational Activities		

Permanent changes to groundwater levels because of cutting and/or embankment drainage	In	**Permanent impacts to the current status or status objectives of WFD quality elements are possible because of this activity. Further assessment is required.** Given the scheme route would broadly follow a ridgeline at the intersection of three WFD groundwater bodies, the groundwater resource potentially intersected by the scheme would be relatively isolated and localised. Despite this, the drainage of cuttings has the potential to permanently lower groundwater levels which may impact upon nearby receptors that are reliant upon groundwater.
Discharge of runoff to receiving waters from the road drainage system	Out	**No permanent impacts on the status or future potential of WFD quality elements are expected because of this activity.** The carriageway drainage would follow the principles of SuDS and include a two-stage or three-stage treatment train, consisting of filter drains and detention ponds, along with grassed swales (dry) or wet ponds where additional treatment is required. Infiltration to groundwater would also be promoted as the primary method of drainage. The levels of soluble and sediment bound treatment embedded in the drainage system design would be sufficient to reduce soluble and sediment bound pollutants in the road runoff to levels that achieve a PASS of HAWRAT, the methodology used by Highways England and the Environment Agency to assess the potential quality of discharges from road runoff to surface waters, as detailed in DMRB HD 45/09. Details of the treatment trains for each area of road drainage, along with the HAWRAT assessments carried out, are included in **DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Section 13.2. Therefore, the quality of discharges to receiving waters would be sufficient to ensure to no detriment to the status or objectives of WFD water bodies. In addition, the transfer of the majority of traffic from the existing A30, which currently discharges runoff to surface water with no treatment, to the new section of highway would reduce pollutant loadings to the wider water environment. This is likely to have a beneficial effect on the quality of receiving watercourses in multiple WFD water bodies.
Accidental spillage of pollutants (e.g. fuel spillage)	Out	**No permanent impacts on the status or future potential of WFD quality elements are expected because of these activities.** The proposed drainage system does not include measures specifically designed to minimise the impact of any accidental spillage of a pollutant. However, an assessment of the risk of spillage has been undertaken as per Method D of DMRB HD 45/09 (**DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Section 13.4). This assessment has indicated that the risk of serious spillage is low, and no further mitigation is required.
New in-channel or floodplain structures (e.g. culverts or	Out	**No permanent impacts on the status or future potential of WFD quality elements are expected because of these activities.**

drainage outfalls)		In-channel structures would consist of new culverts and drainage outfalls as listed in Table 13-1. Where the scheme crosses watercourses, flows would be maintained within their catchment through culverts. These culverts would be designed to convey flow equivalent to the 100-year event plus 40% and would have a minimum size of 1200mm. The design of the culverts would be refined at detailed design and shall ensure that: • The base of the culvert is set >150mm below the existing bed of the watercourse with structures attached to the base of the culvert (e.g. wooden batons) to retain sediment within the full length of the culvert. This will help to retain habitat connectivity either side of the culvert and promote continued sediment transport downstream; • Scour protection at the inlet or outlet uses bioengineering methods wherever practicable to maximise habitat potential; and Road drainage outfalls would be installed adjacent to attenuation basins where they are not fully infiltrating. The design of these outfall would be refined at detailed design and shall ensure that: • The headwall structure is set back from or flush with the channel profile and does not protrude into the channel; • The outfall is angled to direct flow at an angle no greater than 60 degrees from the existing flow direction in the watercourse; • Any scour protection surrounding the outfall headwall uses bioengineering methods wherever practicable to maximise habitat potential; and A geomorphologist should be consulted during the detailed design of all culverts and outfall structures. The watercourses where in-channel modifications are proposed are all Ordinary Watercourses with limited upstream catchment areas (< 1km^2). Given the mitigations included in the detailed design of the culverts and drainage outfalls and the limited value of the watercourses impacted to the wider water environment, the potential for impacts upon the status or objectives of WFD quality elements is negligible.

Zone of influence

13.1.58 The initial screening has noted that potential changes in groundwater levels during the construction of cuttings and the operation of the cutting drainage may result in impacts upon the status or objectives of WFD quality elements. Changes in groundwater levels have the potential to impact upon nearby receptors that are reliant upon groundwater inputs, such as groundwater dependant terrestrial ecosystems (GWDTEs) and baseflows in surface watercourses.

13.1.59 Therefore, the zone of influence of the scheme is deemed to be all surface water and groundwater bodies containing areas of cutting, as listed in Table 13-2. This includes the following WFD water bodies:

Surface water bodies:

- Calenick Stream;
- Bolingey Stream;
- Kenwyn;

- Zelah Brook;
- Upper River Allen (Fal);
- Benny Stream.

Groundwater bodies:

- West Cornwall;
- South Cornwall;
- North Cornwall.

Given the localised scale of any dewatering activities, it is not anticipated the potential effects would extended beyond the boundaries of the water bodies retained in the assessment.

Stage 2: Scoping

13.1.60 The WFD water bodies and activities considered to be within the zone of influence of the scheme have been assessed in greater detail to establish the likelihood of effects upon the status or objectives of WFD quality elements.

13.1.61 The following sections make use of the results of additional groundwater assessment (**DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Sections 13.5 & 13.6) to inform the potential for effects upon each WFD water body retained in the assessment.

Calenick Stream (GB108048001250)

13.1.62 This surface water body contains Mainline Cutting 1 and Side Road Cutting 1 (Table 13-2). Groundwater levels are anticipated to be above the cutting level in the side road cutting with potential impacts during construction and operation of the scheme.

13.1.63 A desk-based assessment has considered the potential for effects upon nearby surface water receptors because of changes in groundwater level, finding that there would be no impacts upon receptors with value to WFD quality elements (**DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Sections 13.5). Therefore, no effects upon the status of objectives of WFD quality elements are anticipated and the water body is scoped out of further assessment or mitigation.

Bolingey Stream (GB108049000700)

13.1.64 This water body contains Mainline Cuttings 2, 4-6 and Side Road Cutting 3 (Table 13-2). Groundwater levels are anticipated to be above the cutting level in Mainline Cuttings 4 and 5, along with Side Road Cutting 3 with potential impacts during construction and operation of the scheme.

13.1.65 A desk-based assessment has considered the potential for effects upon nearby surface water receptors because of changes in groundwater level, finding that there would be no impacts upon receptors with value to WFD quality elements (**DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Sections 13.5). Therefore, no effects upon the status of objectives of WFD quality elements are anticipated and the water body is scoped out of further assessment or mitigation.

Kenwyn (GB108048002340)

13.1.66 This water body contains Cutting 3 (Table 13-2), which is anticipated to be above typical groundwater levels. Resultantly, no effects upon surface water - groundwater interactions are anticipated, and the water body is scoped out of further assessment or mitigation.

Zelah Brook (GB108048002360)

13.1.67 This water body contains eleven areas of cutting including Mainline Cuttings 3-9 and Side Road Cuttings 2-5 (Table 13-2). Groundwater levels are anticipated to be above the cutting level in Mainline Cuttings 4, 5 and 9, along with Side Road Cuttings 3-5 with potential impacts during construction and operation of the scheme.

13.1.68 A desk-based assessment has considered the potential for effects upon nearby surface water receptors because of changes in groundwater level, finding that there is the potential for impacts upon surface water features that are at least partially reliant upon groundwater (**DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Sections 13.5). These include:

- A watercourse crossed by the scheme at ch 8+850;
- An area of wet ground at ch 9+900; and
- A pond 35m north of the scheme at ch 10+450.

13.1.69 The wet ground is disconnected from the wider surface water network and has therefore been considered to be a GWDTE and is assessed as part of the relevant WFD groundwater body (South Cornwall).

13.1.70 The watercourse and pond are connected to the wider surface water network and given the potential for impacts upon WFD quality elements, **detailed assessment is required.**

Upper River Allen (Fal) (GB108048002370)

13.1.71 This water body contains Mainline Cuttings 10 and 11, along with Side Road Cutting 5 (Table 13-2). Groundwater levels are anticipated to be above the cutting level in Mainline Cutting 10 and Side Road Cutting 5 with potential impacts during construction and operation of the scheme.

13.1.72 Given the proximity and level of Mainline Cutting 10 relative to the Newlyn Downs SAC, a detailed, desk-based assessment of hydrogeologic connectivity between the cutting and the protected area has been conducted (**DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Sections 13.6). This concluded that there is unlikely to be any connectivity between the groundwater that supports the protected area and the groundwater potentially impacted by dewatering during construction and operation of the cutting.

13.1.73 A desk-based assessment has considered the potential for effects upon nearby surface water receptors (other than Newlyn Downs SAC) because of changes in groundwater level, finding that there is potential for impacts to several surface water features (**DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Sections 13.5). These include:

- A pond adjacent to Side Road Cutting 5 at ch 10+050;

- A pond 30m east of Side Road Cutting 5 at ch 10+100; and
- A wet depression north of the scheme at ch 11+200.

13.1.74 The wet depression is disconnected from the wider surface water network and has therefore been considered to be a GWDTE and is assessed as part of the relevant WFD groundwater body (South Cornwall).

13.1.75 Both ponds are connected to the wider surface water network and given the potential for impacts upon WFD quality elements, **detailed assessment is required.**

Benny Stream (GB108049000210)

13.1.76 This water body contains Mainline Cutting 12 and Side Road Cutting 6 (Table 13-2). Both features are anticipated to be above typical groundwater levels, with no effects upon surface water – groundwater interactions anticipated. Therefore, the water body is scoped out of further assessment or mitigation.

West Cornwall (GB40802G800100)

13.1.77 This water body contains sections of Mainline Cuttings 2, 4-6 and 9, along with Side Road Cuttings 3-5 (Table 13-2). Groundwater levels are anticipated to be above the cutting level in Mainline Cuttings 4, 5 and 9 and Side Road Cuttings 3-5 with potential impacts during construction and operation of the scheme.

13.1.78 A desk-based assessment has not identified any nearby groundwater receptors of value to WFD quality elements (**DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Sections 13.5). Therefore, no effects upon the status or objectives of WFD quality elements are anticipated and the water body is scoped out of further assessment.

South Cornwall (GB40802G800200)

13.1.79 This water body contains sections of Mainline Cuttings 1 and 3-10, along with Side Road Cuttings 1-5 (Table 13-2). Groundwater levels are anticipated to be above the cutting level in Mainline Cuttings 4, 5, 9 and 10 and Side Road Cuttings 1 and 3-5 with potential impacts during construction and operation of the scheme.

13.1.80 A desk-based assessment has identified two areas of wet ground (at ch 9+900 and ch 11+200) that may be impacted by cutting construction (**DMRB Assessments** (Volume 6 Document Ref 6.4 ES Appendix 13.3), Sections 13.5). These features are disconnected from the wider surface water network and likely to be supported by groundwater and are therefore considered to be GWDTEs.

13.1.81 Given the potential for impacts upon these features, **detailed assessment is required.**

North Cornwall (GB40802G800300)

13.1.82 This groundwater body contains Mainline Cuttings 11 and 12, along with Side Road Cutting 6 (Table 13-2). Cutting levels are anticipated to be above typical groundwater levels. Resultingly, no effects upon groundwater resources are anticipated and the water body is scoped out of further assessment or mitigation.

Stage 3: Detailed assessment

13.1.83 Potential impacts upon surface water and groundwater WFD quality elements have been identified because of dewatering associated with the construction and operation of cuttings. These potential impacts shall be mitigated by incorporating the following measures during the detailed design of the scheme:

- Detailed assessment shall be undertaken during detailed design to fully understand the potential impact upon each feature of interest. This should include hydrogeological calculations of the likely drawdown of the water table and monitoring of the recharge mechanisms where applicable.
- Where the potential for impact remains following detailed assessment, suitable mitigation should be implemented to prevent impacts upon the existing feature (e.g. local re-profiling of ponds to maintain their ecological value). Where impacts cannot be prevented, a compensatory feature of similar or greater value should be created in consultation with the EA. These would seek to mimic or enhance the habitat features that were being lost and should be designed by a suitably qualified team, which includes an ecologist and a geomorphologist.

13.1.84 The assessment should be updated following the implementation of the mitigation measures proposed during the detailed design stage.

Consultation

13.1.85 Stakeholders have been consulted at various stages of the assessment, including during baseline data gathering and all stakeholders were offered the opportunity to comment on the PEIR.

13.1.86 The Environment Agency has been consulted at the PEIR stage and indicated that they were satisfied with the contents of the document. This included an initial WFD Compliance Assessment for the scheme.

Conclusions

13.1.87 It is considered that the activities related to the scheme will not cause deterioration in the status of any WFD water bodies or prevent them from achieving either Good Ecological Status or Potential by 2021/2027, provided that the mitigations listed in Section 0 are implemented. The delivery of this mitigation is secured by its inclusion within the Environment Statement as part of the DCO submission.

13.1.88 This assessment has been based on currently available WFD baseline data and design information for the scheme. The assessment is considered a ‘live’ document and should be reviewed and updated at detailed design and construction, particularly if:

- the EA update or provide additional WFD baseline data for the relevant water bodies; and/or
- significant changes to the nature, alignment, scale or construction methods of the Proposed Development are made.

13.1.89 Any future updates to the assessment should be shared and agreed with the EA as the regulatory authority for the WFD in England.

Annex A Background to the WFD

1 Overview of the WFD

1.1 Aims

1.1.1 The Water Framework Directive (WFD) aims to protect and enhance the quality of the water environment across all European Union (EU) member states. It takes a holistic approach to the sustainable management of water by considering the interactions between surface water, groundwater and water-dependent ecosystems.

1.1.2 Under the WFD, 'water bodies' are the basic management units and are defined as all or part of a river system or aquifer. These water bodies form part of a larger 'River Basin District' (RBD), for which 'River Basin Management Plans' (RBMP) are developed by EU member states and environmental objectives are set. These RBMP are produced every six years, in accordance with the river basin management planning cycle.

1.1.3 The WFD requires all EU member states to classify the current condition or 'status or potential' of surface water and groundwater bodies and to set a series of objectives for maintaining or improving conditions so that water bodies maintain or reach 'good status or potential'.

1.2 WFD requirements for new developments

1.2.1 To ensure compliance with the WFD, decision makers must consider whether proposals for new developments have the potential to:

- cause a deterioration of a water body from its current status or potential;
- prevent future attainment of good status or potential where not already achieved;
- impact on protected or priority species and habitats; and/or
- provide opportunities to improve the water environment.

2 Legislative Context

2.1 EU Water Framework Directive

2.1.1 The Water Framework Directive (WFD)[15] has been in force since 2000 and is currently the largest and most influential piece of European Union (EU) legislation relating to the water environment. The Directive was transposed into UK law by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017[16]. The Environment Agency is the competent authority responsible for delivering the Directive in England.

[15] EU Water Framework Directive: Directive 2000/60/EC of the European Parliament and of the Council; of 23 October 2000; Establishing a framework for Community action in the field of water policy.
[16] Statutory Instruments, 2017 No.407, The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

2.1.2 The Directive requires that Environmental Objectives be set for all surface and groundwater water bodies to enable them to achieve 'Good Ecological Status' (GES) – or 'Good Ecological Potential' (GEP) for Heavily Modified and Artificial Water Bodies – by a defined date. These Environmental Objectives are to:

- prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- aim to achieve at least 'Good' status for all water bodies by 2021. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve Good status by 2027;
- meet the requirements of WFD Protected Areas;
- promote sustainable use of water as a natural resource;
- conserve habitats and species that depend directly on water;
- progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- contribute to mitigating the effects of floods and droughts.

2.1.3 The framework for delivering the Directive is through the definition of River Basin Districts (RBDs) and the River Basin Management Plans (RBMPs)17. The current and objective 'Overall Status', 'Ecological Status/Potential' and 'Chemical Status' classifications of each surface water body is set out in the relevant RBMP. Background information regarding the water body status classification process that applies under the WFD is provided in Annex A section 1.

2.1.4 All new (and currently on-going) activities in the water environment need to consider the requirements of the WFD to ensure that no changes occur that:

- cause a deterioration of current status of a water body; and
- prevent the achievement of the future status objectives of a water body (i.e. GES or GEP by 2021 or 2027).

2.1.5 This principle is now integrated into the project/option appraisal process, as well as the EIA requirements for proposed schemes/activities under the town and country planning system.

2.2 Water Framework Directive Directions (England & Wales) 2015

2.2.1 Under the WFD, a range of environmental standards and condition limits are applied in order to define water body status and the set status objectives via the RBMP process to support "healthy" aquatic life. For instance, standards are set for the composition of biological communities, the physicochemical water quality parameters, the concentration of pollutants, and the level of flows in rivers. These standards inform the EA on the implementation of the RBMP process, including the identification of measures required to support the achievement of GES/GEP objectives, as well as underpinning efforts to protect the water environment by helping to regulate activities that could cause adverse impacts.

[17] See: https://www.gov.uk/government/collections/river-basin-management-plans

2.3 Cycle 2 River Basin Management Plans

2.3.1 The 'Cycle 2' RBMPs were released in 2015 and are an update to the 'Cycle 1' plans originally published in 2009. This study has been conducted based on the 2015 Cycle 2 RBMP water body status classification data. This data comprises the latest information that is currently available regarding the baseline condition of WFD water bodies in the UK.

3 Determination of WFD status

3.1 Introduction

3.1.1 Surface water bodies and Groundwater bodies are defined within WFD legislation. There are three types of surface water body, as follows:

- Natural water bodies;
- Heavily Modified Water Bodies (HMWBs);
- Artificial Water Bodies (AWBs).

3.1.2 The overall status of natural surface water bodies is determined based on their Ecological Status and Chemical Status (see Figure 3.1 below). The overall status of Heavily Modified and Artificial Water Bodies is classified based on their Ecological Potential and Chemical Status. The overall status of groundwater bodies is determined based on their Quantitative Status and Chemical Status.

3.1.3 Groundwater bodies are defined within WFD legislation as Groundwater Management Units (GWMU) and Water Resource Management Units (WRMU) and their status is determined based on quantitative and chemical sub-elements.

3.1.4 How these determinations are made for both surface water and ground water bodies is described below.

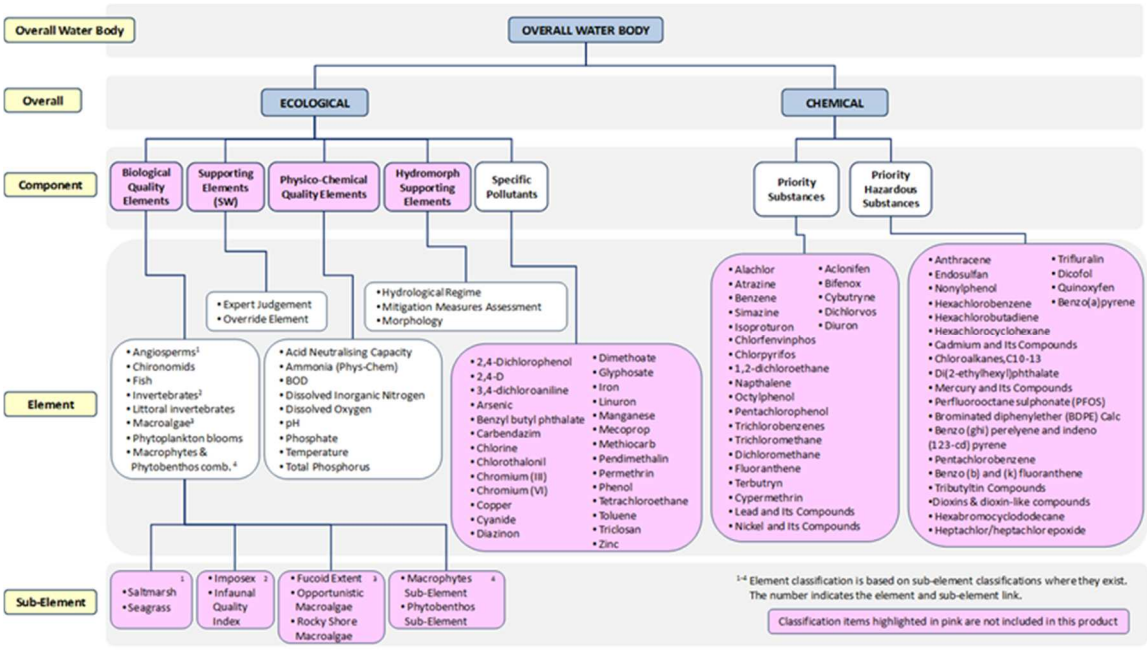

Figure 3-1 Overview of the Ecological Status and Chemical Status classification components for natural surface water bodies [EA, 2015]

3.2 Determination of the Ecological Status of natural surface water bodies

Ecological status

3.2.1 Ecological Status is defined by the overall quality of the structure and functioning of aquatic ecosystems associated with surface waters, i.e. the condition of the watercourse. This is assigned on a scale of High, Good, Moderate, Poor or Bad, and based on four classification elements or 'tests', as follows:

- **Biological** - This test is designed to assess the status indicated by a Biological Quality Element such as fish, invertebrates, macrophytes or phytobenthos (diatoms). The Biological Quality Elements can influence an overall water body status from Bad through to High. It is also important to note that the presence of invasive species prevents a water body from achieving high status when all other elements attain high.
- **Physicochemical** - This test is designed to assess the status indicated by Physicochemical Quality Elements such as dissolved oxygen, phosphorus and ammonia, against environmental standards. The Physicochemical Quality Elements can only influence an overall water body status from Moderate through to High.
- **Specific pollutants** - This test is designed to assess compliance with environmental standards for concentrations of Specific Pollutants, such as zinc, cypermethrin or arsenic. As with the physicochemical test, the specific pollutant assessment can only influence an overall water body status from Moderate through to High.
- **Hydromorphology** - For natural surface water bodies this test is undertaken by the Environment Agency during classification when the biological and physicochemical tests indicate that a water body may be of High status. It specifically assesses Hydromorphological Quality Elements such as water flow, sediment composition and movement, continuity, and structure of the habitat against reference or 'largely undisturbed' conditions. If the Hydromorphological Quality Elements do not support High Ecological Status, then the status of the water body is limited to Good overall status. Hydromorphological assessments are used to determine 'High' overall Ecological Status only, and are not be used to drive a water body status class below Good. The 'does not support good' classification should be reported for the purposes of identifying water bodies which fail the flow test.

3.2.2 The worst-case classification is assigned as the overall surface water body status, in a 'one-out all-out' system. This system is summarised in Figure 3.2.

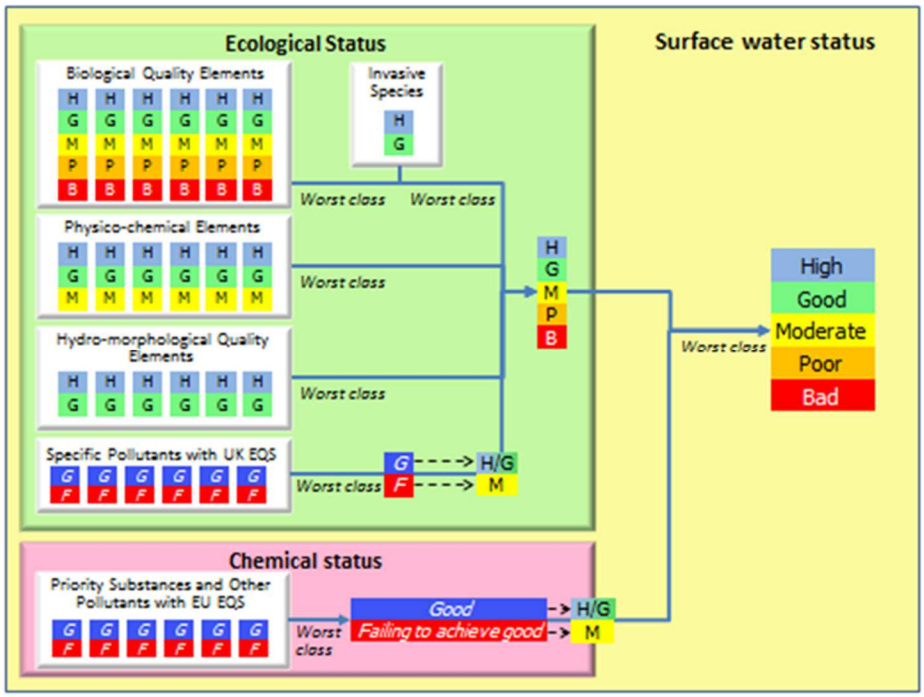

Figure 3-2 WFD classification elements for surface water body status. [Source: Environment Agency Rules for Assessing Surface Water Body Status and Potential (2015)]

Chemical status

3.2.3 Chemical Status is defined by compliance with environmental standards for chemicals that are Priority Substances and/or Priority Hazardous Substances, in accordance with the Environmental Quality Standards Directive (2008/105/EC). This is assigned on a scale of Good or Fail.

3.2.4 Surface water bodies are only monitored for Priority Substances where there are known discharges of these pollutants; otherwise surface water bodies are reported as being of Good Chemical Status.

3.3 Determination of Ecological Potential for Heavily Modified (and Artificial) Water Bodies

3.3.1 Ecological Potential is assigned to Artificial Water Bodies (AWB) (such as reservoirs and canals), or natural water bodies which, because of physical alterations by human activity, are substantially changed in character. The latter are termed Heavily Modified Water Bodies (HMWB). The term 'Ecological Potential' is used to classify AWBs and HMWBs as it may be impossible for these water bodies to achieve Good Ecological Status (GES) because of their creation or modification for a specific use, such as navigation, water supply or flood protection. The Ecological Potential of an AWB or HMWB represents the degree to which the quality of the water body approaches the optimum condition it could achieve given its artificial or heavily modified state.

3.3.2 AWB and HMWBs are subject to an additional set of rules that need to be implemented prior to running the one-out-all-out process. These rules determine which Biological Quality Elements should be used in the water body Ecological

Potential classification. Under normal circumstances, AWB and HMWBs are classified according to an assessment of Mitigation Measures, which defines Good Ecological Potential in water bodies where all applicable mitigation is in place, and Moderate Ecological Potential in water bodies where some or all relevant mitigation is missing. However, to prevent AWB and HMWBs being incorrectly classified as good potential in situations where all mitigation is in place, but other pressures are causing an impact (e.g. nutrient enrichment or pollution from toxic substances), the methodology adopted in the UK additionally considers biological indicators providing they are not sensitive to the heavily modified nature of the water body.

3.3.3 AWB and HMWB hydromorphological elements are assessed using a 3-stage process, firstly looking at flow, then Mitigation Measures and Biological Quality Elements.

3.3.4 Flow conditions are assessed initially on a fail or pass basis to determine which of the Biological and Physicochemical Quality Elements should be used in the classification of Ecological Potential.

3.3.5 Where the flow conditions are unaffected by the physical modification (flow conditions pass), the water body potential is determined by the worst of either the Mitigation Measures assessment, or any element that is not sensitive to the modified nature of the water body.

3.3.6 Where the flow conditions are significantly impacted by the physical modification (flow conditions fail), the water body potential is determined by the worst of any of the Mitigation Measures assessments or the assessment of Biological Quality Elements, Physicochemical Quality Elements or Specific Pollutants.

3.3.7 Where a water body is designated as Artificial or Heavily Modified for water resources usage, either solely or jointly with other uses, the flow condition is assumed to be good (pass).

3.4 Determination of the Ecological Status of groundwater bodies

3.4.1 Under the WFD, groundwater body status is classified based on Quantitative Status and Chemical Status. The groundwater bodies are separated into Groundwater Management Units (GWMU) and Water Resource Management Units (WRMU). GWMU are sub-divisions of the groundwater to aid the resource assessment process. WRMU are sub-divisions according to the water resource availability and the management of water.

Quantitative status

3.4.2 Quantitative Status is defined by the quantity of groundwater available as base flow to watercourses and water-dependent ecosystems and as ‘resource’ available for use as drinking water and other consumptive purposes. It is assigned on a scale of Good or Poor, and based on four classification elements or ‘tests’ as follows:

- Saline or other intrusions - This test is designed to identify groundwater bodies where the intrusion of poor quality water, such as saline water or water of different chemical composition, because of groundwater abstraction is leading

to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.

- Surface water - This test is designed to identify groundwater bodies where groundwater abstraction is leading to a significant diminution of the Ecological Status of associated surface water bodies.
- Groundwater Dependent Terrestrial Ecosystems (GWDTE) - This test is designed to identify groundwater bodies where groundwater abstraction is leading to significant damage to associated GWDTE.
- Water balance - This test is designed to identify groundwater bodies where groundwater abstraction exceeds the 'available groundwater resource', defined as the rate of overall recharge to the groundwater body itself less the rate of flow required to meet the ecological needs of associated surface water bodies and GWDTE.

Chemical status

3.4.3 Chemical Status is defined by the concentrations of a range of key pollutants, by the quality of groundwater feeding into watercourses and water-dependent ecosystems and by the quality of groundwater available for drinking water purposes. This is assigned on a scale of Good or Poor, and based on five classifications elements or 'tests', as follows:

- Saline or other intrusions - This test is designed to identify groundwater bodies where the intrusion of poor quality water, such as saline water or water of different chemical composition, because of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.
- Surface water - This test is designed to identify groundwater bodies where groundwater is leading to a significant diminution of the chemical status of associated surface water bodies.
- GWDTE - This test is designed to identify groundwater bodies where groundwater is leading to significant damage to associated GWDTE.
- Drinking Water Protected Areas (DrWPA) - This test is designed to identify groundwater bodies failing to meet the DrWPA objectives defined in Article 7 of the WFD or at risk of failing in the future. The aim is no deterioration in quality of waters for human consumption.
- General quality assessment - This test is designed to identify groundwater bodies where widespread deterioration in quality has, or will, compromise the strategic use of groundwater. The aim is no significant impairment of human use of groundwater and no significant environmental risk from pollutants across a groundwater body.

3.4.4 Status is assessed primarily using data collected from the Environment Agency monitoring network; therefore the scale of assessment means that groundwater status is mainly influenced by larger scale effects such as significant abstraction or widespread diffuse pollution. The worst-case classification is, as with surface water bodies, assigned as the overall groundwater body status, in a 'one-out all-out' system. This system is summarised below in Figure 3.3.

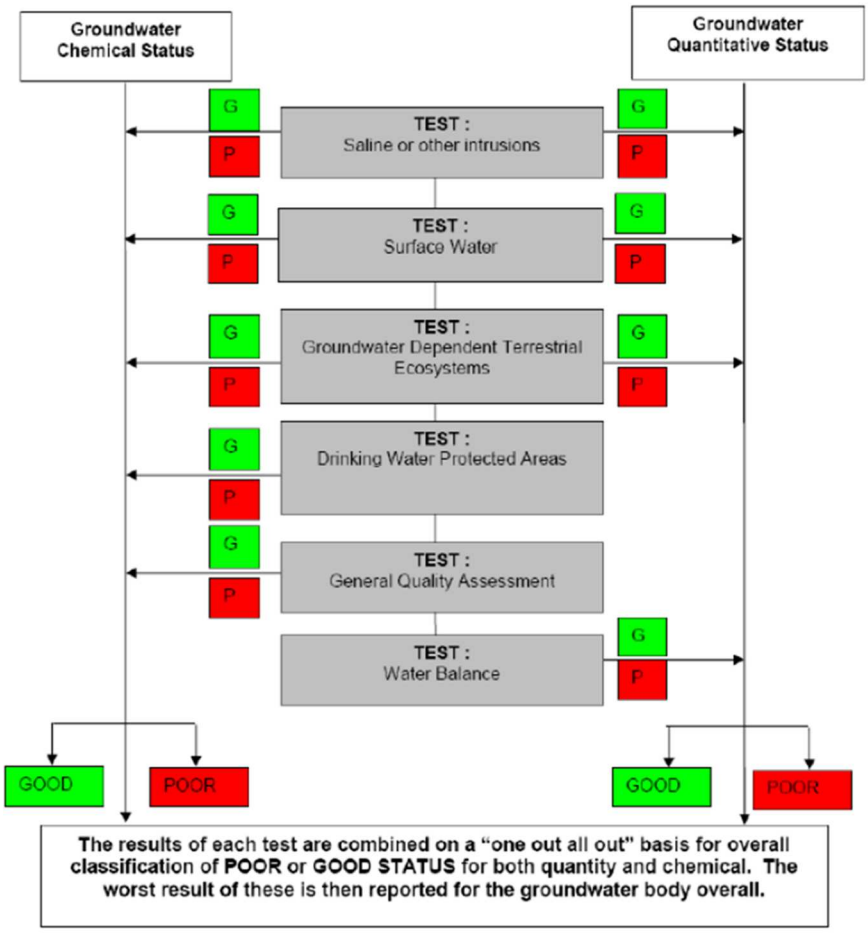

Figure 3-3 WFD classification elements for groundwater body status. [Source: Environment Agency Groundwater Quantitative Status Assessment (Classification) Method Statement]

3.5 Assessing Deterioration

3.5.1 Any activity that has the potential to have an impact on ecological status of a water body (as defined by the biological, physic-chemical, and hydromorphological quality elements) needs consideration as to whether it could cause deterioration in the current Ecological Status or Ecological Potential classification. Deterioration is reported as a negative change between classes in Ecological Status or Potential (e.g. from Good to Moderate status).

3.5.2 Moreover, all activities that could impact on watercourses also need to be considered in terms of whether they will compromise the ability of the water body to reach Good Ecological Status or Good Ecological Potential by the date specified in the RBMP.

3.6 Article 4.7 Derogation

3.6.1 Article 4.7 of the WFD states that Member States will not be in breach of the Directive when failure to meet its environmental objectives is the result of either new modification to the physical characteristics of a water body or as a result of new human sustainable development, on the proviso that the modifications or new development proposed are compliant with the key conditions outlined in the

Planning Inspectorate Guidance[1]. In doing so, Article 4.7 provides a means whereby a derogation for a proposed modification or sustainable development may be granted where it meets these four conditions.

3.6.2 The content of an Article 4.7 test report should document clearly how:

- all practicable steps have been taken to mitigate the adverse impact on the status of the water body;
- the reasons for the modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development;
- the beneficial objectives served by the modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

3.6.3 In addition, the reasons for the modifications or alterations need to be clearly identified to the Environment Agency, so that they can be specifically set out and explained in the relevant RBMP (as required under Article 13). These documents are reviewed every six years. This condition is addressed at a site-wide level.

Abbreviations List

WFD	Water Framework Directive
CEMP	Construction Environmental Management Plan
RBMP	River Basin Management Plan
SUDS	Sustainable Urban Drainage System

Glossary

Word	Explanation/description
Word	Explanation/description
Word	Explanation/description

References

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